TC 1-251

AIRCREW TRAINING MANUAL
Attack Helicopter
AH-64D

SEPTEMBER 2005

DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.

HEADQUARTERS
DEPARTMENT OF THE ARMY

CHANGE NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 28 May 2007

TRAINING CIRCULAR

AIRCREW TRAINING MANUAL

ATTACK HELICOPTER
AH-64D

TC 1-251, 14 September 2005, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page.

Remove pages	Insert pages
-----	A through B
i through vi	i through vii
1-1	1-1
2-1 through 2-11	2-1 through 2-11
4-1 through 4-8	4-1 through 4-8
4-61 through 4-62	4-61 through 4-62
4-65 through 4-68	4-65 through 4-68
4-71	4-71
4-73 through 4-80	4-73 through 4-80
4-91 through 4-92	4-91 through 4-92
4-99 through 4-104	4-99 through 4-104
4-107 through 4-110	4-107 through 4-110
4-131 through 4-136	4-131 through 4-136
4-147 through 4-148	4-147 through 4-148
4-155 through 4-158	4-155 through 4-161
-----	4-161.0 through 4-161.5
4-162	4-162
4-165 through 4-167	4-165 through 4-167
-----	4-167.0 through 4-167.1
4-168 through 4-174	4-168 through 4-174
4-183 through 4-194	4-183 through 4-194
4-213 through 4-216	4-213 through 4-216
-----	4-216.1 through 4-216.2
4-221 through 4-228	4-221 through 4-228
-----	4-228.1 through 4-228.3
4-243 through 4-256	4-243 through 4-256.4
-----	4-263 through 4-264
5-3 through 5-8	5-3 through 5-8
5-13 through 5-14	5-13 through 5-14
5-23 through 5-32	5-23 through 5-32

Remove pages	Insert pages
5-35 through 5-38	5-35 through 5-38
5-41 through 5-42	5-41 through 5-42
6-5 through 6-8	6-5 through 6-8
-----	A-1 through A-2
-----	B-1 through B-2
Index-1	Index-1

2. File this change sheet in the front of the publication for reference purposes.

By the order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

Joyce E. Morrow

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0713401

This publication is available at
Army Knowledge Online (www.us.army.mil) and
General Dennis J. Reimer Training and Doctrine
Digital Library at (www.train.army.mil).

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES: DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Date of issue for original and change pages are—

Original ……………0…………14 September 2005
Change………………...1……........……28 May 2007

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 376 CONSISTING OF THE FOLLOWING:

PAGE NO.	*CHANGE No.	PAGE NO.	*CHANGE No.
Cover	0	4-107 - 4-110	1
Publication Internet Listing	0	4-111 - 4-130	0
A – B	1	4-131 - 4-136	1
i – vi	1	4-137 - 4-146	0
vii Added	1	4-147 - 4-148	1
viii Blank Added	1	4-149 - 4-154	0
1-1 – 1-2 Blank	1	4-155 - 4-161	1
2-1 – 2-12 Blank	1	4-161.0 - 4-161.5 Added	1
3-1 – 3-8	0	4-163 - 4-164	0
4-1 – 4-8	1	4-165 - 4-167	1
4-9 – 4-60	0	4-167.1 – 4-167.2	1
4-61 – 4-62	1	4-168 - 4-174	1
4-63 – 4-64	0	4-175 - 4-182	0
4-65 – 4-68	1	4-183 - 4-194	1
4-69 – 4-70	0	4-195 - 4-212	0
4-71 – 4-80	1	4-213 - 4-216	1
4-81 – 4-90	0	4-216.1 - 4-216.2 Added	1
4-91 – 4-92	1	4-217 - 4-220	0
4-93 – 4-98	0	4-221 - 4-228	1
4-99 – 4-104	1	4-228.1 - 4-228.4 Added	1
4-105 - 4-106	0	4-229 - 4-242	0

***Zero in this column indicates an original page.**

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES: DESTROY SUPERSEDED PAGES.

***Zero in this column indicates an original page.**

Training Circular
No. TC 1-251

Headquarters
Department of the Army
Washington, DC, 28 May 2007

AIRCREW TRAINING MANUAL ATTACK HELICOPTER, AH-64D

Contents

Distribution Restriction: Approved for public release; distribution is unlimited.

Tasks

Figures

Tables

Preface

The aircrew training manual (ATM) standardizes aircrew training programs and flight evaluation procedures. This manual provides specific guidelines for executing AH-64D aircrew training. It is based on the battle-focused training principles outlined in FM 7-1. It establishes crewmember qualification, refresher, mission, continuation training, and evaluation requirements. This manual applies to all AH-64D crewmembers and their commanders.

This is not a stand-alone document. All of the requirements of AR 600-105, AR 600-106, NGR 95-210, and TC 1-210 must be met. Implementation of this manual conforms to AR 95-1 and TC 1-210. If differences exist between the maneuver descriptions in TM 1-1520-251-10 and this manual, this manual is the governing authority for training and flight evaluation purposes.

This manual (in conjunction with the ARs and TC 1-210) will help aviation commanders at all levels to develop a comprehensive aircrew training program. By using this ATM, commanders ensure that individual crewmember and aircrew proficiency is commensurate with the unit mission and that aircrews routinely employ standard techniques and procedures.

Crewmembers will use this manual as a “how to” source for performing crewmember duties. It provides performance standards and evaluation guidelines so crewmembers know the level of performance expected. Each task has a description of a technique that may be performed to safely meet the standard.

Standardization officers, evaluators, and unit trainers will use this manual and TC 1-210 as the primary tools to assist the commander to develop and implement his aircrew training program.

This manual applies to the Active Army, the Army National Guard (ARNG)/Army National Guard of the United States (ARNGUS), and the U.S. Army Reserve (USAR) unless otherwise stated.

The proponent of this publication is United States Army Training and Doctrine Command (TRADOC). Send comments and recommendations on DA Form 2028 (*Recommended Changes to Publications and Blank Forms*) through the aviation unit commander to Commander, U.S. Army Aviation Warfighting Center, ATTN: ATZQ-ES (Attack Section), Building 4503 Kingsman Avenue, Fort Rucker, Alabama 36362-5263. Recommended changes may also be e-mailed to ATZQES@conus.army.mil.

This publication implements portions of STANAG 3114 (Edition Seven).

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

This publication has been reviewed for operations security considerations.

This page intentionally left blank.

Chapter 1

Introduction

This ATM describes training requirements for crewmembers. It will be used with AR 95-1, AR 600-105, AR 600-106, NGR 95-210, TC 1-210, and other applicable publications. The tasks in this ATM enhance training in individual and aircrew proficiency. The training focuses on the accomplishment of tasks supporting the unit's mission. The scope and level of training to be achieved individually by crewmembers and collectively by aircrews will be dictated by the mission essential task list (METL). Commanders must ensure that aircrews are proficient in mission-essential tasks.

1-1. CREW STATION DESIGNATION. The commander will designate a crew station(s) for each crewmember. The commander's task list must clearly indicate all crew station designations. Training and proficiency sustainment is required in each designated crew station. Instructor pilots (IPs), standardization instructor pilots (SPs), instrument examiners (IEs), and maintenance examiners (MEs) must maintain proficiency in both seats. Commanders may designate unit trainers (UTs), maintenance pilots (MPs), selected pilots-in-command (PCs) and pilots as dual-station crewmembers. Aviators designated to fly from both stations will be evaluated in each seat during annual proficiency and readiness training (APART) evaluations including dual-seat designated flight activity category (FAC) 3. This does not mean that all tasks must be evaluated in each seat.

1-2. SYMBOL USAGE AND WORD DISTINCTIONS.

a. **Symbol usage.** The diagonal (/) indicates "and," "or," or both. For example, IP/SP may mean IP and SP or may mean IP or SP.

b. **Word distinctions.**

(1) Warning, caution, and note. These words emphasize important and critical instructions.

(a) A warning indicates an operating or maintenance procedure, practice, condition, or statement, which, if not strictly observed, could result in injury to, or death of, personnel.

(b) A caution indicates an operating or maintenance procedure, practice, condition, or statement, which, if not strictly observed, could result in damage to, or destruction of, equipment, or loss of mission effectiveness.

(c) A note highlights an essential operating or maintenance procedure.

(2) Will, must, shall, should, can, and may. These words distinguish between mandatory, preferred, and acceptable methods of accomplishment.

(a) Will, shall, or must indicate a mandatory requirement.

(b) Should is used to indicate a non-mandatory but preferred method of accomplishment.

(c) May or can indicates an acceptable method of accomplishment.

c. **Night vision devices (NVD).**

(1) Night vision system (NVS) refers to the night vision system that is attached to the aircraft systems (for example, the TADS/PNVS).

(2) NVG refers to any night vision goggle image intensifier system (for example, the AN/AVS-6 [ANVIS]).

(3) NVD refers to both NVG and NVS.

(4) MPD refers to the multipurpose display.

This page intentionally left blank.

Chapter 2

Training

This chapter describes requirements for qualification, readiness level (RL) progression, and continuation training. Crewmember qualification requirements will be per AR 95-1, TC 1-210, and this ATM.

Note: The following training restrictions apply for flight training and operations with night vision goggles (NVG).

- Both crewmembers must be night vision system (NVS) current.
- Pilot night vision system (PNVS) and target acquisition and designation sight (TADS) forward looking infrared (FLIR) remains the primary sensor for night operations and must be operational prior to takeoff, and during the entire mission.
- NVG tasks are not crew station specific. Evaluation or training in one seat will suffice for evaluation or training in the other crew station.
- For both crewmembers to fly using NVG simultaneously, one crew station must have and use an operational symbology display unit (SDU).

2-1. QUALIFICATION TRAINING.

a. **Aircraft qualification.** Initial or series qualification training will be conducted at the U.S. Army Aviation Warfighting Center (USAAWC) or a DA-approved training site according to a USAAWC-approved program of instruction.

b. **NVG qualification.** Initial NVG and AH-64D aircraft NVG qualification will be per this manual and TC 1-210.

(1) Initial NVG qualification. Initial qualification will be conducted at the U.S. Army Aviation Warfighting Center or DA-approved training site, according to the USAAWC-approved program of instruction, or locally using the USAAWC NVG ETP. The USAAWC NVG ETP may be obtained by writing to the Commander, U.S. Army Aviation Warfighting Center, ATTN: ATZQ-TDS-O, Fort Rucker, Alabama 36362-5105.

(2) Aircraft NVG qualification.

(a) Academic training. The crewmember will receive training and demonstrate a working knowledge of the topics of paragraph 3-4b(12). Academic training must be completed prior to flight training.

(b) Flight training. The crewmember will receive training, and demonstrate proficiency, from the designated crew station, in all base tasks marked with an X in the NVG column of table 2-1. He will also receive training and demonstrate proficiency in any other base tasks specified for NVG on the task list for the crewmember's position. If designated to perform NVG duties, Task 2081 Operate night vision goggles, becomes a mandatory training and evaluation task and will be added to the aviators crew task list (CTL).

Note: The AH-64D and the AH-64A are considered similar aircraft for NVG purposes. If an aviator is qualified in the AH-64A, there is no requirement to conduct an NVG aircraft qualification for the AH-64D.

c. **Minimum flight hours.** There are no minimum flight hour requirements. The qualification is proficiency based, determined by the crewmember's ability to satisfactorily accomplish the designated tasks.

d. Aircraft SDU qualification will be according to appendix A of this manual.

e. Aircraft Modernized Target Acquisition Designation Sight / Pilot Night Vision Sensor (MTADS/PNVS) qualification will be according to appendix B of this manual.

2-2. REFRESHER TRAINING.

a. **Aircraft refresher training.** Crewmembers will receive refresher training in the crew station(s) in which they are authorized to perform crew duties.

(1) Academic training. The crewmember will receive training and demonstrate a working knowledge of the applicable topics in paragraph 3-4b and complete the operator's manual written examination.

(2) Flight training. The crewmember will receive training and demonstrate proficiency from either crew station in each base task and in the modes marked with an X in the D, NS, I, and N columns of table 2-4. The crewmember will complete gunnery tables 3/4. Table 2-1 is a guide to developing a refresher flight training period. Crewmembers must demonstrate proficiency in required base tasks and be designated RL2 prior to undergoing mission training.

Table 2-1. Refresher flight training hours

Flight Instruction	***Hours***
Local area orientation	2.0
Demonstration and practice of individual tasks	8.0
Flight evaluation	2.0
Total hours	12.0
NVS Instruction	
Demonstration and practice of individual NVS tasks	10.0
Flight evaluation	2.0
Total hours	12.0
Instrument Instruction	
Flight or LCT training	4.0
Instrument evaluation	1.5
Total hours	5.5

b. **NVG refresher training.**

(1) Academic training. The crewmember will receive training and demonstrate a working knowledge of the applicable topics in 3-4b(12). Academic training must be completed prior to flight training.

(2) Flight training. The crewmember will receive training and demonstrate proficiency in all base tasks marked with an X in the NVG column of table 2-4 and other base tasks specified for NVG on the task list for the crewmember's position.

(3) Minimum flight hours. There are no minimum flight hour requirements. The training is proficiency based, determined by the crewmember's ability to accomplish the designated tasks satisfactorily.

2-3. MISSION TRAINING.

a. **Training requirements.**

(1) Academic training. The crewmember will receive training and demonstrate a working knowledge of the applicable mission topics in paragraph 3-4b.

(2) Flight training. The crewmember will receive flight training and demonstrate proficiency in the mission and additional tasks in each mode, as specified on the task list for the crewmember's position. Table 2-2 is a guide to developing a mission flight training period.

Table 2-2. Mission flight training hours

Flight Instruction	*Hours*
Local area orientation*	2.0
Mission tasks	20.0
Total hours	22.0

*Not required if accomplished during refresher training

b. **NVG mission training.** NVG mission training will be per the commander's training program specifying tasks and flight hours. When commanders determine a requirement for using NVG in mission profiles, they must develop a mission training program, specify mission tasks, and determine the minimum number of NVG training hours required. Before undergoing NVG mission training, the aviator must complete qualification or refresher training and must be NVG current in the AH-64D.

(1) Academic training. The crewmember will receive training and demonstrate a working knowledge of the subject areas designated by the commander.

(2) Flight training. The crewmember will receive flight training and demonstrate proficiency in the mission and additional NVG tasks, as specified on the task list for the crewmember's position.

(3) Minimum flight hours. There are no minimum flight hour requirements. The training is proficiency based, determined by the crewmember's ability to accomplish the designated tasks satisfactorily. NVG mission training may be included as part of refresher training.

Note: The AH-64D and the AH-64A are considered similar aircraft for NVG purposes. If an aviator is qualified in the AH-64A, there is no requirement to conduct an NVG mission qualification for the AH-64D. Only those additional mission tasks not designated in the AH-64A need to be evaluated.

c. **Maintenance test pilot (MP) and maintenance examiners (ME) mission training.** Due to the complexity of the AH-64D, MPs and MEs should be limited to duties in their primary aircraft only. They should be required to complete only those mission or additional tasks that the commander considers complimentary to the mission. Personnel performing duties as MPs should be classified as flight activity code (FAC) 2 aviators. Commanders are not authorized to delete any maintenance test pilot tasks.

(1) Academic training. The crewmember will receive training and demonstrate a working knowledge of the subject areas in paragraph 3-4b(13).

(2) Flight training. The MP/ME will receive training and demonstrate proficiency in the tasks in table 2-3.

(3) Table 2-3 is a guide to developing a maintenance test pilot / maintenance examiner flight training period.

Table 2-3. Maintenance test pilot / maintenance examiner flight training hours

Flight Instruction	*Hours*
Maintenance test flight area orientation	1.0
Demonstration and practice of test flight tasks	8.0
Flight evaluation	2.0
Total hours	11.0

2-4. CONTINUATION TRAINING

a. **Semiannual aircraft flying-hour requirements.**

(1) Single-seat designated aviator.

(a) FAC 1—70 hours, of which 63 hours must be flown in the designated crew station.

(b) FAC 2—50 hours, of which 45 hours must be flown in the designated crew station.

(c) FAC 3—No crew duties authorized in Army aircraft.

Note: At least once annually, FAC 1 and FAC 2 single-seat designated aviators will receive a familiarization flight in the opposite crew station in the aircraft with an IP, SP, IE, UT, or an approved simulation device.

(2) Dual-seat designated aviators (IPs; SPs; IEs; MEs; and commander-designated MPs, UTs, PCs, and PIs).

(a) FAC 1—70 hours, of which 15 hours must be flown in each crew station.

(b) FAC 2—50 hours, of which 7.5 hours must be flown in each crew station.

(c) FAC 3—No crew duties authorized in Army aircraft.

b. **Semiannual simulation device flying-hour requirements.** Trainers and evaluators may credit instructor/operator (I/O) hours toward their semiannual simulation device flying-hour requirements. However, at least 4.5 hours must be flown in each crew station semiannually. All aviators may apply a maximum of 12 simulation hours flown in a semiannual period toward that period's semiannual flying-hour requirements for 2-4a(1) and (2) above. RCMs may apply 12 hours of LCT time toward their semiannual aircraft flying hour requirements. All Active and Reserve RCMs within 200 statue miles (SM) of an LCT will complete the following number of hours:

(1) Single-seat designated aviator.

(a) FAC 1—15 hours in the designated crew station.

(b) FAC 2—9 hours in the designated crew station.

(c) FAC 3—24 hours in the designated crew station.

(2) Dual-seat designated aviators (IPs; SPs; IEs; MEs; and commander-designated MPs, UTs, PCs, PIs, and FAC 3 aviators).

(a) FAC 1—15 hours, of which 4.5 hours must be flown in each crew station.

(b) FAC 2—9 hours, of which 3 hours must be flown in each crew station.

(c) FAC 3—24 hours, which may be flown in either crew station.

Note: RCMs outside of 200 SM refer to AR 95-1. ARNG RCMs refer to NGR 95-1.

c. **Hood/weather requirements.** All FAC 1, 2, and 3 aviators will complete hood or weather requirements as determined by the commander. This requirement may be completed in the aircraft or simulator. Hour requirements will be annotated on the DA Form 7120-R (*Commander's Task List*).

d. **Annual task and iteration requirements.**

(1) FAC 1 and FAC 2. Crewmembers must perform at least one task iteration annually in each mode the aviator is required to fly, as indicated in table 2-4 and on his CTL. One iteration of each task that can be trained in the aircraft must be performed in the aircraft. Day iteration tasks performed at night or while using NVDs may be counted for day iterations. The crewmember is responsible for maintaining proficiency in each task. The commander may require additional iterations of specific tasks.

(2) FAC 3. Each crewmember must perform at least one iteration of each task of table 2-4 in the simulator annually, and any additional iterations or mission tasks on his CTL. The crewmember is responsible for maintaining proficiency in each task. The commander may require additional iterations of specific tasks.

(3) MPs and MEs. In addition to required minimum annual tasks and iterations, MPs will perform a minimum of four iterations of MTF mission tasks annually. The commander should incorporate six hours per test pilot in the annual flying-hour program for MP and ME training and evaluations. MEs and dual-seat-designated MPs will perform two iterations from each flight crew station annually. Each MTF mission task listed is mandatory for an MTF standardization evaluation.

2-5. TASK LIST.

a. **PERFORMANCE TASK.** For the purpose of clarifying mode and conditions, a performance task is differentiated from a technical task. An ATM performance task is defined as a task designed primarily to measure the ability of the crewmember to perform, manipulate the controls, and respond to tasks that are affected by the mode of flight. These tasks are significantly affected by the conditions and the mode of flight and, therefore, the mode and condition under which the task must be performed is specified. These tasks are listed in **UPPERCASE** and **BOLD** throughout this manual.

b. **Technical task.** Technical tasks may be performed under all conditions, regardless of the listed task iteration requirements. Technical tasks are characterized as those tasks that measure the ability of the crewmember to 1) plan; 2) preflight; 3) brief; 4) run up; 5) shut down; 6) debrief; or 7) operate specific onboard systems, sensors, pages, avionics, and so forth while in flight or on the ground. These tasks are not significantly affected by the mode of flight and may be performed or evaluated in any mode or either cockpit. These tasks are in lowercase and plain type throughout this manual.

Note: Task iteration condition code "I" (instrument), as used on DA Form 5484-R (*Mission Schedule/Brief*), is an independent flight condition as explained in AR 95-1, appendix C. Instrument (H or W) condition tasks may be flown at night or during the day, per mission briefing.

Table 2-4. Aviator base task list

Task	Title	D	N	NS	NVG	SIM	EVAL
1000	Participate in a crew mission briefing	X					S, I, NS, NVG
1004	Plan a visual flight rules flight	X					S
1006	Plan an instrument flight rules flight	X					I
1010	Compute/verify aircraft performance planning	X					S, I
1012	Verify aircraft weight and balance	X					S, I
1013	Operate mission planning system	X					S
1014	Operate aviation life support equipment	X					S
1022	Perform preflight inspection	X					S, I

Table 2-4. Aviator base task list							
Task	Title	D	N	NS	NVG	SIM	EVAL
1024	Perform before starting engine through before leaving helicopter checks	X					S, I
1026	MAINTAIN AIRSPACE SURVEILLANCE	X	X	X	X	X	S, I, N, NS, NVG
1028	PERFORM HOVER POWER CHECK	X	X	X	X	X	S, I, N, NS, NVG
1032	Perform radio communications procedures	X					S, I
1034	PERFORM GROUND TAXI	X	X	X		X	S, N, NS
1038	PERFORM HOVERING FLIGHT	X	X	X	X	X	S, N, NS, NVG
1040	PERFORM VISUAL METEOROLOGICAL CONDITIONS TAKEOFF	X	X	X	X	X	S, N, NS, NVG
1041	PERFORM TRAFFIC PATTERN FLIGHT	X	X	X	X	X	S, N, NS, NVG
1044	NAVIGATE BY PILOTAGE AND DEAD RECKONING	X	X	X	X	X	S, NS, NVG
1046	Perform electronically aided navigation	X					S
1048	Perform fuel management procedures	X					S, I, NS, NVG
1052	PERFORM HIGH SPEED FLIGHT	X		X		X	
1055	PERFORM HIGH/LOW G FLIGHT	X		X		X	
1058	PERFORM VISUAL METEOROLOGICAL CONDITIONS APPROACH	X	X	X	X	X	S, N, NS, NVG
1062	PERFORM SLOPE OPERATIONS	X		X	X	X	S, NS, NVG
1064	PERFORM A ROLL-ON LANDING	X		X	X	X	S, NVG
1070	Respond to emergencies	X					S, I, N, NS, NVG
1072	PERFORM ENGINE FAILURE, IN-GROUND EFFECT HOVER					X	
1073	PERFORM ENGINE FAILURE, OUT-OF-GROUND EFFECT HOVER	X		X		X	S, NS
1074	RESPOND TO ENGINE FAILURE AT CRUISE FLIGHT	X	X	X	X	X	S, I, N, NS, NVG
1075	PERFORM SINGLE ENGINE LANDING	X	X	X	X	X	S, N, NS, NVG
1082	PERFORM AUTOROTATION	X		X		X	S, NS
1085	PERFORM SCAS-OFF/BUCS-ON FLIGHT	X		X		X	S
1110	PERFORM ELECTRONIC CONTROL UNIT/DIGITAL ELECTRONIC CONTROL UNIT LOCKOUT PROCEDURES	X		X		X	S
1114	PERFORM A ROLLING TAKEOFF	X		X	X	X	S, NS, NVG

Table 2-4. Aviator base task list							
Task	***Title***	***D***	***N***	***NS***	***NVG***	***SIM***	***EVAL***
1116	Perform tactical situation display operations	X					S
1122	Perform target store procedures	X					S
1132	Perform integrated helmet and display sight system boresight	X					S, NS
1133	Perform aircraft position update function	X					
1134	Perform integrated helmet and display sight system operations	X					S, NS
1135	Perform integrated helmet and display sight system video adjustments	X					S, NS
1138	Perform target acquisition and designation sight boresight (F)	X					S
1139	Perform target acquisition and designation sight operational checks (F)	X					S, NS
1140	Perform target acquisition and designation sight sensor operations (F)	X					S, NS
1142	Perform digital communications	X					S
1143	Perform fire control radar operational checks	X					S
1144	Perform fire control radar operations	X					S
1148	Perform data management operations	X					S
1155	**NEGOTIATE WIRE OBSTACLES**	**X**		**X**		**X**	**S**
1160	Operate video recorder	X					S
1170	Perform instrument takeoff	X					I
1172	Perform radio navigation	X					I
1174	Perform holding procedures	X					I
1176	Perform nonprecision approach	X					I
1178	Perform precision approach	X					I
1180	Perform emergency global positioning system recovery procedure	X					S, I
1182	**PERFORM UNUSUAL ATTITUDE RECOVERY**	**X**		**X**		**X**	**S, I, NS**
1184	**RESPOND TO INADVERTENT INSTRUMENT METEOROLOGICAL CONDITION.**	**X**	**X**	**X**	**X**	**X**	**S, I, NS, NVG**
1188	Operate aircraft survivability equipment	X					S
1194	**Perform refueling/rearming operations**	**X**					
1262	Participate in a crew-level after-action review	X					S, I, N, NS, NVG
1402	Perform tactical flight mission planning	X					S
1404	Perform electronic countermeasures/electronic counter-countermeasures procedures	X					
1405	Transmit tactical reports	X					S

Table 2-4. Aviator base task list

Task	*Title*	*D*	*N*	*NS*	*NVG*	*SIM*	*EVAL*
1406	**PERFORM TERRAIN FLIGHT NAVIGATION**	**X**		**X**	**X**	**X**	**S**
1407	**PERFORM TERRAIN FLIGHT TAKEOFF**	**X**		**X**	**X**	**X**	**S, NS, NVG**
1408	**PERFORM TERRAIN FLIGHT**	**X**		**X**	**X**	**X**	**S, NS, NVG**
1409	**PERFORM TERRAIN FLIGHT APPROACH**	**X**		**X**	**X**	**X**	**S, NS, NVG**
1410	**PERFORM MASKING AND UNMASKING**	**X**		**X**		**X**	**S, NS**
1411	**PERFORM TERRAIN FLIGHT DECELERATION**	**X**		**X**	**X**	**X**	**S, NS, NVG**
1412	**PERFORM EVASIVE MANEUVERS**	**X**		**X**		**X**	**S, NS**
1413	**PERFORM ACTIONS ON CONTACT**	**X**		**X**		**X**	**S, NS**
1414	**PERFORM FIRING POSITION OPERATIONS**	**X**		**X**		**X**	**S**
1415	**PERFORM DIVING FLIGHT**	**X**		**X**		**X**	
1416	Perform weapon initialization procedures	X					S
1422	**PERFORM FIRING TECHNIQUES**	**X**		**X**		**X**	**S, NS**
1458	Engage target with point target weapons system	X					S
1462	Engage target with rockets	X					S
1464	Engage target with area weapon system	X					S
1469	Perform area weapon system dynamic harmonization	X					
1471	Perform target handover	X					S
1835	Perform night vision system operational checks	X					S, NS

Legend:

D – Day
I – Instrument
(F) – Front seat only
N – Night
NVG – Night goggle evaluation
SM – Simulator
NS – Night system evaluation requirement
S – Standardization flight EVAL
EVAL – Mandatory annual proficiency and readiness test (APART)
CBRN – Chemical, biological, radiological, and nuclear
X – Mandatory annual task iteration requirement

Note 1: Except for those tasks designated as "N" or "NVG" in the EVAL column, which additionally must be evaluated in those modes, tasks evaluated in a more demanding mode may be credited toward completion of annual evaluation requirements. "NS" is considered the most demanding mode, followed by "N," "D," and finally, "SM."

Note 2: Tasks identified with both "S" and "I" in the EVAL column may be evaluated during either or both evaluations. Tasks identified with "SM" only in the EVAL column will be evaluated in the aircraft simulator. If a simulator is not available, they are not considered mandatory evaluation tasks.

Note 3: For the purpose of clarifying mode and conditions, a performance task is UPPERCASE and BOLD throughout this figure.

Table 2-5. Aviator mission task list	
Task	**Title**
2010	**PERFORM MULTIAIRCRAFT OPERATIONS**
2013	Perform tactical fire computer airborne target handover system air/transfer mode operations
2042	**PERFORM TEAM EMPLOYMENT TECHNIQUES**
2045	**OPERATE THE IR ZOOM LASER ILLUMINATOR-DESIGNATOR (IZLID) 1000P-W LASER**
2050	Develop an emergency global positioning system recovery procedure
2066	Perform extended range fuel system operations
2068	**PERFORM SHIPBOARD OPERATIONS**
2081	**OPERATE NIGHT VISION GOGGLES**
2127	**PERFORM COMBAT MANEUVERING FLIGHT**
2130	**PERFORM CLOSE COMBAT ATTACK**
2162	Call for indirect fire
2164	Call for a tactical air strike
2170	**OPERATE NIGHT VISION GOGGLES WITH THE SDU (SYMBOLOGY DISPLAY UNIT) ATTACHED**

Task	Title
4000	Perform prior-to-maintenance test-flight checks
4001	Perform a maintenance operational check/maintenance test flight crewmember brief
4004	Perform interior checks
4008	Perform before starting auxiliary power unit checks
4010	Perform starting auxiliary power unit checks
4012	Perform after-starting auxiliary power unit checks
4088	Perform starting engine checks
4090	Perform engine runup and systems checks
4110	Perform before-taxi checks
4112	**PERFORM TAXI CHECK**
4114	**PERFORM BASELINE AND NORMAL ENGINE HEALTH INDICATOR TEST**
4123	Perform before-hover checks
4144	**PERFORM HOVER CHECKS**
4160	**PERFORM HOVER MANEUVERING CHECKS**
4162	**PERFORM FLIGHT MANAGEMENT COMPUTER/ATTITUDE HOLD CHECKS**
4182	**PERFORM VISIONIC SYSTEMS CHECKS**
4184	**PERFORM HOVER BOX DRIFT CHECKS**
4208	**PERFORM INITIAL TAKEOFF CHECKS**
4220	**PERFORM MAXIMUM POWER CHECK**
4221	**PERFORM MAXIMUM POWER CHECK NONLIMITING METHOD**
4222	**PERFORM CRUISE FLIGHT CHECKS**
4236	**PERFORM AUTOROTATION REVOLUTIONS PER MINUTE CHECK**
4238	**PERFORM ATTITUDE HOLD CHECK**
4240	**PERFORM MANEUVERING FLIGHT CHECKS**
4242	**PERFORM STABILATOR SYSTEM CHECK**
4258	**DETERMINE TURBINE GAS TEMPERATURE SETTING/CONTINGENCY POWER**
4262	Perform communication and navigation equipment checks
4264	Perform sight/sensor checks
4266	Perform weapons systems check
4276	Perform special/detailed procedures
4284	Perform engine shutdown checks
4292	**PERFORM MAXIMUM OPERATING LIMIT SPEED CHECK**

2-6. CURRENCY REQUIREMENTS.

a. **Aircraft currency.** Aircraft currency will be per AR 95-1 and this paragraph. A crewmember whose currency has lapsed must complete a proficiency flight evaluation given in the aircraft by an IP/SP. The commander will designate the tasks for this evaluation.

b. **NVG currency.** Those aviators whose currency has lapsed must complete, as a minimum, a one-hour NVG proficiency evaluation given at night in the aircraft by an NVG IP/SP. The aviator must demonstrate proficiency in all tasks with an NVG in the evaluation column of table 2-1. To be considered NVG current, every 60 consecutive days an aviator must take part in at least a one-hour flight in the aircraft while wearing NVG.

c. **NVS currency.** To be considered NVS current, every 60 consecutive days an aviator must take part in a one-hour flight at night in the aircraft, during the day with blackout curtains, or a one-hour flight in the AH-64D simulator while using the NVS. An aviator must participate every 120 consecutive days in a one-hour flight in the aircraft at night while using NVS. Those aviators whose currency has lapsed must complete, as a minimum—

- A one-hour NVS proficiency evaluation given at night in the aircraft by an IP/SP.
- The aviator must demonstrate proficiency in all tasks with an NS in the evaluation column of table 2-1.

Note 1: Aviators assigned with the AH-64A as an additional aircraft may maintain NVS and NVG currency in either aircraft.

Note 2: Units may seek interim statement of airworthiness qualification (ISAQ) approval for the use of day curtains in support of NVS currency requirements. Direct support (DS) flight training will require the commander to develop an internal standing operating procedure (SOP) that addresses critical parameters of DS flight. He must authorize crew station assignments (for example, with an IP or UT in the CPG station), DS egress procedures, and other parameters (for example, auxiliary [AUX] tank restrictions, flight modes, or registration check procedures).

2-7. CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR (CBRN) TRAINING REQUIREMENTS.

a. Per TC 1-210, crewmembers will receive chemical, biological, radiological, and nuclear (CBRN) training in the tasks listed in below, if training is required. The commander may select other tasks based on the unit's mission. If CBRN tasks are selected, the commander will establish, in writing, a CBRN evaluation program.

b. Annually, crewmembers will perform at least one iteration of the following tasks while wearing MOPP level 4 CBRN gear.

(1) **TASK 1026, MAINTAIN AIRSPACE SURVEILLANCE.**

(2) **TASK 1028, PERFORM HOVER POWER CHECK.**

(3) **TASK 1034, PERFORM GROUND TAXI.**

(4) **TASK 1038, PERFORM HOVERING FLIGHT.**

(5) **TASK 1040, PERFORM VMC TAKEOFF.**

(6) **TASK 1058, PERFORM VMC APPROACH.**

This page intentionally left blank.

Chapter 3

Evaluations

This chapter describes evaluation principles and grading considerations. It also contains guidelines for conducting academic and hands-on performance testing. Evaluations are a primary means of assessing flight standardization and crewmember proficiency. Evaluations will be conducted per AR 95-1, TC 1-210, and this ATM.

3-1. EVALUATION PRINCIPLES.

a. **Value of evaluations.** The value of any evaluation depends on adherence to fundamental evaluation principles. These principles are described below.

(1) The evaluators must be selected not only for their technical qualifications but also for their demonstrated performance, objectivity, and ability to observe and provide constructive comments. These evaluators are the SPs, IPs, IEs, and MEs who assist the commander in administering the aircrew training program (ATP).

(2) The method used to conduct the evaluation must be based on uniform and standard objectives. In addition, it must be consistent with the unit's mission and strictly adhere to the appropriate standing operating procedures (SOPs) and regulations. The evaluator must ensure a complete evaluation is given in all areas and refrain from making a personal "area of expertise" a dominant topic during the evaluation.

(3) All participants must completely understand the purpose of the evaluation.

(4) Cooperation by all participants is necessary to guarantee the accomplishment of the evaluation objectives. The emphasis is on all participants, not just on the examinee.

(5) The evaluation must produce specific findings to identify potentional training requirements. The examinee needs to know what is being performed correctly or incorrectly, and how improvements can be made.

b. **Evaluation performance.** The evaluation determines the examinee's ability to perform tasks to prescribed standards. Evaluations will determine the examinee's ability to exercise crew coordination in conjunction with the accomplishment of selected tasks.

c. **Evaluation guidelines.** The guidelines for evaluating crew coordination are based on a subjective analysis of how effectively a crew performs together to accomplish a series of tasks. The evaluator must determine how effectively the examinee employs aircrew coordination, as outlined in chapter 6.

d. **Evaluation special circumstances.** In all phases of evaluation, the evaluator is expected to perform as an effective crewmember. At some point during the evaluation, circumstances may prevent the evaluator from performing as a crewmember. In such cases, a realistic, meaningful, and planned method should be developed to pass this task back to the examinee effectively. During the conduct of the flight evaluation, the evaluator normally performs as outlined in the task description or as directed by the examinee. At some point, the evaluator may perform a roll reversal with the examinee. The examinee must be made aware of both the initiation and termination of roll reversals. The examinee must know when he is being supported by a fully functioning crewmember.

Note: When evaluating a PC, IP, SP, ME, IE, or a unit trainer (UT), the evaluator must advise the examinee that, during role-reversal, he may deliberately perform some tasks or crew coordination outside the standards to check the examinee's diagnostic and corrective action skills.

3-2. GRADING CONSIDERATIONS.

a. **Academic evaluation.** The examinee must demonstrate a working knowledge and understanding of the appropriate subject areas.

b. **Flight evaluation.**

(1) Academic. Some tasks are identified in TRAINING AND EVALUATION REQUIREMENTS as tasks that may be evaluated academically. The examinee must demonstrate a working knowledge of the tasks. Evaluators may use computer based instruction (CBI), mock-ups, or other approved devices to assist in determining the examinee's knowledge of the task.

(2) Aircraft or simulator. These tasks require evaluation in the aircraft or the AH-64D simulator. Task standards are based on an ideal situation. Grading is based on meeting the minimum standards. The evaluator must consider deviations (high wind, turbulence, poor visibility, FLIR imagery, A/C performance and etc.) from the ideal conditions during the evaluation. If other than ideal conditions exist, the evaluator must make appropriate adjustments to the standards.

3-3. CREWMEMBER EVALUATION. Evaluations are conducted to determine the crewmember's ability to perform the tasks on his CTL and check understanding of required academic subjects listed in the ATM. When the examinee is an evaluator/trainer, the recommended procedure is for the evaluator to reverse roles with the examinee. When the evaluator uses this technique, the examinee must understand how the role-reversal will be conducted and when it will be in effect. Initial validation of an aviator's qualifications following a military occupational specialty (MOS) producing course or program of instruction/school (for example, AH-64D IP course, MP course, and IE course) will be conducted in the aircraft upon return from that course and in the aircraft at each new duty station.

a. **Recommended performance and evaluation criteria.**

(1) Pilot. The pilot must demonstrate a basic understanding of the appropriate academic subjects from paragraph 3-4b. In addition, he must be familiar with his individual aircrew training folder (IATF) and understand the requirements of his CTL.

(2) PC/MP. The PC/MP must meet the requirements in paragraph 3-3a(1). In addition, he must demonstrate sound judgment and maturity in the management of the mission, crew, and assets.

(3) UT. The UT must meet the requirements in paragraph a(2). In addition, he must be able to instruct the appropriate tasks and subjects, recognize errors in performance or understanding, make recommendations for improvement, train to standards, and document training.

(4) IP or IE. The IP or IE must meet the requirements in paragraph a(2). In addition, he must be able to objectively instruct, evaluate, and document performance of the pilot, PC, UT, and IE, using role-reversal for IP (for example, aircraft/night vision device [NVD] currency evaluations), IE, UT, and PC as appropriate. He must be able to develop and implement an individual training plan, and have a thorough understanding of the requirements and administration of the ATP.

(5) SP. The SP must meet the requirements in paragraph 3-3a(2) and (4). The SP must be able to instruct and evaluate IPs, SPs, UTs, and PCs, as appropriate, using role-reversal. The SP must also be able to develop and implement a unit-training plan and administer the commander's ATP.

(6) ME. The ME must meet the requirements in paragraph 3-3a(1) and (2). The ME must be able to instruct and evaluate other MEs and MPs using role reversal when required.

Note: SP/IP/IE/ME/UT will be evaluated on their ability to apply the learning and teaching process outlined in paragraph 3-4b(14).

b. **Academic evaluation criteria.**

(1) Proficiency flight evaluations (PFE). This evaluation is conducted per AR 95-1 and TC 1-210. The commander (or his representative) will select the topics to be evaluated from paragraph 3-4b.

(2) APART standardization evaluation D/N/NS. The IP will evaluate a minimum of two topics from the subject areas in paragraph 3-4b that apply. If evaluated, topics selected will be based on the unit mission essential task list (METL). In addition, the evaluator will have the examinee identify at least two aircraft components and discuss their functions.

(3) APART instrument evaluation. The IE will evaluate a minimum of two topics from the subject areas from paragraph 3-4b in relation to instrument meteorological condition (IMC) flight and flight planning. If the evaluated crewmember is an IP/SP/IE, the IE will evaluate the ability of the IP/SP/IE to instruct instrument related tasks.

(4) Annual NVG evaluation. The NVG IP will evaluate a minimum of two topics from the subject areas in paragraph 3-4b that apply.

(5) APART MP/ME evaluation. The ME will evaluate a minimum of two topics from the appropriate subject areas in paragraph 3-4b with specific emphasis on how they apply to maintenance test flights. Additionally, evaluate paragraph 3-4b(14) if the examinee is an ME.

(6) Other ATP evaluations. The SP/IP will evaluate a minimum of two topics from each subject area in paragraph 3-4b that apply.

3-4. EVALUATION SEQUENCE. The evaluation sequence consists of four phases. The evaluator will determine the amount of time devoted to each phase.

a. **Phase 1—introduction.** In this phase, the evaluator will—

(1) Review the examinee's individual flight records folder (IFRF) and IATF records to verify that the examinee meets all prerequisites for designation and has a current DA Form 4186 (*Medical Recommendation for Flying Duty*).

(2) Confirm the purpose of the evaluation, explain the evaluation procedure, and discuss the evaluation standards and criteria to be used.

b. **Phase 2—academic evaluation topics.**

(1) Tactical and mission operations (FM 1-112, FM 1-114, FM 1-116, FM 3-04.140, FM 1-400, FM 1-402, TM 1-1520-251-10, and unit SOP). Topics in this subject area are—

- Mission graphics and symbols.
- Mission statement and employment method.
- Firing techniques.
- Attack by fire/support by fire/NORMA.
- Engagement area operations.
- Battlefield environment.
- Major U.S. or allied equipment and major threat equipment identification.
- Tactical formations and fire control.
- Firing position selection and recon.
- Target coordination and control.

- Fratricide prevention.
- Tactical reports.
- Aviation mission planning.
- Downed aircraft procedures.
- Aerial observation: visual/onboard sensors.
- Call for and adjust indirect fire.
- Navigational chart, map, and tactical overlay interpretation.
- Fire support and tactical airstrike control.
- Evasive maneuvers.
- Terrain flight planning safety.
- Radar countermeasures.
- Reconnaissance ops/mission fundamentals.
- Deck landing and flight operations.
- Combined-arms operations.

(2) Mission systems operation and employment (FM 1-112, FM 3-04.140, and TM 1-1520-251-10). Topics in this subject area are—

- Communication subsystem.
- Navigation subsystem.
- Tactical situation display (TSD) zones and improved data modem (IDM) messaging.
- Integrated helmet and display sight system (IHADSS) operation and boresight.
- Target storing, management, and handover.
- Fire control radar (FCR)/target acquisition and designation sight (TADS) operational checks and TADS boresight.
- Target acquisition.
- Up-front display (UFD), multipurpose display (MPD), and high action display (HAD) messages.
- Flight/weapons symbology.
- Aircraft survivability equipment.
- Degraded system operations.
- Sight/sensor acquisition slaving, linking, and cueing operations.

(3) Weapon system operation and deployment (FM 1-112, FM 3-04.140, and TM 1-1520-251-10). Topics in this subject area are—

- Hellfire missile, semiactive laser (SAL)/ radio frequency (RF) characteristics.
- 30-millimeter ammunition.
- Point target weapons system: SAL/RF LOAL (lock on after launch).
- Area weapon system.
- Laser operations (range/designator).
- FCR and laser operations.
- Hydra 70 rocket characteristics.
- Combined weapons engagement.
- Point target weapon system: SAL/RF LOBL (lock on before launch).
- Weapons initialization, arming, and safety.
- Weapons affects on night vision.
- Aerial rocket subsystem.

(4) Night mission operation and deployment (TC 1-204). Topics in this subject area are—

- Unaided night flight.
- Night visual limitations and techniques.
- Visual illusions.
- Helmet display optimization.
- Forward looking infrared (FLIR) sensor optimization.
- MPD optimization.
- Dark adaptation, night vision protection and central night blind spot.
- Night tactical operations, to include aircraft lighting.
- Night vision system (NVS) characteristics and operation.
- Flight symbology and modes.
- Aircrew night and NVD requirements.
- NVD limitations and techniques.
- Types of vision.
- Distance estimation and depth perception.
- Night terrain interpretation, map preparation, and navigation.
- Parallax effect.

(5) Aircraft and systems (TM 1-1520-251-10). Topics in this subject area are—

- Principal dimensions.
- Engines and related equipment.
- Flight control system.
- Power train and mast mounted assembly.
- Auxiliary power unit.
- Lighting.
- Flight instruments.
- Fuel system.
- Emergency equipment.
- Data management system.
- Hydraulic and integrated pressurized air system (IPAS).
- Main and tail rotor.
- Environmental control system.
- Electrical power management system.
- Servicing, parking, and mooring.
- Utility systems.

(6) Operating limitations and restrictions (TM 1-1520-251-10). Topics in this subject area are—

- Wind limitations.
- Power limits.
- Airspeed limits.
- Aircraft system limitations.
- Interim statement of airworthiness qualification (ISAQ).
- Flight envelope limitations: aircraft, aux tank, FCR, navigation.
- Weather/environmental limitations/restrictions.
- FCR, FLIR, NVD limitations.
- Rotor limits.
- Engine limits.
- Pressure limits.
- Temperature limits.
- Laser limits.
- MPD PERF page/performance chart interpretation.
- Weigh and balance requirements and MPD page interpretation.
- Other limitations.

(7) Aircraft emergency procedures and malfunction analysis (TM 1-1520-251-10). Topics in this subject area are—

- Emergency terms and definitions.
- Warning/caution/advisory MPD and UFD messages.
- Fault detection and isolation system procedures.
- Engine malfunctions and restart procedures.
- Fires and hot starts.
- Hydraulic system failures.
- Flight control failures/malfunctions.
- Mission equipment failures/malfunctions.
- Smoke and fume elimination.
- Tail rotor malfunctions.
- Fuel system malfunctions.
- NVS malfunctions.
- IHADSS malfunctions.
- After emergency action.
- Emergency exits, equipment, egress and entrance.
- Rotor, transmission, drive system malfunctions.
- Stability and command augmentation system (SCAS)–ON/backup control system (BUCS)–OFF malfunctions/flight.
- Electrical system failures.
- Landing and ditching.
- Caution/warning light procedures.
- Display processor failures.
- Electrical system malfunctions.
- Chip detectors.
- Environmental control system (ECS) failures.
- Weapon system malfunctions.
- Landing and ditching procedures.

(8) Regulations and publications (AR 95-1, DA Pam 738-751, Department of Defense (DOD) FLIP, TC 1-210, TM 1-1520-Longbow/Apache, TM 1-1520-251-10; local regulations, and unit SOPs). Topics in this subject area are—

- ATP, IATF/CTL requirements.
- DOD flight information pubs and maps.
- Airspace regulations and usage.
- Flight plan preparation and filing.
- Weight and balance requirements.
- Range operations and safety.
- Aviation life support equipment.
- Unit SOP and local requirements.
- Fuel requirements.
- Visual flight rules (VFR)/instrument flight rules (IFR) minimums and procedures.
- Crew coordination.
- Publications required in aircraft.
- Inadvertent IMC procedures.

(9) Aeromedical factors (AR 40-8, FM 3-04.301, and TC 1-204). Topics in this subject area are—

- Flight restrictions due to exogenous factors.
- Middle ear discomfort.
- Spatial disorientation.

(10) Aerodynamics (FM 1-203 and TM 1-1520-251-10). Topics pertaining to this subject area are—

- Effective translational lift.
- Dynamic rollover.
- Retreating blade stall.
- Settling with power.

(11) Maneuvering flight (AWR, AR 95-1, FM 1-107, FM 1-112, FM 3-04.140, FM 1-202, FM 1-203, TM 1-1520-251-10, and The Army Aviator's Handbook for Maneuvering Flight and Power Management). Topics in this subject area are—

- Techniques and considerations.
- Transient torque.
- Sustained turns.
- Vertical stabilizer during diving flight.
- Diving flight.
- Rotor disc coning and resultant revolutions per minute (RPM)/torque effects.

(12) NVG operation and deployment (ISAQ, FM 1-301, TC 1-210, TC 1-204, TM 1-1520-251-10, and unit SOP). Topics in this subject area are—

- Vision, depth perception, and night vision orientation.
- NVG effects on distance estimation and depth perception.
- Hemispherical illumination
- NVG terrain interpretation, map preparation, and navigation.
- Aircraft modification requirements for NVG flight.
- Night tactical operations, to include lighting.
- Night terrain interpretation.

(13) ME and MP system operations—systems malfunction analysis and trouble-shooting (TM 1-1520-251-10, EM 0126 integrated electronic technical manual (ETM) and TM 11-1520-Longbow/Apache, TM 1-1520-251-MTF). Topics in this subject area are—

- Engine start.
- Electrical system.
- Power plant.
- Hydraulic system.
- Vibrations.
- Communications and navigation equipment.
- Sensors–TADS and PNVS.
- Local airspace usage.
- Test flight weather requirements.
- Test flight forms and records.
- Instrument indications.
- Warning, caution, and advisory messages.
- Engine performance check.
- Flight controls.
- Fuel system.
- Fault detection and location system (FDLS).
- Stability augmentation subsystem (SAS) and hover augmentation system (HAS).
- Maintenance operation checks.
- Maintenance test flight requirements.

(14) SP, IP, IE, ME, and UT—evaluator/trainer topics (TC 1-210, IP Handbook). Topics in this subject area are—

- Levels of learning.
- Principles of learning.
- Characteristics of learning.
- Theories of forgetting.
- Obstacles to learning.
- Principles of remembering.
- Common defense mechanism.
- Steps in the teaching process.
- Professional instructor pilot.
- Abnormal reaction to stress.

c. **Phase 3—flight evaluation.** If this phase is required, the following procedures apply.

(1) Briefing. The evaluator will explain the flight evaluation procedure and brief the examinee on which tasks he will be evaluated. When evaluating an evaluator/trainer, the evaluator must advise the examinee that, during role-reversal, he may deliberately perform some tasks outside standards to check the examinee's diagnostic and corrective action skills. The evaluator will conduct or have the examinee conduct a crew briefing in accordance with Task 1000.

(2) Preflight inspection, engine-start, and runup procedures. The evaluator will evaluate the examinee's use of the appropriate TMs/CLs/MTFs, and/or the integrated electronic technical manual as appropriate. The evaluator will have the examinee identify and discuss the function of at least two aircraft systems.

(3) Flight tasks. As a minimum, the evaluator will evaluate those tasks listed on the CTL as mandatory evaluation for the designated crew station(s), type of evaluation being conducting and those mission or additional tasks selected by the commander. The evaluator, in addition to the commander-selected tasks, may randomly select for evaluation any tasks listed on the mission or additional task list. An IP, SP, ME, IE, and UT must demonstrate an ability to instruct and/or evaluate appropriate flight tasks. When used as part of the proficiency flight evaluation, the evaluation may include an orientation of the local area, checkpoints, and other pertinent information.

Note: During the conduct of any instrument flight evaluation, the aviator's vision will be restricted to the aircraft instruments. If the aircraft is not under actual IMC conditions, then wearing a vision-limiting device will restrict the vision, and the appropriate flight symbol will be logged on DA Form 2408-12 (*Army Aviator's Flight Record*).

(4) Engine shutdown and after-landing tasks. The evaluator will evaluate the examinee's use of the appropriate TMs/CLs/MTFs, and/or the integrated electronic technical manual (ETM), as appropriate.

d. **Phase 4—debriefing.** Upon completion of the evaluation—

(1) Discuss the examinee’s strengths and weaknesses.

(2) Offer recommendations for improvement.

(3) Tell the examinee whether he passed or failed the evaluation, and discuss any tasks not performed to standards.

(4) Complete the applicable forms and ensure that the examinee reviews and initials the appropriate forms.

Note: Inform the examinee of any restrictions, revocations or limitations the evaluator will recommend to the commander following an unsatisfactory evaluation.

Chapter 4

Crewmember Tasks

This chapter implements portions of STANAG 3114.

This chapter describes the tasks essential for maintaining crewmember skills. It defines the task, title, number, conditions, and standards by which performance is measured. A description of crew actions, along with training and evaluation requirements, is also provided. It does not contain all the maneuvers that can be performed in the aircraft.

4-1. TASK CONTENTS

a. **Task number.** Each ATM task is identified by a 10-digit systems approach to training (SAT) number. The first three digits of each task in this ATM are 011 (U.S. Army Aviation School); the second three digits are 251 (AH-64D attack helicopter). For convenience, only the last four digits are listed in this training circular. The last four digits of—

- Individual tasks are assigned 1000-series numbers.
- Mission tasks are assigned 2000-series numbers.
- Additional tasks are assigned 3000-series numbers.
- Maintenance tasks are assigned 4000-series numbers.

Note: Additional tasks designated by the commander as mission essential are not included in this ATM. The commander will develop conditions, standards, and descriptions for those additional tasks.

b. **Task title.** The task title identifies a clearly defined and measurable activity. Titles may be the same in several ATMs but the tasks are written for the specific aircraft.

c. **Conditions.** The conditions specify the situation (normal operation, wartime, training, or evaluations) under which the task will be performed. They describe important aspects of the performance environment. All conditions must be met before task iterations can be credited. References to AH-64 within this ATM apply only to the AH-64D series. Common conditions are as follows—

(1) Common conditions are—

(a) When a UT, IP, SP, IE, or ME is required for the training of the task in the aircraft, that individual will be at one set of flight controls while the training is performed.

(b) The following tasks require an IP or SP for training/evaluation in the aircraft.

- **TASK 1070, RESPOND TO EMERGENCIES.**
- **TASK 1073, RESPOND TO ENGINE FAILURE, OUT-OF-GROUND EFFECT (OGE).**
- **TASK 1074, RESPOND TO ENGINE FAILURE AT CRUISE FLIGHT.**
- **TASK 1075, PERFORM SINGLE-ENGINE LANDING.**
- **TASK 1082, PERFORM AUTOROTATION.**
- **TASK 1085, PERFORM SCAS-OFF/BUCS-ON FLIGHT.**
- **TASK 1110, PERFORM ECU/DECU LOCKOUT PROCEDURES.**
- **TASK 1182, PERFORM UNUSUAL ATTITUDE RECOVERY.** (An IP, SP, or IE may conduct the training/evaluation in the aircraft.)

(2) Unless otherwise specified in the conditions, all in-flight training and evaluation will be conducted under visual meteorological conditions (VMC). Simulated instrument meteorological condition (IMC) denotes flight solely by reference to flight instruments.

(3) Tasks requiring specialized equipment do not apply to aircraft that do not have the equipment installed. This consideration includes fire control radar (FCR) tasks or FCR task elements that cannot otherwise be adequately trained or evaluated from an AH-64D without radar. Trainers and evaluators should use an AH-64D simulator as an FCR surrogate when an actual AH-64D with radar is unavailable.

(4) When night vision goggles (NVG) are used to accomplish a task, standards will be the same as those described for performance of the task without the NVGs.

(5) Common conditions are—

(a) In a mission aircraft with mission equipment and crew, items required by AR 95-1, and required publications.

(b) Under visual or instrument meteorological conditions.

(c) Day, night, and night vision device employment.

(d) In any terrain or climate.

(e) In a chemical, biological, radiological, and nuclear (CBRN) environment with mission protective posture equipment used.

(f) In an electromagnetic environment effects (E3).

(g) Pilot on the controls (P*) and pilot not on the controls (P) fitted with a boresighted helmet display unit (HDU). (The PC may approve instances when wearing an HDU during task performance is not desired.)

(6) The aircrew will not attempt the tasks or task elements listed below when performance planning indicates that OGE power is not available.

(a) **TASK 1040, PERFORM VMC TAKEOFF** (confined area altitude over airspeed).

(b) **TASK 1058, PERFORM VMC APPROACH** (termination to an OGE hover).

(c) **TASK 1073, RESPOND TO ENGINE FAILURE, OGE HOVER.**

(d) **TASK 1408, PERFORM TERRAIN FLIGHT** (nap of the earth [NOE] flight).

(e) **TASK 1411, PERFORM TERRAIN FLIGHT DECELERATION.**

(f) **TASK 1410, PERFORM MASKING AND UNMASKING** (unmasking at a hover vertically).

(g) **TASK 1170, PERFORM INSTRUMENT TAKEOFF** (from a hover).

d. **Standards.** The standards describe the minimum degree of proficiency or standard of performance to which the task must be accomplished. The terms, “without error,” “properly,” and “correctly” apply to all standards. The standards are based on ideal conditions. Many standards are common to several tasks. Individual instructor pilot techniques are not standards, nor are they used as grading elements. Unless otherwise specified in the individual task, the common standards below apply. Alternate or additional standards will be listed in individual tasks.

(1) All tasks.

(a) Perform crew coordination actions per chapter 6 and the task description.

(b) Do not exceed aircraft limitations.

(2) Hover.

(a) Maintain heading +/- 10 degrees.

(b) Maintain altitude ±2 feet or ±10 feet OGE (80 feet above ground level [AGL] or higher).

(c) Do not allow drift to exceed 3 feet in-ground effect [IGE] or 12 feet OGE (80 feet AGL or higher).

(d) Establish and announce a forced landing or single engine flyaway plan when operating at an OGE hover.
(e) Maintain ground track within 3 feet.
(f) Maintain a constant rate of movement for existing conditions.
(g) Maintain a constant rate of turn.

(3) In flight.
(a) Maintain heading ±10 degrees.
(b) Maintain ground track alignment with minimum drift.
(c) Maintain altitude ±100 feet.
(d) Maintain airspeed ±10 knots.
(e) Maintain rate of climb or descent ±200 feet per minute (FPM).
(f) Maintain trim ±1 ball width.

(4) All tasks with the auxiliary power unit (APU)/engines operating.
(a) Maintain airspace surveillance (task 1026).
(b) Apply appropriate environmental considerations.

CAUTION

The PC will consider and ensure the crew is aware of the effects of an engine failure during combat maneuvering flight. Airspeed should be maintained between minimum and maximum single engine airspeed. If an engine failure occurs above or below these airspeeds, torque will immediately double associated with possible turbine gas temperature (TGT) limiting, which will result in rapid rotor decay that may not be recoverable.

Note 1: It is essential for the PC to brief specific duties before entering the aircraft. The ability for either crewmember to perform most aircraft/system functions breaks down the standard delineation of duties. This could mean that during an unforeseen event, one crewmember may attempt to resolve the situation, rather than seek assistance from the other crewmember.

Note 2: In lieu of performing multiple hover power checks, PERF page (CUR, PLAN, or MAX mode) calculations may be used by the PC or IP in determining the hover power torque (%Q) percent baseline. At the beginning of the flight, an initial hover power check should be completed in accordance with Task 1038 (IGE power available and environmental conditions permitting) and pertinent environmental and load considerations will be applied throughout the flight.

Note 3: Situational awareness information needed for the successful accomplishment of these tasks will be provided to each crewmember through their individual HDUs. The PC will approve those instances when it may be desired not to employ the HDU during the conduct of a flight-training mission or a specific flight maneuver.

Note 4: Minimum safe altitude (MSA) is defined as the minimum safe height above the surface or obstacles to which the aircraft can descend in a masked condition.

Note 5: Minimum maneuvering altitude (MMA) is defined as the altitude above the mask or barriers at which the aircraft may safely maneuver.

e. **Description.** The description explains one or more recommended techniques for accomplishing the task to meet the standards. This manual cannot address all situations and alternate procedures may be required. Tasks may be accomplished using other techniques, as long as the task is done safely and the standards are met. These actions apply in all modes of flight during day, night, instrument, night vision device (NVD), or CBRN operations. When specific crew actions are required, the task will be broken down into crew actions and procedures as follows:

(1) Crew actions. These define the portions of a task performed by each crewmember to ensure safe, efficient, and effective task execution. The designations P* (pilot on the controls), P (pilot not on the controls), PI (pilot, not the PC), PLT (backseat crewmember), and CPG (copilot-gunner, front seat crewmember) do not refer to PC duties. When required, PC responsibilities are specified. For all flight tasks, the following responsibilities apply.

(a) Both crewmembers. Perform crew coordination actions, and announce malfunctions or emergency conditions. Monitor engine and systems operations, and avionics (navigation and communication), as necessary. During VMC, focus attention primarily outside the aircraft, maintain airspace surveillance, and clear the aircraft. Provide timely warning of traffic and obstacles by announcing the type of hazard, direction, distance, and altitude. Crewmembers announce when attention is focused inside the aircraft—except for momentary scans—and announce when attention is focused back outside.

(b) The PC. The PC is responsible for the conduct of the mission, and for operating, securing, and servicing the aircraft he commands. The PC will ensure that a crew briefing is accomplished and that the mission is performed per air traffic control (ATC) instructions, regulations, and standing operating procedure (SOP). He may approve those instances when it may be desired to not employ the HDU during the conduct of a task.

(c) The PI. The PI is responsible for completing tasks as assigned by the PC.

(d) The P*. The P* is responsible for aircraft control, obstacle avoidance, and the proper execution of emergency procedures. He will announce any deviation, and the reason, from instructions issued. He will announce changes in altitude, attitude, airspeed, or direction. He will announce “braking” when he intends to apply brake pressure.

(e) The P. The P is responsible for navigation, computations, assisting the P* as requested and the proper execution of emergency procedures. When duties permit, assist the P* with obstacle clearance. The P will acknowledge braking by announcing “guarding.”

(f) The PLT. The PLT is the back seat crewmember.

(g) The CPG. The CPG is the front seat crewmember.

(h) The trainer/evaluator. When acting as pilot during training and evaluations, the trainer/evaluator will act as a functioning crewmember and perform as required, unless he is training or evaluating pilot response to an ineffective crewmember. In the aircraft, the trainer/evaluator will ensure safe landing areas are available for engine failure training and that aircraft limits are not exceeded. To prevent negative habit transfer during emergency training, the trainer/evaluator should recover the aircraft from simulated malfunction within the parameters of the procedure being trained or evaluated.

(2) Procedures. This section explains the portions of a task that an individual or crew accomplishes.

f. **Other considerations.** This section defines considerations for task accomplishment under various flight modes (for example, night, night vision system [NVS]/NVG, and environmental conditions—snow/sand/dust). Crewmembers must consider additional aspects to a task when performing it in different environmental conditions. The inclusion of environmental considerations in a task does not relieve the commander of developing an environmental training program per TC 1-210. Common night/NVG/NVS considerations are listed below and will be applied to tasks conducted in night/NVG/NVS modes.

(1) Night and NVD. Wires and other hazards are more difficult to detect and must be accurately marked and plotted on paper maps and tactical situation display (TSD). Visual barriers (areas so dimly viewable that a determination cannot be made if they contain barriers or obstacles) will be treated as physical obstacles. Always use proper scanning techniques to detect traffic and obstacles and avoid spatial disorientation. The P should make all internal checks (for example, computations and frequency changes). Altitude and ground speed are difficult to detect and use of artificial illumination may be necessary. Determine the need for artificial lighting prior to descending below barriers. Adjust light for best illumination angle without causing excessive reflection into the cockpit. Cockpit controls and switches will be more difficult to locate and identify. Take special precautions to identify and confirm the correct switches and controls.

(2) Night unaided. Use of the white light or weapons flash impairs night vision. The P* should not view white lights, weapons flash, or impact directly. Allow time for dark adaptation or, if necessary, adjust altitude and airspeed until adapted. Exercise added caution if performing flight tasks before reaching full dark adaptation. Dimly visible objects may be more easily detected using peripheral vision, but may tend to disappear when viewed directly. Use off-center viewing techniques to locate and orient on objects.

(3) NVS. The pilot night vision system (PNVS) and target acquisition and designation sight (TADS) forward-looking infrared (FLIR) both exhibit an inherent AC coupling video effect that pilots can use to enhance terrain flight obstacle avoidance procedures. AC coupling is the inherent system operation of AC coupled FLIR systems (such as on the AH-64D). Because of the importance to denote and exploit the phenomenon, this normal video effect has been descriptively termed “nap of the earth (NOE) coupling.”

(a) NOE coupling (AC coupling) is a positive AC coupling FLIR video effect that is predominately observed and exploited throughout the terrain flight environment. The FLIR video generated by the electro-optical (EO) multiplex (MUX) of the AC coupled system displays horizontal bands of varying shades of gray under many operational conditions. The varying bands of the grayscale scene are generated, for example, when a tree, obstacle, or structure is viewed with a differential background temperature.

(b) Objects/obstacles that extend above other surrounding objects/obstacles will have a comparably colder background rendition. A viewed object/obstacle that embodies a distinct cold component (cold background thermal rendition, such as sky) as compared to the remainder of the same object/obstacle that has a warm background (terrain, vegetation) as its overall background rendition will cause the EO MUX AC coupled FLIR to exhibit a perceivable distinct horizontal band separating a lighter or darker shade of gray. This scene discrimination is extremely important for a pilot to comprehend. “NOE coupling” is a cue that can help alert the aircrew to an obstacle or hazard on the immediate horizon that is horizontally opposed to the sensor or, in other words, the aircraft.

(c) During terrain flight, the differential in banding and grayscale definition means that an obstacle is in the flight or sensor’s path. Increasing altitude until the obstacle’s backdrop thermal rendition is relatively uniform will cause the banding to disappear and the object viewed will return to a common grayscale video definition display. The common grayscale object definition, with the absence of horizontal grayscale banding, now means that the aircraft is clear of obstacles or above the mask. Aircrews must meld “NOE coupling” cues with familiar monocular cues when operating in the terrain/tactical flight environment.

(d) The PNVS and TADS each possess an objective lens of a different size and corresponding “f number.” The PNVS has a larger objective lens, f/1.5, which collects more energy than the smaller TADS WFOV FLIR objective lens, f/2.3. Since the oversized PNVS objective lens collects more infrared (IR) energy, during times of attenuation, a normal functioning PNVS will be superior to that of the TADS for flight task functions. The TADS, with its reduced IR energy collecting capability, will be more susceptible to IR energy attenuation phenomena such as particles in the air and during operations at or near IR crossover.

(e) The PNVS and TADS each possess differing abilities to cope with the negative effects of AC coupling; for example, rolling maneuvers or in a turn. The primary disadvantages of AC coupling—direct current (DC) droop and undershoot—are most noticeable during rolling maneuvers when using the NVS NORM TADS-FLIR or TADS WFOV FLIR with GHS as the slaved acquisition source. The TADS is not equipped with automatic low frequency gain limiting (ALFGL) circuitry. TADS AC coupling video image degradation will worsen as a bank angle is increased.

Note. Negative effects within the PNVS itself are no longer a problem with the inclusion of ALFGL circuitry.

(4) The MTADS/PNVS may exhibit video characteristics that the operator should be aware of. These include—

(a) Frozen video. This is due to the loss of video link communication and results in a VIDEO FROZEN message in the status section of the selected sight symbology. The video will freeze if the missing frame count is greater than 10 (at a 60 Hz update rate) and the video will be removed if the count is not restored in 4 seconds. If the video is not restored, the affected crewmember should cycle the NVS mode switch from OFF to NORM. If the video is still not restored, follow the procedure for PNVS failure in TM 1-1520-251-10.

(b) Degraded video. This is due to a code word error, missing column count, or cyclic redundancy check within the MTADS/MPNVS system. The result is all or a portion of the video image will appear degraded, and a VIDEO DEGR message will appear in the status section of the selected sight symbology. If the crewmember determines the degraded system is not conducive to NVS flight, follow the procedures for PNVS failure in TM 1-1520-251-10.

(c) Loss of BUS communication. The result is the affected turret (MTADS/MPNVS) will move to the fixed forward position within 5 seconds. If DTV is selected, the sensor will change to FLIR wide field of view.

(d) Dead channel. This results in a failed detector and is evident by a horizontal line in the video.

(e) Flashing channels. This is caused by intermittent detectors and appears as a horizontal broken line or line segments. The broken line segments may alternate between black and white and may also flash.

(f) Cloud shifting: This appears as a lighter cloud in the horizon as a result of dynamic range compression (DRC) and IR detector non-uniformity. The non-uniform horizontal lines appear as a cloud which may move up and down through the lighter regions in the horizon caused by the DRC algorithm.

(g) DRC effect. When viewing vertical scene contents (objects such as a runway), the near and far areas of the object will appear in varying shades. This shading will not remain fixed; instead it will move vertically and may appear as a light fog in the scene.

(h) Halo effect. This effect occurs during low contrast scene contents where image enhancements can cause "halos" around an object. For example, during formation flight an aircraft above the horizon may appear to have borders on it that appear as a "halo."

(5) NVD. Using NVDs degrades distance estimation and depth perception. Aircraft in flight may appear closer than they actually are, due to the amplification of navigation lights and the lack of background objects to assist in distance estimation and depth perception. If possible, confirm the distance unaided. Weapons flash may temporarily impair or shut down NVGs.

g. **Training and evaluation requirements.**

(1) Task groups.

(a) Performance task. These tasks measure the crewmember's ability to perform, manipulate the controls, and respond to tasks that are affected by the mode of flight. These tasks are significantly affected by the conditions and/or mode of flight and, therefore, the mode and condition under which the task must be performed must be specified. The base tasks listed as performance tasks in table 2-5 already have the applicable modes of flight specified. The mission tasks listed as performance tasks in table 2-5 must have the modes specified by the commander based on the unit METL. These specified modes will be outlined in the unit SOP. These tasks are listed in uppercase and bold type on the commander's task list.

(b) Technical task. These tasks measure the crewmember's ability to plan, preflight, brief, run up, or operate specific onboard systems, sensors, or avionics—in flight or on the ground. These tasks are not significantly affected by the condition and/or mode of flight; therefore, they may be performed or evaluated in any condition and/or mode. These tasks are listed in lowercase and plain type on the commander's task list.

(2) Training and evaluation requirements define whether the task will be trained or evaluated in the aircraft, simulator, or academic environment. Training and evaluations will be conducted only in the listed environments. Listing aircraft and/or simulator under evaluation requirements does not preclude the evaluator from evaluating elements of the task academically to determine the depth of understanding or planning processes. The evaluation must include hands-on performance of the task. Table 2-4, page 2-5, lists the modes of flight in which the task must be evaluated. The commander may also select crew and/or additional tasks for evaluation.

(3) The AH-64D glass cockpit allows multiple ways to achieve the standards of some tasks. While an aviator must receive initial and sustainment training in the various methods of accomplishing a given task, he is not necessarily required to receive an extensive evaluation that would examine the competency of all those methods. For those tasks that contain more than one method of accomplishment, evaluators will determine which method(s) to examine while conducting an evaluation.

(4) An aviator is authorized to access the various MPD mission, aircraft, communication, and other pages through any existing user interface route while conducting a given task (for example, fixed action button, menu page, or soft button access).

h. **References.** The references are sources of information relating to that particular task. Certain references apply to many tasks. Besides the references listed with each task, the following common references apply as indicated.

(1) All flight tasks (tasks with APU/engines operating).
(a) AR 95-1.
(b) AR 95-20.
(c) FM 1-203.
(d) FM 1-230.
(e) TM 1-1520-251-10/TM 1-1520-251-CL/TM 1-1520-251-MTF.
(f) DOD FLIP.
(g) FAR/host-country regulations.
(h) Unit/local SOPs.
(i) Aircraft logbook (DA Form 2408series).
(j) DA Pam 738-751.
(k) New equipment training team (NETT) supplemental information.
(l) Current USAAWC student handouts.

(2) All instrument tasks.
(a) AR 95-1.
(b) FM 1-251.

(c) FAAH-8261-1.
(d) FAAH-8083-15.
(e) DOD FLIP.
(f) Aeronautical information manual.

(3) All tasks with environmental considerations.
(a) FM 1-202.
(b) TC 1-204.

(4) All tasks used in a tactical/weapons situation.
(a) TM 1-1520-251-10/TM 1-1520-251-CL.
(b) FM 3-40.140.
(c) FM 3-04.111-111.
(d) FM 1-112.
(e) TC 1-201.
(f) TC 1-400.
(g) The Army Aviator's Handbook for Maneuvering Flight and Power Management.
(h) Fire Control Training Update.

(5) All medical tasks—FM 3-04.301.

4-2. TASKS

a. **Standards versus descriptions.** The description is a preferred method of completing the maneuver to the standards and will allow safe accomplishment of the maneuver in most circumstances. Deviations from the task description may be acceptable provided all the standards are still met and safety of the aircraft and crew is not in question. The commander, trainers, and evaluators are the final authority in determining whether the method of task accomplishment is unsafe.

b. **Task considerations.**

(1) References to IP in the task conditions include SP.

(2) When a UT, IP, or IE is cited as a condition, that individual will be at one set of the flight controls.

TASK 1000

Participate in a crew mission briefing

CONDITIONS: Prior to ground or flight operations in an AH-64D helicopter or in an AH-64D simulator, and given DA Form 5484-R (*Mission Schedule/Brief*) and a unit-approved crew briefing checklist.

STANDARDS: Appropriate common standards and the following:

1. The pilot in command (PC) will actively participate in and acknowledge an understanding of DA Form 5484-R mission briefing.
2. The PC will conduct or supervise an aircrew mission briefing using a unit-approved crew briefing checklist.
3. The crewmember receiving the aircrew mission brief will verbally acknowledge a complete understanding of the aircrew mission briefing.

DESCRIPTION:

1. Crew actions.

    a. A designated briefing officer will evaluate and brief key areas of the mission to the PC in accordance with AR 95-1. The PC will acknowledge a complete understanding of the mission brief and initial DA Form 5484-R.

    b. The PC has overall responsibility for the crew mission briefing. The PC will ensure that the pilot is current and qualified to perform the mission. The PC may direct the other crewmember to perform all or part of the crew briefing.

    c. The crewmember being briefed will address any questions to the briefer and will acknowledge that they understand the assigned actions, duties, and responsibilities. Lessons learned from previous debriefings should be addressed as applicable during the crew briefing.

Note: An inherent element of the mission briefing is the crew-level after action review that follows the mission's conclusion (see task 1262).

2. Procedures. Brief the mission using a unit-approved crew mission briefing checklist. (See the following suggested format for an attack crew briefing checklist.) Identify mission and flight requirements that will demand effective communication and proper sequencing and timing of actions by the crewmembers.

Crew Briefing Checklist
1. Mission overview.
2. Flight plan.
3. Weather. (Departure, en route, destination, and void time.)
4. Flight route.
5. Airspace surveillance procedures (Task 1026)
6. Required items.
a. Personal.
b. Professional.
c. Survival/flight gear.

CREW BRIEFING CHECKLIST
7. Crew actions, duties, and responsibilities. a. Transfer of flight controls. b. Two challenge rule. c. Elements of crew coordination: (1) Communicate positively. (2) Direct assistance. (3) Announce actions. (4) Offer assistance. (5) Acknowledge actions. (6) Be explicit. (7) Provide aircraft control and obstacle advisories. (8) Coordinate action sequence and timing. 8. Emergency actions. a. Dual engine failure. b. Dual hydraulic (HYD) failure/emergency hydraulic button. c. Fuel pounds per square inch (PSI) engine (ENG) 1 and 2. d. Engine failure out-of-ground (OGE) hover. e. Loss of tail rotor. f. Actions to be performed by pilot on the controls (P*) and pilot not on the controls (P). g. Portable fire extinguisher. h. First aid kits. i. Egress procedures and rendezvous point. j. Canopy jettison. k. Emergency stores jettison (JETT). l. Power lever manipulation. m. Chop button. n. Engine and auxiliary power unit (APU) fire buttons/extinguishing bottles. o. Loss of intercommunication system (ICS)/communications interface unit (CIU). p. Unusual attitude recovery. q. Simulated emergencies. 9. General crew duties. a. Pilot on the controls (P*). (1) Fly the aircraft with primary focus outside when visual meteorological conditions (VMC), inside when instrument meteorological condition (IMC). (2) Avoid traffic and obstacles. (3) Cross check helmet mounted display (HMD) symbology/flight page, messages, limitation timers/limiting indications, turbine gas temperature (TGT), wind velocity/direction, and engine/system pages as appropriate. (4) Monitor/transmit on radios as directed by the PC. b. Pilot not on the controls (P). (1) Assist in traffic and obstacle avoidance. (2) Manage radio network presets and set transponder. (3) Navigate. (4) Copy clearances, automatic terminal information service (ATIS), and other information.

CREW BRIEFING CHECKLIST
(5) Cross-check multipurpose display (MPD) pages (for example, ENG/SYS, PERF, FLT) and/or instruments (PLT pilot). (6) Monitor/transmit on radios as directed by the PC. (7) Read and complete checklist items as required. (8) Set/adjust pages/switches and systems as required. (a) Internal/back seat (BS) external lighting. (b) Anti-ice/de-ice systems. (c) Other systems/switches as required. 10. Both pilots. a. MPD/video select (VSEL)/acquisition (ACQ) setting considerations. b. Weapons (WPNs), fire control radar (FCR), and aircraft survivability equipment (ASE) considerations (as applicable). c. Monitor radios. d. Monitor aircraft performance. e. Monitor each other. f. Announce when focused inside for more than 4 seconds (VMC) or as appropriate to the current and briefed situation. 11. IMC crew duties. a. Inadvertent IMC. b. During instrument flight rules (IFR) operations. (1) Instrument takeoff (ITO)/note takeoff time. (2) Level off check. (3) Calculate and monitor times for holding and approaches. (4) Approach/holding brief. (5) When on approach, P watches for the airfield. (6) On breakout and landing environment in sight, notify the P* and, if directed by the PC, land the aircraft. (7) Be prepared to direct the P* for the missed approach procedure, if required. (8) Navigation programming. 12. Analysis of the aircraft. a. Logbook and preflight deficiencies. b. Performance planning (approved software, performance planning card (PPC), aircraft PERF page). (1) Engine torque factor (ETF)/aircraft torque factor (ATF)/turbine gas temperature (TGT) limiter settings and cockpit indications. (2) Recomputation of PPC, if necessary. (3) Go/No-Go data. (4) Single engine (SE) capability-minimum (MIN)/maximum (MAX) SE true airspeed (TAS). (5) Fuel requirements. (6) Performance limitations/restrictions. c. Mission deviations required based on aircraft analysis. 13. Tail wheel lock/unlock. 14. Refuel/rearm procedures. 15. Fighter management. 16. Risk mitigation/considerations. 17. Crewmembers' questions, comments, and acknowledgement of the briefing. 18. Conduct a walk around inspection.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted academically.
2. Evaluation will be conducted academically.

REFERENCES: Appropriate common references.

TASK 1004

Plan a visual flight rules flight

CONDITIONS: Before a visual flight rules (VFR) flight in an AH-64D helicopter or in an AH-64D simulator, and given access to weather information; notice to airman (NOTAM); flight planning aids; necessary charts, forms, publications; and weight and balance information.

STANDARDS: Appropriate common standards and the following:

1. Verify aircraft performance using TM 1-1520-251-10, approved software or performance (PERF) page.
2. Obtain weather briefing and confirm the weather will be at or above VFR minimums.
3. Plan the mission to meet all requirements for VFR flight.
4. Determine appropriate departure, en route, and arrival procedures.
5. Select routes that avoid hazardous weather and best ensure mission completion. If appropriate, select altitudes that conform to VFR cruising altitudes.
6. Compute for each leg of flight—
   a. Distance ±1 nautical mile.
   b. Magnetic heading(s) ±5 degrees.
   c. True airspeed ±5 knots.
   d. Ground speed ±5 knots.
   e. Estimated time en route (ETE) ±3 minutes.
7. Compute for the mission—
   a. Total flight and mission time.
   b. Fuel requirements ±100 pounds. Ensure the VFR fuel reserve requirement will be met per AR 95-1.
8. Perform mission risk assessment and mission briefing/brief back per unit standing operating procedure (SOP), and thoroughly brief the other crewmember.
9. Complete and file the flight plan.

DESCRIPTION:

1. Crew actions.
   a. The pilot in command (PC) will ensure that the pilot is current and qualified to perform the mission, and that the aircraft is properly equipped to accomplish the assigned mission. He may direct the pilot to complete some portions of the VFR flight planning.
   b. The pilot will complete all assigned elements and report the results to the PC.
2. Procedures. Using appropriate military, Federal Aviation Administration (FAA), or host-country facilities, obtain required flight weather information. After ensuring that the flight can be completed under VFR, check NOTAMs and other appropriate sources for any restrictions that may apply to the flight. Obtain navigational charts that cover the entire flight area, and allow for changes in routing that may be required because of weather or terrain. Select the course(s) and altitude(s) that will best facilitate mission accomplishment. Determine the magnetic heading, ground speed, and ETE for each leg. Compute total distance and flight time, and calculate the required fuel using the appropriate charts in TM 1-1520-251-10. Determine if the duplicate

weight and balance forms in the aircraft logbook apply to the mission per AR 95-1. Verify that the aircraft weight and center of gravity (CG) will remain within allowable limits for the entire flight. Complete the appropriate flight plan and file it with the appropriate agency.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Checkpoints used during the day may not be suitable for night or NVD use.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted academically.
2. Evaluation will be conducted academically.

REFERENCES: Appropriate common references.

TASK 1006

Plan an instrument flight rules flight

CONDITIONS: Prior to instrument flight rules (IFR) flight in AH-64D helicopter or in an AH-64D simulator, and given access to weather information; notice to airman (NOTAM); flight planning aids; necessary charts, forms, publications; and weight and balance information.

STANDARDS: Appropriate common standards and the following:

1. Verify performance planning card (PPC) and weight and balance forms using TM 1-1520-251-10, approved software or performance (PERF) page.
2. Obtain weather briefing and confirm the weather will be at or above IFR minimums for the approach to be flown.
3. Plan the mission to meet all requirements for instrument meteorological condition (IMC) flight. Determine the proper departure, en route, and destination procedures to include an alternate airfield if required.
4. Select route(s) and altitudes that avoid hazardous weather conditions and conform to IFR cruising altitudes. If off-airway, determine the course(s) ±5 degrees.
5. Compute for each leg of the flight—
   a. Distance ±1 nautical mile.
   b. True airspeed ±3 knots.
   c. Ground speed ±5 knots.
   d. Flight time ±5 minutes.
   e. Estimated time en route (ETE) ±3 minutes.
6. Compute for the mission—
   a. Total flight and mission time.
   b. Fuel requirement ±100 pounds. Ensure IFR fuel reserve requirement will be met per AR 95-1.
7. Perform mission risk assessment and mission briefing/brief back. Thoroughly brief the other crewmember.
8. Complete and file the flight plan.

DESCRIPTION:

1. Crew actions.
   a. The pilot in command (PC) will ensure that the pilot is current and qualified to perform the mission, and that the aircraft is properly equipped to accomplish the assigned mission. He may direct the pilot to complete some portions of the IFR flight planning.
   b. The pilot will complete the assigned elements and report the results to the PC.
2. Procedures. Using appropriate military, Federal Aviation Administration (FAA), or host-country facilities, obtain required flight weather information. Compare destination forecast and approach minimums, and determine if an alternate airfield is required. Check the NOTAMs and other appropriate sources for any restrictions that may apply to the flight. Obtain navigation charts that cover the entire flight area, and allow for changes in routing or destination that may be

required because of the weather. Select the route(s) or course(s) and altitude(s) that will best facilitate mission accomplishment. When possible, select preferred and alternate routing.

a. Select altitude(s) that avoid the icing level and turbulence and are above minimum altitudes, conform to the semicircular rule (when applicable), and do not exceed aircraft or equipment limitations. Determine the magnetic heading, ground speed, and ETE for each leg, to include flight to the alternate airfield if required.

b. Compute the total distance and flight time, and calculate the required fuel using the appropriate charts in TM 1-1520-251-10 or approved software. Determine if the duplicate weight and balance forms in the aircraft logbook apply to the mission. Verify that the aircraft weight and center of gravity (CG) will remain within allowable limits for the entire flight. Complete the appropriate flight plan and file it with the appropriate agency.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted academically.
2. Evaluation will be conducted academically.

REFERENCES: Appropriate common references.

TASK 1010

Prepare a performance planning card

CONDITIONS: This task includes the following conditions:

1. Performance (PERF) page. Given approved software; a data transfer cartridge, DD Form 365-4 (*Weight and Balance Clearance Form F-Transport/Tactical*), or data that includes aircraft basic and gross aircraft weight; the planning pressure altitude (PA) and temperature for takeoff, en route, and destination; and an AH-64D aircraft or AH-64D simulator.

2. Performance planning card (PPC) DA Form 5701-R (*UH-60/AH-64 Performance Planning Card*). Given a completed DD Form 365-4 or data that includes basic and gross aircraft weight; the planning PA and temperature for takeoff, en route, and destination, TM 1-1520-251-10, and a blank DA Form 5701-64-R (*AH-64 Performance Planning Card*).

3. Electronic PPC. Given approved software; DD Form 365-4 or data that includes basic and gross aircraft weight; and the planning PA and temperature for takeoff, en route, and destination.

Note: Condition 2 is required for the standardization evaluation. All three conditions must be completed as part of an aviator's task iteration requirements. Condition 3 is dependent on software and hardware availability and capabilities. A task iteration worksheet listing all conditions separately is not required.

STANDARDS: Appropriate common standards and the following:

1. Input aircraft basic weight, gross weight (GWT), pilot ([PLT] backseat crewmember) and copilot-gunner (CPG) (front seat crewmember) weights, storage bay weight, and survival bay weight into the software and download to a data transfer cartridge (DTC) (task condition 1).
2. Input the PA, free air temperature (FAT), GWT, and anti-ice performance for maximum/planned environmental conditions (task condition 1).
3. Compute performance planning card data using TM 1-1520-251-10 (task condition 2).
4. Obtain performance data from approved software (task condition 3).
5. Compute aircraft performance data for current, maximum, and planned environmental conditions and correctly interpret and correlate aircraft limitations and capabilities (task condition 1, 2, or 3).
6. Brief the other crewmember on the performance planning data that was obtained through the appropriate method.

DESCRIPTION:

1. Crew actions.

    a. The crew will compute or obtain the aircraft performance data using any of the following procedures.

        (1) DA Form 5701-64-R performance data computed using TM 1-1520-251-10.

        (2) Electronic PPC software.

    b. The pilot in command (PC) or pilot will verify that the aircraft meets the performance requirements for the mission and will brief the other crewmember on the performance planning data obtained by either of the above methods.

    c. The crew will validate the aircraft PERF page by comparing the manual or electronic performance planning and results of the hover power check (conditions permitting).

d. The PC will ensure that aircraft limitations and capabilities will not be exceeded during flight.

2. Procedures.

a. Condition 1—PERF page. The aircraft PERF page displays both dynamic and projected performance parameters and operating limits. The current (CUR) mode GWT display and performance calculation status windows depend on valid DTC performance factor values input through the approved software, then downloaded to the aircraft via the DTC, or manually entered through the weight (WT) page. The aircraft will correlate DTC loaded performance factors and weight entries with lookup table weight values for onboard equipment that the data management system (DMS) automatically detects. The PERF page will then automatically provide the aircrew with dynamic aircraft performance data required for flight.

b. Condition 2—PPC (DA Form 5701-64-R). The DA Form 5701-64-R is primarily a premission planning aid used to organize planned aircraft performance data. The PPC may also be used in the aircraft in lieu of the PERF page modes. Additionally, the PPC is used to record remarks that may assist in handling certain emergency procedures that may arise during the mission.

c. Condition 3—electronic PPC. The DA Form 5701-64-R obtained by approved software is a produced aid for organizing performance planning data. The approved software provides aircrews with an automated way of calculating performance data independently of the aircraft.

3. Methods of performance planning and verification. The three methods of obtaining aircraft performance data have been correspondingly subdivided into three sections. Section I supports condition 1. Section II supports condition 2 and describes the TM 1-1520-251-10 and DA Form 5701-64-R method (see figure 4-1). Section III describes the automated method.

SECTION I. CONDITION 1: AIRCRAFT PERFORMANCE PAGE (PERF PAGE) METHOD.

The following are aircraft current performance mode page status checks.

1. CUR PERF mode weight, balance, and performance preflight input. Prior to arriving at the aircraft, input the aircraft weight, balance, and performance data values through the approved software and then perform a download to a DTC.

2. Data transfer unit (DTU) upload. Specific to this task, the DTC contains values for basic aircraft weight, storage bay weight, survival kit bay weight, pilot weight, CPG weight, and performance plan and maximum (MAX) mode data. The miscellaneous (MISC) button of the DTU page contains the software derived weight and performance data. When a master load is selected, the MISC data is downloaded to the DMS automatically. It is essential for the P to select the MISC button when performing a selective load.

3. Engine (ENG) 1 and ENG 2 engine torque factor (ETF) validation. The PLT or CPG will validate/edit the ENG page ETF values for ENG 1 and ENG 2. The SP uses the engine ETFs and resultant aircraft torque factor (ATF) with the applicable performance calculations displayed on the CUR, MAX, and PLAN mode pages. The PERF page maximum torque dual engine is derived by the ATF and maximum torque single engine is based on the lower of the two ETFs.

4. ENG 1 and ENG 2 turbine gas temperature (TGT) limiter validation. The PLT or CPG may validate the TGT limiter setting for ENG 1 and ENG 2 during or prior to the initial power checks. The ENG 1 and ENG 2 TGT limiter setting is recorded and maintained through the ENG ETF ENG 1 last

page and ENG ETF ENG 2 last page. This TGT limiter setting factor is the specific numerical value at which that engine is expected to TGT limit within the specified ranges.

5. CUR PERF mode page status window validation. To perform an initial PERF-page validation, the PLT/CPG should accomplish the following steps:

a. Validate aircraft (A/C) WT page and the A/C basic weight and moment values against current DD Form 365-4.

b. Validate A/C ETF for ENG 1 and 2 values against aircraft health indicator test (HIT) log.

c. Validate the performance values displayed in the CUR PERF mode page status windows against the PPC.

d. Verify CUR PERF mode page values against hover power check (when conditions permit, Task 1107).

Note 1: The PLT or CPG may enable or disable the anti-ice inlet via the DTC prior to flight for the purpose of evaluating PERF page anti-ice ON calculations for PLAN or MAX.

Note 2: Lot 7 and previous versions of the PERF page GO-NO/GO out-of-ground effect (OGE) torque calculation is not computed using the identical procedure used with the AH-64D performance planning card. The GO-NO/GO OGE PERF page calculation is the power required to hover OGE (80-foot wheel height) at the maximum GWT for OGE, not the power required to hover at the altitude that the power check is made (normally 5 feet) at maximum gross weight for OGE. In-ground effect (IGE) GO/NO-GO torque values are calculated at a 5-foot hover utilizing maximum GWT IGE. OGE hover capability can be determined from the PERF page by one of the following methods:

- Comparing hover torque OGE to maximum torque (dual engine).
- Comparing maximum GWT OGE to current GWT.
- Noting the color of hover torque OGE or maximum GWT OGE.

Note 3: Current software will compute and display a maximum GWT of 23,000 pounds (lbs) if environmental conditions permit for both single and dual engine hover exclusive of wing stores configuration.

Note 4: The dual engine maximum torque status window indicates 30-minute limit 701, 10-minute limit 701C engine. Single engine maximum torque status window indicates 2.5-minute limit 701/701C engine.

Note 5: The system processor (SP) calculates velocity safe single engine (VSSE) using equations derived from each cruise chart in the operator’s manual. The SP will interpolate between charts and perform limited extrapolation for areas outside the chart.

Note 6: Crewmembers should be aware of minimum single engine speeds for all departure, arrival, and low-speed/low-altitude conditions.

SECTION II. CONDITION 2: TM 1-1520-251-10, DA FORM 5701-64-R (PPC) METHOD.

The procedures for correctly completing DA Form 5701-64-R and the extrapolation of performance data from chapters 5, 7, and 9, TM 1-1520-251-10, are explained below.

1. Departure.

a. Item 1—PA. Record the PA forecast for the time of departure (1a), and the maximum PA that will be encountered during the mission (1b).

b. Item 2—FAT. Record the free air temperature (FAT) forecast for the time of departure (2a), and the maximum FAT that will be encountered during the mission (2b).

c. Item 3—Takeoff GWT. Record takeoff gross weight.

d. Item 4—Load. Record the weight of the external stores during the mission profile that can be jettisoned to improve aircraft performance margins in the event of an emergency condition.

e. Item 5—Fuel MSN. Record fuel weight with reserve required at takeoff to complete the mission (MSN).

Note: Crewmembers must consider all flight profiles planed for the mission to determine mission fuel and reserve fuel requirements. Further refinement of fuel for mission can be obtained by interpolating data for fuel flow from various stages of the mission (for example, periods at a hover, or aerial holding at maximum endurance true airspeed (TAS).

f. Item 6—ATF. Record the aircraft torque factor. The ATF is a ratio of individual aircraft torque available to specification torque at a reference temperature of +35 degrees Celsius (C). The ATF is the average of the two ETFs, and is allowed to range from 0.9 to 1.0.

g. Item 7—ETF. Record the individual engine torque factors. The ETF represents a ratio of individual engine torque available to specification torque at a reference temperature of +35 degrees C. The ETF is allowed to range from 0.85 to 1.0. ETFs are located on the engine HIT log in the aircraft logbook for each engine.

h. Item 8—TR. Torque ratio (TR) is used to compute the actual single/dual engine maximum torque available with ETFs other than 1.0. If the ETFs are 1.0, record 1.0 in TR (block(s) 8). If the ETFs are other than 1.0, compute using the torque factor chart.

i. Items 9 and 10—Maximum torque available (dual/single engine).

Note: It essential to understand that while performance is planned using the maximum torque available charts, the TGT limiting factor setting cannot be exceeded.

CAUTION

During mission planning, crewmembers must be aware that the TGT limiter setting may prevent the engine from reaching the specification torque calculated from the maximum torque available (either dual or single engine) chart.

CAUTION

Certain temperature and pressure altitude combinations will exceed -10, chapter 5 torque limitations. Items 9 and 10 represent actual maximum torque available. During normal aircraft operations, -10, chapter 5 torque limitations shall not be exceeded.

(1) Maximum torque available (dual engine). The maximum torque available (dual engine) is the maximum torque (power) that both engines are predicted to collectively produce at a specific pressure altitude and temperature. At warmer temperatures (approximately greater than 0 degrees C), the maximum torque available (dual engine) correlates to the top end

(864 degrees C) of the 30-minute TGT range for the 701 engine, and to the top end (870 degrees C) of the 30-minute TGT range for the 701C engine. However, TGT limiting may enable a value that is either above or below the chart specification torque/TGT value.

(a) At colder temperatures (approximately less than 0 degree C), the maximum torque available dual engine correlates to the maximum torque output of the engine at fuel flow limiting or gas producer turbines speed (N_G) limiting conditions as set inside the hydromechanical unit (HMU). Fuel flow or N_G limiting can be recognized by power limiting (power turbine speed (N_P)/main rotor speed (N_R) droop) with no further torque increase possible and TGT at or below limiting values. Correlation of these indications with outside air temperature (OAT) will identify the possible limiting factor.

(b) Using the maximum pressure altitude (PA) (item 1b) and maximum temperature (item 2b) that will be encountered during the mission and the maximum torque available 30-minute limit chart, compute maximum torque available and record the value in the maximum torque available (dual engine) (block 9).

Note 1: If the ATF is 1.0, enter the torque derived in the maximum torque available (dual engine), block 9.

Note 2: If the ATF is less than 1.0, multiply the specification torque by the torque ratio (dual engine) (item 8) to determine actual torque available, and enter that value in block 9, or use torque conversion chart.

Note 3: It is important to note that, once limiting is occurring with both engines, one engine may produce more than this value while the other engine is producing less. The average of the two numbers (based on ETFs) is supplied in this item.

(2) Maximum torque available (single engine). The maximum torque available (single engine) is the maximum torque (power) that ENG 1 and 2 are predicted to individually produce at a specific pressure altitude and temperature. The maximum torque available (single engine) correlates to the top end (919 degrees C) of the 2.5-minute TGT range for the 701 engine, and to the top end (896 degrees C) of the 2.5-minute TGT range for the 701C engine. However, TGT limiting may enable a value that is either above or below the chart specification torque/TGT value.

(a) At colder temperatures (approximately less than 0 degrees C), the maximum torque available (single engine) correlates to the maximum torque output of the engine at fuel flow limiting or N_G limiting conditions as set inside the HMU. Fuel flow or N_G limiting can be recognized by power limiting (N_P/N_R droop) with no further torque increase possible and TGT at or below limiting values. Correlation of these indications with OAT will identify the possible limiting factor.

(b) Using the maximum PA (item 1b) and maximum temperature (item 2b) that will be encountered during the mission and the single engine maximum torque available 2.5-minute limit chart, compute the maximum single engine torque available as shown in item 9(1), and record the value in the maximum torque available (single engine) (block 10).

Note: If the ETF is different for each engine, compute maximum torque available (single engine) for each engine using the torque ratio derived from the respective engine's ETF. Do not use the ATF.

j. Items 11 and 12—Maximum allowable GWT (OGE/IGE). The maximum allowable GWT (OGE/IGE) represents the maximum gross weight under specific environmental conditions with both engines operating that, using maximum torque available (not to exceed 100 percent), sufficient power is available for OGE or IGE maneuvers. Aircraft with an ATF of 1.0 or maximum torque available (dual engine) equal to or greater than 100 percent (after use of the torque conversion chart or multiplication by the torque ratio) use the hover ceiling chart or the hover chart as described below. Aircraft with an ATF less than 1.0 and a maximum torque available (dual engine) less than 100 percent (after use of the torque conversion chart or multiplication by the torque ratio) use the hover chart as described below.

Step 1. Using the maximum PA that will be encountered during the mission, enter the hover chart at the pressure altitude-feet. Move right to the maximum temperature that will be encountered during the mission. Draw a line down to the bottom of the lower grid.

Step 2. OGE. Enter the top left grid, torque per engine-percent torque (%Q), at the maximum torque available, (dual engine) (item 9), or the maximum continuous dual engine torque limit (100 percent), whichever is less. Move down to the 80 (OGE) wheel height-foot line, and then move right to intersect the previously drawn line. Record the GWT in maximum allowable GWT (OGE/IGE) (block 11).

Step 3. IGE. Enter the top left grid, torque per engine-percent %Q; at the maximum torque available (dual engine) (item 9), or the maximum continuous dual engine torque limit (100 percent), whichever is less. Move down to the 5 (foot) wheel height-foot line, and then move right to intersect the previously drawn line. Record the gross weight in maximum allowable GWT (OGE/IGE) (block 12).

k. Items 13 and 14—GO/NO-GO torque (OGE/IGE). GO/NO-GO torque represents the power required to hover IGE or OGE at the maximum allowable GWT OGE/IGE. Reference to this during hover power checks is to confirm that the aircraft weight does not exceed the maximum allowable GWT.

(1) OGE.

Step 1. Using the departure PA, enter the hover chart at pressure altitude-feet. Move right to the departure FAT-degree C line, and move down to the maximum allowable GWT-lb OGE (as determined in item 11).

Step 2. Move left to the desired wheel height-foot line (normally the 5-foot line). Move up to torque per engine-percent %Q. Record the torque value in GO/NO-GO torque (OGE/IGE) (block 13).

Note: This torque correlates to dual engine operation at the lesser of the maximum torque available, (dual engine) (item 9a), or the maximum continuous dual engine torque limit (100 percent) at maximum GWT OGE (80 feet). If calculated at 5 feet, this torque correlates to maximum torque at 80 feet.

(2) IGE.

Step 1. Using the departure PA, enter the hover chart at pressure altitude-feet. Move right to the departure FAT-degree C line, and move down to the maximum allowable GWT-lb IGE (as determined in item 12). If the value in item 12 exceeds the –10, chapter 5 limitation use 23,000/20,260 lbs, as appropriate for this computation.

Step 2. Move left to the desired wheel height-foot line (normally the 5-foot line). Move up to torque per engine-percent %Q. Record the torque value in GO/NO-GO torque (OGE/IGE) (block 14).

Note: This torque correlates to dual engine operation at the lesser of the maximum torque available (dual engine) (item 9), or 100 percent, whichever is less, at maximum GWT IGE (5 feet). If maximum allowable GWT (IGE), (item 12) is less than the -10 chapter 5 structural limit (20,260 lbs), this value should equal maximum torque available (dual engine) (item 9).

l. Items 15 and 16—Predicted hover torque (OGE/IGE). This value represents the torque required to hover OGE or IGE under specific environmental conditions.

(1) OGE.

Step 1. Using the departure PA, enter the hover chart at pressure altitude-feet (item 1a). Move right to the departure FAT-degree C line (item 2a), and move down to takeoff GWT (item 3).

Step 2. Move left to the 80 (OGE) wheel height-foot line. Move up to torque per engine-percent %Q. Record the torque value in predicted hover torque (block 15).

(2) IGE.

Step 1. Enter the hover chart at departure pressure altitude-feet (item 1a). Move right to the departure FAT-degree C line (item 2a), and move down to takeoff GWT (item 3).

Step 2. Move left to the desired wheel height-foot line (normally the 5-foot line). Move up to torque per engine-percent %Q. Record the torque value in predicted hover torque (block 16).

Note: A change in GWT of approximately 200 lbs equates to a change in torque of approximately 1 percent.

2. Cruise data.

Note: The cruise charts are predicated on the aircraft's baseline (primary mission) configuration. When planning for a wing store configuration other than baseline, torque, fuel, and true airspeed corrections, if significant, may be applied to applicable cruise data values. The adjustments based upon the change to baseline configuration are often so negligible that they will go unnoticed by the crew on cockpit-displayed indications. The PC will determine when it is necessary to compute adjustments to baseline configuration figures derived from the cruise charts. The following items in this section will contain the necessary information to obtain this data.

a. Item 17—PA. Record the maximum PA that will be encountered during the cruise profile portion of the mission.

b. Item 18—FAT. Record the maximum FAT that will be encountered during the cruise profile portion of the mission.

c. Item 19—Velocity not to exceed (Vne) KTAS. Compute and record using the airspeed operating limits chart.

d. Item 20—TR. Using maximum environmental conditions for the cruise profile portion of the mission, compute as in item 8 above.

e. Item 21—Maximum torque available (dual engine). Using maximum environmental conditions for the cruise profile portion of the mission, compute as in item 9 above.

f. Item 22—Maximum torque available (single engine). Using maximum environmental conditions for the cruise profile portion of the mission, compute as in item 10 above.

g. Item 23—Cruise speed (dual engine TAS). Using the applicable cruise chart, select a cruise TAS (based on mission requirements, aircraft GWT, and power available). Record the value in cruise speed (block 23).

h. Item 24—Cruise torque (dual engine).

Step 1. Enter the applicable cruise chart at the TAS in item 23. Move horizontally to the appropriate aircraft GWT-lb line (item 3).

Step 2. Move down to the indicated torque per engine–percent %Q to read cruise torque. Record this value in cruise torque (block 24).

Note: To determine corrected torque percent for other than baseline wing-store configuration, compute %Q.

i. Item 25—Cruise fuel flow (dual engine). Using the applicable cruise chart, record the predicted dual engine fuel flow.

Step 1. Enter the applicable cruise chart at the TAS in item 23 above. Move horizontally to the appropriate aircraft GWT-lb line (item 3).

Step 2. Move up to the total fuel flow-lb/hour to read cruise fuel flow. Record this value in cruise fuel flow (block 25).

Note: To determine corrected fuel flow for other than baseline wing store configuration, read up from the corrected cruise torque percent (item 24, step 2) and record total fuel flow-lb/hour in cruise fuel flow (block 25).

j. Item 26—Maximum rate of climb (R/C) or endurance TAS. Compute and record.

k. Item 27—Maximum range TAS. Compute and record.

l. Items 28 and 29—Single engine capability TAS (minimum/maximum). Minimum and maximum single engine capability TAS is the minimum/maximum TAS at which the aircraft can maintain level flight with a single engine under specific environmental conditions while operating at maximum torque available (single engine) (item 10) or 2.5-minute torque limit (122 percent), whichever is less.

Note 1: Crewmembers must be aware of minimum single engine airspeeds for all departure, cruise, arrival, and low-speed/low-altitude conditions.

Note 2: If the ETF is different for each engine, compute single engine capability TAS (minimum/maximum) using maximum torque available (single engine) derived from the lesser of the two ETFs. Do not use the ATF.

Step 1. Enter the bottom of the applicable (items 17 and 18) cruise chart at 50 percent of the single engine contingency, 2.5 minute torque limit, or the maximum single engine torque available (item 22), (122%) whichever is less. Move up to the first intersection of indicated torque per engine-percent %Q and the GWT-lb line (item 3).

Step 2. Move horizontally to the true airspeed-knots line. Record this value in single engine capability as (minimum/maximum) (block 28).

Step 3. Continue up to the second intersection of torque and the GWT-lb line (item 3).

Step 4. Move horizontally to the true airspeed-knots line.

Record this value in single engine capability as (minimum/maximum) (block 29).

Note: If the GWT-lb line is not intercepted, there is insufficient power to maintain level flight with a single engine at the current gross weight.

Step 5 (Optional). Subtract the weight in item 4 (this equates to jettisoning the external load) from the aircraft GWT (item 3). Repeat steps 1 and 2 above and record the TAS value in remarks (item 42).

Note 1: If after jettison, the GWT-lb line is not intercepted, there is insufficient power to maintain level flight with a single engine at the current gross weight. Refer to item 30 for maximum allowable GWT for single engine flight, and note that as fuel is consumed, single engine level flight may be possible.

Note 2: A reduction in GWT of approximately 200 lbs equates to a change of approximately 1 knot less minimum single engine airspeed and 1 knot greater maximum single engine airspeed.

m. Item 30—Maximum allowable GWT (single engine). Maximum allowable GWT (single engine) is the maximum GWT at which the aircraft can maintain level flight with a single engine under specific environmental conditions.

Note: If the ETF is different for each engine, compute the maximum allowable GWT (single engine) using maximum torque available (single engine) derived from the lesser of the two ETFs. Do not use the ATF.

Step 1. Enter the bottom of the applicable cruise chart at 50 percent of the single engine contingency, 2.5-minute torque limit, or the maximum single engine torque available (item 22), whichever is less. Move up to intersect the maximum R/C or maximum end line.

Step 2. Interpolate maximum GWT for single engine flight.

Record this value in maximum allowable GWT—single engine (block 30).

3. Fuel management (item 31). Use this space to record the in-flight fuel consumption check, to include fuel burnout and appropriate VFR or IFR reserve (Task 1138 discusses fuel management procedures.).

4. Arrival.

a. Item 32—PA. Record the forecast PA at the destination at ETA.

b. Item 33—FAT. Record the forecast FAT at the destination at ETA.

c. Item 34—Landing GWT. Record the estimated landing gross weight.

d. Item 35—TR. Using arrival environmental conditions, compute as in item 8 above.

e. Item 36—Maximum torque available (dual engine). Using arrival environmental conditions, compute the maximum dual engine torque available as described in item 9.

f. Item 37—Maximum torque available (single engine). Using arrival environmental conditions, compute the maximum single engine torque available as described in item 10.

g. Items 38 and 39—Maximum allowable GWT (OGE/IGE).

(1) OGE. Using arrival environmental conditions, compute the maximum allowable GWT OGE as described in item 11.

(2) IGE. Using arrival environmental conditions, compute the maximum allowable GWT IGE as described in item 12.

h. Item 40—Predicted hover torque (IGE). Using arrival environmental conditions and landing GWT, compute the torque required to hover IGE as described in item 14.

i. Item 41—Predicted hover torque (OGE). Using arrival environmental conditions and landing GWT, compute the torque required to hover OGE as described in item 13.

5. Item 42—Remarks. Use this area to record various pertinent performance planning remarks. Whenever IGE power is not available or is limited, use this area to record the minimum airspeed/power requirements for conducting rolling takeoff(s) and/or roll-on landing(s) in support of Task 1114 and/or Task 1182. The procedure provides a power (torque percent) margin to avoid, if applicable, TGT, fuel flow, or N_G limiting.

a. IGE power limited/unavailable takeoff or landing. To determine required torque percent and TAS for IGE power limited/unavailable takeoff or landing, perform the following steps.

Step 1. Enter the bottom of the applicable cruise chart at 5 percent below the maximum torque available (dual engine) (item 9), or at the maximum continuous dual engine torque limit (100 percent), whichever is less. Move up to the first intersection of indicated torque per engine-percent %Q and, as applicable, the takeoff or landing GWT-lb line (item 3 or 34).

Step 2. From this point, read horizontally to the true airspeed-knots required to conduct a power limited/unavailable rolling takeoff or roll-on landing. Record the torque required and TAS in the remarks section.

b. Maximum airspeed with one engine in-op. Record the greater of 67 percent of Vne (Item 19) or maximum R/C airspeed.

c. (Optional) Height-velocity single engine failure. At the discretion of the PC, use the remarks section to record height-velocity single engine failure data. Record the minimum/maximum airspeed/altitude combinations using the height-velocity single engine failure chart that most closely approximates the ambient conditions and aircraft GWT.

Note: The low-speed area of the cruise charts (below 40 knots) can familiarize crewmembers with the low-speed power requirements of the aircraft. This area shows the power margin available for climb or acceleration during maneuvers, such as NOE flight. At zero airspeed, the torque represents the torque required to hover OGE. During missions involving high aircraft GWT and/or high PA and/or FAT, this area of the cruise chart must be closely reviewed.

SECTION III. CONDITION 3: ELECTRONIC PERFORMANCE PLANNING METHOD.

Current software release provides AH-64D aircrews with automated pre-mission performance planning independent of the aircraft. The conditions and standards for this task may be achieved solely with the approved software once it is provided to the operator with pre-mission data.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted academically.
2. Evaluation will be conducted academically. Satisfactorily completing condition 2 will satisfy the minimum requirement for the conduct of a standardization evaluation.

REFERENCES: Appropriate common references.
TM 1-2840-248-23

AH-64 PERFORMANCE PLANNING CARD

For use of this form, see TC 1-251; the proponent agency is TRADOC.

DEPARTURE

PA (1a) / (1b)	FAT (2a) / (2b)	TAKEOFF GWT (3)

	DUAL ENG	SINGLE ENG #1	SINGLE ENG #2
LOAD (4)			
FUEL MSN (5)			
	ATF (6)	ETF (7)	ETF (7)
	TR (8)	TR (8)	TR (8)
MAX TORQUE AVAILABLE	(9)	(10)	(10)
MAX ALLOWABLE GWT *(OGE/IGE)*	(11) / (12)		
GO/NO-GO TORQUE *(OGE/IGE)*	(13) / (14)		
PREDICTED HOVER TORQUE *(OGE/IGE)*	(15) / (16)		

REMARKS:
(42)

CRUISE DATA

PA (17)	FAT (18)	Vne (19)	Vh

	DUAL ENG	SINGLE ENG	
	TR (20)	TR (20)	TR (20)
MAX TORQUE AVAILABLE	(21)	(22)	(22)
CRUISE SPEED TAS	(23)		
CRUISE TORQUE	(24)		
CRUISE FUEL FLOW	(25)		
CONT TORQUE AVAILABLE			
MAX R/C OR ENDURANCE TAS	(26)		
MAX RANGE TAS	(27)		
SINGLE-ENG CAPABILITY TAS *(MIN/MAX)*		(28) / (29)	
MAX ALLOWANCE GWT - SINGLE ENG		(30)	
SINGLE-ENG MAX R/C IAS *(MAX GWT)*			

DA FORM 5701-64-R, SEP 2004 PAGE 1 of 2 APD V1.00

Figure 4-1. Sample DA Form 5701-64-R (front).

FUEL MANAGEMENT (31)			
	FUEL/TIME	BURNOUT	______ Z
START	______ / ______	RESERVE	______ Z
STOP	______ / ______	CONSUMPTION RATE	______ LB PER HR

ARRIVAL				
PA (32)	FAT (33)		LANDING GWT (34)	
	DUAL ENG		SINGLE ENG	
			#1	#2
	TR (35)		TR (35)	TR (35)
MAX TORQUE AVAILABLE	(36)		(37)	(37)
MAX ALLOWABLE GWT *(OGE/IGE)*	(38) / (39)			
PREDICTED HOVER TORQUE *(IGE)*	(40)			
PREDICTED HOVER TORQUE *(OGE)*	(41)			

REMARKS:
(42)

DA FORM 5701-64-R, SEP 2004 PAGE 2 of 2 APD V1.00

Figure 4-2. Sample DA Form 5701-64-R (back).

TASK 1012

Verify aircraft weight and balance

CONDITIONS: Given crew weights, aircraft configuration, aircraft weight and balance information, TM 1-1520-251-10, and DD Form 365-4 (*Weight and Balance Clearance Form F-Transport/Tactical*); in an AH-64D helicopter or AH-64D simulator with the appropriately loaded data transfer cartridge (DTC).

STANDARDS: Appropriate common standards and the following:

1. Verify that center of gravity (CG) and gross weight (GWT) remain within aircraft limits for the duration of the flight.
2. Verify performance (PERF) page CG and aircraft weight limitations during runup, or as aircraft performance permits, during the hover power check.
3. Identify all mission or flight limitations imposed by weight or CG.

DESCRIPTION:

1. Crew actions.
    a. Using the completed DD Form 365-4 from the aircraft logbook, verify/compute aircraft gross weight and CG. Ensure aircraft GWT and CG will remain within the allowable limits for the entire flight. Note all GWT, loading task/maneuver restrictions/limitations.

    b. If there is no completed DD Form 365-4 that meets mission requirements, refer to the unit weight and balance technician, or refer to TM 55-1500-342-23 and compute a new DD Form 365-4.

    c. All crewmembers will be briefed on any limitations.
2. Procedures.
    a. Utilize the PERF page GWT buttons to input weight data. Editing allows for accurate CG and performance value calculations through the current (CUR) PERF page.

    b. The aircraft's GWT and CG data are both obtained through the CUR PERF page. Prior to initiating a hover power check, and periodically during flight, check the CUR PERF page dynamic CG display data to validate that the aircraft is within CG.

    c. Verify the aircraft CG in relation to CG limits at predetermined times during the flight when an aircraft's configuration requires special attention (for example, when it is a critical requirement to keep a certain amount of fuel in a particular tank). Conduct CG checks for fuel and ammunition expenditures.

Note: Refer to Task 2066 for asymmetrical wing store (auxiliary [AUX] tank) lateral CG computation procedures.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted academically.
2. Evaluation will be conducted academically.

REFERENCES: Appropriate common references.

TASK 1013

Operate mission planning system

> **CAUTION**
>
> Exercise caution when making, or verifying, sight power selections through the approved software. The target acquisition and designation sight (TADS) and pilot night vision system (PNVS) power options are both ON/OFF selectable. With power OFF selection, the execution of master load, or selective weapons/sights load in flight will power down the OFF selected sight systems.

CONDITIONS: Given approved software, mission briefing, signal operation instructions (SOI) information, weather information, navigational maps, Department of Defense (DOD) flight information publications, intelligence data, and other materials as required.

STANDARDS:

1. Configure and operate the approved software.
2. Evaluate and enter all pertinent weather data.
3. Perform map load and verify map digital aeronautical flight information file (DAFIF) currency.
4. Enter aircraft weight and moment data.
5. Construct and select appropriate routes as applicable.
6. Select and enter appropriate communication and improved data modem net data.
7. Configure approved software for receiving and transmitting TACFIRE/ATHS/JVMF/HF messages.
8. Enter appropriate weapons, fire control radar (FCR) and aircraft survivability equipment (ASE) data.
9. Download/upload mission data to/from the data transfer cartridge.
10. Download/upload, and review post mission files.

DESCRIPTION:

1. The pilot in command (PC) is responsible for ensuring that pertinent data has been correctly entered into the approved software and subsequently loaded onto the data transfer cartridge (DTC). Depending on the situation, the crew may perform programming cooperatively or independently. The PC will perform, or will task the pilot to perform software configuration, data processing, and DTC loading.
2. Upon mission completion, the aircrew will perform DTC upload/download procedures as required.

Note: The PC should validate the DTC load whenever other personnel perform data programming. To ensure an accurate data load, the crew may select a hardcopy printout review using the approved software, or verify with an aircraft load.

3. Procedures. Conduct in accordance with the current technical bulletin (TB)/technical manual (TM).

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will utilize the approved software.
2. Evaluation will utilize the approved software.

REFERENCES: Appropriate common references.

TASK 1014

Operate aviation life support equipment

CONDITIONS: Given the appropriate aviation life support equipment (ALSE) for the mission.

STANDARDS: Appropriate common standards plus these additions/modifications:

Inspect/perform operational checks on ALSE.

DESCRIPTION:

1. Crew actions. The pilot in command (PC) will verify that all required ALSE equipment is onboard the aircraft before takeoff.
2. Procedures. Based on mission requirements, obtain the required ALSE. Inspect equipment for service-ability and perform required operational checks. Secure the required ALSE in the aircraft per FM 3-04.508, operators manual, and the unit SOP.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted academically.
2. Evaluation will be conducted academically.

REFERENCES: Appropriate common references.

TASK 1022

Perform preflight inspection

CONDITIONS: Given an AH-64D helicopter with armament safety and ground procedures completed and in accordance with a current TM 1-1520-251-10 and TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Perform the preflight inspections of the aircraft, armament, and any other required equipment.
2. Activate the load maintenance panel (LMP), select the desired format, and enter the correct data into the LMP.
3. Load aircraft communication security (COMSEC).
4. Enter all appropriate information on DA Form 2408-12 (*Army Aviator's Flight Record*), DA Form 2408-13 (*Aircraft Status Information Record*), and DA Form 2408-13-1 (*Aircraft Maintenance and Inspection Record*).

DESCRIPTION:

1. Crew actions.

   a. The pilot in command (PC) is responsible for ensuring that a preflight inspection is conducted using TM 1-1520-251-10 and TM 1-1520-251-CL. He may direct the pilot to complete elements of the aircraft preflight inspection as applicable, and will verify that all checks have been completed. The PC will report any aircraft discrepancies that may affect the mission and will ensure that the appropriate information is entered on DA Form 2408-12 and DA Form 2408-13.

   b. The PC will ensure a walk-around inspection is complete prior to flight.

   c. The pilot will complete the assigned elements and report the results to the PC.

2. Procedures.

   a. Consider the helicopter armed and approach it from the side to avoid danger areas. Ensure that the aircraft is in an armament safe status and follow grounding procedures prior to continuing further with the preflight.

   b. Refer to TM 1-1520-251-10 and TM 1-1520-251-CL throughout the conduct of the aircraft preflight inspection. Comply with the preflight checks contained in the checklist and standing operating procedure (SOP) as applicable.

   c. As applicable, the PC will ensure that all pertinent LMP, COMSEC, and global positioning system (GPS) key data has been loaded into the aircraft.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Tactical situation permitting, use a flashlight with an unfiltered clear lens to supplement available lighting if performing the preflight inspection during the hours of darkness. Hydraulic leaks, oil leaks, and other defects are difficult to see using a flashlight with a colored lens. TC 1-204 contains details on preflight inspection at night.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted at the AH-64D aircraft.
2. Evaluation will be conducted at the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1024

Perform before starting engine through before leaving helicopter checks

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, and given TM 1-1520-251-10 and TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Perform procedures and checks using TM 1-1520-251-10 and TM 1-1520-251-CL.
2. Enter appropriate information on DA Form 2408-12 (*Army Aviator's Flight Record*), DA Form 2408-13 (*Aircraft Status Information Record*), and DA Form 2408-13-1 (*Aircraft Maintenance and Inspection Record*) and the health indicator test (HIT) log.

DESCRIPTION:

1. Crew actions.

   a. Both crewmembers will complete the required checks pertaining to their assigned crew duties using TM 1-1520-251-10 and TM 1-1520-251-CL.

   b. The pilot ([PLT] backseat crewmember) will announce auxiliary power unit (APU) and engine starts.

   c. Both crewmembers will clear the area around the aircraft before APU start and each engine start. Set (and hold) the force trim/hold mode release switch forward on the PLT's cyclic control grip during the control sweep and trim check.

   d. Before starting the engines or performing the runup check, the crew will ensure that all appropriate internal and external lights are operational and properly set. They must make sure the lighting levels and multipurpose display (MPD) brightness are high enough to see the instruments and systems status easily.

   e. Access the avionics from either station through the MPD. Crew coordination, prior to mission commencement, should determine which crewmember will be responsible for avionics. Avionics configurations and frequencies may be set on the data transfer cartridge (DTC).

2. Procedures.

   a. TM 1-1520-251-10 and TM 1-1520-251-CL checks.

      (1) Perform interior, before starting APU and starting APU checks in accordance with the checklist. The checklist is designed for most checks to be performed with a degree of PLT/copilot-gunner (CPG) (front seat crewmember) independence. During the checks, overall crew awareness is fostered by periodic progress queries directed by each crewmember to the opposite crewmember. The fire detector test should be a cooperative check between the PLT and CPG. The PLT should announce intention to perform the fire detector test. The PLT should initiate the test by depressing the switch position #1 for at least two seconds. The PLT and CPG should verify three fire lights, master warning light, and AFT deck fire on the up-front display (UFD), and the voice warning activates. It is not necessary to allow the entire warning audio to play before initiating the position #2 test. During the position #2 test, both crewmembers should verify the same indications noted during the position #1 test along with the illumination of the two discharge (DISCH) lights.

(2) Perform all after-starting APU checks, to include optionally installed equipment checks and weapons systems initialization checks (see Task 1416). Most checks are performed with a degree of PLT/CPG independence

(3) Perform applicable engine start procedures.

(4) When applicable, perform all post rearming or post refueling before flight checks in accordance with TM 1-1520-251-10, TM 1-1520-251-CL, and unit/local standing operating procedure (SOP).

Note: During the HIT check, the aircraft may experience yaw oscillations due to flight management computer (FMC) inputs. If this occurs, the crew may elect to disengage the appropriate FMC channel through the aircraft (A/C) utility (UTIL) page.

(5) Perform engine health indicator test, determine if the HIT is within limits, and record the results in the logbook.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Before starting the engines, ensure that all internal and external lights are operational and properly set. Internal lighting levels must be high enough to easily see the instruments and to start the engines without exceeding operating limitations.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1026

MAINTAIN AIRSPACE SURVEILLANCE

CONDITIONS: In an AH-64D helicopter or simulator, and with the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Clear the aircraft and immediately inform the other crewmember of all air traffic, targets, or obstacles that pose a threat to the aircraft.
2. Announce heading, altitude, or position changes.
3. Alert wingman, team, section, and unit to all sightings of other aircraft, obstacles, or unknowns that may pose a threat.
4. Acknowledge alerts of aircraft, obstacles, or unknowns.
5. Announce when attention will be focused inside the aircraft.

DESCRIPTION:

1. Crew actions.

   a. The PC will brief airspace surveillance performance prior to the flight. The briefing will include applicable visual and fire control radar (FCR) airspace surveillance considerations specific to either the AH-64D with radar or the AH-64D without radar.

   b. The pilot not on the controls (P) will inform the P* of any unannounced heading, altitude, attitude, or position changes. The P will announce his inability to assist due to concentration inside the aircraft.

   c. The crew will confirm the suitability of the landing area and that the aircraft is clear of barriers.

2. Procedures.

   a. Maintain close surveillance of the surrounding airspace. Keep the aircraft clear from other aircraft and obstacles by maintaining visual (close, mid, and far areas) and radar surveillance of the surrounding airspace. Inform the opposite crewmember or other aircraft by voice radio immediately of any air traffic or obstacles that pose, or may pose, a threat. Call out the location of traffic or obstacles by the clock position, altitude, and distance method. (The 12 o'clock position is at the nose of the aircraft.) Give distance in kilometers or fractions of kilometers. When reporting air traffic, specify the type of aircraft (fixed-wing or helicopter) and, if known, the model. Give direction of travel (for example, left to right, right to left, climb, or descent). The altitude of the air traffic should be reported as the same, higher, or lower than the altitude at which you are flying.

Note: C-SCP targets/obstacles are more readily detectable through the HDU when utilizing a mode of flight symbology that displays a minimal amount of symbolic flight information. The transition mode of flight symbology presents an adequately de-cluttered display where the crew can more easily detect air targeting mode targets.

   b. When operating an AH-64D with radar, the crew may employ radar scanning. Select the FCR mode that is appropriate for the mission and, if desired, select C-SCP from the FCR page. Air targets can be detected in all modes of radar operation. Regardless of the mode of acquisition, the FCR active scan centerline will remain fixed on the magnetic heading that was coincident to the acquisition source at the time that the scan was initiated.

c. Employment of the FCR terrain profile mode will aid in the detection of up to 64 objects or terrain features, which the FCR defines as obstacles.

d. Prior to changing altitude or heading, visually clear the aircraft for hazards and obstacles. Hazards and obstacles will be noted by each crewmember and information shared.

e. Prior to performing a descending flight maneuver, it may sometimes be desirable to perform a clearing “S” turn to the left or right. The clearing “S” turn will provide the aircrew with a greater visual scan area.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: The use of proper scanning techniques will assist in detecting traffic and obstacles, and in avoiding spatial disorientation. When clearing the aircraft left and right, the area cleared should be coincident with the HDU symbolic field of regard limits for the PLT and coincident with the target acquisition and designation sight (TADS) FOR 90-degree tick marks for the CPG.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1028

PERFORM HOVER POWER CHECK

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator with the before takeoff check completed and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS:

1. Perform the check near the takeoff point and in the direction of takeoff.
2. Determine without error that sufficient power is available to complete the mission.

DESCRIPTION:

1. Crew actions.

   a. The P* will announce his intent to perform a hover power check and will remain focused outside the aircraft. He will announce his intentions to use the hold modes during the maneuver. He will announce when he terminates the maneuver.

   b. The pilot in command (PC) will announce specific hover height altitudes; or as pre-briefed, the P* will announce the hover height.

2. Procedures. At the beginning of the flight, an initial power check will be completed and pertinent environmental and load considerations will be applied throughout the flight. Perform a "power check" either by referencing the performance current (PERF CUR) mode page, or by performing a hover power check and referencing performance planning card (PPC). When environmental conditions allow, the crew should perform an initial power check at a hover and validate the PERF CUR mode page calculations.

   a. The P* will announce his intent to bring the aircraft to a stationary hover, in the direction of takeoff, for a hover power check. Remain focused outside the aircraft and announce when the aircraft is stabilized at the desired hover altitude. Use a 5-foot stationary hover when performing a hover power check unless the mission or terrain constraints dictate otherwise. Attitude and/or altitude hold modes may be engaged if desired. If another hover height is required, use that height to compute GO/NO-GO torque and predicted hover torque.

   b. The pilot not on the controls (P) will monitor the aircraft instruments and verify the power check. He will compare the actual hover performance data to that of the PERF page or PPC and will announce the results to the P*. If the torque required to maintain a stationary hover exceeds the GO/NO-GO torque (out-of-ground effect [OGE]) but does not exceed the GO/NO-GO torque (in-ground effect [IGE]), the P* may attempt only IGE maneuvers. If the PPC torque required to maintain a stationary hover does not exceed the GO/NO-GO torque (OGE), or if the PERF GO/NO-GO OGE page, set with current conditions (Lot 8 aircraft) is displayed with a figure that is at or below max continuous dual engine torque, he may attempt any maneuver requiring OGE/IGE power or less. The PERF page GO/NO-GO OGE for Lot 7 and previous aircraft is based on the 80-foot line, and does not provide useful information when conducting a 5-foot hover power check.

   c. If the margin between hover power and GO/NO-GO OGE power is minimal, an OGE hover power check may be performed to verify OGE power and aircraft controllability. To conduct an OGE hover power check, the P* will apply sufficient collective to ascend to an 80-foot hover or above surrounding obstacles, whichever is higher. He will execute a 360-degree left pedal turn while constantly checking the engine (ENG) page for aircraft power and controllability. He will not exceed aircraft limitations. The P* on the controls will terminate the maneuver at an IGE hover, on the ground, or as required.

d. Anytime the load or environmental conditions increase significantly (1,000 pounds gross weight [GWT], 5 degrees C, or 1,000 feet pressure altitude [PA]), the crew will perform additional power checks in conjunction with the PERF page data and/or PPC.

e. The P will announce when the hover power check is completed.

SNOW/SAND/DUST CONSIDERATIONS: Do not perform IGE hovering operations if insufficient surface contrasts exist to maintain position over the ground. Hovering in snow/sand/dust conditions reduces available ground references and may increase the possibility of spatial disorientation.

Note: At night, use of the searchlight may cause spatial disorientation while in blowing snow/sand/dust.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1032

Perform radio communications procedures

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Check, set, and operate aircraft avionics.
2. Establish radio contact with the desired individual, unit, or air traffic control (ATC) facility.
3. Employ standard radio communication procedures, terms, and phraseology applicable to the situation.
4. Operate intercom system.
5. Perform two-way radio failure procedures in accordance with DOD flight information publication (FLIP).

DESCRIPTION:

1. Crew actions.

    a. The pilot in command (PC) will assign radio frequencies and NETs per mission requirements during the crew briefing and will indicate which crewmember will establish and maintain primary communications.

    b. The pilot not on the controls (P) should monitor avionics, perform frequency changes, and establish initial contact. He will copy pertinent information and repeat information as requested by the pilot on the controls (P*). In case of two-way radio failure, the P will troubleshoot the avionics and announce results.

    c. The crewmember will announce information not monitored by the opposite crewmember.

2. Procedures.

    a. The pilot (PLT) (backseat crewmember)/copilot-gunner (CPG) (front seat crewmember) should access the communication (Com) page and check/set NETs, radios, radio modes, and transponder as required.

    b. The PLT/CPG should select the proper radio/frequency referencing the UFD prior to transmitting. Ensure that the selected radio is set to the correct mode of operation. Continuously monitor the avionics and, when required, establish communications with the appropriate individual, unit, or ATC facility. The PLT/CPG should ensure that the frequency is clear prior to transmitting. Use the correct call sign, signal operating instruction (SOI), or tail number appropriate to the situation when acknowledging each communication. Acknowledge all radio transmissions/instructions appropriate to the situation. When instructed (civil airspace), the P or P* should select new frequencies as soon as possible unless instructed to do so at a specified time, fix, or altitude.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1034

PERFORM GROUND TAXI

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, on a suitable surface, with the before-taxi check completed, the aircraft cleared, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Maintain speed appropriate for conditions.
2. Maintain the desired ground track ±3 feet.
3. Apply the torque that is appropriate for the ground taxi condition.
4. Perform taxi check.
5. Maintain level fuselage attitude.

DESCRIPTION:

1. Crew actions.

   a. The P* will ensure the parking brake is released and, if required, unlock the tail wheel before starting the ground taxi. The tail wheel will be unlocked prior to applying anti-torque pressure for a turn. The P* will announce "braking" when he intends to apply brake pressure. The P* will announce when the aircraft is clear, his intent to begin ground taxi operations, and the intended direction of turn before turning. The P* will remain focused outside the aircraft. Prior to initial taxi, the P* should direct the pilot not on the controls (P) to call out the before taxi check and then once taxiing, the taxi check. The P* will direct the P to assist in clearing the aircraft during the checks.

   b. The P will announce "guarding" to acknowledge the P*'s announcement of braking. He should not apply any pressure against the anti-torque pedals when guarding the brakes unless an unsafe situation is detected. The P will call out the before taxi check and the taxi check, when directed. He will assist in clearing the aircraft and will provide adequate warning to avoid obstacles.

2. Procedures.

   a. Ensure the area is suitable for ground taxi operations. Initiate the taxi by increasing the collective to approximately 27 to 30 percent torque and then apply a slight amount of cyclic either forward or aft of neutral to begin movement. Avoid excessive strap pack loads and droop-stop pounding by applying appropriate torque for terrain and gross weight. High gross weights, soft, rough, or sloping terrain may require the use of more than 30 percent torque.

   b. During single engine ground taxi (if required, after hot refuel), double the required dual engine taxi torque for a given condition. With the tail wheel unlocked, control the aircraft heading with the pedals and maintain a level attitude with cyclic. Roll attitude is controlled with the cyclic. Use left or right pedal input to turn the aircraft in conjunction with applying lateral cyclic into turns to maintain a level fuselage attitude. Rate of turn will be controlled by pressure and counter pressure on the anti-torque pedals. HDU symbology (transition and cruise mode), flight page symbology, and the standby instruments, as well as outside visual cues, may be used to reference fuselage roll attitude. Establish a constant speed commensurate to the surface conditions. To regulate taxi speed, use a combination of cyclic, collective and, when necessary, brakes. The hover mode velocity may be used to establish a constant ground (inertial) speed.

Note 1: Depressing either the collective or left console pushbutton switch will energize the unlock actuator and retract the lock pin; the pushbutton indicator will then illuminate and display unlock. The pushbutton indicator on the left console is checked for the tail wheel lock/unlock status. If the unlock push button fails to illuminate, taxi forward a short distance while making light pedal inputs. Depressing either switch again will de-energize the lock actuator and allow spring force to insert the lock pin when the tail wheel is properly aligned to the center position. The up-front display (UFD) will display the last tail wheel lock/unlock button command while on the squat switch, which reflects the command but not the actual status of the tail wheel. When the lock pin is in place, the pushbutton indicator will extinguish. Switch annunciation and system status will be simultaneous in both crew stations when activated from either crew station panel or collective grip.

Note 2: The flight (FLT) page will display on the left multipurpose display (MPD) anytime the symbology select (SYM SEL) switch is Z axis selected and, when selected again within 60 seconds by the same crewmember, will display the previously selected page. This allows the PLT/CPG, for example, to Z-axis between the FLT page and engine (ENG) page during the taxi check.

Note 3: Depending on ground velocity and surface conditions, emergency stops may be performed by applying the wheel brakes, using aerodynamic braking, or by bringing the aircraft to a hover.

Note 4: If the tail wheel is unlocked during rearward taxi, the trailing arm tail wheel may swivel 180 degrees, causing momentary heading instability. Use caution so that the tail wheel does not caster around suddenly, as this puts an excessive load on the tail wheel cam.

Note 5: The P* may temporarily reduce taxi torque to 22 to 24 percent for short periods with limited cyclic displacement. There may be temporary conditions where the P* desires to reduce the rotor down wash component to prevent or reduce negative rotor downwash effects.

Note 6: Excessive cyclic input and insufficient collective application may result in droop-stop pounding or excessive strap pack loading. Collective power application may disengage the squat switch during taxi operations.

Note 7: The aircraft may experience vertical oscillations due to flight management computer (FMC) inputs. If this occurs, the crew may elect to disengage the appropriate FMC channel through the aircraft utility (A/C UTIL) page.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

1. Night. The searchlight should be used for unaided ground taxi.
2. Night vision system (NVS).
   a. To maintain orientation during taxi, use the head tracker symbology to maintain the aircraft centerline relative to the desired ground track.
   b. To maintain the desired ground track, reference the heading scale, lubber line, and head tracker symbology.
   c. Be aware of the location of the sensor and the effects of parallax during turns.

d. To reference the aircraft roll attitude, use the transition mode horizon line, NVS line of sight (LOS) skid/slip (trim) ball along with the skid/slip lubber line symbology. To maintain a level fuselage with the tail wheel unlocked, use the cyclic to center the trim ball. With the tail wheel locked, use the cyclic and pedals to center the trim/slip ball.

e. To establish and measure a constant rate, use composite forward looking infrared (FLIR) cues and periodically toggle between transition and hover mode. Hover mode will provide a valid velocity vector through the embedded global positioning inertial navigation system (EGI) while on the ground.

f. Be aware that the NVS turrets are mounted relative to the waterline of the aircraft. The aircraft sits on the ground (flat pitch) at +4.9 degrees nose up. During ground operations, the ground appears to tilt during off-axis (left to right of centerline) viewing with the NVS.

SNOW/SAND/DUST CONSIDERATIONS: If ground reference is lost because of blowing snow/sand/dust, lower the collective and neutralize the flight controls until visual reference is reestablished. Taxiing at a slower speed may allow sufficient visibility. Use caution when taxiing near other maneuvering aircraft because of limited visual references and relative motion illusion. When initiating ground taxi in snow or ice, apply pressure and counter pressure to the pedals to ensure the wheels are not frozen to the ground. At night, use of the search/landing light may cause spatial disorientation.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1038

PERFORM HOVERING FLIGHT

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator with the before-takeoff check completed, aircraft cleared, pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU), performance (PERF) page selected when a hover power check will be accomplished, hover power check completed, and given a specific hover height, velocity, heading, or ground track.

STANDARDS: Appropriate common standards and the following:

1. Perform a smooth controlled ascent to a hover.
2. Perform hover power check, as appropriate.
3. Execute a smooth controlled descent with minimum drift at touchdown.

DESCRIPTION:

1. Crew actions.

   a. The P* will announce his intent to perform a specific hovering flight maneuver and will remain focused outside the aircraft. The P* will announce his intentions to use the hold modes during the maneuver. The P* will announce when he terminates the maneuver. During any out-of-ground effect (OGE) hover or low speed OGE hovering operations, the P* will announce his forced landing or single engine flyaway plan.

   b. The pilot in command (PC) will announce specific hover height altitudes, or as pre-briefed, the P* will announce the hover height.

   c. The P* will announce his intended forced landing area or flyaway plan anytime the aircraft is brought to an OGE hover.

2. Procedures.

   a. Takeoff to a hover. With the collective fully down, place the cyclic in a neutral position. Increase the collective with a smooth, positive pressure. Apply pedals to maintain heading, and coordinate the cyclic for a vertical ascent. Using outside references, the horizon line, or the trim ball, keep the fuselage level until the main landing gear is off the ground. As the aircraft leaves the ground, check for proper control response and aircraft center of gravity (CG). On reaching the desired hover altitude, perform a power check according to TM 1-1520-251-10 and TM 1-1520-251-CL.

   b. Hovering flight. Adjust the cyclic to maintain a stationary hover or to move in the desired direction. Control heading with pedals, and maintain altitude with the collective. Maintain a constant hover speed. To return to a stationary hover, apply the cyclic in the opposite direction while maintaining altitude with collective and heading with the pedals.

      (1) Hover taxi is used when slow forward movement is desired or when it may be appropriate to move very short distances). Pilots should avoid this procedure if rotor down wash is likely to cause damage to parked aircraft or if blowing dust/sand could obscure visibility. If it is necessary to operate above 25 feet above ground level (AGL) when hover taxiing, the pilot should initiate a request to air traffic control (ATC).

Note: When visual references deteriorate, making a hover taxi unsafe, determine whether to abort the maneuver, ground taxi, air taxi, or perform a takeoff.

(2) Air taxi is the preferred method for helicopter ground movements at airports, provided ground operations and conditions permit. Unless otherwise requested or instructed, pilots are expected to remain below 100 feet AGL. However if a higher than normal airspeed or altitude is desired, the request should be made prior to lift-off. The pilot is solely responsible for selecting a safe airspeed for the altitude/operation being conducted. Use of air taxi enables the pilot to proceed at an optimum airspeed/altitude, minimize downwash effect, conserve fuel, and expedite movement from one area to another. Helicopters should avoid over flight of other aircraft, vehicles, and personnel during air taxi operations. Caution must be exercised concerning active runways and pilots must be certain that air taxi instructions are understood. Special cautions may be necessary at unfamiliar airports or airports with multiple/intersecting active runways.

c. Hovering turns. Apply pressure to the desired pedal to begin the turn. Use pressure and counter pressure on the pedals to maintain a constant rate of turn. Coordinate cyclic control to maintain position over the pivot point while maintaining altitude with the collective. (Hovering turns can be made around the vertical axis, nose, or tail of the aircraft.) The origin of the hover mode velocity vector represents a point approximate to the aircraft's mast.

d. Landing from a hover. From a stationary hover, lower the collective to affect a smooth descent to touchdown, while making necessary corrections with the pedals and cyclic to maintain a constant heading and position. On ground contact, ensure that the aircraft remains stable. Continue decreasing the collective smoothly and steadily until the entire weight of the aircraft rests on the ground. Neutralize the pedals and cyclic, and reduce the collective to the fully down position. If uneven surface conditions are suspected, set the parking brake before starting the descent.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Movement over areas of limited contrast, such as tall grass, water, or desert, tends to cause spatial disorientation. To avoid spatial disorientation, seek hover areas that provide adequate contrast and use proper scanning techniques. If disorientation occurs, perform unusual attitude recovery, apply sufficient power, and execute a go-around. If a go-around is not feasible, try to maneuver the aircraft forward and down to the ground, referencing the velocity vector to limit the possibility of touchdown with sideward or rearward movement.

NVS CONSIDERATIONS:

1. Takeoff to a hover.

a. Clear the aircraft by slewing the forward looking infrared (FLIR) sensor within the available field of regard.

b. Select visual references to aid in heading, position, and altitude control. Supplement visual references, as appropriate, with symbolic information.

c. Orient the night vision system (NVS) line of sight (LOS) so that the selected references remain visible during the maneuver. Align the NVS turret in azimuth to the longitudinal axis of the aircraft to aid in heading control. Depress the NVS turret below level in order to perceive more ground cues.

d. Maintain a fixed-head position during takeoff so that any movement perceived in the imagery is relative to the aircraft and not to the pilot night vision system (PNVS)/target acquisition and designation sight (TADS) turret.

e. Use imagery and the appropriate symbology for heading, altitude, and drift (position) control.

2. Hovering flight.
   a. Select the appropriate symbology mode (hover, bob-up, or transition).
   b. Clear the aircraft by slewing the FLIR sensor in the direction of travel. Use the acceleration cue and velocity vector to maintain position and imagery for altitude reference. Select references that can be used to determine arrival at the desired termination point.
   c. When clearance to perform a lateral hover is assured, use the acceleration cue and velocity vector to establish the desired rate and direction of movement. Full-scale deflection of the velocity vector display is equivalent to 6 knots ground speed (GS) in hover mode and 60 knots GS in transition mode. Use imagery to maintain altitude and clearance, and cross-check heading tape symbology to maintain heading.
   d. Upon approaching the desired termination point (imagery-provided references), begin decelerating so as to arrive in a stabilized hover using primarily acceleration cue and velocity vector. Maintain altitude with imagery and a cross-check of radar altitude symbology.
3. Hovering turns.
   a. Select the appropriate symbology mode (hover or bob-up).
   b. Stabilize the aircraft while referencing imagery-supplied close-in cues, the acceleration cue and velocity vector, and the radar altitude symbology.
   c. Clear the aircraft by slewing the FLIR sensor within the field of regard (CPG TADS FOR 90-degree tick mark). Use the acceleration cue and velocity vector to maintain a constant position and the altitude and vertical speed indicator (VSI) symbols to maintain a constant altitude. Depending on the rate (acceleration) of turn, the acceleration cue will show some displacement even when there is no velocity vector stemming from the centroid. When clearance to perform a hovering turn is assured, slew the FLIR sensor in the desired direction of turn. Maintain aircraft position, heading, and altitude before turning by referring to the composite imagery, imagery-supplied cues, and appropriate symbols.
   d. To aid in determining the termination point, select a reference point visible within the instantaneous field of view (FOV) of the FLIR. If the turn is greater than 90 degrees, use the heading symbology to help identify the termination point.
   e. During the turn, employ a cross-check that scans imagery-supplied cues as well as the altitude and vertical velocity symbols.
   f. Keep the NVS LOS oriented toward the visual reference point. All movement observed in the imagery will be the result of changes in aircraft attitude rather than by turret movement.

Note: Heading hold is always operational. The P* will have to apply a limited extra amount of pedal pressure to break out of the heading hold. Once the aircraft breaks out of heading hold, a small amount of pedal counter pressure will have to be smoothly yet quickly applied to establish a constant rate of turn.

4. Landing from a hover.
   a. Select the desired mode of NVS symbology.
   b. Use imagery and symbology to control the descent rate (VSI/RAD ALT [radar altitude]), drift (acceleration cue and velocity vector), and heading.

Note 1: The location and gimbal limits of the FLIR sensor prevent the P* from seeing the actual touchdown point during this maneuver. He must obtain clearance of the intended touchdown point before positioning the aircraft over the point. If uneven surface conditions are suspected, the crew should set the parking brakes before initiating the descent.

Note 2: Under normal loading conditions, the aircraft will hover approximately 3 degrees left side low.

Note 3: Use of the manual stabilator mode reduces airframe vibration in strong crosswinds or tail winds.

Note 4: Position hold may be selected while on the ground; it will not take effect until off the squat switch. A box will appear around the airspeed readout when position hold is engaged. If a position hold drift of 48 feet occurs, an advisory will be given.

Note 5: Altitude hold may be engaged after the aircraft lifts off the squat switch. When altitude hold is initiated, a home plate symbol will be displayed at the zero rate of climb reference point and the up-front display (UFD) will display an advisory notification. If altitude hold or position hold are lost, an advisory tone will sound and a UFD message will be displayed.

SNOW/SAND/DUST CONSIDERATIONS: Do not perform IGE hovering operations if insufficient surface contrasts exist to maintain position over the ground. Hovering in a snow/sand/dust condition reduces available ground references and may increase the possibility of spatial disorientation. If necessary to reposition the aircraft in snow/sand/dust, execute an instrument takeoff. When marginal power exists, do not attempt to ascend to an out-of-ground effect (OGE) hover in a snow/sand/dust environment. If during an ascent to an OGE hover, it is discovered that OGE power is not available, transition to the instruments and conduct an instrument takeoff using max torque available.

Note: At night, use of the searchlight may cause spatial disorientation while in blowing snow/sand/dust.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1040

PERFORM VISUAL METEOROLOGICAL CONDITIONS TAKEOFF

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator with the hover power and before-takeoff checks completed, aircraft cleared, and pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Maintain takeoff heading ±10 degrees below 50 feet or until clear of the obstacles, or minimum power takeoff until through effective translational lift (ETL).
2. Maintain ground track alignment with the takeoff direction.
3. Maintain the aircraft in trim above 50 feet above ground level (AGL) or as appropriate for obstacle avoidance.
4. Accelerate to desired airspeed ±10 knots.
5. Apply takeoff power, not to exceed maximum (MAX) torque (%Q) available for the selected takeoff, until reaching desired altitude, minimum single engine airspeed, or as conditions permit.

DESCRIPTION:

1. Crew actions.

   a. The P* will remain focused outside the aircraft during the maneuver. The P* will announce the type of takeoff and whether the takeoff is from the ground or from a hover and his intent to abort or alter the takeoff. The P* may select the flight (FLT)/engine (ENG) page. The P* will consider snow, sand, and obstacle barrier clearance when he evaluates the power required versus power available. The P* should not exceed dual engine torque/turbine gas temperature (TGT) limits during these high power takeoffs.

   b. The pilot not on the controls (P) will announce when ready for takeoff. The P will remain focused primarily outside the aircraft to assist in clearing the aircraft and to provide adequate warning of obstacles. The P will announce when his attention is focused inside the cockpit. The P will select reference points to assist in maintaining the takeoff flight path. The P will monitor power requirements and advise the P* if power limits are being approached.

   c. The pilot in command (PC) will determine the direction and type of takeoff by analyzing the power available, the wind, the long axis of the takeoff area, and the lowest obstacles.

2. Procedures.

   a. Visual meteorological conditions (VMC) takeoff from the ground (10 percent above hover power available). Select reference points to maintain ground track. With the cyclic in the neutral position, increase the collective until the aircraft becomes “light on the wheels.” Maintain heading with the pedals. Continue increasing the collective to obtain approximately 10 percent above hover torque or as necessary. Depending upon the configuration of the aircraft and the load, the P* may have to increase the collective to a value greater than 10 percent above hover power to establish the desired climb. As the aircraft leaves the ground, apply forward cyclic as required to accelerate through effective translational lift (ETL) to obtain the desired climb attitude (approximately 90 knots true airspeed [KTAS]). Maintain ground track and keep the aircraft aligned with takeoff direction below 50 feet. Maintain heading with the pedals until 50 feet AGL or clear of obstacles/barriers, then place the aircraft in trim. When above minimum single engine airspeed, position the collective to establish the desired rate of climb (approximately 500 feet per minute [FPM] for training).

b. VMC takeoff from a hover (10 percent above hover power available). Select reference points to maintain ground track. Apply forward cyclic to accelerate the aircraft while applying approximately 10 percent torque above hover power or as necessary, not to exceed dual engine maximum torque, with the collective. Perform the rest of the maneuver as for a takeoff from the ground.

c. VMC level acceleration takeoff. When surface conditions and obstacles permit, the aircraft should be accelerated through minimum single airspeed prior to establishing a climb. This profile will aid the crew in establishing airspeed and reduce the risks associated with operation in the avoid region should an engine fail. Select reference points to maintain ground track. Place the cyclic and pedals in the neutral position and apply power. As the aircraft leaves the ground, adjust power to approximately 10 percent above hover power (if available), not to exceed dual engine maximum torque, and apply forward cyclic to establish an accelerative attitude appropriate for the terrain and obstacle avoidance. After accelerating through minimum single engine airspeed, adjust the cyclic to continue the acceleration to the desired climb airspeed and maintain the desired ground track. Adjust power upon reaching minimum single engine airspeed to obtain the desired rate of climb. Maintain heading with the pedals until 50 feet AGL or clear of obstacles/barriers, then place in trim. After obtaining the desired airspeed, adjust the controls as necessary to stop the acceleration and maintain the desired rate of climb.

Note: Avoid rapid and excessive forward cyclic application to prevent main rotor contact with the takeoff surface.

d. VMC minimum power takeoff (hover power). Environmental and helicopter loading may result in the helicopter hovering in-ground effect (IGE) at or near maximum torque available dual engine. The crew should recognize this through accurate performance planning, hover power check (environmental conditions permitting), and validation of data indicated on the PERF page. The crew should give consideration to perform a rolling takeoff if surface conditions are suitable. If surface conditions are unsuitable for a rolling takeoff, the may perform the following takeoff but should be aware of the limited power margin and its effect on aircraft maneuverability.

Note: Due to high gross weight and adverse environmental conditions, when operating at or near maximum power limits, the P* will select the aircraft (A/C) ENG page and monitor the torque and TGT during takeoff.

(1) From the ground. Select reference points to maintain ground track. With the cyclic in a neutral position, increase the collective until the helicopter becomes light on the wheels. Apply pressure and counter pressure to the pedals to ensure the helicopter is free to ascend. While maintaining heading with the pedals, continue increasing the collective until the helicopter leaves the ground. As the helicopter leaves the ground, apply forward cyclic as required to accelerate through ETL at an altitude that is appropriate for the terrain and to avoid obstacles. A slight loss in altitude can be expected as the helicopter transitions into forward flight. As the helicopter reaches ETL, adjust the cyclic and collective to obtain the desired rate of climb and use the pedals to place the aircraft in trim.

(2) From a hover. Select reference points to maintain ground track. Apply forward cyclic to accelerate the aircraft while maintaining hover torque. Apply forward cyclic as required to accelerate through ETL at an altitude that is appropriate for the terrain and to

avoid obstacles. A slight loss in altitude can be expected as the helicopter transitions into forward flight. As the helicopter reaches ETL, adjust the cyclic and collective to obtain the desired rate of climb and use the pedals to place the aircraft in trim.

Note 1: Once through ETL, for acceleration a 5-degree nose low attitude is recommended. Avoid unnecessary accelerative attitudes of more than 10-degree nose low.

Note 2: The height velocity diagram in TM 1-1520-251-10 displays “avoid areas.” This diagram assumes the availability of a suitable forced landing area in case of engine failure. If surface conditions permit, the P* should accelerate the aircraft to minimum single engine airspeed prior to establishing the desired climb rate.

Note 3: Stabilator mode selection will affect the amount of cyclic required to achieve the climb pitch attitude and the power required to accelerate and climb in the desired attitude (drag related). Under normal circumstances, the automatic stabilator program provides an optimum schedule for acceleration. However, the P* can use the manual mode stabilator control to fine-tune drag versus airspeed and achieve lower power requirements for a given airspeed. The P* will announce the use of the manual stabilator.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

1. If sufficient illumination or NVD resolution exists to view obstacles, the P* can accomplish the takeoff in the same way as he does a normal VMC takeoff during the day. Visual obstacles, such as shadows, should be treated the same as physical obstacles. If sufficient illumination or NVD resolution does not exist, he should perform an altitude-over-airspeed takeoff, power permitting, to ensure obstacle clearance. The P* may perform the takeoff from a hover or from the ground.
2. Reduced visual references during the takeoff and throughout the climb at night may make it difficult to maintain the desired ground track. The crew should know the surface wind direction and velocity. This will assist the P* in establishing the crab angle required to maintain the desired ground track.
3. Night vision system (NVS) from the ground.
    a. Select the hover mode of symbology.
    b. Use forward looking infrared (FLIR) imagery and torque symbology to establish the aircraft light on the wheels.
    c. As the aircraft leaves the ground, verify the desired rate of forward movement by cross-checking the acceleration cue, velocity vector, and composite video. When the velocity vector becomes saturated, select transition mode symbology.
    d. On climb out, adjust aircraft attitude (horizon line) and climb rate (vertical speed indicator [VSI] symbol) as desired.
    e. Use available FLIR imagery and velocity vector to establish and maintain ground track.
4. NVS from a hover.
    a. Select hover mode of symbology.
    b. As the aircraft accelerates to ETL, verify the desired rate of motion by cross-checking the acceleration cue, velocity vector, and composite video. When the velocity vector becomes saturated, select transition mode symbology.
    c. Monitor altitude before ETL using imagery and altitude symbology.
    d. On climb out, adjust aircraft attitude (horizon line) and climb rate (VSI symbol) as desired.

e. Use available FLIR imagery and velocity vector to establish and maintain ground track.

Note: The crew must use proper scanning techniques to avoid spatial disorientation.

SNOW/SAND/DUST CONSIDERATIONS: Prior to takeoff, the P* should select an ENG page and FLT page. Smoothly increase the collective until the aircraft becomes "light on the wheels," approximately 20 percent torque below hover power. Check the controls for proper response. Continue, smoothly increasing the collective to maximum torque available, not to exceed aircraft limits. As the aircraft leaves the ground, maintain heading with the pedals and a level attitude with the cyclic. Monitor HDU symbology to aid in detecting aircraft drift, rate of climb, attitude, altitude, and airspeed.

1. Out-of-ground effect (OGE) hover power available. Give consideration to engaging position hold until the aircraft clears the snow/sand/dust cloud and all barriers. Once clear, establish visual flight, accelerate to climb airspeed, and trim the aircraft. If during the ascent, it is discovered that insufficient power is available to clear the obscurant, continue to apply maximum torque available, adjust pitch attitude to level attitude for the initial acceleration, and maintain heading with the pedals as in an instrument takeoff. Cross reference HDU symbology and FLT page as necessary to avoid unusual attitude or aircraft drift. A slight loss in altitude can be expected as the helicopter transitions into forward flight. As the aircraft clears the snow/sand/dust cloud and all barriers, establish visual flight, accelerate to climb airspeed, and trim the aircraft. The P will monitor ENG page and announce approaching performance limitations. He will also monitor aircraft drift, rate of climb, attitude, and airspeed, and announce unplanned deviations to the P*. Upon clearing the obscurant, he will announce when able to continue visual flight.
2. OGE hover power marginal or unavailable.

   a. Altitude over airspeed (OGE power marginal). As rate of climb diminishes, continue to apply maximum torque available, and adjust pitch attitude to level attitude for the initial acceleration, and maintain heading with the pedals as in an instrument takeoff. Cross-reference HDU symbology and FLT page as necessary to avoid unusual attitude or aircraft drift. A slight loss in altitude can be expected as the helicopter transitions into forward flight. As the aircraft clears the snow/sand/dust cloud and all barriers, establish visual flight, accelerate to climb airspeed, and trim the aircraft. The P will monitor ENG page and announce approaching performance limitations. He will also monitor aircraft drift, rate of climb, attitude, and airspeed, and announce unplanned deviations to the P*. Upon clearing the obscurant, he will announce when able to continue visual flight.

   b. Airspeed over altitude (OGE power unavailable). As a positive rate of climb is established, continue to apply maximum torque available, and adjust pitch attitude to level attitude for the initial acceleration, and maintain heading with the pedals as in an instrument takeoff. Cross-reference HDU symbology and FLT page as necessary to avoid unusual attitude or aircraft drift. A slight loss in altitude can be expected as the helicopter transitions into forward flight. As the aircraft clears the snow/sand/dust cloud and all barriers, establish visual flight, accelerate to climb airspeed, and trim the aircraft. The P will monitor ENG page and announce approaching performance limitations. He will also monitor aircraft drift, rate of climb, attitude, and airspeed, and announce unplanned deviations to the P*. Upon clearing the obscurant, he will announce when able to continue visual flight.

Note 1: Prior to takeoff, P* should select a FLT page and if desired bias the pitch ladder. Although it is not a requirement to perform a limited visibility takeoff, the P* may adjust the nose-up or nose-down bias of the pitch ladder and horizon line (±10 degrees). Commonly, the pitch bias is set approximately 5 degrees nose high.

Note 2: In some cases, applying collective to blow away loose snow from around the aircraft is beneficial before performing this maneuver.

Note 3: Be prepared to transition to instruments and perform an instrument takeoff if ground reference is lost.

Note 4: At night, use of the searchlight may cause spatial disorientation while in blowing snow/sand/dust.

CONFINED AREA CONSIDERATIONS: A VMC takeoff from a confined area will be initiated in the same manner as a terrain flight takeoff (Task 1407). After clearing the barriers, adjust the flight controls as necessary to establish the desired rate of climb and proceed as in a VMC takeoff.

MOUNTAIN/PINNACLE/RIDGELINE CONSIDERATIONS: Analyze winds, obstacles, and density altitude. Perform a hover power check, if required. Determine the best takeoff direction and path for conditions. Execute an airspeed-over-altitude take-off by gaining forward airspeed while maintaining sufficient altitude to clear any obstacles until reaching climb airspeed. After clearing obstacles accelerate to the desired airspeed.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in an AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1041

PERFORM TRAFFIC PATTERN FLIGHT

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, given altitudes, airspeeds, and traffic pattern headings with the aircraft cleared, and pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

Without error, complete the before-landing check prior to the approach/landing according to TM 1-1520-251-CL.

DESCRIPTION:

1. Crew actions.

    a. The P* will remain focused outside the aircraft while in the traffic pattern. The P* will announce and clear each turn in the pattern. The P* also will announce the type of approach planned, initiation of the approach, intended point of touchdown and direct assistance as necessary.

    b. The pilot not on the controls (P) will acknowledge the P* and provide assistance. The P will assist in clearing the aircraft in the traffic pattern and will provide adequate warning of traffic and obstacles detected in the flight path. The P will announce when his attention is focused inside the cockpit, for example, when calling out the before-landing check.

2. Procedures.

    a. Select cruise mode or transition mode flight symbology as desired on the HDU. Remain focused outside the aircraft while in the traffic pattern. Evaluate the wind direction and magnitude noting either the tactical situation display (TSD)'s wind status window; PERF page wind status window, velocity vector with a comparison of true airspeed (TAS) and ground speed (GS), or external wind cues. Announce and clear each turn in the pattern and the type of approach planned transition flight symbology (flight path vector and velocity vector).

    b. Maneuver the aircraft into position to enter the downwind leg midfield at a 45-degree angle, according to local procedures, or as directed by air traffic control (ATC) at traffic pattern altitude, and at the proper airspeed. A straight-in or base-leg entry may be used if approved by ATC. Prior to the approach/landing, complete the before-landing check. Prior to turning base, reduce power and airspeed as required and initiate a descent. If performing a straight in or a base-leg entry, reduce airspeed as in conducting a visual meteorological conditions (VMC) approach (Task 1058). Turn to establish base and final leg, as appropriate. Maintain the desired ground track. Execute the desired approach.

    c. For a closed traffic pattern after takeoff, climb straight ahead at climb airspeed to the appropriate altitude, turn to crosswind, and continue the climb. Initiate the turn to downwind and adjust heading as required to maintain the desired ground track. Adjust power and attitude, as required, to maintain traffic pattern altitude and airspeed.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Maintain a continuous coordinated turn to the downwind leg and establish airspeed and altitude as directed. Initiate the turn from downwind when in a position to make a continuous coordinated turn to the final approach course.

TRAFFIC PATTERN FLIGHT NVS CONSIDERATIONS:

1. On departure, establish ground track using forward looking infrared (FLIR) imagery, velocity vector, lubber line, and heading tape. Obtain attitude, altitude, rate of climb (R/C), airspeed, and heading information by cross-checking the appropriate symbology.
2. To initiate the turn to downwind, look in the direction of the turn and then maneuver the aircraft into the cleared night vision system (NVS) field of view (FOV). Use the horizon symbology to determine pitch and roll angle, and rate of climb indicator to maintain desired rate of climb during the turn.
3. On downwind, establish a torque setting (symbology) that will maintain the desired airspeed and altitude.
4. From downwind, look in the direction of the turn and use composite video to maintain altitude and decelerate to initial approach speed. As the turn progresses, the intended landing area will become visible within the pilot night vision system (PNVS) field of regard. Using that relative position information, plan the remainder of the turn to arrive aligned with the intended touchdown area.

TRAINING CONSIDERATIONS: Recommended airspeed for traffic pattern for training is 110 knots true airspeed (KTAS) on downwind and 90 KTAS on crosswind and base.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1044

NAVIGATE BY PILOTAGE AND DEAD RECKONING

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, and given appropriate maps, plotter, computer, and flight log.

STANDARDS: Appropriate common standards and the following:

1. Maintain orientation within 500 meters of the planned route, or the actual aircraft position if deviation from the planned route is required.
2. Arrive at checkpoints ±3 minutes of adjusted estimated time of arrival (ETA).

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will remain focused outside the aircraft and will respond to navigation instructions or cues given by the pilot not on the controls (P). The P* will acknowledge commands issued by the P for heading and airspeed changes necessary to navigate the desired course. The P* will announce significant terrain features to assist in navigation.

   b. The P will direct the P* to change aircraft heading and airspeed as appropriate to navigate the desired course. The P will use rally terms, specific headings, relative bearings, or key terrain features in accomplishing this task. The P will announce all plotted hazards prior to approaching their location. The P will focus his attention primarily inside the cockpit; however, as his workload permits, he will assist in clearing the aircraft and will provide adequate warning to avoid traffic and obstacles.

2. Procedures. Use both pilotage and dead reckoning to maintain the position of the aircraft. Perform a ground speed check as soon as possible by computing the actual time required to fly a known distance or as indicated on the multipurpose display (MPD). Adjust estimated times for subsequent legs of the route using actual ground speed. Determine correction for winds, if necessary, so that the airspeed or ground speed and heading can be computed for the remaining legs of the flight. Make heading corrections to maintain the desired course (ground track).

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Interior cockpit lighting should be considered when selecting colors for preparing navigational aids; for example, maps and knee board notes.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1046

Perform electronically aided navigation

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Ensure navigational system checks are performed in accordance with the TM 1-1520-251-10/TM 1-1520-251-CL.
2. Operate the installed electronically aided navigational system per the appropriate technical manual (TM) and perform the following—
    a. Add/delete/edit/store points to a route.
    b. Coordinate review.
    c. Abbreviation (ABR) page functions.
    d. Perform direct function.
    e. Build a route.
    f. Select appropriate route.
    g. Reverse a route.
    h. Route review function.
    i. Pan functions.
    j. Show page functions.
    k. Perform digital map navigation.
    l. Determine the position of the aircraft along the route of flight within 100 meters.
    m. Arrive at checkpoints ±30 seconds of planned estimated time of arrival (ETA).

DESCRIPTION:

1. Crew actions.

    a. The pilot on the controls (P*) will fly the programmed navigation course using appropriate navigation cues provided through the helmet display unit (HDU), multipurpose display (MPD), or as directed by the pilot not on the controls (P).

    b. The P will announce all navigation destination changes and verify the heading. The P* will acknowledge and verify the new navigation heading.

Note 1: Only the P will perform in-flight time/labor intensive tactical situation display (TSD) navigation (NAV) programming duties (for example, building routes). Whenever possible, the P should perform most TSD NAV programming duties.

Note 2: The PC will ensure situational awareness is maintained at all times due to increased workload and information management challenges.

    c. The pilot (PLT) (backseat crewmember) or copilot-gunner (CPG) (front seat crewmember) will perform the preflight TSD NAV phase page configuration, embedded global positioning inertial navigation system (EGI) initialization, initiated built-in tests (IBITs), and programming procedures. As pertinent to the situation, either the P or P* will perform route navigation, position verification, and target management procedures.

2. Procedures. Test and programming procedures per the appropriate TM.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1048

Perform fuel management procedures

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Verify/input the correct internal auxiliary fuel (IAF)/auxiliary (AUX)-tank fuel type and quantity.
2. Verify that the required amount of fuel is onboard at the time of takeoff.
3. Manually or by the use of the aircraft (A/C) fuel check page, compute in-flight fuel consumption check 15 to 30 minutes after leveling off or entering into the mission profile.
4. Select and perform fuel page subsystem operations.

DESCRIPTION:

1. Crew actions.

   a. The pilot in command (PC) will brief fuel management responsibilities before takeoff. He will ensure the other crewmember understands procedures.

   b. The PC will acknowledge the results of the fuel check. He will initiate an alternate course of action during the flight if the actual fuel consumption varies from the planning value and the flight cannot be completed with the required reserve.

   c. The pilot not on the controls (P) will announce when he initiates the fuel check and when he completes the fuel check. The P also will announce the results of the fuel check.

   d. Either crewmember may access the fuel page during aircraft runup and will confirm the correct AUX-tank fuel type and quantity. He will announce to the other crewmember when the transfer group is accessed and the forward (FWD) or (AFT) transfer button is selected during a manual internal fuel transfer. He will also announce when fuel-balancing operations have been completed. An aircraft's configuration may require the aircrew to perform manual fuel transfer in the instance of unusual aircraft weight and balance center of gravity (CG) considerations.

2. Procedures.

   a. Before-takeoff initial fuel. Note fuel quantity. Compare total fuel status window with mission fuel requirements determined during premission planning. If fuel on board is inadequate, have the aircraft refueled or abort or revise the mission.

   b. Fuel consumption check. Compute total pounds per hour, reserve entry time, and burn out time.

Note 1: Calculation (CALC) flow on the fuel page is NOT actual fuel flow.

Note 2: The displayed fuel endurance is predicated on the CALC flow rate, which is dependent on the engine torque setting. If torque settings are changed, the fuel flow and endurance values will change. Fuel endurance (ENDR) is also displayed on the tactical situation display (TSD) page in the endurance status window. Fuel remaining in the forward, aft, and external cells is displayed in hours and minutes.

   c. Fuel management. Maintain the aircraft within CG limitations.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in an AH-64D aircraft or an AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1050

PERFORM HIGH SPEED FLIGHT

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, given altitudes, with the aircraft cleared, pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU), and aircraft engine (A/C ENG) page selected.

STANDARDS: Appropriate common standards and the following:

Set power to maximum continuous power.

DESCRIPTION:

1. Crew actions.

a. The pilot in command (PC) will consider and ensure the crew is aware of the effects of an engine failure during high-speed flight. If an engine failure occurs above maximum single engine airspeed, torque will immediately double associated with turbine gas temperature (TGT) limiting, which will result in rapid rotor decay.

b. The P* will remain focused outside the aircraft and will announce his intent to initiate the maneuver and direct assistance as necessary. The P* will make smooth and controlled inputs. The P* will only momentarily divert focus during critical portions of the maneuver to ensure trim, torque (%Q), and rotor control are maintained. He also will announce recovery from the maneuver.

c. The pilot not on the controls (P) will acknowledge the P* and provide assistance. The P will provide adequate warning to avoid traffic or obstacles detected in the flight path. The P will announce when attention is focused inside the cockpit (for example, checking %Q and TGT). The P will acknowledge the P* and provide assistance.

2. Procedures. Select the A/C ENG page and temporarily bring up the PERF page to check the maximum dual engine %Q available. Smoothly increase the collective to maximize continuous power (torque or TGT, whichever comes first). Adjust cyclic as required to maintain altitude and ground track. Maintain the aircraft in trim with the pedals and stabilize the aircraft at Vh in trim.

Note 1: Vh is defined as the maximum airspeed in level flight with maximum continuous power being applied.

Note 2: High-speed flight is a random night system (NS) evaluation task element. There is no aircrew training manual (ATM) requirement to train or evaluate this element under night (N) or nuclear, biological, and chemical (NBC) conditions.

Note 3: The crew must be aware of the effects of transient torque at high power settings as well as the effects the maximum torque rate attenuator (MTRA) has on the 701C.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1056

PERFORM HIGH/LOW G FLIGHT

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, with the aircraft cleared, P* fitted with a boresighted helmet display unit (HDU), and aircraft flight (A/C FLT) set page selected.

STANDARDS: Appropriate common standards and the following:

1. Establish entry altitude ±50 feet.
2. Establish entry airspeed 130 knots true airspeed (KTAS), ±5 KTAS.
3. Attain appropriate G loading.
   a. High: +2.0 Gs, ±0.2 Gs.
   b. Low: +0.2 Gs, ±0.2 Gs.
4. Recover to straight and level flight.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will remain focused outside the aircraft. The P* and pilot not on the controls (P) will clear above the aircraft and the P* will announce his intent to initiate the maneuver.

   b. The P will acknowledge the P* and provide assistance.

2. Procedures.

   a. Prior to initiating the maneuver, the P and the P* will select the FLT page and the set button. The accelerometer reset button will be displayed just above the accelerometer. (The only place the accelerometer will be displayed is when the FLT set button is selected from the FLT page. The accelerometer is not available with helmet mounted display (HMD) symbology; a G status digital readout will be displayed when a G limitation is about to be exceeded.) Select the reset button. The accelerometer tell-tales will reset to 1 G. Following the reset, the tell-tales continue to be driven by actual acceleration data. Therefore, if the helicopter is experiencing acceleration values exceeding (in either direction) the reset values, the tell-tales will display this as their new position.

   b. Establish straight-and-level flight on a fixed ground track at a given entry altitude, at an airspeed of 130 KTAS, accelerometer set to zero, and aircraft cleared above. Announce intent to initiate maneuver. The maneuver is initiated by firmly applying aft cyclic as necessary to achieve +2.0 Gs, maintaining the aircraft in trim with the pedals. The collective should remain fixed or be increased slightly to initially aid vertical (positive) acceleration. The gravity-force (Gs) attained will be displayed to the left of the airspeed readout on the FLT set as a maintained indicator. As +2.0 Gs are attained and airspeed passes through 110 KTAS, apply forward cyclic to attain +0.2 Gs for one second and then recover to straight-and-level.

Note 1: A digital indication of the vertical acceleration will be displayed when the aircraft is within 0.25 Gs of the current acceleration limit or when the aircraft exceeds the 0.3 G to 2 Gs normal operating range.

Note 2: Minimum altitude is 200 feet above ground level (AGL) during the maneuver.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1058

PERFORM VISUAL METEROLOGICAL CONDITIONS APPROACH

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator with the before-landing check completed and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Select a suitable landing area.
2. Maintain a constant approach angle to the desired point of termination (hover or touchdown) with deviations for surface conditions or obstacles at the point of termination.
3. Maintain ground track alignment with the landing direction with minimum drift.
4. Maintain rate of closure appropriate for the conditions.
5. Align aircraft with landing direction below 50 feet or as appropriate for obstacle avoidance.
6. Perform a smooth and controlled termination to a hover or to the ground at the intended point of touchdown.

DESCRIPTION:

1. Crew actions.

   a. The P* will select a flight path, an airspeed, and an altitude that afford best observation of the landing area. He will remain focused outside the aircraft to evaluate suitability of the area, evaluate the effects of wind, and clear the aircraft throughout the approach and landing. The P* will remain focused outside the aircraft. He will announce when he begins the approach, whether the approach will terminate to a hover or to the ground, the intended point of landing, and any deviation to the approach. He will announce the use of the manual stabilator.

   b. The pilot not on the controls (P) will confirm the suitability of the area, assist in clearing the aircraft, and provide adequate warning of traffic or obstacles. He will acknowledge the use of the manual stabilator and any intent to deviate from the approach. He will announce when his attention is focused inside the cockpit.

2. Procedures. Evaluate the wind direction and magnitude, noting either the tactical situation display's (TSD) wind status window, PERF page wind status window, velocity vector with a comparison of true airspeed (TAS) and ground speed (GS), or external wind cues. Select an approach angle that allows obstacle clearance while descending to the desired point of termination. Once the termination point is sighted and the approach angle is intercepted (on base or final), adjust the collective as necessary to establish and maintain a constant angle with deviations for surface conditions or obstacles at the point of termination. If desired, use the nap of the earth (NOE) approach mode or the manual stabilator mode to enhance forward visibility during the descent, or the P* can make a pedal input to enhance visibility of the intended touchdown point. Maintain entry airspeed until the rate of closure appears to be increasing. Adjust airspeed as necessary commensurate with power available, obstacles, and intended touchdown point. Select a go-around path. Above the obstacles or 50 feet above ground level (AGL), maintain ground track alignment and the aircraft in trim. Below the obstacles or 50 feet AGL, align the aircraft with the landing direction. Progressively decrease the rate of descent and rate of closure until reaching the termination point (hover, touchdown), or until a decision is made to perform a go-around.

a. Termination at a hover. The approach to a hover may terminate with a full stop over the planned termination point, or continue movement to transition to hovering flight. On short final, progressively decrease the rate of descent and rate of closure until an appropriate hover is established over the intended termination point.

b. Termination to the ground. Proceed as for an approach to a hover, except continue the descent to the ground. Prior to touchdown, if uneven surface conditions are suspected, set the parking brake. Make the touchdown with minimum forward movement. After surface contact, ensure that the aircraft remains stable until all movement stops. Smoothly lower the collective to the full down position, neutralize the pedals and cyclic.

Note 1: Steep approaches, or approaches that place the aircraft below effective translational lift (ETL) while out-of-ground effect (OGE) can place the aircraft in potential settling-with-power condition. The crew must be familiar with diagnosing and correcting this condition.

Note 2: The crew should make the decision to go around if visual contact with the touchdown point is lost or if it becomes apparent that it will be lost. Hover OGE power may be required in certain situations. Evaluate power required versus power available.

c. Go-around. Perform a go-around if a safe landing is doubtful or if visual reference with the intended termination point is lost. Once climb is established, reassess the situation and develop a new course of action.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

1. Altitude, apparent ground speed, and rate of closure are difficult to estimate at night. The rate of descent during the final 100 feet should be slightly less than during the day to avoid abrupt attitude changes at low altitudes. After establishing the descent during unaided flights, airspeed may be reduced to approximately 40 knots until apparent ground speed and rate of closure appear to be increasing. Progressively decrease the rate of descent and forward speed until termination.
2. Surrounding terrain or vegetation may decrease contrast and degrade depth perception during the approach. Before descending below obstacles, determine the need for artificial lighting.
3. Use proper scanning techniques to avoid spatial disorientation.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. To assist in determining rate of descent, the rate of climb indicator and radar altitude readouts may be used.
2. Symbology enhances approach angle determination and maintenance. When the aircraft is aligned with the intended landing area, position the line of sight (LOS) reticle on the intended landing point and reference the flight path vector (FPV). The separation between the LOS reticle and the head tracker will provide an approximate angle to touch down when correlated to aircraft attitude. The attitude of the aircraft varies as a function of the stabilator mode that is selected.
3. The location and gimbal limits of the forward looking infrared (FLIR) sensor prevent the P* from seeing the actual touchdown point. To avoid overshooting, establish a new reference point beyond the intended touchdown point.

SNOW/SAND/DUST CONSIDERATIONS:

Note: At night, use of the searchlight may cause spatial disorientation while in blowing snow/sand/dust.

1. Termination to an OGE hover. This approach requires OGE power and may be used for most snow landings and those sand/dust landings where there is only a thin obscurant covering a firm

surface. Terminate to a stationary OGE hover over the touchdown area. Slowly lower the collective and allow the aircraft to descend. The descent may be vertical or with forward movement. The rate of descent will be determined by the rate at which the snow/sand/dust is blown from the intended landing point. During the descent, remain above the snow/sand/dust cloud until it dissipates and the touchdown point can be seen.

Note 1: Hovering OGE reduces available ground references due to blowing obscurants, and may increase the possibility of spatial disorientation. Recommend use of hold modes to decrease pilot workload and provide stability. Be prepared to transition to instruments/symbology and execute an instrument takeoff if ground reference is lost.

Note 2: Steep approaches can place the aircraft in potential settling-with-power condition. The crew must be familiar with diagnosing and correcting this condition.

2. Termination to the surface with no forward speed. This termination should be made to landing areas where slopes, obstacles, or unfamiliar terrain preclude a landing with forward speed, or where it is necessary to put the aircraft at a precise point (for example, a forward arming and fueling point [FARP]). It may not be recommended to utilize this type of approach to a snow-covered surface, unless the surface conditions under the snow are known to be suitable. The termination is made directly to a reference point on the ground with no forward speed. Establish a steeper than normal approach angle, at a slightly higher than normal rate of closure. The rate of closure and the approach angle should be such that the aircraft remains above and ahead of the blowing obscurants, until the aircrew is close enough to touchdown to see the intended point of touchdown through the obscurants. Cushion the touchdown at the bottom of the approach to avoid a hard landing.

Note: Resist the urge to attain a silky-smooth touchdown. Applying too much collective as the aircraft approaches low altitude ground effect can result in a complete brownout and spatial disorientation. Generally, 200 to 300 feet per minute (FPM) rate of descent at touchdown is desirable.

3. Termination to the surface with minimal ground roll. This termination may be made to an improved landing surface or suitable area with minimal ground obstacles. (For additional information, see Task 1064.)

Note: In snow conditions, the above approach should only be conducted in an area where the surface conditions below the snow are known to be suitable for touchdown with forward airspeed.

MOUNTAIN/PINNACLE/RIDGELINE CONSIDERATIONS:

1. Normal. Select an approach angle, based on the wind, line of demarcation, density altitude, gross weight, and obstacles. During the approach, continue to determine the suitability of the intended landing point. Lack of motion parallax cues may make the rate of closure difficult to determine until the aircraft is close to the landing area. When the approach angle is intercepted, decrease collective to establish the descent. Do not allow the aircraft to descend below the line of demarcation. Reduce airspeed to slightly above effective translational lift until the rate of closure can be determined. Progressively decrease rate of descent and forward airspeed until apparent ground speed is that of a brisk walk. Maintain the aircraft in trim above 50 feet and aligned with landing direction below 50 feet.

   a. At approximately 50 feet above the touchdown point, the aircraft should begin losing effective translational lift and termination power applied. Do not decelerate the aircraft to an out of ground effect hover. Slow the rate of closure prior to reaching the near edge of the landing area. Evaluate power required to continue and decide whether to continue the approach or initiate a go-around.

b. The decision to go around should be made prior to the aircraft descending below the obstacles and before the aircraft is decelerated below ETL. If the approach is continued, apply forward cyclic and reduce collective as necessary to maintain the proper descent angle.

2. To a hover. Maintain an altitude clear of obstacles with sufficient forward cyclic applied to keep the aircraft moving. When over the touchdown point, reduce collective and descend vertically.

3. To the ground. Maintain an altitude clear of obstacles with sufficient forward cyclic to keep the aircraft moving. Make a smooth and controlled touchdown with zero forward ground speed. After touching down in the landing zone (LZ) ensure the aircraft is stable prior to lowering the collective to the full down position.

Note: Continuing an approach to a pinnacle or ridgeline after allowing the aircraft to descend below the line of demarcation can result in flight in very turbulent air with poor lift characteristics. Always have a flyaway plan established prior to initiating an approach to a pinnacle or ridgeline.

CONFINED AREA CONSIDERATIONS:

1. Prior to the approach, the crew will perform a landing area reconnaissance to evaluate the size of landing area, suitability of the surface, any barriers to the approach path, approach direction, touchdown point, possible takeoff direction, and effects of wind. On final approach, the crew will perform a low reconnaissance and confirm the suitability of the selected landing area. They will evaluate obstacles, which constitute a possible hazard, and will confirm the suitability of the departure path selected during the landing area reconnaissance. If visual contact with the touchdown point is lost or if it becomes apparent that it will be lost, the crew should make a decision to modify the approach or execute a go-around. If the success of the landing is in doubt, go-around should be initiated before airspeed is reduced below effective translational lift or descending below the barriers. An approach to the forward one-third of the area will reduce the approach angle and minimize power requirements.

2. Confined areas are more difficult to evaluate at night because of low contrast. To perform successful confined area operations, the crew must know the various methods of determining the height of obstacles.

3. Before conducting confined area operations at night, the crew must ensure that the searchlight is in the desired position. If they use the searchlight, their night vision will be impaired for several minutes. Therefore, they must exercise added caution if they resume flight before reaching full dark adaptation.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1062

PERFORM SLOPE OPERATIONS

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator with the aircraft cleared, with an aircraft (A/C) flight (FLT) page displayed on one multipurpose display in both crew stations, with before-landing checks completed, and the pilot on the controls (P*) properly fitted with a helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Set the parking brake prior to landing.
2. Maintain heading ±5 degrees.
3. Maintain minimum drift after wheel contact with the ground.
4. Do not exceed slope limits of TM 1-1520-251-10.
5. Perform a smooth, controlled descent and touchdown.
6. Perform a smooth, controlled ascent.

DESCRIPTION:

1. Crew actions.

   a. The P* will announce his intent to perform a slope landing and establish the helicopter over the slope. The P* will request assistance in setting the brakes and will announce the intended landing area and any deviations from the landing or takeoff. The P* will ensure the parking brake is set. The P* should be aware of the common tendency to become tense and, as a result, to over control the aircraft while performing the slope operation. The P* will note the aircraft attitude at a hover, before starting descent to land on the slope. The P* will select the flight page throughout the maneuver.

   b. The pilot not on the controls (P) will assist in setting the parking brakes and clearing the aircraft. If the brakes must be set in flight, the copilot gunner (CPG) (front seat crewmember) should be on the flight controls and will announce "guarding." The pilot (PLT) (backseat crewmember) will acknowledge by announcing "braking" and will set the parking brakes. The crew will confirm that the parking brakes are set.

   c. The P will select and monitor the flight page throughout the maneuver and advise the P* any time it becomes apparent that aircraft limits will be exceeded. The P will provide adequate warning of obstacles, unusual drift, or altitude changes. The P will confirm suitability of the intended landing area.

2. Procedures.

   a. Landing. Select a suitable area for slope operations that appears to not exceed slope limitations. If possible, orient the aircraft into the wind. Set the parking brakes. Select a reference for determining the roll angle during the execution of the maneuver. Announce the initiation of the slope landing. Smoothly lower the collective until the tail wheel or upslope main landing gear contacts the ground. Adjust the cyclic to maintain the aircraft in a level attitude while maintaining heading with the pedals. Continue lowering the collective and simultaneously apply cyclic into the slope to maintain the position of the upslope wheel until the upslope landing gear is firmly on the ground.

Coordinate the collective and cyclic to control the rate of attitude change to lower the down slope gear to the ground. With the down slope gear on the ground, simultaneously lower the collective and neutralize the cyclic. To avoid droop-stop pounding, begin to adjust the cyclic and simultaneously reduce the collective to achieve centered cyclic with at least 20 to 25 percent torque applied. Once the cyclic is neutralized, continue to lower the collective to the full down position. f at any time it becomes apparent that aircraft limits will be exceeded, terminate the maneuver, return the aircraft to a hover, and reposition to a suitable landing area.

b. Takeoff. Before takeoff, announce initiation of an ascent. Maintain neutral cyclic and smoothly raise the collective to 20 to 25 percent torque, then begin applying cyclic into the slope to maintain the position of the upslope wheel while continuing to raise the collective. Maintain heading with the pedals, and simultaneously adjust the cyclic to level the aircraft. As the aircraft leaves the ground, adjust the cyclic to accomplish a vertical ascent to a hover with minimum drift.

Note 1: Available roll angle indicators include transition and cruise mode HDU symbology, the multipurpose display (MPD) FLT page, and the PLT's standby attitude indicator. The P will select and monitor the flight page throughout the maneuver.

Note 2: With the flight (FLT) page displayed, a roll/slope angle reference is provided via the bank angle indicator for lateral slopes. When performing nose-up or nose-down landings, selection of the (-W-) waterline symbol will level the horizon line with aircraft symbol in pitch and provide a ready reference when approaching slope limits.

Note 3: Before conducting slope operations, the crew must understand dynamic rollover characteristics.

Note 4: When the tail wheel is locked and on the ground, over controlling the pedals results in roll oscillations, which are caused by the tail rotor torque effect.

NIGHT OR NIGHT VISION GOGGLES (NVG) CONSIDERATIONS: When conducting slope operations, determine the need for artificial illumination prior to starting the maneuver. Select reference points to determine slope angles. (References probably will be limited and difficult to ascertain.) If successful completion of the landing is doubtful at any time, abort the maneuver.

NVS CONSIDERATIONS:

1. The location and gimbal limits of the forward looking infrared (FLIR) sensor prevent the PLT from seeing the actual touchdown point. He must obtain clearance of the intended touchdown point before positioning the aircraft over the point.
2. The P* must select the desired mode of symbology.

Note1: During slope operations, the crew must use both FLIR imagery and symbology to successfully complete a slope landing. If relying solely on one or the other, undesirable drift rates and changes in aircraft heading may result.

Note2: Symbolic skid and slip ball is a useful indicator of roll angle.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1064

PERFORM A ROLL-ON LANDING

CONDITION: In an AH-64D helicopter or in an AH-64D simulator, with the before-landing check completed, and the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Touchdown at or above effective transitional lift (ETL), or when in-ground effect (IGE) power is not available, at or above the calculated minimum required landing airspeed described in task 1010.
2. Maintain ground track alignment with the landing direction with minimum drift.
3. Maintain a constant approach angle to the desired point of touchdown with deviations for surface conditions or obstacles in the landing area.
4. Maintain runway or suitable landing area alignment ±5 degrees.

DESCRIPTION:

1. Crew actions.
   a. The P* will remained focused outside the aircraft throughout the approach and landing. He will announce his intent to perform a roll-on landing, the intended point of landing, and any deviation from the approach. He will announce if the manual stabilator is being used as well as the method of braking: "aerodynamic braking" and/or "braking."
   b. The pilot not on the controls (P) will confirm suitability of the area, assist in clearing the aircraft, and provide adequate warning of traffic or obstacles. He will acknowledge the use of the manual stabilator, the method of braking, and any intent to deviate from the approach. The P will announce when his attention is focused inside the cockpit.
2. Procedures.
   a. Evaluate the wind direction and velocity, noting the tactical situation display's (TSD) wind status window, PERF page wind status window, or external wind cues. Select the desired HDU flight symbology format or the flight (FLT) page. When the desired approach angle is intercepted, reduce the collective to establish the descent. Assume a decelerating attitude as necessary while maintaining the desired angle of approach with the collective. If desired, use the nap of the earth (NOE) approach or manual stabilator mode to enhance forward visibility during the descent. Before touchdown, confirm that the brakes are released, the tail wheel is locked, and that the area is suitable for the landing. Once the descent has been initiated, use of the flight path vector (FPV) may help to maintain a constant approach angle to the desired touchdown point.
   b. On final, maintain a constant approach angle to the desired point of touchdown, deviating from that angle only for surface conditions or obstacles in the landing area. After landing, neutralize the cyclic, lower the collective, and, if desired, use aerodynamic braking to assist in stopping the rollout and apply brakes if necessary. To avoid droop-stop pounding, center the cyclic before lowering the collective.

Note 1: Aerodynamic braking is accomplished by applying aft cyclic with no less than 30 percent dual engine torque (%Q). The amount of %Q required will vary based on gross weight (GWT) of the helicopter and length of the landing area.

Note 2: A roll-on landing may be performed during those approved flight missions where in-ground effect (IGE) power is not available; for example, high density altitude or GWT. This may be performed in an environment where obscurants such as sand, dust, or snow are present.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Altitude, apparent ground speed, and rate of closure are difficult to estimate at night. The rate of descent at night during the final 100 feet should be slightly slower than during the day to avoid abrupt attitude changes at low altitudes.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS: Referencing the FPV, the separation between the line of sight (LOS) reticle and the head tracker, or the position of the cued LOS dot, or field of view box in the field of regard will provide an approximate angle to touch down when correlated to aircraft attitude. The attitude of the aircraft varies as a function of the degree of deceleration and stabilator mode that is selected.

UNPREPARED SURFACE CONSIDERATIONS: Closely monitor touchdown speed when landing to a rough or unprepared surface. Consistent with the situation and aircraft capabilities, a more aggressive deceleration before touchdown, coupled with a pronounced aerodynamic braking after touchdown, may be appropriate. Note that the wheel brakes may be less effective. If the surface is soft, exercise care when lowering the collective until the aircraft comes to a complete stop.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator. For training, the crew may set a simulated power limit.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1070

Respond to emergencies

CONDITIONS: In an AH-64D helicopter with an instructor pilot (IP)/instrument flight examiner (IE), in an AH-64D simulator, or academically, and given a specific emergency, caution, advisory, or warning condition detected or as instructed by the IP.

STANDARDS: Appropriate common standards and the following:

1. Analyze the emergency condition or system malfunction.
2. Correctly identify the emergency condition or system malfunction and the effects on further flight or mission accomplishment.
3. Without error, perform the appropriate underlined emergency procedure steps without reference to the TM 1-1520-251-10/TM 1-1520-251-CL, or for nonunderlined emergency steps, reference TM 1-1520-251-10/TM 1-1520-251-CL.

DESCRIPTION:

1. Crew actions. When either crewmember detects an emergency situation, he will immediately alert the other crewmember with a pertinent announcement.
   a. The pilot on the controls (P*) will remain focused outside the aircraft to maintain aircraft control and to provide adequate clearance from traffic or obstacles. The P* will perform or direct the pilot not on the controls (P) to perform the underlined steps in TM 1-1520-251-10, as briefed, and will initiate the appropriate type of landing for the emergency.
   b. The P will perform as directed or briefed. If time permits, the P will verify all emergency checks with TM 1-1520-251-10/TM 1-1520-251-CL. The P will request emergency assistance if appropriate.
   c. The pilot in command (PC) will include emergency procedures guidance in the crew briefing.
2. Procedures. Analyze the indications; for example, aircraft response, warning/caution/advisory messages, abnormal aircraft noise, and odors. Identify the malfunction and perform the appropriate emergency procedure.

TRAINING AND EVALUATION REQUIREMENTS: The primary purpose for this task is to support the training and evaluation of those emergency procedures referenced in chapter 9 of the operator's manual that have not been assigned aircrew training manual (ATM) task numbers.

Note: With the exception of approved program of instruction (POI) tasks supporting the AH-64D aircraft qualification course (AQC)/instructor pilot course (IPC), emergency procedures that have not been assigned a specific ATM task number will only be trained/evaluated (hands-on) in a compatible simulator or through written/oral training/evaluation. Oral training/evaluation may be conducted in the aircraft during the course of a flight mission.

1. Training may be conducted in the AH-64D aircraft or the AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft, AH-64D simulator, or academically.

REFERENCES: Appropriate common references.

TASK 1072

RESPOND TO ENGINE FAILURE, IN-GROUND EFFECT HOVER

CONDITIONS: In an AH-64D simulator, with the P* properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Recognize the emergency and identify the appropriate corrective actions.
2. Perform the immediate action procedures per TM 1-1520-238-10/TM 1-1520-251-CL.
3. Maintain heading ±10 degrees.
4. Execute a smooth, controlled descent and touchdown with no lateral drift.

DESCRIPTION:

1. Crew actions.

   a. Upon detecting a single engine failure, the P* will reduce the collective as necessary commensurate with the altitude and airspeed at the time of failure. (For example, the collective should not be reduced when an engine fails while the helicopter is hovering below 15 feet.) When hovering in ground effect, the collective should be used only to cushion the landing; the primary consideration is in maintaining a level attitude.

   b. If the altitude is above 15 feet and the aircraft is operating at low airspeed or a stationary hover, the P* will reduce the collective only enough to attempt to restore main rotor revolutions per minute (RPM) and establish single engine flight if possible. Should single engine flight not be possible, reduce the collective only enough to attempt to restore main rotor RPM, then apply the remaining collective to cushion the touchdown as the aircraft settles to the ground. Forward airspeed may be desirable to reduce the amount of vertical impact force.

   c. On a smooth or prepared surface, make ground contact with some forward speed. If over a rough area, use partial or full deceleration with touchdown speed as close to zero as possible. After touchdown, the P* will neutralize the controls and, if necessary, use aerodynamic braking or toe brakes, if required, to assist in stopping ground roll.

   d. The pilot not on the controls (P) will confirm the emergency, cross-check the instruments, check landing area for hazards, back up the P* on emergency procedures, and assist as directed.

2. Procedures. Adjust the collective as necessary to within single engine operating limits. If the aircraft continues to hover, move to a suitable area and land. If the aircraft continues to settle, align the aircraft with the landing direction, and make a touchdown with forward roll surface and area permitting. If over rough, wooded, or sloping terrain, descend vertically with touchdown speed as close to zero as possible. Landing on steep terrain may require adjusting the heading to land the nose upslope.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D simulator.
2. Evaluation will be conducted in the AH-64D simulator.

REFERENCES: Appropriate common references.

This page intentionally left blank.

TASK 1073

RESPOND TO ENGINE FAILURE, OUT-OF-GROUND EFFECT HOVER

CONDITIONS: In an AH-64D helicopter with an instructor pilot (IP) or in an AH-64D simulator, with an aircraft engine (A/C ENG) page displayed on one multipurpose display (MPD) in both crew stations, out-of-ground effect (OGE) power available, the before-landing check completed, and the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Establish a forced landing or single engine flyaway plan.
2. Recognize the emergency and identify the appropriate corrective action.
3. Establish single engine flight with minimum loss of altitude or effect a smooth and controlled touchdown in a suitable area.
4. Establish entry altitude, +50 feet, -0 feet.

DESCRIPTION:

1. Crew actions.

   a. During any OGE hover or low speed OGE hovering operations, the P* will announce his forced landing or single engine flyaway plan. Upon detecting an engine failure, the P* will announce the emergency situation, adjust the collective as necessary to maintain the rotor within operating limits, and perform the emergency procedure per the operator's manual. After touchdown, the P* will neutralize the controls and use the brakes as necessary to assist in maintaining heading.

   b. The pilot not on the controls (P) will confirm the emergency, cross-check the instruments, check landing area for hazards, back up the P* on emergency procedure, and assist as directed.

2. Procedures.

   a. Position the aircraft at an OGE hover in a location to make the force landing area or flyaway plan and note the torque required to maintain the hover. Determine the effect of the wind, right pedal input, and terrain to develop a forced landing or flyaway plan. Once established at the OGE hover and in a position to land/fly away with selected entry point, the IP will ensure that an engine (ENG) page is selected in each crew station before initiating the maneuver. Consideration will include the possibility of maneuvering the aircraft to complete the selected plan.

   b. The IP will initiate the maneuver by announcing: "simulated engine failure" on a specific engine. Upon detecting and verifying engine failure, the P* will acknowledge the simulated engine failure with an immediate reduction of collective as necessary to maintain single engine torque within limitations and a simultaneous application of forward cyclic (approximately 10 to 15 degrees nose low) to descend and accelerate to minimum single engine airspeed or land the aircraft. Perform immediate action steps outlined in TM 1-1520-251-10/TM 1-1520-251-CL, and announce intentions. Once the aircraft is established at level single engine flight, the IP may return the power lever to the fly position.

c. Over controlling the cyclic may result in a higher rate of descent and greater altitude loss than necessary. As the aircraft accelerates to minimum single engine airspeed, apply aft cyclic to zero the rate of climb indicator, stop the descent, and establish level flight. Consideration should be given to accelerating to n airspeed between 77 and 107 knots true airspeed (KTAS) to provide for a successful autorotational capability should the second engine fail. Avoid excessive collective reduction during the entry to prevent the possibility of entering a settling-with-power condition. Evaluate the situation and determine if continued flight is possible or complete a landing as appropriate. If the aircraft continues to settle, wing stores jettison as appropriate and establish single engine flight. If continued flight is not possible, adjust to a landing attitude and make a touchdown with forward movement surface and area permitting. Cushion the landing with available power.

Note 1: The IP will not retard the power lever while performing duties as P*. Prior to performing this maneuver with one power lever at idle, the IP must ensure that the aircraft can be operated within single engine limitations.

Note 2: When this task is conducted in the aircraft at or above 400 feet above ground level (AGL), the IP may retard one power lever to IDLE after the P* has reduced the collective to a torque setting less than 50 percent of the maximum single engine torque available. However, when this task is performed in the aircraft below 400 feet AGL, both power levers must remain in the FLY position. The IP will announce when making an input to or assuming the aircraft controls.

Note 3: With the combination of high density altitude and gross weight (GWT), main rotor speed (Nr) may become uncontrollable under single engine conditions if an aircraft is allowed to enter a settling-with-power condition.

TRAINING AND EVALUATION REQUIREMENTS:

Note: When performing this task in the aircraft, the IP will ensure that an ENG page is selected and up on one MPD in both crew stations prior to initiating the maneuver.

1. Training will be conducted in the AH-64D aircraft or in an AH-64D simulator. The IP will announce “simulated engine failure on ENG 1 or ENG 2” and will provide adequate verbal warning or corrective action if engine operating limits may be exceeded (for example, torque on the fully operating engine). During training less than 400 feet AGL, the IP should direct the P* to use a dual-engine torque that is derived from 50 percent of the 2.5 minute single-engine torque limit. IPs should consider the aircraft performance maximum (A/C PERF MAX) or plan page to simulate operations in adverse environmental conditions.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1074

RESPOND TO ENGINE FAILURE AT CRUISE FLIGHT

CONDITIONS: In an AH-64D helicopter with an instructor pilot (IP), or in an AH-64D simulator, with an aircraft engine (ACFT ENG) page displayed on one multipurpose display (MPD) in both crew stations, and the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Recognize the emergency and identify the appropriate corrective actions.
2. Adjust airspeed to remain within single engine airspeed limits.

DESCRIPTION:

1. Crew actions.

a. The P* will perform the emergency procedure in TM 1-1520-251-10/TM 1-1520-251-CL. The P* will determine if further flight is possible and determine if there is a need to jettison external wing stores. The P* will request assistance if appropriate.

b. The pilot not on the controls (P) will perform as directed or briefed. The P will monitor cockpit instruments to provide adequate warning for corrective action if aircraft operating limits may be exceeded. If time permits, the P will verify all emergency checks with TM 1-1520-251-10/TM 1-1520-251-CL.

c. When conducting training prior to performing the maneuver, the IP must ensure that the aircraft can be operated within single engine limitations. He will announce "simulated engine failure on ENG 1 or ENG 2" and reduce one power lever to IDLE to initiate the maneuver. He will provide adequate verbal warning or corrective action if engine operating limits may be exceeded. The IP will announce when making an input to or when assuming the aircraft controls.

d. If training this task during high speed, high-powered flight (for example, high speed flight) the IP will ensure that the crew is aware of the effects of an engine failure during times when a high power setting is applied. Engine failures will cause opposite engine torque to double. At high torque settings, torque doubling will result in extremely high torque values on the engine carrying the load, followed by engine power limiting and rotor decay. **While performing this maneuver above maximum single engine airspeed, both power levers will remain in the fly position.**

2. Procedures.

a. Upon hearing the announcement, the P* will immediately detect or verify engine malfunction, acknowledge the simulated engine failure, and announce the emergency action step. Adjust the collective and cyclic as necessary to maintain single engine torque (TQ) and rotor revolutions per minute (RPM) within limits. Select an airspeed that is between velocity safe single engine (VSSE) and single engine velocity not-to-exceed (Vne) to prevent loss of rotor RPM and altitude.

b. Perform immediate action steps outlined in TM 1-1520-251-10/ TM 1-1520-251-CL and advise the P of intentions. Evaluate and determine if continued flight is possible and if the need exists to jettison external wing stores. Evaluate the wind direction and velocity, noting the tactical situation display's (TSD) wind status window, performance (PERF) page wind status window, or external wind cues.

c. If the aircraft is above single engine airspeed, the P* will reduce the collective to a torque setting that is less than 50 percent of the maximum single-engine torque available while simultaneously applying aft cyclic to decelerate below maximum single engine airspeed. During an actual engine failure, the combination of collective reduction and aft cyclic will load the rotor to allow Nr to increase while minimizing altitude loss. In some conditions, the aft cyclic may allow the P* to perform a climb, if needed, during the deceleration.

Note 1: The IP may elect to terminate the task with a single engine landing (Task 1075).

Note 2: While performing this task above maximum single-engine airspeed, the IP must guard against an excessive reduction of collective (below 20 percent torque) which may result in a rotor overspeed during deceleration.

Note 3: When restarting ENG 1 in flight, the crew must consider that the cross-feed valves will rotate and could result in a dual engine flame out.

Note 4: Single engine Vne is the speed beyond which an average pilot will not be capable of regaining main rotor speed (Nr) after the loss of the other engine due to excessive blade pitch and low inertial rotor blades. An actual engine failure at high torque setting will be accompanied by the "**Engine 1 or 2 out**" warning, reduction in engine noise, engine autopage, and possible "**Rotor RPM Low**" warning. It is critical to react immediately to these warnings/indications in order to conserve Nr and safely recover the aircraft. Extremely low Nr can result in an extreme loss of lift and consequently loss of helicopter control, as well as a possible loss of electrical power.

TRAINING AND EVALUATION REQUIREMENTS:

Note: When performing this task in the aircraft, the IP will ensure that an ACFT ENG page is selected on one MPD in both crew stations prior to initiating the maneuver.

1. Training may be conducted in the AH-64D aircraft or in the AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1075

PERFORM SINGLE ENGINE LANDING

CONDITIONS: In an AH-64D helicopter with an instructor pilot (IP), or in an AH-64D simulator, with an aircraft engine (ACFT ENG) page displayed on one multipurpose display (MPD) in both crew stations, with the before-landing check completed, and the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Maintain airspeed at or above velocity safe single engine (VSSE) until 10 to 20 feet above the intended landing area.
2. Maintain ground track alignment with the landing direction with minimum drift.
3. Maintain a constant approach angle to the desired point of touchdown with deviations for surface conditions or obstacles in the landing area.
4. Maintain runway, or suitable landing area, alignment ±5 degrees.

DESCRIPTION:

1. Crew actions.

   a. The P* will remain focused outside the aircraft, clearing the aircraft throughout the approach and landing. The P* will announce the intended point of landing and any deviation from the approach. Whenever used, the P* will announce use of the manual stabilator. Upon landing, the P* will announce the method of braking: “aerodynamic braking” and/or “braking” (when toe brakes must be used).

Note: Aerodynamic braking is accomplished by applying aft cyclic with no less than 30 percent dual engine torque or no less than 60 percent single engine. The amount of torque required will vary based on gross weight of the helicopter and length of landing area.

   b. The pilot not on the controls (P) will remain focused outside the aircraft to assist in clearing and to provide adequate warning of traffic or obstacles. He will provide adequate warning for corrective action if minimum airspeed or engine operating limits (especially torque on the fully operating engine) may be exceeded. He will acknowledge use of the manual stabilator and any intent to deviate from the approach. He will announce when his attention is focused inside the cockpit. If the P* announces “braking,” the P will acknowledge the maneuver by announcing “guarding.” He must not apply anti-torque pedal pressure when guarding the brakes, and brakes should not be used unless the safe outcome of the maneuver is in doubt.

2. Procedures.

   a. When the desired approach angle is intercepted, reduce the collective to establish the descent. Avoid steep turns during a reduced-power condition. Assume a decelerating attitude as necessary while maintaining the desired angle of approach with the collective. If desired, use the nap of the earth (NOE) approach or manual stabilator mode to enhance forward visibility during the descent. Once the descent has been initiated, use of the flight path vector (FPV) may help to maintain a constant approach angle to the desired touchdown point. Arrive on final at a shallow approach angle with the intended touchdown point in sight.

   b. On final, maintain a constant approach angle to the desired point of touchdown, deviating from that angle only for surface conditions or obstacles in the landing area. Prior to touching down, confirm that the brakes are released, the tail wheel is locked, and that the area is suitable for the landing. Below 50 feet above ground level (AGL), align the aircraft with the landing direction. Maintain minimum single engine airspeed (VSSE) until 10 to 20 feet above touchdown, then coordinate cyclic, pedals, and collective to affect a smooth touchdown without exceeding single engine torque limits. After landing, neutralize the cyclic, adjust the collective as necessary and, if desired, use aerodynamic braking to assist in stopping the rollout. To avoid droop-stop pounding, center the cyclic before lowering the collective. Apply brakes if necessary.

Note: This task may be performed as a continuation of Task 1074.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Rate of closure will be much more difficult to detect unaided or under night vision devices (NVDs).

TRAINING AND EVALUATION REQUIREMENTS:

Note: When performing this task in the aircraft, the IP will ensure that an engine (ENG) page is selected on one MPD in both crew stations prior to initiating the maneuver.

1. Training may be conducted in the AH-64D aircraft with an IP or in the AH-64D simulator. Prior to performing the maneuver, the IP must ensure that the aircraft can be operated within single engine limitations. The IP will announce input to or when assuming the aircraft controls.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1082

PERFORM AUTOROTATION

CONDITIONS: In an AH-64D helicopter or in an AH-64D simulator with an instructor pilot (IP), an alternating current engine (AC ENG) page displayed on one multipurpose display (MPD) in each crew station, before-landing check completed, given an entry altitude and airspeed, and the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Select the correct entry point.
2. Visually check and call out main rotor speed (Nr), airspeed, and aircraft trim.
3. Ensure that the airspeed at 125 feet above ground level (AGL) is not less than 80 knots true airspeed (KTAS).
4. Execute a proper deceleration and termination as directed by the IP.

DESCRIPTION:

1. Crew actions.

   a. Prior to initiating an autorotation in the aircraft, the pilot on the controls (P*) will select an ENG page on one MPD and direct the pilot not on the controls (P) to select an ENG page on one MPD to simulate engine failure generated automatic (AUTO) page. The P* will select a suitable landing site. Upon reaching the correct entry point, the P* will announce "entering autorotation." If responding to an actual aircraft emergency, either in the aircraft or in the simulator, he will announce the emergency. The P* will smoothly lower the collective (at a positive moderate rate of travel) to the full down position and then adjust as necessary to maintain Nr. He will apply pedal as required to compensate for the decrease in torque, apply cyclic as required (between minimum rate of descent and maximum glide distance airspeed), and initiate a turn as required to maneuver the aircraft toward the intended landing area.

   b. The P* will call out Nr, airspeed, trim and announce any deviations during the maneuver. He will perform the emergency procedure per the operator's manual and the aircrew training manual (ATM). When performing an autorotation with turn within a traffic pattern, the P* should adjust the cyclic to assume a 90 KTAS attitude, and turn as required to the intended touchdown point. The P* will acknowledge any announced alerts, recommendations, or control input made by the P.

   c. The P will confirm the suitability of the landing area and monitor Nr, airspeed, and trim. He will perform actions as directed. He will monitor and back up the performance of the emergency procedures, and confirm actions per the checklist, time permitting. He will alert the P* in time for corrective action if it appears any limitations will be exceeded. If the P must make a control input to prevent exceeding any limitations, he will announce his actions to the P*.

2. Procedures.

   a. Recognize the emergency and enter autorotation or, during training, select the correct entry point. An autorotation may be accomplished either "straight in" or "with turn." When executing an autorotation with turn, aircrews must be aware of the tendency for Nr to increase. Smoothly lower the collective (at a moderate rate) to the full down position. Apply pedal as required to maintain the aircraft in trim. Adjust the cyclic to assume a 90 KTAS attitude, and initiate a turn if necessary.

Note 1: When turning to the right, an increase in Nr will develop rapidly in relation to the rate of cyclic application. The Nr increase can be quite rapid with a corresponding rapid right turn. The increase in Nr will be even further aggravated with heavy gross weight (GWT) aircraft, and high density altitude. Adjust the collective as necessary to prevent Nr overspeed.

Note 2: When executing an autorotation with turn to the left, a slight to moderate increase in Nr will normally occur. However, when right lateral cyclic is rapidly applied from a left turn condition into a right turn condition, an even greater increase in Nr will be evident. The increase in Nr will be even further aggravated with heavy GWT aircraft, and high density altitude. Adjust the collective as necessary to prevent Nr overspeed.

b. During the descent, the P* and P will monitor Nr to prevent an overspeed or underspeed condition and the P* will adjust the collective as necessary to establish and maintain a steady state autorotation. Call out Nr, airspeed, and aircraft in trim.

c. Prior to reaching 400 feet AGL for a straight in autorotation and 200 feet for an autorotation with turn, the IP will announce “go-around,” “terminate with power,” or in the simulator, “touchdown.” Prior to 200 feet AGL, ensure a steady state autorotation is obtained. If conditions are not met, execute a go-around.

d. Between 75 and 125 feet AGL, adjust the cyclic for a smooth, progressive deceleration. Maintain ground track and apply pedal to align the aircraft with the direction of touchdown.

(1) Go-around. Upon receiving the command “go-around,” adjust the collective as necessary to arrest the rate of descent while simultaneously maintaining trim with the pedals. Continue to apply sufficient collective to establish a normal climb prior to reaching 200 feet AGL.

Note: During application of the collective for a go-around, be aware of the tendency for initial Nr decay.

(2) Terminate with power. Upon receiving the command “terminate with power,” maintain steady state autorotation. After initiating the deceleration, adjust the collective to arrest the descent at an altitude that will ensure that the tail wheel will not contact the ground. Ground speed should be the same as for touchdown.

(3) Touchdown (actual emergency or simulator). Prior to tail wheel contact, make initial pitch application. Adjust the cyclic and collective to smoothly cushion the main gear onto the landing surface. After the main wheels are on the ground, smoothly lower the collective to full down, neutralize the cyclic, and maintain heading and ground tract with the pedals. Use the brakes as necessary to stop roll out.

Note 1: Steady state autorotation is defined as Nr within limits, airspeed, torque, trim, and aircraft in position to land at the desired touchdown point.

Note 2: When conducting autorotation training/evaluation in the aircraft (power levers to fly), the P* should limit the torque to below 10 percent to ensure that an autorotational descent (not a steep approach) is occurring. Torque spikes as a result of collective application to arrest Nr are acceptable as long as the collective is reduced below 10 percent dual engine torque (TQ). The intent of the torque limit is to ensure the rotor is decoupled from the engines and autorotational descent is established. Establishing and maintaining a NR of greater than 101 percent will also validate an autorotational descent.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Suitable landing areas will be much more difficult to locate at night. Plan for areas of lighter contrast indicating open areas. Hazards will be difficult to detect in the landing area. Use the search light as appropriate.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. The flight characteristics of the aircraft remain the same for the performance of the task utilizing the forward-looking infrared (FLIR) systems. The crew will have greater situational awareness through the FLIR imagery and displayed helmet display unit (HDU) symbology. Under normal circumstances, the FLIR system field of regard will allow the crew to maintain visual contact with the intended touchdown point during the descent.
2. During training, establish the aircraft at the appropriate entry point with reference to the cruise or transition flight symbology modes displayed on the HDUs and with reference to the FLIR imagery.
3. Upon entering the maneuver with the reduction of the collective, the P* will cross-check the FLIR imagery and reference the displayed flight symbology to maintain aircraft heading, trim, and torque.
4. The radar altitude will aid in determining the altitude at which the IP will announce the selected type of landing to be performed. Utilize FLIR imagery and visual cues provided through the FLIR system to maintain landing area alignment and aid in estimation of rate of descent and closure.

EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or the AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1085

PERFORM STABILITY AND COMMAND AUGMENTATION SYSTEM-OFF/BACKUP CONTROL SYSTEM-ON FLIGHT

> **CAUTION**
>
> The force trim brakes for all axes are connected to the pilot's flight controls. In a severance between pilot (PLT) (backseat crewmember) and copilot-gunner (CPG) (front seat crewmember) crew stations or when the CPG engages backup control system (BUCS) by decoupling an automatic roller detent decoupler (ARDD), he is disconnected from the pilot's flight controls and the force trim brakes. Selecting force trim off to simulate this condition is prohibited.

CONDITIONS: In an AH-64D helicopter or in an AH-64D simulator with an instructor pilot (IP); pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU) during hover, takeoff, cruise, or landing with the aircraft utility (A/C UTIL) page selected and with the aircraft cleared prior to disengaging flight management computer (FMC) axis stability and command augmentation system (SCAS) channel(s).

STANDARDS: Appropriate common standards and the following:

1. Maintain aircraft control.
2. Recognize the FMC SCAS failure/disengagement or simulated backup control system (BUCS) ON emergency and identify the appropriate corrective actions.

DESCRIPTION:

1. Crew actions.

   a. The P* will perform or announce emergency procedure immediate action steps as outlined in TM 1-1520-251-10/TM 1-1520-251-CL. The P* will announce his intentions and request assistance if appropriate.

   b. The pilot not on the controls (P) will perform as directed or briefed. If time permits, the P will verify all emergency checks with TM 1-1520-251-10/TM 1-1520-251-CL. He will acknowledge the intentions of the P* and offer assistance.

   c. Prior to performing SCAS OFF flight, the IP must ensure that an A/C UTIL page is displayed in both crew stations. For simulating FMC SCAS malfunctions, the IP will announce "simulated SCAS failure on FMC pitch, roll, yaw, or collective axis." For simulating BUCS ON, the IP will announce "simulated BUCS ON in pitch, roll, yaw, or collective axis." He will allow adequate warning if operating limits may be exceeded and then deselect the appropriate SCAS axes button on the A/C UTIL page or press the cyclic FMC release button if desired. The IP will announce input to or when assuming the aircraft controls. The crew will re-engage unaffected FMC axes (pitch, roll, yaw, coll, or all channels) when training maneuver is complete.

Note. The purpose for conducting SCAS OFF flight is to demonstrate AH-64D flight handling characteristics with FMC SCAS channels off and to practice flying the aircraft without SCAS functions in one or more FMC axis. Conduct of this task emulates conditions where the aircraft stabilization equipment has malfunctioned, or where BUCS has engaged in one or more axis.

2. Procedures. Upon hearing the announcement or detecting and verifying a SCAS malfunction or BUCS ON condition, acknowledge the simulated failure. Adjust the flight controls as necessary to maintain positive control. Evaluate and determine the extent of the FMC SCAS malfunction or BUCS ON condition. Perform or announce immediate action steps as outlined in TM 1-1520-251-10/TM 1-1520-251-CL.

a. FMC SCAS malfunction may manifest itself as uncommanded control inputs, which may cause unusual rotor disk movement or aircraft attitude/heading changes. FMC SCAS axes failure/disengagement may be recognized by the following:

(1) Increase in flight control response.

(2) Caution tone/master caution (MSTR CAUT) pushbutton illumination.

(3) Up-front display (UFD) caution message(s).

(4) UFD advisory message(s).

(5) Multipurpose display (MPD) caution message(s).

b. The aircraft flies with similar characteristics to SCAS OFF flight when BUCS ON in an axis. BUCS ON indications may be recognized by the following:

(1) Increase in flight control response.

(2) Caution tone/MSTR CAUT pushbutton illumination.

(3) UFD caution message(s).

(4) UFD advisory message(s).

(5) MPD caution message(s).

NIGHT OR NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. Depending on the ambient light conditions, the aviator should consider using the search/ landing light.

2. To aid in preventing spatial disorientation, do not make large or abrupt attitude changes.

TRAINING AND EVALUATION REQUIREMENTS: This task will not be trained or evaluated with any other simulated malfunction.

1. Training may be conducted in the AH-64D aircraft or in the AH-64D simulator.

2. Evaluation will be conducted in the AH-64D aircraft or in the AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1110

PERFORM ELECTRONIC CONTROL UNIT/DIGITAL ELECTRONIC CONTROL UNIT LOCKOUT PROCEDURES

CONDITIONS: In an AH-64D helicopter with an instructor pilot (IP) or in an AH-64D simulator, with an aircraft engine (A/C ENG) page displayed on one multipurpose display (MPD) in both crew stations, and given an emergency condition that requires operation in digital electronic control unit (DECU)/electronic control unit (ECU) lockout, and the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Recognize the emergency and identify the appropriate corrective action.
2. Perform immediate action procedures per TM 1-1520-251-10/TM 1-1520-251-CL.
3. Place the malfunctioning engine in lockout and maintain torque 5 percent below the good engine, ±5 percent.

DESCRIPTION:

1. Crew actions.

   a. The P* will acknowledge the simulated emergency. The P* will perform or direct the pilot not on the controls (P) to perform the immediate action emergency procedures per the operator's manual. The P* will announce when his attention is focused inside the cockpit and the type of landing.

   b. The P will acknowledge the type of landing, and any intent to deviate from the approach. The P will announce when his attention is focused inside the cockpit and will confirm proper execution of immediate action steps. The P will continually monitor the instruments and aircraft condition, and perform other actions as directed. Time permitting, the P will verify the procedures with TM 1-1520-251-10/TM 1-1520-251-CL.

2. Procedures.

   a. If attempts to control power turbine speed (N_P) with collective fail, lock out the DECU/ECU and control the N_P manually with the power lever. Take manual control of the affected engine by selecting the power lever, pull up on the detent override, momentarily push the power lever forward to the lockout position, and immediately bring it back to an intermediate position. Control N_P, gas producer turbines speed (N_G), turbine gas temperature (TGT), and torque manually with the power lever and set the locked out engine's torque to 5 percent below the good engine's torque ±5 percent. In the event that manual control of the engine cannot be attained, place the engine's power level in the idle position. Depending on the urgency of the emergency, find a suitable landing area, announce the type of landing, and execute the approach and termination while maintaining N_P, N_G, TGT, and torque within limits.

   b. To mechanically reset the DECU/ECU, retard the selected power lever to the idle position. Announce "power lever reset." After the IP confirms proper reset, the P*/P will cautiously advance the engine power control lever to the fly position while monitoring N_P, N_G, TGT, and torque.

Note 1: The lockout position will electrically lock out DECU/ECU inputs to the hydromechanical unit and, if allowed to remain in lockout, cause the engine to accelerate to maximum power.

Note 2: A locked out engine's overtemperature protection is disabled.

Note 3: When the power lever on one engine is retarded to IDLE, the torque on the other engine will double. The crew must monitor the opposite engine torque and N_P to ensure that it remains within engine limitations.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft with an IP, or in the AH-64D simulator. Prior to initiating the maneuver, the IP will ensure that an A/C ENG page is selected in each crew station. When ready, he will initiate the maneuver by announcing "simulated N_P failed low" on a specific engine. The IP/P will provide adequate warning for corrective action if engine operating limits (N_P, TGT, and torque) may be exceeded. The IP will announce input to or when assuming the aircraft controls. He will confirm the power lever is properly reset upon completion of the task.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1114

PERFORM ROLLING TAKEOFF

WARNING

Depending on aircraft weight and speed, and size of the takeoff area, if a rolling takeoff is aborted, it may be impossible to stop the aircraft before reaching any barriers. Situations requiring this maneuver will most often not allow for single engine flight capabilities.

CONDITIONS: In an AH-64D helicopter or AH-64D simulator, with a suitable takeoff area, ground track reference points selected, before takeoff check completed, aircraft cleared, and pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Before liftoff.

   a. Position the stabilator to 0 degrees trailing edge down (TED).

   b. Establish and maintain a simulated power limit of 10 percent below hover power ±3 percent or, when in-ground effect (IGE) hover power is limited or not available, as described in the task procedures ±3 percent.

   c. Coordinate accelerating the aircraft while maintaining aircraft longitudinal alignment in coincidence with the takeoff area's heading/direction ±5 degrees.

   d. Do not allow the aircraft nose to drop below the fuselage level until the aircraft departs the takeoff surface.

2. After liftoff.

   a. Maintain a simulated power limit of 10 percent ±3 below hover power or, when IGE hover power is not available, as described in the task procedures ±3 percent.

   b. Maintain takeoff ground track.

   c. Establish the aircraft in trim commensurate with obstacles.

   d. Establish and maintain a climb angle appropriate for the terrain and obstacles.

   e. Accelerate to maximum rate of climb or desired airspeed.

DESCRIPTION:

1. Crew actions.

   a. The crew will confirm that the area and surface are suitable for the maneuver. Considerations may include winds, barriers (obstacles/terrain), other hazards, available length of area for takeoff, pressure altitude (PA), temperature (TEMP), gross weight (GWT), and power available.

   b. The P* will announce his intent to set the manual stabilator. The P* will announce when he initiates the maneuver and his intent to abort or alter the takeoff. The P* will remain focused outside the aircraft during the maneuver.

c. The pilot not on the controls (P) will announce when ready for takeoff and will remain focused primarily outside the aircraft to assist in clearing and to provide adequate warning of obstacles. The P will verify that the stabilator is set for takeoff. The P will monitor power requirements, true air speed, and advise the P* when power limits are being approached.

2. Procedures.

Note: Pilot technique, power available, winds, and type of runway surface will greatly affect the distance needed to perform this maneuver.

a. With appropriate crew actions completed, select ground reference points for longitudinal alignment with the desired takeoff direction. Set the stabilator to 0 degrees TED to minimize drag; the flight (FLT) page displays a stabilator icon with a zero degree tic mark. Maintain aircraft position with neutral cyclic and increase the collective to establish the aircraft "light on the wheels." Use, as a minimum, 30 to 35 percent torque or more as required, based on gross weight, to prevent excessive strap pack loads. Begin accelerating the aircraft forward by smoothly applying forward cyclic while progressively increasing the collective to the simulated power limit of 10 percent (±3 percent) below hover power (when IGE power is not available, computed torque derived from the appropriate cruise chart ±3 percent). Place the aircraft in a level longitudinal attitude (minimum drag profile) to facilitate acceleration; do not exceed a level fuselage attitude. Use the pedals to maintain heading aligned with the desired takeoff direction. Maintain takeoff heading with the pedals and cyclic while avoiding excessive cross-controlling.

b. On liftoff, trim the aircraft as soon as possible, commensurate with surface obstacles. Abrupt pedal input could cause torque to exceed available limit. Accelerating to a higher airspeed before establishing a climb will place the aircraft in a profile, which will allow a trade-off of airspeed for altitude, thereby aiding in obstacle clearance. Continuing to trade off airspeed for altitude (cyclic climb) will eventually result in a decreased rate of climb, loss of airspeed, and increased required power for flight. Accelerate the aircraft to the maximum rate of climb or desired airspeed and adjust power to climb and arrive at the desired altitude.

c. Conditions may exist where IGE hover power is not present. Performance planning and knowledge of the limited power margin is crucial. Crews must be aware of the turbine gas temperature (TGT) limiter setting and the onset of rotor droop when encountered. Determine torque for the maneuver by applying collective, not to exceed dual engine torque limits, while observing the TGT on the ENG page. TGT limiting and maximum torque available is indicated by a drop in rotor revolutions per minute (RPM) with further increase in collective. The power turbine speed (N_P) and rotor RPM will decrease if the P* demands any more power at this point. The engines may not TGT limit at the same time due to differences in engine torque factors (ETFs). At this setting, the crew will note the torque and reduce the collective. This torque value is the maximum torque for the maneuver. Due to fluctuation in torque from flight control inputs and environmental conditions, a torque setting of approximately 3 to 5 percent below the value at which engine TGT limiting was encountered should be used for the maneuver. The crew may also elect to set the torque for the maneuver 5 percent below the dual engine maximum torque available as calculated on the performance planning card (PPC).

Note: A rolling takeoff may be performed during approved flight missions where IGE power is not available (high density altitude or high gross weight [GWT]). The cruise charts contained in TM 1-1520-251-10 can be used to determine the predicted power and airspeed combination required for a rolling takeoff when IGE power is not available. This airspeed represents the minimum airspeed under dual engine conditions at which level flight can be maintained. The torque represents the power required to maintain level flight at this gross weight and airspeed combination.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

1. Night/NVD. If sufficient illumination or NVD resolution exists to view obstacles, accomplish the takeoff in the same way as a rolling takeoff during the day. If sufficient illumination or NVD resolution does not exist, a rolling takeoff should not be performed. Reduced visual references during the takeoff and throughout the ascent at night may make it difficult to maintain the desired ground track. Knowledge of the surface wind direction and velocity will assist in establishing the crab angle required to maintain the desired ground track.
2. Night vision system (NVS).
    a. Orient the sensor forward in the direction of takeoff.
    b. Use the transition mode to reference the horizon line symbology.
    c. Use the horizon line and head tracker symbology to reference longitudinal attitude and the skid/slip ball to reference lateral attitude.
    d. Use the head tracker, heading scale, and lubber line symbology to reference heading.
    e. Use the velocity vector and flight path vector (FPV) to reference longitudinal trim and velocity.
    f. Use vertical speed indicator (VSI) symbology (rate of climb indicator) to confirm that a climb has been established.

SNOW/SAND/DUST CONSIDERATIONS: This task may be used in environments where these conditions are present and the surface area is suitable. It may allow the aircraft to get ahead of the blowing conditions into clear air prior to takeoff. This maneuver should be aborted if visual cues become lost as the aircraft gets light when power is applied. Extreme care should be taken to confirm that the obscurants do not cover rough terrain in the takeoff area that could damage the aircraft. If surface conditions are poor or if adequate power is available, the crew should perform an altitude over airspeed takeoff.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft. To simulate situations requiring a rolling takeoff, use 10 ±3 percent below hover torque as maximum torque available. Terminate the maneuver when the aircraft is established with a positive rate of climb, clear of all obstacles, and maximum rate of climb or desired airspeed is achieved. The IP will ensure that the P* does not allow the aircraft to slow to a point where it will no longer climb or sustain level flight with simulated power limits.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1116

Perform tactical situation display operations

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator and given a condition to conduct tactical situation display (TSD) operations.

STANDARDS: Appropriate common standards and the following:

1. File data management.
   a. Perform TSD point–add, edit, delete, store, transmit, and review functions.
   b. Perform TSD route (RTE)–add, delete, direct, route review, and reversal functions.
   c. Perform cursor acquisition operations.
2. TSD report functions.
   a. Review, send, and request battle damage assessment (BDA).
   b. Send and receive target (TGT).
   c. Review, send, and request present position (PP).
   d. Review, send, and request FARM.
   e. Receive, review, and reply to a situation report (SIT).
   f. Receive, review, and send a SPOT.
3. Perform TSD digital map operations.
   a. Select appropriate type of map for display.
   b. Select desired viewing range and scale.
4. Priority fire zone/no fire zone operations.
   Create, delete, assign, and transmit priority fire zone/no fire zones.

DESCRIPTION:

1. Crew action.
   a. The pilot on the controls (P*) will primarily remain focused outside the aircraft, clearing the aircraft during TSD operations.
   b. The pilot not on the controls (P) will perform TSD operations.
2. Procedures.
   Conduct operations in accordance with the operator's manual, TM 1-1520-251-10/ TM 1-1520-251-CL, student handouts, interactive multimedia instruction, and unit standing operating procedures (SOPs).

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in an AH-64D aircraft, AH-64D simulator, or using an approved TSD emulation software.
2. Evaluation will be conducted in an AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1122

Perform target store procedures

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Store a target/threat to the coordinate file using the target acquisition and designation sight (TADS) or helmet display unit (HMD).
2. Store a target or threat to the coordinate file using the tactical situation display (TSD) flyover method.
3. Store a target or threat to the coordinate file using the fire control radar (FCR) single, all, or next to shoot (NTS).

DESCRIPTION:

1. Crew actions.
   a. The pilot on the controls (P*) maneuvers the aircraft over the position/target to be stored as a target/threat or as otherwise required for storing targets with the FCR or TADS.
   b. The pilot not on the controls (P) performs duties as assigned.
2. Procedures.
   a. Software specific target storing methods. The method of accomplishment for the following tasks varies between different AH-64D lot/block designations from one software version to another. These tasks will be accomplished according to the current operator's manual:
      (1) TADS/HMD target or threat coordinate file store method.
      (2) TSD target or threat storing (flyover method).
      (3) FCR target or threat storing.
         (a) FCR single target storing.
         (b) Storing all FCR targets.
         (c) FCR NTS target storing.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCE: Appropriate common references.

TASK 1132

Perform integrated helmet and display sight system boresight

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator and given TM 1-1520-251-10/ TM 1-1520-251-CL with integrated helmet and display sight system (IHADSS) video adjustments completed.

STANDARDS: Appropriate common standards and the following

1. Perform boresight procedures, in the proper sequence, for the appropriate crew station.
2. Record all discrepancies on DA Form 2408-13-1 (*Aircraft Maintenance and Inspection Record*).

DESCRIPTION:

1. Crew actions. With the IHADSS video adjustments completed, the pilot (PLT) (backseat crewmember) and copilot gunner (CPG) (front seat crewmember) must boresight their IHADSS. Boresighting requires selection of the IHADSS as line of sight (LOS). When the task is completed, they will record any discrepancies on DA Form 2408-13-1 (*Aircraft Status Information Record*)
2. Procedures.

   a. Position the sight SEL (select) switch on the collective mission grip (PLT/CPG) or the sight select switch on the ORT right handgrip (CPG) to HMD. Boresighting requires selection of the IHADSS as LOS. The weapon (WPN) page is used to functionally control sight and weapons moding. PLT/CPG IHADSS grayscale, sizing, and centering must be accomplished before proceeding (Task 1135). Select the sight boresight page button to display the boresight page. The pilot and CPG page will display the IHADSS maintained option button. The weapons page boresight provides access to IHADSS/TADS B/S controls and the page is unique to each crew station. Select the IHADSS B/S maintained button to place the IHADSS in the boresight mode, inhibiting the LOS from the sight electronics unit to the display processor (DP) and weapons processor (WP).

   b. Adjust the primary light's control knob on the interior light (INTR LT) panel, as desired, to obtain desired boresight reticle unit (BRU) brightness. Adjust the seat up or down to align the IHADSS LOS reticle coincident with the BRU target. The primary lighting level control knob controls lighting level. The boresight polarity (B/S PLRT) switch on each collective flight control grip is active and is ready to store the boresight when the IHU is properly aligned by the crewmember. In MTADS equipped aircraft and some non-MTADS equipped lots, a "B/S Now" button will appear on the weapons page. Align the HMD LOS reticle to the BRU.

   c. Set the B/S PLRT switch on the collective flight grip to B/S. In MTADS equipped aircraft and some non-MTADS equipped lots, select the "B/S Now" button on the weapons page. If the boresight is valid and accepted by the sight electronics unit (SEU), the message "IHADSS B/S...required" will blank on the HMD and the four cueing dots will disappear and the BRU reticle light will switch off. Deselect the boresight page button. If the first boresight is invalid, the message "boresight . . . required" and the four flashing cueing dots will remain on the display. In this case, reboresight the IHADSS using the procedures listed in above crew actions. If one or both of the IHADSS B/Ss were invalidated because of an IHADSS component problem, the IHADSS B/S button shall remain an operation in progress (OIP) and select fail state. The boresight requirement can be overridden by holding the B/S PLRT switch on the collective flight grip to B/S. If the button is pressed and held for more than 5 seconds, the OIP shall be removed, and the cueing dots will disappear; however, the select fail indication shall remain. The message "boresight . . . required" will remain in the high action display (HAD) sight status. In MTADS equipped aircraft and some non-MTADS equipped lots, the crewmember may select REMOVE MESSAGE on the Boresight Page to remove the "boresight … required" message. Deselect the

IHADSS maintained option button. Before taking this action, determine if mission requirements can be met.

Note 1: The IHADSS boresight maintained button is used to boresight the IHADSS in either crew station. The IHADSS button is not available when the outfront or internal boresight modes are active.

Note 2: Deselecting the IHADSS B/S button or deselecting the sight boresight page button will exit the boresight mode. The IHADSS and the primary lighting control will return to normal operation.

Note 3: If the PNVS TADS-NVS is slaved to the IHADSS LOS sight SEL switch in night vision system [NVS] and the boresight mode is selected, the pilot night vision system PNVS/TADS-NVS will slave to the BRU LOS (0 degrees in azimuth and -15 degrees in elevation).

NIGHT VISION GOGGLES (NVG) CONSIDERATIONS: A symbology display unit (SDU), used in conjunction with the IHADSS NVG visor, is required to achieve proper boresight while using NVG. The BRU center concentric circles will not be visible but will appear as a round glow unless the BRU filter is used. Reduction of primary instrument panel lights (PRI INT LT) to the minimum level will reduce the glow. The LOS must be placed in the center of the round glow to achieve a proper boresight.

WARNING

Significant errors in aiming may occur if the HMD is used as a sight while using NVG without a valid boresight. Failure to have a valid boresight may result in the death of or damage to unintended targets and/or fratricide.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1133

Perform aircraft position update function

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, and given an inertial navigation unit (INU) position error.

STANDARDS: Appropriate common standards and the following:

1. Determine the aircraft position ±50 meters.
2. Update the aircraft position using—
   a. Manual entry position update procedure.
   b. Fly-over position update procedure.
   c. Target acquisition and designation sight line of sight (TADS LOS) position update procedure.

DESCRIPTION:

1. Crew actions.
   a. The pilot on the controls (P*) will fly the aircraft to allow the pilot not on the controls (P) to get a fix on the current location.
   b. The copilot-gunner (CPG) (front seat crewmember) or P will inform the other crewmember that he is performing aircraft position update procedures, and that his attention will be inside the aircraft.
2. Procedures. Perform aircraft position update in accordance with TM 1-1520-251-10/ TM 1-1520-251-CL.

TRAINING AND EVALUATION REQUIREMENTS:

Note: Prior to data transfer cartridge (DTC) mission load, when the embedded global positioning inertial navigation system (EGI) begins its initialization, the tactical situation display position (TSD "POS") button, and often the up-front display (UFD) "POS update" advisory message, will display. At this time, the trainer/evaluator should temporarily change the TSD UTIL (utility) page system date ahead or behind by one day to generate and/or prolong the UFD "POS update" advisory message. The system date change will help ensure that an adequate amount of time is available to accomplish the task. When ready, the pilot being trained or evaluated can perform a simulated "flyover position update" procedure while the aircraft remains stationary on the ground, and then correct the erroneous system date.

1. Training may be conducted in an AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in an AH-64D aircraft or an AH-64D simulator.

REFERENCE: Appropriate common references.

TASK 1134

Perform integrated helmet and display sight system operations

CONDITIONS: In an AH-64D helicopter, or an AH-64D simulator, with integrated helmet and display sight system (IHADSS) boresighting and IHADSS video adjustments completed.

STANDARDS: Appropriate common standards and the following:

1. Place the IHADSS into operation.
2. Select the appropriate line of sight (LOS).
3. Use the cueing functions.

DESCRIPTION:

1. Crew actions. Either crewmember can accomplish target acquisition with their respective IHADSS by acquiring the acquisition (ACQ) source's cueing dots. The helmet mounted display (HMD) sight select mode establishes both crewmembers' IHADSS as the LOSs. The pilot's (PLT's) pilot helmet sight (PHS) and copilot-gunner's (CPG's) gunner helmet sight (GHS) line of sights are provided to the weapons processor (WP) for processing the commands that control sensor pointing, weapons aiming, sensor/seeker/coordinate data target acquisition, symbol generation, and ranging.

2. Procedures.

   a. PLT IHADSS sight options.

      (1) HMD sight select option. In the HMD sight mode, the pilot night vision system (PNVS) is stowed and only the selected symbology is displayed. The AH-64D will always provide the PLT with an active LOS and initializes in the HMD sight mode.

      (2) Night vision system (NVS) mode switch sight option. The NVS NORM (normal) mode is functionally the same as the HMD selected sight mode with the exception that the PNVS forward looking infrared (FLIR) is coupled to the PLT's LOS and overlayed with independent PLT flight symbology. When the NVS mode switch is selected to NVS NORM, the PLT's high action display (HAD) sight select status field will display the message "HMD." This mode also enables the NVS switch on the collective (PNVS or TADS).

      (3) PLT HMD and NVS NORM acquisition sources. The cueing function in the pilot station is initialized to an enabled (ON) setting at power up. The PLT's cueing will always remain on unless the PLT deselects cueing on the weapons utility (WPN UTIL) page cueing maintained option button. Set the sight select switch on the collective mission grip to HMD or select the NVS mode switch to NORM. Select an acquisition source through the WPN, TSD, or fire control radar (FCR) page as desired through the ACQ multistate button.

         (a) Select the desired acquisition source from the ACQ grouped option. The selected acquisition source will be displayed in the acquisition select status window on the TSD, WPN, or FCR page and in the acquisition select status field of the HAD. If an acquisition source is not valid or not available, that maintained option button will not be displayed. Acquire the selected acquisition source by aligning the HMD LOS reticle with the cued LOS reticle. Then visually acquire the target or area of interest. If the cueing function is no longer desired, select the WPN UTIL page cueing maintained option button and deselect it. If a sight is selected that creates an invalid acquisition LOS selection, the acquisition source will default to fixed. PLT IHADSS acquisition sources include the following:

1. GHS option button. Selects the copilot/gunner's LOS as the acquisition source.

2. Seeker (SKR) option button. Selects the tracking missile seeker as the acquisition source. The tracking seeker used for acquisition is dependent on the type of missile; for example, semiactive laser (SAL) missile seeker (tracking seeker on the priority laser channel) or radio frequency (RF) missile seeker (tracking seeker for next to shoot [NTS] target).

3. Radar frequency interferometer (RFI) option button. Selects the RFI #1 or selected RFI emitter as the acquisition LOS. Cueing will be provided to the azimuth of the emitter with zero degrees elevation.

4. FCR option button. Selects the FCR NTS LOS, whether detected by own ship or FCR data received from the improved data modem (IDM) as the acquisition LOS. If no NTS target exists, there will be no cueing.

5. Fixed (FXD) option button. Selects the fixed forward position as the acquisition LOS.

6. Target acquisition and designation sight (TADS) option button. Selects the TADS LOS as the acquisition source.

7. TXX/WXX/CXX (coordinate point target, waypoint/hazard, control measure) option button. Selects the coordinate point LOS as the acquisition LOS. One of 99 stored waypoints or control measures or one of up to 56 targets.

8. TRN option button. Selects the PLT T55 or the CPG T56 terrain point location.

Note: The pilot helmet sight (PHS) option button is not displayed when the pilot's selected sight is HMD.

b. CPG IHADSS sight options.

(1) HMD sight select option. When HMD is the selected sight, HMD is the active LOS for weapons processing. Selecting any other sight will deselect the HMD.

(2) NVS mode switch sight option. The NVS mode is functionally the same as the HMD selected sight mode, with the exception that the TADS wide field of view (WFOV) FLIR is coupled to the CPG's LOS and overlayed with independent CPG flight symbology. When the NVS mode switch is selected in NVS NORM, the CPG's HAD sight select status field will display the message "HMD" and the TADS sight select switch will not be functional. With the exception of TADS, all other HMD ACQ sources will be available through the TSD, FCR, or WPN pages. This mode will also enable the NVS switch on the collective (PNVS or TADS).

(3) TADS sight select with GHS ACQ selected and slaved option. Although not technically an IHADSS mode, the TADS is operational and slaved to the IHADSS LOS. If the IHADSS LOS is detected as invalid, the TADS will freeze until valid IHADSS LOS data is obtained. To unslave the TADS for manual control, depress the slave pushbutton on the optical relay tube right handgrip (ORT RHG). The TADS will uncouple from the IHADSS LOS, and the manual tracker (MAN TKR) thumb force controller is enabled to control the TADS. The weapons processor (WP) will use TADS LOS data. Both symbology and video are displayed.

(4) HMD and NVS NORM acquisition sources. Set the sight select switch on the collective mission grip or the ORT right handgrip to HMD or select the NVS mode switch to NORM. In the HMD mode, the TADS is stowed and only the selected symbology is displayed. The NVS NORM sight option is functionally the same as HMD. Select an acquisition source. Select the WPN, TSD or FCR page, as desired. Select the ACQ multistate button. Select the desired acquisition source from the ACQ grouped option. If an acquisition source is not valid or not available, that specific maintained option button will not be displayed. Acquire the selected acquisition source. Press the slave switch on the ORT right handgrip to slave on. Whenever an acquisition source is selected in the CPG station, the slave switch is preset to slave off. Align the HMD LOS reticle with cued LOS reticle display. Visually acquire target or area of interest. If the cueing function is no longer desired, press the slave switch on the ORT right handgrip to slave off or select another sight. If a sight is selected that creates an invalid acquisition LOS selection, the acquisition source will default to fixed. CPG IHADSS acquisition sources include the following:

(a) PHS option button. Selects the pilot's LOS as the acquisition source.

(b) SKR option button. Selects the tracking missile seeker as the acquisition source. The tracking seeker used for acquisition is dependent on the type of missile selected.

(c) SAL missile seeker. Tracking seeker on the priority laser channel.

(d) RF missile seeker. Tracking seeker for NTS target.

(e) RFI option button. Selects the RFI #1 or selected RFI emitter as the acquisition LOS. Cueing will be provided to the azimuth of the emitter with zero degrees elevation.

(f) FCR option button. Selects the FCR NTS LOS, whether detected by own ship or FCR target data received from the IDM as the acquisition LOS. If no NTS target exists, there will be no cueing when the slave is on.

(g) FXD option button. Selects the fixed forward position as the acquisition LOS.

(h) TADS option button. Selects the TADS LOS as the acquisition source.

(i) TXX/WXX/CXX (coordinate point target, waypoint/hazard, control measure) option button (B5). Selects the coordinate point LOS as the acquisition LOS. One of 99 stored waypoints or control measures or one of 56 targets.

(j) TRN option button. Selects the PLT T55 or the CPG T56 terrain point location.

Note: When in the HMD or NVS NORM mode, cueing is selected by pressing the slave button. When cueing is selected, one cueing dot (azimuth or elevation) or two cueing dots (azimuth and elevation) will appear at the end of the LOS reticle segments. These cueing dots indicate the direction in which you must turn your head to align with the referenced LOS. As the referenced LOS comes into the display field of view (FOV), the cued LOS reticle (dashed reticle) will appear on the HDU. This reticle represents the LOS of the selected source. As the HDU LOS comes within 4 degrees of the cued LOS reticle, the cueing dots will disappear. To deselect cueing, press the slave button again.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1135

Perform integrated helmet and display sight system video adjustments

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator and given TM 1-1520-251-10/ TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Adjust the video brightness and contrast for best video quality.
2. Align the image using the image rotation collar.
3. Adjust the symbology brightness for best view.
4. Set the focus collar to achieve infinity of focus.

DESCRIPTION:

1. Crew actions. Record any discrepancies on a DA Form 2408-13 (*Aircraft Status Information Record*). When troubleshooting, the pilot (PLT) or copilot-gunner (CPG) will coordinate with the opposite crewmember before activating the initiated built-in test (IBIT).

2. Procedures. Initial integrated helmet and display sight system (IHADSS) video adjustment. IHADSS video adjustment (grayscale, sizing and centering, brightness and contrast [BRT/CONT], and infinity focus) is the initial component of IHADSS boresight procedures.

a. Sight SEL (select) switch. Position the sight SEL switch on the collective mission grip (PLT/CPG) or the sight select switch on the optical relay tube (ORT) right handgrip (CPG) to helmet mounted display (HMD). If the CPG's selected sight is fire control radar (FCR) or target acquisition and designation sight (TADS), BRT/CON adjustments will affect the ORT display and not the helmet display unit (HDU).

b. WPN page. Select the weapons (WPN) page, and select the grayscale maintained option button. The display electronics unit’s (DEUs) grayscale image will now be projected in the HDU. However, the grayscale button is not displayed when a weapons system has been actioned or selected. Using a part of the airframe such as the windshield frame or instrument display console, note the image’s orientation and adjust the image rotation collar on the HDU until the display image is level.

c. IHADSS video BRT and CON controls.

(1) Sizing and centering. Adjust the display brightness (DSPL BRT) control on the ORT control panel (CPG) or the IHADSS BRT control knob on the video control panel (PLT) from minimum to maximum. Adjust the DSPL CONT control on the ORT control panel (CPG) or the IHADSS CON control knob on the video control panel (PLT) from minimum to maximum. If necessary, perform an initial focus of the grayscale. This initial focus facilitates the sizing and centering process and is not the formal grayscale infinity focus adjustment. If desired, adjust the HDU infinity focus collar to obtain the sharpest raster line focus possible. Make display adjust panel (DAP) electronic focus adjustments only if absolutely necessary. In any case, clear focus of the lines may not be entirely possible due to the overdriven grayscale, and therefore, focus adjustment should be attempted only to the extent necessary to complete the sizing and centering process.

Verify display sizing and centering using the grayscale borderlines. The field flattener lens, on the face of the cathode ray tube, has a visible mask that is used as a reference during the sizing and centering process. The properly sized and centered grayscale will display a barely visible but distinct outer border (field flattener lens mask) that is comprised of four equal sized lines at the top, bottom, left, and right edges of the display. The properly sized and centered display represents a 30 degree x 40 degree field of view (FOV). When grayscale sizing and centering is determined to be correct, the PLT or CPG can then continue with grayscale adjustment. When it is determined that an adjustment to grayscale sizing and centering relative to the mask is required, the aviator must perform or have maintenance accomplish the following:

(a) Position the combiner lens and HDU assembly. The combiner lens is positioned correctly when the display is perfectly centered in the lens as viewed by the operator. The four corners of the display will be equally cut off with a correctly positioned combiner lens with no excessive loss of video/symbology. If too much video/symbology is cut off, verify sizing/centering and, if necessary, slide the HDU assembly aft to position the lens closer to the eye.

(b) Adjust horizontal sizing and centering potentiometers on the DAP as necessary to make the grayscale's border, left and right, adjacent to the mask. Adjust the vertical sizing and centering potentiometers on the DAP as necessary to make the grayscale border, top and bottom, adjacent to the mask. "Adjacent to the mask" means that the grayscale's borderlines are touching the mask on all four sides. The lines must be visible (not behind the mask), but there must not be a gap between the lines and the mask.

(c) Recheck for a level image before proceeding. If necessary, readjust the image rotation collar and combiner lens assemblies for a level, centered image.

(2) Grayscale adjustment. Adjust the DSPL BRT control on the ORT control panel (CPG) or the IHADSS BRT control knob on the video control panel (PLT) from maximum to minimum. Adjust the DSPL CONT control on the ORT control panel (CPG) or the IHADSS CON control knob on the video control panel (PLT) from maximum to minimum. Adjust the DSPL BRT control on the ORT control panel (CPG) or the IHADSS BRT control knob on the video control panel (PLT) up until a video background is barely visible (produces a faint glow) across the display. Adjust the DSPL CONT control on the ORT control panel (CPG) or the IHADSS CON control knob on the video control panel (PLT) up just until 10 distinct shades of gray are visible from the grayscale pattern.

(3) Infinity focus adjustment. Adjust the infinity focus collar on the HDU for sharp raster line definition. Rotate the infinity focus collar, as it is worn, fully counter clockwise. The grayscale will appear blurred. The mechanical focus of the HMD is now set to a positive diopter value (beyond infinity). If distant objects (light sources at night) are present, look through the combiner lens past the windscreen at the most distant object available (200 foot minimum) to keep the eye relaxed for infinite focus. If no distant objects are present, it is important to have the correct mental set (ability) and allow the eye to relax.

(a) Generally, when the eye has nothing to focus on, as is the case when the grayscale is completely blurred, the eye will relax to infinite focus. While remaining focused on the distant object, slowly rotate the focus ring clockwise until the center vertical raster lines of the grayscale video first appear in sharp focus, then immediately stop the rotation. If necessary, blink the eyes periodically during the rotation to ensure they remain relaxed to an infinite focus.

(b) The instant the raster line comes into sharp focus, the HDU is adjusted to a true infinity focus (0 diopter) since the human eye is not capable of accommodating beyond infinity. Do not rotate the ring further, as this will always leave the HDU adjustment in a position that will stimulate accommodation away from the relaxed distance focus. If, at this point, it is not possible to focus the raster lines sharply, make adjustments to the electronic focus on the DAP, then continue with the HDU focus collar adjustment. Deselect the grayscale maintained option button.

(4) Symbol brightness (SYM BRT) control. With the grayscale deselected, adjust the SYM BRT control on the ORT control panel (CPG) or video control panel (PLT) between minimum and maximum, and set where displayed symbology is clearly visible over the background real-world or NVS imagery. Take care not to over brighten the SYM BRT, as this will create an apparent out of focus condition.

Note 1: The focus ring on the HDU compensates for the variation in visual acuity among aviators. The infinity focus ring/collar allows each individual to focus the image to infinity.

Note 2: Focusing in on anything less than infinity cannot be maintained for a prolonged duration without creating eyestrain and other negative effects.

Note 3: Any loss of video/symbology after a proper IHADSS video adjustment is the result of improper helmet fit, improper combiner lens movement/position, improper HDU movement/position, wearing of glasses, or the wearing of an nuclear, biological, and chemical (NBC) protective mask.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1138

Perform target acquisition designation sight boresight

CONDITIONS: In an AH-64D helicopter or AH-64D simulator with TADS / MTADS operational checks completed and given TM 1-1520-251-10/TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Without error, perform target acquisition and designation sight (TADS) / modernized target acquisition designation sight (MTADS) internal boresight.
2. Without error, perform TADS outfront boresight.

DESCRIPTION:

1. Crew actions. The copilot gunner (CPG) (front seat crewmember) will announce when he initiates internal boresighting and when he completes the procedure.
2. Procedures (TADS).

   a. Internal boresight. Complete the internal TADS boresight before doing the out-front boresight. Boresight the day television (DTV) and the forward looking infrared (FLIR) sensors to the laser spot, and then boresight the direct view optics (DVO), if installed, to the DTV. Boresight either the DTV or FLIR sensor first; however, for each sensor, the narrow field of view (NFOV) must be boresighted before the zoom field of view (ZFOV) is boresighted. The aiming reticles in the NFOV and ZFOV of each sensor are the only reticles boresighted to the laser range finder/designator (LRF/D) during TADS boresighting; therefore, use only the NFOV or ZFOV in conjunction with laser operations. Do not boresight the medium field of view (MFOV) and the wide field of view (WFOV) reticles to the LRF/D. Make appropriate adjustments to ensure proper alignment of the sensors with the laser.

   b. Out-front boresight. Perform the out-front boresight to correct for mechanical inaccuracies in the boresight module. The out-front boresight will not impact adversely on internal boresights.

Note 1: Failure to accurately perform the boresight procedure may result in the laser and selected weapons impacting other than where the selected sensor is pointing. A recent internal boresight increases the probability of hit (PH) factor for semiactive laser (SAL) missile target engagements and for all weapons engagements where the laser is the range source.

Note 2: Internal boresight operational considerations. Internal errors can develop in flight due to temperature changes within the internal components of the TADS (thermal drift). As the component modules in the TADS are used, heat is produced, which has an adverse effect on the boresight accuracy. When confidence in the boresight is suspect, an in-flight DTV and FLIR internal boresight should be accomplished as often as desired (recommendation—once every 1 hour and 15 minutes; two times in a 2.5 hour flight). Generally, the more recent the internal boresight, the more accurate the system will be. As long as the CPG validated or performed an out-front boresight prior to flight, there is no requirement or reason to perform out-front boresights following an in-flight internal boresight unless a hard shutdown occurred or a CUE update was performed. The target acquisition and designation sight electronics unit (TEU) will retain the original accurate out-front boresight correctors throughout the flight.

Note 3: Out-front boresight correctors are initially stored in the TEU's volatile memory for use during the flight and subsequently placed in nonvolatile memory during the first proper power-down sequence. Initial boresight correctors will be lost if the system is not properly powered- down at least one time after completing an out-front boresight. If a proper power down of the TEU was accomplished (correctors store in nonvolatile memory), an improper power down will have no adverse effects on the correctors.

3. Procedures (MTADS).

   Internal boresight. The internal boresight is an automated process which independently boresights the DTV and the FLIR sensors. The DTV boresight must be performed successfully before the FLIR boresight can be performed. Initiating an internal boresight automatically sets the CPG sight to TADS, and selects the sensor to DTV narrow field of view. A STANDBY FOR INT BORESIGHT message is displayed on the weapons utility page (WPN UTIL) while the TADS slews to the boresight position, completes an automatic cue search, and is ready for boresight. At initial power up, the automatic cue search will take approximately 90 seconds with the entire internal boresight procedure taking approximately 2 minutes. Subsequent internal boresights, under the same power cycle, will take approximately 30 seconds since the system will use azimuth and elevation data obtained from the initial boresight. During the automatic cue search, three dots (boresight targets) will appear on the TADS Electronic Display And Control (TEDAC) at varying intensities and not necessarily centered or leveled with respect to the line-of-sight reticle. When the three dots disappear, a laser warning message appears with prompts to complete the internal boresight on the WPN UTIL page. The DTV boresight begins when the laser trigger is depressed to the second detent and the prompts are replaced by DTV BORESIGHT IN PROGRESS. The laser may appear intermittent but the laser trigger should not be released until the DTV BORESIGHT COMPLETE appears on the WPN UTIL page. After a successful DTV boresight and the laser trigger is released, the system automatically selects FLIR and the FLIR boresight begins. The only further interaction required is ensuring the proper displays are presented on the WPN UTIL page and the TEDAC. If the FLIR NOT COOL status displays, the boresight will not continue until the FLIR is cooled. The FLIR BORESIGHT IN PROGRESS displays below the DTV COMPLETE status and the three dots will appear on the TEDAC. After approximately 15 seconds, the three dots will disappear, and the FLIR BORESIGHT COMPLETE will appear on the WPN UTIL page. Upon completion, an EXIT INTERNAL BORESIGHT MODE message appears. To exit the boresight mode, select the BORESIGHT button on the WPN UTIL page. The INTERNAL B/S message will be removed and the MTADS will return to its previous selected settings (sensor select, FOV).

Note 1: Legacy TADS characteristics requiring out-front boresight are compensated for by MTADS internal boresight improvements and are no longer required.

Note 2: If the DTV boresight has been successfully completed and the FLIR boresight fails, the DTV boresight is valid. If the DTV boresight fails, FLIR boresight will not be completed.

Note 3: Upon completion of the internal boresight, the TADS line-of-sight reticle in FLIR may appear to be off centered. These offsets are considered normal and will continuously be updated with range changes in order to correct for parallax.

Note 4: The MTADS system automatically tracks internal temperature. Following initial startup and boresight, the message “Internal Boresight … Required” will appear in the Sight Status section of the HAD when the internal temperature exceeds 30^{o}C if the startup temperature is <20^{o}C, or 15^{o}C if the startup temperature is >20^{o}C.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1139

Perform target acquisition designation sight operational checks

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, and given TM 1-1520-251-10/TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Without error, perform target acquisition and designation sight (TADS), and modernized target acquisition designation sight (MTADS) operational checks.
2. Correctly determine the operational status of the TADS/MTADS.

DESCRIPTION:

1. Crew actions. The copilot gunner (CPG) (front seat crewmember) will perform operational checks as necessary to determine whether the TADS is operating properly. The CPG will determine the effects of any TADS/MTADS discrepancies against the needs of the mission. The CPG will announce the status of the TADS/MTADS when the checks are completed and will record any discrepancies on DA Form 2408-13-1 (*Aircraft Status Information Record*).
2. Procedures.
   a. The CPG will perform operational checks as necessary to determine whether the TADS/MTADS is operating properly. The CPG will announce when he completes the checks.
   b. The crew will determine the affect of a TADS/MTADS malfunction and if the system can be used to perform the assigned mission.
   c. The crew will record any discrepancies on DA Form 2408-13-1.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1140

Perform target acquisition designation sight sensor operation

CONDITIONS: In an AH-64D helicopter, or an AH-64D simulator, with the target acquisition and designation sight (TADS) / modernized target acquisition and designation sight (MTADS) operational check and TADS/MTADS boresight complete.

STANDARDS: Appropriate common standards and the following:

1. Employ TADS/MTADS sensors (direct view optics [DVO] if installed, day television [DTV], and forward-looking infrared [FLIR]).
2. Acquire a target manually or through an acquisition source using TADS/MTADS slaving or linking.
3. Track a target with the most appropriate TADS/MTADS mode available.

DESCRIPTION:

1. Crew actions.

a. The pilot (PLT) flies the aircraft and maintains obstacle clearance while the copilot gunner (CPG) performs TADS/MTADS sensor operations. When required for target or area of interest (AOI) intervisibility, the CPG will provide directions to the PLT using clear and concise terms (for example "come up/down," "move forward/backward," "slide left/right," "mask," and "unmask"). When practical, the PLT should have the CPG's video underlay displayed on one multipurpose display (MPD). The PLT will announce any intentions of taking control of TADS/M/TADS through the fire control radar (FCR) link function prior to actually selecting TADS/M/TADS link.

b. The CPG will operate the TADS in a manner that will take full advantage of the sensor's optimum capabilities (DVO/DTV/FLIR, field of view [FOV], video view, image auto track [IAT]/linear motion compensation [LMC], multitarget tracker [MTT], laser spot tracker [LST], or manually) for a given situation (mission, enemy, terrain and weather, troops and support available, time available, civil considerations [METT-TC]) in acquiring, tracking, and identifying targets.

2. Procedures.

a. Direct view optics (DVO), if installed. The DVO is a visible-energy (0.4 to 0.7 micron) optical path through the TADS to the ORT, which provides a real-world view. Select the DVO by placing the sensor switch in the DVO position. While the DVO is selected, the DTV presentation (in the same FOV as selected for DVO) is available for display on the heads out display (HOD) and the integrated helmet and display sight system helmet display unit (IHADSS HDU). The message "DVO" will appear in the upper left portion of the video (DTV) display to indicate that the DVO has been selected.

b. DTV.

(1) The DTV converts near-infrared energy (0.7 to 1.1 microns) to a video signal and routes this signal through the target acquisition and designation sight electronics unit (TEU) and symbol generator to the ORT and DEU. The DTV shares the optical path of the DVO narrow field of view (NFOV) and the laser. The TEU/M-TEU adds the TADS/MTADS reticle and image auto track (IAT) gates (if the IAT is selected) and routes the video to the symbol generator. There is no direct video capability.

(2) The CPG will move the FOV switch to the desired FOV position (W [14.3x], N [63.5x], or Z [127x]). The M position will select the wide field of view (WFOV). FOV gates will appear in W and N. The zoom field of view (ZFOV) is actually an electronic underscan of the center 50 percent of the NFOV; therefore, some resolution will be lost. The display processor (DP) processes the video, superimposes symbology in conjunction with the weapons processor (WP), and routes the video to the MPDs and optical relay tube (ORT) for display. The message DTV will appear in the upper left portion of the display to indicate that the DTV sensor has been selected.

Note: The MPD VID page video select (VSEL) display option provides additional electronic FOV capabilities, which should be used in conjunction with the TADS/MTADS DTV sensor's FOVs. With a video page display option previously selected (for example, TADS or CPG sight), the CPG may at anytime select the VID page to recall the selection. When the VID page is recalled, the selected option's video and symbology will be presented along with three view option buttons (WIDE, NORM, and ZOOM) and a SHARP button that allows the operator to amplify the presentation of fine detail information.

The wide view option will present the center 95 percent of the selected sensor's FOV image on the MPD while NORM presents 75 percent of the image and ZOOM presents a 2:1 electronic zoom of the wide (95 percent) image. An example of the MPD 95 percent display 2:1 ZOOM in conjunction with the DTV ZOOM FOV image would be that the DTV's 127x ZOOM magnification power can now be viewed at 241x via the MPD. The MPD's enhanced capabilities assist the aircrew's target detection capabilities and weapon's probability of hit (PH) values.

c. Forward-looking infrared (FLIR).

(1) The FLIR sensor converts intermediate- and far-infrared energy (7.5 to 12 microns) to a video signal and routes it through the TEU/M-TEU and symbol generator to the ORT, VDU, and display electronics unit (DEU).

(2) By placing the sensor select switch to FLIR, the CPG selects the FLIR as the TADS sensor. The CPG then selects the desired FOV (W [1.2x], M [6.0x], N [19.9x], or Z [39.8x]) by moving the FOV select switch. The TEU/M-TEU adds the TADS LOS reticle and IAT gates, if selected. The DP in conjunction with the WP, adds all other appropriate symbology. The WFOV, MFOV, and NFOV are true optical fields of view. The ZFOV is actually an electronic underscan of the center 50 percent of the NFOV; therefore, some resolution will be lost. For target engagements, MFOV is used for target acquisition, and NFOV or ZFOV is used for target recognition and engagement.

Note 1: The TEU/M-TEU will not shut down completely when the system is turned off via the DMS page SHUT DOWN option. To recycle the system, both the TADS and PNVS must be cycled off, and then on.

Note 2: The engineering test (ETEST) option on DMS page provides access to FCR, TADS, and PNVS for maintenance functions. This page shall only be accessed by qualified maintenance personnel.

Note 3: While maneuvering and tracking a target with LMC, an accurate dynamic range must be maintained to target.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1142

Perform digital communications

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator and given the requirement to establish Air Force applications program development (AFAPD [Longbow])/airborne target handover system (ATHS [TACFIRE])/joint variable message format (JVMF [TI])/JVMF (FS)/high frequency (HF) digital communications.

STANDARDS:

1. Construct a preset communications network using all the correct network parameters required for the mission.
2. Modify an existing preset communications network with the required corrected data.
3. Transmit and/or receive digital communication messages, files, and other data through the fire control radar (FCR), tactical situation display (TSD) and/or communication (COM) page as the situation dictates.
4. Transmit and receive digital reports.

DESCRIPTION:

1. Crew actions. The ability to perform digital (improved data modem [IDM]) communications is contingent on the aircrew establishing digital nets. Both voice and digital traffic can be sent and received over a digital enabled net. However, digital traffic is not possible over a voice net. Digital net users must have subscriber and originator identification (ID) tags set in a minimum of two IDM aircraft, possess a common very high frequency (VHF), ultra high frequency (UHF), HF, or frequency modulation (FM) frequency, and subscribers must be enabled as team/primary members.
2. Procedures. The crew will initially construct and develop the desired digital nets during premission planning through the use of approved software. Certain critical elements of digital nets will not be able to be configured in the aircraft. Unit of assignment, mission essential task list, aircraft configuration, and resources will determine the ability to establish a digital network for communication. The crew will send/receive TSD digital reports in accordance with TM 1-1520-251-10.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1143

Perform fire control radar operational checks

CONDITIONS: In an AH-64D helicopter with radar or an AH-64D simulator and given TM 1-1520-251-10/TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

Perform fire control radar (FCR) operational checks.

DESCRIPTION:

1. Crew actions. Prior to activating the FCR, the crew will verify that the radar is physically unpinned, as part of preflight. The FCR may be unpinned at anytime following the alignment.

2. Procedures. Complete the procedures as per the TM 1-1520-251-10/TM 1-1520-251-CL and verify FCR BIT (built-in test) is complete and no faults are displayed on the data management system (DMS) fault page or the up-front display (UFD). Verify the DMS UTIL boresight page blade position sensor (BPS) boresight values are correct and that the inertial navigation unit (INU) is aligned. FCR will delay the actual power-up until the forward avionics bay reports a temperature of 90 degrees Fahrenheit or less. The EGI's INU alignment is confirmed when the heading tape displays. The FCR takes approximately 3 minutes to run IBITs and power up (extreme cold weather starts less than –10 degrees Celsius (C) could take as long as 13 minutes).

Note: The radar frequency interferometer (RFI) mode two state button will allow presentation of all detected RFI emitters, and the default state on power-up is ALL.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1144

Perform fire control radar operations

CONDITIONS: In an AH-64D helicopter with radar or an AH-64D simulator with FCR operational check completed.

STANDARDS: Appropriate common standards and the following:

1. Operate the fire control radar (FCR) to search for and detect target(s)/threat equipment.
2. Place FCR cued search mode into operation.
3. Upon completion of cued search, determine if FCR has correlated radar frequency interferometer (RFI) detected target.
4. Utilize FCR terrain profile mode.
5. Enable FCR C-Scope.

DESCRIPTION:

1. Crew actions. Either the pilot (PLT) or copilot-gunner (CPG) may select and activate the FCR as a target detection or obstacle/terrain avoidance sensor. No matter which crewmember controls the FCR, C-SCP will increase the target or obstacle/terrain situational awareness of both crewmembers. The pilot in command (PC), standing operating procedure (SOP), mission briefing, and the unique current situation are all factors that are used in determining which crewmember controls the FCR during any of the various segments of a given flight/mission. The pilot on the controls (P*) or the pilot not on the controls (P) will announce, and/or coordinate, sight selecting the FCR.
2. Procedures.

   a. FCR targeting. Set the sight select switch on the right optical relay tube (ORT) handgrip or collective mission grip to FCR. Set the FCR mode switch on the left ORT handgrip or collective mission grip to ground targeting mode (GTM), radar mapping (RMAP), or aircrew training manual (ATM), as desired. Set FCR scan size switch on the right ORT handgrip or collective mission grip to wide, medium, narrow, or zoom, as desired. Check the FCR scan footprint on the tactical situation display (TSD). Select the centerline left or centerline right buttons on the FCR page or use the manual thumbforce controller as required to align the FCR with the desired search area.

      (1) Cueing symbology or slaving of the FCR centerline to the current acquisition source is also available. Set the scan switch, on the collective mission grip, to single scan burst or continuous scan burst, as desired. Check the target data on the FCR page or TSD.

      (2) Target data on the FCR page as displayed is a "snapshot," and is not continuously updated. On the TSD, target icons are presented based on position data provided by the FCR and will move relative to the own ship. The weapons processor uses position information of the current next to shoot target (NTS) for computing line of sight (LOS) data and ballistic solutions. Subsequently select other targets, as NTS will provide that target information for processing. The FCR NTS target data can be used as the LOS data for gun, rocket, and radio frequency (RF) missile engagements.

Note 1: Wide and medium scans provide two scans per scan burst. Narrow scan provides three scans and zoom provides four scans per scan burst. More scans will provide more radar energy (painting) on a given target or target area, which will improve the detection, classification, and subsequently prioritization of targets. Use WFOV for target detection only. Once targets are detected, crews should switch to narrower fields of view for targeting.

Note 2: Priority schemes D, E, F, and G are programmed to employ either the aircraft's built-in lethal ranges or, when required, a pre-built lethal range may be loaded through the data transfer unit (DTU) page. If the PLT/CPG desires to use the aircraft's resident lethal range after the DTU lethal range was previously loaded, the FCR will have to be completely powered down and then powered back on.

Note 3: Terrain sensitivity setting (TSS) provides the capability to adjust how the aircraft presents detected stationary targets, or stationary target indicators (STIs), when using the FCR in ground targeting mode (GTM) and radar map (RMAP). TSS has no effect on the detection or classification of moving target indicator (MTI) targets in GTM, RMAP, or air targeting mode (ATM). TSS settings can dramatically affect FCR STI performance. To disable STI processing completely, use the RESERVED (MTI ONLY) mode.

Note 4: Continuous scan allows the FCR to correlate targets from scan burst to scan burst in GTM and RMAP. Scan-to-scan correlation is not available in ATM.

Note 5: When in continuous scan, with a weapons action switch and the NTS frozen, the NTS target must be redetected every 12 seconds. If not, the LOS INVALID, YAW LIMIT, or TARGET DATA? Message will appear, and the NTS will either be broken or disappear.

b. Perform cued search. The purpose of a cued search is to rapidly position the FCR centerline to the azimuth of an RFI detected emitter and complete a scan in an effort to correlate the FCR and RFI data. A successful correlation of RFI and FCR data can occur on any scan without a cued search being performed. When a successful correlation occurs, the respective RFI emitter icon will disappear, and an FCR "merged air defense" icon will appear. As many as 10 priority RFI active emitter threats (AET) icons will display on the periphery of the FCR GTM and ATM footprints on the FCR page, and on the outside border of the aircraft survivability equipment (ASE) footprint on the TSD and ASE page.

(1) Emitter icons will be displayed in full intensity during the period when the target is actively emitting for 30 seconds after the emitter becomes inactive, at which time the symbol will be displayed at partial intensity for 60 seconds. The symbol will blank 90 seconds after the emitter becomes inactive.

(2) The RFI will track and maintain up to 40 AETs. The RFI will reprioritize the maintained AETs whenever a new AET has been detected. Cued search may be initiated from any FCR targeting mode by two methods—automatic or manual. A cued search may be performed on both course and fine detected emitters that are within an area ±90 degrees off the nose of the aircraft. If the emitter is a fine detect, the FCR will be set to the zoom scan size. If the emitter is a course detect, the FCR scan size will be set to wide.

c. Perform cued search using the ORT or collective mission grip, cued search button (automatic mode). Press the cued search button on the ORT or collective mission grip. The FCR will orient toward the RFI #1 emitter (highest priority), depicted by the home plate symbol, and complete a single scan burst in an attempt to correlate the azimuth of the emitter with the position of an FCR detected target. If the cued search button is pressed during a normal FCR scan, the scan will stop and a cued search initiated. Pressing the cued search pushbutton a second time will orient the FCR centerline to the next priority emitter. Subsequent activation of the cued search pushbutton will cycle the FCR through all emitters in the list that are in the area available for cued search (±90 degrees off the nose of the aircraft). If a second scan burst is desired on a particular emitter, select the FCR scan switch on the collective mission grip to single scan burst (SS) or continuous scan burst (CS).

d. Perform cued search of RFI detected target using the cursor control (manual method). Select the desired RFI threat symbol from the periphery of the FCR page using the cursor control on the collective grip or ORT left handgrip. The FCR centerline will orient to the emitter, but the scan will not occur. Set the FCR scan switch on the collective mission grip or ORT right handgrip to SS or CS. To select additional RFI targets, repeat the steps. If the desired emitter is not within ±90 degrees of the nose of the aircraft, the ability to cursor select it will not function.

e. Operate the FCR in the terrain profile mode (TPM). Set the sight select switch on the collective mission grip or the ORT right handgrip to FCR. The FCR page will be displayed on the left multipurpose display (MPD) unless it is already displayed on the right MPD. Set the FCR mode switch on the collective mission grip or ORT left handgrip to TPM. The FCR page will display TPM format. Select the PROF (profiles) button, desired profile range interval GEOM (geometric), ARITH (arithmetic), or TEST from the PROF group and select the lines button, as desired. Select the clearance button; the clearance grouped option will be displayed. Select the desired clearance plane from the clearance group. These values represent the number of feet below the helicopter (wheels) at which the clearance plane exists.

f. C-Scope. FCR target symbology is processed for overlay on the TADS/PNVS video by the selection of the C-SCP button. Target symbols appear virtual in position on the display. Selecting the C-SCP button, when using the technical management plan (TMP), will cause the display of virtual profile line symbols and obstacles on the HMD in the pilot station, and on the HMD and ORT in the CPG station.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1148

Perform data management operations

CONDITIONS: In an AH-64D or an AH-64D simulator and given a data transfer cartridge (DTC).

STANDARDS: Appropriate common standards and the following:

1. Load the DTC via the mission planning software.
2. Select an initialization method.

DESCRIPTION:

1. Crew actions. Selective initiated built-in tests (IBITs) will be coordinated between the crewmembers. The copilot gunner (CPG) (front seat crewmember) will announce: "data management system (DMS) autopage is OFF" to the pilot (PLT) (backseat crewmember) anytime that he disables the DMS autopage.
2. Procedures. The DTC is installed and data downloaded via the DTR. DTC auto-initialization occurs when the PLT inserts the DTC into the data transfer receptacle (DTR), or upon aircraft power-up with the DTC already installed. Either the PLT or CPG may perform master or selective load procedures. The DTC may contain sensitive or classified information that, if not controlled, could present a mission security compromise. In training, the DTC will not normally contain classified or sensitive information.

Note 1: Before disabling the DMS autopage (emergency warning procedure autopage), the CPG and/or pilot in command (PC) will carefully consider potential risks versus gains. The DMS autopage should not be disabled whenever the CPG anticipates that he will fly the aircraft. The PLT is not provided with cockpit information related to the CPG's DMS autopage selections.

Note 2: The PLT and CPG are able to check the online functionality of the system processor, weapons processor (WP), and data point (DP) by noting that two version numbers are present for each of these processors. In the case of the system processor, the PLT or CPG is able to identify a problem by the absence of one of the system processor's version numbers. The absence of a version number in either the SP1 or SP2 position indicates that either the CPG has performed a manual SP1 or SP2 selection or the system processor corresponding to the blank version number space has failed.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator

Note: IPs may train/evaluate single DP operations while on the ground through the DMS UTIL (utility) page DP select button. IPs may train/evaluate the DMS system processor and WP interrupt autoload functions while on the ground through the system processor switch and DMS UTIL page via the WP select button.

REFERENCES: Appropriate common references.

TASK 1155

NEGOTIATE WIRE OBSTACLES

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Locate and accurately estimate the height of wires ±10 feet.
2. Determine the best method to negotiate the wire obstacle.
3. Negotiate the wire obstacle, minimizing the time unmasked.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will focus his primary attention scanning outside the aircraft and will confirm visual contact with wires and supporting structures.

   b. The pilot not on the controls (P) will focus both inside and outside the aircraft. He will announce adequate warning to avoid hazards, wires, and poles or supporting structures. He also will announce when the aircraft is clear.

   c. The pilot in command (PC) will determine if underflight or ground taxi under the wire obstacles will be performed.

2. Procedures.

   a. Program all known wire hazards and other obstacles through the approved software and download to the data transfer cartridge (DTC) before flight. During terrain/tactical flight, select and display a tactical situation display (TSD) on a multipurpose display (MPD) in both crew stations. Search for both known and unknown wire and other hazards to flight. All programmed TSD hazards can be located through onboard sensors by selecting a waypoint (WPT) or hazard (HAZ) as an acquisition source.

   b. Announce when wires and other obstacles are seen. Confirm the location of wire obstacles with the other crewmember. Announce the method of negotiating the wires and when the maneuver is initiated.

   c. Discuss the characteristics of wires and accurately estimate the amount of available clearance between them and the ground to determine the method of crossing. Locate guy wires and supporting poles.

      (1) Over flight. Identify the top of the pole and the highest wire. Cross near a pole to aid in estimating the highest point. Minimize the time that the aircraft is unmasked.

      (2) Underflight. When underflying wires, maintain a minimum wire clearance of displayed hover height plus 30 feet. Compute minimum wire height by adding 30 feet to the hover height. This will give approximately a 12-foot clearance between the top of the aircraft and the wire (ground speed no greater than that of a brisk walk). Ensure lateral clearance from guy wires and poles.

      (3) Ground taxi. Minimum wire height is 30 feet for ground taxi. When ground taxiing under wires, maintain a minimum wire height of 30 feet and ground taxi no greater than that of a brisk walk. During ground taxi only, this will result in a distance of approximately a 12-foot clearance between the top of the aircraft and the wire. Ensure lateral clearance from guy wires and poles.

Note 1: The crew must maintain proper scanning techniques to ensure obstacle avoidance and aircraft clearance.

Note 2: The wire hazard icon will always appear perpendicular to the own ship's flight path, regardless of the actual orientation of the wires on the terrain.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Wires are difficult to detect at night with night vision devices (NVDs). For training, underflight of wires will not be performed unless the location has been checked during daylight conditions and all hazards have been identified.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1160

Operate video recorder

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Initialize the video tape recorder.
2. Select a video source.
3. Record and play back video on the desired displays, monitor audio, and employ the event mark.
4. Shut down the video tape recorder.

DESCRIPTION:

1. Crew actions. The pilot (PLT) (backseat crewmember) or copilot-gunner (CPG) (front seat crewmember) will announce when he is operating the video tape recorder.
2. Procedures.

a. Video tape recorder initialization. Confirm the initial videocassette recorder (VCR) settings. At aircraft power up, the VCR is defaulted to ON and moded to standby. The VCR ON/OFF button is not displayed when the VCR mode is record, play, or rewind.

(1) The VCR cannot be used during single display processor (DP) operation, and the VCR is automatically set to off and a non-selectable barrier is displayed. The tape is threaded into the VCR during standby, allowing for rapid operation when record or playback is selected by a crewmember.

(2) If at any time the VCR is unable to enter a commanded state, it will enter an unthreaded stop condition from which the crew can send it to play, record, or be placed in a threaded standby condition. The accuracy of the tape counter is dependent on the correct length being set. Tape count, displayed in minutes, is based on the amount of tape on the takeup spool, not the actual elapsed time (for example, 20-minute tapes will play/record for approximately 40 minutes, 30-minute tapes will play/record for approximately 60 minutes).

b. Video source selection.

(1) Select the VCR page and then select the desired option button from the record group. The target acquisition and designation sight (TADS) button sets the VCR to record the TADS selected sensor composite video (DTV or FLIR). If DVO is the selected TADS sensor, day television (DTV) will be recorded. If the TADS power is off or the turret is stowed, no imagery will be recorded. Flight symbology will be recorded when the night vision system (NVS) mode switch is on or fixed and TADS is the selected NVS sensor. The CPG and PLT sight buttons, set the VCR to record the CPG or PLT selected sight's composite video. This is an automated mode, which records the sensor video for the CPG's or PLT's selected sight. If the VCR-controlling CPG or PLT changes his selected sight, the video recorded correspondingly changes as follows:

(a) TADS – composite video is recorded (CPG ONLY).

(b) FCR (fire control radar) – composite video is recorded.

(c) HMD (helmet mounted display) – composite video is recorded.

(2) CPG HMD button—sets the VCR to record the composite video selected to be displayed on the CPG's HMD. PLT HMD button—sets the VCR to record the composite video selected to be displayed on the pilot's HMD. FCR button—sets the VCR to record the FCR video. The symbology recorded will contain all FCR page format symbology except button label information. Video that is recorded is dependent on the FCR mode, which includes ground targeting mode (GTM) = none, aircrew training manual (ATM) = none, radar mapping (RMAP) = RMAP imagery, and terrain profiles mode (TPM) = TPM imagery. At aircraft power-up, the VCR is initialized to record CPG sight as the video source.

c. Record. Press the video RCD (record) pushbutton on the ORT left handgrip (CPG) or select the RCD button from the VCR group on the VCR page. Tape count is displayed in minutes. Either crewmember may initiate video recording by selecting the RCD button from the VCR group on the VCR page. When RCD is selected, the selected video will be displayed as an underlay on the video page. If selected, video select (VSEL) will remove the video control overlay and deselecting VSEL will command the video control overlay to display. To place an event mark on the tape, select the MK (mark) button. To stop recording, press the video RCD pushbutton on the optical relay tube (ORT) left handgrip (CPG) or deselect the RCD button from the VCR group on the VCR page. Either crewmember may stop video recording by deselecting the RCD button from the VCR group on the VCR page.

Note 1: An event marker, MK, may be placed on the tape either during the actual recording or while reviewing the tape in the play mode.

Note 2: When commanded, the VCR records the selected image source with its symbology overlay. In addition, the approximate Zulu time and ownership format are recorded in the upper left corner. Formats and format labels include: 1) C-FLT (flight), 2) P-FLT, 3) TADS, 4) C-FCR, and 5) P-FCR.

d. Play.

(1) VCR playback. Select the VCR page and then select the play maintained button from the VCR group. Select the event button to either event/pause or event/ignore as desired. During tape playback, the tape will pause at the mark and a tone will be presented when event/pause has been selected. Event marks will be ignored when event/ignore has been selected. Select a method to reverse tape to desired start point (rewind, fast reverse, or reverse—as desired). The rewind method is accomplished by selecting the rewind button from the VCR group. When tape reaches desired point, deselect the rewind button from the VCR group. If desired, the tape can be completely rewound. When the tape has been completely rewound, the tape counter will BOT. To proceed beyond an event mark (if event/pause is selected), select any play mode besides pause. To advance tape forward quickly, select the >> (fast forward) button from the play group; to stop playback, deselect the play maintained option.

(2) ORT playback (CPG). Select the VCR page and then select the play button from the VCR group. Select desired play mode from the play group. Select the ORT playback maintained button. The ORT playback maintained button is only displayed on the CPG multipurpose display (MPD) format. It is only displayed when the play option has been selected. Selection of the ORT playback maintained option will display the recorded video playback on the ORT heads out display (HOD)/heads down display (HDD) if the VCR format is selected on one of the CPG MPDs. The ORT playback option will remain selected when the VCR page format is deselected. However, recorded video playback will be displayed on the ORT HOD/HDD only if the VCR page is once again selected.

(3) ORT VCR playback video removal. If it is desired to remove VCR playback video from the ORT, deselect the ORT playback option, or deselect the VCR page format from the CPG MPD, or mode the VCR out of play. Set the VID SEL switch on the ORT control panel to TADS, FCR, or PNVS.

e. VCR shutdown. Select the VCR page and then select the rewind button from the VCR group, if desired. Tape rewind may take up to three minutes.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCE: Appropriate common references.

TASK 1170

Perform instrument takeoff

CONDITIONS: In an AH-64D helicopter under instrument meteorological condition (IMC) or simulated IMC, or in an AH-64D simulator, with power check and before-takeoff checks completed, and aircraft cleared.

STANDARDS: Appropriate common standards and the following:

1. Select the flight page.
2. Maintain required takeoff power.
3. Maintain accelerative climb attitude ±2 bar width.
4. Maintain the aircraft in trim after effective transitional lift (ETL).
5. Maintain an appropriate rate of climb ±200 feet per minute (FPM).

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will focus primarily outside the aircraft during the visual meteorological conditions (VMC) portion of the maneuver. He will enable the flight page on one of the multipurpose displays (MPDs) and may select the tactical situation display instrument (TSD INST) page or the aircraft engine (A/C ENG) page to monitor power on the other MPD. He will announce when he initiates the maneuver and his intent to abort or alter the takeoff. As the aircraft enters simulated or actual IMC, he will make the transition to the flight instruments.

   b. The pilot not on the controls (P) will announce when ready for takeoff and will remain focused outside the aircraft to assist in clearing during the VMC portion of the maneuver and to provide adequate warning of obstacles. The P will announce when his attention is focused inside the cockpit (for example, when interfacing with the communication or navigation system). Prior to the aircraft entering actual IMC, the P will select and maintain the flight page and will monitor and assist in establishing coordinated flight within aircraft operating limits.

2. Procedures. Select the A/C FLT (flight) page and, if desired, bias the pitch ladder. Align the aircraft with the desired takeoff heading. Smoothly increase the collective until the aircraft becomes “light on the wheels,” approximately 20 percent torque below hover power.

   a. From the ground. Using outside visual references, prevent movement of the aircraft. Check the controls for proper response. While referring to the flight page, smoothly increase the collective to obtain takeoff power; 15 to 20 percent above actual, or PERF page hover power. As the collective is increased, cross-check the pitch ladder and heading scale to maintain the proper attitude (approximately 5 degrees nose high) and constant heading. When takeoff power is reached and the symbolic altimeter and vertical speed indicator show a positive climb, adjust pitch attitude to level attitude for the initial acceleration. Maintain heading with the pedals until the airspeed increases (generally 40 to 50 knots true airspeed [KTAS]); then make the transition to coordinated flight. When approaching climb airspeed, adjust the controls as required to maintain the desired climb airspeed.

   b. From a hover. On the runway or takeoff pad, align the aircraft with the desired takeoff heading. Set the attitude on the A/C FLT page for takeoff (approximately 5 degrees nose high). Establish the aircraft at a 5-foot hover and check the controls for proper response. Using outside visual references, prevent movement of the aircraft. While referring to the flight page, smoothly increase the collective to obtain takeoff power, 15 to 20 percent above actual or performance (PERF) page hover power. As the collective is increased, cross-check the pitch ladder and heading scale to maintain the proper attitude (approximately 5 degrees nose high) and constant heading. When takeoff power is reached and the symbolic altimeter and vertical speed indicator show a positive climb, adjust pitch attitude to level attitude for the initial acceleration. Maintain heading with the pedals until the airspeed increases (generally 40 to 50 KTAS); then make the transition to coordinated flight. When approaching climb airspeed, adjust the controls as required to maintain the desired climb airspeed.

c. From forward flight. Establish the aircraft in forward while maintaining VMC. Ensure the departure path is clear of obstacles for selected rate of climb and airspeed. If desired, engage the attitude hold mode and initiate a climb into IMC. This method may be used when out-of-ground effect (OGE) hover power is not available.

Note 1: Refer to Task 1042.

Note 2: Prior to takeoff, P* should select a FLT page and, if desired, bias the pitch ladder. Although it is not a requirement to perform a limited visibility takeoff, the P* may adjust the nose-up or nose-down bias of the pitch ladder and horizon line (±10 degrees). Commonly, the pitch bias is set approximately 5 degrees nose high.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1172

Perform radio navigation

CONDITIONS: In an AH-64D helicopter under instrument meteorological condition (IMC) or simulated IMC or in an AH-64D simulator, with navigation equipment checks completed, given an altitude and appropriate navigational publications.

STANDARDS: Appropriate common standards and the following:

1. Power up, test, and initialize the navigation equipment.
2. Tune and identify appropriate navigational aids (NAVAID).
3. Determine aircraft position.
4. Intercept and maintain the desired course.
5. Identify station passage.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will remain focused inside the aircraft and will monitor radios and air traffic control (ATC) information. He will acknowledge all directives given by ATC or the pilot not on the controls (P), and will announce any deviations. Attitude and altitude hold modes should be activated by the P* during applicable segments of this task.

   b. The P will select and announce radio frequencies. He also will monitor radios and ATC information and acknowledge any deviations.

2. Procedures.

   a. Ensure navigation equipment power-up and operational checks were completed during aircraft runup before conducting flight into instrument flight rules (IFR) conditions. Also conduct navigation equipment operational checks if flight operations are expected to be conducted in marginal visual flight rules (VFR) weather conditions, or at other times that the crew is required to navigate to, or receive, a navigational aid, commercial station, or an emergency signal.

   b. Announce any deviation not directed by ATC or the P and acknowledge all directives given by the P.

   c. During simulated IMC only, the P will remain focused outside the aircraft to provide adequate warning for avoiding obstacles and hazards detected. He also will announce when his attention is focused inside the cockpit.

Note 1: AH-64Ds with radar should activate the FCR and employ the air targeting mode during simulated and actual IMC flight. (Refer to Task 1042.)

Note 2: IFR use of the current AH-64D embedded global positioning inertial navigation system (EGI) is not authorized; however, the crew should consider and plan for its use as an emergency backup system.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1174

Perform holding procedures

CONDITIONS: In an AH-64D helicopter under instrument meteorological condition (IMC) or simulated IMC or in an AH-64D simulator, given an altitude, holding instructions, and the appropriate navigational publications.

STANDARDS: Appropriate common standards and the following:

1. Correctly tune and identify the appropriate navigational aids (NAVAID).
2. Correctly enter the holding pattern.
3. Correctly time and track holding pattern legs.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will fly headings and altitudes and will adjust inbound and outbound times as directed by air traffic control (ATC) or the pilot not on the controls (P). The P* will announce any deviation as well as ATC information not monitored by the P. The P* should activate attitude and altitude hold modes during applicable segments of the task.

   b. The P will perform duties as assigned by the P*. The P will announce ATC information not monitored by the P* when requested. The P also will compute outbound times and headings to adjust for winds and direct the P* to adjust the pattern as necessary. Evaluate the wind direction and magnitude, noting the tactical situation display (TSD) wind status window or performance (PERF) page wind status window. During simulated IMC only, the P will remain focused outside the aircraft to provide adequate warning for avoiding obstacles and hazards detected. The P will announce when his attention is focused inside the cockpit.

2. Procedures.

   a. Analyze the holding instructions and determine the holding pattern and proper entry procedures before arrival at the holding fix. Announce to the other crewmember on the proposed entry, outbound heading, and inbound course. (The pilot in command (PC) may delegate this task to the other crewmember.)

   b. Upon arrival at the holding fix, execute the appropriate holding pattern entry to the predetermined outbound heading and check the inbound course. Maintain the outbound heading per the Department of Defense flight information publication (DOD FLIP) or as directed by ATC. The crew will note the time required to fly the inbound leg and adjust outbound course and time accordingly.

Note 1: Published holding patterns can be displayed on the TSD by using engagement areas during pre-mission planning. Appropriate TSD show page options will need to be enabled to view engagement areas using TSD NAV.

Note 2: Refer to Task 1042.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1176

Perform nonprecision approach

CONDITIONS: In an AH-64D helicopter under instrument meteorological condition (IMC), or simulated IMC in an AH-64D simulator, with navigational equipment operational checks completed as applicable, given the appropriate Department of Defense flight information publication (DOD FLIP), approach clearance and before-landing check completed.

STANDARDS: Appropriate common standards and the following:

1. Perform the approach per AR 95-1, FM 1-240, and the DOD FLIP.
2. During airport surveillance radar (ASR) approaches, make immediate heading and altitude changes issued by air traffic control (ATC) and maintain heading ±5 degrees.
3. Comply with descent minimums prescribed for the approach.
4. Execute the correct missed approach procedure.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will focus primarily inside the aircraft on the instruments and perform the approach. The P* will follow the heading/course, altitude, and missed approach directives issued by ATC and the pilot not on the controls (P). The P* will announce any deviation not directed by ATC or the P and will acknowledge all navigation directives. The attitude hold mode should be activated by the P* during applicable segments of this task.

   b. The P will perform duties as directed by the P*. The P will call out the approach procedure to the P* and will acknowledge any unannounced deviations. The P will monitor outside for visual contact with the landing environment. The P will complete the approach when visual meteorological conditions (VMC) are encountered. During simulated IMC only, the P will remain focused outside the aircraft to provide adequate warning for avoiding obstacles and hazards detected. The P will announce when his attention is focused inside the cockpit.

2. Procedures. Review approach and missed approach procedures before initiating the task. Confirm that the correct navigational aid (NAVAID) and communication frequencies, instrument (INST) page, and tactical situation display navigation (TSD NAV) show pages are properly set, as required.

Note 1: FM 1-240 describes approach procedures.

Note 2: Refer to Task 1042.

Note 3: The use of the fire control radar (FCR) and forward looking infrared (FLIR) systems may aid in the detection of the runway environment.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1178

Perform precision approach

CONDITIONS: In an AH-64D helicopter under instrument meteorological condition (IMC), or simulated IMC, or in an AH-64D simulator, before landing check completed and given the appropriate Department of Defense flight information publication (DOD FLIP).

STANDARDS: Appropriate common standards and the following:

1. Perform the approach per AR 95-1, FM 1-240, and the DOD FLIP.
2. Maintain heading ±5 degrees.
3. Make immediate heading and altitude corrections issued by air traffic control (ATC).
4. Comply with the decision height prescribed for the approach.
5. Execute the correct missed approach procedure.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will focus primarily inside the aircraft on the instruments and perform the approach. The P* will follow the heading/course, altitude, and missed approach directives issued by ATC and the pilot not on the controls (P). The P* will announce any deviation not directed by ATC or the P and will acknowledge all navigation directives. If visual contact is not made by the decision height (DH), he will announce a missed approach. The attitude hold mode should be activated by the P* during applicable segments of this task.

   b. The P will perform duties as directed by the P*. The P will call out the approach procedure to the P* and will acknowledge any unannounced deviations. The P will monitor outside for visual contact with the landing environment. The P will complete the approach when visual meteorological conditions (VMC) are encountered. During simulated IMC only, the P will remain focused outside the aircraft to provide adequate warning for avoiding obstacles and hazards detected. The P will announce when his attention is focused inside the cockpit.

2. Procedures. Review approach and missed approach procedures before initiating the task. Confirm that the correct navigational aids (NAVAID) and communication frequencies, instrument (INST) page, and tactical situation display navigation (TSD NAV) show pages are properly set, as required.

Note 1: FM 1-240 describes approach procedures.

Note 2: Refer to aircrew training manual (ATM), Task 1042.

Note 3: The use of the fire control radar (FCR) and forward looking infrared (FLIR) systems may aid in the detection of the runway environment.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1180

Perform emergency global positioning system recovery procedure

CONDITIONS: In an AH-64D helicopter under instrument meteorological condition (IMC), simulated IMC, or in an AH-64D simulator.

> ***Note:*** Use of the global positioning system (GPS) as an instrument flight rules (IFR) navigational system is not authorized; however, its use should be considered and planned for as an emergency backup system.

STANDARDS: Appropriate common standards and the following:

1. Maintain airspeed appropriate for the conditions (final approach fix [FAF] to missed approach point [MAP]).
2. Maintain heading ±5 degrees.
3. Comply with descent minimums prescribed for the approach.
4. Execute the correct missed approach procedure.

DESCRIPTION:

1. Crew actions.

   a. The pilot in command (PC) will review the approach with the other crewmember before initiating the procedure. The PC will confirm with the pilot not on the controls (P) the specific approach to be flown, that the correct route and communication frequencies are set/selected, waypoints are properly entered, and attitude indications properly set, as required. The PC may assign the P to perform these duties.

   b. The pilot on the controls (P*) will focus primarily inside the aircraft on the instruments. He will follow the heading/course, altitude, and missed approach directives issued by air traffic control (ATC) and/or the P. The P* will announce any deviation to instructions directed by ATC (if available) or the P and will acknowledge all navigation directives. The P* will apply information provided by the helmet mounted display (HMD), flight (FLT) page, tactical situation display (TSD), and fire control radar (FCR) to the conduct of the emergency global positioning system (GPS) approach.

   c. The P will call out the approach procedure to the P*. The P will select and announce radio frequencies. He also will monitor radios and ATC information not monitored by the P*. If directed by the PC, the P will complete the approach when visual meteorological conditions (VMC) are encountered. During simulated IMC, the P will remain focused outside the aircraft to provide adequate warning for avoiding obstacles and hazards detected. The P will announce when his attention is focused inside the cockpit. The P will apply information provided by the HMD, flight page, TSD, and FCR to the conduct of the emergency GPS approach.

5. Procedures.

   a. En route to the FAF. After initially completing the inadvertent IMC recovery procedures (Task 1184), the P should select the pre-programmed TSD route for the emergency GPS approach and the P* should fly to the initial approach fix ([IAF] (WPTHZ/CTRLM).

   b. FAF to missed approach point (MAP). As the aircraft arrives at the IAF, conduct a procedure turn or (for direct entry) continue to the FAF (WPTHZ/CTRLM) as the next “fly to” waypoint and reduce airspeed to 100 knots true airspeed (KTAS) or less (if desired). The

P should set the FLT set page low (LO) indicator to the minimum descent altitude (MDA) as time permits. During the descent to the MAP, the P will monitor outside for visual contact with the landing environment and complete the approach as briefed if VMC is encountered. Consider reducing the airspeed prior to arrival at the MAP in anticipation of a full stop landing. The forward looking infrared (FLIR) and FCR may be used to assist in identifying the landing area. When FCR equipped, the P can use the terrain profiles mode (TPM) and radar mapping (RMAP) modes to aid in avoiding obstacles and, in some cases, determining the landing area while IMC prior to reaching the MAP.

(1) MDA (preferred method). Once established on the course inbound control the rate of descent to arrive at the decision height (DH) prior to the MAP. Consideration should be given to the weather conditions and if required, a higher rate of descent may be needed to arrive at the MDA prior to the MAP. Arriving at this altitude prior to the MAP allows for a greater chance of encountering VMC.

(2) Cursor application (CAQ)/flight path vector (FPV). The P* and P will CAQ the IAF to increase their individual and crew situational awareness through the TSD, flight page, HMD/MPD VSEL. The P* should then reference the aircraft's FPV in relation to the cued line of sight (LOS) referenced to fly to the IAF (WPTHZ/CTRLM). When over the FAF, reduce airspeed and adjust rate of decent using the collective to fly the FPV to the cued LOS. Arrive at the MDA at the MAP (WPTHZ/CTRLM).

c. MAP procedure. If VMC conditions are not encountered, perform the missed approach procedure per the plan upon reaching the MAP. Immediately establish a climb utilizing maximum rate of climb airspeed until established at the minimum safe altitude (MSA).

Note 1: This procedure will only be used for training in simulated IMC or during inadvertent IMC when a nondirectional beacon (NDB) approach or ground controlled approach (GCA) is not available. IFR use of the current AH-64D embedded global positioning inertial navigation system (EGI) is not authorized; however, the crew should consider and plan for its use as an emergency backup system.

Note 2: When flying an aircraft equipped with radar, the FCR (TPM, RMAP, or ground targeting mode [GTM]) can be used both prior to, and during, the approach to assist in clearing obstacles that may be in the intended landing area.

Note 3: In AH-64Ds equipped with radar, the crew should activate the FCR and employ the air targeting mode during simulated and actual IMC flight.

NIGHT OR NIGHT VISION SYSTEM (NVS) CONSIDERATIONS: During the descent to the MAP, select the NVS mode switch to NORM and the MAP as the selected acquisition source. The P should be in a position to assume control of the aircraft at the MAP and assume control of the aircraft when the landing environment can be determined in the FLIR or visually (unaided). During night unaided flight, consider using the searchlight to identify the landing environment.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1182

PERFORM UNUSUAL ATTITUDE RECOVERY

CONDITIONS: In an AH-64D helicopter with a unit trainer (UT), instructor pilot (IP), or instrument flight examiner (IE), or in an AH-64D simulator and the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Analyze aircraft attitude.
2. Without delay, use correct recovery procedures in the proper sequence.
3. Recover without exceeding aircraft limitations and with minimum loss of altitude.

DESCRIPTION:

1. Crew actions.

   a. The P* will remain focused inside the aircraft during recovery if instrument meteorological condition (IMC).

   b. The pilot not on the controls (P) will assist in monitoring the aircraft instruments and call out attitude, torque, and trim. The P will provide adequate warning for corrective action if aircraft operating limitations may be exceeded. The P will report any deviation from the assigned altitude to air traffic control (ATC). If the P is not disoriented, he should take the flight controls.

2. Procedures.

   a. Level the pitch and bank attitude.

   b. Establish and maintain a heading.

   c. Adjust torque to cruise or hover power as applicable.

   d. Trim the aircraft as required to return to level flight.

Note: The multipurpose display (MPD) flight page may be accessed by the Z-axis of the cyclic flight symbology select switch.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: IMC is not a prerequisite for an unusual attitude. Low-level ambient light may induce visual illusions and spatial disorientation. During night vision goggles (NVG) operations, video noise may contribute to loss of visual cues.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS: During NVS operations, the P* may experience an unusual attitude even though he has visual reference with the earth's surface. He also may experience an unusual attitude when he loses visual reference as a result of forward looking infrared (FLIR) image degradation, alternating current (AC) coupling, and flight symbology degradation/failure or sensor failure. Crew coordination during the recovery should be preplanned and prebriefed to conform to the flight condition (day or night) and to the P's capability to assist. If an unusual attitude is encountered, the method of recovery used varies according to the symbology mode, type of unusual attitude, and the flight parameters. If hover or bob-up symbology is being used, unusual attitudes will probably involve excessive sink rates during out-of-ground effect (OGE) hovers or masking procedures. This is sometimes combined with undesirable drift.

a. Hover or bob-up symbology recovery.

(1) Orient the pilot night vision system (PNVS)/target acquisition and designation sight (TADS) turret toward the nose of the aircraft and minimize head movement during the recovery. Cross-check the positional relationship of the line of sight (LOS) reticle and the head tracker reference symbol.

(2) Apply appropriate cyclic to stop any drift. Cross-check the acceleration cue and velocity vector symbology with FLIR imagery and the bob-up box, if displayed.

(3) If descending, increase the collective pitch control to slow or stop the rate of descent, as necessary. Cross-check the torque percentage and vertical speed symbology in conjunction with FLIR imagery.

(4) Adjust pedals to maintain a constant heading and cross-check heading tape with FLIR imagery.

b. Transition or cruise symbology recovery sequence.

(1) Orient the PNVS/TADS turret toward the nose of the aircraft and minimize head movement during the recovery. Align the LOS reticle and the head tracker reference symbology.

(2) Adjust the cyclic to establish a level pitch-and-roll attitude. Cross-check the horizon line, heading tape, FLIR imagery (if adequate detail is displayed), and airspeed symbology.

(3) Establish a constant heading. Cross-check the heading tape and FLIR imagery.

(4) Adjust the collective to arrest aircraft climb or descent. Cross-check torque and altitude readouts.

Note: Variations in radar altitude may be observed even with no climb or descent in progress.

(5) Adjust pedals to trim the helicopter.

(6) Request assistance from the P, as required, to assist in recovery.

(7) Return to mission profile after control is established.

SNOW/SAND/DUST CONSIDERATIONS: Obscurants other than weather can induce loss of visual contact. At low altitudes where these conditions would be encountered, it is extremely important that these procedures be initiated immediately to prevent ground contact.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft, visual meteorological conditions (VMC), or in the AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft, VMC, or in the AH-64D simulator.

Note: The trainer or evaluator will place the aircraft in an unusual attitude and transfer aircraft controls to the P. The P will acknowledge the transfer of controls, the unusual attitude, and recover the aircraft as P*.

REFERENCES: Appropriate common references.

TASK 1184

RESPOND TO INADVERTENT INSTRUMENT METEOROLOGICAL CONDITION

CONDITIONS: In an AH-64D helicopter under instrument meteorological condition (IMC) or simulated IMC, in an AH-64D simulator, with the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards and the following:

1. Announce IMC and immediately transition to instrument flight.
2. Level the aircraft wings on the attitude indicator or appropriate symbology.
3. Maintain heading; turn only to avoid known obstacles.
4. Adjust torque to climb power.
5. Adjust to climb airspeed.
6. Maintain aircraft in trim ±1 ball width.
7. Set transponder to emergency.
8. Contact air traffic control (ATC) as appropriate, and comply with ATC instructions, local regulations, and standing operating procedures (SOPs).

DESCRIPTION:

1. Crew actions.

   a. The P* will announce inadvertent IMC, transition to instrument flight, and begin recovery procedures. The P* will announce if he is disoriented and unable to recover.

   b. The pilot not on the controls (P) will announce IMC and monitor instruments to assist in recovery, make the appropriate radio calls, and perform any other crew tasks as directed by the P*. The P may need to take the controls and implement recovery procedures.

2. Procedures. If inadvertent IMC is encountered, perform the following:

   a. Attitude – Correctly adjust bank and pitch attitude to level the wings on the appropriate attitude symbology (copilot-gunner [CPG] front seat crewmember/pilot [PLT] backseat crewmember) or standby attitude indicator (PLT). Change flight symbology to either transition or cruise if using the helmet mounted display (HMD). The P* will Z-axis to the flight page and transition to the flight instruments as soon as possible.

   b. Heading – Maintain heading using the heading scale symbology (PLT/CPG) or magnetic compass (PLT); turn only to avoid known obstacles.

   c. Torque (%Q) – Adjust the torque to initiate a climb at or near the maximum torque available to ensure obstacle clearance. The crew must be aware of the surrounding terrain and the power limitations due to environmental conditions. It is absolutely imperative that a climb be immediately established.

   d. Airspeed (AS) – Adjust the airspeed to maximum rate of climb airspeed or as briefed.

   e. Set the transponder to emergency once the aircraft is fully under control.

Note 1: %Q and AS adjustments with the stabilator in the manual (MAN) or nap of the earth (NOE) mode could manifest itself in exaggerated aircraft pitch altitudes. When the stabilator is not in automatic (AUTO), reset it.

Note 2: When operating in an environment when contact is imminent with a surface obstacle, consideration will first be given to establishing a rate of climb to clear the obstacle.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Entering IMC with the searchlight on may induce spatial disorientation. The night vision goggles (NVGs) may be removed or flipped up once stable flight is established. When using NVGs, it may be possible to see through thin obscuration (for example, fog and drizzle) with little or no degradation. It may be beneficial for the CPG not to completely remove his NVGs. The NVGs may assist in recovery by allowing the CPG to see through thin obscuration that would otherwise prevent him from seeing the landing environment.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS: When IMC are encountered, use the HDU, multipurpose display (MPD), or aircraft instruments to initiate inadvertent instrument meteorological condition (IIMC) procedures. The preferred method is to use the flight page.

SNOW/SAND/DUST CONSIDERATIONS: Inadvertent IMC may be encountered in environments where obscurants (such as sand, dust, snow, rain, and smoke) are present.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1188

Operate aircraft survivability equipment

CONDITIONS: In an AH-64D helicopter, AH-64D simulator, or academically.

STANDARDS: Appropriate common standards and the following:

1. Perform preflight inspection and prepare the equipment for operation.
2. Initialize (turn-on and test) and shut down installed aircraft survivability equipment (ASE).
3. Identify the threat or friendly radar system from the visual display or audio warning.
4. Correctly employ aircraft survivability equipment for detected emitter.

DESCRIPTION:

1. Crew actions.

a. The crew will perform a preflight inspection and will perform or simulate employment procedures, precautions, and Initiated Built In Tests (IBIT) as necessary for the AN/ALQ-136(V)5, AN/ALQ- 144A(V)3, AN/APR-39A(V)4, M141 (chaff/flare), AN/AVR-2A(V)1, AN/APR-48A(V), RT-1471/APX-100(V) with KIT-1C, RT-1836/APX-118(V), and the AAR-57 Common Missile Warning System (CMWS) These procedures will determine the status and operation of each system in the ASE suite and permit employment of these systems with minimal switch positioning. The crew will determine what effect an ASE system malfunction will have on the assigned mission, inform appropriate personnel of the aircraft's status, and record any discrepancies on DA Form 2408-13-1 (*Aircraft Status Information Record*).

b. Either the pilot (PLT) (backseat crewmember) or copilot-gunner (CPG) (front seat crewmember) will perform turn-on, self-test, and operational checks; operating procedures; and shutdown procedures. The PLT or CPG will evaluate and interpret the ASE, fire control radar (FCR) or tactical situation display (TSD) page, and voice indications.

2. Procedures.

a. Setting up the ASE suite begins during pre-mission planning with the programming of the data transfer cartridge (DTC). Default settings for ASE should be entered or verified for the mission load. Configuration of the ASE suite on the DTC will reduce the ASE page entries that would otherwise be required by the crew in the aircraft.

b. Upon arriving at the aircraft, the crew will conduct the preflight check in accordance with the operator's manual. In addition to checking the general condition and serviceability of the ASE, the crew should confirm with the unit electronic warfare officer (EWO) that the appropriate user data modules (UDM) are installed for the AN/APR-39A(V)4, AN/AVR-2A(V)1, AN/APR-48A(V), and AAR-57(V7); and that there are proper settings for the AN/ALQ- 136(V)5 and the AN/ALQ-144A(V)3, and appropriate load for the M141 or AAR-57(V7) payload modules. The crew should also verify the proper settings and load of the RT-1471/APX-100(V) with KIT-1C or RT- 1836(X)/APX-118(V).

c. During the after starting auxiliary power unit (APU) checks, the PLT will load applicable DTC data to the aircraft. The crew will verify that the correct radar confusion reflectors (CHAFF) settings are displayed, and verify the power on condition of infrared jammer (IRJAM), radar laser warning receiver (RLWR), radar frequency interferometer (RFI), and radar jammer (RJAM). Select the data management system initiated built-in test navigation (DMS IBIT NAV)/ASE for each system to be tested. Both PLT and CPG will independently select/verify the desired ASE auto page threshold on either the tactical situation display utility (TSD UTIL) page or the ASE page.

Note 1: An icon will appear in front of the own ship if the RLWR low band “blade” antenna detects an emission, which is not correlated with any of the higher band “spiral” antenna.
There is no azimuth information associated with this icon. The icon is presented to alert the crew to possible missile activity.
Note 2: To obtain “dynamic” RFI icon information, the crew should refer to the TSD or ASE displays.
Note 3: When there are FCR target icons present within the FCR footprint, the RFI icons will be presented in relation to the last scan centerline azimuth. This “pseudo-frozen” presentation makes the RFI icons appear to be stationary as the aircraft changes its heading.

d. The crew can use the RFI to rapidly orient a sight (FCR, target acquisition and designation sight [TADS], or helmet mounted display [HMD]) to the azimuth of an emitter. The CUED search feature allows the crew to align the FCR centerline on the azimuth of the #1 emitter. Selecting the RFI as the aircraft qualification course (AQC) source when the sight select is TADS or HMD will provide slaving and cueing, as appropriate, of the TADS or HMD to the azimuth of the #1 emitter. TADS or HMD slaving and cueing is also possible to an “other than #1 emitter” through the cursor acquisition (CAQ) function. CAQing on an “other than #1 emitter” will cause shaded home plate symbol to be displayed over that icon, enabling slaving and cueing to that icon’s azimuth.

Note 1: This “shaded home plate” icon does not alter the order of the threat list or affect the CUED search priority. The RFI has a TRAIN mode located on the ASE UTIL and FCR UTIL pages. Enabling the TRAIN mode will cause the RFI to present 10 icons of simulated emitters. The FCR’s programmable signal processor (PSP) will treat these simulated emitters as if they were real emitters, allowing for CUED search operations.
Note 2: It is possible to merge a RFI training icon with a FCR detected ADU icon provided the azimuths coincide. In the TRAIN mode, the RFI still detects real emitters, however, they will not be presented to the crew because the 10 training icons fill the threat list.
Note 3: The RFI aborts environmental monitoring when pitch exceeds ±35 degrees and roll exceeds ±20 degrees.
Note 4: Refer to the appropriate publication to determine applicable CMWS software codes.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator or academically.
2. Evaluations will be conducted in the AH-64D aircraft, AH-64D simulator, or academically.

REFERENCES: Appropriate common references plus the following:

ASE TTP's.ppt (electronic ATM unique file)
ASE Equipment.doc (electronic ATM unique file)
Current Computer-Based Aircraft Survivability Training
Electronic Warfare.Mpg (electronic ATM unique file)
Introduction to Electronic Warfare.ppt (electronic ATM unique file)
Merged Symbol Trainer (electronic ATM unique file)
Tasks 1012, 1035, 1151, 1162, 1426, and 1451
TM 11-5841-283-12
TM 11-5865-200-12
TM 11-5865-202-12
TM 11-5895-1199-12
TM 11-5895-1733-13&P
USAF Special Operations Intelligence Guide.doc (electronic ATM unique file)

TASK 1194

Perform refueling/rearming operations

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator and given TM 1-1520-251-10/ TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Ensure that refueling procedures are followed.
2. Ensure that rearming procedures are followed.
3. Verify (or update) aircraft weight and balance and performance data.

DESCRIPTION:

1. Crew actions.

a. The pilot on the controls (P*) will position the aircraft to the refuel or rearm point. He will perform refuel and rearm procedures.

b. The pilot not on the controls (P) will call out the applicable refuel and rearm checks and any standing operating procedure (SOP) checks. He will monitor the aircraft position and will provide adequate warning for obstacle avoidance.

c. The pilot in command (PC) will verify that the proper types and quantities of ordnance are loaded to meet the mission profile. Once refueled or rearmed, the PC will check and/or set the current (CUR), PLAN, or maximum performance (MAX PERF) mode page and determine if there will be any limitations imposed on the flight as a result of the ordnance and fuel loads. When in-ground effect (IGE) power and a hover area are available, the PC will ensure another hover power check is performed after rearm/refuel checking center of gravity (CG) and controllability.

2. Procedures. Properly ground and refuel/rearm the aircraft. Observe the refuel/rearm operations, announce hazards, and initiate appropriate actions. Ensure that the tanks are filled to the required level and/or the aircraft is rearmed as required. When the refueling or rearming is completed, ensure that all caps are secured and/or remove the ground connections as required. Make appropriate entries on DA Form 2408-13-1 (*Aircraft Status Information Record*).

Note 1: If the CUR PLAN PERF mode page CG displays that accuracy is suspect, and/or a load compatible DD Form 365-4 (*Weight and Balance Clearance Form F-Transport/Tactical*) does not exist, recompute the DD Form 365-4 to determine any possible limitations on the flight.

Note 2: Risk assessment must be factored in the mission briefing when dual-engine hot refueling is to be accomplished.

NIGHT OR NIGHT VISION GOGGLES (NVG): Supplement aircraft lighting at the refueling station by using an explosion-proof flashlight with an unfiltered lens to check for leaks and fuel venting.

TRAINING AND EVALUATION REQUIREMENTS:

Note: When actual refuel/rearm facilities are not available, refuel/rearm pilot (PLT) (backseat crewmember)/copilot-gunner (CPG) (front seat crewmember) procedural training/evaluation may still be conducted from the aircraft. This will satisfy the conditions of this task.

1. Training will be conducted with the AH-64D aircraft.
2. Evaluation will be conducted with the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1262

Participate in a crew level after-action review

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator and given TM 1-1520-251-10/ TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Perform shutdown procedures and checks.
2. Complete post-flight inspection.
3. Enter appropriate information on DA Form 2408-12 (*Army Aviator's Flight Record*), DA Form 2408-13 (*Aircraft Status Information Record*), and DA Form 2408-13-1 (*Aircraft Maintenance and Inspection Record*).
4. The PC will ensure a crew debrief is conducted and DA Form 5484-R (*Mission Schedule/Brief*) is completed.

DESCRIPTION:

1. Crew actions.

   a. The pilot not on the controls (P) will call out the after-landing checks and tasks.

   b. The pilot on the controls (P*) will confirm and announce completion of the checks.

   c. Both crewmembers will complete the required checks pertaining to their assigned crew duties. They will participate in a crew-level debrief.

   d. The pilot (PLT) (backseat crewmember) will announce when power (PWR) levers-IDLE, and PWR levers-OFF. The copilot-gunner (CPG) (front seat crewmember) will acknowledge PLT, and announce when his shutdown is complete.

2. Procedures.

   a. After-flight checks. Complete the after-flight checks to include after-landing engine shutdown, and before-leaving-aircraft checks.

   b. Current mission data transfer cartridge (DTC) download. If desired, either the PLT or CPG may elect to download the aircraft's current mission to the DTC for mission debriefing purposes. This procedure has to be concluded prior to securing the auxiliary power unit (APU).

   c. Crew debrief. The pilot in command (PC)/air mission commander (AMC) will ensure the DA Form 5484-R is completed and conduct a crew debrief using a checklist similar to the one shown in figure 4-3. The PC will actively seek input from the pilot. The pilot will participate in the review. The intent is to constructively review the mission and apply lessons learned into subsequent missions.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

CREW DEBRIEF
1. Pilot in command (PC) and pilot (PI) present.
2. Restate mission objectives.
3. Mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC).
4. Conduct review for each mission segment:
a. Restate planned actions/interactions for the segment.
b. What actually happened?
(1) PC and PI state in own words.
(2) Discuss impacts of crew coordination requirements, aircraft/equipment operation, tactics-techniques-procedures, and command intent.
c. What was right or wrong about what happened?
(1) PC and PI state in own words.
(2) Explore causative factors for both favorable and unfavorable events.
(3) Discuss crew coordination strengths and weaknesses in dealing with each event.
d. What must be done differently the next time?
(1) PC and PI state in own words.
(2) Identify improvements required in the areas of team relationships, mission planning, workload distribution and prioritization, information exchange, and cross-monitoring of performance.
e. What are the lessons learned?
(1) PC and PI state in own words.
(2) Are changes necessary to:
(a) Crew coordination techniques?
(b) Flying techniques?
(c) Standing operating procedure (SOP)?
(d) Doctrine, aircrew training manuals (ATMs), and technical manuals (TMs)?
5. Effect of segment actions and interactions on the overall mission.
a. Each crewmember states in his own words.
b. Lessons learned.
(1) Individual level.
(2) Crew level.
(3) Unit level.
6. Dismiss crewmembers.
7. Advise commander of significant lessons learned.
8. Incorporate significant lessons learned in subsequent missions.

Figure 4-3. Sample crew debrief.

TASK 1402

Perform tactical flight mission planning

CONDITIONS: Before a tactical flight in an AH-64D helicopter or an AH-64D simulator, and given a mission briefing, navigational maps, a navigational computer, approved software and other materials as required.

STANDARDS: Appropriate common standards and the following:

1. Analyze the mission using the factors of mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC).
2. Perform a map/photo reconnaissance using the available map media or photos. Ensure that all known hazards to terrain flight are plotted on the map or into the approved software.
3. Select the appropriate terrain flight modes.
4. Select appropriate primary and alternate routes and enter all of them on a map, route sketch, or into the approved software.
5. Determine the distance ±1 kilometer, ground speed ±5 knots, and estimate time en route (ETE) ±1 minute for each leg of the flight.
6. Determine the fuel required ±100 pounds.
7. Obtain and analyze weather briefing to determine that weather and environmental conditions are adequate to complete the mission.

Note: This task specifically considers the tactical flight planning aspects of mission planning. The standards of this task may be achieved through exclusive manual means or approved software.

DESCRIPTION:

1. Crew actions.
   a. The pilot in command (PC) will ensure that all necessary tactical flight information is obtained and will conduct a thorough crewmember briefing in accordance with the unit SOP and Task 1000. He may delegate mission planning tasks to the other crewmember but retains overall responsibility for mission planning. He will analyze the mission in terms METT-TC.
   b. The pilot (PI) will perform the planning tasks directed by the PC. He will report the results of his planning to the PC.
2. Procedures. Analyze the mission using the factors of METT-TC. Conduct a map or aerial photoreconnaissance. Obtain a thorough weather briefing that covers the entire mission and input as necessary into the approved software. Include sunset and sunrise times, density altitudes, winds, and visibility restrictions. If the mission is to be conducted at night, the briefing should also include moonset and moonrise times, ambient light levels, and an electro-optical forecast, if available. Determine primary and alternate routes, terrain flight modes, and movement techniques. Determine time, distance, and fuel requirements using the navigational computer or approved software. Annotate the map, overlay, or approved software with sufficient information to complete the mission. This includes waypoint coordinates that define the routes for entry into the approved software. Consider such items as hazards, checkpoints, observation posts, and friendly and enemy positions. Determine the fire control radar (FCR) terrain sensitivity appropriate for the environment and either record the data for future manual aircraft input or enter the data into the approved software. Review contingency procedures.

Note: Evaluate weather impact on the mission. Considerations should include aircraft performance, limitations on visual sensors, use of FCR, and weapons employment.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: More detailed flight planning is required when the flight is conducted in reduced visibility, at night, or in the night vision device (NVD) flight environment. TC 1-204 contains details on night navigation.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted academically.
2. Evaluation will be conducted academically.

REFERENCES: Appropriate common references.

TASK 1404

Perform electronic countermeasures/electronic counter-countermeasures procedures

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator and given signal operation instructions.

STANDARDS: Appropriate common standards and the following:

1. Operate secure communications equipment, avionics, and electronic sensing equipment.
2. Recognize and respond to electronic warfare actions.

DESCRIPTION:

1. Crew actions.

   a. The pilot in command (PC) will assign radio frequencies per signal operation instructions (SOI) and mission requirements during the crew briefing. The PC will indicate which crewmember will establish and maintain primary communications.

   b. The pilot on the controls (P*) will announce mission information not monitored by the pilot not on the controls (P) and any deviation from directives.

   c. The P should operate the radio NETs and announce radio frequencies as well as copy and interpret pertinent information. The P will announce information not monitored by the P*.

2. Procedures.

   a. General. Maintain radio discipline at all times. Use electronic communications in the tactical environment only when absolutely necessary. When electronic communication is required, the two modes of operation are secure digital and secure voice (analog). To eliminate confusion and reduce transmission time, use digital messaging, or when operating analog, use standard phrases, words, and codes. Plan what to say before keying the transmitter. Transmit analog information clearly, concisely, and slowly enough to be understood by the receiving station. Keep transmissions under 10 seconds, if possible.

   b. Digital communication. When there is no jamming, use the lowest frequency modulation power setting required and the highest baud rate.

3. Communication considerations.

   a. Authentication. Use proper SOI procedures to authenticate all in-flight mission changes and artillery advisories when entering or departing a radio net or when challenged. Authentication can be accomplished through a printed SOI or aircraft SOI page.

   b. Meaconing, interference, jamming, and intrusion (MIJI) procedures. Keep accurate and detailed records of any MIJI incident suspected to be intentional interference. Report the incident as soon as possible when a secure communications capability exists.

   c. Identification, friend or foe (IFF) usage. During radio checks, select the appropriate transponder mode from the communication transponder (COM XPNDR).

   d. Anti-jamming procedures. To overcome jamming use, have quick, single-channel ground and airborne radio system (SINCGARS), high frequency (HF), and/or change the frequency modulation power setting to HIGH. In addition, reconfigure the tactical fire-computer (TACFIRE) by changing the block selection to double and lower the baud rate. Changes must be coordinated with other aircraft per the unit standing operating procedure (SOP) to ensure uninterrupted reception.

e. Other visual methods. Flags, lights, panels, pyrotechnics, hand-and-arm signals, and aircraft maneuvers are some of the possible visual communication methods. The unit SOP and SOI describe these methods in detail.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1405

Transmit tactical reports (digital/voice)

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS:

1. Transmit the appropriate report using the proper format and current signal operations instruction (SOI).
2. Transmit tactical reports using tactical standing operating procedures (TSOPs).
3. Transmit/receive digital reports.

DESCRIPTION:

1. Crew actions.

a. The pilot on the controls (P*) will remain focused outside the aircraft to avoid obstacles. The P* will announce any maneuver or movement prior to execution. The P* should not unmask the aircraft in the same location more than once.

b. The pilot not on the controls (P) will assemble and transmit the report using the correct format as specified in the SOI and transmit the report to the appropriate agency.

c. Crewmembers must be able to provide timely, concise reports. The P will make the call and transmit the report.

2. Procedures

a. To save time, minimize confusion, and ensure completeness, report information in an established format. Assemble the report in the correct format and transmit it to the appropriate agency.

b. Voice reports. Unit TSOPs include line number tactical report examples and provide directives for the handling of the specific reports. The following are common line numbered tactical reports.

(1) Battle damage assessment report (voice). A battle damage assessment should be submitted following naval gunfire, artillery fire (if requested), or a tactical air strike. Phonetic letters may precede each element (for example, Alpha, Bravo, Charlie, or Delta). The standard format for a battle damage assessment (BDA) is given below.

(a) Call sign of observing source.

(b) Location of the target.

(c) Time strike started and ended.

(d) Percentage of target coverage (pertains to the percentage of projectiles that hit the target area.).

(e) Itemized destruction.

(f) Remarks. (These may be omitted, however, they may contain additional information such as the direction the enemy may have taken in leaving the target area.)

(2) Spot report (voice). A crewmember has determined a need to transmit a spot report. Transmit the spot report over secure communications, or encrypt the transmission. The standard format for a spot report is given below.

(a) Call sign of observer.

(b) SALUTE.

1) S—size.

2) A—activity.

3) L—location.

4) U—unit (if known).

5) T—time.

6) E—equipment.

(c) What you are doing about it.

(3) Enemy shelling; bombing; or nuclear, biological, and chemical (NBC) warfare activity report (voice).

(a) Call sign and type of report.

(b) Position of observer, grid coordinates encrypted, or use of secure communications.

(c) Azimuth of flash, sound, groove of shell (state which), or origin of flight path of missile.

(d) Time from (date-time of attack).

(e) Time to (for illumination time).

(f) Area attacked (either azimuth and distance from observer encrypted, or grid coordinates in the clear).

(g) Number and nature of guns, mortars, aircraft, or other means of delivery, if known.

(h) Nature of fire (for example, barrage or registration) or NBC-1 type of burst (air or surface) or type of toxic agent.

(i) Number and type of bombs, shells, and rockets.

(j) Flash-to-bang time in seconds.

(k) If NBC-1, damage (encrypted) or crater diameter.

(l) If NBC-1, fireball width immediately after shock wave. (Do not report if data was obtained more than 5 minutes after detonation.)

(m) If NBC-1, cloud height (top or bottom) 10 minutes after burst.

(n) If NBC-1, cloud width 10 minutes after burst.

Note: State units of measure used, such as meters or miles. As a minimum, an NBC-1 report requires lines A, B, C, D, H, J, and either L or M.

(4) Information using visual signaling techniques. Technology has greatly diminished, but has not completely eliminated, the need to perform visual signaling techniques. The crew will utilize visual signaling techniques per the unit SOP, unit directives, or as situationally advantageous.

(5) Meaconing, interference, jamming, and intrusion (MIJI) report (voice). The MIJI report should be forwarded using the most expeditious secure communications means available.

(a) Type of report (for example, meaconing, intrusion, jamming, or interference).

(b) Affected unit (for example, call sign and suffix).

(c) Location (your grid location [encrypted]).

(d) Frequency affected (for example, encrypted).

(e) Type of equipment affected (for example, ultrahigh frequency, very high frequency, frequency modulated, and beacon).

(f) Type interference (type jamming and type signal).

(g) Strength of interference (strong, medium, or weak).
(h) Time interference started and stopped (if continuing, so state).
(i) Interference effectiveness (estimate percent of transmission blockage).
(j) Operator's name and rank (self-explanatory).
(k) Remarks. List anything else that may be helpful in identifying or locating source of interference and pass it on to higher headquarters by an alternate, secure means.

Note: Encryption is required only if information is transmitted over nonsecure means.

c. Digital TACFIRE/airborne target handover system (ATHS) reports. The TACFIRE/ATHS (AIR mode) is enabled to build and send a variety of tactical reports. Refer to aircrew training manual (ATM), Task 1475, and TB 11-5895-1632-10 for the following digital (TACFIRE/ATHS) message format procedures:
(1) Situation (SIT)/status report own ship send.
(2) SPOT report.
(3) BDA report.
(4) Casualty (CAS) assessment report.
(5) ATI (artillery target indicator) report.
(6) Request specific type report—
(a) Situation/status report.
(b) SPOT report.
(c) BDA report.
(d) Casualty (CAS) assessment report.
(7) Subscriber automatic position/status update.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1406

PERFORM TERRAIN FLIGHT NAVIGATION

CONDITIONS: In an AH-64D helicopter or AH-64D simulator, visual meteorological conditions (VMC), with tactical flight mission planning completed.

STANDARD: Appropriate common standards and the following:

1. During nap of the earth (NOE) flight—
    a. Know the en route location within 200 meters (500 meters night vision device [NVD]).
    b. Locate the final objective within 100 meters.
    c. Locate and avoid obstacles/hazards.
2. During low-level or contour flight—
    a. Know the en route location within 500 meters (1,000 meters NVD).
    b. Locate the final objective within 100 meters.
    c. Locate and avoid obstacles/hazards.

DESCRIPTION:

1. Crew actions.

    a. The pilot on the controls (P*) will remain focused outside the aircraft and will acknowledge all navigational and obstacle clearance instructions given by the pilot not on the controls (P). The P* will announce the intended direction of flight and any deviation from instructions given by the P.

    b. The P will provide adequate warning to avoid obstacles detected in the flight path or identified on the map. The P will announce when his attention is focused inside the cockpit (for example, when monitoring aircraft systems).

    c. Terrain flying involves flight close to the earth's surface. During terrain flight, the crew's primary concern is the threat and obstacle avoidance.

2. Procedures. Terrain flight navigation requires the crew to work as a team. The crew will remain primarily focused outside the aircraft and respond to navigation instructions and cues as displayed on the tactical situation display (TSD) and helmet display unit (HDU). The P* will acknowledge commands for heading and airspeed changes necessary to navigate the desired course. The P* must be cognizant to not focus inside on the TSD and to exercise an effective TSD scan for short periods of time (for example, 3 to 5 seconds) unless announced, and coordinated with the P.

    a. The P will announce significant terrain features and other cues to assist in navigation. The P will announce any verified or perceived hazards to flight and provide instructions and perform actions for obstacle/hazard avoidance. Change aircraft heading and airspeed as appropriate to navigate the desired course. The P will announce all plotted hazards prior to approaching their location. Use standard terms and specific headings, relative bearings, or key terrain features to accomplish this task. When using the HDU, include headings.

    b. Point out terrain features as the aircraft approaches them. Use the target acquisition and designation sight (TADS) active route and route (RTE) features to arrive at a specific checkpoint or turning point. Select the TSD map and scale that provides the best detail for precise navigation. Situational awareness is further enhanced when both crewmembers periodically change their independent maps and scales during the progress of the flight. Use standardized terms to prevent misinterpretation of information and unnecessary cockpit conversation. The crew must look far enough ahead of the aircraft at all times to avoid hazards.

c. During NOE flight, the crew may use several navigational techniques. In one technique, the crew identifies prominent terrain features that are located some distance ahead of the aircraft and which lie along or near the course. Using these points to key on, maneuver the aircraft to take advantage of the terrain and vegetation for concealment. If general navigational techniques do not apply, identify the desired route by designating a series of successive checkpoints. To remain continuously oriented, compare actual terrain features with those on the map.

d. Contour navigation is less precise than NOE navigation because the contour route is more direct. An effective technique is to combine the use of terrain features and rally terms when giving directions. This will allow the P* to focus his attention outside the aircraft.

e. For low-level navigation, compute time and distance to fly specific headings and airspeeds. The crew can also use radio navigation, depending on the terrain and enemy situation.

Note 1: If the area permits, the crew should navigate at least 20 kilometers during NOE flight training or 40 kilometers during low-level or contour flight training.

Note 2: The aircrew should incorporate the use of approved software resources in coordination with this task. Consideration should be given to the crew utilizing approved software-produced strip maps. When possible, the crew should review the digital projections of the proposed routes prior to conducting the flight.

Note 3: Deviations from the planned route may be necessary to prevent the aircraft from becoming an easily engaged target and to avoid predictability. Depending upon mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC), avoid the tendency to become locked to a course line. Make the aircraft a difficult target to track and engage.

OVERWATER CONSIDERATIONS: Overwater flight, at any altitude, is characterized by a lack of visual cues and, therefore, has the potential of causing visual illusions. Be alert to any unannounced changes in the flight profile and be prepared to take immediate corrective actions. The radar altimeter low bug should be set to assist in altitude control. Hazards to terrain flight (for example, harbor lights, buoys, wires, and birds) must also be considered during overwater flight.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1407

PERFORM TERRAIN FLIGHT TAKEOFF

CONDITIONS: In an AH-64D helicopter or AH-64D simulator, visual meteorological conditions (VMC), with tactical flight mission planning completed.

STANDARDS: Appropriate common standards and the following:

1. Maintain takeoff flight path until clear of obstacles.
2. Apply power as required to clear obstacles.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will remain focused outside the aircraft and will acknowledge all navigational and obstacle clearance instructions given by the pilot not on the controls (P). The P* will announce whether the takeoff is from the ground or from a hover, intent to abort or alter the takeoff, the intended direction of flight, and any deviation from instructions given by the P.

   b. The P will provide adequate warning to avoid obstacles detected in the flight path or identified on the map. The P will announce when his attention is focused inside the cockpit (for example, when monitoring aircraft systems).

2. Procedures.

   a. Determine the direction of takeoff by analyzing the tactical situation, wind, long axis of the takeoff area, and lowest obstacles. Select reference points to assist in maintaining the takeoff flight path. Remain focused outside the aircraft during the maneuver. If required, reposition the aircraft to maximize the long axis and effects of wind. Align the aircraft with the takeoff reference point and adjust power as required to initiate the takeoff.

   b. Airspeed over altitude. The crew may select airspeed over altitude takeoff if sufficient maneuver area exists. Select an abort point in the takeoff direction at which the aircraft must be through effective translational lift. Should the crew determine to abort the takeoff, the abort point will allow adequate area to decelerate and terminate safely without impacting the ground or obstacles.

   c. Altitude over airspeed. The crew may select an altitude over airspeed takeoff in an area where maneuver space is limited and / or out-of-ground effect (OGE) hover power is available. The crew should attempt to ascend vertically to an altitude above the obstacles and then accelerate to forward flight. This takeoff allows the P* to safely abort the takeoff or descend into a forced landing area in the event of rotor droop due to limited power or an engine failure. If OGE power is marginal and the necessary altitude cannot be reached to clear the obstacles, the crew should be prepared to descend back into the confined area and execute airspeed over altitude takeoff.

Note 1: The option to ascend vertically allows for the descent back to the point of origin should the takeoff need to be aborted. This also allows for a limited maneuver area clear of possible obstacles in the event of an engine failure.

Note 2: If power is marginal and the possibility exists of exceeding a limit, the crew should have an aircraft engine (A/C ENG) page selected and monitor for impending performance limiters.

d. Ensure the flight path vector (FPV) remains above the obstacles until the aircraft is clear. The FPV provides an indication of the aircraft's flight path. Once obstacles are cleared, adjust the flight controls as required to maintain the FPV on the takeoff reference point and transition into the desired terrain flight mode (NOE, contour, or low level).

TRAINING AND EVALUATION REQUIREMENTS:

Note: When target (TGT) limiters may be reached, the P* should select the ENG page to monitor performance.

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1408

PERFORM TERRAIN FLIGHT

CONDITIONS: In an AH-64D helicopter or AH-64D simulator, visual meteorological conditions (VMC), with tactical flight mission planning completed.

STANDARD: Appropriate common standards and the following:

1. Terrain flight mode.
   a. Nap of the earth (NOE) flight (out-of-ground [OGE] power required).
      (1) Fly as close to the earth's surface as obstacles and visibility will permit.
      (2) Maintain airspeed appropriate for the terrain, enemy situation, weather, and visibility.
   b. Contour flight.
      (1) Maintain an altitude that allows safe clearance of obstacles while generally conforming to the contours of the earth.
      (2) Maintain airspeed appropriate for the terrain, enemy situation, weather, and visibility.
      (3) Maintain the aircraft in trim.
   c. Low-level flight.
      (1) Maintain altitude ±50 feet.
      (2) Maintain airspeed ±10 knots true airspeed (KTAS).
      (3) Maintain the aircraft in trim.
   d. Correctly conduct or explain tactical movement procedures.
      (1) Select the correct mode of terrain flight for the level of cover and concealment necessary.
      (2) Conduct tactical movement using traveling, traveling overwatch, or bounding overwatch.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will remain focused outside the aircraft and will acknowledge all navigational and obstacle clearance instructions given by the pilot not on the controls (P). The P* will announce the intended direction of flight and any deviation from instructions given by the P.

   b. The P will provide adequate warning to avoid obstacles detected in the flight path or identified on the map. The P will announce when his attention is focused inside the cockpit; for example, when monitoring aircraft systems.

   c. Terrain flying involves flight close to the earth's surface. The modes of terrain flight are NOE, contour, and low-level. The transition mode of flight symbology is the normal mode for terrain flight. The crew will seldom perform pure NOE or contour flight. Instead, they will alternate techniques while maneuvering over the desired route. During terrain flight, the crew's primary concern is the threat and obstacle avoidance.

2. Procedures.

   a. Terrain flight mode. Terrain flight is conducted at one of, or a combination of, three distinct modes of flight: 1) NOE, 2) contour, or 3) low level. As applicable, the crew will employ the technique of movement (traveling, traveling overwatch, or bounding overwatch) and the terrain flight mode that best supports the situation. Terrain flight modes and techniques of movement are described below:

Note: Crewmembers should consider setting the flight (FLT) SET page altitude low (ALT LO) selection to an altitude (above ground level [AGL]) that best supports the tactical situation and mode of flight

(1) NOE flight. NOE flight is conducted at varying airspeeds and altitudes as close to the earth's surface as vegetation, obstacles, and ambient light will permit. It is essential to trim the aircraft longitudinally along the NOE flight path to diminish the possibility of striking an obstacle. The AH-64D provides symbolic cues that can be used day or night for establishing and maintaining this NOE flight condition. The symbolic cue for maintaining longitudinal trim during NOE flight has been termed "NOE trim."

(a) Establish NOE trim by initially noting the velocity vector deflection in the transition mode of flight symbology. Slip the aircraft to align with the NOE flight path by applying anti-torque pedal pressure corresponding to the direction of the displaced velocity vector.

(b) Apply slight cyclic pressure opposite the side of velocity vector displacement if exact ground track is to be maintained. Apply required counter pressure and pressure to the anti-torque pedals as necessary to maintain the velocity vector extended at the 12:00 position of the LOS.

(2) Contour flight. Contour flight is characterized by varying altitude and relatively constant airspeed, depending on vegetation, obstacles, and ambient light. It generally follows the contours of the earth.

(3) Low-level flight. Low-level flight is usually performed at a constant airspeed and altitude. It generally is conducted at an altitude, which prevents or reduces the chance of detection by enemy forces.

(4) Techniques of movement and principles of overwatch. Techniques of movement are designed to exploit the mobility of helicopters while employing the fire and maneuver concept. Security is established and maintained by adapting the flight to specific flight modes and techniques of movement in consideration of mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC). Flight modes and techniques of movement incorporate principles of overwatch, which include: 1) find the enemy with a minimum of forces, 2) use all available cover and concealment, 3) overwatch lead elements and be prepared to fire and maneuver; and 4) adjust the movement technique and type of terrain flight to the factors of METT-TC. The techniques of tactical movement are briefly described below.

(a) Traveling. This technique is used primarily when enemy contact is not likely. It is the fastest method for moving a formation of aircraft but provides the least amount of security. Low-level flight and contour flight at high airspeed are normally used for movement.

(b) Traveling overwatch. This technique is used when enemy contact is possible. Continuous movement of the main elements characterizes it. The overwatching element keys its movement to the terrain and its distance from the main element. It remains ready to fire or maneuver, or both, to support the main elements. Contour flight is normally used for movement. Airspeed is generally high and varied depending on the weather, ambient light, terrain, and threat.

(c) Bounding overwatch. This technique is used when enemy contact is likely and the greatest degree of concealment is required. Elements move by bounds. One element remains in position to observe, fire, or maneuver before the other element moves. Overwatching elements cover the progress of bounding elements from a covered and concealed position, which offers observation and fields of fire against potential enemy positions. Contour flight and NOE flight are normally used for movement. Airspeed during each bound is varied, depending on the availability of vegetation and terrain for concealment.

OVERWATER CONSIDERATIONS: Overwater flight, at any altitude, is characterized by a lack of visual cues and, therefore, has the potential to cause visual illusions. Be alert to any unannounced changes in the flight profile and be prepared to take immediate corrective actions. The radar altimeter low bug should be set to assist in altitude control. Hazards to terrain flight (for example, harbor lights, buoys, wires, and birds) must also be considered during overwater flight.

TRAINING AND EVALUATION REQUIREMENTS:

Note: Terrain flight modes (NOE, contour, or low level) are inherent to the performance of tactical movement (traveling, traveling overwatch, or bounding overwatch). Tactical movement procedures may be accomplished academically when resources are not able to facilitate hands-on performance.

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1409

PERFORM TERRAIN FLIGHT APPROACH

CONDITIONS: In an AH-64D helicopter or AH-64D simulator, visual meteorological conditions (VMC), with tactical flight mission planning and before landing checks completed.

STANDARD: Appropriate common standards and the following:

1. Maintain desired approach angle to clear obstacles.
2. Maintain ground track alignment with the selected approach path with minimum drift.
3. Maintain an appropriate rate of closure.
4. Make a smooth, controlled termination at the intended approach point.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will remain focused outside the aircraft and will acknowledge all navigational and obstacle clearance instructions given by the pilot not on the controls (P). The P* will announce the intended direction of flight and any deviation from instructions given by the P.

   b. The P will provide adequate warning to avoid preplanned hazards or obstacles detected in the flight path. The P will announce when his attention is focused inside the cockpit; for example, when monitoring aircraft systems.

   c. During terrain flight, the crew's primary concern is the threat and obstacle avoidance.

2. Procedures.

   a. Initiate the approach from a straight-in or modified pattern, depending on the tactical situation, wind, long axis of the landing area; lowest obstacles; and arrival path. Evaluate the wind direction and magnitude, noting the tactical situation display's (TSD) wind status window, performance (PERF) page wind status window, or external wind cues. The flight path vector (FPV) provides an indication of the aircraft's flight path to aid in obstacle clearance.

   b. Maneuver the aircraft as required (straight-in or circle) to intercept the desired approach path. Adjust the airspeed as necessary and keep the landing area in sight at all times. Start the approach upon intercepting an angle appropriate for tactical situation and that ensures obstacle clearance. The P* may elect to place the helicopter out of nap of the earth (NOE) trim condition to view the landing area or intended touchdown point through the side canopy. The crew must ensure that the fuselage will remain clear of all obstacles in this sideslip condition. Once the aircraft is aligned with the desired landing area, and is clear of obstacles, adjust power as required and place the FPV on the intended point of landing. The FPV will assist with obstacle avoidance throughout the approach. Adjust the flight controls as necessary to maintain the FPV on the intended landing point and above any obstacles until the FPV disappears; continue the approach, utilizing the remaining helmet display unit (HDU) symbolic cues in conjunction with visual cues.

c. If a successful landing is doubtful or visual reference with the touchdown point is lost, announce initiation of a go-around before reducing airspeed below effective transitional lift (ETL) or before descending below obstacles. Whether the approach will terminate to a hover or to the ground, announce the intended point of landing, and any deviation from the approach. Announce the intention to use the manual stabilator.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Maintain proper scanning techniques to ensure obstacle avoidance and tail rotor clearance.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS: Perform a landing area reconnaissance on final while all critical obstacles in and around the landing area are visible within the instantaneous field of view (FOV). Briefly reconnoiter beyond the landing area for a potential go-around route. A deceleration may be required prior to reaching the desired approach angle to arrive on the angle with the correct rate of closure. Obtain rate of closure information from the forward looking infrared (FLIR) imagery. Relative motion cues are most reliable when the NVS is offset from the aircraft centerline (looking left, right, or down). The crew may cross-check imagery-supplied perception of motion with symbology information such as the velocity vector. Under no-wind or light-wind conditions, use of the airspeed symbology may give additional information. When obstacles are near, perform this maneuver by maintaining nose-to-tail trim with the pedals and ground track with the cyclic. The velocity vector provides the nose-to-tail relationship reference. The ground track is established and maintained using imagery-supplied cues.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1410

PERFORM MASKING AND UNMASKING

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU), and out-of-ground effect (OGE) power available for unmasking at a hover (vertically).

STANDARDS: Appropriate common standards and the following:

1. Perform a thorough map reconnaissance.
2. Mask the aircraft from enemy visual and electronic detection.
3. Maintain a sufficient distance behind obstacles to allow for safe maneuvering.
4. Move to a new location, if available, before subsequent unmasking.
5. Report observations as directed.

DESCRIPTION:

1. Crew actions.

   a. The P* will remained focused outside the aircraft. He will announce the type of masking and unmasking before executing the maneuver. The P* will announce his intentions to use the hold modes during the maneuver. His primary concern will be aircraft control while viewing his assigned sector.

   b. The pilot not on the controls (P) will perform a thorough map reconnaissance to identify natural and manmade features before the unmasking (may be accomplished during tactical flight mission planning or in the aircraft), and announce when ready. The P will primarily view his assigned sector, overlap the P* sector, and warn the P* of obstacles or unanticipated drift and altitude changes.

   c. The PC will brief other crewmember on single engine contingency plan. The PC will assign observation sectors to the other crewmember to maximize the areas scanned during the time unmasked. The PC will also ensure observations are reported.

2. Procedures.

   a. Masking in flight. Fly to the destination with the aid of the tactical situation display (TSD), a strip map, a digital map, or a topographic issued map. Take maximum advantage of terrain and vegetation to prevent exposure of the aircraft to enemy visual observation or electronic detection. Maintain situational awareness and orientation at all times and look far enough ahead on the map for hazards.

Note: The crew may elect to use the fire control radar (FCR) radar mapping (RMAP) mode (AH-64D with radar), and the resultant FCR page not displaying any radar return imagery to ensure that the aircraft is masked.

   b. Unmasking in flight. Keep aircraft exposure time to a minimum to prevent enemy visual observation or electronic detection. Gun dish radars may be able to lock onto a target within 2 to 9 seconds.

   c. Unmasking at a hover (vertically). OGE hover power required. Ensure that sufficient power is available by referencing the performance (PERF) page or performance planning data prior to unmasking. The crew should employ attitude and altitude hold modes during all the phases of this maneuver. Apply collective until sufficient altitude is obtained to either visually acquire target area or utilize the FCR to scan over the mask without exceeding aircraft power limitations. The PC will maintain horizontal main rotor blade clearance from the mask in case of a power loss or a tactical need to mask the aircraft quickly. Each crewmember ensures a weapon system/video recorder is actioned or ready to employ as appropriate for the mission. Begin the scan by clearing the area around the aircraft, then outward. The P* will be focused outside during the unmasking, and the CPG should be prepared to scan, record, and store areas/objects of interest with the target acquisition and designation sight (TADS) or FCR. Unmask at a safe distance from the mask to allow a rapid descent to a masked condition if detected or fired upon. Keep aircraft exposure time to a minimum. Depending on mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC), AH-64Ds with radar may only have to unmask the radar dome and RFI.

Note 1: A common tendency when masking/remasking vertically is to move forward or rearward while performing this maneuver. Establish reference points to assist in maintaining position during ascents and descents.

Note 2: When operating at high gross weights and limited power margins, the P* will select an aircraft engine (A/C ENG) page on one multipurpose display (MPD) and monitor engine performance to prevent possible rotor decay.

d. Unmasking at a hover (laterally). Sometimes unmasking can be accomplished by moving laterally from the mask. Hover the aircraft sideward to provide the smallest silhouette possible to enemy observation or fire. Keep aircraft exposure time to a minimum.

Note: When unmasking the helicopter, select a new location that is a significant distance from the previous location and where the target area can still be observed. If the target area is a long distance (2,000 to 3,000 meters) away, moving only 100 meters will still keep the aircraft in the same field of view from the target. However, if the target area is close to the unmasking position, a drift of 100 meters will make a significant difference.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Maintaining altitude and position is more difficult when hovering above 25 feet without aircraft lights. Use the radar altimeter to assist in maintaining altitude and use the position box to assist in maintaining aircraft position. Use references such as lights, tops of trees, or man-made objects above and to the front and sides of the aircraft. By establishing a reference angle to these objects, the P* can detect altitude changes by changing his viewing perspective. Hovering near ground features, such as roads, provides ideal references for judging lateral movement. However, the P* may become spatially disoriented when alternating his viewing perspective between high and low references. Therefore, he must rely on the P for assistance if he becomes disoriented.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. Masking.

   a. Using forward looking infrared (FLIR) imagery and nap of the earth (NOE) coupling, catalog obstacle locations and heights. Determine a minimum safe altitude at which the aircraft is clear of obstacles prior to unmasking.

   b. Use imagery to select visual reference points for visual orientation during performance of the maneuver. These reference points will assist in maintaining heading and position.

c. When a stable hover has been achieved at the desired location, select the hold modes and appropriate symbology. The P* will establish and brief the P on a forced landing or flyaway plan and determine the minimum maneuvering altitude.

2. Unmasking.

a. Apply collective to initiate the desired rate of ascent. (Reference torque and rate of climb indicator symbology.)

b. Use the cyclic as necessary to maintain position during the ascent. Imagery reference and symbology (position box) will indicate drift or movement from the original position. Attitude (position) hold may be used during the unmasking.

c. Use FLIR imagery-provided cues and heading tape symbology to maintain aircraft heading.

d. Once the desired altitude is reached, adjust the collective to maintain altitude. Reference the radar altitude symbology, torque, and rate of climb symbology.

3. Remasking.

a. Use the composite display to verify the position.

b. Reduce collective to initiate a descent while referencing torque and the rate of climb indicator (descent). Use FLIR image cues inclusive of NOE coupling to remask. Attitude (position) hold may be used during the remasking. Ensure that the composite display imagery-position box and/or line of sight (LOS) reticle indicates a return to a vertical position over the place of origin unless it is unsafe to do so.

c. Continue the descent to remask the aircraft, but no lower than the established minimum safe altitude (MSA).

d. Maintain heading while remasking by referencing imagery-provided cues and heading tape symbology.

Note: The P* must not base obstacle clearance on the ability of the aircraft to maintain its position hold alone. The P* must base his decision to descend on FLIR imagery references. He can use position symbology information to enhance aircraft position control. However, the use of symbology alone will not ensure obstacle avoidance.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1411

PERFORM TERRAIN FLIGHT DECELERATION

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, the pilot on the controls (P*) properly fitted with a boresighted helmet display unit (HDU), and out-of-ground effect (OGE) power available.

STANDARDS: Appropriate common standards and the following:

1. Maintain alignment with the desired flight path or nap of the earth (NOE) trim.
2. Maintain obstacle clearance.
3. Decelerate to the desired airspeed or to a full stop at the selected location.

DESCRIPTION:

1. Crew actions.

   a. The P* remains focused outside the aircraft. The P* will announce his intention to decelerate or come to a full stop, any deviation from the maneuver, and completion of the maneuver. The stabilator NOE approach or manual mode will enhance forward visibility during performance of the maneuver. The P* will announce his intentions to use the manual stabilator.

   b. The pilot not on the controls (P) will provide adequate warning to avoid obstacles detected in the flight path and will announce when his attention is focused inside the cockpit.

   c. The crew must clear the area below the aircraft before descending.

2. Procedures. Consider variations in the terrain and obstacles when determining tail rotor clearance.

   a. Below effective transitional lift (ETL). With terrain and obstacle considerations made, increase the collective just enough to maintain the altitude of the tail rotor while simultaneously applying aft cyclic to slow down to the desired airspeed/groundspeed or come to a full stop. Additional collective may be necessary if transitioning to an OGE hover. Maintain heading with the pedals and make all control movements smoothly. If the attitude of the aircraft is changed too much or too abruptly, returning the aircraft to a level attitude will be difficult and over controlling may result. The rate of climb indicator should be referenced throughout the maneuver.

   b. Above ETL. With terrain and obstacle considerations made, decelerate the aircraft by applying aft cyclic. Due to the velocity of the aircraft, it may be necessary to decrease collective simultaneously with the aft cyclic application to insure an undesired climb does not develop. Maintain altitude of the tail rotor with coordinated collective and cyclic movements. Maintain heading with pedals and make all control inputs smoothly. If the attitude of the aircraft is changed too much or too abruptly, returning the aircraft to a level attitude will be difficult and over controlling may result. The rate of climb indicator should be referenced throughout the maneuver.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Because of the limited field of view (FOV) of the night vision device (NVD), avoid making abrupt changes in aircraft attitude. An extreme nose-high attitude limits the forward FOV. Maintain proper scanning techniques to ensure obstacle avoidance and tail rotor clearance.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. Prior to initiating the maneuver, refer to the imagery or radar altimeter to determine altitude.
2. Maintain heading by using composite video or imagery and symbology heading tape.
3. As the nose of the aircraft rises, lower the night vision system (NVS) field of view to provide an unobstructed view of obstacles in the flight path. Monitor the rate of closure with the composite video and altitude with the symbolic rate of climb.
4. Monitor the composite video to verify the absence of a climb or descent at termination.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1412
Perform evasive maneuvers

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, in a simulated tactical environment.

STANDARDS: Appropriate common standards and the following:

1. Describe evasive maneuver (EVM) considerations for each type of threat.
2. Perform appropriate EVM inter-flight and intra-cockpit communications.
3. Perform countermeasure procedure (CP) appropriate for the type of threat.
4. Conduct post-engagement procedures.

DESCRIPTION:

1. EVM considerations**:** EVMs consist of a combination of classified and unclassified tactics techniques and procedures (TTP) used to defeat enemy surface-to-air fire (SAFIRE) and aircraft threats. A complete discussion of EVM requires aircrews to consult critical additional classified information. When specific strengths and weaknesses of U.S. aircraft and survivability equipment are tied to a specific threat weapon system, the information is classified SECRET NOFORN. EVM TTP is both preemptive and reactive.

2. The ideal counter to SAFIRE and enemy aircraft is to limit exposure of the aircraft through the use of altitude, time period, environmental factors, or a variety of tactical factors. Maximum use of Joint and Combined arms will significantly contribute to aircraft survivability by preemptively destroying enemy threat systems or limiting the enemy's freedom of action.

3. If the enemy cannot be avoided, then EVMs are used to avoid or minimize the heart of the enemy weapons engagement zone (WEZ). The WEZ is defined by the four dimensions of the weapon's maximum range (R_{MAX}), minimum range (R_{MIN}), maximum altitude, minimum altitude and the weapons time of flight (TOF). Traditionally Army helicopters employ standoff to avoid the enemy WEZ by staying outside R_{MAX}. Where the enemy locations are unpredictable other aspects of the WEZ must be exploited to improve aircraft survivability. Once engaged, the crew's primary goal should be to suppress the system (if able), limit enemy weapon effectiveness, and exit the WEZ as quickly as possible by breaking away from the enemy fire and applying the appropriate EVM.

4. Traditional preemptive and reactive TTP stress the importance of terrain masking. Achieving terrain masking is always an effective countermeasure although care should be exercised on differentiating between cover and concealment. For instance, although masked behind a tree line, a targeted aircraft would remain vulnerable to a long burst of heavy antiaircraft fire or interlocking fire from multiple systems. Additionally the relatively slow speed of helicopters combined with the very short time lines associated with SAFIRE events may preclude "remasking" or flying the helicopter to a concealed area prior to the weapon's impact. Cover and concealment should be a flexible term and employed as METT-TC requires.

5. Common EVM procedures: Regardless of the type of SAFIRE or air threat encountered the crew will perform the following common actions:

   a. Alert the flight.

   b. Select and perform an appropriate CP.

   c. Evaluate damage to aircraft.

   d. Continue or modify the mission as appropriate.

6. Signature control: Significant helicopter signatures exist in the visual, aural, infrared, and radar spectrums. The techniques below are methods to delay enemy detection prior to a SAFIRE event and where practical should be integrated into post SAFIRE procedures.

a. Audio signature:

(1) Mounted enemy forces operating “buttoned up” in tanks or air defense units (ADU) will not be able to hear the helicopter beyond 100 meters. The distance at which dismounted enemy forces can hear the helicopter will vary based on ambient conditions (wind speed and direction), terrain (mountainous or flat), vegetation (forested or barren), and the amount of urbanization. Other battlefield noise will also help mask the audio signature of the helicopter.

(2) An unobstructed audio signature can be spatially located within 15 degrees. This is within an “o’clock position” and is sufficiently accurate to cue visual searches. This narrowing of the visual search area makes audio signature control particularly important at night or during reduced visibility operations.

(3) The lowest audio signature would be achieved by approaching the enemy at the lowest safe altitude (to minimize the “audio footprint”) with as much intervening noise attenuating structure (ridgeline, trees, buildings, and so forth) as possible and approaching from downwind. Additionally the crew should minimize ownship noise by limiting increased rotor noise produced by high G, out of trim conditions, descending turns or high torque settings.

b. Visual signature:

(1) Classic terrain flight techniques result in the smallest overall visual signature. The maximum use of shadow, minimization of rotor wash signature, and relative movement will limit enemy visual detection. To minimize main rotor blade signature, limit large pitch or bank attitude changes to avoid showing the top or bottom of the rotor disk to the enemy.

(2) Attacking out of the sun is a time proven counter to enemy visual detection.

(3) Night operations significantly limit the enemy’s ability to visually detect the helicopter at long range and make it very difficult to accurately aim iron sight-equipped weapons. However, even under zero illumination conditions, a dark adapted enemy will be able to see an unlit helicopter with unaided vision when it is within rifle range (~400 meters).

c. Radar/IR signature control:

(1) Radar cross section (RCS) data and infrared (IR) aircraft signature plots are classified. The crew must check for detailed information on these topics.

(2) The largest source of IR signature is the engine exhaust. The crew can significantly limit the IR signature of the aircraft by keeping the exhausts pointed away from the enemy. This technique is preemptive in nature and under ideal conditions can effectively deny an IR missile lock, however, many later models of IR guided weapons have an all-aspect engagement capability. Even under less than ideal conditions, this technique can significantly reduce the size of the IR missile engagement zone (MEZ) thereby reducing the range at which an IR missile can lock onto an aircraft. However, once an IR missile has achieved a lock and is fired, the very short time of flight of the missile means it may be impractical for the crew to employ these techniques reactively.

d. Signature mitigation: In general, the most effective method of signature control is to point the nose of the aircraft at the enemy. This presents the smallest visual, IR, radar, and physical target to the enemy as well as orients the aircraft weapons, sensors, and jammer on the enemy. A disadvantage is that this TTP reduce the aircraft’s standoff from the enemy, making the crew more susceptible to other enemy weapon systems. Standoff can also be an effective signature mitigator, as this technique reduces the amount of detectable IR energy through distance and reduces the chance of detection and engagement with IR systems. IR missiles, especially older models, are highly susceptible to the backscatter of energy at low altitudes and terrain flight altitudes can also be considered an effective signature mitigating factor.

7. EVM considerations: When preemptive TTP are insufficient, the crew will select and apply the appropriate reactive defensive procedures. These reactive CPs are unclassified and can be trained and evaluated as a subset of classified and unclassified EVM TTP. CP listed below are used in concert with aircraft survivability equipment (ASE), onboard weapon systems, and other TTP to minimize the SAFIRE threats to the aircraft. Appropriate countermeasures are based on whether the enemy weapon is guided or unguided. Both guided and unguided weapons require time to get to the target. The time required varies greatly depending on the type of weapon. Tank main gun rounds and automatic antiaircraft (AAA) cannons have extremely high velocities and very short time of flight (TOF) where Rocket Propelled Grenades (RPG) and certain antitank guided missiles (ATGMs) have comparatively slow TOF. At some ranges, this enemy weapon TOF can be exploited to allow the pilot to maneuver the aircraft out of danger.

8. EVM communication. Intracockpit and interflight communication during a SAFIRE or air attack event are critical in performing EVM in a timely manner. Alerting the rest of the flight maximizes mission survivability and can enhance ownship aircraft survivability by orienting additional combat power onto the enemy. The SAFIRE or air attack "Threat call" must be both "directive" (telling the flight what you want them to do) and "descriptive" (telling the flight why, build the flight's situational awareness). Always preface threat calls with the flight call sign to avoid potential confusion in situations where multiple flights are using the same frequency.

a. Crew actions. When engaged by the enemy, the crewmember that first identifies the threat will announce the nature of the threat and the direction of the threat using standard SAFIRE or air attack prowords according to FM 3-54.10.

b. The pilot on the controls (P*) will announce the direction of threat to other aircraft and perform the appropriate CP. The P* will remain focused outside the aircraft during execution of the CP and should be aware that if the pilot not on the controls (P) is returning suppressive fire, he may be unavailable for assisting in obstacle avoidance or noting other threat sources.

c. The P will remain oriented on the threat location and employ appropriate countermeasures or suppressive fire. The P will announce when his attention is focused inside the cockpit; for example, when firing the weapons. The P will be alert for obstacles and new threat sources encountered during the evasive maneuver.

Note: The P* will not attempt to simultaneously fly the countermeasure procedure maneuver and suppress the enemy. The P* flies the maneuver and the P suppresses the system engaging the aircraft.

9. CP—non kinetic

a. Unguided weapons CP: Unguided weapons (such as small arms, unguided rockets, and tanks) require the enemy gunner to predict an intercept point by estimating where the target aircraft will be at the TOF of the projectiles. Once fired, the rounds cannot be corrected. The two basic strategies of defeating unguided weapons are to present the most difficult targeting (ballistic) solution possible and then to change the enemy's ballistic solution as often as possible. The pilot presents the enemy with the most difficult target by maneuvering in three dimensions. Unguided weapons are generally employed in three basic methods: aimed fire, curtain fire, and barrage fire—each requires a different countermeasure. Curtain and baggage fire may not be specifically aimed at an individual aircraft but rather fired into a predicted or suspected air avenue of approach that the enemy believes will be over flown by the aircraft.

(1) Countering aimed fire: When encountering accurate aimed fire, the crew should immediately alert the flight, suppress with organic weapons if feasible, break away from the enemy fire, and employ "jinking" until the aircraft exits the enemy WEZ. Jinking is used to disrupt/deny the enemy a weapon's firing solution by moving the aircraft away from the

predicted point of impact/intercept. Properly executed, the jink maneuver maximizes errors in the enemy's weapon system's firing solution by displacing in multiple dimensions, and forcing the gunner to correct for azimuth, range, altitude, and changing velocity. This maneuver incorporates a change in heading with a (optional) climb or descent every several seconds. Jinks should be random in direction so as not to establish a pattern. The jinking maneuver is an aggressive but not a violent maneuver. A jink will be ineffective if the helicopter does not displace over the ground and cause the enemy to shift his aiming point. Therefore, excessively tight turns should normally be avoided as they result in the helicopter failing to displace out of the enemy's weapon's field of view.

Note: Prolonged jinking may dissipate the aircrafts kinetic energy and my make the aircraft an easier target.

(2) Countering barrage fire: If engaged by accurate barrage fire, depart the area of fire as quickly as possible via the most direct path. Since barrage fire is being aimed into a 'box,' turn only to avoid areas of concentrated fire. Do not "jink" as this will just delay departure from the barrage.

(3) Countering curtain fire: Turn to avoid flying into curtain fire when possible. When engaged by accurate curtain fire, depart the area of fire as quickly as possible via the most direct path.

(4) Tanks. Generally the unguided weapons countermeasures listed above are appropriate defenses against tank fire. Additionally, tank fire control systems and turret slew rates in azimuth and elevation combined with the limited field of view on the tank gunner's weapon sight make it very difficult to track aircraft with high relative velocity. Tank gunners are particularly vulnerable to aircraft displacing in the vertical plane. If engaged with a semiautomatic command to line of sight (SACLOS) missile fired from a tank, refer to the procedure listed in paragraph 9c below.

(5) Artillery countermeasures procedure. Artillery can pose a threat to slow-speed helicopters particularly operating at a readily identifiable firing position. Artillery takes time to shift fires; this time interval can be used by helicopters to stay ahead of the enemy's ability to target/shift fires onto them. If two or more unexplained explosions occur within 500 meters of the aircraft, suspect enemy artillery and proceed as follows:

(a) Depart the impact area by 500 meters.

(b) Reposition every 20 seconds to avoid enemy adjusting (shifting) fire onto your new location.

(c) Report receiving enemy artillery/mortar fire to facilitate timely counter battery fire from friendly field artillery.

b. AAA guns. The crew should use the unguided weapons countermeasures above to defeat the guns/projectiles themselves. For radar aided/directed AAA systems, use the radar countermeasures listed below.

c. SACLOS CP. SACLOS weapon systems include ATGM and certain antiaircraft missiles. These systems can vary from slow speed ATGMs (~100 meters per second) to very high-speed antiaircraft missiles (700 meters per second) and may use wires, radio, or laser for the command link. These systems are countered by departing the missile engagement zone (MEZ) or WEZ prior to weapons impact. Regardless of the type of SACLOS missile, the weakest part of the guidance system is the enemy gunner. Older ATGMs glide during most of their flight resulting in low energy and poor missile maneuverability. This combined with relatively high latency within the guidance systems means the missile can be readily out flown by the targeted aircraft. With high-speed/high-G SACLOS antiaircraft systems, the missiles themselves are more difficult to be out flown by a helicopter due to its maneuverability/speed and decreased reaction time by the aircrew. In these cases, the enemy gunner needs to be defeated via use of kinetic countermeasure explained in paragraph 10 below.

d. Radar guided weapons CP: See Classified Army Aviation TTP.

e. Heat seeking (IR) missile countermeasure procedure: See Classified Army Aviation TTP.

f. Fixed wing evasive maneuver considerations: Fighter aircraft are characterized by their high performance with high attack speeds. Their ability to move vertically in excess of 40,000 + feet per minute means that fighter aircraft can easily come and go from the area without detection by the attack helicopter crew. Fighters can work independently or in a minimum of two aircraft section. If one is detected, expect another enemy aircraft nearby. When operating in an area of possible enemy fighter activity, perform the following actions:

(1) Crew actions.

(a) Be predictable to friendly fighters by being on the Air Tasking Order (ATO) and squawk the appropriate transponder codes/modes to avoid fratricide.

(b) Be unpredictable to enemy fighters by using night and/or adverse weather to avoid detection when possible.

(c) In daylight, avoid flying over areas of high contrast such as bodies of water or open fields if possible.

(d) Have the APR-48 & APR-39 on and turned up to provide cueing of the threat.

(e) Maintain airspace surveillance for fighter aircraft.

Note1: If fighters are observed circling, rapidly climbing, or turning towards the AH-64D, the crew should consider a fighter attack imminent.

Note2: Carefully consider the Fire Control Radar's (FCR) limitations in maximum detection range, scan rate, vertical beam height per kilometer of range, and the fighter' speed when relying exclusively on the FCR air-to-air mode for early warning.

(2) If hostile fighter activity is observed:

(a) Take defensive (passive) protection measures.

(b) Take offensive (active) protective measures if fighters are identified as enemy.

(c) See classified Army Aviation TTP for further crew procedures:

(3) Air-to-ground gun/rocket evasive maneuvers. Fighters normally carry limited cannon ammunition with its high performance working against rocket or gun attack accuracy against helicopter targets. The enemy fighter will have as little as 0.5-3 seconds to execute a gun or rocket engagement due to their high speed and the limited effective range of their gun or rockets.

(4) Air-to-ground bomb passive countermeasures. Once dropped, the fighter's bomb will fall on a ballistic flight path that can be avoided or mitigated if detected in time. The time of fall of the bombs can be exploited by the attack helicopter crew to avoid the heart of the enemy's weapons effect zones. To avoid being hit by their own fragments, bombs are equipped with time-delayed fuzes of 4 to 6 seconds minimum. At 100 KTGS, a helicopter can displace over 300 meters in 6 seconds. Once bombs depart the fighter, the helicopter should fly perpendicular to the bomb's line of fall and proceed at maximum speed and minimum altitude. This will place the helicopter at the edge of the fragment envelope where fragment density will be at a minimum.

IR / radar missile evasive maneuvers: See classified Army Aviation TTP.

g. Helicopter evasive maneuver considerations: Due to their limited performance differential and inability to accelerate out of enemy weapons range, once engaged it is impractical for helicopters to break contact from one another. Consequently, the success of helicopter evasive maneuvers will likely depend on seeing the enemy aircraft first and avoiding its WEZ. The most effective means of avoiding a helicopter WEZ is to achieve "rotor blade masking" by operating above the enemy helicopter.

(5) Crew actions.

(a) Maintain maximum maneuver energy and do not decelerate below max R/C END airspeed (bucket speed).

(b) Maintain the enemy helicopter in sight until it is destroyed.

(c) Vector other friendly helicopters onto the enemy.

(d) Deny or limit enemy shooting opportunities by exiting the enemy weapon system WEZ and then climb above the enemy helicopter and force rotor blade masking.

(e) If undetected, employ Hellfire missiles starting at maximum range.

(f) Firing multiple flechette rockets will be an effective weapon against enemy helicopters.

(g) The 30-mm cannon should be fired in short bursts until the enemy helicopter is destroyed.

Note 1: Mi-24 Hind helicopter, however less maneuverable, is substantially faster than the AH-64 so never attempt to run from a Hind helicopter.

Note 2: Friendly locations must be considered prior to firing.

10. Kinetic countermeasures: A violently executed counterattack (immediate, high volume, suppressive fire) can be effective in limiting enemy weapon effectiveness. Some weapon systems can be effectively countered by attacking the guidance chain. Both automatic command to line of sight (ACLOS) and SACLOS missiles require guidance until target impact. If the guidance system or the command link can be destroyed or interrupted, the missile becomes unguided.

a. Rockets and guns: Rules of engagement (ROE) permitting, consider firing rockets towards the shooter to break the optical line of sight or laser guidance link by rapidly creating smoke and dust between the enemy gunner and the targeted aircraft. Even relatively little smoke and dust can break the guidance link of a laser beam rider.

b. Missiles**:** The Hellfire missile is only one-half to one-third of the speed of typical antiaircraft missiles. Even when employed in a "fire and forget mode," the relatively slow speed of the Hellfire missile must be considered in countermeasure selection.

11. Post hit procedures*:* If hit by hostile fire, rapidly assess the situation, and determine an appropriate course of action. The most important consideration in an emergency is aircraft control. The first step is to assess aircraft controllability. Check EUFD/UFD and MPD fault and engine/system pages to assess aircraft status. Due to the likelihood of undetected hits into the fuel system, note aircraft fuel status and start fresh fuel consumption check to detect fuel leaks. If a leak is detected or suspected in a tank, perform manual transfer operations to conserve onboard fuel. If rate of fuel loss is severe, consider preempting engine failure due to fuel starvation through crossfeeding operations. It is also possible for a hit and subsequent damage to go unnoticed by the aircrew. Mutually supporting formation flight positions will enable the wingman to assist in battle damage assessment.

SAFETY CONSIDERATIONS:

The pilot must balance the risk from enemy fire with the safety of flight risk during low altitude jinking. The probability of kill from small arms fire is comparatively low; 7.62-mm fire posing a very minimal risk to the AH-64. Note: avoiding rifle fire while flying into the ground in the process still results in an enemy victory.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

1. Flares dispensed at night can highlight the ownship location and may affect the wingman's NVG.
2. Slow TADS slew rates may result in the CPG becoming spatially disoriented while performing evasive maneuvering. To successfully complete this task, crew coordination between the P* and the P while performing evasive maneuvering is paramount.
3. Night vision goggle use is recommended at night by either the P* or P to acquire the source of tracer fire and to provide direction for the evasive maneuver.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in an AH-64D aircraft.

REFERENCES: Appropriate common references plus the following:
Current Computer-Based Aircraft Survivability Training
FM 3-54.10
http://aviation.portal.inscom.army.smil.mil

TASK 1413

PERFORM ACTIONS ON CONTACT

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, in a simulated tactical environment, and given a tactical map.

STANDARDS: Appropriate common standards and the following:

1. Locate the enemy.
2. Immediately employ suppressive fires or perform evasive maneuvers.
3. Use correct actions on contact consistent with the tactical situation.

DESCRIPTION:

1. Crew actions. The first crewmember to recognize the threat will immediately announce enemy contact (visual or electronic), type (hostile fire), and location of threat.
    a. The pilot on the controls (P*) will position the aircraft to return suppressive fire or deploy to cover. The P* will announce the direction of flight to evade detection and will direct the P to remain focused outside the aircraft for clearing.
    b. The pilot not on the controls (P) will remain oriented on threat location and employ appropriate counter measures and/or suppressive fire. The P will announce warning to avoid obstacles and when his attention is focused inside the aircraft (for example, when operating the weapons systems).
    c. The crew will transmit a digital/voice report, as required.
2. Procedures.
    a. Undetected by enemy. Fly the helicopter to a concealed area, or bypass, using evasive maneuvers and suppressive fire as per rules of engagement (ROE). Choose a course of action that supports the mission as briefed.
    b. Detected by enemy. Immediately employ suppressive fires or perform evasive maneuvers. Fly the helicopter to a concealed area, or bypass, using evasive maneuvers and suppressive fire as per ROE. Choose a course of action that supports the mission as briefed.
    c. Meeting engagement. Occurs when direct contact is made with the threat and an exchange of fire is imminent. The only course of action is to engage to prevent damage to own ship or flight.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Threat elements will be harder to detect. Rapid evasive maneuvers will be more hazardous. Crewmembers must maintain situational awareness.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D simulator.
2. Evaluation will be conducted in an AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1414

PERFORM FIRING POSITION OPERATIONS

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Select the firing position and ensure that the target/engagement area is within range and field of fire.
2. Enter the firing position, keeping the aircraft masked from visual or electronic detection.
3. Engage targets as appropriate.
4. Exit the firing position, keeping the aircraft masked from visual or electronic detection.

DESCRIPTION:

1. Crew actions.

a. Perform crew actions outlined in Task 1410 and Task 1422.

b. The pilot on the controls (P*) will remain focused outside the aircraft to provide clearing and to maintain aircraft orientation toward the target. The P* will announce any maneuver or movement prior to execution. Selection of the tactical situation display (TSD) page, with the appropriate video underlay, will enhance situational awareness during firing position operations. Alternate or back-up sources of flight information can be obtained by accessing the flight (FLT) page. The P* will announce all visually or electronically detected threats to the pilot not on the controls (P).

c. The P will direct the P* to maneuver the aircraft as necessary to maintain target orientation, utilizing standard crew terminology.

d. The crew will evaluate the wind and analyze the firing position for the availability of forced landing areas/flyaway plan. Evaluate the wind direction and magnitude, noting the TSD's wind status window, performance (PERF) page wind status window, or external wind cues. The crew must decide if they can attain single engine airspeed; if not, they should plan to land at the selected forced landing area.

2. Procedures. Evaluate winds, enter the firing position, engage the target as appropriate, exit, and reposition to an alternate firing position.

a. Attack by fire/support by fire/battle position. Selection should allow for support of multiple primary firing positions and alternate firing positions. Selection should be based on the following considerations:

(1) Nature of the target. Determine the type of target and thickness of armor or cover. Evaluate the target and any associated weapon systems (antiaircraft artillery [AAA], air defense artillery [ADA], surface to air missiles [SAMs]). Evaluate the possibility of collateral damage in accordance with the briefed ROE.

(2) Obstacles. This may include physical features such as the type of terrain or man-made structures. Man-made structures may include protected sites. Associated with protected sites is the probability of civilian population in close proximity to possible target area. Another possible obstacle is limited aircraft performance due to environmental conditions.

(3) Range to target. Determine the type of weapon system to be employed. Select a range that allows for maximum standoff distance from the target, if possible, and an adequate maneuver area for unexpected contacts or events. Consider exposure time, element of surprise, and time required to engage target.

(4) Multiple firing positions/lanes. Should support mutual coverage between aircraft within a team while still allowing for sufficient distance for individual maneuvering to avoid the possibility of becoming a single target for the enemy. The positions/lanes must support the aircraft by keeping exposure time for team elements to a minimum.

(5) Area to maneuver. Allows freedom of movement for maneuver with sufficient distance between aircraft and teams while supporting mutual coverage.

b. Firing position. Selection of firing positions should be based on the following considerations:

(1) Background. The helicopter should not be silhouetted.

(2) Range. The kill zone should be within the last one-third of the weapon's range for aircraft survivability. Range must be within the minimum and maximum effective range of the selected weapon system, and should be outside the enemy's maximum effective range, if possible.

(3) Target altitude. The firing position should be level with or higher than the target area, if possible. Altitudes above the target may affect minimum engagement ranges for Hellfire lock on after launch (LOAL) engagements.

(4) Sun or full moon. The sun or full moon should be behind or to the side of the helicopter.

(5) Shadow. When possible, the firing position should be within an area covered by shadow (weapons flash may be more visible from darker areas).

(6) Concealment. Vegetation around the firing area should be sufficient for the helicopter to remain masked.

(7) Rotor wash. The location of the firing position should avoid or reduce the visual signal caused by the effect of rotor wash on the surrounding terrain (for example, debris, trees, snow, and dust).

(8) Maneuver area. The position should permit concealed entry and exit and obstacle avoidance to successfully accomplish evasive and emergency procedure maneuvers. This may require the establishment of running or diving fire lanes.

(9) Field of fire. The target/engagement area must be visible throughout the kill zone. The firing position must allow for autonomous direct fire engagements, and provide obstacle clearance for ordnance delivery.

Note: Crewmembers should consider setting the FLT SET page altitude low (ALT LO) selection to a minimum maneuvering or minimum safe altitude.

NIGHT OR NIGHT VISION GOGGLES (NVG) CONSIDERATIONS:

1. The use of NVGs may aid the copilot-gunner (CPG) (front seat crewmember) detect obstacles difficult or impossible to identify with the forward looking infrared (FLIR) (for example, wires and objects lost due to NOE coupling).

2. NVG capability depends on the ambient light level. Navigation, target hand-offs, and assistance to the P* may be more difficult and time consuming when the CPG is wearing NVGs due to a lack of symbology, altitude information, rate of climb/descent, and heading references.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. The crew may experience nap of the earth (NOE) coupling while masking the aircraft in and around the firing position. This may limit the crew's ability to identify terrain or obstacles.
2. The crew may have to re-optimize the TADS once in the firing position.

TRAINING AND EVALUATION REQUIREMENTS:

Note: Live fire of weapon systems is not required for training and evaluation of this task.

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft. Evaluation may be conducted using the weapons tactical mode, TRAIN mode, or a combination of the modes.

REFERENCES: Appropriate common references.

This page intentionally left blank.

TASK 1415

PERFORM DIVING FLIGHT

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator with a 180-degree clearing turn completed.

STANDARDS: Appropriate common standards and the following:

1. Establish entry altitude 1,500 feet above ground level (AGL) (minimum), ±100 feet.
2. Establish entry airspeed 110 knots true airspeed (KTAS) (normal) or 60 KTAS (steep), ±10 KTAS.
3. Set low altitude warning on the radar altimeter to the desired recovery altitude.
4. Establish a 10 to 15 degree dive angle (normal) or a 25 to 30 degree dive angle (steep).
5. Maintain the aircraft in trim.
6. Recover to level flight before reaching computed velocity-not-to-exceed (Vne) or 500 feet AGL.
7. Perform low altitude warning recovery if aircraft is allowed to descend below the recovery altitude.

DESCRIPTION:

1. Crew actions.

   a. The crew will be aware of the characteristics of retreating blades stall or compressibility, effects of blade coning, mushing, and transient torque.

   b. The pilot on the controls (P*) will remain focused outside the aircraft to clear the aircraft throughout the maneuver. The P* will verify Vne prior to performing the maneuver. The crew will set the low altitude warning on the radar altimeter to the desired recovery altitude. The P* will announce a normal or steep dive prior to initiating the maneuver and any deviation from the maneuver. He also will announce recovery from the maneuver. During the dive recovery, the P* is prohibited from performing any other task that is not directly related to aircraft control.

   c. The pilot not on the controls (P) will provide adequate warning to avoid traffic or obstacles detected in the flight path and any deviation from the parameters of the maneuver. The P also will announce when his attention is focused inside the cockpit (for example, when monitoring airspeed, altitude, or rotor revolutions per minute [RPM]).

2. Procedures.

   a. Normal. From straight-and-level flight at assigned altitude and airspeed, smoothly apply the cyclic to establish a 10- to 15-degree dive angle. Maintain a constant power setting (power required to maintain straight-and-level flight prior to entry) and constant trim. Apply additional right pedal as airspeed increases. Maintain a constant dive angle until the recovery. Start the recovery by verifying cruise torque is applied and smoothly applying aft cyclic at an altitude that will allow the recovery to be completed before reaching computed Vne or descending below 500 feet AGL.

   b. Steep. From straight-and-level flight at assigned altitude and airspeed, smoothly apply forward cyclic to establish a 25- to 30-degree dive angle. Maintain a constant power setting (power required to maintain straight-and-level flight at 60 KTAS); this does not correlate to a fixed collective position and constant trim. Apply additional right pedal as the airspeed increases. Maintain a constant dive angle until the recovery. Airspeed and rate of descent will increase rapidly in a steep dive. Start the recovery early enough to complete it before reaching computed Vne or descending below 500 feet AGL.

c. Dive recovery techniques. Straight ahead dive recovery is not always feasible. By incorporating a left or right turn into the dive recovery, descent arrest occurs with a change of aircraft direction. This maneuver is accomplished by turning the aircraft simultaneously as dive pullout is being accomplished. Additionally, sufficient power margin may not be available. During minimum available power dive recovery, aft cyclic input is reduced as g-loading builds and the aircraft is allowed to fly out of a dive as opposed to attempting to establish a climb. During dive recoveries, the P* is prohibited from performing any other task that is not directly related to aircraft control. The P* shall remain focused outside during the dive recovery.

d. Low altitude warning recovery. Should at any time the LOW ALTITUDE WARNING audio sound, the aircrew shall give their sole attention to placing the aircraft back above the minimum altitude. The P* will ensure that the nose of the aircraft is placed equal to or above the horizon prior to adding power to preclude accelerating, descending flight. Tactical play, radio transmissions, and nonessential intercommunication system (ICS) shall cease until the P* states "BACK ABOVE" to the P.

Note 1: Excessive bank angles during recovery offset lift from weight and may require additional recovery altitude. The nose of the aircraft should be raised to the horizon prior to initiation of a turn to arrest the rate of descent of the dive.

Note 2: The collective in a 2G recovery will decrease to the full down position if not checked by the P*.

Note 3: The normal tendency during the recovery pullout from a step dive angle is for failure of the P* to simultaneously recover from the dive and maintain the power setting at or above the cruise entry value.

Note 4: The entry altitude and airspeed for this task is for training and evaluation purposes only. Refer to Task 1422, Perform Firing Techniques to determine entry airspeed, entry altitude, dive angle, recovery airspeed, and recovery altitude when performing diving fire.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Altitude, apparent ground speed, and rate of closure are difficult to estimate at night.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. Rapid evasive maneuvers will be more hazardous due to division of attention and limited visibility. Be particularly aware of aircraft altitude and three-dimensional position in relation to threat, obstacles, and hazards. Proper sequence and timing is critical. Consider using cruise mode symbology to have the pitch ladder available for orientation.
2. As airspeed increases, altitude above the obstacles should also increase. Bank angles should be commensurate with ambient light and altitude above the terrain. Using NVG without symbology display will require greater crew coordination to monitor torque, airspeed, trim, and rates of descent information not present in the NVG.

CAUTION

If conducting alternate dive recovery techniques according to Task 2127, flight crews should be aware that after exceeding a roll attitude of 90 degrees, the turn-rate indicator on the flight page will be unreliable for 1 minute and usually be fixed at full deflection (left or right). Aircrews should disregard the turn-rate indicator and cross-check other flight page parameters (that is, attitude, heading, torque, airspeed, trim, and altimeter) to maintain aircraft control while maintaining the aircraft in level flight until the turn-rate indicator returns to center.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1416

Perform weapons initialization procedures

> **CAUTION**
> Do not weapons action switch (WAS) the gun while ground taxiing. The aircraft's squat switch may not inhibit the gun from striking the ground

CONDITIONS: In an AH-64D helicopter with the 30-millimeter (mm) gun turret area and the wing pylons clear, or in an AH-64D simulator.

STANDARDS: Appropriate common standards and the following:

1. Conduct weapons operational check in accordance with TM 1-1520-251-10/
TM 1-1520-251-CL.
2. Determine the status of the weapon systems.

DESCRIPTION:

1. Crew actions.

a. The crew will perform weapon system initialization procedures on all flights/missions that involve weapon systems use. The operational checks will be coordinated and accomplished as a crew. These procedures will determine the status and operation of each weapon system and permit firing of each system with minimal switch positioning.

b. The copilot gunner (CPG) (front seat crewmember) will control the coordination of weapon initialization procedural checks unless the pilot in command (PC) directs otherwise. The crew will determine what effect a weapon system malfunction will have on the assigned mission. Inform appropriate personnel of aircraft's status and record any discrepancies on DA Form 2408-13-1 (*Aircraft Status Information Record*).

2 Procedures.

a. The initialization of the weapon systems begins during pre-mission planning with the programming of the data transfer cartridge (DTC). Selections for the default power-up configuration of each weapon system should be entered or verified for the mission load.

b. Upon arriving at the aircraft, the crew will conduct armament safety procedures and preflight checks in accordance with the TM 1-1520-251-10/TM 1-1520-251-10CL. During the after starting APU checks, the pilot (PLT) (backseat crewmember) will load applicable DTC data into the aircraft.

c. After the auxiliary power unit (APU) is started, the CPG will alert the PLT when he is ready to begin the weapons system check (weapons operational) in accordance with the TM 1-1520-251-CL. The PLT will acknowledge the CPG and will announce that he is ready to continue with the weapons operational checks or will coordinate otherwise.

d. The crew will determine the operational status of each weapon system and, when a deficiency is noted, determine its effect on the mission. The pertinent weapon's (WPN's) page for each weapon system should be evaluated during the WPN operational checks. The PC will report weapon system deficiencies to pertinent personnel as soon as possible and ensure that appropriate write-ups are recorded on DA Form 2408-13.

Note 1: Each crewmember should have one multipurpose display (MPD) with the opposite crewmember's sight displayed, during the weapons initialization checks.

Note 2: When a weapon discrepancy is noted, the discrepant weapon system should be further checked by activating the pertinent data management system (DMS) weapons initiated built-in test (IBIT) button(s).

Note 3: This task should be completed immediately after rearming, prior to departing an area where maintenance support is available. Armed power, as a part of weapons initialization checks, is not required when local procedures prohibit (for example, range, forward arming and refueling point [FARP]). Manually rotating the missile launcher arm/safe switch to arm will preclude the need to apply aircraft arm power to initialize the missile system.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator. The crew should conduct weapon system initialization during regularly scheduled training flights to exercise aircraft armament systems and sustain crew proficiency. The PLT/CPG should enable the weapon page train mode to enhance weapon system training.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1422

PERFORM FIRING TECHNIQUES

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, with aircraft weapons operational checks completed, and given a target to engage.

STANDARDS: Appropriate common standards and the following:

1. Identify the target.
2. Formulate an attack plan (TPM-R).
3. Determine the attack pattern or direction.
4. Select the appropriate munitions.
5. Determine the range to the target.
6. Set low altitude warning on the radar altimeter to the desired recovery altitude (if appropriate).
7. Employ firing techniques.
8. Perform LOW ALTITUDE WARNING recovery if aircraft is allowed to descend below the recovery altitude.

DESCRIPTION:

1. Crew duties.

a. The pilot on the controls (P*)/pilot not on the controls (P) will determine the range to the target.

b. The pilot in command (PC) will evaluate the situation using the applicable factors of mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC). The PC will select, or supervise the selection of the appropriate weapon system and type of fire.

c. The crewmember not engaging with a weapon system will focus his attention outside the aircraft to assist with obstacle avoidance.

d. The P will operate the SAFE/ARM button.

e. The PC will determine the appropriate safe level of the armament system for the firing method being employed. The critical task for all engagement is maintaining situational awareness and aircraft control. Any one of the three levels below will ensure that the weapons system will not fire. Appropriate levels of aircraft system safing are defined as:

(1)Weapons trigger switch released.

(2)Weapons action switch deselected.

(3)SAFE/ARM button – SAFE

f. Low Altitude Warning Recovery. Should at any time the LOW ALTITUDE WARNING audio sound, the aircrew shall give their sole attention to placing the aircraft back above the minimum altitude. The P* will ensure that the nose of the aircraft is placed equal to or above the horizon prior to adding power to preclude accelerating, descending flight. Tactical play, radio transmissions, and nonessential inter communication system (ICS) shall cease until the P* states "BACK ABOVE" to the P.

2. Procedures.

a. Attack plan (TPM-R). The first of the critical elements in performing the proper technique of fire is to develop an attack plan. The attack plan is the initial step developed by the crew prior to engaging a target. The crew must understand these basic elements along with associated weapon systems and types of munitions to successfully terminate the threat. The basic elements of the attack plan are technique, pattern/attack direction, munitions, and range.

b. Techniques of fire.

(1) Diving/running fire initial point. The crew selects an initial point about 8 to 10 kilometers from the target. The initial point should be an identifiable terrain feature. The initial point is selected primarily for security and as a function of the desired route to the target. Fly a holding pattern in a secure area. Select an altitude and airspeed appropriate for the environmental conditions as well as the tactical situation. Be aware that predictable actions will make it simple for threat forces to engage and defeat attack helicopter assets. The aircraft departs the initial point toward the target flying contour, using terrain to mask the approach. Longer ranges are preferred for co-op rocket engagements due to the crew firing technique.

(2) Diving fire. Diving fire offers the advantages of reduced vulnerability to small arms fire, increased armament load, improved accuracy, and better target acquisition and tracking capabilities. The entry altitude, entry airspeed, dive angle, and recovery altitude will depend on the threat, tactical mission profile, ambient weather conditions, aircraft gross weight, and density altitude. The PC will establish the entry altitude and airspeed and determine the minimum recovery altitude. Aircraft control is most critical when engaging targets with rockets. Changes in pitch attitude and relative wind affect rockets as they leave the launcher. Regardless of the engagement technique used, aircrews should use the four Ts—target, torque, trim, and target. The following describes the sequence.

(a) Target verified. Crews verify that they are engaging the correct target, and that weapons symbology is correctly aligned. The pilot may select key terrain to assist in lining up on the target.

(b) Torque verified. The pilot verifies the torque required to maintain dive entry altitude and does not change it. Any torque changes during the firing sequence will affect the distance that the rockets fly based on the changed induced flow from the rotor system. The pilot will likely have to increase collective throughout the dive to maintain a constant torque setting.

(c) Trim verified. The trim of the aircraft includes both horizontal and vertical trim. The pilot should verify and adjust the pitch attitude (vertical trim) for the specific range with the cyclic. The pilot should verify and adjust the trim of the aircraft (horizontal trim) with the pedals before firing. An out-of-trim condition will deflect the rockets toward the trim ball. That is, if the nose of the aircraft is out of trim to the left (right sideslip), the rockets will plane into the relative wind to the right, and vice versa.

(d) Target re-verified. Finally, the crew re-verifies the correct target and symbology alignment.

Note1: While maneuvering and tracking a target with Linear Motion Compensation (LMC), an accurate dynamic range must be maintained to target to ease the CPGs tracking workload.

Note2: If dive angles exceed 45 degrees, the weapons system will be inhibited and the message “ACCEL LIMIT” will appear in the WEAPONS INHIBIT STATUS FIELD. The weapons will be inhibited from firing.

(3) Running fire. Running fire is an effective weapons delivery technique to use during terrain flight, especially in regions where cover, concealment, and environmental conditions hamper or limit stationary weapons delivery techniques, or antiaircraft artillery (AAA)/surface to air missile (SAM) threats may prevent the use of diving fire. Running fire is performed at airspeeds above effective transitional lift (ETL) and offers a mix of aircraft survivability and weapons accuracy. Airspeeds above 30 knots eliminate rotor downwash

error and provide increased accuracy. Proper crew coordination and section/team briefings are essential to producing continuous fires on the target.

(a) The aircraft departs the initial point toward the target flying contour, using terrain to mask the approach.

(b) At maximum usable sensor range, the pilot starts a climb by performing a "bump up" maneuver (as appropriate) to unmask the active line of sight (LOS) and acquire the target. Distance permitting, once the crew acquires and stores the target, the pilot may re-mask the aircraft and continue inbound until within weapons engagement range.

(c) Approximately 500 meters prior to the desired engagement range, the crew performs another bump to reestablish with the target. The magnitude of the bump will depend on threat, friendly situation, range, and desired beaten zone. Closer engagement ranges allow for a smaller beaten zone and more accurate fires, but may make the crew more vulnerable to enemy fire. At the top of the bump, proceed as in diving fire, using the four Ts.

(d) Outside the maximum effective range of the threat weapons systems, the pilot begins his break and uses terrain to cover his departure from the target area. Closer engagement ranges will require a break that allows for a safe distance from the exploding ordnance and possible secondary explosions.

(e) Egress the target area at the selected egress point or prior to threat acquisition or weapons range. Return to the initial point and re-enter the terrain flight holding pattern, or if re-attack is necessary, continue with the briefed attack pattern, or modify as necessary.

Note 1: Do not fly over the target in running fire.

Note 2: Suggested aircraft speed for weapons delivery and maneuver should be at or near predicted maximum rate of climb airspeed. This will provide for a stable delivery platform while maintaining optimum power settings. In an emergency, or during evasive maneuvers, the aircrew should have sufficient power available to accelerate and depart the area.

Note 3: To avoid fratricide, do not engage when target area inter-visibility is lost or target confirmation is questionable.

Note 4: During running fire, the gun may be employed off axis. Autonomous SAL Hellfire engagements may be designated off axis (up to the gimbal limits of the TADS). Running fire off axis engagements will maintain standoff with the enemy longer than if the aircraft heading remains aligned with the gun target line.

Note 5: While maneuvering and tracking a target with LMC, an accurate dynamic range must be maintained to target to ease the CPGs tracking workload.

(4) Hover fire. Hover fire is delivered when the helicopter is below effective translational lift, either in-ground effect or out-of-ground effect (OGE). It may be stationary or moving, but movement during hover fire is always below ETL airspeed. When using this technique, station time or armament load may need to be reduced because of power limitations. Because the aircraft is less stable at a hover, the accuracy of fin-stabilized weapon systems is reduced. The weapons processor will compensate for certain weapon system anomalies as well as exterior ballistic solutions. When possible, move the aircraft between engagements and use point-type weapons as the preferred method of attack.

(a) During high temperature, high-pressure altitude, and/or high gross-weight conditions, many aircraft hover OGE near their maximum torque available or are unable to hover OGE at all. Pilots must make smooth, deliberate control inputs when narrow power margins exist.

Note 2: The signal processor (SP) provides dynamic environmental and gross weight (for rotor downwash, based on an OGE hover) calculations to the weapons processor (WP) for ballistic solution equation. Factors for ballistic solution include (but are not limited to) dynamic temperature, altitude, and aircraft gross weight (based on SP calculation as observed in the performance [PERF] page current [CUR] mode gross weight window).

Note 3: When hovering (below ETL) at an altitude below 33 feet above ground level (AGL) (radar) with the missiles actioned, the pylons will elevate to 4 degrees above the EGI's inertial horizon. At 33 feet and above, the pylons will depress as commanded by WP.

c. Pattern or attack direction. Select the attack pattern or the direction of planned attack. METT-TC, along with power available, will influence the decision to maintain the aircraft in a maneuvering profile or establish a hover to engage targets. The patterns available are the racetrack, cloverleaf, L-pattern or the figure (Task 2043).

d. Munitions. Select the appropriate type of munitions for the target to be engaged. The type of target and concern for collateral damage may limit certain types of munitions. Consideration of danger close to friendly positions is required for close combat operations. If possible, use maximum standoff of selected weapon system.

e. Range. The range to the target is critical for accurate employment of all weapon systems. Ranging can be done with the fire control radar (FCR), laser, autorange, navigation (NAV) range, point review, cursor information, or visually using map reconnaissance. Accurate range to the threat is essential for the crew to select the bump point, start fire line, stop fire line, breakpoint, and initial point (IP) or re-attack point when conducting maneuvering flight.

NIGHT OR NIGHT VISION GOGGLES (NVG) CONSIDERATIONS: The crew must consider ambient light levels and available contrast, as well as the factors of METT-TC, when selecting the type of fire. Difficulty in determining aircraft altitude and rate of closure and detecting obstacles will increase the fatigue level of the aircrew. The crew must use proper scanning techniques to avoid obstacles and to prevent spatial disorientation.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft. Evaluation may be conducted using the weapons TRAIN mode or a combination of the modes.

REFERENCES: Appropriate common references.

TASK 1458

Engage target with point target weapons system

CONDITIONS: This task includes the following three conditions:

1. In an AH-64D helicopter with the weapon train mode enabled and one or more semiactive laser (SAL) Hellfire training missiles installed, target acquisition and designation sight (TADS) internal and outfront boresight completed, weapons systems initialization completed, and if installed, fire control radar (FCR) operational checks completed and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

2. In an AH-64D helicopter on a gunnery range with live missiles loaded, TADS internal and outfront boresight completed, weapons systems initialization completed, and, if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

3. In an AH-64D simulator with TADS internal and outfront boresight completed, weapons systems initialization completed, and, if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

Note: Satisfactorily completing any one of the above conditions will satisfy the minimum requirement for the standardization evaluation. Completing any one of the three conditions will satisfy the gunnery tables III and IV requirement for readiness level (RL) 2 progression and an aviator's task iteration requirement. A task iteration worksheet listing all three conditions separately is not necessary.

STANDARDS: Appropriate common standards and the following:

1. Select the missile type SAL or radio frequency (RF).
2. Select the SAL missile lock on before launch (LOBL) or lock on after launch (LOAL) means of delivery.
3. Select and employ the SAL missile-firing mode (normal, rapid, ripple, or manual).
4. Select the SAL missile trajectory (TRAJ) that applies to the tactical situation.
5. Select and employ autonomous SAL missile designation procedures.
6. Select and employ remote SAL missile procedures.
    a. Transmit a request for a remote SAL missile engagement.
    b. Provide precision coded laser energy on the target in accordance with mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC).
    c. Receive and process a remote SAL missile mission request.
7. Engage targets with the RF missile.
    a. Autonomous RF with FCR selected as sight.
    b. Autonomous RF with TADS selected as sight.
    c. Remote RF after receiving radar frequency missile handover (RFHO).

DESCRIPTION:

1. Crew actions.
    a. The crewmember performing the target engagement will announce when ready to engage and when the engagement is complete. He will announce which side of the aircraft that the

missile will launch from, type of missile, whether it is a single target or multiple targets, and each missile firing.

b. The opposite crewmember will acknowledge that the crewmember performing the target engagement is ready to engage and will confirm appropriate actions through the high action display (HAD) or one multipurpose display (MPD) with the opposite crewmember's pertinent video as selected through the video select (VSEL) display option.

c. The P* can also access his own independent weapons page and review the aircraft's active missile status as pertinent to the engagement. The P* will make an announcement whenever he intends to unmask, remask, or reposition the aircraft and will maneuver the aircraft into pre-launch constraints.

Note: Selection and display of the opposite crewmember's video improves crew coordination and increases situational awareness during the execution of this task.

2. Procedures. SAL and RF procedures are as follows:

a. SAL missile. Engagements will be conducted either autonomously against a direct target by the own ship or remotely in coordination with a remote laser range finder/designator (LRFD) aircraft or ground laser.

(1) Accessing, setting, or verifying the missile weapon's (MSL WPN) page. At some point prior to actioning the missile system, the pertinent copilot-gunner (CPG) (front seat crewmember) or pilot (PLT) (backseat crewmember) desiring to perform the missile engagement must validate the MSL WPN page option settings prior to engaging a given target.

(a) Missile type (TYPE) options. Through either the PLT or CPG independent weapon's page, the crewmember performing the Hellfire target engagement must confirm that the second line of the missile TYPE data field window displays SAL as the active missile type. To access and change the missile type, the crewmember must first enable HMD or TADS as the active sight. The weapon's processor continuously reads the TYPE data field for the independent weapon's pages of both crewmembers.

Note 1: With the exception of the pulse interval modulation/pulse repetition frequency (PIM/PRF) codes, their corresponding channels, and the LRFD first/last button, the PLT and CPG weapon's pages are essentially independent. Independent weapon's pages provide each crewmember with the ability to establish preferences that may be different, not standardized, from that of the opposite crewmember.

Note 2: Whenever the selected sight is TADS or HMD, the default selection will always default to SAL, regardless of the respective missile load and inventory. Whenever an AH-64D with radar is employed and either crewmember has enabled his sight select to FCR, the missile type will always default to RF with the type button barriered, regardless of the missile type inventory. Whenever target acquisition is employed through use of the FCR, the respective crewmember will have to first action the sight select switch to either TADS or HMD, as appropriate, to enable and access the missile type button, regardless of onboard missile type inventory.

(b) Missile channels (CHAN), LRFD/laser spot tracker (LST), and laser code/frequency (FREQ) group options.

1. SAL missile priority/alternate (PRI/ALT) channel options. The crewmember performing the Hellfire target engagement must confirm that the second line of the *PRI (priority) and *ALT (alternate) missile channel data

field windows, or the SAL missile status window, both display the desired PIM or PRF missile channels. Three missile icons (*if missiles are available) will display an “L” over an “S” and be replaced by the pertinent priority or alternate channel code over “R,” once the missiles have spun up, for both the PRI and ALT missiles. The next missile to be fired will be displayed in normal video. Only one missile will be displayed with the appropriate coding when the manual mode has been enabled. Selecting the current alternate (ALT) channel as the priority channel will cause the previous priority and alternate channels to switch states, instantly reassigning the priority missile codes. To select a different channel from the 16 available options, the crewmember will have to access the channel (CHAN) page through the CHAN button. After selecting the desired primary channels, the crewmember will return to the weapon’s missile page by de-selecting CHAN or by selecting the weapon fixed action button (WPN FAB).

Note 1: Alternate channel missiles cannot be fired; they are maintained in a ready (R) or tracking (T) status only. When the PRI missile channel data field is initially actuated to prioritize a channel, the weapons processor (WP) will automatically code the next missile(s) to fire in sequence with the priority channel laser code.

Note 2: The WPN missile channel quantity default logic is set for three missiles and cannot be altered by the crew. In the normal (NORM) and manual (MAN) mode, regardless of the actual inventoried quantity of SAL missiles, the WP will always reserve three missiles for the priority channel before any missiles will be allocated to the alternate channel. In the ripple (RIPL) mode, the quantity is evenly divided between the two channels, with the priority channel assigned the extra missile in the case of an odd number of missiles available.

Note 3: SAL1 missile channel/frequencies are assigned against 16 aircraft (PRF) laser code letters that range from A through R. The code letters “I” and “O” were omitted to preclude confusion with the numbers one (1) and zero (0).

2. SAL SEL button. The SAL select (SEL) button is used to select the type of SAL missile. Depressing the SAL SEL button will allow the CPG or PLT to select automatic (AUTO), SAL1, or SAL2. Basic SAL missiles are identified as SAL1, and Hellfire II missiles are designated as SAL2.

Note: When AUTO is selected, the WP will designate SAL2 missiles as the priority until all SAL2 missiles are expended.

3. LRFD/LST and laser code/frequency group options. Prior to initiating autonomous or remote laser designation, the crewmember performing the Hellfire target engagement must verify the 16 loaded PRFs, the LRFD and LST channel selections, and make changes as necessary. Select the code button and input a desired laser frequency between 1111 and 1788, press the keyboard unit (KU) enter button, and note the desired change on the frequency page. If more than one frequency requires changing, repeat the steps until all the desired changes have been made.

Note: The aircraft will default initialize with 16 (A through R) PRFs (FREQ) loaded spanning the minimum (1111) and maximum (1788) frequency limits. Through the data transfer cartridge (DTC), the aircraft can initialize PRI or ALT laser channels with any of the 16 onboard frequencies (A through R). The WP will continuously read the PRI and ALT laser channel data fields.

(c) SAL missile mode options. The crewmember performing the Hellfire target engagement must confirm that the second line of the mode status data field window displays the desired SAL missile firing mode option. The weapon's processor will automatically select, spin up, and encode SAL missiles according to what the respective crewmember has selected on his independent weapon's page, inclusive of the PRI and ALT selected CHAN and its corresponding code that is representative of a selected laser FREQ. Anytime a crewmember actions (WAS) SAL missiles, the WP will continuously read the mode switch on that crewmember's independent weapon's page. The aircraft's default initialization will enable the SAL missile in the NORM mode. However, the aircraft is capable of initializing in any of the three modes via the data transfer cartridge (DTC).

1. Rapid fire mode definition (non-weapon's processor mode). Rapid fire is a mode of fire controlled by the PLT or CPG, as opposed to the WP, which involves firing multiple SAL missiles with the same laser code or multiple RF missiles. It is used to rapidly, but accurately, engage multiple targets in the shortest span of time possible within the constraints of the tactical situation. Rapid-fire engagements may be employed for autonomous or remote engagements and for LOBL or LOAL engagements.

2. Ripple fire mode definition (WP auto mode and manual mode). Ripple fire is a mode of fire that employs multiple missiles launched with two, or more, unique laser channel codes. Ripple fire engagements require at least two laser designators.

   a. Ripple fire is employed during autonomous and remote or double-remote missions using LOBL, LOAL, or some combination thereof. As with any remote Hellfire engagement, close coordination with the remote designator (air or ground) is required. This coordination must ensure that the laser offset angle, designator safety zone, laser code, and laser-on time requirements are met.

   b. Ripple fire engagements can be accomplished automatically (mode RIPL) or manually (mode NORM, PRI CHAN, and ALT CHAN fields switch moded). The RIPL mode requires both the PRI and ALT channel missiles to possess different codes. If this requirement is not met, the missile system will default to NORM even though the RIPL mode is selected. In the RIPL mode, the WP will perform the same functions as in the NORM mode but will automatically reverse the priority and alternate missile channels after each missile firing. The RIPL mode missile quantity defaults to three missiles if sufficient quantities are available. In the RIPL mode, the quantity is evenly divided between the two channels, with the priority channel assigned the extra missile in the case of an odd number of missiles available.

3. Manual advance. In the MAN mode, the WP will perform the same functions as in the NORM mode except that the MAN ADV switch is enabled, allowing the crewmember to select and spin up a single missile to the priority channel for firing. This allows the crewmember to manually select a specific missile for firing or initiate the separation of the ice protection dome on a crew-selected missile.

(d) SAL missile trajectory (TRAJ) options.

1. Hellfire target engagements. To access and change the current TRAJ, the crewmember must activate the TRAJ button. Upon activation, the TRAJ group option window will appear and display: direct (DIR); high (HI), and low (LO), respectively. SAL automatic LOBL moding will occur anytime that a priority channel missile acquires and locks onto properly coded laser energy return prior to missile launch. The automatic function occurs without regard to the TRAJ button. The WP continuously reads the selected TRAJ data field pertaining to the crewmember's independent weapon's page. The aircraft's default initialization will enable the SAL trajectory to DIR. However, the aircraft is capable of initializing in any of the three trajectories via the DTC.

2. SAL missile trajectory constraints box driver factors. The aircrew must understand what drives (controls) the SAL missile constraints box when a specific trajectory has been selected. During a SAL missile LOBL engagement, the LOAL constraints box will change to LOBL when the priority channel track (PRI CHAN TRK) message appears in the HAD weapon status field and is driven by the missile seeker. During a LOAL DIR engagement, the constraints box is driven by TADS, HMD, or night vision system (NVS) as appropriate. During a LOAL LO or HI engagement, the constraints box is driven by an acquired (cursor or file) target/threat, waypoint, hazard, or control measure from the aircraft's coordinate database; or a cursor acquired (ACQ) FCR or radar frequency interferometer (RFI) target.

(e) First or last LRFD option. The first/last button allows the LRFD system to gain a certain amount of integrity for range only solutions during certain battlefield environment conditions. With first in the LRFD data field, the laser return from the scene of interest determines the range that the WP uses to compute ballistic equations. With last in the LRFD data field, the WP uses the last laser return. Unless altered through the DTC, the aircraft defaults LRFD/first at startup. If either crewmember observes unrealistic changes in the laser range being displayed (for example, range changes that cannot be reasonably attributed to the aircraft), the last position can be selected.

(f) Weapon's page SAL missile inventory and status indications. The weapon's page provides the crewmember with the current missile/launcher inventory and status, weapons action switch (WAS) indication, weapon's arm/safe (SAFE/ARM) indication, weapon's action indication, selected sight indication, and acquisition source indication. When the WP detects that SAL missiles are present on any of the launcher rails, SAL missile icons (identified with one horizontal line approximating the bottom of the graphic SAL seeker dome) will display to reflect this condition. Both RF and SAL missiles can be loaded on the same pylons and racks.

1. As soon as the WP selects, prioritizes, codes, and spins up a SAL missile, its type, status, and fault condition information will display within the missile icon symbol. The weapon's page will also display icons representative of empty missile launcher rails. Each empty rail is identified by a single vertical line icon symbol. Missile launcher rail icons will display and replace missile icons as soon as the WP determines that a launcher rail is empty (either at power up or after a missile was successfully launched). Like the individual missile icons, the missile launcher rail icons will display inverse video when the weapons missile page is selected.

2. Missile launcher fail/safe icons are displayed when a launcher fail condition is detected or when the launcher SAFE/ARM switch is in the safe position. The fail/safe icon is identified as a vertical rectangle with either fail or safe longitudinally displayed within the center of the icon. When displayed, the fail/safe icons replace the missile or rail icons.

(2) SAL missile autonomous target engagements. The WP was designed to exclusively provide the CPG with autonomous SAL missile HAD messages. CPG WP profiled autonomous HAD messages require the TADS to be the selected LOS, the missile PRI channel must match the LRFD channel, and the laser button must be on regardless of the selected missile trajectory. The PLT is not capable of independently engaging a SAL missile target autonomously; at best, the PLT could cooperatively engage a target autonomously with a SAL missile while the CPG lazes a target with the same LRFD channel that the PLT has selected for the priority channel missile.

(a) Autonomous LOBL engagement (general pre-launch). The aircrew initially acquires a potential SAL missile target through any of the aircraft's acquisition sources, for example, FCR, RFI, TADS, pilot helmet sight (PHS)/gunner helmet sight (GHS), or by any of the various methods of voice, digital, and laser seeker (SKR) target handovers. The aircrew will then identify the target, correlate SAL missile employment parameters, and then determine the trajectory that will be employed for the engagement. To perform an autonomous SAL LOBL missile trajectory target engagement, the CPG must first select TADS as the sensor (if not already selected), track the target, and prepare to laser designate the target with matching LRFD and missile coded laser energy. If the FCR was initially used to acquire the target, change RF missile type to SAL. The CPG will then select either the TADS narrow field of view (NFOV) or zoom field of view (ZFOV) in conjunction with either the TADS-FLIR (for example, night, low horizon sun, and smoke) or TADS-DTV (day) as situationally appropriate and then action (WAS) the missile system.

1. SAL missile weapons action and autonomous LOBL pre-launch HAD messages/missile constraints box. The crewmember desiring to action the missile system will select and enable the missile (MSL) segment of the weapons action switch (WAS) by placing the switch to MSL. Upon actioning the missile WAS, the WP commands the aircraft's missile configured independent pylons to articulate/mode into position as commanded by the WP in correlation with the missile option selections. With a priority missile spun up, the pilot who actioned the missiles will initially observe one of the following pertinent autonomous messages in his HAD weapon status field: 1) *DIR, LO, or HI MAN; 2) *DIR, LO, or HI NORM; 3) *DIR, LO, or HI RIPL; 4) *PRI CHAN TRK; or 5) *2 CHAN TRACK. The pilot who has not actioned missiles will observe either PMSL or CMSL, as appropriate, in his HAD weapon control status field. The arm/safe status window on both crewmembers' weapon's pages will become cross-hatched on the border to indicate that the missiles are actioned. A weapons/flight LOAL or LOBL missile constraints box symbol (LOAL ±7.5degrees, LOBL± 20degrees) will display on both crewmembers HDU and on the TADS HOD/HDD.

Note 1: The WP will present an autonomous SAL missile engagement profile to the CPG whenever the PRI channel is the same as the LRFD channel.

Note 2: The default LOBL trajectory weapon status field display messages, PRI CHAN TRK or 2 CHAN TRACK, require the priority SAL missile's seeker to detect properly coded laser energy before a HAD message will be displayed.

Note 3: When a weapon system is actioned while the SAFE/ARM indicator is safe, a safe message will display in the weapon inhibit section of the HAD of the pilot whose weapons action switched the missile system.

2. Autonomous laser designation and subsequent pre-launch HAD messages/missile constraints box. With the desired initial missile TRAJ selected (DIR, LO, or HI) and with the TADS LOS correctly placed on the target, the CPG initiates laser designation by pulling the LRFD trigger (ORT RHG) to the second detent (first detent is for laser ranging only). The CPG verifies the presence of coded laser energy by noting the presence of an asterisk adjacent to the displayed laser range. Without regard to the weapon's page missile TRAJ selection, the priority channel missile's seeker will always attempt to look toward the TADS LOS when the LRFD is being fired on the same code as the priority channel missile. When the priority channel's missile seeker acquires and locks onto the target's reflected laser energy, the missile weapons action switched crewmember's HAD weapons status section message will change to PRI CHAN TRACK. Both crewmembers will be provided with a LOBL constraints box display on their symbology. Missile firing is inhibited anytime that the CPG or PLT observes the HAD BACKSCATTER weapon inhibit status field message (safety inhibit). The BACKSCATTER inhibit prevents firing of autonomous engagements when TADS LOS and missile LOS differ by more than 2 degrees. The BACKSCATTER inhibit cannot be overridden by the trigger's second detent, the crew must instead apply backscatter avoidance techniques in accordance with FM 3-40.140. The aircrew will continue with either the LOBL engagement or engage with LOAL once the backscatter phenomenon is no longer relevant.

Note 1: A recent TADS laser internal boresight will increase the SAL missile's probability of hit. (Refer to Task 1448 for specific information.)

Note 2: The SAL missile probability of hit will be reduced anytime that an autonomous missile is fired after an ENERGY LOW HAD sight status field message is displayed to the CPG.

3. Autonomous LOBL pre-launch HAD messages (firing crewmember). When the priority channel is tracking coded laser energy, the message PRI CHAN TRACK will be displayed in the HAD weapons status field. If two missile channels are tracking laser energy on the proper codes, the message 2 CHN TRACK will display in the crewmember's HAD weapon's status field. In both instances, the priority channel missile is tracking laser energy and, consequently, the missile trajectory mode automatically reverts to LOBL. If the alternate missile channel is tracking laser energy, the message ALT CHAN TRACK will display without a constraint's box. Alternate channel missiles cannot be fired even when they are tracking. To launch an ALT CHAN TRACK missile, the missile weapons action switched crewmember will first have to select the ALT channel as the PRI channel. If neither channel is tracking laser energy, the missile delivery and fire mode will be displayed in the HAD and weapons status section, for example: 1) DIR, LO, or HI MAN;

2) DIR, LO, or HI NORM; 3) DIR, LO, or HI RIPL. If the missile system is weapons action switched with SAFE/ARM indicator display in safe, a safe inhibit message will be displayed in the HAD weapon's inhibit display field.

Note: The weapon status field display is unique to each crewmember and represents an individual's weapon's status. The only way for a crewmember to view the weapon's status field display of the opposite crewmember is through the VSEL display options as accessed and situationally selected through the video (VID) page.

4. Autonomous LOBL pre-launch HAD messages (assisting crewmember). The nonmissile weapons action switched crewmember assisting with the LOBL Hellfire target engagement will normally be provided with two, and occasionally three, pertinent pieces of information displayed on the HDU: the missile constraints box, the weapon control status field message, and weapon's inhibit message (situation depending). The HAD weapon control field message will either display CMSL or PMSL as situationally appropriate.

5. Autonomous SAL missile LOBL pre-launch constraints.

(a) A LOAL pre-launch constraints box will initially be displayed on the PLT and CPG sensors until the CPG designates the target with proper coded laser (autonomous LOAL DIR constraints are ±7.5 degrees from the TADS LOS, while LOAL LO/HI are ±7.5 degrees from the acquired [ACQ] WP, TGT, THREAT, HAZARD, or CM). Once the SAL missile's seeker locks onto properly coded laser energy, a LOBL pre-launch constraints box will appear indicating the direction to steer the helicopter to achieve missile constraints (LOBL constraints are ±20 degrees as referenced from the tracking missile seeker's LOS).

(b) An out-of-constraints box will appear dashed, while an in-constraints box will appear solid when the applicable constraints are met. Steer the nose of the aircraft towards the constraints box until it changes from dashed to solid. Attempt to center the constraints box along the referenced LOS to increase the missile's probability of hit.

(b) Autonomous LOAL-DIR engagement. The WP's built-in logic will only permit the CPG to perform an autonomous SAL LOAL DIR missile engagement and the sight must be TADS. An autonomous LOAL-DIR engagement should be performed whenever the aircrew determines that the lasing of a target prior to the missile's launch would not be desirable (threat laser detector capabilities or laser BACKSCATTER considerations). The aircrew will first acquire and identify a target to be engaged with a LOAL missile through any of the pertinent aircraft's acquisition sources. The aircrew will determine an accurate range to the target (FCR, manual, automatic, or the TSD acquisition (NAV) ranges can all be employed with the LOAL engagement for TOF countdown purposes).

1. SAL missile weapons action and autonomous LOAL-DIR pre-launch HAD messages/missile constraints. The crewmember desiring to action the missile system will select and enable the MSL segment of the WAS by placing the switch to MSL. Upon actioning the missile WAS, the WP commands the aircraft's missile configured independent pylons to articulate/mode into position as commanded by the WP in correlation with the missile option selections. With a priority missile spun up, the pilot who actioned the missiles will initially observe one of the following pertinent LOAL DIR messages in his HAD weapon status field: 1) DIR MAN; 2) DIR NORM; or 3) DIR RIPL. The pilot who did not action missiles will observe either PMSL or CMSL, as appropriate, in his HAD weapon control status field. The ARM/SAFE status window on both crewmembers' weapon's pages will become cross-hatched on the border to indicate that the missiles are actioned. A weapons/flight *LOAL missile constraints box symbol, representing 7.5º, will display on both crewmembers' HDU and on the TADS HOD/HDD.

2. Autonomous LOAL-DIR pre-launch weapon's page missile status messages. The weapon's page missile icons will display which missiles are ready with an "R" status message symbol and the next missile to be fired (flashing R) as well as the SAL missile's assigned code.

3. Autonomous LOAL-DIR pre-launch HAD messages of the opposite crewmember (assisting crewmember). The nonmissile weapons action switched crewmember assisting with the LOAL DIR Hellfire target engagement will normally be provided with information displayed on the HDU: the missile constraints box, the weapon control status field message, and the weapon's inhibit message (situation depending). The HAD weapon control field message will either be CMSL or PMSL as situationally appropriate. When possible, the assisting crewmember should VSEL the opposite crewmember's sight on one of his MPDs.

Note: Whenever the CPG weapons action switches missiles, the PLT will be provided with a missile constraints box. Whenever the PLT weapons action switches missiles, the CPG will not be provided with a missile constraints box.

4. Autonomous SAL missile LOAL DIR pre-launch constraints (firing crewmember). The appropriate missile constraints box symbology will display to both the PLT and CPG, indicating the direction to steer the helicopter to meet launch constraints. An out-of-constraints box will appear dashed and an in-constraints box will appear solid to both crewmembers. The constraints box directional characteristic depends on the active trajectory. LOAL symbology constraints are ±7.5 degrees and LOBL are ±20 degrees. Regardless of TRAJ, align the nose of the aircraft with an out-of-constraints box until it appears solid. Under certain LOBL conditions, tighter constraints standards may have to be met than what the constraints box actually depicts. When constraints are met, the box changes from dashed to solid lines. Normally, the PLT should attempt to center the constraints box along the referenced LOS to increase the probability of target hit.

(c) Autonomous LOAL-LO/HI missile engagements. The CPG could elect to autonomously engage a target from a defilade (mast) position with a laser delay. The CPG may elect to employ LOAL-LO or LOAL-HI in this and other situations. To perform an autonomous LOAL-LO/HI engagement, the CPG or PLT will have to first acquire (ACQ) a target through the aircraft's FCR or TADS, code both the PRI CHAN missile and LRFD with the same channels, and select LOAL-LO or LOAL-HI as the trajectory. As soon as the CPG selects the LOAL-LO or LOAL-HI trajectory and actions (WAS) the missiles, a LOAL LO/HI missile constraints box will appear in both crewmembers' displays. The missile constraints box represents ±7.5 degrees from the acquired (ACQ) WP, TGT, threat, hazard, or CM. An out-of-constraints box will appear dashed, while an in-constraints box will become solid when constraints are achieved. The CPG will note and confirm that a LO or HI NORM, LO or HI RIPL, or LO or HI MAN HAD message is displayed in his weapon's status field message section and that the desired ACQ source is displayed in his HAD acquisition status field message section. The PLT will note that a CMSL message is displayed in his weapon control status field message field. When ready, align the nose of the aircraft with an out-of-constraints box display until it appears solid. With a solid constraints box and all missile parameters achieved, the PLT or CPG may now launch the missile.

(3) Remote SAL missile target engagements. The designation of a target by a remote aircraft or ground designator potentially allows the launch aircraft to increase the stand off range from the target. Both the PLT and the CPG are able to engage targets with SAL missiles remotely with an equal degree of capability. A remote LOBL or LOAL engagement should be performed whenever the aircrew determines that the current mission situation requires and accommodates a remote Hellfire target engagement.

(a) Remote SAL missile weapons action and associated (LOBL, LOAL DIR, LOAL LO, and LOAL HI) pre-launch HAD messages/missile constraints. The crewmember desiring to action the missile system will select and enable the MSL segment of the weapons' action switch. Upon actioning the missile WAS, the WP commands the aircraft's missile configured independent pylons to articulate/mode into position as commanded by the WP in correlation with the missile option selections. With a priority missile spun up, the pilot who actioned the missiles will initially observe either DIR, LO, or HI MAN; DIR, LO, or HI NORM; DIR, LO, or HI RIPL; ALT CHAN TRACK; or PRI CHN TRACK in his HAD weapon status field. The pilot who did not action missiles will observe either PMSL or CMSL, as appropriate, in his HAD weapon control status field.

(1) The arm/safe status window on both crewmembers' WPN pages will become cross-hatched on the border to indicate that the missiles are actioned. A weapons/flight *LOAL missile constraints box symbol, representing 7.5^{O}, will display on both crewmembers' HDUs as well as the TADS HOD/HDD, and in the case of a remote LOBL, a 20^{O} constraints box will display when the priority channel missile's seeker locks on to properly coded laser energy.

(2) The WP will project a remote missile engagement when the pilot actions SAL missiles, regardless of the following factors: the LRFD's channel and the priority missile's channel, the CPG actions SAL missiles and HMD or NVS is the selected LOS, the CPG actions SAL missiles and the LRFD channel does not match the priority missile's channel, or the CPG actions SAL missiles and the LASER is off. The WP will exclusively display a remote message in the CPG's HAD sight status field whenever remote SAL missile requirements are detected by the WP. The remote message will never display on the PLT's HAD (the WP assumes that the PLT will always launch remote missiles).

(b) Remote SAL missile target engagement coordination. The aircrew will coordinate with the remote ground or aircraft designator and develop the techniques and procedures necessary to properly engage the remote target. As a minimum, the coordination will ensure that the applicable minimum/maximum ranges, maximum offset angles, horizontal and vertical safety zones, laser code, and laser-on time requirements can be met. Coordinate with the remote designator over a prebriefed voice or IDM radio net. When the remote designator is another AH-64D, or another IDM enabled aircraft, the crew should perform a PP query. The icon graphic of the remote aircraft will be displayed on the TSD when the PP RQST is answered, and stored as a control measure. This will aid the crew that initiated the query in determining if certain requirements can be met.

(c) Weapon's page remote SAL missile pre-launch status/inventory indications and messages. The weapon's page missile icons will display which missiles are ready with an "R" status message symbol and the next missile to be fired (flashing R) as well as the SAL missile's assigned code.

(d) Remote SAL missile TRAJ options. Remote SAL missile engagements include LOBL, LOAL DIR, LOAL LO, and LOAL HI trajectories (TRAJ) with either the NORM, RIPL, or MAN modes. The three critical considerations for determining which remote SAL missile TRAJ to employ includes: 1) range to target, 2) minimum cloud ceiling, and 3) desired constraints box drive source. The appropriate missile constraints box symbology will display to both the PLT and CPG, indicating the direction to steer the helicopter to meet launch constraints. The WP-computed LOS for LOAL-DIR missile constraints is driven by either the TADS, HMD, or NVS sensors, while LOBL constraints are driven by the tracking primary missile seeker, and LOAL-LO/HI are both driven by the acquired WP, CM, threat/target, or hazard point.

Note: The WP will command up to three SAL missiles to begin an overlapping scan pattern whenever the CPG has weapons action switched remote LOAL-DIR.

(e) Remote SAL missile pre-launch HAD messages (assisting crewmember). The non-missile weapons action switched crewmember assisting with the remote LOBL or LOAL Hellfire target engagement will normally be provided with information displayed on the HDU: the missile constraints box, the weapon control status field message, and the weapon's inhibit message (situation depending). The HAD weapon control field message will either be CMSL or PMSL, as situationally appropriate. When possible, the assisting crewmember should VSEL and display the opposite crewmember's sight on one of the MPDs to enhance situational awareness during the engagement.

(f) Remote SAL missile pre-launch constraints (firing crewmember). The appropriate missile trajectory constraints box symbology will be displayed to both the PLT and CPG, indicating the direction to steer the helicopter to achieve launch constraints. An out-of-constraints box will appear dashed and an in-constraints box will appear solid to both crewmembers. The constraints box directional characteristic depends on the active trajectory. LOAL-DIR, LOAL-LO, and LOAL-HI missile constraints are ±7.5 degrees and LOBL constraints are ±20 degrees. Regardless of TRAJ, align the nose of the aircraft with an out-of-constraints box display until it changes from dashed to solid. Under certain LOBL conditions, tighter constraints standards may have to be met than what the constraints box lines. Normally, the PLT should attempt to center the constraints box along the referenced LOS to increase the probability of target hit.

Note: The constraints box will remain dashed if the A/S indicator is displaying a safe indication.

(4) SAL missile launch/post launch HAD messages (TRAJ common). To launch a missile, lift the protective cover over the trigger switch and pull the trigger to the first detent; the WP initiates the launch sequence for the priority channel missile to be launched. If the priority channel missile code and the LRFD code are both the same and the laser has been moded on

(weapons UTIL page), the WP projects a profile for an autonomous SAL missile engagement. It then displays all the weapons status field messages appropriate for that launch (SIM launch, MSL launch, FIRE MSLS, LASE NN TGT, and HF TOF=NN) in the weapons status field message section of the HAD. If the launch status is go, the message MSL launch will display for two seconds in the HAD weapons status field message section (autonomous) or sight select status field message section (remote). (If the selected missile is a training missile, the message SIM launch will be displayed.) If missile umbilical separation occurs at or before the predicted time (approximately one and a half seconds), the launch message will be replaced by TOF = NN. This message shows the TOF from launch until impact based on the range displayed in the HAD. The TOF is initialized at launch, decreasing toward zero. At the same time, the icon status and inventory for that missile will disappear.

(a) When performing an autonomous SAL missile rapid-fire mode engagement and the priority channel is loaded with two or more missiles, the WP prompts the PLT or CPG to launch the next missile after 8 seconds have elapsed. It replaces the message: TOF = XX with FIRE . . . MISSILES for 2 seconds. The TOF then counts down until reaching minimum terminal guidance lase time. At that time, the TOF is replaced by the message: LASE 1 . . . TARGET until the TOF reaches zero. The TOF for the second missile will then be displayed. The message: FIRE . . . MISSILES will again be displayed to prompt the CPG that he may launch a third missile once the minimum launch separation time has elapsed. The TOF for the second missile will count down until terminal guidance LASE time is reached. The message: TOF = XX will be replaced by LASE 2 . . . TARGET until the TOF for the second missile reaches zero. If a third missile is launched, the TOF for that missile will be displayed, followed by the message: LASE 3 . . . TARGET. After the last LASE X . . . TARGET message, the missile delivery mode (DIR, LO, or HI) and the fire delivery mode (NORM, RIPL, or MAN) will be displayed.

(b) During rapid-fire engagements, the WP will automatically replenish (select, spin up, and encode missiles) the priority channel until the inventory is exhausted. The WP is programmed to always maintain three SAL missiles on the priority code and then, inventory permitting, maintain three additional missiles coded on the alternate channel. The WP will not code, and the inventory will not display, an alternate channel coded SAL missile with an inventory of three missiles or less. The WP will project a remote SAL missile engagement profile anytime the PLT actions SAL missiles, anytime the CPG actions SAL missiles with a LRFD code that does not match the priority channel, anytime the utility page laser button is off, or anytime the CPG selects HMD as the LOS. A remote profile includes a pre-launch remote message, as well as all post launch messages for the engagement, displayed in the sight status field section of the HAD. The PLT's remote SAL missile profile nearly emulates the CPG's with one exception—the PLT's HAD will never display a remote message (The WP assumes that the PLT will always launch a remote missile.) The WP controls automatic SAL missile RIPL (mode RIPL) fire engagements, and the priority and alternate missile channels are automatically reversed following each missile launch without PLT or CPG action.

(c) Manual SAL missile RIPL (mode NORM or MAN) engagements will require manual switch moding between the PRI and ALT channel as required. The RIPL mode can accommodate two remote channel missiles or one autonomous channel missile and one remote missile. In both automatic and manual ripple fire engagements, prioritization of the correct initial PRI missile channel is vitally important. In the WP automatic mode, missile messages are displayed in both the sight and weapons status sections of the HAD. The missile actioned crewmember is alerted to the current priority channel and the next missile to be launched through the CPG's HDU and TADS (CPG) gunner symbology, the PLT's HDU, and either crewmember's weapon's missile page. Automatic missile replenishment occurs via the normal WP protocol until the inventory is exhausted.

(d) When the RIPL requirements can no longer be met, the missile system automatically defaults to the NORM mode. During manual ripple fire, the PRI channel is manually switch moded with the pertinent ALT or other channel following each missile launch to reverse, or renew, the priority and alternate missile channels. The major difference in manual ripple fire executed via weapon's page PRI channel switch moding is that the messages for the launched missile(s) in the sight and weapons status sections are lost when the CPG selects the new priority channel. No problem may exist if the initial missile is launched for a remote designator. However, loss of autonomous missile messages during missile flight will eliminate needed CPG prompts and TOF data. If the priority channel missile, alternate channel missile, and LRFD laser codes are all different, the WP projects a double RIPL remote engagement (RIPL mode) profile. It then alternates the missile launch messages between the weapons status message field section and the sight status message field section, beginning with the weapons status message field section. This will continue until RIPL mode requirements can no longer be met. The system then defaults to the normal mode.

Note 1: The WP will accurately calculate the missile's TOF based on range, trajectory, and outside temperature.

Note 2: Both rockets and missiles can be actioned simultaneously by the crew. The weapons processor controls each wing store pylon independently of the other pylons. When either a rocket or missile system launch is in progress, all wing stores pylon weapons are inhibited from firing during the launch and for 2 seconds after. An "ALT launch" weapon control status field HAD message will be displayed to both crewmembers when a crewmember attempts to fire wing store weapons during a launch and for 2 seconds after.

(5) SAL missile launch anomalies (TRAJ common). If the launch sequence fails, the weapon's page icon for that missile will show missile abort (M over A). This indicates that the launch sequence was initiated and either the battery or the missile pneumatics failed and no motor fire signal was initiated. If missile umbilical separation does not occur within the predicted time, the WP will indicate a hang fire. The message hangfire will be displayed in the HAD weapons status field message section for six seconds. The weapon's page missile icon will display M over H for 6 seconds. It then changes to N over A (not available). All missiles on the same side of the helicopter as the hang-firing missile will also show N over A for 6 seconds. They then revert to their previous status. (During the 6 seconds, these missiles cannot be launched.) The WP then selects a missile on the side of the helicopter opposite the hang-firing missile. It will be designated the next missile to be launched and is coded on the priority channel. After 6 seconds, the WP will again select missiles for launch based on the preferred firing order.

b. RF Hellfire missile target engagement procedures. Targets may be engaged with RF Hellfire missiles from either an AH-64D with radar (FCR) or an AH-64D without radar. Engagements will be conducted either autonomously with the own ship's active sight selected as FCR (PLT or CPG of an AH-64D with radar) or TADS (CPG), or cooperatively with another AH-64D through a RF handover (RFHO). The PLT or CPG must evaluate the WPN's MSL page option settings prior to engaging a given target and, when it is determined necessary, select and set the WPN's MSL buttons as described below:

(1) Weapon's missile page (accessing and general information). At some point prior to actioning the missile system, the crewmember performing the RF Hellfire target engagement must initially select and display a weapon's page on one of his MPDs and validate the settings. The main weapon's page can be selected by pressing the MPD's WPN fixed action button or by pressing the main menu mission group option set WPN button. With the main WPN's page displayed, select the MSL button and note that the missile icons have changed to inverse video and the unique missile option windows are now displayed.

(2) RF missile type options. Through either the PLT's or CPG's independent weapon's page, the crewmember performing the RF Hellfire target engagement must confirm that the second line of the missile TYPE data field window displays RF as the active missile type. When the selected sight is FCR, the default selection is always RF and the type button is not selectable, regardless of missile load. All other sight modes will allow access to the missile type button. Enabling the type button will cause the data field to toggle between RF and SAL. The WP continuously reads the TYPE data field for both crewmembers' independent weapon's pages.

(3) RF missile mode options. The crewmember performing the RF Hellfire target engagement must confirm that the second line of the mode status data field window displays the desired RF missile firing mode option. To access and change the current mode, the crewmember must activate the mode button. This will toggle the mode group button between NORM and MAN. The aircraft will initialize the RF missile mode as NORM unless MAN was previously downloaded from the Data Transfer Cartridge (DTC). NORM allows the WP

to automatically select the missile firing order. MAN may be used when a particular RF missile is required to be fired. Selecting MAN will activate the missile advance buttons located on the CPG's right hand ORT grip and the PLT's and CPG's collective mission grip.

(4) RF missile power group options. The crewmember performing the RF Hellfire target engagement must select the appropriate RF missile power option. Available MSL PWR group options include ALL, automatic (AUTO), or NONE. RF missile power is normally initialized in AUTO (aircraft default). However, any of the RF missile power group options may be selected for initialization via the DTC. Selecting the all button will command power to all of the RF missiles. Selecting the auto button will cause power to the RF missiles to be automatically managed to prevent missile overheating. The number of missiles powered in the AUTO mode is based on the total RF inventory available as follows:

Missiles Available	Missiles Powered
8 or more	4
4-7	2
2-3	1
1	0

Note: If AUTO mode is selected and only one missile is available, the missile will be powered when the weapons action switch is set to missiles.

(5) RF missile LOBL inhibit options. Select the LOBL inhibit button, if desired. The LOBL inhibit function allows the aircrew to engage RF missile targets in the LOAL mode only, inhibiting RF missiles from transmitting. This option is used to eliminate the RF missile signature. Select the 2ND TARGET inhibit button, if desired.

Note 1: Selecting the second target inhibit (FCR aircraft's own ship target only) button will inhibit the hand over of secondary target data during RF missile LOAL engagements. Once the WPN page missile control options have been verified or set, displaying the TSD page will provide increased situational awareness during RF missile engagements. Target status (priority, shot-at), fire zones, no-fire zones, FCR footprint, and control measure areas are all displayed on the FCR page. The employment of the second target inhibit should be considered when engaging targets in close proximity to friendly troops with RF missiles.

Note 2: When a missile detects a moving target with a range between 0.5 kilometer and 8.0 kilometers, it will radiate and attempt to LOBL. If the target is not detected or track is subsequently lost, the message "NO ACQUIRE" will be displayed. When a stationary target is handed over to the RF missile between 0.5 kilometer and 1.0 kilometer, the missile will radiate and attempt to LOBL. If unable to detect the target, the message "NO ACQUIRE" will be also displayed. When a stationary target is handed over between 1.0 kilometer and 2.5 kilometers, the missile will radiate and attempt LOBL, but if not detected the message LOAL NORM will be displayed. The RF missile FCR LOAL range limitation is from 1.0 kilometer to 6.0 kilometers. The missile is capable of servicing LOAL targets via the TADS and through RFHOs to a maximum range of 8.0 kilometers.

(6) RF Hellfire missile target engagements, sight select FCR (PLT/CPG).

(a) The PLT or CPG must validate the weapon's MSL page option settings prior to engaging targets. The pilot performing the target engagement (P or CPG) will select the weapon's page and then the MSL button. The pilot will then confirm that the TYPE button field is displaying RF, that the mode button is set to NORM (unless MAN is desired), and that either the all or auto button from the MSL PWR group has been enabled. The PLT/CPG may select the LOBL inhibit or 2nd target inhibit buttons if desired. Messages are additionally displayed in the weapon status field of the AND that correspond to messages displayed in the HAD for RF missile engagements.

(b) The PLT or CPG will select the appropriate FCR mode (RMAP, GTM, or ATM), activate a scan, and accept or select a target from the FCR page.

(c) With the MSL options validated, the pilot performing the target engagement will then press the A/S indicator pushbutton to arm and note the arm/safe status window on the weapon's page, change to indicate the arm status, and note that the A/S pushbutton amber arm indicator is now displayed.

(d) With the WPN system armed, the pilot performing the target engagement will action MSL. The arm/safe status window on both the PLT's and CPG's weapon's page will now be displayed in a crosshatched format along the border to indicate arm status with a weapon actioned. The opposite crewmember will note the pertinent CMSL or PMSL message displayed in his weapon control status field HAD message. One of the following weapon status field HAD messages will be displayed in the MSL weapons action switched crew station on the FCR page, HDU, or ORT HOD/HDD—

- NO ACQUIRE—RF missile has completed its attempts to acquire the target and has returned to the standby mode (LOAL).
- RF MSL TRK—RF missile is tracking (LOBL).
- LOBL INHIBIT—RF missile trajectory is defaulted to LOAL, as the LOBL inhibit mode has been selected (LOAL).
- LOAL NORM—RF missile trajectory is defaulted to LOAL and RF missile mode is set to NORM (LOAL).
- LOAL MAN—RF missile trajectory is defaulted to LOAL and RF missile mode is set to MAN (LOAL). Either LOBL or LOAL missile constraints symbology, as appropriate, will be displayed on the ORT HOD/HDD, FCR page, and HMD. The NTS target symbol border will change from dashed to solid.

Note 1: The RF missile should only be weapons action switched before or after an FCR scan, not during a scan. This practice permits the FCR to determine the target prioritization from complete scan burst data. The missile will be provided with data for NTS and ANTS targets based on the prioritization of the total target count. If the missile system is weapons action switched during the initiation of a scan, the FCR will hand over the first target detected.

Note 2: If a brief period of time has elapsed, consideration should be given to performing a new FCR target acquisition scan to preclude using stale target data.

Note 3: RF missile secondary target handover data is restricted to reflect the primary target's characteristic as a STI.

Note 4: Constraints symbology is referenced to the FCR NTS target.

Note 5: The highest percentage of kill (Pk) shot is LOBL.

Note 6: Shooting a stale STI greatly reduces the probability of detection for the RF missile.

(e) With the weapons system armed and missiles weapons action switched, the P* will then align the aircraft to achieve missile pre-launch constraints. Once satisfied that all pre-launch requirements have been met, the pilot performing the target engagement may then press the weapons trigger. Following the weapons trigger pull, a MSL launch message will be displayed for 2 seconds in the weapon status section of the weapons action switched crewmember's HAD. HF TOF = NN will replace the launch message and will be displayed until predicted missile impact. When more than one missile is launched, the initial TOF is that of the first missile until impact followed, in turn, with the remaining TOF for each subsequently launched missile until their respective impact.

Note 1: Either a misfire or hangfire weapons status field message will display anytime that the WP does not detect a missile launch after a trigger pull is made, assuming all launch parameters are otherwise met.

Note 2 (AH-64D with radar): When multiple FCR targets are displayed on the FCR and TSD page, the alternate NTS target will become the NTS target. If additional RF missiles are available, HAD messages and constraints symbology will be referenced to the new NTS target.

Note 3: The TSD page will provide increased situational awareness during RF missile engagements. Target status (priority, shot-at), fire zones, no-fire zones, FCR footprint, and control measure areas are displayed.

Note 4: Both rockets and missiles can be actioned by the crew at the same time. The weapons processor controls each wing store pylon independently of the other pylons. When either a rocket or missile system launch is in progress, all wing stores pylon weapons are inhibited from firing during the launch and for 2 seconds after. An "ALT launch" weapon control status field HAD message will be displayed to both crewmembers when a crewmember attempts to fire wing store weapons during a launch and for 2 seconds after.

(f) To de-action the missile system, select the weapons action switch on the ORT left handgrip (CPG) or cyclic (CPG/PLT) to MSL and observe that the weapon's MSL page cross-hatch border on the arm/safe status window on the blanks and note that all missile HAD/MSL page messages and HAD symbology have blanked. The opposite crewmember will note that either the PMSL or CMSL weapon control status field message has blanked and that the LOBL/LOAL constraints box is no longer displayed.

(7) RF Hellfire missile target engagements, sight select TADS (CPG).

(a) The CPG must validate the weapon's MSL page option settings in accordance with paragraph 4 of this task and sight select TADS on the ORT RHG prior to engaging targets. The CPG will observe the weapon's page sight status display showing "sight TADS" and the HAD sight select status field message displaying TADS. The CPG should then select the MSL button and observe the missile inventory icons change from normal to inverse video. The CPG should then ensure that the type is set to RF, that the mode is set to NORM (unless MAN is desired), and that MSL PWR is set to AUTO unless ALL is desired.

Note 1: Secondary target information is not applicable to TADS handover RF missile engagements.

Note 2: Use of IAT/LMC will ensure proper target rates when tracking moving targets.

Note 3: The CPG must place the NVS mode switch on the NVS mode control panel to OFF before the TADS will activate as a sight. This action will not turn the TADS FLIR sensor off.

Note 4: Failure to perform an internal or out-front boresight prior to a TADS to RF missile hand over could result in an erroneous location being transmitted to the missile and a subsequent missile miss. This is more likely to occur when firing LOAL than in the LOBL mode and may be displayed as a broken LOAL box changing to a broken LOBL box despite designating a stationary target.

(b) With the MSL options validated, the CPG should then press the SAFE/ARM pushbutton indicator to arm. The arm/safe status window on the weapon's page will change to indicate arm status. The SAFE/ARM pushbutton arm indicator will illuminate on the armament control panel.

(c) With the weapons system armed, set the weapons action switch on the ORT left handgrip to MSL. The arm/safe status window on the weapon's page will now be displayed in a cross-hatched format along the border to indicate ARM status with a weapon actioned. A "Target Data?" message will be displayed in the sight status field of the HAD. A Hellfire missile LOAL out of constraints box symbol will be displayed on flight and weapons symbology formats. The PLT will note the CMSL message displayed in his weapon control status field HAD message.

(d) With the weapon's system armed and missiles weapons action switched, the CPG should now select and operate the MAN TRK controller on the ORT right handgrip to track the target with a centered LOS and engage the IAT or LMC when desired.

(e) To accomplish the TADS RF missile handover, the CPG must press the laser trigger to the second detent and hold until target data handover is complete (approximately 3 seconds). The "Target Data?" message displayed in the sight status field of the HAD will blank once TADS target data handover is complete. After TADS target data has been accepted by the RF missile, one of the following messages will be displayed in the weapon status field of the HAD (and Hellfire missile constraints box symbol)—

- NO ACQUIRE—RF missile has completed its attempts to acquire the target and has returned to the standby mode (LOAL).
- RF MSL TRK—RF missile is tracking (LOBL).
- LOBL INHIBIT—RF missile trajectory is defaulted to LOAL, as the LOBL inhibit mode has been selected (LOAL).
- LOAL NORM—RF missile trajectory is defaulted to LOAL and RF missile mode is set to NORM (LOAL).
- LOAL MAN—RF missile trajectory is defaulted to LOAL and RF missile mode is set to MAN (LOAL). Either LOBL or LOAL missile constraints symbology, as appropriate, will be displayed on the ORT HOD/HDD, FCR page, and HMD.

Note: An AH-64D without radar will commonly display the "Target Data?" message in the HAD sight status field. Whenever type is selected as RF, this message will always be present unless an RFHO has been received or a TADS RF handover has been accomplished.

(f) With the weapons system armed and missiles weapons action switched, the P* will then align the aircraft to achieve missile pre-launch constraints. Once satisfied that all pre-launch requirements have been met, the CPG may then press the weapons trigger on the ORT left handgrip. Following the weapons trigger pull, a MSL launch message will be displayed for 2 seconds in the weapon status section of the weapons action switched crewmember's HAD. HF TOF = NN will replace the launch message and will be displayed until predicted missile impact. When more than one missile is launched, the initial TOF is that of the first missile until impact, followed in turn with the remaining TOF for each subsequently launched missile until their respective impact.

Note 1: Sight will replace the launch message in the weapons status field immediately following an RF missile launch from an AH-64D without radar. To blank the message and enable the TOF countdown, select another sight, for example, TADS.

Note 2: Once the target data is replaced with the correct message for missile launch, the crew must ensure that missile launch is performed as soon as possible to increase probability of hit.

Note 3: The WP gives PLT-activated missiles priority over the CPG.

Note 4: If using a TADS to RF missile hand over to engage a target, the crew must be aware of the potential problems with laser ranging. If the laser range is erratic or questionable due to environmental conditions or poor technique, the data transferred to the RF missile may be corrupted or may make the RF missile believe a stationary target is moving.

Note 5: To decrease the effect of target velocities building up over time, the crew should attempt to fire the LOAL TADS to RF missile hand over no longer than 5 to 7 seconds after the "Target Data ?" message disappears.

(8) RFHOs and engaging TSD NTS target with an RF Hellfire missile. Either the PLT or CPG, in an AH-64D with radar, may transmit an RFHO whenever it is desired to rapidly transmit FCR NTS target information to a primary member. The receipt capability of an RFHO is common to both the AH-64D with radar and the AH-64D without radar, and either the PLT or CPG may accept the RFHO and subsequently engage the presented RFHO target. RFHOs may be engaged with any onboard weapon system.

(a) Receiving RFHOs. See Task 1414 for a description of RFHO receiving procedures.

(b) Engaging an RFHO target with RF missiles.

- After the RFHO has been properly received, the PLT or CPG (regardless of whether the aircraft is FCR equipped or not equipped) must sight select the FCR to transfer target data to an RF missile.
- Upon selecting the FCR sight, that crewmember will be provided with a radar range from the receiving own ship to that of the RFHO target. The range will be displayed on both the HAD of the FCR page and the HAD of the HDU or ORT (center MPD) of the receiving crewmember. AH-64Ds, both with and without radar, will additionally be provided with a "RF handover" status window centered on the receiver's FCR pages. The TSD page will display the RFHO target overlaid with the NTS symbol. The aircrew will evaluate the displayed radar range to the target before launching the missile to ensure that a missile range probability of hit limitation is not violated.

Note 1: It is imperative that an RFHO be engaged immediately due to target latency.

Note 2: The "RF handover" status window alerts the crew that the TSD NTS target is representative of the RFHO target.

Note 3: Whenever a FCR TGT report is accepted (received), an "IDM target data" status window will be displayed on the receiving aircraft's FCR page. This message alerts the crew that all the displayed TSD targets are now the FCR TGT Report targets.

Note 4: An excessive range readout for an RFHO target will not provide an inhibit for missile firing.

Note 5: The only time out associated with the remote hand over is the receiving ship must accept the RFHO within 6 minutes of the RFHO target data being received in the aircraft's IDM buffer. After 6 minutes, the weapon inhibit "DATA INVALID" will be present and will prevent the crew from accepting the RFHO.

Note 6: The target stale times do not continue counting up during an RFHO. RFHO target status does not reflect the true state of the target during an engagement and only reflects that target state at the time it was digitally sent from the transmitting aircraft.

- The PLT or CPG can now engage the NTS target.

Note7: Sight will replace the launch message in the weapons status field immediately following an RF missile launch from an AH-64D without radar. To blank the message and enable the TOF countdown, select another sight (for example, TADS).

TRAINING AND EVALUATION REQUIREMENTS:

1. Training. Training may be conducted in the AH-64D aircraft or AH-64D simulator. The PLT/CPG should enable the weapon page train mode to enhance weapon system training.

2. Evaluation. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator. Evaluation may be conducted using train mode. Tactical evaluation support system (TESS) may be used to evaluate weapon system proficiency.

Note: Live fire is not required for training and evaluation of this task.

REFERENCES: Appropriate common references.

TASK 1462

Engage target with rockets

CONDITIONS: This task includes the following three conditions:

1. In an AH-64D helicopter with the weapon train mode enabled, target acquisition and designation sight (TADS) internal and outfront boresight completed, and weapons systems initialization completed, and if installed, fire control radar (FCR) operational checks completed and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).
2. In an AH-64D helicopter on a gunnery range with live rockets loaded, TADS internal and outfront boresight completed, weapons systems initialization completed, and, if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.
3. In an AH-64D simulator with TADS internal and outfront boresight completed, weapons systems initialization completed, and if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

Note: Satisfactorily completing any one of the above conditions will satisfy the minimum requirement for the standardization evaluation. Completing any one of the three conditions will satisfy the gunnery tables III and IV requirement for readiness level (RL) 2 progression and an aviator's task iteration requirement. A task iteration worksheet listing all three conditions separately is not necessary.

STANDARDS: Appropriate common standards and the following:

1. Place the system into operation.
2. Engage the target with pilot (PLT) (backseat crewmember) or copilot-gunner (CPG) (front seat crewmember) independent mode of aerial rocket system (ARS) firing.
3. Engage the target with cooperative mode of ARS firing.

DESCRIPTION:

1. Crew actions.

    a. The P* will announce whenever he intends to unmask, remask, climb for diving fire, accelerate/decelerate for running fire, or reposition the aircraft and will maneuver the aircraft into constraints.

    b. The pilot not on the controls (P) will assist in monitoring the aircraft's position while the P* maneuvers the aircraft into coincidence with the rocket steering cursor constraints and will provide adequate warning for obstacle avoidance.

    c. The crew will predetermine who will fire the rockets during a cooperative rocket mode target engagement. The crewmember that is to conduct the target engagement will announce his intention to conduct an independent or cooperative rocket engagement. He will announce the type and quantity of rockets to be fired, when ready to engage, and when the engagement is completed. The opposite crewmember will acknowledge all announcements and will confirm the actions of the first crewmember through the high action display (HAD) or one multipurpose display (MPD) displaying the opposite crewmember's video select (VSEL) video display option.

Note: Selection and display of the opposite crewmember's video and sight improves crew coordination and increases situational awareness during the execution of this task.

2. Procedures.

a. ARS common page settings. Under normal dual display processor operations, the PLT and CPG rocket weapon's (WPN) pages are enabled and set independently. The only normal operation exception to the independent WPN's page status occurs during rocket cooperative (RKT COOP) engagements. During a RKT COOP mode, settings displayed on the PLT's WPN's page will be those selections made by the CPG. Prepare for the engagement by first selecting the RKT WPN's page and then set the page option buttons as necessary. Check, verify, select, and set the following WPN's RKT page buttons as desired.

(1) Check the RKT inventory group display and select the corresponding option button when the situation deems it necessary to select and change a rocket group and type. The RKT inventory can be precisely set through the load maintenance panel (LMP), the data transfer cartridge (DTC), and from selections made through the WPN's UTIL page load option button in conjunction with the WPN's RKT page. PLT/CPG RKT inventory selections will overwrite LMP and DTC settings.

Note: Up to five rocket inventory option data fields will be displayed for each of the five possible zones. The inventory group option will always include five buttons, regardless of how many types are actually loaded. When like rocket types are loaded into more than one zone, only one data field will be presented.

(2) Check the quantity (QTY) multistate display and select the corresponding button when the situation deems it necessary to change the number of rockets to be fired. Upon selecting the QTY multistate button, the rocket QTY option group will display the options 1, 2, 4, 8, 12, 24, and ALL.

(3) Check the rocket penetration (PEN) multistate display and select the corresponding button when the situation deems it necessary to set the warhead fuse penetration option. Upon selecting the PEN button, the penetration page will appear with the penetration group options bunker fusing (BNK) 10, 15, 20, 25; super quick fusing (SPQ) 30, 35, 40, and 45. The PEN button is only displayed when rockets with PEN warhead capabilities are loaded.

Note: The RKT inventory, QTY, and PEN settings are independent in each crew station. However, when the CPG has actioned rockets on the ORT right handgrip and the PLT has actioned rockets (COOP), the settings displayed on the PLT's WPN's page will be those selections made by the CPG. Once either crewmember deselects rockets, the PLT selections will again be displayed on the PLT WPN's page.

(4) After the RKT WPN's page options have been established, press the arm/safe (SAFE/ARM) pushbutton on the armament control panel to ARM, then set the weapons action switch on the cyclic grip to R (rocket).

Note: An inhibited cursor will be displayed if a safety or performance inhibit exists. A stowed cursor will be displayed if pylon ground stow has been selected.

b. Independent rocket engagements employing the HMD/TADS/FCR sight select. Evaluate the RKT WPN's page option settings prior to engaging a given target and, when it is determined necessary, select and set the WPN's RKT page buttons as described in paragraph 2 (ARS common page settings) of this task.

(1) After the RKT WPN's page options are set or verified, the WP must then be provided with a valid LOS and range. The PLT or CPG will select either the helmet mounted display ([HMD] [PLT/CPG]), TADS (CPG), or FCR (PLT/CPG) sight via the appropriate sight SEL switch on either the cyclic (PLT/CPG) or the optical relay tube's

([ORT's] [CPG]) right handgrip. The aircraft will initially default power up with the PLT's line of sight (LOS) set to HMD. As is the case for all independent RKT engagements, the weapons processor (WP) will use the range data from the station in which the rockets were activated. The WP limits the fire control solution to a maximum range of 7,500 meters (MK-66) and 9,000 meters (CVR-7).

(2) The PLT is able to employ manual (MAN), automatic (AUTO), radar (autonomous FCR and radar frequency missile handover [RFHO]), and navigation (NAV) coordinate ranging to targets. The CPG is able to employ MAN, AUTO, radar (autonomous FCR and RFHO), NAV coordinate, and TADS laser ranging. PLT/CPG manual or automatic range selections are accomplished through the WPN's page range option button. The PLT default range is 1.5 kilometers and the CPG default is 3.0 kilometers. NAV coordinate data range is displayed on the CPG's and PLT's HDU HAD range and range source message field when a coordinate point (TXX, WXX, or CXX) is selected as the acquisition source and HMD is the selected LOS. NAV coordinate data range is displayed on the TADS HAD when TADS is the LOS, a coordinate point has been selected as the acquisition source, and the ORT's RHG slave has been pressed. Laser range can be provided to the CPG through either the TADS or HMD/TADS LOS. NTS target FCR range is displayed in the HAD's range and range source message field anytime the PLT or CPG has selected FCR as the active LOS and the FCR has detected a NTS.

Note: The CPG must place the night vision system (NVS) mode switch on the NVS mode control panel to OFF before the TADS will activate as a sight. This action will not turn the TADS forward looking infrared (FLIR) sensor off.

(3) The crewmember that actioned the rockets must acquire and track the target while maintaining the selected sight's LOS reticle on the target. When either the PLT or CPG independently positions the weapons action switch (WAS) to rockets, both the PLT and CPG displays will show the rocket steering cursor. A dashed I-beam (rocket steering cursor) represents that the ARS is inhibited from firing and that the pylons are articulating at +4.9 to -15 degrees under control of the WP (for example, WPN system is safe). The solid I-beam symbol indicates that the rocket pylons will articulate +4.9 to -15 degrees under control of the WP, that the aircraft has been armed, and that no inhibits are active. The top and bottom horizontal legs of the rocket steering cursor indicate articulation constraints. The solid I-beam also indicates the helicopter orientation required to meet the WP-calculated firing constraints.

(4) If the WPN's utility (UTIL) page pylon ground stow button is active when the aerial rocket system (ARS) is weapons action switched, a dashed and broken rocket inhibit I-beam will be displayed to the aircrew informing them of the firing inhibit condition. To achieve pre-firing independent rocket constraints in the hover fire mode, place the LOS reticle over the target and align the helicopter's LOS reticle with that of the rocket steering cursor by stepping on the I-beam. During running fire, align the helicopter into firing constraints with the cyclic while maintaining aircraft trim. Firing constraints are met when the rocket steering cursor overlays the LOS reticle. The top and bottom horizontal legs of the solid I-beam must be above and below the center of the LOS reticle, respectively. Hover-fire engagements can be achieved at a range of approximately 4,500 meters without changing aircraft pitch attitude. At ranges beyond 4,500 meters, pitch attitude changes (nose-up) may have to be made to meet firing constraints.

Note: When the FCR is the selected sight (autonomous FCR or RFHO receiver) and a crewmember sets the weapons action switch to rockets, the rocket steering cursor will align to the next to shoot (NTS) target (if there is a detected NTS target).

(5) To fire the rockets, lift the protective cover over the cyclic trigger and pull the trigger to the first detent until the selected rocket quantity has fired. If a rocket inventory type was not selected before the rockets being actioned, the message "TYPE?" is displayed in the HAD and WPN's RKT page weapons status section. If the trigger is released before the selected quantity is fired, firing stops and the ARS resets for the next salvo. The message "RKT normal" in the HAD weapons status section is replaced by a decreasing time of flight (RKT TOF = NN). The crewmember that activated the rocket initializes the time of flight (TOF) based on the range in his HAD. As rockets are fired, the WPN's RKT page inventory will count down by type, indicating the rocket inventory. If the rockets will not fire with the first trigger detent, pull the trigger to the second detent. This will override performance inhibits but not safety inhibits. Release the trigger when the target is neutralized or the selected quantity has been fired.

Note 1: In the event of a rocket misfire, misfired rockets will not be available for firing. In this case, the total number of rockets actually available for firing will be displayed in the selected grouped option button data field of the WPN's RKT page. The total of all rounds (of the selected type on board) will be displayed in the total rocket quantity status window.

Note 2: Once a particular rocket inventory type has been expended, the RKT page inventory data field for that specific TYPE will blank and the weapons action switched crewmembers HAD weapon status field message will change from "RKT normal or RKT TOF = NN" to "TYPE." To continue firing rockets, the crewmember desiring to continue the engagement will have to select another rocket inventory type option button. In the event of rocket misfire, misfired rockets will not be available for firing. In this case, the total number of rockets actually available for firing will be displayed in the selected grouped option button data field of the WPN's RKT page. When all rocket types have been expended, available rocket quantity = zero (0), the weapon status field message "no rockets" will be displayed in the weapons action switched crewmember's HAD.

Note 3: Both rockets and missiles can be actioned by the crew at the same time. The weapons processor controls each wing store pylon independently of the other pylons. When either a rocket or missile system launch is in progress, all wing stores pylon weapons are inhibited from firing during the launch and for 2 seconds after. An "alternate (ALT) launch" weapon control status field HAD message will be displayed to both crewmembers when a crewmember attempts to fire wing store weapons during a launch and for 2 seconds after.

(6) To deselect or deaction the ARS, select another weapon system or reselect the rockets using the cyclic WAS (PLT/CPG) or center the TADS ORT WAS switch (CPG). In any case, the crew should note that rocket symbology has disappeared along with pertinent HAD messages.

c. Cooperative rocket engagements employing the HMD/TADS/FCR LOS. The cooperative rocket mode provides the greatest precision in rocket delivery. Evaluate the RKT WPN's page option settings prior to engaging a given target and, when it is determined necessary, select and set the WPN RKT page buttons.

(1) Upon announcing and acknowledging a cooperative engagement, the crew will determine, verify, or set the WPN RKT page option settings for the engagement.

Note: During the rocket cooperative mode, both the CPG and PLT share a common WPN's RKT page. Both crewmembers have the ability to view, access, and edit the common RKT page and either crewmember may fire the rockets.

(2) After the RKT WPN's page options are set or verified, the WP must then be provided with the CPG's valid LOS and range. The PLT will select HMD on his cyclic and the CPG will select the TADS, FCR (CPG) via the sight SEL switch on the CPG's ORT right handgrip. The aircraft will initially default power up with the PLT's LOS set to HMD. As is always the case for cooperative RKT engagements, the WP will use the range data from the CPG's station.

Note 1: The CPG should position the sight SEL switch to TADS or FCR (AH-64D with radar) to obtain the most accurate sight.

Note 2: The CPG must place the NVS mode switch on the NVS mode control panel to OFF before the TADS will activate as a sight. This action will not turn the TADS FLIR sensor off.

(3) The CPG will either position (track, image auto track [IAT], linear motion compensation [LMC], or slave) the TADS on or over the sensor viewed or system generated target (direct), scan a NTS rocket target with ground targeting mode (GTM) or radar mapping ([RMAP] (direct/indirect), link the TADS to the FCR NTS target (direct—AH-64D with radar/RFHO) or select a TGT/WPT/THRT acquisition source. The CPG will announce when he is ready to engage and will confirm PLT actions via the RKT WPN page or the HAD.

(a) The WP will use the CPG-selected LOS and range data in the fire control solution and will disregard the PLT LOS and range data. This allows the P* to look where necessary without impacting on the firing solution. During direct-fire engagements (LOS established with the target), laser range, and autonomous FCR range should be employed. During indirect rocket engagements laser range, autonomous FCR radar range, RFHO radar range, NAV/WPT/THRT/HAZ coordinate data range, or MAN range can all be employed.

(b) The WPN's page laser range finder/designator (LRFD) first and last button allows use of the LRFD system for target range determination when laser backscatter or other obscurations are present. With the button set to first, the first laser return from the scene of interest determines the range the WP uses to compute ballistic equations. With the button set to last, the WP uses the last laser return. When a crewmember observes unrealistic changes in the laser range being displayed (for example, range changes that cannot be reasonably attributed to aircraft or target movement), the last position should be selected.

(4) With the WPN's RKT page options set or validated in accordance with Task 1463, the ARS must now be actioned. The PLT activates the rockets by momentarily positioning the cyclic WAS to rockets. The CPG activates rockets by positioning the ORT WAS to rockets. The WP interprets this dual rocket action as cooperative rockets.

(5) When the cooperative mode is enabled, the rocket steering cursor is displayed to both crewmembers. When the CPG positions the TADS WAS to rockets and the PLT positions the cyclic WAS to rockets, all displays will now display the rocket steering cursor. With the cooperative rocket mode switchology requirements met, the independent HAD RKT normal weapon status field message will change to RKT COOP. A dashed I-beam (rocket steering cursor) represents that the ARS is inhibited from firing and that the pylons are articulating at +4.9 to -15 degrees under control of the WP (for example, WPN

system is safe). The solid I-beam symbol indicates that the rocket pylons will articulate +4.9 to -15 degrees under control of the WP, that the aircraft has been armed, and that no inhibits are active. The top and bottom horizontal legs of the rocket steering cursor indicate articulation constraints. The solid I-beam also indicates the helicopter orientation required to meet the WP-calculated firing constraints.

If the WPN's UTIL page pylon ground stow button is active when the ARS is weapons action switched, a dashed and broken rocket inhibit I-beam will be displayed to the aircrew, informing them of the firing inhibit condition. The cooperative rocket mode WPN's RKT page will be a common page and available for display in both the CPG and the PLT station. Since the CPG controls the cooperative rocket mode, the available cockpit common WPN's rocket page is actually the CPG's. Either the PLT or CPG may make changes to the common cooperate rocket mode WPN's RKT page.

(6) To achieve pre-firing cooperative rocket constraints in the hover fire mode, the P* places the LOS reticle over the target and aligns the helicopter's LOS reticle with that of the rocket steering cursor by stepping on the I-beam. During running fire, align the helicopter into firing constraints with the cyclic while maintaining aircraft trim. Firing constraints are met when the rocket steering cursor overlays the LOS reticle. The top and bottom horizontal legs of the solid I-beam must be above and below the center of the LOS reticle, respectively. Hover-fire engagements can be achieved at a range of approximately 4,500 meters without changing aircraft pitch attitude. At ranges beyond 4,500 meters, pitch attitude changes (nose-up) may have to be made to meet firing constraints.

Note 1: The WP/DP generated rocket steering cursor's accuracy and sensitivity is a true 1 to 1 real world representation.

Note 2: When the FCR is the selected sight (autonomous FCR or RFHO receiver) and a crewmember sets the weapons action switch to rockets, the rocket steering cursor will align to the NTS target (if there is a detected target).

(7) Once the aircraft is maneuvered to meet launch constraint alignment, either the PLT (using the cyclic trigger) or the CPG (using his ORT WPN trigger) may fire the rockets with their respective weapons' triggers. The weapon's trigger should be held to the first or second detent until the selected rocket QTY has fired. If a rocket inventory type was not selected before the rockets being actioned, the message "TYPE?" is displayed in the HAD and WPN's RKT page weapons status section. If the trigger is released before the selected quantity is fired, firing stops and the ARS resets for the next salvo. The message "RKT normal" in the HAD weapons status section is replaced by a decreasing time of flight (RKT TOF = NN). The crewmember that activated the rocket initializes the TOF based on the range in his HAD. As rockets are fired, the WPN's RKT page inventory will count down by type, indicating the rocket inventory. If the rockets will not fire with the first trigger detent, the PLT or CPG may pull the trigger to the second detent. This will override performance inhibits but not safety inhibits. Release the trigger when the target is neutralized or the selected quantity has been fired.

Note 1: In the event of a rocket misfire, misfired rockets are not available for firing. In this case, the total number of rockets actually available for firing will be displayed in the selected grouped option button data field of the WPN's RKT page. The total of all rounds (of the selected type on board) will be displayed in the total rocket quantity status window.

Note 2: Once a particular rocket inventory type has been expended, the RKT page inventory data field for that specific type will blank and the weapons action switched crewmember's HAD weapon status field message will change from "RKT normal or RKT TOF = NN" to "TYPE." To continue firing rockets, the crewmember desiring to continue the engagement has to select another rocket inventory type option button. In the event of rocket misfire, misfired rockets will not be available for firing. In this case, the total number of rockets actually available for firing will be displayed in the selected grouped option button data field of the WPN's RKT page. When all rocket types have been expended, available rocket quantity = zero (0), the weapon status field message "no rockets" will be displayed in the weapons action switched crewmember's HAD.

(8) To deselect/deaction the ARS, select another weapon system or reselect the rockets using the cyclic WAS (PLT/CPG) or center the TADS ORT WAS switch (CPG). In all cases, the rocket symbology and pertinent HAD messages will disappear.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

Note: Live fire is not required for training and evaluation of this task.

REFERENCES: Appropriate common references.

TASK 1464

Engage target with area weapon system

CONDITIONS: This task includes the following three conditions:

1. In an AH-64D helicopter weapon train mode enabled, target acquisition and designation sight (TADS) internal and outfront boresight completed, weapons systems initialization completed and, if installed, fire control radar (FCR) operational checks completed and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).
2. In an AH-64D helicopter on a gunnery range with live 30-millimeter (mm) loaded, TADS internal and outfront boresight completed, weapons systems initialization completed, dynamic harmonization completed and, if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.
3. In an AH-64D simulator with TADS internal and outfront boresight completed, weapons systems initialization completed and, if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

Note: Satisfactorily completing any one of the above conditions will satisfy the minimum requirement for the standardization evaluation. Condition 2 or 3 is required to complete gunnery tables III and IV for readiness level (RL) 2 progression. Completing any one of the three conditions will satisfy an aviator's task iteration requirement. A task iteration worksheet listing all three conditions separately is not necessary.

STANDARDS: Appropriate common standards and the following:

1. Place the system into operation.
2. Conduct dynamic harmonization procedure if required.
3. Engage the target by employing the appropriate type of area weapon system (AWS) firing as directed.

DESCRIPTION:

1. Crew actions.

   a. The P* will announce when he intends to unmask, remask, climb for diving fire, accelerate/decelerate for running fire, or reposition the aircraft, and will maneuver the aircraft into constraints.

   b. The pilot not on the controls (P) will assist in monitoring the aircraft's position while the P* maneuvers the aircraft and will provide adequate warning for obstacle avoidance.

   c. The crewmember intending to perform the target engagement will announce his intention to conduct a gun engagement, when ready to engage, and when the engagement is completed. The opposite crewmember will acknowledge all announcements and will confirm the actions of the crewmember performing the target engagement through the high action display (HAD) or one multipurpose display (MPD) displaying the opposite crewmember's video select (VSEL) video display option.

Note: Selection and display of the opposite crewmember's video and sight improves crew coordination and increases situational awareness during the execution of this task.

2. Procedures.

a. Gun page common settings. Under normal dual display processor (DP) operations, the pilot (PLT) (backseat crewmember) and copilot-gunner (CPG) (front seat crewmember) weapon's (WPN) gun pages are enabled and options set independently. Prepare for the engagement by selecting the WPN's gun page and set, or validate, the page option buttons as necessary. Check (validate), select, and set (as necessary) the following WPN's gun page button options—

(1) Select the gun maintained option button. The gun icon will change to inverse video and the gun control option buttons will be displayed.

(2) Set the independent gun mode two state button to normal (NORM) or fixed (FXD), as desired. The gun mode is initialized by aircraft default in the NORM mode unless set to FXD on the data transfer cartridge (DTC).

(3) Get the desired independent gun burst limit option (10, 20, 50, 100, or ALL) from the burst limit group. This procedure is limited by the burst limit selector on the turret control box. Set to ALL.

b. Normal gun engagements. The two gun modes that may be employed are NORM or FXD. The normal mode allows the gun to flex in azimuth and elevation as directed by the WP and is employed against direct and indirect type targets. Fixed gun may be desirable when a "line of sight (LOS) invalid" HAD weapon inhibit message is displayed along with a flashing LOS. Selecting fixed gun will extinguish the "LOS invalid" safety inhibit.

(1) Normal mode. After the WPN's gun page options have been set or verified, arm the weapon system by depressing the arm/safe indicator switch on the armament panel. Each time the arm/safe switch is depressed, the indicator and WPN's page arm/safe status window will alternately mode between ARM or SAFE and provides the weapons processor (WP) a valid LOS and range. When the pilot ([PLT] backseat crewmember) desires to action the gun, he will sight select (SEL) HMD, FCR, or FCR link (with a next to shoot [NTS] target displayed) on his collective mission grip's sight SEL switch.

(2) When the CPG desires to action the gun, he will sight select HMD, TADS, FCR, or FCR link (with a NTS target displayed) via the sight SEL switch on either the CPG's optical relay tube (ORT) right handgrip or collective mission grip. The aircraft will initially default power up with the PLT's LOS set to HMD. The WP will use the range data from the station in which the area weapon system (AWS) was activated. The maximum effective range of the 30-millimeter is 1,500 to 1,700 meters and the WP will provide a fire control solution up to a range of 4,200 meters. The PLT is able to employ manual (MAN), automatic (AUTO), radar (autonomous FCR and radar frequency missile handover [RFHO]), and navigation (NAV) coordinate data ranging to targets.

(3) The CPG is able to employ MAN, AUTO, radar (autonomous FCR and RFHO), NAV coordinate, and TADS laser ranging. PLT/CPG manual or automatic range selections are accomplished through the WPN's page range option button. The CPG should position the sight SEL switch to TADS or FCR (AH-64D with radar) to obtain the most accurate sight. AWS target engagements are most accurate when the CPG actions the AWS on the ORT, employs TADS or FCR as the selected sight, and ranges the target with the laser range finder/designator (LRFD) or FCR. The CPG must place the night vision system (NVS) mode switch on the NVS mode control panel to OFF before the TADS will activate as a sight. This action will not turn the TADS forward looking infrared (FLIR) sensor off. Action the gun by momentarily placing the weapons action switch (WAS) on the cyclic forward to the gun (G) position. The CPG may also action

the gun by placing the ORT WAS forward to the G position. The WP will use the active range and range source data displayed on the HAD of the crewmember activating the gun. The crewmember who actions the gun will normally observe a "rounds (RNDS) NNNN" weapon status field message in his HAD and the opposite crewmember will note a "copilot gun (CGUN)" or "pilot controls gun (PGUN)" weapon control status field message.

Note 1: If the gun system is actioned and the WP has detected a NO GO status, a "gun fail" weapon status field message will be displayed to the crewmember who actioned the system. The LOS reticle will also flash anytime that the trigger is pulled and the actioned gun system has been detected to be in a NO GO status.

Note 2: If any weapon system is actioned while the ARM/SAFE switch is set to SAFE, a "SAFE" weapons inhibit message will be displayed on the HAD.

(a) Direct engagements. The LOS reticle is the aiming reticle for the AWS in the NORM mode. The crewmember that activates the guns must acquire and track the target with the LOS reticle of the selected sight. When activated, the gun moves from the stow position to the command LOS as modified by the WP super-elevation range correction. Each crewmember has equal priority when activating the AWS. The last crewmember to activate the gun controls it. The crewmember controlling the gun will have the "RNDS NNNN" HAD weapons status field section message displayed. The number of rounds remaining will decrease as rounds are expended. The gun will fire until the trigger is released, the burst limit is reached, the gun fails, the ammunition supply is depleted, or a weapon's inhibit trigger occurs. To deselect the gun, the actioned crewmember should select another weapon system or momentarily reselect the gun if the cyclic WAS was used. If the ORT WAS was used, place the WAS in the center position. In either case, the gun messages will disappear and the gun will stow.

Note 1: The WPN's page LRFD first and last button allows use of the LRFD system for target range determination when laser backscatter or other obscurations are present. With the button set to first, the first laser return from the scene of interest determines the range the WP uses to compute ballistic equations. With the button set to last, the WP uses the last laser return. When a crewmember observes unrealistic changes in the laser range being displayed (for example, range changes that cannot be reasonably attributed to aircraft or target movement), the last position should be selected.

Note 2: The crew may perform simultaneous wing store pylon weapon and 30-millimeter gun engagements. The 30-millimeter is actioned and fired by the crewmember that is not engaging a target with a wing store pylon weapon (missiles or rockets). When the 30-millimeter gun is selected by a crewmember and a pylon weapon is selected by the other crewmember, the gun azimuth limits are restricted.

Note 3: The gun will be inhibited from firing during any wing store pylon weapon launch and for 2 seconds after. If a crewmember attempts to fire the gun during this time period, the weapon control status HAD field message "ALT launch" will be displayed to both the PLT and CPG.

Note 4: Firing a 30-millimeter software burst limit setting (WPN's gun page that exceeds the physical burst limit setting of the turret control box) will cause the weapon status field message "gun fail" to display. If the gun fails under this condition, either the PLT or CPG will have to turn the WPN's UTIL page gun button OFF and then back ON to clear the fault.

(b) Indirect engagements.

(1) Indirect fire is fire delivered on a target that cannot be directly viewed by optics or observation from the firing weapon system. Either the CPG or PLT may independently engage indirect targets with the AWS with a high degree of accuracy. Indirect fire targets can be acquired autonomously through direct sight means (TADS/IHADSS) or the FCR/RFI and engaged from a masked position, or targets can be handed over from a remote aircraft (digital or voice), tactical vehicle, ground observer, etcetera.

(2) For indirect fire, it is extremely important that the WP is provided with accurate range and azimuth data from the aircraft to the target. When the FCR is not the selected sight or a RFHO has not been received, the CPG inherently possesses a much higher degree of precision fire capability over that of the PLT. The PLT may accurately engage an indirect fire target with the AWS via a RFHO or by way of autonomous FCR. The CPG is able to accurately engage indirect fire targets by employing the TADS and FCR sights as well as through the conduct of RFHOs.

(3) When employing the FCR, the PLT and CPG both share the precision capability that it affords. The PLT is limited to the HMD sight when not employing the FCR or a RFHO. The CPG, however, is uniquely enabled for precise indirect weapons firing through use of the TADS sight. As commanded by the WP, the TADS sight is able to precisely slave to the various CPG acquisition sources, including the embedded global positioning inertial navigation system (EGI) waypoint hazard/control measure/threat (WPTHZ/CTRLM/THRT) coordinate database. The WP computed acquisition slave action results in a very precise, and steady, azimuth and elevation command to the AWS with respect to a THRT coordinate acquired indirect fire target. If the range in the HAD exceeds the maximum elevation of the gun or an azimuth limit, the message LIMITS will replace RNDS NNNN in the HAD.

Note: When either the PLT or CPG has selected FCR (autonomous FCR or RFHO receiver) as their sight and then actions (weapons action switches) the gun, the 30-millimeter will slave to the NTS target at the computed elevation for the displayed HAD radar range (RX.X), "sight?" will be displayed in the HAD's weapon status message field, and the weapon safety inhibit "LOS invalid" will display until an FCR scan is made and an NTS target is detected.

(2) Fixed-gun mode. The fixed (FXD) gun mode of fire is not a normal target engagement mode; it is a degraded mode of operation with respect to the normal (NORM) mode that utilizes the aircraft's various sights. Whenever a "LOS invalid" HAD weapon safety inhibit message displays along with a flashing LOS reticle, an appropriate response is for the affected crewmember to select "FXD" from the WPN's gun page mode option button. Selecting fixed gun will extinguish the "LOS invalid" safety inhibit. The P* or P will announce the fixed-gun engagement, when ready to engage, and when the engagement is completed.

(a) To engage targets in the fixed mode, place the WPN's gun page mode option two state button "FXD." The gun will remain in the stowed position until activated using the WAS. When activated, the gun will relocate and remain at the fixed position (0 degrees azimuth and +6 degrees elevation). The cued LOS reticle (broken cross hair) is the aiming reticle for a fixed gun. It is displayed only to the crewmember that activated the gun and is visible when the sight is oriented forward. The crewmember who actioned the gun will note the "RNDS NNNN" HAD weapons status field section message and the opposite crewmember will note that either "PGUN" or "CGUN" is displayed in the HAD weapon's control message field.

(b) In the FXD mode, the WP drives the cued LOS reticle in elevation based on the range data displayed to the crewmember activating the gun. Therefore, the aircraft must be maneuvered to place the cued LOS reticle over the target.

Note: Automatic range with HMD LOS is not recommended in the FXD mode because of the dynamics in the displayed range and the resultant dynamics in the cued LOS aiming reticle.

(c) Place the cued LOS reticle over the target and validate the range and range source, then the gun may be fired. The number of rounds remaining will be displayed in both the HAD and on the WPN's page and will decrease as rounds are expended. The gun will fire until the trigger is released, the burst limit is reached, the gun fails, or the ammunition supply is depleted. To deselect (WAS) the gun, select another weapon system or, if the cyclic WAS was used, momentarily reselect the gun. If the ORT WAS was actuated, place the WAS in the center position. In either case, the gun messages will disappear and the weapon will stow.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

Note: Live fire is not required for training and evaluation of this task.

REFERENCES: Appropriate common references.

TASK 1469

Perform area weapon system dynamic harmonization

CONDITIONS: This task includes the following three conditions:

1. In an AH-64D helicopter with the weapon train mode enabled, target acquisition and designation sight (TADS) internal and outfront boresight completed, and weapons systems initialization completed, and if installed, fire control radar (FCR) operational checks completed and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).
2. In an AH-64D helicopter on a gunnery range with live rockets loaded, TADS internal and outfront boresight completed, weapons systems initialization completed, and, if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.
3. In an AH-64D simulator with TADS internal and outfront boresight completed, weapons systems initialization completed, and if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

Note: Satisfactorily completing any one of the above conditions will satisfy the minimum requirement for the standardization evaluation. Completing any one of the three conditions will satisfy the gunnery tables III and IV requirement for readiness level (RL) 2 progression and an aviator's task iteration requirement. A task iteration worksheet listing all three conditions separately is not necessary.

STANDARDS: Appropriate common standards and the following:

1. Maintain heading of aircraft to the target 0 ±5 degrees.
2. Maintain range 500 to 1500 ±10 meters from target.
3. Use normal (NORM) firing mode.
4. Place 5 out of 10 rounds in the target (Boyevaya Mashina Pekhoty—Russian combat vehicle, infantry (amphibious armored)[BMP] frontal).
5. Accurately transcribe (or describe the procedures) dynamic harmonization data to the aircraft's logbook boresight corrector's card.

DESCRIPTION:

1. Crew actions. To correct for inherent captive boresight harmonization kit (CBHK) gun corrector errors, the copilot-gunner (CPG) (front seat crewmember) and pilot (PLT) (backseat crewmember) will perform or describe the correct procedures for accomplishing an area weapons system dynamic harmonization.
2. Procedures.
   a. PLT. Clear and, in coordination with the CPG, position the aircraft between a range of 500 to 1,500 meters away from the dynamic harmonization target. Once the aircraft has been correctly positioned for range, select and activate both the position hold sub-mode and radar altitude hold.

   b. CPG. Locate the boresight corrector's sheet in the aircraft's logbook for the purpose of checking CBHK correctors and for recording the results of the dynamic harmonization. Check the gun CBHK correctors located through the data management system utility (DMS UTIL) page boresight button. With the boresight page displayed, select the gun button and confirm the correctors. If any of the correctors are found in error, edit the gun boresight correctors and make those needed changes to reflect the corrector's sheet. With the gun CBHK validated, position the aircraft at a point 500 to 1,500 meters away from the dynamic harmonization target. The dynamic harmonization target should be the size of a BMP frontal target. Select the weapon's (WPN) page and gun maintained option button. Select the harmonize maintained option button. Set the sight select switch on the optical relay tube (ORT) right handgrip to TADS. Press the slave pushbutton switch on the ORT right handgrip to slave off. Acquire and track a target for harmonization (range 500 to 1,500 meters). Set the TADS sensor select switch to forward looking infrared ([FLIR] (night)) or DTV (day). Set the TADS field of view (FOV) switch to N (narrow). Set the IAT polarity switch on the ORT right handgrip to W, A, or B as appropriate. Set the image auto track (IAT) switch on the ORT left handgrip to IAT.

c. Verify that IAT gates lock onto target. Press the arm/safe (SAFE/ARM) pushbutton on the armament control panel to arm. Press the laser trigger switch on the ORT right handgrip to the first detent and ensure the displayed range is accurate to 500 to 1,500 meters ±10 meters. Select DTV or FLIR zoom, release target, and confirm range. Once satisfied with the range, select DTV or FLIR NFOV. Set the weapons action switch on the ORT left handgrip to gun. Press the weapons trigger on the ORT left handgrip and fire one 10-round burst and note the mean point of impact (MPI). Release the weapons trigger upon reaching burst limit. Press the SAFE/ARM pushbutton on the armament control panel to safe. Set the weapons action switch to gun to deselect the gun. Operate the manual track (MAN TRK) controller to place the gun dynamic harmonization reticle over the actual impact point of the rounds. Set the update (UPDT)/store switch on the ORT left handgrip momentarily to store. If the gun dynamic harmonization is not within allowable limits, the weapons processor will set the gun dynamic harmonization correctors to zero. Gun CBHK boresight correctors will still be present.

d. If the WPN's page gun dynamic harmonization not valid status window is displayed, repeat the procedure, as required. With a proper dynamic harmonization established, the CPG will select the DMS UTIL page and then select the boresight button. The DMS boresight page will now be displayed. Select harmonize gun button and transcribe the displayed correctors to the logbook's boresight corrector sheet. Validate the dynamic harmonization by re-engaging the BMP frontal (size) dynamic harmonization target from the same point, range, and altitude with 10 rounds. Engage target and validate dynamic harmonization using the TADS sight with the NORM gun mode selected. A dynamically harmonized aircraft should be able to place 10 out of 10 rounds through an 18-meter area weapon system (AWS) fan (AWS range dependent) and Task 1464.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

Note: Live fire is not required for training and evaluation of this task.

REFERENCES: Appropriate common references.

TASK 1471

PERFORM TARGET HANDOVER

CONDITIONS: In an AH-64D helicopter or AH-64D simulator and given a condition to perform a target handover. Determination of the selection of appropriate handover methods is by the type of equipment, unit mission essential task list (METL), and established communication procedures.

STANDARDS: Appropriate common standards and the following:

1. Crew internal.
   a. Select the correct acquisition select (ACQ SEL) switch setting.
   b. Conduct target handover.
   c. Receive the target handover.
2. Laser spot tracker (LST).
   a. Perform laser code data entry procedures.
   b. Select the correct laser tracker code.
   c. Employ the laser tracker.
3. Radar frequency handover.
   a. Select the desired target and transmit the handover.
   b. Receive a radar frequency missile handover (RFHO) target.
4. Tactical situation display target (TSD TGT) report (fire control radar target report [FCR TGT RPT]).
   a. Select the primary target or all the targets (sender).
   b. Transmit the target data.
   c. Receive FCR target report.
5. TSD point target/threat (TGT/THRT).
   a. Transmit TSD target/threat point data.
   b. Receive TSD target/threat point data.
6. COM IDM page current mission target threat file (improved data modem message [IDM MSG]).
   a. Transmit IDM current mission TGT/THRT files.
   b. Receive IDM current mission TGT/THRT files.
7. Target handover to wingman (voice).
   a. Hand over a target to another helicopter.
   b. Receive and process a voice method target handover.

DESCRIPTION:

1. Crew actions.
   a. The pilot on the controls (P*) may send/receive a target handover.
   b. The pilot not on the controls (P) will send/receive a target handover.

2. Procedures.

a. Crew internal. The target handover procedure is used to quickly acquire targets detected by the other crewmember. The pilot (PLT) (backseat crewmember) can use the helmet mounted display (HMD) or FCR to hand over and acquire targets. The CPG can use the FCR, TADS, or HMD.

(1) PLT to CPG. The PLT will alert the CPG of a target by announcing, then describing, the sight being used and the target; for example:

"Gunner, target; FCR; tank." or "Gunner, target; HMD; troops."

The target may be acquired by cueing (HMD) or slaving (TADS or FCR). Select the PLT's line of sight (pilot helmet sight [PHS] or FCR) from the ACQ button on the TSD page. Press the slave switch on the optical relay tube (ORT) right handgrip to slave or activate cueing. If the selected line of sight (LOS) is HMD, when the cueing dots or cued LOS reticle appears, the CPG will move his LOS reticle in the direction indicated until the cued reticle and his LOS are overlayed. If the selected LOS is TADS or FCR, the CPG will de-slave when the selected LOS stabilizes on the target. The CPG will announce to the PLT "tally" when the target is detected and cueing is no longer required; if the target is not detected, the CPG will announce "no joy."

(2) CPG to PLT. The CPG will alert the PLT by announcing the sight being used. An example would be:

"Pilot, target; TADS; tank." or "Pilot, target; HMD; truck."

The target may be acquired by the PLT by selecting the CPG line of sight (gunner helmet sight [GHS], FCR, or TADS) from the TSD ACQ button and cueing to the acquisition source. If the selected LOS is HMD, when the cueing dots or cued LOS reticle appears, the CPG will move his LOS reticle in the direction indicated until the cued reticle and his LOS are overlayed. If the PLT selects the FCR as his LOS, upon selecting the acquisition source from the CPG, the FCR will align in azimuth to the selected acquisition source, and the PLT will conduct a scan. PLT will announce to the CPG "tally" when the target is detected and cueing is no longer required. If the target is not detected, the PLT will announce "no joy."

b. LST target handover. The CPG employs the LST in conjunction with the TADS to acquire targets that are handed over via coded laser energy in coordination with another aircraft or compatible ground designator. This may be accomplished either by automatic (AUTO) or manual (MAN) laser spot tracker. Upon acquiring the laser spot, the CPG will turn the LST off. The LST is not boresighted to the day television (DTV) or forward looking infrared (FLIR) LOS; as a result, the selected sensor LOS may not be directly over the intended target. The CPG will announce "tally" to the designator when the target is detected and lasing is no longer required. If the target is not detected, the CPG will announce "no joy."

c. Software specific digital handovers. The methods of accomplishment for the following tasks vary between different AH-64D lot/block designations from one software version to another. These tasks will be accomplished according to the current operator's manual:

(1) Send/receiving radio frequency missile handover (RFHO).

(2) Send/receiving TSD TGT report (FCR TGT RPT).

(3) Send/receiving target or threat from the TSD page.

(4) Send/receiving current mission TGT/THRT file.

d. Target handover to wingman (voice). The transmitting aircrew will provide the following to the receiving aircraft:

(1) Target description.

(2) Target location in clock position, distance, and direction of movement. If the target is an aircraft, include whether it is high, low, or level.

Note: Local units may adjust the example, provided that the procedures are standardized.

NIGHT OR NIGHT VISION GOGGLES (NVG) CONSIDERATIONS: Obstacle avoidance is especially critical during crew-internal target handovers because both crewmembers may be looking in the same direction. Target handovers should be accomplished as quickly as possible so that normal scan patterns can be resumed.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 1835

Perform night vision system operational checks

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, with grayscale integrated helmet and display sight system (IHADSS) optimization completed, and given TM 1-1520-251-10/ TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

Perform night vision system (NVS) operational checks.

DESCRIPTION:

1. Crew actions.

a. The crew will perform the NVS operational checks, to include turning on the system and adjusting the forward-looking infrared (FLIR).

b. The pilot on the controls (P*) or pilot not on the controls (P) will announce when he takes control of the alternate sensor and when he completes the check.

c. When troubleshooting, the pilot (PLT) (backseat crewmember) or copilot-gunner (CPG) (front seat crewmember) will coordinate with the opposite crewmember before activating the initiated built-in test (IBIT).

2. Procedures.

a. Optimization.

(1) The PLT and CPG will independently set their NVS mode switch on the NVS mode control panel to normal (NORM) or fixed (FXD). If FXD is selected, the NVS sensor's turret will be fixed forward in the zero degree azimuth and elevation position. NORM commands the NVS to the normal flight position that allows the crewmembers' IHADSS LOS to control the azimuth and elevation positioning based on their head position. In the CPG station, selecting either NVS NORM or FXD will replace weapons symbology with independent flight symbology. With the appropriate NVS mode selected, the PLT and CPG will check and ensure that the NVS not cool message is not present on their HDU's HAD.

(2) Each will then accomplish the following adjustments. Adjust the FLIR LVL (level) control, on the video control panel (PLT) or optical relay tube ([ORT] (CPG)), to full counterclockwise (CCW). Adjust the FLIR gain control, on the video control panel (PLT) or ORT (CPG), to full CCW. Adjust the FLIR LVL control, on the video control panel (PLT) or ORT (CPG), clockwise (CW) until the FLIR imagery begins to bloom. Adjust the FLIR gain control, on the video control panel (PLT) or ORT (CPG), CW until contrast or FLIR imagery is acceptable. Adjust the FLIR LVL control, on the video control panel (PLT) or ORT (CPG), to optimize FLIR imagery. Adjust the FLIR gain control, on the control panel (PLT) or ORT (CPG), to optimize FLIR imagery. Set the ACM switch, on the video control panel (PLT) or ORT (CPG), to on. Observe the FLIR imagery on the HDU, then set the switch as desired. When the switch is placed forward (up) to the ACM position, the FLIR LVL and gain controls are disabled and automatic adjustment should occur for varying scene thermal content and polarity switching. Placing the switch to the aft (down) position will enable the FLIR LVL and gain potentiometers.

b. NVS FLIR polarity check. With the NVS optimized, the PLT and CPG will perform a NVS FLIR polarity check. The PLT and CPG will independently set their boresight polarity (B/S PLRT) switch, on the collective flight grip, to white hot PLRT. The CPG may additionally select PLRT from the right ORT handgrip. The PNVS and TADS FLIR polarity will initialize in black hot, so when the button is initially actioned, the polarity will change to white hot as required. The FLIR polarity will continue to change from black to white hot alternately each time the switch is placed to the polarity position. Set the B/S PLRT switch to PLRT. The FLIR polarity will change to black hot. Set the B/S PLRT switch to the desired polarity, black or white.

c. Flight symbology check. The PLT and CPG both must check their independent flight symbology as described in this paragraph. Verify that the transition mode's symbology is displayed on the HDU. The system will initialize in the transition mode. Set the symbology select (SYM SEL) switch, on the cyclic grip, to hover mode. Verify that the hover mode's symbology is displayed on the HDU. Set the SYM SEL switch, on the cyclic grip, to bob-up mode. Verify that the bob-up mode's symbology is displayed on the HDU. Set the SYM SEL switch, on the cyclic grip, to cruise mode. Verify that the cruise mode's symbology is displayed on the HDU. Set the SYM SEL switch to the transition mode.

d. NVS FLIR registration check.

(1) Prior to proceeding with the registration check, the CPG should verify pilot night vision system (PNVS) and TADS captive boresight harmonization kit (CBHK) correctors. A proper registration check will not occur if the PNVS or TADS correctors are incorrect. The aircraft armament section uses a captured boresight harmonization kit (CBHK) to determine boresight correctors for the PNVS, TADS, gun, and pylons. Aviators are only authorized to verify and correct CBHK values to the current CBHK values as recorded in the logbook. Selecting the boresight button from the DMS UTIL page can access the corrector's page. With the boresight page displayed, select the PNVS button or TADS button as appropriate and verify (correct, if necessary) the correctors. Registration is performed to ensure that the PNVS and NVS TADS turrets are, in fact, looking at the same point as that of the aviator's eye. When the PLT or CPG boresights the PNVS or NVS TADS FLIR, he electrically corrects for minor errors between his visual LOS and the electrical LOS of the IHU. A good helmet fit is important not only for aviator comfort, but also for maintaining proper boresight. If, after boresighting, the aviator shifts his helmet for any reason, he will have changed the relationship between his visual LOS and the IHU's electrical LOS. This change in LOS relationship can result in a perceivable difference between where the aviator is looking and where the PNVS or NVS/HMD-TADS is pointing.

(2) Set the NVS mode switch, on the NVS mode control panel, to NORM. The NVS sensor's turret movement should now be coincident with head movements. Select a reference object approximately 90 feet in front of the aircraft. Align the aircraft with a real world object or align an object with the aircraft along the 0 degree azimuth (AZ) and 0 degree elevation (EL) line as measured by the head tracker or ACQ fixed cued LOS. The object being viewed must be at least 90 feet in front of the PNVS or NVS TADS FLIR. If the object is not aligned along the 0 degree AZ and 0 degree EL (aircraft LOS) line or is closer than 50 feet, accurate registration will be difficult because of parallax. With an acceptable registration reference object visible to both the PLT and CPG, check the registration (alignment differential) between the thermal image and reference object (AZ and EL). If the real-world image and the FLIR image are not superimposed within the specification limits, perform another boresight and recheck the registration.

Note: The allowable registration error is 1 foot in AZ/EL at 90 feet. The open center position of the LOS reticle is equivalent to 1 foot at 90 feet. When there is no other acceptable registration reference object, an individual may be positioned in front of the aircraft within the superimposed head tracker. The individual will require a light visible to both the PLT and CPG. The individual may hold the light at approximately the center of the torso. This allows the PLT and CPG to determine the quality of real world and image alignment. By viewing the light, the aviator is able to determine the registration point in a darkened environment.

e. Unity magnification check. Check the unity magnification of the FLIR image and reference object for a 1 to 1 relationship. The NVS TADS FLIR image will appear to be slightly larger than the real world viewed image due to its inherent 1.2 magnification versus the PNVS's 1.1 magnification.

f. Infinity focus check. The FLIR's infinity focus is checked by placing the LOS on the horizon, relaxing the eye, and concentrating on the thermal image, and changing symbology modes. Considering that a gray scale infinity focus was previously accomplished, the symbology should remain in focus. If the symbology is not in focus, use the procedures described in Task 1135. If the FLIR image is not focused out to infinity, contact maintenance personnel and make any appropriate DA Form 2408-13-1 (*Aircraft Status Information Record*) comments.

Note: Initial infinity focus of symbology is accomplished during gray scale checks.

g. Alternate NVS sensor check. The PLT or CPG will announce when he takes control of the alternate sensor and when he completes the check. Set the NVS select switch, on the collective flight grip, to TADS or PNVS as desired. Check selected sensor's turret movement coincident with real world image. Set the NVS select switch, on the collective flight grip, to the primary sensor or as desired.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCES: Appropriate common references.

TASK 2010

PERFORM MULTIAIRCRAFT OPERATIONS

CONDITIONS: In an AH-64D helicopter and given a unit standing operating procedure (SOP).

STANDARDS: Appropriate common standards and the following:

1. Participate in a formation flight briefing according to the unit SOP.
2. Perform formation flight as briefed.
3. React to loss of visual contact according to the unit SOP.

DESCRIPTION:

1. Crew actions.

a. The pilot on the controls (P*) will focus primarily outside the aircraft, keeping track of other aircraft on the route of flight. He will announce any maneuver or movement before execution and inform the pilot not on the controls (P) if visual contact is lost with other aircraft. If visual contact is lost with other aircraft, the crew will immediately notify the flight and begin reorientation procedures. If instrument meteorological conditions (IMC) are encountered, execute inadvertent instrument meteorological conditions (IIMC) break up as briefed.

b. The P will provide adequate warning of traffic or obstacles detected in the flight path and identified on the map. He will assist in maintaining aircraft separation. He will inform the P* if visual contact is lost with other aircraft, and if threat elements are detected or sighted. He will perform duties as briefed. He will notify the P* when his attention is focused inside the aircraft.

c. The P should frequently assist the P* by communicating his situational awareness perceptions and formation/multiship observations. Additionally, the P should assist the P* by monitoring aircraft systems, by operating the navigation system, and by scanning the air route for possible enemy activity or other hazards and obstacles that could impact the integrity and security of the flight.

d. If visual contact with the other aircraft is not reestablished (<5 seconds), then the crew will notify the flight by transmitting their call sign and the proword “BLIND” (for example, “Gun 2 is BLIND”). The flight will then begin reorientation procedures.

e. When an aircraft in the flight calls ‘BLIND,” the flight must remain predictable and provide cueing to the BLIND aircraft by transmitting the flights location in reference to an easily/rapidly identifiable manmade, natural, or electronic feature (for example, “Gun 2 is BLIND” -- “Roger, Lead is north of the bridge heading 360 degrees at hard deck altitude maintaining 100 knots true, coming up position lights bright”).

f. If instrument meteorological conditions (IMC) are encountered, execute IIMC breakup as briefed.

Note: The most important consideration when an aircraft has lost visual contact with the flight is to immediately notify the flight and execute reorientation procedures. Except for enemy contact, all mission requirements are subordinate to this action.

2. Procedures. Maneuver into the flight formation, changing position as required. Maintain horizontal and vertical separation for the type of formation being flown. If the tactical situation requires, perform techniques of movement as briefed.

a. **Takeoff:** All helicopters should leave the ground simultaneously. The trailing aircraft must remain at a level altitude or stack up 1 to 10 foot vertically to remain out of the disturbed air of the aircraft in front of them. In the event an aircraft in the flight loses visual contact with the formation, it will immediately make a radio call to the formation and the P* will initiate a climb above the briefed cruise altitude and attempt reorientation of the formation.

b. **Cruise:** Free cruise formation should be employed when operating at terrain flight altitudes or in a combat environment. This will allow the individual aircraft more flexibility to move within the formation to avoid terrain, obstacles, and enemy threat. During periods of degraded visibility, crews are more susceptible to losing other aircraft in the formation. Crews should consider flying a close formation to maintain orientation on the flight. In the event an aircraft in the flight looses visual contact with others in the flight, it will immediately make a radio call to the lead. The lead will announce the heading, altitude, and airspeed. The lead must maintain this heading, altitude, and airspeed until all aircraft have rejoined the flight. The aircraft that has lost visual contact with the flight will immediately assume the flights heading and airspeed and maintain vertical separation as briefed. The flight will begin reorientation procedures. The most important consideration when an aircraft has lost visual contact with the flight is reorientation. Except for enemy contact, all mission requirements are subordinate to this action. Unit SOPs must state the procedures for reestablishing contact with the flight. Considerations should include but are not limited torally to a known point, use covert/overt lighting, use the FCR (if equipped), and use ground rally. METT-TC, power available, and ambient light will influence how contact is reestablished. When a flight rallies to a known point, the point may be an ACP along the route, a PP sent by lead, or a terrain feature. Situations may occur when an aircraft rejoins the flight in a position other than briefed. Mission commanders may use altitude, a TRP/PFZ, a cardinal direction, or other method to maintain separation. Only after the entire flight is reformed can the mission commander proceed with the mission.

c. **Approach:** The lead aircraft must maintain a constant approach angle so other aircraft in the formation will not have to execute excessively steep, shallow, or slow approaches. Aircraft should not descend below the aircraft ahead of them in the formation to avoid entering their rotor wash. This could result in an over torque, loss of aircraft control, or entering a settling with power condition. In the event an aircraft in the flight loses visual contact with the formation, it will immediately make a radio call to the formation and execute a go-around in the briefed direction**.**

Note1: The P* must keep the P thoroughly informed to what he is observing and doing throughout the formation flight or multiship operation. Normally, the pilot ([PLT] backseat crewmember) will be on the controls, using the pilot night vision system (PNVS). The copilot-gunner ([CPG] front seat crewmember) may be out of the NVS normal (NORM) position using target acquisition and designation sight (TADS) or TADS acquisition-gunner helmet sight (ACQ-GHS) on occasions in the narrow and zoom fields of view (FOV) during the execution of his duties. The constricted perceptual limits of narrow and zoom FOVs necessitates the need for the P* to inform the CPG where they are at in time and space. This is especially important in the case of a pilot's IHADSS failure that requires the CPG to take over aided flight duties. Keeping the CPG informed will reduce the negative effects of transitioning from a TADS narrow or zoom frame of mind to a wide field of view (WFOV) perspective of time and space. The P should frequently assist the P* by communicating his situational awareness perceptions and formation/multiship observations. Additionally, the pilot not on the controls should assist the P* by monitoring aircraft systems and scanning the air route for possible intruders or other hazards and obstacles to the integrity and security of the flight.

Note2: Regardless of the number of aircraft in the formation, the lead/wing concept must be applied. During multiaircraft operations, additional crew actions from Task 2043 (Perform team employment techniques) and Task 1412 (Perform evasive maneuvers) must be considered.

Note3: All multiaircraft operations will be briefed using a unit-approved multiaircraft/mission briefing checklist. The following are mandatory briefing items and must be included in all multiaircraft briefings.

MultiAircraft Operations Briefing Checklist
1. Formation type(s) 2. Altitude 3. Airspeed 4. Aircraft lighting 5. Lead change procedures 6. Loss of visual contact/in-flight linkup 7. Loss of communications procedures 8. IIMC procedures 9. Actions on contact 10. Downed aircraft procedures

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Increase the interval between aircraft to a minimum of three to five rotor disks. Keep changes in the formation to a minimum. All crewmembers must avoid fixation by using proper scanning techniques.

1. Night. During unaided night flight, the crew should use formation and position lights to aid in maintaining the aircraft's position in the formation.
2. NVD. The reduced infrared signature of the AH-64D makes multiship operations, in general, and pilot night vision system (PNVS) formation flights challenging tasks initially. The PNVS and NVS NORM TADS-forward-looking infrared (FLIR) presents a two-dimensional image that makes depth determination and rates of closure difficult to detect and measure. When conducting formation flight, the crew must learn to use FLIR cues to maintain visual reference and separation from other aircraft.

NIGHT VISION SYSTEM (NVS) NIGHT VISION GOGGLES (NVG) CONSIDERATIONS:

WARNING

During periods of reduced visibility, crewmembers may lose sight of other aircraft in the formation. If this occurs, the crewmember should announce loss of visual contact and transmit a call to the other aircraft in the formation.

1. NVS. The multiship/formation procedures found in TC 1-204 generally apply to NVS operations. However, to exploit advantages and diminish limitations of the AH-64D's PNVS and NVS-TADS FLIR, certain techniques and procedures should be modified.

2. FLIR optimization. Formation/multiship flight FLIR optimization normally requires dynamic adjustments to the gain and level settings as the flight transitions into and out of the various modes of flight. The night system (NS) crew will normally find it necessary to reoptimize their specific FLIR sensors each time a flight mode transition is made or as changing environmental conditions dictate.

3. NVS NORM operations with the TADS-FLIR will normally require more frequent reoptimization than that of the PNVS.

4. Polarity determination. Many environmental and sensor performance factors will affect the personal determination of which polarity is ideal for application at a specific given place and time. As FLIR images vary in quality and contrast, switching polarities can be a useful tool in maintaining visual contact with the other multiship operation aircraft. This is particularly important when experiencing adverse effects of alternating current (AC) coupling.

5. Performance distinctions between NVS-TADS and PNVS. The capabilities and limitations of the PNVS are fairly well known and documented. However, the pilot in command (PC) and the other PLT or CPG must also possess a basic understanding of performance distinctions that exist between the NVS NORM WFOV TADS-FLIR and the PNVS.

6. NVS multiship formations. In support of the tactical unit's METL, the aircrew will develop those skills necessary to participate in NVS multiship formation flight. The unit SOP will likely incorporate some variations to the two most common NVS FLIR formations. The first formation, NVS staggered right, is a flight formation designed for deploying a formation of FLIR aircraft at no lower than low level terrain flight mode. The second common formation is NVS free cruise, which is designed for the tactical deployment of NVS aircraft in the NOE and contour terrain flight modes.

a. NVS echelon trail right. The aircrew will fly as part of the NVS staggered right formation when en route to a specific control point or destination at no less than low level flight altitudes. The formation is essentially a highbred trail formation flown with a 20-degree offset (echelon) that takes full advantage of the NVS's 40-degree field of view. The formation requires a great deal of P* skill and attention. A 20-degree echelon allows for the safe egress of aircraft from the formation and also allows for safe position changes. The aircrew will be prebriefed as to what the required minimum horizontal (normally 3, 5, or 7) and vertical (as desired or SOP), rotor disk separation will be between aircraft. The aircrew will normally participate as part of a team or section. The unit SOP and -T will dictate any horizontal separation of participating teams or sections. Vertical separation will be flown per unit SOP and briefing. If either the PLT or CPG is the P* using the NVS NORM TADS-FLIR, a minimum step up of 5 to 10 feet will be required to maintain aircraft FLIR video intervisibility in turns (roll attitude) due to the negative AC coupling video effect.

b. NVS free cruise. The NVS free cruise multiship formation provides participating aircrews with lateral flexibility and greater horizontal distance between aircraft. Combined with an effective scanning technique, NVS free cruise allows more time to scan the terrain and horizon for obstacles, threat, and other aircraft. It will allow flexibility of movement during nap of the earth (NOE) and contour flight. NVS free cruise allows movement up to 45 degrees either side of lead aircraft. During NVS flight, u only the right 45-degree sector simplifies chalk number and team identification. An independent team wingman may find it more effective to be allowed the freedom of maneuver of both 45-degree sectors. Horizontal separation will normally equal 8 to 12 rotor disks until reaching a designated control measure and, from that point, any further separation will be dictated by SOP and mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC). Vertical separation of teams and sections will vary with terrain, obstacles, and the tactical situation.

7. AC coupling effects in rolling (banking) flight. To reduce the adverse effects of AC coupling, reduce the amount of sky visible within the NVS NORM TADS-FLIR (the ALFGL circuited PNVS is not normally affected) field of view. To reduce the visible horizon in a turn or rolling maneuver, depress the NVS sensor just enough to view more of the terrain below the horizon. As part of a formation flight performing a turn (change of heading), a trailing aircraft must reduce the visible horizon by viewing the preceding aircraft from a higher vertical separation aspect, normally 10 feet. This preventative NVS NORM TADS-FLIR technique helps to assure that the limit emitting diodes (LEDs) are operating within their operational limitations by decreasing the drastic signal changes from the infrared (IR) detectors.

8. Night vision goggles (NVG). When conducting NVG formation flight, the crew should use the IR position lights and/or IR strobe lights to maintain aircraft position in the formation (METT-TC dependent).

9. When one crewmember is using NVGs during formation flight, the opposite crewmember should acquisition select the opposite crewmember's HMD.

10. When using NVGs during formation flight in an urban environment, altitude should stack down to "sky light" the aircraft ahead and prevent loss of visual reference in the city lights (METT-TC dependent).

***Note1*:** If visual contact is lost with the aircraft ahead of you, using the FCR in the ATM mode will help facilitate a linkup if your aircraft is FCR equipped.

Note2: White-hot polarity provides the best resolution and reference during NVS formations.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 2013

Perform tactical fire computer airborne target handover system air/transfer mode operations

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS:

1. Configure the improved data modems (IDMs) tactical fire computer (TACFIRE)/airborne target handover system (ATHS) for desired operation.
2. Receive, access, review, and delete TACFIRE AIR/transfer (TFR) mode messages.
3. Transmit TACFIRE AIR/TFR mode reports, movement messages, call for fire, Hellfire mission, and free text.

DESCRIPTION:

1. Crew actions.
   a. The pilot on the controls (P*) is primarily responsible for obstacle avoidance and clearing the aircraft.
   b. The pilot not on the controls (P) is the primary operator of the TACFIRE/ATHS and will announce when focused inside the cockpit.
2. Procedures. Procedures for performing this task are outlined in chapter 3 of TM 1-1520-251-10.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D simulator.

REFERENCE: Appropriate common references, ATHS-TACFIRE emulator, and ATHS-TACFIRE initialization.pdf.

TASK 2043

PERFORM TEAM EMPLOYMENT TECHNIQUES

CONDITIONS: In an AH-64D helicopter or AH-64D simulator, with a properly fitted helmet display unit (HDU), and aircraft cleared.

STANDARDS:

1. Assign team responsibilities and position.
2. Correctly respond to threat and employ weapons as necessary.
3. Maintain situational orientation of objective, friendly ground forces and team members.

DESCRIPTION:

1. Crew actions.

   a. The pilot on the controls (P*) will remain primarily focused outside the aircraft throughout the engagement. The P* will attempt to make smooth and controlled inputs. Desired pitch and roll angles are best determined by referencing aircraft attitude with the outside horizon and/or helmet display unit (HDU) symbology. The P* will only momentarily divert focus during critical portions of the engagement to respond to an aircraft system failure or monitor for performance limitations. The P* will announce the technique of firing to be performed and any deviation from the maneuver. The P* also will announce recovery from the engagement.

   c. The pilot not on the controls (P) will provide adequate warning to avoid enemy fire, obstacles, or traffic detected in the flight path and any deviation from the parameters of the maneuver. The P will also announce when his attention is focused inside the cockpit; for example, when monitoring airspeed, altitude, attitude, or rotor revolutions per minute (RPM).

2. Procedures. The following attack patterns are primarily employed during a two-aircraft mission. The actual pattern is less critical than coordinating the direction of traffic (outbound turn to inbound heading), the break turn direction, and the flight formed call. Lead will announce type of engagement pattern. These three items should be briefed regardless of the selected pattern (for example, “Slayer 1, Slayer 2 clover leaf, right turns, left breaks”). Upon rejoining with lead after the outbound turn, wing will inform the lead that he is safely off the target and team integrity is re-established. The lead aircraft is responsible for reconnaissance and accurate fires on the target while the lead’s wingman is responsible for maintaining protective overwatch of the lead, and suppressive fires if necessary. The distance between lead and wing (suggested 500 to 700 meters) should allow the wing to provide lead with supporting fires and allow the lead aircraft room to maneuver without influencing the wing’s flight path. The length of the inbound course is determined by threat, terrain, and friendly situation. The inbound course should allow for adequate acquisition time and standoff distance. The first track inbound may be a dry run to locate the target, followed by engaging on subsequent patterns. Formations may be adjusted as determined by the tactical environment.

Note 1: One good technique for the wingman is to offset 45 degrees from lead aircraft on inbound run, regardless of attack pattern type. This allows the wingman to suppress from a different avenue of approach, and not fly down the gun barrel of the enemy. It also allows the wingman opportunity to get proper spacing and be able to break off the engagement at a greater standoff range than the lead.

Note 2: When performing movement to contact or reconnaissance missions, primary duties could be switched and wing could be primary shooter and lead only focused on finding and fixing the enemy.

a. Racetrack pattern. The racetrack pattern (figure 4-4) is the basic attack pattern from which the others are derived. This pattern may be used on any mission or may be modified as the situation dictates. More than one team may be used in the racetrack pattern to provide continuous fire on the target.

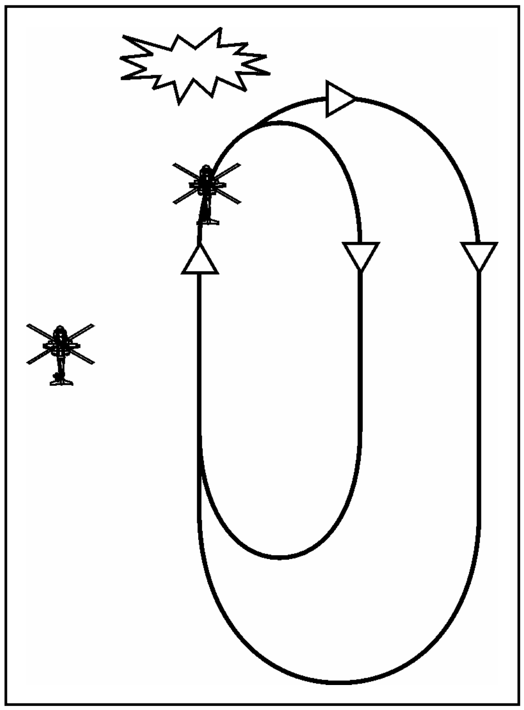

Figure 4-4. Racetrack pattern.

b. Cloverleaf pattern. The cloverleaf attack pattern (figure 4-5) allows for unpredictable direction of attack, good target coverage from multiple directions, and continuous fire on the enemy. The pattern may be modified to adapt to terrain and the number of firing passes required. It is well suited for destruction missions against point or small area targets. The number of inbound turns (leaves) will vary with the enemy situation during the attack.

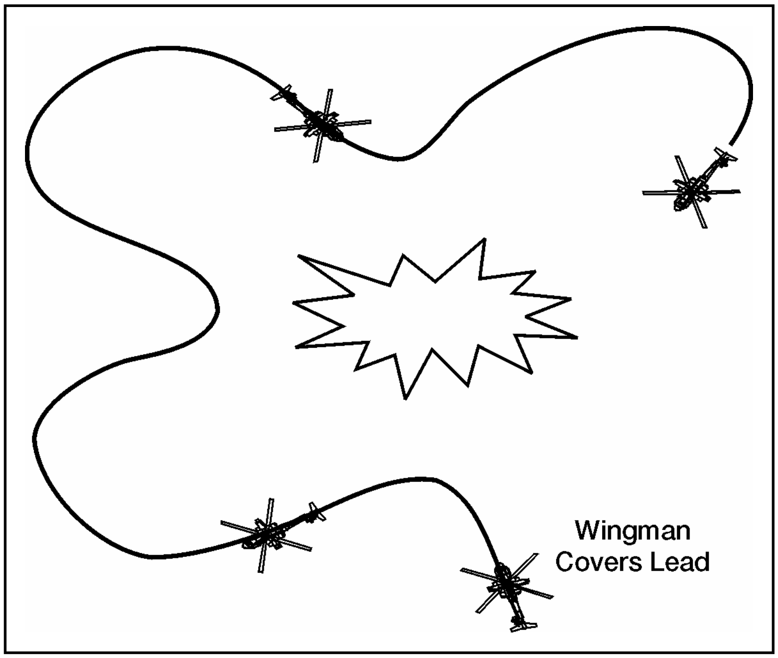

Figure 4-5. Cloverleaf pattern.

c. Figure 8 pattern. The figure 8 pattern (figure 4-6) alternates the direction of attack and egress within a limited maneuver area. Similar to a cloverleaf pattern, it is best suited for targets with natural or man-made obstacles limiting inbound attack directions.

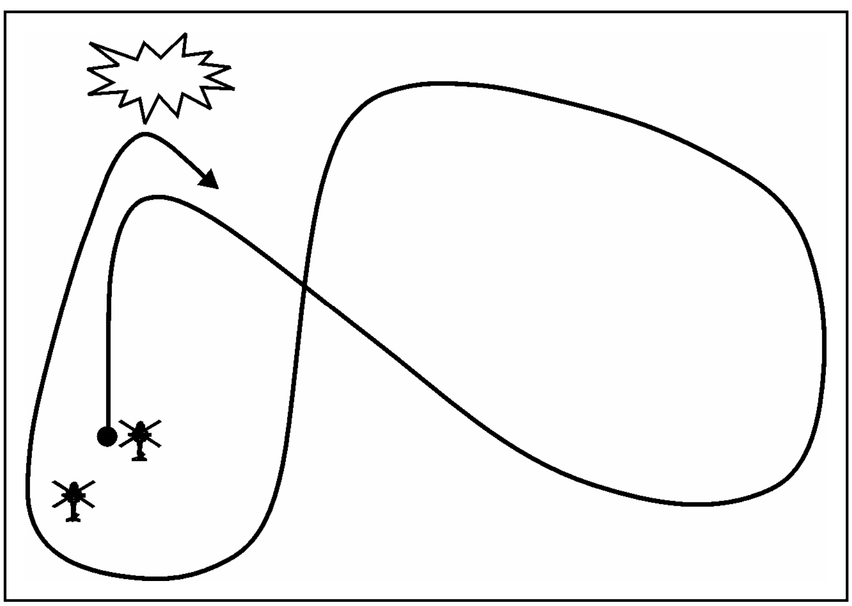

Figure 4-6. Figure 8 pattern.

d. L-pattern. The L attack pattern (figure 4-7) is most effective against targets requiring a large volume of fire for a short duration. Teams in the L-pattern are capable of attacking linear targets or targets that are masked on one side by natural or man-made obstacles. L-pattern is best suited for two teams attacking sequentially.

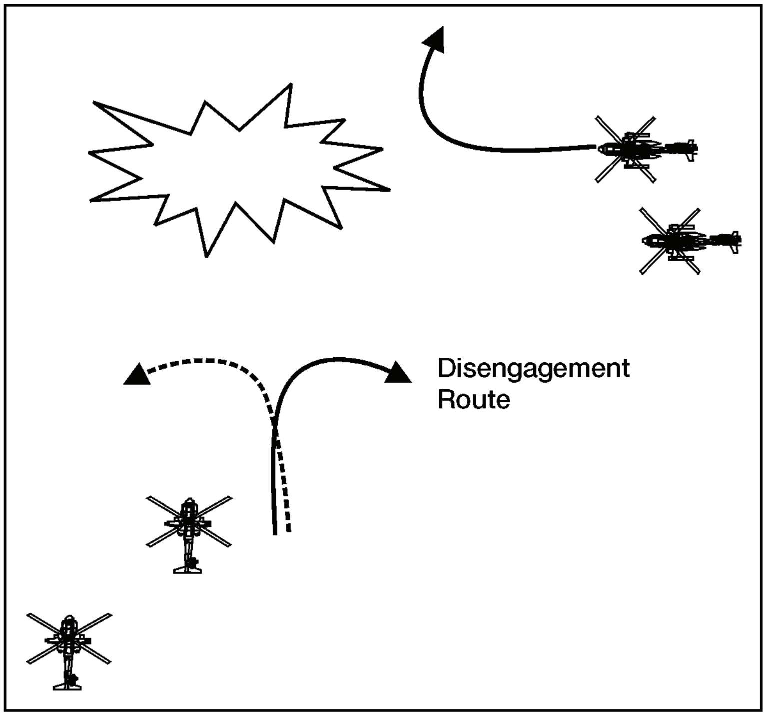

Figure 4-7. L–pattern.

NIGHT/NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Under NVD, the crew must maintain situational awareness and spacing between team members. Crew and team coordination becomes imperative. Due to the slow slew rates of the target acquisition and designation sight (TADS), wearing night vision goggles (NVGs) in the front seat could greatly enhance the copilot-gunner's (CPG) (front seat crewmember) effectiveness. The crew must exercise care when observing the impact of rounds because the flash signature may momentarily degrade the capability of the NVG. When firing rockets, missiles, adjusting indirect fire, or firing the 30-millimeter chain gun off axis, the crew must follow procedures to protect their night vision.

TRAINING AND EVALUATION REQUIREMENTS:

1. Initial training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluations will be conducted in the AH-64D aircraft.

Note: Crewmembers will ensure that the appropriate authority has authorized any training flights.

REFERENCES: Appropriate common references.

TASK 2045

OPERATE THE IR ZOOM LASER ILLUMINATOR-DESIGNATOR (IZLID) 1000P-W LASER

CONDITIONS: In an AH-64D helicopter with an IZLID 1000P-W laser installed, target acquisition designation sight (TADS) internal and outfront boresight completed (not required with modernized target acquisition designation sight [MTADS]), weapons systems initialization completed, and the pilot using the IZLID (either P* or P) wearing AN/ANVIS-6 night vision goggles.

STANDARDS: Appropriate common standards and the following:

1. Place the system into operation.
2. Conduct IZLID boresight.
3. Employ the IZLID laser for target designation and pointing.
4. Use appropriate night brevity codes according to FM 3-09.32.

DESCRIPTION:

1. Crew actions.

   a. The P* will announce when he intends to unmask, remask, or reposition the aircraft and will maneuver the aircraft into position.

   b. The pilot not on the controls (P) will assist in monitoring the aircraft's position while the P* maneuvers the aircraft and will provide adequate warning for obstacle avoidance.

   c. The crewmember will announce when intending to perform target designation and pointing, when operating the IZLID, and when completing the operation. The opposite crewmember will acknowledge all announcements and will confirm the actions of the crewmember performing IZLID laser operations through one multipurpose display (MPD) displaying the opposite crewmember's video select (VSEL) video display option or looking outside the aircraft to physically locate the laser spot.

Note: Selection and display of the opposite crewmember's line-of-sight (LOS) reticle improves crew coordination and increases situational awareness during the execution of this task.

2. Procedures.

   a. Gun page common settings. (Page setup for using the IZLID 1000P-W laser is similar to Task 1464.)

      (1) Select the gun maintained option button. The gun icon will change to inverse video and the gun control option buttons will be displayed.

      (2) Set the independent gun mode to normal (NORM). The gun mode is initialized by the aircraft default in the NORM mode unless set to FXD on the data transfer cartridge (DTC).

   b. IZLID boresighting procedure. Boresight procedure will be IAW current IZLID Laser AWR.

WARNING

The IZLID 1000P-W is a Class IV invisible non-eye-safe laser. All personnel should be alerted to the hazards specific to the IZLID. Avoid direct exposure to the beam to prevent eye injury. The laser is not disabled with the master arm switch, therefore it can be operated with the aircraft weight on wheels. To prevent eye injury, ground personnel should wear eye protection with a minimum optical density of 3.0 at wavelengths of 860 nanometers. Minimum safe skin distance is 43 meters. Use with the precautions of any direct fire weapon.

Note1: During operations with the IZLID laser, and night vision goggles (NVG) are not being worn, a laser-visor or spectacles must be worn for eye protection. When NVG are being worn, CLEPIR spectacles must also be worn for eye protection. Using laser eye protection (spectacles) with NVG may degrade the NVG's transmissivity.

Note2: Flight testing revealed that the IZLID laser boresight relative to the gun is not maintained during Area Weapons System (AWS) engagements.

c. Normal laser operations. The gun mode that may be employed with the IZLID 1000P-W is NORM. The normal mode allows the gun to flex in azimuth and elevation as directed by the weapons processor (WP) for effective laser pointing and target designation while using the P* or P's HMD or TADS as the selected LOS.

(1) After the WPN's gun page options have been set or verified, the pilot or CPG desiring to use the IZLID 1000P-W will action the gun and sight select (SEL) HMD on his collective mission grip's sight SEL switch. The CPG will turn the IZLID power rotary switch to the LOW, HIGH, or PULSE position. The pilot or CPG will insert a manual range of 1,000 meters on the weapons page. The CPG may sight select TADS on his ORT right handgrip instead of HMD.

(2) Depending on environmental conditions, the P* or P may see the entire beam or just the flickering of the infrared (IR) pointer on the ground. Used alone or in conjunction with other IR marking devices, IR pointers are very effective for identifying both friendly and enemy positions. The P* or P may point the beam of the laser directly at the target, "rope" the target or friendly location, or use other methods to designate the target. (Other marking procedures can be found in JP 3-09.3.)

(3) Any IR pointer will be seriously degraded by high light levels, high humidity, or battlefield obscurants. The low grazing angle inherent with ground or low flying aircraft will result in under spill (appears as multiple spots between the source and the target) or over spill (appears as spots beyond the target).

Note1: The purpose of the IZLID 1000P-W is to provide the crew the capability to confirm target location with ground forces and thereby minimize the potential for fratricide. IZLID laser should be limited to target illumination/pointing and not be used as a means of directing AWS fire.

Note2: Energy from the IZLID laser may be reflected back to the crew during use. The minimum safe employment range is 620 meters. Recommend an employment range of greater than 620 meters be maintained to minimize the risk to the crew and ground personnel. The IZLID laser should only be powered when the AWS is the weapon actioned and a target is being designated. Direct view optics (DVO) will increase the minimum safe range.

Note3: To designate targets with the IZLID laser beyond 1,000 meters, a manual range of 1,000 meters must be entered into the WP to prevent the gun barrel from elevating above LOS.

Note4: Proper crew coordination must occur between the ilot and for activating and deactivating the IZLID 1000P-W laser, as the IZLID power rotary switch is only located in the CPG's cockpit.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references plus the following:

AWR 2004D-A51
JP 3-09.3
JP 3-09.32
Task 1138 and Task 1464

TASK 2050

Develop an emergency global positioning system (GPS) recovery procedure

> **WARNING**
>
> **This procedure is strictly for recovery under visual meteorological conditions (VMC) for training and for inadvertent instrument meteorological conditions (IIMC) use only and will not be used for a planned IFR flight unless approved by USAASA. This emergency recovery procedure is only authorized to be flown when the situation prevents the use of an approved navigational aid.**

Note: This task should be selected for instrument examiners.

CONDITIONS: With a tactical or aeronautical map with current obstruction information. A mission planning system with digital maps and recent CHUM may be used to aid in developing this procedure.

STANDARDS:

1. Select a suitable recovery/landing area and coordinate, if required, airspace deconfliction.
2. Select an approach course (degrees magnetic), a missed approach course, final approach fix (FAF), missed approach point (MAP), intermediate approach fix (IF), initial approach fix (IAF) and missed approach holding fix (MAHF).
3. Determine obstacle clearance for the final, MAHF, missed, intermediate, initial segments, and the MSA.
4. Determine altitudes based on obstacle clearance for FAF, MAHF, MAP, IF, IAP, and MSA.
5. Determine the appropriate obstacles in the missed approach segment and determine 20:1 slope penetration.
6. Establish a 3 nautical mile (NM) holding pattern at the MAHF.
7. Prepare an emergency recovery procedure diagram per the example.
8. Complete a suitability/flyability check—to include loading waypoints—under VMC to validate the procedure.

Note 1: All altitudes are in eet MSL, all waypoints are LAT/LONG, all distances are NM, and visibility is SM. All obstacles are MSL unless otherwise noted. The FIH has the necessary conversion tables.

> **WARNING**
>
> **Ensure coordinates for maps and GPS are the same datum (for example, WGS-84) or the point on the ground may be off significantly and obstacle clearance will be questionable.**

***Note 2*:** PPS refers to the GPS precise positioning service. It is Department of Defense (DOD) policy that military aircraft operate with the GPS in the PPS mode.

***Note 3*:** Complete the enclosed figures for determining approach criteria. The width cannot be adjusted.

DESCRIPTION:

1. **Most suitable recovery/landing area.** Select an area based on mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC) and obstacles. Ensure proper coordination for airspace deconfliction has been done.

2. **Final approach segment.** The final approach segment begins at the FAF and ends at the MAP.

   a. Determine the MAP (normally associated with the landing area or threshold).

   b. Determine the FAF. The minimum distance is 3 NM from the MAP. The maximum length is 10 NM. The optimum length is 5 NM. The width is 2.4 NM (1.2NM on either side of the centerline).

3. **The MAHF.** Determine the MAHF for the landing area. The minimum distance is 3 NM and the maximum distance is 7.5 NM from the MAP. The optimum distance is 5 NM. The holding pattern leg will not exceed 3 NM. The width is 4 NM (2 NM on either side).

Solution: (A) _____ (rounded up nearest 100 ft) + (B) 1,000 ft = (C) _____ (MAHF altitude)
Note: (A) = Highest obstacle within 10 NM centered on the MAHF

Table 4-1: MAHF altitude calculation table

4. **Missed approach segment.**

   a. The missed approach segment will start at the MAP and will end at a holding point designated by a MAHF.

   b. Optimum routing is straight ahead (within 15 degrees of the final approach course) to a direct entry. A turning missed approach may be designated if needed for an operational advantage but is not discussed in this task due to the complexity of determining obstacle clearance.

   c. The area of consideration for missed approach surface and the 20 to 1 obstacle clearance evaluation apply for all rotary wing.

5. **Intermediate approach segment.** The intermediate segment begins at the IF and ends at the FAF. Determine the IF. The minimum distance is 3 NM and the maximum distance is 5 NM from the IF to the FAF. The width is 4 NM (2 NM on either side).

6. **Initial approach segment.** The initial approach segment begins at the IAF and ends at the IF. Determine the IAF. Up to three IAFs are allowed. The minimum distance is 3 NM from the IF and the maximum distance is 10 NM. The width is 4 NM (2 NM on either side).

7. **MSA for the landing area.** To determine the MSA for the landing area, use the OROCA or ORTCA elevation from the en route low altitude (ELA) chart for the area of operations, if available. Select the highest altitude within 30 NM of the MAP.

   a. If an ELA is not available, the minimum sector altitude will be determined by adding 1,000 feet to the maximum elevation figures (MEFs). When a MEF is not available, apply the 1,000-foot rule to the highest elevation within 30 NM of the MAP.

b. Minimum sector altitudes can be established with sectors not less than 90 degrees° and with sector obstacle clearance having a 4 NM overlap. Use the following for determining MSA.

Solution: (A) _____ (rounded up nearest 100 ft) + (B) 1,000 ft = (C) _____ (MSA)
Note: (A) = Highest obstacle within 30 NM centered on the MAP

Table 4-1.1 MSA calculation table

8. **The procedures diagram.** The procedure diagram may be computer generated or hand sketched. The diagram need not be as detailed as a DOD-approved chart, but it must provide all data as outlined in the example to execute the procedure.

a. The plan view. The plan view will include the following:

(1) The highest obstacle altitude (MSL) in BOLD.

(2) The approach course (degrees magnetic), IAF, IF, FAF, MAP, MAHF holding pattern, obstacles, and MSA. It also includes the following terms:

- "FOR VFR TRAINING and EMERGENCY USE ONLY" twice.
- "PPS REQUIRED."

b. Minimums section. The minimums section will include the following. The minimum descent altitude, visibility, and the height above landing (HAL). Use Table 4-1.2 to compute the landing visibility minimum based on HAL.

c. Landing area sketch. The landing area sketch includes a drawing/diagram of the landing area and the elevation of the highest obstacle within the landing area (if applicable).

d. Prior to publication, the diagram will include, as a minimum, all items included in the following diagram.

	250 – 475 ft	476 – 712 ft	713 – 950 ft
Landing visibility minimum (SM)	½	¾	1.0

9. **Flight check**. Complete a flight check under VMC in an aircraft to finalize the procedure and validate the diagram. Once a successful flyability/suitability check has been completed, the diagram will be validated by the developer in the lower marginal data area. Once validated by the developer, the procedure must be approved by the appropriate authority in the lower marginal data area prior to publication. The flight should validate the following:

a. Locations—IAF, IF, FAF, MAP, and MAHF.

b. Obstacles.

c. Approach course.

d. Obstacle clearance.

e. Altitudes—MDA, FAF, IF, IAF, MSA/holding pattern altitude.

***Note*:** All waypoints (IAF, IF, FAF, MAP, and MAHF) will be verified by two separate GPS NAV systems, for example, DGNS, EGI, PLGR. At least one will have PPS. If unable to complete a suitability/flyability check due to the operational environment, the commander should consider an elevated risk when using this recovery procedure.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted academically.

2. Evaluation may be conducted academically.

REFERENCES: Appropriate common references plus the following:
FAA Handbook 8260.3 (TERPS Manual)
FAA Order 8460.42A (Helicopter GPS Nonprecision Approach Criteria)
FAA Order 7130.3 (Holding)

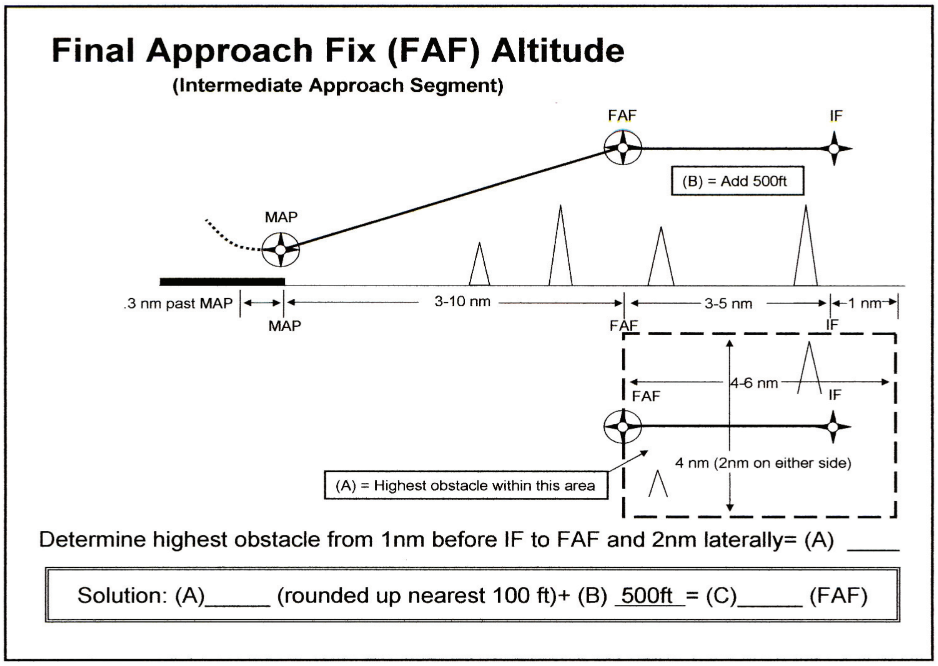

Figure 4-8. Final approach fix altitude

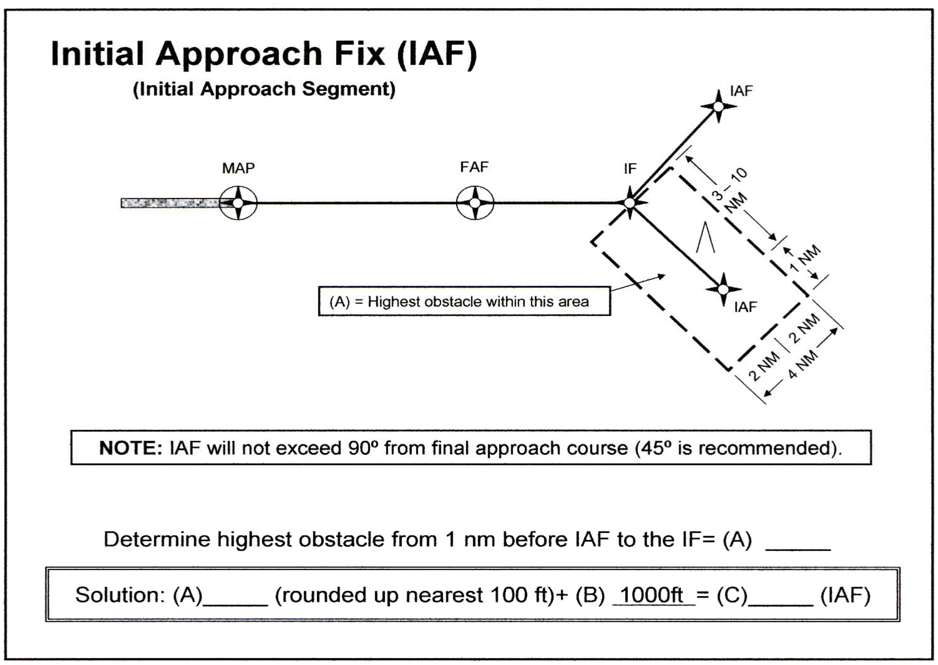

Figure 4-8(a). Initial approach fix

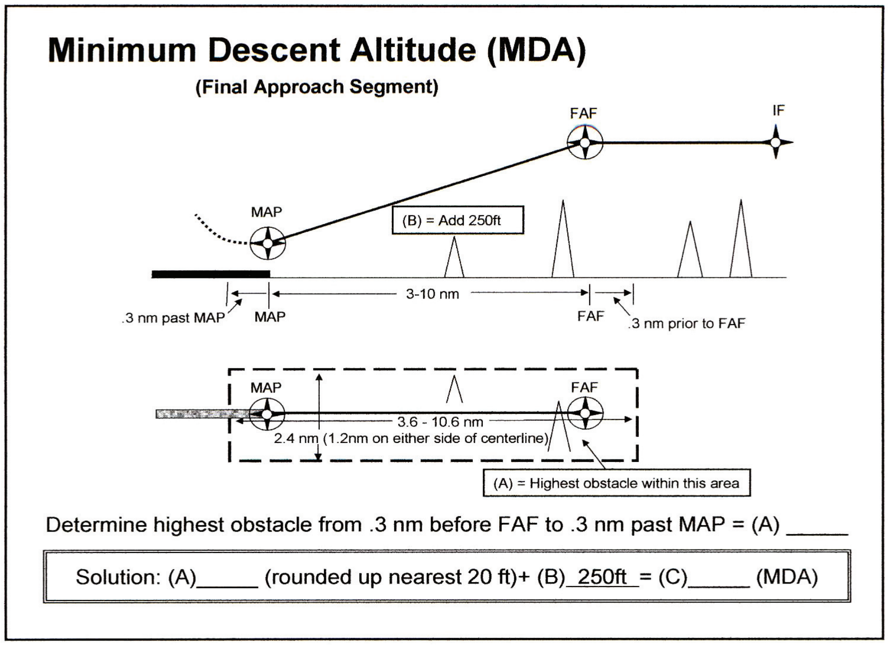

Figure 4-8(b) Minimum Descent Altitude (MDA)

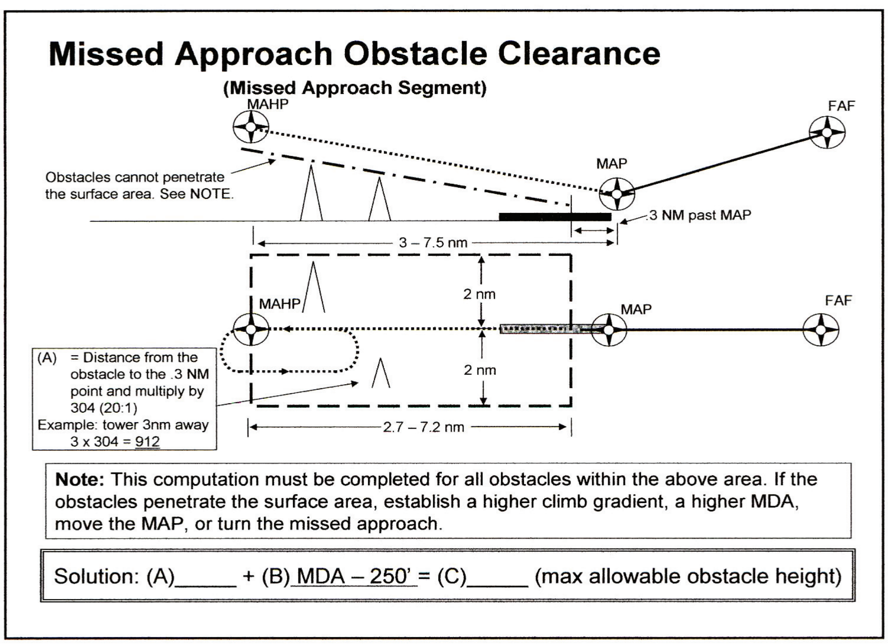

Figure 4-8(c). Missed approach obstacle clearance

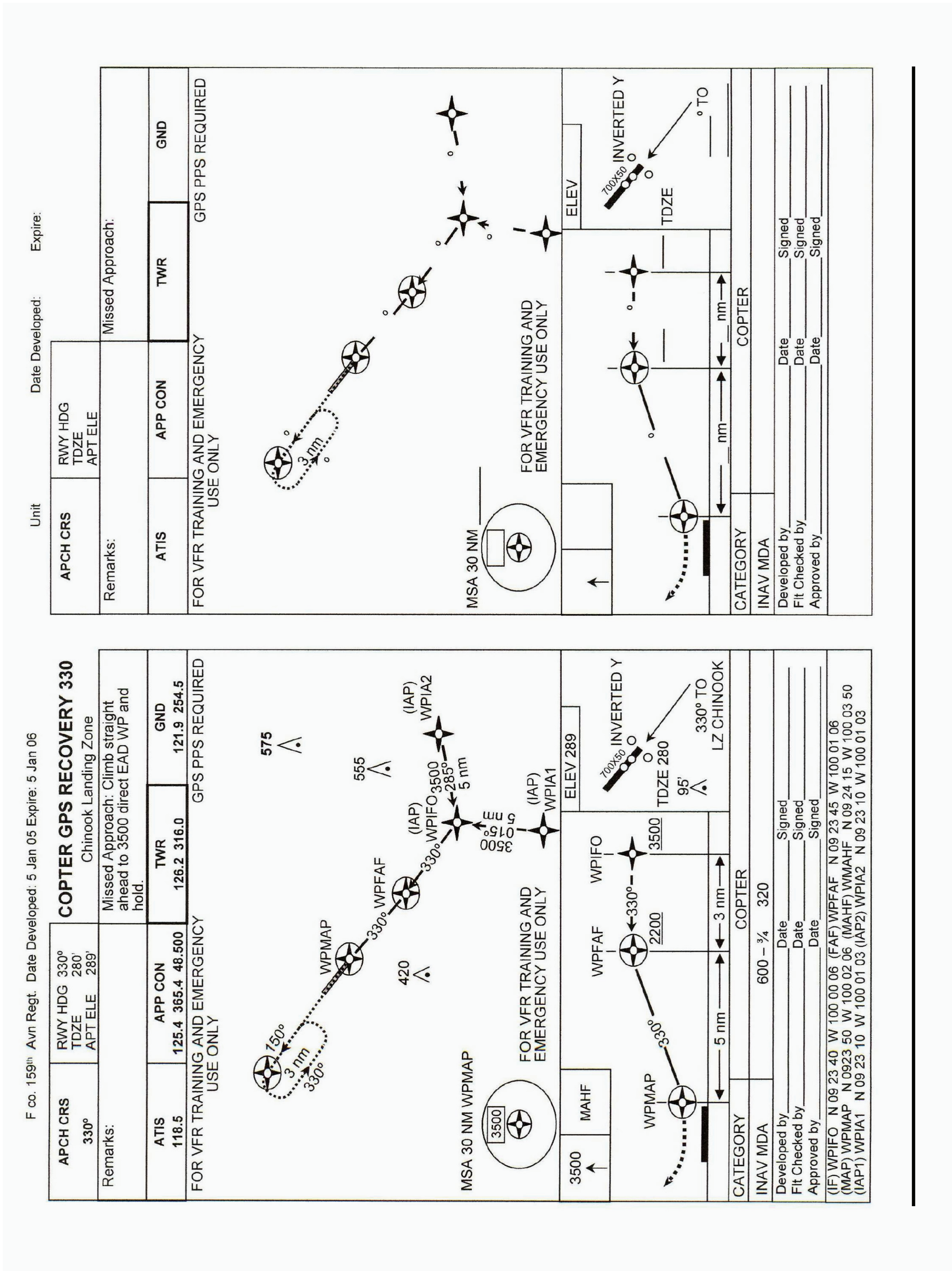

Figure 4-8(d). Sample GPS approach

This page intentionally left blank.

TASK 2066

Perform extended range fuel system procedures

WARNING

With a single 230-gallon extended-range fuel tank installed, the main rotor tip-path plane can flap dangerously low during ground taxi operations. Exercise extreme caution to ensure the safety of ground personnel and avoid striking objects near the aircraft during all ground operations.

CAUTION

The use of extended range fuel system (ERFS) carries an increased risk to the aircrew. The risk results from decrements in maneuverability, performance, responsiveness, ballistic tolerance, and the increased possibility of post crash fuel spill and fires.

CAUTION

Final aircraft attitude (controls neutralized) is unpredictable when performing lateral slope operations in an AH-64 helicopter with a single external-tank configuration. Loss of downslope controllability can occur when landing in either direction. It is especially pronounced when landing with tank on the downslope side of the aircraft. Whenever possible, the landing should be performed with the external tank upslope to avoid exceeding the aircraft slope limit or rolling over.

CONDITIONS: In an AH-64D helicopter, AH-64D simulator, or academically with an ERFS consisting of one, two, or four 230-gallon fuel tanks.

STANDARDS:

1. Correctly perform preflight inspection of ERFS.
2. Verify that the aircraft will remain within weight and center of gravity (CG) limitations for the duration of the flight.
3. Participate in an expanded aircrew mission briefing that addresses ERFS operations.
4. Employ, or describe, the correct procedures for conducting ground taxi, hovering flight, takeoffs, in-flight maneuvers, and landing tasks with ERFS installed.

5. Perform, or describe, the procedures for external fuel transfer and management through the fuel page.

6. Perform or describe emergency procedures for external fuel wing store jettison.

7. Correctly perform a postflight inspection of ERFS components and transcribe DA Form 2408-13 (*Aircraft Status Information Record*) flight hour write-ups for single tank operations.

DESCRIPTION:

1. Crew actions. Prior to operating with external fuel tanks, the pilot in command (PC) will ensure that the aircraft remains within lateral CG limits throughout the flight. Careful consideration must be given to the offload of any wing stores in flight. The crew will familiarize themselves with, and adhere to, ERFS requirements and limitations contained in the interim statement of airworthiness qualification (ISAQ), safety of flight bulletin, operator's manual, and unit standing operating procedure (SOP).

2. Procedures.

a. Crew mission briefing. In addition to the standard crew briefing, aircrews will also brief the following when performing ERFS operations.

(1) Emergency procedures to include—

(a) Single engine considerations.

(b) Tank location effects on emergency egress procedures.

(c) Tank jettison procedures including cartridge malfunction procedures when jettison failure occurs.

(d) Fire in flight.

(2) Tank and gross weight maneuver limitations.

(3) Fuel transfer operations.

(4) Weapons employment considerations/procedures.

(5) As applicable, single tank ISAQ limitations.

(6) Warnings and cautions.

b. Lateral CG envelope. Later CG determination is accomplished in three steps.

(1) First, the crewmember must calculate and record stores data moments (table 4-2) from the boundary line (BL) and weight (WT) data.

(2) Second, using table 4-3, the crewmember determines total weight sum (inclusive alternating current gross weight [AC GWT]) and sum of total moment.

(3) Lastly, the crewmember enters these values into the ISAQ lateral CG chart to determine lateral CG. Calculate weight and moment of pylon stores loading by entering launcher/tank weight; add ordnance/fuel weight; then multiply stores total by arm BL to obtain stores moment. For lateral CG computation (table 4-3), tally and record the basic weight (item 1, column [1]) and multiply by BL (item 1, column [2]) to determine moment (item 1, column [3]). Enter internal fuel weight (item 2, column [1]) and crew weight (item 3, column [1]). Enter weight for items not included in basic weight (item 4, column [1]) and total stores weight from table 4-2 (stores total pounds [lbs]) into table 4-3, item 5, column (1). Enter total stores moment from table 4-3, item 5, column (3) by multiplying column (1) and then column (2). Using the ISAQ lateral CG chart, find the value corresponding to table 4-3, item 5, column (1) total weight on the left side of ISAQ chart; move laterally until intersecting the inches from centerline value (total stores moment from table 4-2 total

moment). The intersection represents the calculated lateral CG of the helicopter. The calculated lateral CG must be within the allowable limits of the ISAQ lateral CG chart.

Table 4-2. Step 1–Determine weight and moment of pylon stores loading.

	COL (1)		COL (2)		COL (3)		COL (4)		COL (5)
Pylon	Launcher or Tank (lbs)	+	Ordnance or External Fuel (lbs)	=	Stores Total (lbs)	X	ARM (BL) (inches)	=	Stores Moment (inches-lbs)
OUTBD LH		+		=		X	-93.0	=	
INBD LH		+		=		X	-63.0	=	
INBD LH		+		=		X	+63.0	=	
OUTBD RH		+		=		X	+93.0	=	
Total Stores Weight and Moment									

Table 4-3. Step 2–Determine the aircraft lateral center of gravity.

		COL (1)		COL (2)		COL (3)
		Weight (lbs)	X	BL (inches)	=	Moment (in-lbs)
1.	Vehicle basic weight and moment		X	-0.1	=	
2.	Internal fuel weight		X	0	=	
3.	Crew weight		X	0	=	
4.	Other items not in basic weight		X		=	
5.	Total stores weight and moment		X		=	
6.	Vehicle takeoff lateral center of gravity	Sum of all rows = total weight		Moment/Weight		Sum of all rows = total moment

c. Preflight. Fuel sampling will be accomplished by taking a sample from the sump drain located at the bottom of the tank. Check the ERFS (external fuel tanks) as follows:

(1) Tank mounting—Fore and aft attaching lugs are secure and sway braces are firmly against the tanks.

(2) Fuel and air lines—Check condition and security.

(3) Electrical connectors and jettison lanyard—Check condition and security.

(4) External fuel tanks—Check overall condition and security. Check fuel sample for each tank and ensure minimal ground clearance.

d. Aircraft runup. Once the auxiliary power unit (APU) is started and both generators are online, the external tank is automatically pressurized with pressurized air system (PAS) air. The aircrew and ground crew (when available) will monitor the tanks for signs of leaking fuel.

e. Ground taxi. Use power as required to prevent excessive forward cyclic application and to reduce the possibility of damaging the main rotor strap pack assembly. Taxiing with an external tank requires a level fuselage due to a decreased ground clearance of only 6 to 8 inches, depending on fuel load, struts, and tire servicing. Slower than normal taxi speed is desirable with the decreased ground clearance.

f. Hovering flight. Depending on load and variable power conditions, a hover power check will not always be possible. When applicable, ensure that hover performance data was extrapolated from the hover charts dashed line (drag versus power differential) for AUX tank installation. With the ERFS installed, a 2 percent increase in hover torque at 5 feet is not uncommon.

g. Takeoff. Prior to takeoff, the crew will ensure that the AUX fuel buttons are deselected so that an accurate fuel check can be initiated. When power is marginal, or in-ground effect (IGE) power is not available, a rolling takeoff is either desirable or mandated. Once the rolling takeoff is initiated and obstacles have been cleared, continue to accelerate to maximum (MAX) rate of climb (R/C) airspeed. MAX R/C should be maintained until reaching the desired altitude.

h. Inflight fuel checks and fuel management. Fuel burn rate check procedures must be performed by employing the internal fuel tanks and their associated fuel page indications. After the initial fuel check has been completed, the external fuel transfer capability is checked to insure serviceability. Transferring of any additional fuel is at the discretion of the PC. Fuel management procedures will be conducted in accordance with chapter 2 of TM 1-1520-251-10 and Task 1048.

Note: Refer to Task 1048 (paragraphs 2e(4), external fuel tank initialization, and 2e(5), external fuel tank transfer operation) for more specific information.

i. Maneuvering flight. Flight maneuvers must not exceed the limits described in TM 1-1520-251-10's chapter 5 or the ISAQ.

j. Emergency procedures. The operator's manual does not address any specific ERFS emergency procedures other than external fuel wing store jettison. In a four-tank configuration, selective jettisoning of external fuel tanks potentially causes two major problems. If external tanks are jettisoned off of one side, it may cause a lateral CG problem. Additionally, the ability to refuel the internal tank(s) from the remaining ERFS is lost.

k. Landing. Consider the terrain and suitability of the landing area. The pylons are fixed at 4 degrees, decreasing the ground clearance. If the tanks are full, a roll on landing should be executed whenever the terrain and area allows.

l. Postflight. Conduct postflight checks by checking the same ERFS components inspected during the preflight. When one external fuel tank is mounted on either inboard pylon along with any combination of weapons stores, flight hours will be entered on DA Form 2408-13.

m. ERFS refueling. All tanks are gravity refueled only, and will only be accomplished cold.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft, AH-64D simulator, or academically
2. Initial qualification will be conducted in the AH-64D aircraft. Subsequent and other evaluations will be conducted in the AH-64D aircraft, AH-64D simulator, or academically.

REFERENCES: Appropriate common references.

TASK 2068

PERFORM SHIPBOARD OPERATIONS

CONDITIONS: In an AH-64D helicopter or an AH-64D simulator, provided with a field deck landing spot area or a designated ship, with a deck landing qualification (DLQ) pilot in command (PC), unit trainer (UT), or instructor pilot (IP).

Note: Units and assigned aviators will fully adhere to the Army/Air Force/Navy force deck landing operations memorandum of understanding (MOU) and JP 3-04.1 procedures. This includes pre-sail forecasting and scheduling, conferencing, initial qualification, currency requirements, and applicable waiver procedures.

STANDARDS:

1. Participate in a crew mission briefing.
2. Ensure that the data transfer cartridge (DTC) has been properly loaded with the ship's actual location, or predicted aircraft runup location and that the navigation (NAV) mode has been enabled for SEA.
3. Initialize the embedded global positioning inertial navigation system's (EGI's) NAV mode at SEA for either stationary or moving conditions.
4. Hover power check and takeoff.
   a. Perform takeoff to a hover at the time-synchronized moment where the deck moves the least.
   b. Perform hover power check at prescribed hover height ±2 feet with drift not to exceed 3 feet.
   c. Slide out over the side of the ship and perform a normal takeoff parallel to the line up line or as otherwise directed.
   d. Use correct radio phraseology and communication procedures.
5. Inbound.
   a. Contact the designated ship on the correct voice frequency with the briefed call sign prior to entering the control area (50 miles out when possible).
   b. Provide the designated ship with aircraft position, crew, fuel remaining, ammunition (ammo)/rockets/missiles onboard, any emergency problems with the aircraft to include hung or misfired ordnance.
6. Pattern.
   a. Enter or exit the prescribed pattern.
   b. Pattern altitude as directed, or as standard for type of pattern flown ±50 feet.
   c. Pattern airspeed as directed ±10 knots true airspeed (KTAS).
7. Approach and landing.
   a. Maintain flight track coincident with the landing direction of the deck.
   b. Cross the deck at briefed deck height plus 15 feet or as otherwise instructed.
   c. Perform a normal approach to a point above the assigned spot (intended point of landing), with the helicopter aligned with ship's centerline at touchdown.

d. Perform a landing from a hover and touchdown at the timed moment that the ship moves the least.

e. Use correct terminology to relay landing sequence.

8. After landing deck operations and procedures.

a. Inform ground personnel of any onboard ammunition, rockets, or missiles and provide warning for hung or misfired ordnance.

b. Participate in combat information center (CIC) mission debriefing.

9. Emergency procedures.

a. Explain or execute procedures for lost communication and navigational aid (NAVAID) failures while conducting flight operations over the sea.

b. Explain or execute procedures for aircraft emergencies while conducting flight operations over the sea.

c. Explain or execute procedures for flight deck emergencies from the cockpit.

DESCRIPTION:

1. Crew actions.

a. During overwater flight, the pilot on the controls (P*) will maintain briefed altitude above the water with assistance provided by the pilot not on the controls (P).

b. The P will alert the P* to any descent that might violate minimum briefed altitudes.

c. The crew must be thoroughly familiar with the various communication methods and terminology/phraseology used by naval personnel from vessels equipped with landing deck spots. Communication is a critical aspect of deck landing operations and the Navy uses a variety of communication methods. Radio voice communication is the primary means for conveying and receiving instructions, while other shipboard methods include flags, lights, colored clothing ID, and arm and hand signals.

(1) Flags. The signal flags for helicopter operations are the Hotel or the Foxtrot flags. If the flag is all the way up the mast, the deck is green (cleared for helicopter operations). If the flag is at half-mast, the deck is fouled (not cleared for helicopter operations.

(2) Light beacons. The deck status lights system includes a light fixture with three lenses or rotating beacons. They are normally located on a high point in the pilot's (PLT's) (backseat crewmember) and copilot-gunner's (CPG's) (front seat crewmember) field of vision and are used to indicate the flight deck's ability to operate aircraft. Red indicates fouled deck (when ship is operating airborne aircraft) or clear to start engines (when ship has aircraft on deck). Amber is used for rotor engagement or disengagement, and green indicates clear to launch and recover helicopters. Deck status lights are normally used for communication with flight deck personnel only. Pilots will not use the deck status lights for clearance for engine start, rotor engagement, or takeoff or landing. Pilots will follow landing signal enlisted (LSE) or landing signal officer (LSO) signals.

(3) Hand and arm signals (night: wands and flashlights). Hand and arm signals and, at night, wands and flashlights, are used throughout deck landing operations as referenced in JP 3-04.1.

2. Procedures.

Note: The AH-64D with radar can fix the ship's location with the fire control radar (FCR).

a. Premission, runup and before takeoff deck operations and procedures.

(1) JP5. Because of its high flash point, JP5 is exclusively used on Navy and Coast Guard vessels. The PC's premission performance planning should include JP5 fuel considerations. Engine operating characteristics may change because of lower operating temperatures. Slower acceleration, lower engine speed, harder starting, and greater range may be experienced.

(2) Approved software EGI sea mode data download. The PC should ensure that a valid aircraft (EGI) initialization coordinate is loaded into the DTC along with the command to initialize the EGI in the sea mode. The PLT or CPG will perform a data transfer unit (DTU) page navigation button selective load as part of the DTU load procedures. Selecting the navigation button will command the signal processor (SP) to disregard the last coordinate stored at shutdown and use the provided navigation load coordinate for EGI initialization. The navigation button will also command the mode for EGI initialization, sea or land. The DTC's initialization coordinate should be the actual location of a stationary ship or the estimated location where a moving ship will be when the aircraft is runup.

(3) Aircraft runup procedures. After accomplishing the aircraft preflight, the PLT and CPG are authorized to board the aircraft and complete all checks up to starting the engines. During the runup checks, the PLT or CPG must initiate the appropriate sea align mode for the EGI and set the fuel page type to JP5 or as appropriate. When ready to perform the engine start procedures, request permission from the helicopter control officer (HCO) to start the engines. A red deck status light will be provided in coordination with the LSE for clearance to start engines. The LSE will signal the clearance to start engine one followed by engine two. Once clearance is received, the PLT will perform a rotor lock start for two engines. When both engines are online, request permission to engage the rotor (rotor brake off). Rotor engagement is accomplished under a yellow deck status light. The LSE is responsible for ensuring that helicopters, on signal, are safely started, engaged, launched, recovered, and shut down.

(a) EGI initialization. If not already loaded to the DTC, the PLT or CPG will have to input a valid universal transverse mercator (UTM) or latitude (LAT)/longitude (LONG) coordinate to the EGI through the tactical situation display utility (TSD UTIL) page. Additionally, if the DTC has not been preset to initiate EGI initialization in the sea mode (through a selective navigation DTU load), the PLT or CPG will have to select the NAV mode button and select sea. With the sea mode selected (either through an automatic command from a navigation selective load or through a manual selection of the NAV button), an align mode option bloc will be displayed inclusive of two option buttons: status (STAT) and move. The PLT or CPG will select the pertinent align mode option button for the conditions.

(b) Fuel page. During runup, the PLT or CPG will access the aircraft (A/C) fuel page and change the fuel page type to JP5 if using auxiliary (AUX) tanks.

b. Hover power check and takeoff. When all pre-launch checks have been completed, signal the LSE, LSO, or HCO. Transmit a request for takeoff to the helicopter control station or primary flight control tower. The PLT will also turn the aircraft's navigation lights to bright (dim at night), which will signal his readiness for launch to the deck crews. When takeoff clearance is granted and all tiedowns have been removed, the pilot is cleared to take off at the LSE's signal. Perform a hover power check before leaving the deck to ensure sufficient power is available for flight. Announce if any drifting over the deck is observed. After a hover power check, slide right to clear the ship. Depart from the ship on a 45-degree angle from the bow. (Single spot ships may require a hovering turn prior to takeoff.)

(1) Effects of the wind will be more noticeable when operating on ships that are underway. Once the helicopter has cleared the ship, the pilot will signal or report "ops normal," souls on board, and total fuel in hours and minutes, unless prohibited by operational restrictions.

(2) Prior to departing the pattern, or unless instructed otherwise, the PLT or CPG will turn the landing light on and perform a "fly by." A "fly by" provides the tower and other personnel the opportunity to check the aircraft for obvious signs of problems. Additionally, the "fly by" provides the PLT and CPG one last opportunity to land before extending away from the landing deck spots.

c. Inbound procedures. From the PLT's and CPG's perspective, there is a sequence of events that occurs when flying inbound (returning or initial arrival) for landing on a ship. The ship will be executing a series of evolutions to receive the inbound helicopter. Having received an overhead message in advance of scheduled operations, the aircrew will know the ship's location, assigned radio and navigation aid frequencies, and time expected to arrive overhead the ship. Aircrews are expected to check in with the ship prior to entering the control area; 50 miles out is preferred when possible, electronic emission control conditions permitting. When voice communicating with the ship, use prebriefed call signs.

(1) The aircraft will be asked for position, souls on board, and fuel remaining. The ship's secondary controlled airspace, the control zone, extends out 5 nautical miles (NM) in radius and up to 2,500 feet above the sea.

(2) When reaching the periphery of the control zone, or when otherwise instructed, make radio contact with the ship to receive pertinent landing information and instructions. These include deck status information (red, not ready to conduct flight operations, or green, ready to conduct flight operations); base recovery course of ship (magnetic heading of ship during aircraft recovery); ship velocity; wind speed and direction over the deck; pitch and roll of the ship; and altimeter setting.

Note 1: Regardless of whether the aircraft's EGI was initially aligned on land or at sea, ensure that the TSD NAV button is moded to SEA when operating over water for an extended period. When in flight, changing the TSD NAV mode button from land to sea will enable a Doppler radar return bias that is favorable to overwater flight; it will not cause the EGI to realign.

Note 2: Determination of total fuel will be the time that engine "flame out" (fuel exhaustion) can be expected. If the aircraft is leaving the tower's control, this report will be given to the combat information center or helicopter direction center

Note 3: When illumination is low or operating in reduced visibility, the horizon may not be visible and the crew will have to make nearly constant reference to the HDU's hover or transition mode symbology set.

d. Pattern. Depending on the amount of air traffic around the ship, an inbound aircraft may initially be directed by the either the priority (PRI)-FLY or helicopter direction center (HDC) to enter into a delta pattern. Delta patterns are flown at 1, 3, or 6 miles from the ship. (The distance flown depends on pattern segment location and if flying a port or starboard upwind). A normal Delta pattern entry altitude is 1,000 feet mean sea level (MSL) unless directed otherwise, followed by a descent to 300 feet MSL/above ground level (AGL). Delta pattern aircraft will eventually receive instructions to enter the Charlie pattern. The standard landing pattern (Charlie pattern) is the Case I visual meteorological conditions (VMC) helicopter landing pattern. The night Case I helicopter landing pattern is a modified altitude (200 feet) Charlie pattern. The landing patterns for all ship types are essentially the same.

(1) Principal differences to plan for are flight deck elevations and obstructions in proximity to the landing area that become factors in transitioning from the approach to landing profile. Establish and maintain aircraft flight in the Charlie pattern at 300 feet (200 feet night vision device [NVD]) with a velocity of 90 KTAS (80 knots indicated airspeed [KIAS]). The P will provide altitude, airspeed, radio, and situational position awareness assistance throughout the pattern. After takeoff, and when an aircraft will remain in the Charlie pattern for training, upon reaching 300 feet (200 feet NVD), start a standard rate turn to the right or left while continuing to accelerate to 90 KTAS. This is done so the crew can pick up a visual sighting of the ship/lights at the departure point.

(2) When the ship is sighted, it may be necessary to decrease or increase the bank angle to maintain the pattern (30 degrees maximum during NVD). Turn the anticollision light on; call the break to the ship. When abeam the opposite line-up line on the ship, an "abeam" call will be made to the ship to include a call informing the ship of which pilot is on the controls; "front/back seat." Conduct a before-landing check and the PLT will turn the anticollision light off. Announce crossing the stern position (crossing the wake) of the ship. Commence the approach for landing not later than on the downwind leg abeam the intended point of landing. Return to a standard rate; turn to the left or right to line up for the final approach to landing. The left or right turn to final will be made to intercept the 45-degree line at the 90-degree position for ships with offset landing centerlines, or to intercept the ship's wake for an up-the-stern final approach. The crew will individually make an announcement when the aircraft is lined up with the line-up lines. JP 3-04.1 depicts the typical landing pattern and control zones and restrictions for amphibious assault helicopter carrier–aviation (LPH)/amphibious helicopter assault carrier (LHA)/amphibious helicopter assault carrier deck (LHD) class ships, which is a slight modification to the approach used for smaller, single-spot ships.

e. Approach and landing. The landing areas will have different lengths and widths, depending on the type of ship and number of landing spots. A deck landing area will have a perimeter safety net, perimeter lines, and red lights outlining the landing area. Two white line-up lines will form an X through the landing area on one or two spot decks. The line-up lines will have white lights that can only be seen from the final approach position. At the center of the X, there is a white circle with an amber light in the center. The circle is used for landing. The main landing gear of the helicopter must be placed inside the circle. Some ship and landing platforms will have floodlights to light up the landing areas. These only light up the deck, and will not blind the flight crew. The PC must be aware of deck landing wind limitations. The Navy's wind limitation envelope model was established for a normal approach to the spot, with the helicopter aligned with ship's centerline at touchdown.

(1) Normal approach. The greatest difference between land and sea helicopter landing operations occurs from short final to wheels on deck. For both, the rate of closure to the intended landing spot is affected by head winds, but the relative motion of the ship's movement through the water complicates the sea environment's short final and landing segments. If the approach for landing is being conducted to a moving ship, lateral corrections may be made to stay online with the landing area. During day operations, the pilot in the back seat should normally make the landing. During NVD operations, either the pilot night vision system (PNVS) pilot or night vision system (NVS) target acquisition and designation sight-forward looking infrared (TADS-FLIR) can land the aircraft.

(a) While on the approach for landing, the stabilator should be driven fully down to increase forward visibility. While on final, the LSE will take procedural control of the approach to the landing area with hand and arm signals. As the helicopter approaches the flight deck, avoid the tendency to fixate on the movement of white water from the ship's waterline to the wake. The PLT and CPG must also anticipate burble effects of wind around the superstructure of the ship. Frequently, as the flight deck is approached, there is a potential to get hung up by the "invisible wall" on smaller ships, an area of pressure or wind that requires a correction of additional power and nose attitude to transition. The stabilator should be reset just prior to reaching any anticipated "invisible wall." As soon as the "wall" is overcome, immediately cancel the power and nose correction. Refer to the radar altitude readout on the HDU to assist in maintaining a safe height for crossing the deck (briefed deck height plus 15 feet).

(b) As the approach progresses, make an announcement when the deck begins to pass under the nose. Clear the aircraft and call out when the main landing gear and then tail wheel is over the deck, and then in increments of 5 feet until the main gear is within 5 feet of the circle. Then call out 1 foot increments until the mains are centered over the circle and cleared to descend. When hovering over the deck, it is extremely important to guard against drift and a tendency to overcorrect. Constantly monitor for drift. Scan should not be limited to the immediate flight deck vicinity but should take in the horizon, the ship's amidships, and the flight deck area into scans. The amidships (middle of the ship) is the area of least movement as seas increase in intensity. This will reduce the propensity to "chase the deck," which makes the shipboard landing more difficult. The horizon is the primary hover attitude reference, while the ship's structure will assist in remaining over the landing area. The ship's pitching and rolling motion makes the horizon attitude reference imperative. Once stabilized with the tail cleared and mains over the deck, attempt to land. If seas are rough and the ship is in motion, "smooth" landings cannot be obtained. Place the aircraft "firmly" on the deck. The tail-wheel will be locked and the brakes set. Landing lights will not be used for landing because they will blind the deck crews.

Note 1: When the P* makes an approach on the 45-degree bearing to land immediately in front of a spot occupied by another helicopter (on LHD/LHA/LPH class ships), rotor clearances (main and tail) between the two aircraft during the final portion of a 45-degree approach are significantly reduced. When the P* makes an approach to a spot immediately in front of a spot occupied by another helicopter, the final portion of the approach on the 45-degree bearing should terminate at a point directly abeam the intended landing spot. From this point, the final transition is flown by sliding sideways to a hover over the landing spot.

Note 2: The hover mode's symbolic velocity vector can be helpful on a stationary ship but can be a hindrance in some situations on moving ships. If a ship is moving, the crew should receive information pertaining to the ship's speed and have already developed a mental image of how the resultant velocity vector deflection and magnitude will appear while at a stationary hover over the moving deck. The flight path vector (FPV) may be displayed over a moving ship while stabilized above a point.

Note 3: With sufficient night illumination, use the horizon and the ship for hover reference while operating over the ship. During low or no illumination nights, the aviator will only have the ship's structure for reference. Care must be taken for landing operations during these periods.

Note 4: Landing lights will only be used in case of emergencies. The using unit should provide night vision goggles (NVG) to the applicable deck crew while performing NVD deck operations.

Note 5: The LSO is responsible for the visual control of aircraft in the terminal phase of the approach immediately prior to landing.

(2) Smokelight approach. The smokelight approach is used as a last resort when available equipment will not allow emergency low visibility approach (ELVA) procedures to be used, or when the ship cannot be visually acquired using ELVA procedures and ditching is considered imminent. Both the ship's commanding officer and the pilot in command (or detachment officer in charge) must have agreed to attempt the procedure. The aircraft will be positioned 2 miles behind the ship and proceed inbound on the 180-degree radial relative to the base recovery course (BRC). The aircraft will descend at the pilot's discretion to arrive at approximately 40 feet and 40 knots, 1 mile behind the ship. Ship's personnel drop smoke or matrix lights every 15 seconds (or other prearranged intervals), and the pilot is kept informed of the number of smokelights in the water. The pilot at the controls follows the smokelights up the ship's wake, adjusting the closure rate until there is visual contact with the ship. The helicopter control station (HCS) will receive a "gear down" report from the pilot before the aircraft maneuvers over the deck.

Note 1: The safe launch and recovery wind limitations are presented in NWP-42 and COMDTINST M3710.2.

Note 2: Considerable differences may exist between a ship's flight deck winds and those measured by bridge-level anemometers. However, aircraft wind limitations are based on winds measured by the windward bridge-level anemometer. When operating at or near the outer wind limits, the probability of damage increases sharply when wind gusts exceed 10 knots. Also, the maximum safe wind, in conjunction with excessive ship pitch or roll, can make flight operations unacceptably hazardous; therefore, operations shall be adjusted accordingly. Common sources of turbulence are stack gasses and wash, ship superstructures, deck protrusions, and rotor wash or jet blast caused by the takeoff and landing of adjacent aircraft.

Note 3: When performing stationary hovering flight over a moving ship's landing deck spot, the velocity vector deflection and magnitude will be coincident to the velocity of the ship.

Note 4: During day operations, the TADS or PNVS FLIR video can be used to help provide visual cues during the approach and landing phase in conjunction with the NVS fixed or boresight position.

Note 5: A wave off or a hold signal is a mandatory signal and must be followed if given by the LSE.

f. After landing. Unless the aircraft is to be independently refueled and then rearmed for an immediate turn around, the aircraft will normally be chocked and chained to the deck. The aircrew will be pre-briefed as to what flyaway gear requirements exist. After all shutdown and post-flight procedures are completed, the PLT and CPG will report to the CIC for mission debriefing.

Note 1: During rough sea operations, chains will be used to secure aircraft to the deck before passengers are allowed to deplane or enplane.

Note 2: While the aircraft is on the deck of a moving ship, care must be taken not to move the cyclic while the ship pitches or rolls. Movement of the cyclic could cause the rotor to dip down to extreme low positions. Use the ship's structure for reference.

g. Aircraft/NAVAID emergency and lost communication procedures. Emergencies where navigation aids or communications are available should be handled according to procedures prescribed in JP 3-04.1. Lost communication and lost NAVAID procedures should be as per the FIH and JP 3-04.1. Emergency procedures for aircraft system failures are covered in TM 1-1520-251-10/TM1-1520-251-CL. When an aircraft emergency occurs, the crew must execute the immediate action steps and then contact the tower and explain the exact nature of the emergency. The nature of some emergencies will require priority or diversionary measures. As much deck as possible will be made available for emergency helicopter landings. The optimum relative wind should be determined for the nature of the emergency landing, and the ship maneuvered as necessary. Once the aircraft is on final approach, it is imperative that the ship holds a steady course.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references and the following:

COMDTINST M3710.2
FM 1-564
JP 3-04.1 with MOU
NATOPS manuals
NWP-42

TASK 2081

OPERATE NIGHT VISION GOGGLES

CONDITIONS: In an AH-64D helicopter.

STANDARDS:

1. Inspect the night vision goggles (NVG) prior to use.
2. Operate NVGs.
3. Identify or describe indications of impending NVG failure.
4. Perform or describe emergency procedures for NVG failure.

DESCRIPTION:

1. Crew actions.

   a. The crew may utilize NVGs for flight operations, navigation and obstacle avoidance.

   b. The P will acknowledge NVG failure when announced by the P*.

   c. The pilot in command (PC) will determine if the mission must be modified or aborted after NVG failure.

2. Procedures.

   a. Ensure the NVGs are within inspection dates, and check for serviceability. Adjust for proper fit, focus, and diopter setting. After use, ensure batteries are removed and store the unit in the NVG carrying case.

   b. Impending NVG failure is usually indicated by flickering or dimming in one or both tubes or illumination of the 30-minute low voltage-warning indicator. Impending NVG failures are not always easily discernible by the crewmember. Upon indication of NVG failure, perform the following:

   (1) Immediately announce, "goggle failure."

   (2) If conducting nap of the earth (NOE) or contour flight, begin a climb at a rate, which will ensure obstacle avoidance. (Omit this procedure if the PLT/CPG is not the pilot on the controls [P*].)

   (3) Transfer the flight controls to the P.

   (4) Switch to the second battery and advise the P* of restored vision or of continued failure.

   (5) Replace the failed battery when conditions and time permit.

   (6) If vision is not restored, remove the NVG and use the PNVS/TADS.

Note: NVG tube failure is infrequent, and usually ample warning is provided. Only occasionally will a tube fail completely in a short time. Rarely will both tubes fail at the same time. There is no remedy for in-flight tube failure.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training and evaluation will be conducted in the AH-64D aircraft, at night, with a NVG IP/SP.

2. Training and evaluation will be conducted in the AH-64D aircraft, at night, with a NVG IP/SP.

REFERENCES: Appropriate common references

TASK 2127
PERFORM COMBAT MANEUVERING FLIGHT

CONDITIONS: In an AH-64D in an approved training area or simulated tactical environment, with a properly fitted helmet display unit (HDU), and aircraft cleared.

STANDARDS: Appropriate common standards and the following:

1 Perform low altitude warning recovery if aircraft is allowed to descend below predetermined recovery altitude.

> **CAUTION**
>
> Do not exceed gravity force (G) limits versus gross weight (GWT) and airspeed limitations outlined in TM 1-1520-251-10, chapter 5 and AWR 2006D-A02.

Note: To avoid undesired control input (for example, force trim overshoot while maneuvering) either maintain the force trim interrupted throughout the maneuver, or leave force trim engaged until maneuver is completed.

DESCRIPTION:

1. Crew actions.

a. The pilot in command (PC) will consider and ensure the crew is aware of the effects of an engine failure during combat maneuvering flight. Airspeed should be maintained between minimum and maximum single engine airspeed. If an engine failure occurs above or below these airspeeds, torque will immediately double, associated with possible target (TGT) limiting, which will result in rapid rotor decay that may not be recoverable.

b. The pilot on the controls (P*) will remain primarily focused outside the aircraft throughout the maneuvers. The P* will set the low altitude warning on the radar altimeter to the desired recovery altitude. The P* will make smooth and controlled inputs. Desired pitch and roll angles are best determined by referencing aircraft attitude with the outside horizon and/or helmet display unit (HDU) symbology. The P* will only momentarily divert focus during critical portions of the maneuver to ensure trim, torque, and rotor control are maintained. He will announce the maneuver to be performed and any deviation from the maneuver. He also will announce recovery from the maneuver.

c. The P will provide adequate warning to avoid enemy, obstacles, or traffic detected in the flight path and any deviation from the parameters of the maneuver. He will also announce when his attention is focused inside the cockpit (for example, when monitoring airspeed, altitude, attitude, or rotor revolutions per minute [RPM]).

d. Low altitude warning recovery. Should at any time the low altitude warning audio sound, the aircrew shall give their sole attention to placing the aircraft back above the minimum altitude. The P* will ensure that the nose of the aircraft is placed equal to or above the horizon prior to adding power to preclude accelerating, descending flight. Tactical play, radio transmissions, and nonessential intercommunication system (ICS) shall cease until the P* states "BACK ABOVE" to the P.

2. Procedures.

a. Decelerating turn. The decelerating turn is used to rapidly change the direction of the aircraft at low-level altitudes while trading energy to maintain safe operational altitude.

The angle of bank, airspeed, gross weight, and environmental conditions at the initiation of the maneuver will determine the amount of deceleration necessary to maintain altitude.

(1) During flight with lower forward airspeed, typically below maximum rate of climb airspeed, the deceleration will require an increase of collective, resulting in an increase in torque. While at airspeeds greater than maximum rate of climb, the airspeed may be traded off while adjusting collective to maintain torque within limits and maintain altitude.

(2) Apply directional cyclic to initiate turn. As aircraft begins to move about the roll axis, apply aft cyclic as necessary to maintain altitude by trading airspeed. Apply pedal as necessary to maintain aircraft in trim. Adjust collective as necessary to maintain altitude and rotor within limits. To recover, apply opposite and forward cyclic while adjusting collective to maintain torque within limits as the rotor system unloads.

CAUTION 1

Most transient over-torques occur as the aircraft unloads during maneuver recovery (for example, as coning dissipates with left cyclic applied).

CAUTION 2

Close attention must be paid to rotor RPM to prevent rotor over-speed. High GWT, high density altitude, and high G-loading aggravate this.

b. Break turn. The break turn is used at terrain and cruise flight altitudes to rapidly change the direction of the helicopter while maintaining or gaining airspeed. As altitude allows, this turn also enables a simultaneous three-axis change of position and direction. This maneuver is effective when performing evasive maneuver against small arms, radar directed air defense artillery (ADA), or to employ weapons. Its effectiveness is enhanced when used in conjunction with flares or chaff.

(1) At cruise altitudes, apply directional cyclic to initiate turn. As roll rate and angle increases, the nose will begin to fall. Allow this to occur while maintaining trim with pedals. Recovery is affected by applying opposite cyclic when reaching desired heading. Once the aircraft's wings level in roll, apply collective and aft cyclic when reaching desired airspeed/altitude.

(2) At terrain flight altitudes, initiate with aft cyclic to ensure adequate obstacle clearance, followed immediately by directional cyclic. Angles of bank are much lower than those utilized during cruise flight, as much less recovery altitude is available. Adjust collective as necessary to maintain altitude and compensate for transient torque. Maintain trim with pedals. Do not allow the nose to fall far below the horizon, as this is conducive to sink rate build up. Consider desired direction of turn before initiating and seek masking terrain if evading enemy fire. To recover, apply opposite and forward cyclic.

CAUTION 1

Excessive bank angles at terrain flight altitudes may not allow sufficient recovery time. Airspeed (kinetic energy) may not be available to trade for lift and must be evaluated prior to and during the maneuver. This is aggravated as helicopter GWT and density altitude increase.

CAUTION 2

Do not allow high sink rates to develop, as recovery altitude may not be available. This is aggravated as helicopter GWT and density altitude increase.

CAUTION 3

Most transient over-torques occur when initiating break turns to the left or during recovery from a break turn to the right.

c. Cyclic climb to a pushover break. This maneuver is used in conjunction with complex terrain or close-range running fire engagements to rapidly reposition the aircraft when receiving small arms fire and reorient the aircraft weapons on the enemy. Initiate the maneuver from cruise airspeed. Apply aft cyclic to attain sufficient altitude for intervisibility with target. Adjust collective as necessary to compensate for transient torque and main rotor loads while maintaining trim with pedals. Upon attaining intervisibility with target, adjust the controls to align aircraft with target and maintain required torque. Initiate a break turn in the desired direction upon completing or aborting engagement to mask aircraft from threat fires or reorient on appropriate gun-target line.

CAUTION

In flight attitudes with high nose-up pitch angles and airspeeds below 45 knots, recovery shall be with forward or forward lateral cyclic. Applications of aft cyclic and/or pedal input could result in damage to the aircraft.

d. Pitch back turn. Pitch back turn is employed to rapidly enable aircraft longitudinal alignment for maneuvering engagement when targets are acquired substantially off the nose of the aircraft. It may be initiated from terrain flight or tactical cruise altitudes. It improves the efficiency of off-axis engagements and decreases the aircrew's vulnerability to enemy fire. The forward airspeed at maneuver initiation is again attained at maneuver completion. The maneuver adds stability to the helicopter and reduces engagement times of weapon systems, particularly rockets. Use of the vertical component in the maneuver results in negligible energy loss and a smaller beaten zone in the target area. This maneuver can also be used as an alternate dive entry technique to align the aircraft with an off axis target. This allows inter-visibility with target and dive angle assessment throughout the maneuver.

(1) The maneuver is initiated from the appropriate airspeed (greater than maximum [max] rate climb/max endurance airspeed) based on tactical requirements. Initiation airspeeds less than 90 knots may not provide sufficient energy to perform this maneuver at terrain flight altitudes. Lower airspeeds result in a reduced climb out, as available energy is lost sooner. This is best accomplished by directing the turn to an easily distinguishable terrain feature, target, or man-made structure.

(2) Initiate the maneuver with aft cyclic to attain the desired climb-out angle. As airspeed approaches current max endurance/max rate of climb airspeed, apply cyclic in the desired direction of turn while maintaining trim with pedals. As bank angle is increased, the nose will begin to fall. Adjust cyclic to place aircraft in desired dive angle while continuing the turn to the desired heading. Maintain trim with pedals. Once the desired heading is attained, roll out on selected target. Allow airspeed to build to maneuver initiation airspeed while adjusting controls to keep aircraft on target. Terminate maneuver as in recovery from diving flight.

CAUTION 1

In flight attitudes with high nose-up pitch angles and airspeeds below 45 knots, recovery shall be with forward or forward and lateral cyclic. Applications of aft cyclic and/or pedal input could result in damage to the aircraft.

CAUTION 2

Excessive nose down attitudes will significantly add to recovery altitude required. This is aggravated by high GWT and high density altitude.

CAUTION 3

Most transient over-torques occur as the aircraft unloads at the top of the maneuver or during the roll recovery from a pitch back turn to the right.

CAUTION 4

Do not allow the airspeed to slow below effective transitional lift (ETL), as this may result in backwards movement or insufficient energy to accomplish the turn. This may very well result in excessive tailboom loads and damage to tail rotor components. In addition, it provides a momentary, predictable stationary target for enemy gunners.

e. Dive recovery techniques.

(1) Straight ahead dive recovery is rarely tactically feasible. By incorporating a left or right turn into the dive recovery, descent arrest occurs with a change of aircraft direction, thereby avoiding target over-flight. Prior to pulling aft or lateral cyclic causing G loading, the P* will lead with an increase in collective to avoid main rotor speed (Nr) increase.

(2) This maneuver is accomplished by turning the aircraft simultaneously as dive pull out is being accomplished. During minimum available power dive recovery, aft cyclic input is reduced as G-loading builds and the aircraft is allowed to fly out of a dive as opposed to attempting to establish a climb. Furthermore, a turn can be combined with a descent to terrain flight altitudes, if masking is desired due to enemy situation.

Note1: Excessive bank angles during recovery offset lift from weight and may require additional recovery altitude. The nose of the aircraft should be raised to the horizon prior to initiation of a turn to arrest the rate of decent of the dive.

Note2: If dive angles exceed 45 degrees, the weapons system will be inhibited and the message “ACCEL LIMIT” will appear in the Weapons Inhibit Status Field and the weapons will be inhibited from firing.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. Rapid evasive maneuvers will be more hazardous due to division of attention and limited visibility. Be particularly aware of aircraft altitude and three-dimensional position in relation to threat, obstacles, and hazards. Proper sequence and timing is critical in that the P* must announce prior to initiating any maneuvers that might cause spatial disorientation. Making a stored point the active acquisition source for orientation on threat or friendly troops will aid in maintaining situational awareness (SA). Consider using cruise mode symbology to have the pitch ladder available for orientation.
2. As airspeed increases, altitude above the obstacles should also increase. Bank angles should be commensurate with ambient light and altitude above the terrain. Use of NVGs without symbology display will require greater crew coordination to monitor torque, airspeed, trim, and rates of descent information not present in the NVGs.

TRAINING AND EVALUATION REQUIREMENTS:

1. Initial training will be conducted by an IP and evaluated in the aircraft. Continuation training may be conducted by qualified crewmembers in the AH-64D simulator or aircraft.
2. Evaluation. Evaluations will be conducted in the aircraft.

Note: Crewmembers will ensure that the appropriate authority has authorized any training flights.

REFERENCES: Appropriate common references.

TASK 2128

PERFORM CLOSE COMBAT ATTACK

CONDITIONS: In an AH-64D helicopter, an AH-64D simulator, or academically.

STANDARDS: Appropriate common standards and the following:

1. Participate in a close combat attack (CCA) briefing on the mission.
2. Develop and transmit or receive a CCA briefing.
3. Correctly identify friendly locations.
4. Target hand over terminology, if using either laser designator or infrared (IR) laser pointer, will be according to FM 3-09.32.
5. Transmit to the team member the attack plan, using TPM-R format or unit standing operating procedure (SOP).

DESCRIPTION:

1. Crew actions.

   a. Throughout the close combat attack mission, the pilot on the controls (P*) will remain focused outside the aircraft to avoid obstacles.

   b. The pilot not on the controls (P) will assist the P* as necessary and will announce when his attention is focused inside the cockpit.

   c. The crew will establish communications with ground forces in contact on a predetermined frequency and receive or request information using the CCA briefing checklist provided in figure 4-9 or in accordance with the unit SOP.

   d. The crew will positively identify friendly unit locations.

   e. The crew will formulate an attack plan and transmit it to other team members. As a minimum, techniques, patterns, munitions, and ranges will be briefed and understood.

2. Procedures. Using Army attack/armed reconnaissance aircraft to support a ground maneuver element in contact is considered a close combat attack. In today's world, this could take place anywhere on the battlefield in close or deep operations and in any terrain. Friendly ground troops that are within 1,000 meters of the enemy are doctrinally considered to be in contact with the enemy. Attacking enemy forces that are within 1 kilometer (km) of the friendlies requires special procedures to minimize fratricide. During any operation in close proximity to troops, it is imperative that you understand who you are working with and have direct communication with the troops on the ground.

   a. Danger close is defined as a probability of incapacitation ([PI] = 0.1 percent) or a 1 in 1,000 chance of friendlies being wounded. The ground commander must be informed that he assumes responsibility for friendly casualties when a target is danger close. The ground commander must approve danger close fires by transmitting his initials to the firing crew. These "risk estimate distances" are for PI of 0.1 percent. They are for combat only and assume shooting parallel to friendlies.

High explosive rockets (HE RKTS)	240 meters
30-mm high explosive/dual purpose (HEDP)	40 meters
Hellfire	105 meters

Note: Shooting perpendicular to friendly locations exposes ground forces to great risk due to the likelihood of rounds landing short or long, and the danger of ricochets.

b. The air mission commander must have direct communication with the ground commander on the scene to provide direct fire support. After receiving the CCA brief from the ground troops, the pilots must be able to positively identify the location of the friendlies prior to shooting. Methods for marking the location of friendlies and the enemy include, but are not limited to: laser handover, tracer fire, marking rounds (flares or mortars), smoke grenades, signal mirrors, VS-17 panels, infrared (IR) strobe lights, laser pointers, or chemical sticks (can be tied on to a string and swung over head, "buzz saw").

Note 1: If the troops in contact do not have a CCA briefing checklist, the CAS briefing (9-line) minus the first 4 lines will suffice. Pilots must also be prepared to request the information when working with inexperienced ground personnel.

Note 2: When throwing smoke, the pilot will call out the color of the smoke and the ground commander will confirm. Never call the color of the smoke before it is thrown.

Note 3: At no time should the crew insert friendly locations as a Target/Threat. Only insert the friendly location as a waypoint or control measure during the conduct of a CCA.

c. Once the crew has identified both the enemy and friendly locations, flight lead will formulate a plan and brief his other team members. Using the acronym TPM-R or unit SOP will aid in conveying the plan to other team members.

(1) Techniques. Techniques of fire include running, diving, or hover fire. Type of threat, terrain, visibility, winds, density altitude, gross weight of the aircraft, and the proximity to friendly troops will be considered when selecting a mode of fire. Another technique could be running fire with a bump to acquire targets.

(2) Patterns. When selecting a pattern, refer to Task 2042. They include, but are not limited to: race track, cloverleaf, L-attack, or figure 8 pattern. Direction of turns and direction of breaks must be briefed also. When performing hovering fire, brief standard or nonstandard stack.

(3) Munitions. Munitions selected must be appropriate for the target and provide the most standoff capability. Accuracy and reliability must be considered when firing near friendly troops. Collateral damage could be another consideration in some areas of operation.

(4) Range. When briefing range, include distance from target where inbound engagement will initiate and at what range the break will be executed to prevent over flying the target and staying outside of the enemy's engagement range.

Note: Critical to the success of the CCA mission, aircrews must have a clearly defined "end-state" for any engagement. Crews must understand the target, threat, and desired effects to develop an attack plan that best meets the desired end-state while minimizing risk to the aircrews and collateral damage around the target.

CLOSE COMBAT ATTACK BRIEFING (Ground to Air)
1. Observer / Warning Order: **"__________, THIS IS _____________, FIRE MISSION, OVER.** (AH-64D C/S) (Observer C/S) 2. Friendly Location/Mark**: "MY POSITION ____________ MARKED BY________________."** (TRP, Grid, etc.) (Strobe, Beacon, IR Strobe, etc) 3. Target Location: "_______________________________________". (Bearing [magnetic] & Range [meters], TRP, Grid, etc) 4. Target Description / Mark: "__________________, **MARKED BY** ______________ **OVER.**" (Target Description) (IR Pointer, Tracer, etc) 5. Remarks: "____". (**Threats,** Danger Close Clearance, Restrictions, At My Command, etc) ***AS REQUIRED*** 1. Clearance: Transmission of the fire mission is clearance to fire (unless danger close). Danger close ranges are in accordance with FM 3-09.32. For closer fire, the observer must accept responsibility for increased risk. State **"CLEARED DANGER CLOSE"** (with commander's initials) on line 5. This clearance may be preplanned. 2. At my command: For positive control of the gunship, state **"AT MY COMMAND"** on line 5. The gunship will call **"READY TO FIRE"** when ready.

LEAD - WING ATTACK BRIEF (TPM-R)	
Technique: **- Running** **- Diving** **- Hovering**	
Pattern/Attack Direction: **- Racetrack** **- Cloverleaf** **- Figure 8** **- 45-degree offset**	
Munitions: **- Appropriate for Target** **- Minimize Collateral Damage** **- Maximize Standoff**	
Range: **- Bump Point** **- Start Fire** **- Break/Stop Fire** **- IP/Reattack Point**	

Figure 4-9. Close combat attack briefing.

NIGHT/NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

1. Situation awareness becomes very critical, and marking of friendly troops becomes harder to accomplish. Night vision goggles (NVG) in the front seat will aid in identifying friendlies. Every effort must be made to avoid fratricide. If a grid coordinate to the friendly location is entered into the aircraft, extreme care must be taken so the location is not inadvertently used for targeting. The crew must exercise care when observing the impact of rounds because the flash signature may momentarily degrade the capability of the NVG. When firing rockets, missiles, adjusting indirect fire, or firing the 30-millimeter chain gun off axis, the crew must follow procedures to protect their night vision.
2. Significant errors in aiming may occur if the HMD is used as a sight while using NVG without a valid boresight. Failure to have a valid boresight may result in the death or damage to unintended targets and or fratricide. Usage the HMD as a sight without a valid boresight while using NVG is prohibited.
3. IR pointers can be effectively used by ground personnel and aircraft to point out potential targets. Optimum IR pointer employment requires geometry similar to that of a laser designator. The type and capability of IR pointers varies greatly. IR pointer's effectiveness will be seriously degraded by high light levels, high humidity, or battlefield obscurants. The low grazing angle inherent with low flying aircraft and personnel on the ground will result in underspill(appears as multiple spots between the source and the target) and overspill(appears as spots beyond the target). In addition, handheld operation will result in large spot, jitter-making target acquisition difficult.

WARNING

To avoid eye damage, ensure that proper LASER safety procedures are applied when using IR pointers. IR pointers should not be directed at the cockpit of friendly aircraft that are inside the ocular hazard distance of the pointer being used.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft, AH-64D simulator, or academically.

REFERENCES: Appropriate common references and the following:

FM 3-09.32
FM 17-95
FM 90-21
JP 3-09.03
TC 1-201
Unit SOP

TASK 2162
Call for indirect fire

CONDITIONS: In an AH-64D helicopter, an AH-64D simulator, or academically.

STANDARDS:

1. Use artillery/aerial indirect fire method (voice).
2. Remain oriented on the target while repositioning the aircraft.
3. Mask and unmask the aircraft as required.
4. Adjust indirect fire or provide precision coded laser energy on the target, using the appropriate call-for-fire element.
5. Receive and process an aerial indirect fire (rocket [RKT]/30-millimeter [mm]) mission request.
6. Conduct indirect aerial fire, and perform any subsequent adjustments as necessary.

DESCRIPTION:

Note: A call for fire is not wholly specific to artillery units; it is also used during the conduct of indirect aerial fires. The precision navigation (embedded global positioning inertial navigation system [EGI]) capabilities of the AH-64D and advanced weapons processors allows for precise indirect fire engagements with rockets, 30-millimeter, remote semiactive laser (SAL) Hellfire engagements, and other laser guided munitions (for example, the Copperhead).

1. Crew actions.

a. The pilot on the controls (P*) will remain focused outside the aircraft to clear the aircraft throughout the maneuver. The P* will mask and unmask the aircraft as required, ensuring he does not use the same location more than one. The P* will remain oriented on the target while repositioning the aircraft.

b. The pilot not on the controls (P) will make the call using the procedures in FM 6-30 and FM 3-04.140 as applicable. The P will indicate target location by either grid coordinates or shift from a known point and make subsequent adjustments. The P may request flight time of the rounds, or "splash," for a warning of 5 seconds before the impact. He will send an "end of mission" message with a battle damage assessment or an "unable to observe" message.

c. The target observing crew will determine the need to call for indirect artillery, indirect aerial (rocker [RKT]/30-millimeter), or a remote SAL missile. The P will normally make the call. He will indicate the target location through grid coordinates, a shift from a known point, or request fire on a preplanned point. The P will adjust indirect artillery or indirect aerial fire, or conduct SAL remote Hellfire.

d. The target observer/designator P* will remain focused outside the aircraft to avoid obstacles during the maneuver. He should not unmask the aircraft in the same location more than once. The P should normally request the time of flight for artillery fire. Time of flight requests for indirect aerial fire and remote SAL missiles will be determined by the situation. Time of flight information can be used by the P to know when to direct the P* to unmask for observation of rounds impact. Alternatively, the P may request "splash," which provides a 5-second alert before impact, or "laser on" for a remote Hellfire laser delay.

e. The mission receiving crewmember will acknowledge and process the observer/ designator's indirect aerial fire or remote SAL missile request. He will either accept or not accept the request according to the tactical situation and weapons capabilities. When an aircrew accepts a remote SAL missile request, a SAL missile or missiles will be launched on the correct code(s) according to the designator's mission request.

2. Procedures.

a. Planned targets. Planned targets may be scheduled or on call. They should be planned against confirmed, suspected, or likely enemy locations and on prominent terrain to serve as reference points for shifting fires onto targets of opportunity.

b. Unplanned targets. Targets of opportunity are engaged by grid or shift from a known point. Subsequent indirect artillery adjustments are made based on a reference line and indirect aerial fires can be adjusted similarly. An improved data modem (IDM) target handover is the preferred technique, followed by the grid method as the preferred voice technique. When requesting indirect aerial fire from another AH-64D, unplanned target locations should be transmitted to appropriate IDM subscribers using any of the applicable methods described in task 1471.

Note: When an indirect aerial fire bold adjustment is necessary, the observer should send a new IDM target to the firing aircraft. The target data is representative of the rounds impact adjustment. The observer should note the firing aircraft's location (target line aspect) on the tactical situation display (TSD) and then lase, store, and send the necessary correction.

c. Call-for-fire elements. The call-for-fire elements are—

(1) Observer identification (appropriate call sign).

(2) Warning order (type mission; for example, adjust fire, fire for effect, suppression, immediate suppression).

(3) Location of target (grid coordinates, known location designation, shift with appropriate reference line).

(4) Description of target.

(5) Method of engagement (type adjustment, trajectory, ammunition, or distribution desired).

(6) Method of fire and control (for example, "At my command" or "When ready").

Note 1: Compass directions are sent to the fire direction center (FDC) in mils. If the direction is in degrees, the observer must so indicate.

Note 2: When using a spotting line for adjustments, the FDC will assume that the gun-target line is used unless otherwise specified by the observer.

Note 3: If the observer is using a spotting line and repositions the aircraft, he must inform the FDC if the spotting line changes by 5 degrees or more.

Note 4: High action display time of flight information and associated SAL missile messages are dynamically adjusted for the current temperature.

d. Remote SAL missile target call for fire method (voice). The remote SAL missile launch aircraft will perform weapon system and firing operations with ask 1458. Refer to FM 3-04.140 for a description. The description is supplemented as follows:

(1) Designator identification and warning order. The designator identification tells the launch aircraft who is calling for the missiles, and clears the net for the mission.

Note1: The sender's call for fire warning order element should include "remote SAL" in the verbiage and the number of missiles when desiring more than one. If more than one missile is desired, the designator will state missile separation time.

(2) Target location. This gives the location of the target. For target location, the designating aircraft may reference from a known point (the target reference line or the engagement area), or use grid coordinates, a digitally sent stored target, or a spot with a laser (for example is "120 degrees at 2,800 meters" or "offset left 030 degrees [code]").

(3) Target description. This defines what the target is, what the target is doing, and the number of elements in the target.

(4) Method of engagement. The method of engagement gives the launch aircraft the number of missiles, the delivery mode, and the requested laser code. This line also informs the firing crew—

- Of the designator's location and altitude via grid or laser target line.
- Of the distance and altitude to ensure that the designator is not within the safety fan (both lateral and vertical) of the missile.

Note2: If the observer's grid location is unknown, the observer should send the laser target line (LTL) and observer's range to the target along with the target altitude (if applicable).

(5) Accept or reject. This call informs the designating aircraft whether the launch aircraft will accept or reject the call for fire. See the following checklist.

The following checklist is an example of a standardized procedure for analyzing Hellfire engagements for the shooter to ensure that all items are systematically verified. This procedure can be used for remote or autonomous engagements, and LOAL or LOBL shots. Some steps are not required for some types of engagements as noted.

- Analyze the mission. Assuming the tactical decision to employ a Hellfire has already been assessed, the crew will determine if the particular target is a feasible Hellfire target based on the following technical parameters:
  - Launcher/designator angle. Determine if the angle created by drawing a line between the observer/designator to the target and then back to the shooter is equal to or less than the maximum allowable. If the tactical situation allows, the shooter may have to reposition to meet requirements to accept the mission. (Remote engagements only, not applicable (NA) for autonomous engagements).
  - Number of missiles. Determine if the number of missiles requested or required is available. For a remote engagements if the requested number exceeds the number available, the mission may still be accepted with the number of missiles the shooter has available transmitted to the requestor in the accept message.
  - Minimum/maximum range. Determine if the range to the target is within the allowable range for the type of shot to be performed. If the tactical situation allows, the shooter may have to reposition or may adjust the type of shot (LOAL direct/low/high or LOBL) to meet requirements to accept the mission.
  - Safety fan. The safety fan is predetermined, based on an angle either side of a line from the shooter to the target. Ensure that the designator is not within the minimum angle allowable. Ensure that the designator is not within the shooters safety fan. If the tactical situation allows, the shooter may have to reposition to ensure that the designator is outside of the safety fan. Figures 4-10(a) and 4-10(b) are aids that can be used to determine the designator safety fan. Instructions for using each chart are located below each chart respectively.
  - Obstacle clearance. Determine if the missile can clear any obstacles on the gun-target line for the type of shot to be performed. The shooter may have to

reposition, if the tactical situation allows, or may adjust the type of shot (LOAL low/high) to meet requirements to accept the mission.

- Cloud height. The crew should attempt to determine if the missile will remain out of the clouds for the type of shot to be performed. This can be done by visually confirming the cloud ceiling, based on the forecast. If cloud ceiling is a concern, the lowest trajectory can be achieved by shooting LOAL direct with maximum laser delay.

Note 3: If the shooter must reposition to meet the requirements to accept the mission, the accept message may be sent prior to moving.

(6) Ready call and time of flight. This notifies the designating aircraft that the shooting aircraft is prepared to fire and provides the missile time of flight.

Note 4: Other coordinating calls may have to be made by the mission receiving aircraft prior to the "ready" call. (For example, if safety or performance constraints cannot be immediately achieved, an aircraft reposition or other adjustment is necessary.)

(7) Execution call. The designator will transmit "Fire, over." The launch aircraft will transmit "Shot, over" but will not launch the missile until the designator transmits "Shot, out."

(8) Battle damage assessment. The designating aircraft will send an "end of mission" (EOM) with a battle damage assessment (BDA) call to the launch aircraft.

Note 5: Launch aircraft must be prepared to fire additional missiles due to a miss, malfunction, or multiple targets. Designator will transmit "Repeat, over" to launch aircraft if another missile is required. The launch aircraft will transmit "Shot, over" and will launch the missile when the designator transmits "Shot, out." If more than one additional missile is desired, the call should include the number of missiles and missile separation time (for example, "Repeat, three missiles, 20 seconds, over").

Note 7: If another target is located in the same area, an additional missile can be fired if the designator transmits "repeat, over" to the launching aircraft. If more than one additional missile is desired, the call should include the number of missiles (for example, "Repeat, three missiles, over").

REMOTE HELLFIRE REQUEST – VOICE

(Spoken portions of procedure are in BOLD TEXT or inside BOLD " ")

1. Alert: **"___________________ this is: _____________________ Remote, over! "**

2. Target Location: **"________________________________, over"** (Grid, target number, or distance & bearing)

3. Target Description: **"_______________________, over".**

4. Method of Engagement:
   - **a.** Number of missiles: **"____"**
   - **b.** Time interval between missiles: **"____________ _______________________"**
   - **c.** Delivery mode: **"____"**
   - **d.** Laser code: **"____________________________ ________________________"**
   - **e.** Laser target line and distance or designator grid _________________________"

   (***Note***: **Line e** may be sent either via voice or digitally.)

   - **f.** Designator altitude ____________________(May be sent either voice or digitally)"

5a. The firing aircraft should evaluate the request and respond to the designating aircraft with— **"_____________________this is _________________________, "accept"** or **"reject," "Over."**

5b. If accepted, the firing aircraft must position itself as necessary to make the shot, obtain firing constraints, and respond as follows:

"________________ this is _________________, Ready. Time of flight _________, over."

6. When the designating aircraft is ready for the missile, it will respond as follows: **"This is ____________, Fire, over."**

7. The firing aircraft should announce: **"Shot, over."**

8. Designating aircraft will reply "**Shot, out."** (The firing aircraft will not launch the missile until this transmission has been received.)

9. Designating aircraft should **"**Lase**"** the target until impact or for 20 seconds beyond the expected missile time on target.

10. If another target is located in the same area, an additional missile can be fired if the designator transmits **"Repeat, over"** to the launching aircraft. If more than one additional missile is desired, the call should include the number of missiles (for example **"Repeat, three missiles, over."**)

11. Battle damage assessment: "**End of Mission ________________ Destroyed, over."**

Figure 4-10. Sample remote hellfire request–voice

SAFETY FAN CHART
OFFSET ANGLE

SHOOTER RANGE TO TARGET	10	15	20	25	30	35	40	45	50	55	60
8	6223	5657	5222	4883	4619	4414	4257	4141	4062	4015	4000
7.5	5834	5303	4895	4578	4330	4138	3991	3882	3808	3764	3750
7	5445	4950	4569	4273	4041	3862	3725	3623	3554	3513	3500
6.5	5056	4596	4243	3968	3753	3586	3459	3365	3300	3262	3250
6	4667	4243	3916	3662	3464	3310	3193	3106	3046	3011	3000
5.5	4278	3889	3590	3357	3175	3034	2926	2847	2792	2761	2750
5	3889	3536	3264	3052	2887	2758	2660	2588	2539	2510	2500
4.5	3500	3182	2937	2747	2598	2483	2394	2329	2285	2259	2250
4	3111	2828	2611	2442	2309	2207	2128	2071	2031	2008	2000
3.5	2723	2475	2284	2136	2021	1931	1862	1812	1777	1757	1750
3	2334	2121	1958	1831	1732	1655	1596	1553	1523	1506	1500
2.5	1945	1768	1632	1526	1443	1379	1330	1294	1269	1255	1250
2	1556	1414	1305	1221	1155	1103	1064	1035	1015	1004	1000

During a remote Hellfire, the designator will give the target GRID, LTL, and DISTANCE to the target.

1. Enter the target grid to determine your HEADING and DISTANCE to the target.
2. Subtract your heading to the target (GTL) from the designator's heading to the target (LTL) to determine the OFFSET ANGLE.
3. Enter the chart at your range to target and follow the column until you intercept the OFFSET ANGLE determined above. The number at the intersection of the two columns is the **MINIMUM DISTANCE** from the target that the designator must be to remain clear of the 30-degree horizontal safety fan.

Figure 4-10(a). Hellfire remote-engagement safety fan chart

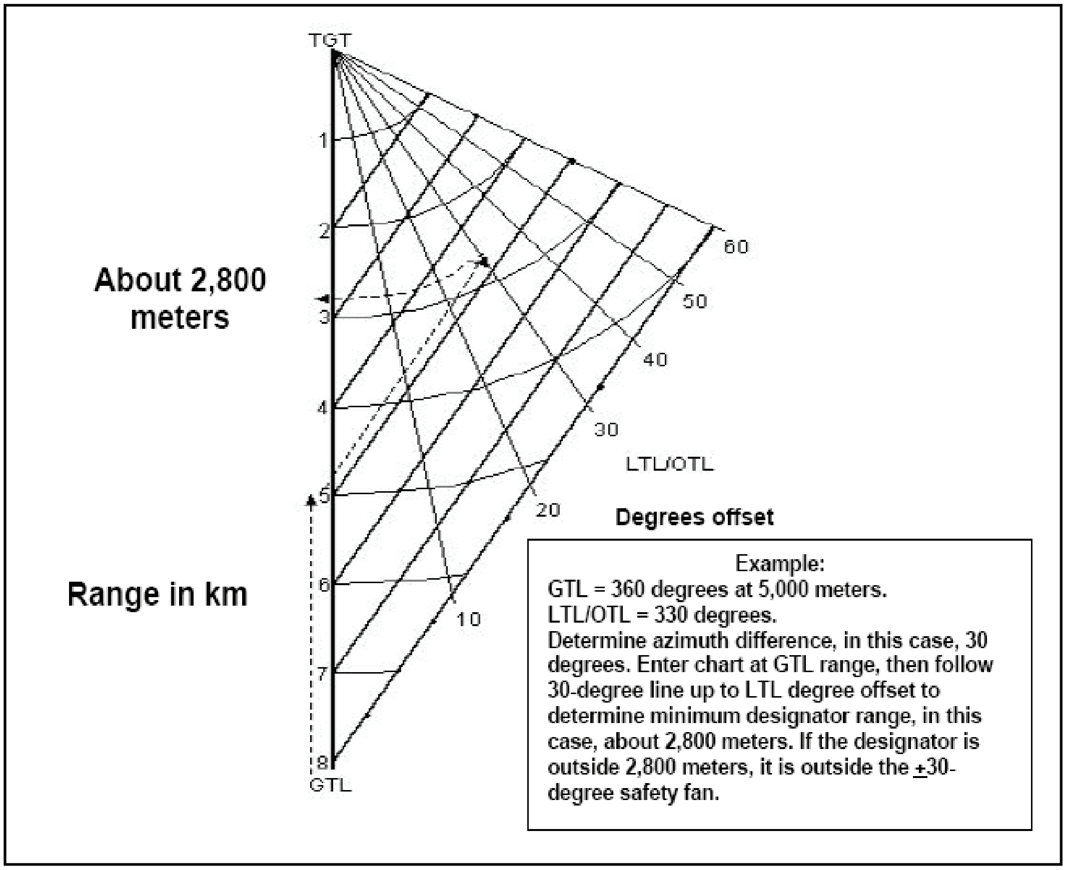

Figure 4-10(b). Hellfire remote-engagement safety fan chart

NIGHT OR NIGHT VISION GOGGLES (NVG) CONSIDERATIONS: The crew must exercise care when observing the impact of artillery rounds because the flash signature may momentarily degrade the capability of the NVG. The P* should not directly observe the impact of the rounds. If the crew is unaided, their night vision will be impaired for a short time if they directly observe the impact. When adjusting indirect fire, the crew must follow procedures to protect their night vision.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft, in an AH-64D simulator, or academically.
2. Evaluation will be conducted in the AH-64D aircraft, in an AH-64D simulator, or academically.

REFERENCES: Appropriate common references and the following:

FM 3-04.140
FM 6-30
FM 3-09.32
Unit SOP

TASK 2164

Call for a tactical air strike

CONDITIONS: In an AH-64D helicopter, an AH-64D simulator, or academically.

STANDARDS: Appropriate common standards and the following:

1. Participate in a close air support (CAS) briefing on the mission.
2. Transmit a CAS briefing (9-line) report and a close air support check-in briefing.
3. Transmit attack methods, firepower timing options, and targeting methods.
4. Transmit to the forward air controller or fighter-bomber an accurate battle damage assessment.

DESCRIPTION:

1. Crew actions.

   a. Throughout the coordinated tactical air strike mission, the pilot on the controls (P*) will remain focused outside the aircraft to avoid obstacles.

   b. The pilot not on the controls (P) will assist the P* as necessary and will announce when his attention is focused inside the cockpit.

   c. The P, if participating in a tactical air strike or CAS mission, will transmit a close air support check-in brief. As a helicopter pilot, the P must be ready to act as the air mission commander (AMC) and be prepared to receive the close air support check-in brief.

   d. The crew will establish contact with the forward air controller on a predetermined frequency and provide the CAS briefing 9-line information.

2. Procedures. Tactical air strikes are conducted between U.S. Army aircraft and attack fighter/bomber aircraft from the Navy, Marines, and Air Force. Close air support is a formalized Air Force tactical air strike procedure consisting of air attacks against enemy targets that are within close proximity to friendly forces. Typical targets are enemy troop concentrations, fixed positions, and armored units of immediate concern to ground forces. Normally, an Air Force forward air controller or tactical air control party (TACP) will control close air support aircraft. To make sure that urgent or emergency requirements for CAS are satisfied when the forward air controller is not available, the tactical air force commander and ground force commander must establish procedures and responsibilities. Once established, the air liaison officer acts as the interface between the air support operations center and the maneuver commander. The crew will establish contact with the forward air controller on a predetermined frequency and coordinate a preplanned CAS, or immediate CAS request as follows:

   a. Preplanned requests. Those requirements foreseen early enough to be included in the joint air tasking order (ATO) are submitted as preplanned requests. As soon as the requirements for a tactical air strike are identified during the planning process, planners submit a preplanned request, prior to the cut off time as specified by HHQ. Planners prepare preplanned requests by using DD Form 1972 (*Joint Tactical Air Strike Request*). Submission procedures (for example, numbering system, time frame for inclusion in the ATO) for preplanned requests are theater-specific, and detailed guidance should be found in unit SOP.

b. Immediate requests. Immediate requests arise from situations that develop outside the ATO planning cycle. Because these requirements cannot be identified early on, tailored ordnance loads may not be available for specified targets. During the execution phase of the ATO, the joint force air component commander (JFACC) staff may need to redirect missions to cover immediate requests for CAS. Immediate requests are forwarded to the appropriate command post by the most rapid means available. Requests are broadcast directly from the TACP to the air support operations center (ASOC)/direct air support center (DASC). Silence by intermediate HQ implies consent to the request. The preferred method for an immediate request is using DD Form 1972 as a guide.

Note 1: Disapproval would most likely be attributed to a particular sortie already in progress, possibly interfering with or impeding current operations. It is also possible that the disapproving TACP determines that CAS aircraft may be vulnerable to unforeseen hazards that have not been sufficiently analyzed by higher echelons.

Note 2: Time of initial request to time of receipt of approval may take several minutes, depending on aircraft availability, other sorties being flown, time on station, weather limitations, communications, etcetera. Aircrews should determine during premission planning briefings if CAS will be on call or readily available. Additionally, aircrews should consider alternative measures such as artillery or additional attack assets during mission planning.

c. CAS control. CAS control procedures include check-in and coordination, strike briefing (9-line), strike control, and battle damage assessment as described below.

(1) Rendezvous and coordination. The aircrew and the CAS aircraft establish radio contact on a predetermined frequency and coordinate verbal directions to the target area. The flight leader will initiate radio contact and provide the controlling agency with the following data in accordance with JP 3-09.3. (See figure 4-11.)

CAS CHECK-IN BRIEFING

(Aircraft transmits to controller)

Aircraft:"____________________________, this is __________________________________"

(controller call sign) (aircraft call sign)

1. Identification/mission number:" ____"

Note: Authentication and appropriate response suggested here. The brief maybe be abbreviated for brevity or security ("as fragged" or "with exception").

2. Number and type of aircraft: "____"
3. Position and altitude: "____"
4. Ordnance: "____"
5. Playtime: "____"
6. About code: "____"

(if applicable)

Figure 4-11. CAS Check-in briefing.

(2) Strike briefing. The aircrew provides the flight lead with information necessary to formulate an effective attack plan. As a minimum, the pertinent information will be provided using the close air support briefing form (9-line) format. In most situations, the air mission commander (AMC) will not have the information to select an initial point (IP) for the strike aircraft; in this case, the AMC will state "lines 1 thru 3 are NA." If the strike is a combined joint attack, the AMC will provide attack methods, firepower timing options, and targeting methods. (See figure 4-12.)

CAS BRIEFING (9-LINE)

(Omit data not required. Do not transmit line numbers. Units of measure are standard unless otherwise specified. *Denotes minimum essential in limited communications environment. BOLD denotes mandatory read back items)

Terminal controller: "_________________________, **this is**____________________________"
(Aircraft Call Sign) (Terminal Controller)

Type________Control________"
(1,2,or 3)

1. *IP/BP: "____"

2. *Heading: "____" (Deg Magnetic)
(IP/BP to Target)

Offset: "____" (Left/Right)
(When required)

3. *Distance: "____"
(IP-to-Target in nautical miles/BP-to-Target in meters)

4. *Target Elevation: "_____________________________________" (in feet/MSL)

5. *Target Description: "_____________________________________"

6. *Target Location: "______________________________________"
(Lat/Long, grid coords to include map datum [for example, WGS-84], offsets or visual description)

7. *Type Mark: "_____________________________________" Code: "__________________"
(WP, Laser, IR, Beacon) (Actual Code)

Laser to Target Line: "______________________________Degrees"

8. *Location of Friendlies: "____"
(from target, cardinal directions and distance in meters)

Position marked by: "____"

9. Egress: "____"

Remarks (as appropriate): "____"
(Ordnance delivery, threats, FAH, hazards, ACAs, weather, Addtnl Tgt Info, SEAD, laser, LTL, GTL {degrees magnetic north} illumination, night vision capability, danger close [with commander's initials])

RESTRICTIONS:"____________________"

Time on Target (TOT):"____"

OR

Time to Target (TTT):

"Stand by____________________________plus_________________________________, Hack."
(minutes) (seconds)

Note: When identifying position coordinates for joint ops, include map data. Grid coordinates must include 100,000 meter grid identification

Figure 4-12. CAS briefing.

(3) Transmit attack methods, firepower timing options, and targeting methods. The aircrew will provide the strike aircraft with a formulated strike plan or enough information for the strike aircraft to make his/her own plan. (see table below.)

Table 4-4. Timing options

Type of attack	*Simultaneous*	*Sequential*	*Random*
COMBINED (Same avenue of attack)	VISUAL or HACK	VISUAL or HACK	Not Normally Used
SECTORED (Separate avenues of attack)	VISUAL or HACK	VISUAL or HACK	Free Flow *
* Must ensure strafe fan/bomb and missile frag deconfliction.			

(a) Combined attack. The avenue to the target is shared airspace. During this attack, all joint air attack team (JAAT) members will fly in the same area.

(b) Sectored attack. The avenue to the target is sectored. During this attack, the strike aircraft will maneuver exclusively in their own sector, separate from the rotary wing aircraft. Participants will ensure weapons and weapons effects do not cross an established sector line.

Note: The sector attack is the preferred method of attack when attack helicopter assets are utilized. This method allows the CAS aircraft to concentrate solely on their objective without impeding the attack helicopter team's mission. Each party, in effect, keeps within a set boundary or sector to accomplish the mission.

(c) Simultaneous. All elements attack at the same time to mass fires and maximize shock effect.

(d) Sequential. All elements attack in a predetermined sequence. This provides continuous pressure on the enemy and ensures individual targets are not double-targeted.

(e) Random. All elements attack at will. This is easiest on pilots because there is no timing required and reduced command and control (C2) requirement, but can complicate the fire support plan.

(4) Strike control. The strike aircraft will normally approach the target area and proceed to the target area at either low level or extreme high level, depending on the status of anti-aircraft artillery and surface to air missile threats.

(a) Flight lead reports arrival at IP.

(b) Aircrew clears aircraft to depart IP or flight lead announces departure (if strike is a specified time on target).

(c) Aircraft continues inbound.

(d) Flight lead announces 1 minute inbound call and announces systems "HOT."

(e) Aircrew marks target by whatever means briefed. Attack helicopter assets and artillery check fires (if doing a combined or sequential attack). USAF aircrews usually will request a laser "SPOT." U.S. Navy and USMC will request a

"SPARKLE" (laser). During CAS missions, use common terms that can be understood by all, for example, "laser on," "laser off."

(f) Flight lead identifies target marking and announces/verifies target marks to aircrew. He may announce "no joy," meaning that a visual confirmation of the target area has not been completed.

Note: If the strike is within close proximity to friendly units, the strike aircraft will not deliver ordnance until it gets a "cleared HOT" call from a qualified forward air controller (FAC). The ground commander will assess the risk and determine the type of control (Type 1, 2, or 3) that will be used prior to weapons release.

(g) Wingmen commence their respective passes in the same sequence and manner as described above.

(h) The strike will continue until the target is neutralized, the aircraft delivers its ordnance (Winchester), or the aircraft reaches its Bingo limit.

(5) Battle damage assessment (BDA). The observer following the strike transmits the battle damage assessment. The flight lead will request a BDA from the controlling FAC or aircrew.

NIGHT/NIGHT VISION DEVICE (NVD) CONSIDERATIONS: The crew must exercise care when observing the impact of rounds because the flash signature may momentarily degrade the capability of the night vision goggles (NVG). When adjusting indirect fire, the crew must follow procedures to protect their night vision.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-65D aircraft or AH-64D simulator.
2. Evaluation will be conducted in the AH-64D aircraft, AH-64D simulator, or academically.

REFERENCES: Appropriate common references and the following:

FM 3-09.32
FM 17-95
FM 90-21
JP 3-09.03
TC 1-201
Unit SOP

TASK 2170

OPERATE NIGHT VISION GOGGLES WITH THE SDU (SYMBOLOGY DISPLAY UNIT) ATTACHED

CONDITIONS: In an AH-64D helicopter with the pilot (either P* or P) using night NVG with the SDU attached.

STANDARDS: Appropriate common standards plus describe and demonstrate correct terminology and usage of the SDU according to the current SDU AWR and the Exportable Training Package.

DESCRIPTION: Perform operational procedures for the SDU. These include assembly, preparation for use, operating procedures, and equipment shutdown.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the aircraft.
2. Evaluations will be conducted in the aircraft.

REFERENCES: Appropriate common references plus the following:

Exportable Training Package

This page intentionally left blank.

Chapter 5

Maintenance Test Pilot Tasks

This chapter describes the tasks that are essential for maintaining maintenance crewmember skills. It defines the task title, number, conditions, and standards by which performance is measured. A description of crew actions, along with training and evaluation requirements is also provided. Tasks described in this chapter are to be performed by qualified AH-64D Maintenance Test Pilots in accordance with AR 95-1. This chapter contains tasks and procedures to be used by contractor maintenance test pilots in accordance with AR 95-20 (DLAI 8210.1) Flight Operations section 1.11 (publications). If a discrepancy is found between this chapter and TM 1-1520-251-MTF, the MTF takes precedence.

5-1. TASK CONTENTS.

a. **Task number.** Each ATM task is identified by a ten-digit systems approach to training number that corresponds to the maintenance test pilot tasks listed in chapter 2 (Table 2-3). For convenience, only the last four digits are referenced in this training circular.

b. **Task title.** This identifies a clearly defined and measurable activity. Task titles may be the same in many ATMs, but task content will vary with the airframe.

c. **Conditions.** The conditions specify the common wartime or training/evaluation conditions under which the MTP tasks will be performed.

d. **Standards.** The standards describe the minimum degree of proficiency or standard of performance to which the task must be accomplished. Standards are based on ideal conditions to which the task must be accomplished. The following common standards, in addition to ATM common standards, apply to all MTP tasks.

(1) Brief the RCM or NCM on the procedures and applicable Warnings, Cautions, and Notes for the task to be performed.

(2) State the reason for performing a specific task and answer questions about system location, operation, and function.

(3) Assess any malfunctions or discrepancies as they occur and apply appropriate corrective actions or troubleshooting procedures.

(4) Perform crew coordination actions per the task description and chapter 6.

(5) Use the oral callout and confirmation method and announce the initiation and completion of each check.

e. **Description.** The description explains how the elements of the task should be done to meet the standards. When specific Crew actions are required, the task will be broken down into Crew actions and procedures as follows:

(1) Crew actions. These define the portions of a task to be performed by each crewmember to ensure safe, efficient, and effective task execution. The P* indication does not imply PC or MP duties. When required, P* or MP responsibilities are specified. All tasks in this chapter are to be performed only by qualified MEs, MPs or student maintenance test pilots undergoing qualification training as outlined in AR 95-1. The MP is the PC in all situations, except when undergoing training or evaluation by an ME. For all tasks, MP actions and responsibilities are applicable to MEs. When

two MEs are conducting training/evaluation together, or two MPs are jointly performing test flight tasks, the mission brief will designate the aviator assuming PC responsibilities.

(2) Procedures. This section describes the actions that the MP/ME performs or directs the RCM /NCM to perform in order to execute the task to standard.

(3) Expanded procedures. Some procedures in TM 1-1520-251-MTF that are listed in the manual as bulleted items have expanded procedures/methods that are not provided in the MTF manual. These items are expanded in procedural text description within this ATM. Only required procedures are expanded within the ATM to provide clarification on preferred methods for accomplishing these procedures. Expansion of these checks within the MTF would clutter the checklist format of the MTF manual. If a check is not expanded within the procedural descriptions of the ATM, it is because the MTF clearly identifies the preferred method of accomplishment.

f. **Considerations:** This section defines training, evaluation, and other considerations for task accomplishment under various conditions.

g. **Training and evaluation requirements.** Some of the tasks incorporate more than one check from TM 1-1520-251-MTF. This section defines the checks in each task that, as a minimum, must be evaluated on an evaluation flight. The evaluator may select additional checks for evaluation. Training and evaluation requirements define whether the task will be trained or evaluated in the aircraft, simulator, or academic environment. Training and evaluations will be conducted only in the listed environments, but may be done in any or all combinations. Listing only "aircraft" under evaluation requirements does not preclude the ME from evaluating elements of the task academically to determine the depth of understanding or troubleshooting processes. However, the evaluation must include hands-on performance of the task in the listed environment(s). If one or more checks are performed unsatisfactorily, the task will be graded unsatisfactory. However, when the task is reevaluated, only those unsatisfactory checks must be reevaluated.

h. **References.** The references are sources of information relating to that particular task. In addition to the common references listed in the References section at the back of this ATM, the following references apply to all MTP tasks:

(1) Aircraft logbook and historical records.

(2) AR 700-138.

(3) DA Pam 738-751.

(4) FM 3.04-500 (FM 1-500).

(5) TM 1-1500-328-23.

(6) TM 1-1520-251-10.

(7) TM 1-1520-251-CL.

(8) TM 1-1520-251-MTF.

(9) TM 1-1520-LONGBOW/APACHE.

(10) TM 1-1500-204-23 series manuals.

(11) TM 1-2840-248-23.

(12) TM 1-6625-724-13&P.

(13) TM 9-1090-208-23 series manuals.

(14) TM 9-1230-416-20 series manuals.

(15) TM 9-1230-476-1.

(16) TM 9-1230-476-20.

(17) TM 9-1230-476-23.
(18) TM 9-1230-476-30.
(19) TM 9-1270-221-23.
(20) TM 9-1270-416-20 series manuals.
(21) TM 9-1427-475-23.
(22) TM 9-1270-476-30.
(23) Applicable airworthiness directives or messages from AMCOM.

5-2. TASK LIST

a. **Standards versus descriptions.** MPs and MEs are reminded that task descriptions may contain required elements for successful completion of a given task. When a standard for the task is to "brief the RCM on the conduct of the maneuver," those crew actions specified in the description are required. Attention to the use of the words, will, should, or may throughout the text of a task description is crucial.

b. **Critical tasks.** All AH-64D maintenance tasks are critical tasks.

Note 1: Situational awareness information needed for the successful accomplishment of these tasks will be provided to each crewmember through their individual HDUs. The PC will approve those instances when it may be desired not to employ the HDU during the conduct of a specific flight maneuver.

Note 2: Conduct of maintenance test flights (MTF) under night (N), night vision system (NVS), or night vision goggles (NVG) requires a high degree of proficiency on the part of the MP/ME and the opposite seat RCM. Maintenance test flights that are conducted after official sunset should be carried out by the most experienced crew available. Risk mitigation should be applied during the mission briefing process to ensure that the crew possesses the degree of proficiency required to safely perform all maneuvers required during the MTF.

Note 3: Maintenance test pilots (MTPs) who are required to perform night MTFs will be trained by a maintenance examiner (ME) prior conducting night MTFs.

Note 4: Performing night MTFs places an increased workload on the crew when compared to day MTF operations. Reduced ambient light levels make it more difficult for the crew to select and maneuver the aircraft to emergency landing areas in the event of an aircraft malfunction. MTF checklist chart interpretation is more difficult and the probability of errors is increased.

Note 5: MTPs should consider conducting night MTFs in an area which has been reconnoitered during the day for hazards. When possible, all autorotational RPM checks will be performed over a prepared surface where crash facilities are available.

TASK 4000

Perform prior to maintenance test flight checks

CONDITION: In an AH-64D helicopter.

STANDARDS: The maintenance test pilot (MP) should direct assistance from the rated crewmember (RCM) or nonrated crewmember (NCM) as appropriate. Appropriate common standards plus the following:

1. Perform the preflight inspection according to TM 1-1520-251-10/TM 1-1520-251-CL.
2. Determine the suitability of the aircraft for flight and the mission to be performed.
3. Determine required maintenance operational checks (MOCs) and maintenance test flight (MTF) maneuvers to be completed.
4. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The MP will ensure that a thorough preflight inspection is conducted. TM 1-1520-251-CL will be used to conduct the preflight inspection; however the inspection will be conducted to the detail level in chapter 8 of the TM. The MP may direct the RCM if available, to complete such elements of the aircraft preflight inspection as are appropriate, but he will verify that all checks have been completed. The MP will ensure that the aircraft logbook forms and records are reviewed and appropriate entries made as per DA Pam 738-751. The MP will ensure that a thorough evaluation of all maintenance actions has been completed. The MP will determine which MOC/MTF maneuvers will be completed. The MP will review each MOC/MTF maneuver to be completed.

   b. The RCM should complete the assigned elements and report the results to the MP.

2. Procedures. Review the aircraft forms and records to determine the necessary checks and tasks to be performed. Use additional publications and references as necessary. Conduct a risk assessment of the mission. Preflight the aircraft with special emphasis on areas or systems where maintenance was performed. Verify all test equipment is correctly installed and secured as applicable.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4001

Perform a maintenance operational check/maintenance test flight crewmember brief

CONDITION: Given a maintenance operational check (MOC)/maintenance test flight (MTF) crewmember-briefing checklist.

STANDARDS: The maintenance test pilot (MP) should direct assistance from the rated crewmember (RCM) or nonrated crewmember (NCM) as appropriate. Appropriate common standards plus the following:

1. Brief crewmembers on the required actions, responsibilities, and safety considerations for each MOC/MTF maneuver to be completed.
2. Ensure that each crewmember has appropriate safety equipment. For the ground crewmember, these will include eye, hearing, head, and skin protection. Ensure that the flight crewmember has the appropriate equipment for flight. Ensure that all crewmembers understand the importance of their responsibilities during all phases of the MOC/MTF.
3. Ensure that the crewmembers receiving the aircrew mission brief verbally acknowledge a complete understanding of the aircrew mission briefing.
4. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. A designated briefing officer will evaluate and brief key areas of the mission to the MP according to AR 95-1. The MP will acknowledge a complete understanding of the mission brief and initial DA Form 5484-R (*Mission Schedule/Brief*). Designated briefing officers will use risk management techniques according to AR 95-1 and TC 1-210.
2. If possible, the MP, the RCM, and the ground crewmember should conduct a review of the MOCs/MTF maneuvers to be completed, as a crew. The MP will use the enclosed briefing template or a briefing template similar in content to accomplish the brief. This template includes the minimum information for a MOC/MTF crewmember brief. Units should modify the template as needed to include specific mission requirements or other necessary changes that reflect unit particular items.
3. The crewmembers being briefed will address any questions to the briefer and will acknowledge that they understand their assigned actions, duties, and responsibilities. Lessons learned from previous debriefings should be addressed as applicable during the crew briefing.

Note 1: The MP will brief, in detail, the crewmember actions and responsibilities required when test flights are conducted in other than day VFR according to TM 1-1500-328-23.

Note 2: Extreme care should be used when conducting MOCs during hours of darkness as fuel, ai, and oil leaks are difficult to detect. The MP should determine if the specific MOC should be conducted during darkness or daylight hours.

PROCEDURES:

1. Brief the mission using a unit-approved MOC/MTF briefing checklist. Figure 4-1 shows a suggested format for a MOC/MTF crew briefing checklist. Identify mission and flight requirements that will demand effective communication and proper sequencing and timing of actions by the crewmembers.

2. MOCs should be performed in a logical, safe order. Turning on and testing of systems, if not specified in maintenance manuals, will be conducted according to the order of power up as laid out in TM 1-1520-251-CL/TM 1-1520-251-MTF.

a. Ground crewmember (NCM).

(1) The MP will ensure that ground crewmembers have appropriate safety clothing/ equipment. The MP should ensure positive and direct means of communications between the crew, and the ground crewmember is provided.

(2) All crewmembers should remove jewelry (such as watches, rings, or loose medallions) prior to movement on or around the aircraft. All loose items in pockets should be secured. Pockets should be closed. Communication cords and other equipment/tools should be under positive control at all times when on or around the aircraft. Accountability of all equipment before, during and after completion of MOCs will be completed prior to securing of cowlings/panels. A foreign object damage (FOD) inspection will also be completed.

(3) If communications is lost between the MTP and ground crewmembers, ground crew should re-establish communications prior to MOCs resuming. All crewmembers should remain in visual contact unless direct communications are provided.

b. Rated crewmember (RCM).

(1) The MTF will be conducted according to TM 1-1520-251-CL/TM 1-1520- 251-MTF. Both crewmembers will be familiar with the maneuvers to be accomplished and their individual duties.

(2) Duties will be performed as per the crew brief or as dictated by the MP if a situation arises that was not covered by the mission brief.

(3) The MP will ensure that a final walk-around inspection has been completed prior to flight.

MOC/MTF CREW BRIEFING CHECKLIST

1. Mission Overview
   a. Purpose of the test flight and maneuvers to be performed.
   b. Route of flight.
2. Flight Plan.
3. Weather (Departure, En Route, Destination, and Void Time).
4. Airspace Surveillance Procedures (FCR/Non-FCR) (Task 1026).
5. Required Items, Mission Equipment, and Personnel.
   a. Special/test equipment – security, location, and operation
6. Crew Actions, Duties, and Responsibilities.
   a. Transfer of flight controls and two challenge rule.
   b. Emergency actions (those pertaining to the crew).
      (1) Dual engine failure
      (2) Dual hydraulic failure/emergency hydraulic button
      (3) Fuel PSI ENG 1 and ENG 2
      (4) Engine failure OGE hover
      (5) Loss of tail rotor
      (6) Actions to be performed by P* and P
      (7) Portable fire extinguisher
      (8) First aid kits
      (9) Egress procedures and rendezvous point
      (10) Canopy jettison

(11) Emergency stores jettison

(12) Power lever manipulation

(13) CHOP button

(14) Engine and APU fire buttons/extinguishing bottles

(15) Loss of ICS/CIU

(16) Unusual attitude recovery

(17) Simulated emergencies

c. Communications plan.

d. Mission considerations.

e. Inadvertent IMC.

f. Egress procedures and rendezvous point.

g. Actions to be performed by P* and P.

h. Checklist usage.

i. Refuel/Re-arm procedures

j. Night and NVS MTF considerations.

7. General Crew Duties.

a. Pilot on the controls (P*)

VMC

(1) Fly the aircraft with primary focus inside and cross-check outside while performing MTF maneuvers.

(2) Fly with primary focus outside while not performing MTF maneuvers.

(3) Avoid traffic and obstacles.

(4) Cross-check systems and instruments.

(5) Monitor/transmit on radios as directed by the PC.

b. Pilot not on the controls (P)

(1) Primary focus outside while performing MTF maneuvers.

(2) Provide traffic and obstacle avoidance/advisories.

(3) Manage radio network presets, and set transponder.

(4) Copy clearances, ATIS, and MTF data as directed by the MP.

(5) Cross-check MPD pages (for example, ENG/SYS, PERF, FLT) and/or instruments (PLT).

(6) Monitor/transmit on radios as directed by the MP.

(7) Read and complete checklist items as required.

(8) Set/adjust pages/switches and systems as required.

(9) Announce when focused inside for more than 3-4 seconds (VMC) or as appropriate to the current situation.

8. Crew station (PLT/CPG) specific.

a. MPD setting considerations

b. WPNs, FCR and ASE considerations (as applicable)

c. Record test flight data as directed by MP.

9. Analysis of the aircraft.

a. Logbook and preflight deficiencies

b. Performance planning (AMPS, PPC, aircraft PERF page)

(1) ETF/ATF

(2) Recomputation of PPC

(3) GO/NO GO data

(4) Single-engine capability (Min/Max)

c. Mission deviations required based on aircraft analysis.

d. Armed aircraft operations

e. Special mission equipment considerations

10. Risk assessment considerations.

11. Ground crewmember.

a. Duties required

b. Emergency actions (those affecting the NCM)

c. Oil, air, and fuel leaks

d. Movement on or about the aircraft

e. Communications (normal and emergency)

f. Tools/test equipment – security, location, operation

g. Warnings affecting crew chief—

(1) Pylon movement

(2) Hot elements

(3) Turning rotors

(4) Canopy jettison

(5) Armed aircraft operations

12. Crewmember questions, comments and acknowledgement of briefing.

TRAINING AND EVALUATION REQUIREMENTS

1. Training will be conducted academically and orally.
2. Evaluation will be conducted academically and orally.

REFERENCES: Appropriate common references plus the following:

AR 95-1
FM 1-300
TM 1-1520-251-10
TM 1-1520-251-CL
Unit SOP

TASK 4004

Perform interior checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF, and appropriate common standards.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the required checks in sequence. The MP should direct assistance from the rated crewmember (RCM) or nonrated crewmember (NCM) if available.
   b. The RCM and/or NCM should assist the MP as directed.
2. Procedures. Brief the RCM and/or NCM as required. Perform the interior checks in maintenance test flight (MTF) sequence. Direct the RCM to perform the required checks at his crew station and announce check completion. If necessary, brief the RCM on the procedures required to perform the checks at the copilot-gunner (CPG) station.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4008

Perform before starting auxiliary power unit checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF, and appropriate common standards.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the required checks in sequence. The MP should direct assistance from the rated crewmember (RCM) or nonrated crewmember (NCM) if available.
   b. The RCM and/or NCM should assist the MP as directed.
2. Procedures.

   a. The MP will check that the selected radio is tuned to an internal frequency on the UFD and will ensure that the intercommunication system (ICS) switch on the communications panel is set to the PTT position. The MP will check internal communications with opposite crewmember and ground crewmember(s) utilizing cyclic ICS rocker position, then RADIO rocker position, both left and right floor mikes, and then HOT MIC and VOX switch positions on the ICS switch, on the communications panel. The MP will confirm that all crewmembers had positive communications in all switch positions. The opposite RCM will check that the selected radio is tuned to an internal frequency on the UFD/EUFD and will ensure that the ICS switch on the communications panel is set to the PTT position. The RCM will check internal communications with opposite crewmember and ground crewmember(s) utilizing Cyclic ICS rocker position, then RADIO rocker position, both left and right floor mikes, and then HOT MIC and VOX switch positions on the ICS switch, on the communications panel. The RCM will confirm that all crewmembers had positive communications in all switch positions. The NCM will confirm communications capabilities with the crew.

   b. Perform fire detection test for test circuits 1 and 2 and note appropriate fire panel lights illuminations, messages and voice warnings. Perform fire detection test in copilot-gunner (CPG) compartment for test circuits 1 and 2.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4010

Perform starting auxiliary power checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF, and appropriate common standards.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will coordinate with and brief the rated crewmember (RCM), nonrated crewmember (NCM) and any additional ground support personnel prior to auxiliary power unit (APU) start. The MP will direct assistance from the RCM and NCM to aid in maintaining the APU exhaust and stabilator areas clear during the APU start sequence and any subsequent ground checks.
   b. The RCM and/or NCM should assist the MP as directed.

2. Procedures. Brief the RCM and/or NCM as necessary. Announce initiation of the APU start. Momentarily press the APU push button and monitor the UFD. Verify the APU START, APU PWR ON, and ACCUM PSI advisory messages are displayed on the UFD during the APU start. Verify the APU ON advisory message is displayed on UFD at the completion of APU start, and confirm the hydraulic pressures are in the normal operating range (ENG SYS PAGE). Verify three previous APU messages are extinguished. After generators are online, verify appropriate default MPD pages are displayed (ENG page ground format on the left MPD; DTU page on right MPD).

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4012

Perform after-starting auxiliary power unit checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF, and appropriate common standards.

DESCRIPTION:

1. Crew actions. The rated crewmember (RCM) and/or nonrated crewmember (NCM) should assist the MP as directed.

2. Procedures. Brief the RCM and NCM (as required) on the checks to be performed and the procedures they will follow in order to accomplish the checks. Direct them to monitor the area around the aircraft pylons wings and stabilator during the checks in order to minimize hazards to personnel and equipment during the checks.

a. Canopy doors check.

After the auxiliary power unit (APU) start, the MP and RCM will verify CANOPY OPEN messages present on both UFDs/EUFDs. Close the copilot-gunner (CPG) station canopy door and verify CANOPY OPEN message is still present on both UFDs/EUFDs. Close the pilot (PLT) station door and verify CANOPY OPEN messages extinguish on both UFDs/EUFDs. Open CPG station door and verify CANOPY OPEN messages on both UFDs/EUFDs. Secure CPG station door and verify CANOPY OPEN messages extinguished on both UFDs/EUFDs.

b. Park brake check.

After the canopy door check, the crew will execute the PARK BRAKE check. The RCM in the PLT station will apply pressure to the brakes until the parking brake handle releases, and seats full in. The RCM in the PLT station will apply pressure to the brakes and then pull the park brake handle out. The RCM in the PLT station will relax brake pressure while holding handle out, then release the park brake handle and insure the handle remains out. The RCM in the CPG station will apply brake pressures, and the RCM in the PLT stations will confirm that the brake handle releases to the full in position. The RCM in the CPG station will apply pressure to the brakes, and the RCM in the PLT station will pull the brake handle out. The RCM in the PLT station will have the RCM in the CPG station relax pressure on the brake pedals and insure the park brake handle remains out.

c. Exterior and interior lights check.

The RCM in the PLT station will turn on all exterior lighting. The NCM will check red and white anti-collision lights, navigation lights in BRT and DIM positions and all formation lights. The RCM in the PLT station will turn the searchlight on, and actuate the light forward, left, right, rear, and then turn the light OFF. Verify with NCM all searchlight functions. The RCM in the CPG station will turn on the searchlight; actuate it forward, left, right, rear, OFF, and then STOW. The RCM will confirm with NCM all searchlight functions. The RCM in the PLT station will confirm that the searchlight will not come out of the STOW position with the NCM outside by turning on the searchlight and trying to extend it out of the STOW position. Both crewmembers will check map lights, floodlights and cockpit backlighting for function.

d. Environmental control system (ECS) check.

(1) Both crewmembers should check airflow in all vents for each crewstation. Both crewmembers should select DMS UTIL page, then ECS page, then CKPIT on one MPD and an AIRCRAFT UTIL page on the other MPD.

Note: Crewstation ECS CKPIT page indications may not change as indicated below if cockpit air temperature is within 2 degrees of set temperature.

(2) The RCM in the CPG station will adjust temperature to full cold (50º F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE is full open.

(b) HEAT MODULATION valve for ECS 1 should be at 0 percent.

(c) Note the position of the HEAT SHUTOFF VALVE, INTERCONNECT, and APS BLOWER status for appropriate indications for crew station selections.

(3) The RCM in the PLT station will adjust the temperature to full cold (50º F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE is full open.

(b) HEAT MODULATION valve for ECS 2 should be at 0 percent.

(c) Note the position of the HEAT SHUTOFF VALVE, INTERCONNECT, and APS BLOWER status for appropriate indications for crew station selections.

(4) The RCM in the CPG station will adjust the temperature to full hot (90º F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE indicates 0 percent.

(b) HEAT MODULATION valve for ECS 1 should read a positive percentage.

(c) The HEAT SHUTOFF should show OPEN, the INTERCONNECT CLOSED, and the APS BLOWER ON.

(5) The RCM in the PLT station will adjust the temperature to full hot (90º F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE indicates 0 percent.

(b) HEAT MODULATION valve for ECS 2 should read a positive percentage. (Lot 6/Lot 7 aircraft will not read a percentage in the ECS 2 column.)

(c) The HEAT SHUTOFF should show OPEN, the INTERCONNECT CLOSED, and the APS BLOWER should show OFF now that both crew stations are in the heating mode.

(6) The RCM in the CPG station will adjust the temperature to full cold (50º F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE is full open.

(b) HEAT MODULATION valve for ECS 1 should be at 0 percent.

(c) Note the position of the HEAT SHUTOFF VALVE, INTERCONNECT, and APS BLOWER status for appropriate indications for crew station selections.

(7) Both crewmembers adjust the crew station temperatures to comfortable ranges on the AIRCRAFT UTIL page. Note appropriate indications on the ECS pages.

e. Flight controls sweep and force trim checks.

(1) Ensure that all flight controls are centered. Ensure that the opposite crewmember is clear of all controls and that both PLT and CPG collective frictions are set at zero.

(2) Interrupt the force trim and displace the cyclic full forward. Move the cyclic through full sweep either clockwise or counterclockwise. Note freedom of movement, no binding and correlating blade pitch changes in all blades.

Return the cyclic to the center position. Both crewmembers will verify cyclic stick movement correlation through full range of travel.

(3) With the force trim interrupted, displace the directional control pedals full left. Confirm with the ground crewmember outside that the tail rotor swash plate is full in and has correlating blade movement. Displace the directional control pedals full right and confirm with the ground crewmember outside that the tail rotor swash plate is full out and has correlating blade movement. During both pedal movements, note freedom of movement no binding. The ground crewmember should confirm smooth motion in and out of the tail rotor swash plate assembly with no ratcheting.

(4) Pull the collective full up and then full down. Verify freedom of movement no binding and correlating blade movement outside.

(5) Without interrupting the force trim, start with the cyclic. From the center position, displace the cyclic approximately 1 to 2 inches from center forward, left, right, and aft, verifying freedom of movement and the feel spring tension in each direction.

(6) Interrupt the force trim and displace the cyclic to one control quadrant while displacing pedals left or right. Release the force trim interrupt. Verify equal feel spring tension in all directions while moving the cyclic approximately 1 to 2 inches forward, left, right, and aft. Relax the control pressures and allow the cyclic to return to the trimmed position. Push in the opposite pedal from the displaced pedal position and note that the feel spring pressure pushes the pedal back to the trimmed setting. Interrupt the force trim, displace the cyclic to a different control quadrant, and set the pedals to the opposite pedal input. Release the force trim. Verify the equal feel spring tension in all directions while moving the cyclic approximately 1 to 2 inches forward, left, right, and aft. Relax the control pressures and allow the cyclic to return to the trimmed position. Push in the opposite pedal from the displaced pedal position and note that the feel spring pressure pushes the pedal back to the trimmed setting. Interrupt the force trim; reset the controls back to the centered position. Release the force trim.

(7) Repeat steps 1 through 6 in the opposite crew station. Trim checks in the opposite crew station should check two opposite quadrants.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4088

Perform starting engine checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF and appropriate common standards.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the checks in sequence. The MP should coordinate with and direct assistance from additional crewmembers and/or ground support personnel if available. The MP will visually or by intercom, reconfirm the location of any crewmembers or support personnel not visible from the cockpit prior to engine start.
   b. The rated crewmember (RCM), nonrated crewmember (NCM), and any ground support personnel should assist the MP as directed.
2. Procedures. Brief and coordinate with the RCM, NCM, and any additional ground personnel as necessary. Perform starting engines in maintenance test flight (MTF) sequence.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4090

Perform engine run-up and systems checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF and appropriate common standards.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the checks in sequence. The MP should coordinate with and direct assistance from the rated crewmember (RCM) and nonrated crewmember (NCM) as appropriate.
   b. The RCM and/or NCM should assist the MP as directed.
2. Procedures. The aircrew and the ground crew will continue to monitor the area around the aircraft and announce when their checks are completed. Perform engine run-up and systems checks in maintenance test flight (MTF) sequence.

> **CAUTION**
>
> The MP should transfer the controls to the pilot not on the controls (P) while conducting the engine overspeed test.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4110

Perform before taxi checks

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with engine run-up checks completed.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF and appropriate common standards.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the before taxi checks in maintenance test flight (MTF) sequence.
   b. The rated crewmember (RCM) and nonrated crewmember (NCM) should assist the MP as directed.
2. Procedures. Perform the before taxi checks in MTF sequence. Coordinate with the RCM and ground crew as appropriate.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4112

PERFORM TAXI CHECKS

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, on a suitable surface, with the before-taxi checks completed, the aircraft cleared, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain constant speed appropriate for conditions.
2. Maintain the desired ground track ± 3 feet.
3. Apply the torque that is appropriate for the ground taxi condition.
4. Perform taxi check.
5. Maintain level fuselage attitude ± 3 degrees roll on attitude indicator. (Approximately ± 1 trim ball width).
6. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence and remain focused outside during taxi operations. The MP will ensure that the parking brake is released and unlock the tail wheel if required before starting the ground taxi. The MP will announce when the aircraft is clear, intent to begin ground taxi operations, and the intended direction. The MP will unlock the tail wheel, clear the aircraft and announce direction of turn before turning. The MP will announce "Braking" when the MP intends to apply brake pressure. The MP will remain focused outside the aircraft. The MP will direct the pilot not on the controls (P) to call out the TAXI CHECK and to assist in clearing the aircraft during the checks. The MP may direct assistance from the RCM as necessary. The MP will ensure that the parking brake is released and the tail wheel is unlocked before starting the ground taxi. The MP will announce "Braking" when the MP intends to apply brake pressure. The MP will announce when the aircraft is clear, intent to begin ground taxi operations. The MP will announce "Braking" when the MP intends to apply brake pressure.

   b. The pilot not on the controls (P) will announce "Guarding" to acknowledge the P*'s announcement of "Braking". The P should not apply any pressure against the anti-torque pedals when guarding the brakes unless an unsafe situation is detected. The copilot-gunner's (CPG's) automatic roller detent decouplers (ARDDs) breakout forces are approximately 15 percent higher than the breakout forces required for the pilot's station ARDDs. The P will call out the taxi check when directed. The P will assist in clearing the aircraft and will provide adequate warning to avoid obstacles. The P will announce when his attention is focused inside the cockpit.

   c. The MP should direct assistance from the RCM as appropriate.

2. Procedures.

   a. Ensure the area is suitable for ground taxi operations. Initiate the taxi by insuring flight controls are centered, then increase collective to approximately 27 to 30 percent torque and then apply a slight amount of cyclic in the direction of desired taxi. During single-engine ground taxi (if required after hot refuel or etc.) double the required dual engine taxi torque for a given condition. When the aircraft begins moving, maintain the collective at a power setting of not less than 27 to 30 percent torque. Control the aircraft heading with the pedals and maintain a level attitude with cyclic. Roll attitude is controlled with the cyclic. Use left or right pedal input to turn the aircraft in conjunction with applying lateral cyclic into turns to maintain a level fuselage attitude ±3°degrees.

b. Rate of turn will be controlled so that lateral acceleration will not displace the trim ball greater than ±1 trim ball width as referenced to the reference lines. The turn and slip indicator, standby attitude indicator, and symbology (transition mode and trim ball), as well as outside visual cues, may be used to reference fuselage roll attitude. Establish a constant speed commensurate to the conditions. To regulate taxi speed, use a combination of cyclic, collective, and when necessary brakes. The hover mode velocity may be used to establish a constant ground (inertial) speed. Be aware that high gross weights, soft, rough, or sloping terrain may require the use of 32 to 40 percent torque.

c. During taxi check, check wheel brakes from both crewstations. Both crewmembers check ENG pages for normal indications. Both crewmembers check FLT pages for proper indications of left and right turns on symbology, proper trim ball and turn and slip indications, and proper indications of changes in aircraft attitude during taxi. Check proper functioning of all symbology and symbology modes on FLT pages and HDUs.

Note: Be aware that soft, rough, or sloping terrain may require the use of more than normal power.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references plus the following:

Task 1034

TASK 4114

Perform baseline and normal engine health indicator test

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Appropriate common standards plus the following:

1. Determine the health indicator test (HIT) check baseline data.
2. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions. The rated crewmember (RCM) should assist the maintenance test pilot (MP) as directed.

Note: The crew should coordinate who will manipulate flight controls to include power levers during the HIT check. The opposite crewmember should manipulate all multipurpose display (MPD) pages/buttons that are necessary during the conduct of the HIT check.

2. Procedures. Perform the procedure as outlined in TM 1-1520-251-MTF.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4123

Perform before hover checks

CONDITIONS: In an AH-64D, or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF and appropriate common standards.

DESCRIPTION:

1. Crew actions.

    a. Each crewmember will complete the required checks pertaining to assigned crew station per TM 1-1520-251-MTF.

    b. The rated crewmember (RCM) should assist the maintenance test pilot (MP) as directed.

2. Procedures. Perform the before-hover checks in maintenance test flight (MTF) sequence and announce when the checks are completed. Direct assistance from the RCM as necessary.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4144

PERFORM HOVER CHECKS

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with performance planning information available, at an appropriate hover height, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain a stationary hover at the selected altitude ±2 feet.
2. Maintain heading ±10°degrees.
3. Maintain minimal aircraft drift.
4. Determine that sufficient power is available to complete the mission.
5. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence and remain focused outside during hover operations. The MP may direct assistance from rated crewmember (RCM) as necessary.

   b. The RCM should assist the MP as directed.

2. Procedures. Announce your intent to bring the aircraft to a hover. Direct the RCM to observe the pylons and confirm they articulate properly for the existing configuration. Verify normal controllability, stability, and center of gravity. Use a stationary 5-foot hover when performing this task unless the mission or terrain constraints dictate otherwise. If another hover height is required, use that height to compute go/no-go torque and predicted hover torque. Note the vibration levels and stabilator effect on vibration through the full range of stabilator travel. Confirm that instrumentation and hover symbology indicates appropriately, (minimize movement of the velocity vector and acceleration cue to the extent possible). Direct the RCM to monitor the aircraft instruments, symbology, and radar altimeter to confirm proper functioning, and compare the actual performance data to the computed performance card (PPC)/ /performance (PERF) page data. Select the TSD utility page and check the navigation system status.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references plus the following:

Task 1038

TASK 4160

PERFORM HOVER MANEUVERING CHECKS

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Do not exceed a 30 degree per second turn rate.
2. Maintain a 5 to 10-foot main wheel height during hovering turns, forward and sideward hover flight, and a 10 to 15-foot main wheel height when performing rearward hover flight.
3. Maintain minimal aircraft drift.
4. Maintain heading ± 10 degrees.
5. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the checks in sequence and remain focused outside during hover operations. The MP may direct assistance from the rated crewmember (RCM) as necessary.
   b. The RCM should assist the MP as directed.
2. Procedures. Direct the RCM to assist with clearing the aircraft and providing warning of obstacles, unusual drift, or altitude changes. Direct the RCM to confirm instruments and symbology are functioning properly during the maneuvers. Establish a 5 to 10-foot hover height into the wind. Announce your intent to perform left and right 90-degree pedal turns from initial heading without re-trimming. During the hovering turns, verify aircraft controllability and response, and proper functioning of instrumentation and symbology. Confirm the aircraft heading is maintained within ±5 degrees of the newly selected heading. Announce your intent to perform a forward, lateral, and rearward hovering flight maneuver and remain focused outside the aircraft. The execution speed of the maneuvers should not exceed hover symbology saturation. Without re-trimming, apply cyclic input in the desired direction of flight; note that no excessive inputs are required, and that the desired aircraft response and controllability are achieved. Confirm the symbology correlates to the aircraft movement and then relax control pressure and allow the cyclic to return to the trimmed position. The aircraft should drift to a stop.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references plus task 1038.

TASK 4162

PERFORM FMC/ATTITUDE HOLD CHECKS

CONDITIONS: In an AH-64D helicopter, or an AH-64D simulator, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain hover at a 5 to10-foot wheel height.
2. Maintain minimal aircraft drift.
3. Maintain altitude ± 20 feet out-of-ground effect (OGE) (80-feet above ground level [AGL] or higher).
4. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the checks in sequence and remain focused outside during hover operations. The MP may direct assistance from the rated crewmember (RCM) as necessary.
   b. The RCM should assist the MP as directed.
2. Procedures. Direct the RCM to assist in clearing the aircraft and to provide adequate warning of obstacles, unusual drift, or altitude changes. Establish a stabilized 5 to 10-foot hover height into the wind. Note the aircraft stability for reference. Cycle the ATT HOLD mode through engage and disengage verify the flight control tone and correct symbology displays. Repeat the check for ALT HOLD mode. Engage ATT and ALT HOLD. Note any tendency of the aircraft attitude and altitude to change from the selected position. The MP will state force landing plan, ensure both crew members are familiar with conditions conducive to settling with power, and verify availability of OGE power. Without displacing the pedals, increase collective to 15 to 20 percent above hover torque and climb to a stabilized OGE hover at 80 feet or above the highest obstacles verify ALT HOLD disengages and that the flight control tone is heard. Check that aircraft maintains heading ± 5 degrees. Reduce collective and re-establish a stabilized 5 to 10-foot hover height. Re-engage ALT HOLD mode, momentarily select the force trim/hold mode switch to the 6 o'clock position and confirm ATT and ALT HOLD mode disengages. Verify the flight control tone and correct symbology displays. Announce termination of the maneuver.

Note 1: Maintain sufficient distance from obstacles to allow for a safe maneuvering area in the event of a single engine failure.

Note 2: OGE power is required for this maneuver.

Note 3: Conditions during this maneuver could be conductive to setting with power.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references plus task 1038.

TASK 4182

PERFORM VISIONIC SYSTEMS CHECKS

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with target acquisition and designation sight (TADS) drift null check completed, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain hover at 5- to 10-foot wheel height.
2. Do not allow drift to exceed 3 feet.
3. Maintain a constant rate of turn not to exceed 30 degrees per second.
4. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the checks in sequence and remain focused outside the aircraft during hover operations. The MP may direct assistance from the rated crewmember (RCM) as necessary.
   b. The RCM should assist the MP as directed.
2. Procedures. Direct the RCM to assist in maintaining obstacle clearance and providing feedback advising of any unusual drift or altitude changes. Direct the RCM to slew the TADS to a target at a distance of 500 meters or more, and select narrow field of view (NFOV) in either the day television (DTV) or the forward looking infrared (FLIR), maneuver the aircraft heading to align with the TADS LOS (line of sight), and minimize turret drift. Brief the RCM not to attempt to re-center the cross hairs on the target during the remainder of the maneuver. Announce your intent to perform 90° left and right pedal turns from TADS LOS, while pivoting about the TADS. The target should remain within narrow field of view during the check.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references plus task 1038

TASK 4184

PERFORM HOVER BOX DRIFT CHECK

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain hover at a 5 to 10-foot wheel height.
2. Maintain heading ± 10 degrees.
3. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence and remain focused outside during hover operations. The MP may direct assistance from the rated crewmember (RCM) as necessary.

   b. The RCM should assist the MP as directed.

2. Procedures. Confirm that the embedded global positioning inertial navigation system (EGI) is keyed and a minimum of four satellites are being tracked. Announce your intent to perform the hover box drift check. Engage the ATT and ALT HOLD mode, select bob-up with the SYM SEL switch mode, and remain focused outside the aircraft. Minimize movement of the velocity vector and acceleration cue to the extent possible. Hover the aircraft for 1 minute and note the amount of hover box drift from the original position. A 5-meter radial error is allowed. Deselect the bob-up with the SYM SEL switch mode. Deselect the ATT and ALT HOLD mode.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references plus task 1038.

TASK 4208

PERFORM INITIAL TAKEOFF CHECKS

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with the hover power and before takeoff checks completed, and the aircraft cleared, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Initiate the takeoff from an appropriate hover altitude, ± 2 feet.
2. Maintain the takeoff heading ±10°degrees.
3. Maintain trim ± 1 ball width.
4. Maintain ground track alignment with the takeoff direction, with minimal drift.
5. Maintain the aircraft in trim above 50 feet AGL throughout the check.
6. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence and remain focused outside during takeoff. The MP may direct assistance from the rated crewmember (RCM) as necessary.

   b. The RCM should assist the MP as directed.

2. Procedures. Announce the initiation of the takeoff, and any intent to abort or alter the takeoff as the situation warrants. Select night vision system (NVS) mode switch to the FIXED or NORM position and verify normal sensor operation on the HDU or multipurpose display (MPD) video underlay. Direct the RCM to select the NVS mode switch to the FIXED or NORM position, confirm normal sensor operation using the HDU or MPD video underlay. Select the NVS mode switch to OFF prior to departure if it is not being used for NVS flight. Ensure that the hold modes are disengaged. If the aircraft is fire control radar (FCR) equipped, the backseat crewmember should select FCR as the active sight, select the air targeting mode (ATM)/ air surveillance mode, wide field of view (WFOV), and initiate continuous scan (CS). Both crewmembers should select C-SCP to maximize airspace surveillance. Select ENG SYS page to monitor stabilator scheduling during takeoff. Direct the RCM to announce when ready for takeoff and remain focused outside the aircraft to assist in clearing and providing adequate warning of obstacles. During takeoff, confirm normal stabilator scheduling, flight control positioning, and aircraft response; note vibration levels and entry airspeed at which encountered, instrument indications and that engine torque matching is maintained within 5 percent.

Note: Avoid nose-low accelerative attitudes in excess of 10°degrees.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references plus the following:

Task 1026, Task 1038 and Task 1040

TASK 4220

PERFORM MAXIMUM POWER CHECK

CONDITION: In an AH-64D helicopter, or an AH-64D simulator, with ENG ETF page selected, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Do not exceed the aircraft torque limits.
2. Maintain entry airspeed 120, ±10 knots true airspeed (KTAS).
3. Determine the appropriate test altitude.
4. Maintain the aircraft in trim.
5. Maintain test altitude ±200 feet.
6. Maintain the selected heading ±10°degrees throughout the check.
7. Take engine readings at the performance limit.
8. Calculate the engine and aircraft torque factor.
9. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will remain focused primarily inside the aircraft throughout the maneuver to avoid exceeding aircraft limitations. The MP will brief the rated crewmember (RCM) on the conduct of the maneuver and any specific crew actions or duties to be performed.

   b. The RCM will remain focused primarily outside the aircraft when assisting the MP as directed.

2. Procedures.

   a. Select the BLEED AIR to OFF for the test engine on the UTIL page. Select the FLT SET button and set the altimeter to 29.92 in Hg or select ENG ETF page for PA reference. Select the ENG ETF page on the MPD. On the ETF page, select ENG 1 or ENG 2. Ensure that ANTI-ICE is selected MANUAL. Select an appropriate heading for an unrestricted climb. Brief the RCM to remain focused outside the aircraft and maintain airspace surveillance.

Note 1: Failure to disable the aircraft survivability equipment (ASE) automatic (AUTO) page may result in the loss of the ENG page during this maneuver.

Note 2: Do not engage HOLD modes during this maneuver.

Note 3: Airspeed and heading may be adjusted during the climb based on environmental conditions.

   b. Limiting method.

      (1) Establish a climb at 120 KTAS and 100 percent dual-engine or MAX TQ AVAILABLE, whichever is less. Adjust the collective as necessary to maintain this torque setting until one of the three following conditions occur:

      (2) The engine being checked reaches the normal dual engine TGT limit and is identified as power limiting within the specified TGT limiter range.

(3) The engine being checked reaches a fuel flow limit or NG limiting. This condition is indicated by power limiting below the normal TGT limit and usually occurs at colder ambient temperatures.

(4) Ambient conditions prevent flight to an altitude at which power limiting would occur. Refer to the nonlimiting method (Task 4221).

(5) Stop the climb and level out at or above the altitude that power limiting was observed. Establish level cruise flight with NP/NR at 101 percent. Maintain altitude by allowing the forward airspeed to increase, and smoothly increase the collective until the dual engine torques are approximately 80 to 85 percent. Maintain altitude by adjusting the cyclic as necessary throughout the remainder of the maneuver. Select and slowly retard the power lever on the engine not being checked until one of the three following conditions occur:

(a) The engine not being checked reaches 60 percent TORQUE.

(b) The engine being checked reaches 100 percent TORQUE.

(c) The TGT on the engine being checked reaches the normal dual engine TGT limiter setting, or fuel flow/NG limiting occurs.

Note 4: A minimum torque split of 10 percent should be maintained between engines to prevent torque oscillations.

(6) to confirm that the engine being checked is power limiting, slightly increase the collective or retard the power lever on the engine not being checked until a NP/NR droop of approximately 2 percent is observed. If a 2 percent droop is not achieved, maintain altitude by allowing forward airspeed to increase and smoothly increase the collective until a 2-percent reduction in NP/NR is observed. If a 2-percent droop still cannot be achieved and weather conditions do not permit climbing to a higher altitude, perform the maximum power check using the nonlimiting method (Task 4221).

(7) Upon establishing a 2-percent droop in NP/NR, monitor the TGT indications of the engine being checked for fluctuations. If the TGT does not stabilize within the normal dual-engine limiter range (within 10 to 15 seconds after the last collective or power lever input), discontinue the maximum power check.

Note 5: The engine may power limit due to fuel flow limiting or as a result of NG limiting. This condition would be recognized by the engine power limiting and a 2-percent droop being established with TGTs lower than the normal TGT ranges for -701 and -701C engines with colder ambient outside air temperatures.

(8) Depending on the method used to induce the 2-percent NP/NR reduction, either gradually decrease the collective pitch or advance the power lever enough on the engine not being checked to reestablish the NP/NR at 100 percent to 101 percent, while maintaining the TGT at the observed limiter setting. Allow the engine instrument indications to stabilize for 30 seconds and then select TEST from the ETF PAGE or request that the RCM record the airspeed (KIAS), NG, TGT, TORQUE, OAT, and PA indications as you call them out to him.

c. Contingency power check. The contingency power check may be in conjunction with the maximum power check power limiting was a result of the TGT limiter and not fuel flow/NG limiting. To perform the contingency power check

(1) Reduce the collective until the combined TORQUE of both engines is below the TORQUE of the engine being checked when TGT limiting was established.

(a) Retard the power lever of the engine not being checked to IDLE and confirm that the engine indications are stable at idle.

(2) Increase the collective to the previously noted TORQUE setting at which TGT limiting was observed. Continue to gradually increase the collective until the TGT is a minimum of 10°degrees above the previously observed normal limiter setting.

Note 6: While increasing the collective to achieve a TGT increase of 10 degrees above the normal limiter setting, monitor the NP/NR to verify there is no NP/NR droop.

Note 7: When increasing the collective back to the previously noted torque setting, you must move the collective slowly due to torque doubling on the test engine.

(3) Advance the power lever of the engine not being checked to FLY. Reestablish cruise flight.

(4) Repeat the maximum power check and contingency check for the other engine as required.

(5) On completion of check, select AIRCRAFT UTIL page, BLEED AIR 1 and/or 2 ON.

(6) Calculate the ETF and ATF using TM 1-2840-248-23 or an AMCOM approved computer based ETF/ATF calculator and record the data on the MTF check sheet. Update the aircraft DMS, forms and records with new ETF/ATF data.

NIGHT AND NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

Execution of this task under night or NVD conditions requires extra vigilance on the part of both RCMs due to high pilot workload. The crew brief must include detailed delineation of crew duties during the entire procedure. The MP will be primarily focused inside the aircraft while manipulating engine / flight controls and monitoring instrumentation. The RCM will remain focused primarily outside the aircraft except when assisting the MP as directed.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4221

PERFORM MAXIMUM POWER CHECK NONLIMITING METHOD

CONDITION: In an AH-64D helicopter, or an AH-64D simulator, with ENG ETF page selected, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Establish entry airspeed of 120 knots true airspeed (KTAS) ± 10.
2. Do not exceed the engine torque limits.
3. Determine the appropriate test altitude.
4. Maintain the aircraft in trim.
5. Maintain the selected test altitude ± 200 feet.
6. Maintain the selected heading ±10°degrees throughout the check.
7. Take engine readings at the performance limit.
8. Calculate the engine and aircraft torque factor.
9. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will remain focused primarily inside the aircraft throughout the maneuver to avoid exceeding aircraft limitations. The MP will brief the rated crewmember (RCM) on the conduct of the maneuver and any specific crew actions or duties to be performed.

   b. The RCM should assist the MP as directed.

2. Procedures. Establish level flight, in trim, at the highest altitude that will allow the test engine to develop 101 percent NP/NR. Select the BLEED AIR to OFF for the test engine on the UTIL page. Select the FLT SET button and set the altimeter to 29.92 in Hg, or select ENG ETF page for PA reference. Ensure ANTI-ICE is selected to MANUAL. Select the ENG ETF page on the MPD. ETF page – select ENG 1 or ENG 2. Brief the RCM to remain focused outside and maintain airspace surveillance.

Note 1: Failure to disable the aircraft survivability equipment (ASE) automatic AUTO page may result in the loss of the ENG page during the maneuver.

Note 2: The contingency power check **will not** be accomplished in conjunction with the nonlimiting method maximum power check.

Note 3: Do not engage HOLD during this maneuver.

   a. While maintaining a constant pressure altitude, adjust the collective pitch to obtain a dual engine TORQUE indication of 80 to 85 percent. Gradually retard the power lever of the engine not being checked until the engine being checked indicates 100 percent TORQUE, with the NP/NR at 101 percent. Do not retard the power lever of the engine not being checked to a position that would result in a TORQUE indication of less than 60 percent for that engine.

Note 4: The nonlimiting method assumes a power setting of 100 percent TORQUE on the test engine and is designed to allow a maximum power check to be performed at TGT less than normal dual engine limiter setting. It is not necessary to droop the ENG-RTR RPM to perform this non-limiting procedure.

b. If a TORQUE of 100 percent is not achieved, maintain pressure altitude, and allow forward airspeed to increase as you gradually increase collective until a 100 percent TORQUE indication is observed on the engine being checked. Adjust the power lever of the engine not being checked to maintain TORQUE above 60 percent.

Note: A minimum torque split of 10 percent should be maintained to prevent torque oscillations.

c. Allow the engine instrument indications to stabilize for 30 seconds, and then select TEST from the ETF page or request that the RCM record the airspeed (KIAS), NG, TGT, TORQUE, OAT, and PA indications as you call them out to him. Advance the power lever of the engine not being checked to FLY. Reestablish cruise flight.

d. Repeat the maximum power check for the other engine as required. On completion of check, select aircraft (AIRCRAFT) UTIL page, BLEED AIR 1 and/or 2 – ON. Calculate the ETF and ATF using TM 1-2840-248-23 or an AMCOM-approved computer-based ETF / ATF calculator and record the data on the MTF check sheet for later inclusion in the aircraft forms and records.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS:

Execution of this task under night or NVD conditions requires extra vigilance on the part of both RCMs due to high pilot workload. The crew brief must include detailed delineation of crew duties during the entire procedure. The MP will be primarily focused inside the aircraft while manipulating engine / flight controls and monitoring instrumentation. The RCM will remain focused primarily outside the aircraft except when assisting the MP as directed.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

Note: For evaluations, the ETF / ATF will be calculated using TM 1-2840-248-23.

REFERENCES: Appropriate common references.

TASK 4222

PERFORM CRUISE FLIGHT CHECKS

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, and pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain airspeed 120, ±10 knots true airspeed (KTAS).
2. Maintain the aircraft in trim throughout the check.
3. Maintain the selected check altitude ± 100 feet.
4. Maintain the selected heading ±10° throughout the check.
5. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence and primarily remain focused outside to avoid traffic or obstacles. The MP may direct assistance from the rated crewmember (RCM) as necessary.

   b. The RCM should assist the MP as directed.

2. Procedures. Establish straight-and-level flight at 120 KTAS and note any unusual vibrations, noises or instrument systems indications, and confirm proper sensor operation. Announce the initiation, or completion, and the results of the fuel check. Confirm normal indications on ENG page and proper operation of STBY instruments. Direct the RCM to assist the MP in clearing as workload permits.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4236

PERFORM AUTOROTATION RPM CHECK

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with the before landing check completed, at a predetermined entry altitude and airspeed, and ENG page selected in each crewstation, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Predetermine the autorotation revolutions per minute (RPM) for the pressure altitude (PA), free air temperature (FAT) and gross weight.
2. Identify a suitable emergency landing area within gliding distance.
3. Complete before landing check.
4. Readings taken in a stabilized autorotational glide at 90 ± 5 knots true airspeed (KTAS), in trim, with collective full down.
5. Complete the power recovery prior to descent to 500 feet above ground level (AGL).
6. Maintain heading ± 10°degrees.
8. Maintain trim ± 1 ball width.
9. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will brief the rated crewmember (RCM) on the conduct of the maneuver and any specific actions or duties he is to perform. The intended check altitude should be determined, and target N_R calculated, during the mission planning phase, but in any case will be determined prior to initiating the maneuver. The MP will announce initiation of the autorotation and his intent to alter or abort the maneuver. Brief the RCM to remain focused outside and maintain airspace surveillance.

   b. The RCM should assist the MP as directed.

2. Procedures.

   a. Brief the RCM on the conduct of the maneuver and direct him to remain focused outside the aircraft to provide airspace surveillance and obstacle clearance. Select an autorotation area that will permit a safe descent and emergency touchdown landing and determine the wind direction.

Note 1: Do not engage altitude or attitude hold during this maneuver.

Note 2: During high gross weights and high density altitude (DA) conditions the N_R could easily exceed aircraft limitations. When the target N_R is high (>107 percent) a reduction in gross weight or DA will reduce the target and also reduce the possibility of an inadvertent rotor overspeed.

Note 3: Failure to disable ASE AUTO PAGE may result in loss of the ENG page during the maneuver.

Note 4: WARNING condition annunciations (for example ROTOR RPM HIGH) will reset the ENG ETF page to an ENG page.

   b. Select the FLT SET button and set the altimeter to 29.92 in Hg, or select ENG ETF page for PA reference. Establish level flight at the selected record altitude and allow the outside air temperature (OAT) to stabilize. Record the PA, FAT, and fuel quantity. Calculate the target autorotation RPM using the charts in section V of the MTF.

> **CAUTION**
>
> Under various combinations of PA, FAT, and aircraft gross weight (GWT); single engine maximum torque available will not support level flight at 90 KTAS. In these circumstances, the entry altitude must allow time for a collective reduction below one-half of the dual engine maximum torque available and the reduction of one power lever to idle. The aircraft may be in a slight descent. After verifying that the engine is operational at idle, continued entry into the autorotation.

c. Climb a minimum of 1,000 feet above the record altitude and establish level flight at 90 KTAS. Reduce the collective to less than 54 percent dual-engine torque or half of the maximum dual engine torque for that day (whichever is less). Select and retard one engine power lever to IDLE, and confirm the appropriate NP/NR split and that the NG of the engine selected to IDLE is above 63 percent and stable.

Note 5: When each power lever is retarded to the idle position, verify the main XMSN sprag clutch disengagement by monitoring NP indications to ensure that the NP drops below NR.

d. Confirm that the intended forced landing area is within gliding distance. Reduce the collective to the full-down position and monitor the NR to confirm that it does not exceed limitations. With the NR stabilized, retard the other engine power lever to IDLE while observing rotor RPM for excessive decay or overspeed. Confirm the second engine NP/NR for appropriate split and that NG is above 63 percent and stable.

e. Establish and maintain a stabilized 90 KTAS autorotational descent, in trim, before reaching the record altitude. Note any abnormal vibrations and verify that aircraft controllability remains normal. Confirm the NR is within 94 to 110 percent. If limits for NR, aircraft trim, or airspeed may be exceeded, announce any corrective actions you intend to take.

f. At record altitude, ensure steady state autorotation and record the percent NR and fuel remaining.

g. Announce "Power Recovery" and advance both power levers to FLY and adjust collective if necessary to maintain NR and NP below 110 percent. Increase the collective as necessary to climb ensuring that torque matching is apparent (clutches engaged) before increasing the collective to approximately 60 percent TORQUE. Monitor the systems instruments for indications of excessive rotor decay.

Note 6: A 2 percent to 4 percent NR droop is acceptable. Excessive rotor decay during a normal power recovery may indicate an inoperable or misadjusted collective potentiometer.

Note 7: When possible, all autorotation RPM checks will be performed over a prepared surface where crash facilities are available.

NIGHT OR NIGHT VISION GOGGLES (NVG) CONSIDERATIONS:

Using NVG may aid the copilot gunner (CPG) to detect obstacles within the emergency landing area that are difficult or impossible to identify with the forward looking infrared (FLIR) sensors.

NIGHT VISION SYSTEM (NVS) CONSIDERATIONS:

1. The flight characteristics of the aircraft remain the same for the performance of the task using the FLIR systems. The crew will have greater situational awareness through the FLIR imagery and displayed helmet display unit (HDU) symbology. Under normal circumstances, the FLIR system field of regard will allow the crew to maintain visual contact with the emergency landing area during the descent.
2. Establish the aircraft at the appropriate entry point with reference to the cruise or transition flight symbology modes displayed on the HDUs and with reference to the FLIR imagery.
3. During initial reduction of the collective, the P* will cross-check the FLIR imagery and reference the displayed flight symbology to maintain aircraft heading and trim.
4. Selection of cruise symbology with 29.92 set in the altimeter will aid in determining the entry altitude and recovery altitude. The MP may also elect to use the ETF page for reference to PA.
5. Ue FLIR imagery and visual cues provided through the FLIR system to maintain emergency landing area alignment and aid in estimation of rate of closure.
6. Crews must be aware that the suitability of an emergency landing area may be difficult to determine during NVS operations at autorotational RPM check altitudes. The crew should consider performing this check only after a thorough reconnaissance of the emergency landing area is conducted. The MP may direct the CPG to use the TADS to verify suitability.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4238

PERFORM ATTITUDE HOLD CHECK

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with an AIRCRAFT UTIL page selected in crewstation of pilot not on the controls (P), and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain airspeed 120, ±10 knots true airspeed (KTAS).
2. Maintain the aircraft in trim.
3. Maintain the selected check altitude ± 100 feet.
4. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence and primarily remain focused outside to avoid traffic or obstacles. The MP may direct assistance from the rated crewmember (RCM) as necessary.

   b. The RCM should assist the MP as directed.

Note: The MASTER CAUTION tone will out-prioritize the flight control tone during the following check. If the MASTER CAUTION is reset prior to reengaging the stability and command augmentation system (SCAS) channels, the flight control tone will sound at MASTER CAUTION reset. If the MASTER CAUTION is not reset, the flight control tones will sound after all SCAS channels are reengaged.

2. Procedures. Establish straight-and-level flight at 120 KTAS, in trim. Select the ATT/HOLD switch to ON; note the proper symbology and UFD advisory messages. Relax control pressures, and verify that the aircraft attitude is reasonably maintained. Select the ALT/HOLD switch to ON, note proper symbology and up-front display (UFD) advisory messages. Relax control pressures, and verify that the aircraft altitude is reasonably maintained. Actuate the cyclic flight management computer (FMC) release switch and verify that all FMC channels and hold modes disengage, the FMC DISENG caution message is displayed on the UFD, flight control tones are present and that the aircraft becomes less stable but remains controllable. Reengage all FMC channels as required, and resume normal cruise flight. Perform left and right 20-degree bank angle turns, without retrimming and observe that the aircraft maintains trim within one-half of the ball width. Reestablish level flight at 120 KTAS.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4240

PERFORM MANEUVERING-FLIGHT CHECKS

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with FLT page and ENG page selected, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain airspeed 120 ±10 knots true airspeed (KTAS).
2. Maintain the aircraft in trim.
3. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.
   a. The maintenance test pilot (MP) will perform the checks in sequence and primarily remain focused outside the aircraft to avoid traffic or obstacles. The MP may direct assistance from the rated crewmember (RCM) as necessary.
   b. The RCM should assist the MP as directed.
2. Procedures. Establish straight-and-level flight at 120 KTAS, in trim, and note vibration levels and control positions. Confirm that the maneuver area is clear, and reduce the collective to a 20-percent TORQUE indication while coordinating the cyclic as necessary to maintain airspeed. Note any rotor instability, vibrations, or abnormal control positioning. Continue to maintain 120 KTAS and initiate a climb by increasing the collective to attain maximum continuous power. Note any rotor instability or unusual control positioning. Resume normal cruise flight at 120 KTAS.

Note: Do not engage altitude or attitude hold during this maneuver.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4242

PERFORM STABILATOR SYSTEM CHECK

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with aircraft AIRCRAFT UTIL and ENG SYS page, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Establish entry airspeed 120, ±10 knots true airspeed (KTAS).
2. Maintain the aircraft in trim.
3. Maintain at the selected check altitude ± 100 feet.
4. Maintain the selected heading ±10°degrees throughout the check.
5. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence and primarily remain focused outside to avoid traffic or obstacles. The MP may direct assistance from the rated crewmember (RCM) as necessary.

   b. The RCM should assist the MP as directed.

2. Procedures. Establish straight-and-level flight at 120 KTAS, in trim. Select the NOE/A mode on the UTIL page. Reduce collective and coordinate cyclic as necessary to gradually reduce airspeed while maintaining the selected altitude. Decelerate to less than 80 KTAS. Verify the stabilator repositions to 25°degrees trailing edge down (SYS page) and note the true airspeed of the stabilator-repositioning threshold. Increase collective and apply cyclic to initiate gradual level flight acceleration above 80 KTAS. Verify the stabilator repositions and note the true airspeed of the stabilator-repositioning threshold. Depress the stabilator control switch to reset the stabilator to the AUTO mode and confirm the stabilator resumes automatic programming. Resume normal cruise flight at 120 KTAS.

Note 1: Do not engage altitude hold during this maneuver.

Note 2: An excessive nose-low attitude may be experienced with abrupt torque and cyclic application during the acceleration. The MP should avoid excessive pitch angles throughout the maneuver.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4258

DETERMINE TURBINE GAS TEMPERATURE SETTING/CONTINGENCY POWER

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with ENG page selected, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain entry airspeed 120, ±10 knots true airspeed (KTAS).
2. Do not exceed the engine torque limits.
3. Maintain the aircraft in trim.
4. Maintain test altitude ± 200 feet.
5. Maintain the selected heading ±10°degrees throughout the check.
6. Engine readings taken at the performance limit.
7. Correctly determine the target (TGT) limiter setting, and verify contingency power is enabled on the test engine.
8. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will announce when initiating the maneuver, the intent to abort the maneuver, and completion of the maneuver. The MP will remain focused primarily inside the aircraft throughout the maneuver on the instruments to avoid exceeding aircraft limitations.

   b. The rated crewmember (RCM) should assist the MP as directed.

2. Procedures. Establish 120 KTAS cruise flight at the predetermined check altitude. Verify BLEED AIR 1 and 2 to ON, on the UTIL page and ANTI-ICE to the ON position as required. Verify appropriate messages and rise in ENG 1 and ENG 2 TGTs. Brief the RCM to remain focused outside and maintain airspace surveillance.

Note 1: Failure to disable ASE AUTO page may result in loss of the ENG page during the maneuver.

Note 2: Do not engage holds during this maneuver.

Note 3: Selecting the ANTI-ICE to the ON position at higher TGT values may result in rotor droop if the resultant TGT rise causes the engine to become TGT limited.

   a. Maintain altitude by allowing forward airspeed to increase, and smoothly increase the collective until the dual engine TORQUE is approximately 80 to 85 percent. Maintain altitude by adjusting cyclic as necessary throughout the remainder of the maneuver.

CAUTION

Do not exceed 110 percent single engine or combined 200 percent dual engine torques when conducting the Turbine Gas Temperature (TGT) limiter check. Do not exceed 122 percent single engine torque or maximum single engine torque available when conducting the contingency power check.

b. Identify and retard the power lever of the engine not being checked until a torque split of at least 10 percent between engines is observed, or until a 2 percent droop of NR/NP is achieved, which ever occurs first. As the power lever is retarded, expect the torque on the engine being checked to increase. Do not allow the TORQUE on the engine being checked to exceed 110 percent or the TORQUE on the engine not being checked to drop below 60 percent. Do not allow the NR to droop more than 4 percent.

c. Continue to retard the engine not being checked until a 2 percent droop of NP/NR is established. If a 2 percent droop in NP/NR cannot be established at 60 percent torque on the engine not being checked, increase collective to attain the droop. Do not exceed 110 percent TORQUE on the engine being checked, or allow the TORQUE of the engine not being checked to exceed 75 percent. If the 75 percent torque limit is approached with the collective application, it may be necessary to further reduce the non-test engine power lever to avoid exceeding the torque limit. Allow the engine indications to stabilize at the limiter setting for 10 seconds.

d. Direct the RCM to record the TGT and TORQUE value of the engine being checked.

e. Reduce the collective until the combined TORQUE of both engines is less than the indicated TORQUE of the engine being checked when TGT limiting was established.

f. Retard the power lever of the engine not being checked to IDLE. Confirm that the engine not being checked remains stable at IDLE.

Note 4: When contingency power is enabled, TGT responds rapidly to small collective changes.

Note 5: When increasing collective back to the previously noted torque setting the collective must be moved slowly due to torque doubling on the test engine.

g. Increase the collective to the previously noted TORQUE setting at which TGT limiting was observed. Continue to gradually increase the collective until the TGT is a minimum of 10°degrees above the observed normal limiter setting.

Note 6**:** The ability to increase TGT at least 10° above the determined TGT limiting value is a valid indication of a correctly performing engine control system.

Note 7: While increasing the collective to achieve a TGT increase of 10° above the normal limiter setting, monitor the NP/NR to verify there is no excessive NP/NR droop.

h. Reduce the collective and advance the power lever of the engine at IDLE to FLY.

i. Repeat the procedure for the other engine as required.

j. Select the ANTI-ICE to the OFF on the UTIL page. Verify that the messages extinguish and ENG 1 and ENG 2 TGTs decrease.

k. Reestablish cruise flight

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4262

Perform communication and navigation equipment checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain entry airspeed 120, ±10 knots true airspeed (KTAS).
2. Maintain the aircraft in trim.
3. Maintain selected check altitude ± 100 feet.
4. Maintain the selected heading ±10°degrees throughout the check.
5. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will remain focused outside the aircraft during the procedures, maneuver as appropriate for the procedure, and maintain airspace surveillance. The MP will perform the ADF radio check and direct the assistance from the rated crewmember (RCM) in accomplishing the additional communication and navigation checks.

   b. The RCM should assist the MP as directed.

2. Procedures. Brief the RCM on the check procedures and direct the RCM to assist with maintaining airspace surveillance.

   a. Tune the ADF receiver to a known station and verify that the ADF bearing pointer indicates a steady lock and points to the selected station. Confirm that the ADF bearing pointer indicates appropriately during station passage.

   b. Verify the EGI 1 and 2 position confidence values, Doppler data, satellites, and global positioning system (GPS) key status windows as required.

   c. Confirm with air traffic control (ATC) or a tactical radar site that the transponder is transmitting the appropriate information on all available modes.

   d. Adjust all available communication radios to the appropriate frequencies and establish communications to verify acceptable transmission and reception ranges. If possible, attempt communications contact at extended ranges to confirm proper transmission output and squelch settings. Conduct a check of the improved data modem (IDM) system as required. The copilot-gunner (CPG) will perform waypoint update and target store procedures.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4264

Perform sight/sensor checks

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Maintain entry airspeed 120, ±10 knots true airspeed (KTAS).
2. Maintain the aircraft in trim.
3. Maintain the selected check altitude ± 100 feet.
4. Maintain the selected heading ±10°degrees throughout the check.
5. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the sight/sensor system checks and direct assistance from the rated crewmember (RCM) as necessary in accomplishing the checks and maintaining airspace surveillance.

   b. The RCM should assist the MP as directed.

2. Procedures. Brief the RCM on the check procedures and direct him to assist with maintaining airspace surveillance.

   PNVS system check. Verify the PNVS system operational capability as required.

   TADS system check. Verify the TADS system operational capability as required.

   FCR system check. If installed, verify the FCR system operational capability in all modes as required.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4266

Perform weapon systems check

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Appropriate common standards plus the following:

1. Ensure that weapon systems are safed and cleared.
2. Maintain entry airspeed 120, ±10 knots true airspeed (KTAS).
3. Maintain the aircraft in trim.
4. Maintain selected altitude ± 100 feet.
5. Maintain the selected heading ±10°degrees throughout the check.
6. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will remain focused outside during the procedures and maintain airspace surveillance. The MP should direct assistance with weapons systems switch functions appropriate to complete the checks.

   b. The rated crewmember (RCM) should assist the MP as directed.

2. Procedures. Brief the RCM on the check procedures and direct him to assist with maintaining airspace surveillance.

   a. Select the ARMAMENT panel A/S switch to the SAFE position, and confirm the weapons are ON, as appropriate.

   b. Select the WAS switch to the G (gun) position, and verify normal gun articulation without any abnormal vibrations. Deselect the G position with the WAS switch.

Note: The training mode (weapon [WPN] page) must be selected to complete the remainder of the checks.

   c. Select a rocket type on the RKT page. Select the WAS switch to the R (rocket) position, verify normal pylon articulation without any abnormal vibrations, and that a broken rocket cursor is displayed.

   d. Select GND STOW on the WPN UTIL page and confirm the pylons articulate to the GND STOW position.

   e. Select the weapons select and A/S switches as desired and resume cruise flight.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4276

Perform special/detailed procedures

CONDITIONS: In an AH-64D helicopter or AH-64D simulator (as appropriate).

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF and appropriate common standards.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the checks in sequence. The MP should direct assistance from the rated crewmember (RCM) as necessary to complete the checks and/or maintain obstacle avoidance or airspace surveillance as appropriate.

   b. The RCM should assist the MP as directed.

2. Procedures. Brief the RCM on the conduct of the check(s) to be performed. Perform any required checks for installed equipment when special/detailed procedures are published in section IV of the MTF, and for which no specific task has been separately published in TC 1-251 or elsewhere. Use additional reference publications as required. If these checks are performed during an MP or maintenance examiner (ME) evaluation, the evaluated crewmember should demonstrate a working knowledge of the system, familiarity with published operational checks, and an understanding and practical application of published charts, graphs, and worksheets.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references and TM 1-1520-LONGBOW/APACHE.

TASK 4284

Perform engine shutdown checks

CONDITIONS: In an AH-64D helicopter or AH-64D simulator.

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF and appropriate common standards plus the following:

Determine the status of the aircraft.

DESCRIPTION:

1. Crew actions.

   a. The maintenance test pilot (MP) will perform the shutdown checks in sequence. The MP should direct assistance from the rated crewmember (RCM) and nonrated crewmember (NCM) as necessary. The MP will ensure that the post flight inspection is conducted using the TM 1-1520-251-10/TM 1-1520-251-CL. The MP may direct the RCM, and NCM if available, to assist with securing and tie down of the aircraft while the MP conducts the post flight inspection. The MP will ensure that the aircraft status is entered in the logbook, and appropriate entries from the MTF check sheet are transcribed to the aircraft forms and historical records as per DA Pam 738-751. The MP will back-brief the NCM and/or maintenance support personnel concerning the condition of the aircraft, and coordinate for repairs or corrective adjustments as necessary.

   b. The RCM and NCM should assist the MP as directed.

2. Procedures. Direct assistance from the RCM and NCM (if available) to aid in maintaining the engine exhaust and stabilator areas clear during the shutdown sequence and any subsequent ground checks. Post flight the aircraft with special emphasis on areas or systems where maintenance was performed (check for security, condition, and leakage as appropriate). Verify all test equipment is removed and secured unless another maintenance test flight requiring the equipment is anticipated. If the mission is complete, close out the MTF check sheet and the mission brief sheet.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4292

PERFORM V_h CHECK

CONDITIONS: In an AH-64D helicopter, or AH-64D simulator, with ENG page selected, and the pilot on the controls (P*) fitted with a boresighted helmet display unit (HDU).

STANDARDS: Appropriate common standards plus the following:

1. Establish entry airspeed 120, ±10 knots true airspeed (KTAS).
2. Maintain the aircraft in trim.
3. Maintain at the selected check altitude ± 100 feet.
4. Maintain the selected heading ±10°degrees throughout the check.
5. Perform procedures and checks in sequence per TM 1-1520-251-MTF.

DESCRIPTION:

1. Crew actions.

   The maintenance test pilot (MP) will perform the checks in sequence and primarily remain focused outside to avoid traffic or obstacles. The MP may direct assistance from the rated crewmember (RCM) as necessary.

   The RCM should assist the MP as directed.

2. Procedures. While maintaining altitude, a level-flight attitude, and in trim, smoothly increase collective until a maximum torque (dual engine average), N_G, TGT, or airspeed limit is reached. Note any abnormal vibrations or control responses and verify that the collective does not reach the full up position before an allowable limit of engine performance is reached. Resume normal cruise flight.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, and AH-64D simulator, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

This page intentionally left blank.

Chapter 6

Crew Coordination

This chapter describes the background of crew coordination development. It also describes the crew coordination elements, basic qualities, and objectives, as found in the Army Aircrew Coordination Enhancement Training Program.

> ***Note:*** Digitization of the crew compartments has expanded and redefined the lines of responsibility for each crewmember. The ability for either crewmember to perform most aircraft/system functions from his crew station breaks down the standard delineation of duties and has added capabilities in training and in combat. This could mean that, during an unforeseen event, one crewmember may attempt to resolve the situation rather than seek assistance from the other crewmember. It is essential for the pilot in command (PC) to brief specific duties prior to stepping into the aircraft. Effective sharing of tasks relies on good crew coordination and information management.

6-1. CREW COORDINATION BACKGROUND. An analysis of U.S. Army aviation accidents revealed that a significant percentage of these accidents resulted from one or more crew coordination errors committed before or during the mission flight. Often an accident was the result of a sequence of undetected crew errors that combined to produce a catastrophic result. Additional research showed that, even when accidents are avoided, these same errors can result in degraded mission performance. A systematic analysis of these error patterns identified specific areas where crew-level training could reduce the occurrence of such errors and break the error chains leading to accidents and poor mission performance.

6-2. CREW COORDINATION ELEMENTS. Broadly defined, aircrew coordination is the interaction between crewmembers necessary for the safe, efficient, and effective performance of tasks. The essential elements of crew coordination are described below.

a. **Communicate positively.** Good cockpit teamwork requires positive communication among crewmembers. Communication is positive when the sender directs, announces, requests, or offers information; the receiver acknowledges the information; and the sender confirms the information, based on the receiver’s acknowledgment or action.

b. **Direct assistance.** A crewmember directs assistance when he cannot maintain aircraft control, position, or clearance. He also directs assistance when he cannot properly operate or troubleshoot aircraft systems without help from the other crewmembers.

c. **Announce actions.** To ensure effective and well-coordinated actions in the aircraft, all crewmembers must be aware of the expected movements (and unexpected individual actions). Each crewmember announces actions that affect the actions of the other crewmembers.

d. **Offer assistance.** A crewmember provides assistance or information that has been requested. He also offers assistance when he sees that another crewmember needs help.

e. **Acknowledge actions.** Communications in the aircraft must include supportive feedback to ensure that crewmembers correctly understand announcements or directives.

f. **Be explicit.** Crewmembers should use clear terms and phrases and positively acknowledge critical information. They must avoid using terms that have multiple meanings, such as “Right,” "Back up," or "I have it." Crewmembers must also avoid using indefinite modifiers such as, "Do you see that tree?" or "You are coming in a little fast."

g. **Provide aircraft control and obstacle advisories.** Although the pilot on the controls (P*) is responsible for aircraft control, the other crewmembers may need to provide aircraft control information regarding airspeed, altitude, or obstacle avoidance.

h. **Coordinate action sequence and timing.** Proper sequencing and timing ensure that the actions of one crewmember mesh with the actions of the other crewmembers.

6-3. CREW COORDINATION BASIC QUALITIES. The crew coordination elements are further broken down into a set of 13 basic qualities. Each basic quality is defined in terms of observable behaviors. The paragraphs below summarize these basic qualities.

a. **Flight team leadership and crew climate are established and maintained.** This quality addresses the relationships among the crew and the overall climate of the flight deck. Aircrews are teams with a designated leader and clear lines of authority and responsibility. The PC sets the tone for the crew and maintains the working environment. Effective leaders use their authority but do not operate without the participation of other crewmembers. When crewmembers disagree on a course of action, they must be effective in resolving the disagreement. Specific goals include the following:

(1) The PC actively establishes an open climate where crewmembers freely talk and ask questions.

(2) Crewmembers value each other for their expertise and judgment. They do not allow differences in rank and experience to influence their willingness to speak up.

(3) Alternative viewpoints are a normal and occasional part of crew interaction. Crewmembers handle disagreements in a professional manner, avoiding personal attacks or defensive posturing.

(4) The PC actively monitors the attitudes of crewmembers and offers feedback when necessary. Each crewmember displays the proper concern for balancing safety with mission accomplishment.

b. **Pre-mission planning and rehearsal are accomplished.** Pre-mission planning includes all preparatory tasks associated with planning the mission. These tasks include planning for visual flight rules (VFR), instrument flight rules (IFR), and terrain flight. They also include assigning crewmember responsibilities and conducting all required briefings and briefbacks. Pre-mission rehearsal involves the crew's collectively visualizing and discussing expected and potential unexpected events for the entire mission. Through this process, all crewmembers think through contingencies and actions for difficult segments or unusual events associated with the mission and develop strategies to cope with contingencies. Specific goals include the following—

(1) The PC ensures that all actions, duties, and mission responsibilities are partitioned and clearly assigned to specific crewmembers. Each crewmember actively participates in the mission planning process to ensure a common understanding of mission intent and operational sequence. The PC prioritizes planning activities so that critical items are addressed within the available planning time.

(2) The crew identifies alternate courses of action in anticipation of potential changes in mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC) and is fully prepared to implement contingency plans as necessary. Crewmembers mentally rehearse the entire mission by visualizing and discussing potential problems, contingencies, and responsibilities.

(3) The PC ensures that crewmembers take advantage of periods of low workload to rehearse upcoming flight segments. Crewmembers continuously review remaining flight segments to identify required adjustments. Their planning is consistently ahead of critical lead times.

c. **Appropriate decisionmaking techniques are applied.** Decisionmaking is the act of rendering a solution to a problem and defining a plan of action. It must involve risk assessment. The quality of decisionmaking and problem solving throughout the planning and execution phases of the mission depends on the information available, time constraints, and level of involvement and information exchange among crewmembers. The crew's ability to apply appropriate decisionmaking techniques based on these criteria has a major impact on the choice and quality of their resultant actions. Although the entire crew should be involved in the decisionmaking and problem solving process, the PC is the key decisionmaker. Specific goals include the following:

(1) Under high-time stress, crewmembers rely on a pattern-recognition decision process to produce timely responses. They minimize deliberation consistent with the available decision time. Crewmembers focus on the most critical factors influencing their choice of responses. They efficiently prioritize their specific information needs within the available decision time.

(2) Under moderate- to low-time stress, crewmembers rely on an analytical decision process to produce high-quality decisions. They encourage deliberation when time permits. To arrive at the most unbiased decision possible, crewmembers consider all important factors influencing their choice of action. They consistently seek all available information relative to the factors being considered.

d. **Actions are prioritized and workload is equitably distributed.** This quality addresses the effectiveness of time and workload management. It assesses the extent to which the crew, as a team, avoids distractions from essential activities, distributes and manages workload, and avoids individual task overload. Specific goals include the following:

(1) Crewmembers are always able to identify and prioritize competing mission tasks. They never ignore flight safety and other high-priority tasks. They appropriately delay low-priority tasks until those tasks do not compete with more critical tasks. Crewmembers consistently avoid nonessential distractions so that these distractions do not impact on task performance.

(2) The PC actively manages the distribution of mission tasks to prevent the overloading of any crewmember, especially during critical phases of flight. Crewmembers watch for workload buildup on others and react quickly to adjust the distribution of task responsibilities.

e. **Unexpected events are managed effectively.** This quality addresses the crew's performance under unusual circumstances that may involve high levels of stress. Both the technical and managerial aspects of coping with the situation are important. Specific goals include the following:

(1) Crew actions reflect extensive rehearsal of emergency procedures in prior training and pre-mission planning and rehearsal. Crewmembers coordinate their actions and exchange information with minimal verbal direction from the PC. They respond to the unexpected event in a composed, professional manner.

(2) Each crewmember appropriately or voluntarily adjusts individual workload and task priorities with minimal verbal direction from the PC. The PC ensures that each crewmember is used effectively when responding to the emergency and that the workload is efficiently distributed.

f. **Statements and directives are clear, timely, relevant, complete, and verified.** This quality refers to the completeness, timeliness, and quality of information transfer. It includes the crew's use of standard terminology and feedback techniques to verify information transfer. Emphasis is on the quality of instructions and statements associated with navigation, obstacle clearance, and instrument readouts. Specific goals include the following:

(1) Crewmembers consistently make the required callouts. Their statements and directives are always timely.

(2) Crewmembers use standard terminology in all communications. Their statements and directives are clear and concise.

(3) Crewmembers actively seek feedback when they do not receive acknowledgment from another crewmember. They always acknowledge understanding of intent and request clarification when necessary.

g. **Mission situational awareness is maintained.** This quality considers the extent to which crewmembers keep each other informed about the status of the aircraft and the mission. Information reporting helps the aircrew maintain a high level of situational awareness. The information reported includes aircraft position and orientation, equipment and personnel status, environmental and battlefield conditions, and changes to mission objectives. Awareness of the situation by the entire crew is essential to safe flight and effective crew performance. Specific goals include the following:

(1) Crewmembers routinely update each other and highlight and acknowledge changes. They take personal responsibility for scanning the entire flight environment, considering their assigned workload and areas of scanning.

(2) Crewmembers actively discuss conditions and situations that can compromise situational awareness. These include, but are not limited to, stress, boredom, fatigue, and anger.

h. **Decisions and actions are communicated and acknowledged.** This quality addresses the extent to which crewmembers are kept informed of decisions made and actions taken by another crewmember. Crewmembers should respond verbally or by appropriately adjusting their behaviors, actions, or control inputs to clearly indicate that they understand when a decision has been made and what it is. Failure to do so may confuse crews and lead to uncoordinated operations. Specific goals include the following:

(1) Crewmembers announce decisions and actions, stating their rationale and intentions as time permits. The P verbally coordinates the transfer of, or inputs to, controls before action.

(2) Crewmembers always acknowledge announced decisions or actions and provide feedback on how these decisions or actions will affect other crew tasks. If necessary, they promptly request clarification of decisions or actions.

i. **Supporting information and actions are sought from the crew.** This quality addresses the extent to which supporting information and actions are sought from the crew by another crewmember, usually the PC. Crewmembers should feel free to raise questions during the flight regarding plans, revisions to plans, actions to be taken, and the status of key mission information. Specific goals include the following:

(1) The PC encourages crewmembers to raise issues or offer information about safety or the mission. Crewmembers anticipate impending decisions and actions and offer information as appropriate.

(2) Crewmembers always request assistance from others before they become overloaded with tasks or before they must divert their attention from a critical task.

j. **Crewmember actions are mutually cross-monitored.** This quality addresses the extent to which a crew uses cross monitoring as a mechanism for breaking error chains that lead to accidents or degraded mission performance. Crewmembers must be capable of detecting each other's errors. Such redundancy is particularly important when crews are tired or overly focused on critical task elements and thus more prone to make errors. Specific goals include the following:

(1) Crewmembers acknowledge that crew error is a common occurrence and the active involvement of the entire crew is required to detect and break the error chains that lead to accidents. They constantly watch for crew errors affecting flight safety or mission performance. They monitor their own performance as well as that of others. When they note an error, they quickly and professionally inform and assist the crewmember committing the error.

(2) The crew thoroughly discusses the two-challenge rule before executing the mission. When required, they effectively implement the two-challenge rule with minimal compromise to flight safety.

Note: The two-challenge rule allows one crewmember to automatically assume the duties of another crewmember that fails to respond to two consecutive challenges. For example, the P* becomes fixated, confused, task overloaded, or otherwise allows the aircraft to enter an unsafe position or attitude. The pilot not on the controls (P) first asks the P* if he is aware of the aircraft position or attitude. If the P* does not acknowledge this challenge, the P issues a second challenge. If the P* fails to acknowledge the second challenge, the P assumes control of the aircraft.

k. **Supporting information and actions are offered by the crew.** This quality addresses the extent to which crewmembers anticipate and offer supporting information and actions to the decision maker—usually the PC—when apparently a decision must be made or an action taken. Specific goals include the following:

(1) Crewmembers anticipate the need to provide information or warnings to the PC or P* during critical phases of the flight. They provide the required information and warnings in a timely manner.

(2) Crewmembers anticipate the need to assist the PC or P* during critical phases of flight. They provide the required assistance when needed.

l. **Advocacy and assertion are practiced.** This quality concerns the extent to which crewmembers are proactive in advocating a course of action they consider best, even when others may disagree. Specific goals include the following:

(1) While maintaining a professional atmosphere, crewmembers state the rationale for their recommended plans and courses of action when time permits. They request feedback to make sure others have correctly understood their statements or rationale. Time permitting, other crewmembers practice good listening habits; they wait for the rationale before commenting on the recommended plans or courses of action.

(2) The PC actively promotes objectivity in the cockpit by encouraging other crewmembers to speak up despite their rank or experience. Junior crewmembers do not hesitate to speak up when they disagree with senior members; they understand that more experienced aviators can sometimes commit errors or lose situational awareness. Every member of the crew displays a sense of responsibility for adhering to flight regulations, operating procedures, and safety standards.

m. **Crew-level after-action reviews are conducted.** This quality addresses the extent to which crewmembers review and critique their actions during or after a mission segment, during periods of low workload, or during the mission debriefing. Specific goals include the following:

(1) The crew critiques major decisions and actions. They identify options and factors that should have been discussed and outline ways to improve crew performance in future missions.

(2) The critique of crew decisions and actions is professional. “Finger pointing” is avoided; the emphasis is on education and improvement of crew performance.

6-4. CREW COORDINATION OBJECTIVES. The crew coordination elements and basic qualities are measured to determine if the objectives of the crew coordination program have been met. The objectives of the program have been defined by five crew coordination objectives. The five objectives are as follows:

a. **Establish and maintain team relationships.** Establish a positive working relationship that allows the crew to communicate openly and freely and to operate in a concerted manner.

b. **Mission planning and rehearsal.** Explore, in concert, all aspects of the assigned mission and analyze each segment for potential difficulties and possible reactions in terms of the commander’s intent.

c. **Establish and maintain workloads.** Manage and execute the mission workload in an effective and efficient manner with the redistribution of task responsibilities as the mission situation changes.

d. **Exchange mission information.** Establish intra-crew communications using effective patterns and techniques that allow for the flow of essential data between crewmembers.

e. **Cross monitor performance.** Cross monitor each other’s actions and decisions to reduce the likelihood of errors impacting mission performance and safety.

6-5. STANDARD CREW TERMINOLOGY. To enhance communication and crew coordination, crews should use words or phrases that are understood by all participants. They must use clear, concise terms that can be easily understood and complied with in an environment full of distractions. Multiple terms with the same meaning should be avoided. Department of Defense (DOD) flight information publications (FLIP) contain standard terminology for radio communications. Operator’s manuals contain standard terminology for items of equipment. Table 6-1 is a list of other standard words and phrases that crewmembers may use.

Table 6-1. Examples of standard words and phrases.

Standard Word or Phrase	***Meaning of Standard Word or Phrase***
Air Target	Fire control radar (FCR) detected fast mover (flyer) or helicopter.
Back above	The aircraft has been placed above the minimum altitude.
Bandit	An identified enemy aircraft.
Blind	The wingman has lost sight of the lead.
Bogey	An unidentified aircraft assumed to be the enemy.
Braking	Announcement made by the pilot who intends to apply brake pressure.
Break	Immediate action command to perform a maneuver to deviate from the present ground track; will be followed by “right” or “left.”

Table 6-1. Examples of standard words and phrases.

Standard Word or Phrase	*Meaning of Standard Word or Phrase*
Call out	Command by the P* for a specified procedure to be read from the checklist by another crewmember.
Cease fire	Command to stop firing but continue to track.
Clear	No obstacle present to impede aircraft movement along the intended ground track. Will be preceded by the word "nose," "tail," or "aircraft" and followed by a direction; for example, "right" or "slide left." Also indicates that ground personnel are clear to approach the aircraft.
Come up/down	Command to change altitude up or down.
Correct	Confirms a statement as being accurate or right. Do not use the word "right" to indicate correct.
Drifting	An alert of the unannounced movement of the aircraft; will be followed by direction.
Egress	Immediate action command to get out of the aircraft.
Execute	Initiate an action.
Expect	Anticipate further instructions or guidance.
Fire light	Announcement of illumination of the master fire warning light.
Firing	Announcement that a specific weapon is to be fired.
Go plain/red	Command to discontinue secure operations.
Go secure/green	Command to activate secure operations.
Hold	Command to maintain present position.
I have the controls	Used as a command or announcement by the rated crewmember (RCM) assuming control of the flight controls.
Inside	Primary focus of attention is inside the aircraft.
In sight	Preceded by the word "traffic," "target, " "obstacle," or descriptive term. Used to confirm the traffic, target, or obstacle is positively seen or identified.
Jettison	Command for emergency release of an external load or stores; when followed by "door," indicates the requirement to perform emergency door removal.
Laser threat	Alert announcement following the audio and symbolic cues of the laser signal detection set (AN/AVR-2A[V]1).
Maintain	Command to keep or continue the same.
Mask	Command to conceal aircraft.
Move forward/backward	Command to hover the aircraft forward or backward, followed by distance. Also used to announce intended forward or backward movement.
Outside	The primary focus is outside the aircraft.

Table 6-1. Examples of standard words and phrases.	
Standard Word or Phrase	***Meaning of Standard Word or Phrase***
Put me up	Command to place the P*'s radio transmit selector switch to a designated position or to place a frequency in a specific radio.
Report	Command to notify.
RFI target	Alert to a target detected by the (AN/APR-48A[V]) radar frequency interferometer (RFI).
Right	Used to indicate a direction only, not to be used in place of "correct."
Slide left/right	Command to hover the aircraft left or right; will be followed by distance. Also used to announce intended left or right movement.
Slow down	Command to decrease ground speed.
Speed up	Command to increase ground speed.
Stop	Command to go no further; halt present action.
Strobe	Indicates that the AN/APR-39 has detected a radar threat; will be followed by a clock position.
Target	An alert that a ground target has been spotted.
Traffic	Refers to any friendly aircraft that presents a collision hazard; will be followed by a clock position, distance, and reference to altitude.
Turn	Command to deviate from the current heading; will be followed by the word "right" or "left" and a specific heading or rally term.
Unmask	Command to position the aircraft above terrain features.
Up on	Indicates the radio selected; will be followed by the position number on the intercommunication system (ICS) panel (for example, "Up on 3").
Weapons hot/cold/off	Indicates weapon switches are in the ARMED, SAFE, or OFF position.
You have the controls	Used as a command or announcement by the RCM relinquishing the flight controls.

Appendix A

Symbology Display Unit

QUALIFICATION TRAINING

A-1. Qualification training will provide the aviators with the knowledge, skills, and techniques required to integrate SDU operations into NVG flight. Training in the aircraft will be with the aviator at a station with access to the flight controls, wearing ANVIS with a SDU attached. A SDU qualified IP, SP, or UT will be at the other station with access to the flight controls. SDU qualification training may be conducted concurrently during NVG qualification, refresher, and mission training.

Note1: Academic training and training flights may be conducted by a NVG UT designated by the commander to conduct SDU training. A SDU-qualified NVG IP/SP must conduct the evaluation.

Note2: Once qualified, the RCM has no currency requirements for SDU operations unless specified by the commander. Only one RCM may fly with the SDU IAW the current SDU AWR. Academic training must be completed before flight training begins.

ACADEMIC TRAINING

A-2. Use the SDU Exportable Training Package (ETP) for the academic training. The trainee will receive instruction in the following subject areas:

a. SDU system components.

b. SDU system operations (adjusting and operating).

c. SDU tactics, techniques, and procedures.

FLIGHT TRAINING

A-3. The minimum flight hour requirement for SDU qualification is 1.0 aircraft hours. Some RCMs may require additional flight time to achieve a satisfactory level of proficiency with the ANVIS SDU. The minimum maneuvers required to be performed for an RCM to be considered SDU qualified include those maneuvers marked as an NVG task in table 2-4. In addition to those tasks listed, additional tasks that must be completed include Tasks 1132 , 1462 , and 1464 using the ANVIS SDU as the line of sight.

Note1: Extreme care must be taken prior to weapons engagement when using dissimilar sensor types (for example, NVG and NVS) to prevent the chance of fratricide. Proper aircrew coordination must be used.

Note2: Ensure that the RCM has completed the proper IHADSS video adjustments to achieve correct unity magnification prior to resuming flight with the HMD FLIR.

TRAINING DOCUMENTATION

A-4. After crewmembers complete SDU initial qualification, units will ensure that an entry is made on the crewmember's DA Form 7122-R (*Crew Member Training Record)* and transcribed to the DA Form 759 (*Individual Flight Record and Flight Certificate—Army)*

APPENDIX B

Modernized Target Acquisition and Designation Sight / Pilot Night Vision Sensor (M/TADS/PNVS)

QUALIFICATION TRAINING

B-1. Qualification training will provide the aviators with the knowledge, skills, and techniques required to effectively operate the modernized target acquisition and designation sight/pilot night vision sensor. Training in the aircraft will be with the aviator at a station with access to the flight controls fitted with a boresighted HDU. A MTADS/PNVS qualified IP or SP will be at the other station with access to the flight controls.

ACADEMIC TRAINING

B-2. Academic training as developed by the MTADS new equipment fielding team (NET) will be completed prior to flight training.

FLIGHT TRAINING

B-3. The RCM will show proficiency to an MTADS/PNVS qualified IP or SP on the following tasks:

- Task 1026 MAINTAIN AIRSPACE SURVEILLANCE
- Task 1028 PERFORM HOVER POWER CHECK
- Task 1038 PERFORM HOVERING FLIGHT
- Task 1041 PERFORM TRAFFIC PATTERN FLIGHT
- Task 1064 PERFORM ROLL–ON LANDING or Task 1075 PERFORM SINGLE-ENGINE LANDING
- Task 1114 PERFORM ROLLING TAKEOFF
- Task 1134 Perform integrated helmet and display sight system operations
- Task 1138 Perform target acquisition designation sight boresight (F)
- Task 1139 Perform target acquisition designation sight operational checks (F)
- Task 1140 Perform target acquisition designation sight sensor operations (F) – with emphases on image automatic tracking, linear motion compensation, multitarget tracking, and range focus operation.

Note1: The RCM must also show proficiency in performing the Scene Assisted Nonuniformity Correction (SANUC) according to TC 1-1520-251-10.

Note2: Any portion of the entire requirement of paragraph B-3 above is waiverable by the first O6 in the chain of command.

Note 3: Flight using the MTADS suffices for MPNVS qualification.

TRAINING DOCUMENTATION

B-4. After crewmembers complete M/TADS/PNVS initial qualification, units will ensure that an entry is made on the crewmember's DA Form 7122-R (*Crew Member Training Record)* and transcribed to the DA Form 759 (*Individual Flight Record and Flight Certificate—Army)*

Glossary

AAA	antiaircraft artillery
abr	abbreviation
AC	alternating current
A/C	aircraft
ACM	automatic control mode
acq	acquisition, acquire
ADA	air defense artillery
ADF	automatic direction finding
adv	advance
AET	active emitter threats
AFPD	Air Force advanced protocol development
AFT	near the stern; toward the stern
AGL	above ground level
AH	attack helicopter
AHO	above highest obstacle
AIM	airman's information manual
ALFGL	automatic low frequency gain limiting
ALSE	aviation life support equipment
alt	alternate, altitude, altimeter
AMC	air mission commander
ammo	ammunition
approved software	aviation mission planning station
ANTS	alternate next-to-shoot
APART	annual proficiency and readiness test
APU	auxiliary power unit
AQC	aircraft qualification course
ARDD	automatic roller detent decoupler
arith	arithmetic
ARS	aerial rocket system
SAFE/ARM	arm/safe
AS	airspeed
ASE	aircraft survivability equipment
ASET	aircraft survivability equipment trainer
ASN	aircraft special navigation
ASOC	air support operations center

ASR	airport surveillance radar
AT	attitude hold
ATC	air traffic control, air traffic controller
ATF	aircraft torque factor
ATHS	airborne target handover system
ATIS	automatic terminal information service
ATM	aircrew training manual
ATO	air tasking order
ATP	aircrew training program
attn	attention
auto	automatic
aux	auxiliary
AWR	airworthiness release
AWS	area weapon system
AZ	azimuth
B1–B6	designators for bottom row multipurpose display bezel pushbuttons
BDA	battle damage assessment
BIT	built-in test
BL	boundary line
BMP	Boyevaya Mashina Pekhoty (Russian combat vehicle, infantry [amphibious armored])
BNK	bunker fusing
BOT	beginning of tape or bottom
BPS	blade position sensor
BRC	base recovery course
BRT	brightness, bright
BRU	boresight reticle unit
B/S	boresight
BS	back seat
BUCS	backup control system
C	Celsius
C2	command and control
calc	calculation
CAQ	cursor application
cas	casualty
caut	caution

CBHK	captive boresight harmonization kit
CBI	computer based instruction
CCA	close combat attack
CCW	counterclockwise
CG	center of gravity
CGUN	copilot gun
CHAFF	radar confusion reflectors
CHAN	missile channel
chn	channel
CIC	combat information center
CIU	communications interface unit
CL(s)	checklist(s), center line, or ON/OFF background contrast
CM	control measure
CMSL	copilot missile
col	column
com	communication
comd	command
COMSEC	communication security
con	contrast
cont	control
CONUS	continental United States
COOP	cooperative
CPG	copilot-gunner (front seat crewmember)
CS	continuous scan burst
C-SCP	C-Scope
CTL	crew task list
ctr	center
CTRLM	control measure
CUR	current
CW	continuous wave
CXX	control measure
DA	Department of the Army
DAP	display adjust panel
DAFIF	digital aeronautical flight information file
DASC	direct air support center
DC	direct current
DD	Department of Defense (form)

DECU	digital electronic control/unit
DEU	display electronics unit
DGNS	Doppler global positioning system navigation system
DH	dynamic harmonization
DIR	direct, directional
disch	discharge
DLQ	deck landing qualification
DMS	data management system
DOD	Department of Defense
DP	data point
dspl	display
DS	direct support
DTC	data transfer cartridge
DTR	data transfer receptacle
DTU	data transfer unit
DTV	day television
DVO	direct view optics
E3	electromagnetic environment effects
ECCM	electronic counter-countermeasures
ECS	environmental control system
ECM	electronic countermeasures
ECU	electronic control unit
EGI	embedded global positioning inertial navigation system
EL	elevation
ELVA	emergency low visibility approach
endr	endurance
ENG	engine
EO	electro-optical
ERFS	extended range fuel system
ETA	estimated time of arrival
ETE	estimate time en route
ETF	engine torque factor
ETL	effective transitional lift
ETM	electronic technical manual
eval	evaluation
EWO	electronic warfare officer
F	front seat

FAA	Federal Aviation Administration
FAB	fixed action button
FAC	flight activity category
FAF	final approach fix
FAR	Federal Aviation regulation
FARM	fuel, ammunition, rockets, missiles
FARP	forward arming and refueling point
FAT	free air temperature
FCR	fire control radar
FDC	fire direction center
FIH	flight information handbook
FLIP	flight information publication
FLIR	forward looking infrared
flt	flight
FM	field manual
FMC	flight management computer
FOD	foreign object damage
FOR	field of regard
FOV	field of view
FPM	feet per minute
FPV	flight path vector
freq	frequency
FS	fuselage station
ft	feet
fwd	forward
fxd	fixed
GCA	ground controlled approach
geom	geometric
GHS	gunner helmet sight
GPS	global positioning system
GS	ground speed
GTL	gun target line
GTM	ground targeting mode
GWT	gross weight
HA	holding area
HAD	high action display
HAS	hover augmentation system

haz	hazard
HCO	helicopter control officer
HCS	helicopter control station
HDC	helicopter direction center
HDD	heads down display
HDU	helmet display unit
HEDP	high explosive/dual purpose
HE	high explosive
HF	high frequency
HI	high
HIT	health indicator test
HMD	helmet mounted display
HMU	hydromechanical unit
HOD	heads out display
hood	view limiting device
hr	hour
HYD	hydraulic
IAF	initial approach fix
IAS	indicated airspeed
IAT	image autotrack
IATF	individual aircrew training folder
IBIT	initiated built-in test
ICS	intercommunication system
ID	identification
IDM	improved data modem
IE	instrument flight examiner
IF	intermediate approach fix
IFF	identification, friend or foe
IFR	instrument flight rules
IFRF	instrument flight rules flight
IGE	in-ground effect
IHADSS	integrated helmet and display sight system
IHU	integrated helmet unit
IIMC	inadvertent instrument meteorological condition
IMC	instrument meteorological condition
inbd	inboard
inst	instrument

intr	interior, internal
INU	inertial navigation unit
I/O	input/output
IP	instructor pilot
IPAS	integrated pressurized air system
IR	infrared
IRJAM	infrared jammer or jamming
ISAQ	interim statement of airworthiness qualification
ITO	installation transportation office
IVSI	instantaneous vertical speed indicator
JAAT	joint air attack team
jett	jettison
JFACC	joint force air component commander
JOG	joint operations graphic
JVMF	joint variable message format
KIAS	knots indicated airspeed
KTAS	knots true airspeed
KU	keyboard unit
KY-58	encryption unit
L1 – L6	designators for left column bezel pushbuttons
LASER	light amplification by stimulated emission of radiation
LAT	latitude
lb	pound
LED	light emitting diode
LH	left hand
LHA	amphibious helicopter assault carrier
LHD	amphibious helicopter assault carrier dock
LMC	linear motion compensation
LMP	load maintenance panel
LO	low
LOAL	lock on after launch
LOBL	lock on before launch
LONG	longitude
LOS	line of sight
LPH	amphibious assault helicopter carrier—aviation
LRFD	laser range finder/designator
LSE	landing signal enlisted

LSO	landing signal officer
LST	laser spot tracker
LTL	laser target line
lvl	level, leveling
LZ	landing zone
MAHF	missed approach holding fix
man	manual
MAP	missed approach point
max	maximum
MAYDAY	The international radiotelephony distress signal. When repeated three times, it indicates imminent and grave danger and that immediate assistance is requested.
MDA	minimum descent altitude
ME	maintenance examiners
MEF	maximum elevation figures
METL	mission essential task list
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, civil considerations
MF	missile fail
MFD	multifunction display
MFOV	medium field of vision
MIJI	meaconing, interference, jamming, and intrusion
min	minimum
misc	miscellaneous
mk	mark
mm	millimeter
MOC	maintenance operational check
MOPP	mission oriented protective posture
MOS	military occupational specialty
MOU	memorandum of understanding
move	moving
MP	maintenance test pilot
MPD	multipurpose display
MPI	mean point of impact
MSA	minimum safe altitude
msg	message
msl	missile
msls	missile(s)

msn	mission
mstr	master
MTADS	modernized target acquisition designation sight
MTF	maintenance test flight
MTP	maintenance test pilot
MTRA	military temporary reserved airspace
MUX	multiplex
N	narrow, night
nav	navigation
NAVAIDS	navigational aids
NBC	nuclear, biological, and chemical
NDB	nondirectional beacon
NETT	new equipment training team
NFOV	narrow field of view
N_G	gas producer turbines speed
NGR	National Guard regulation
NM	nautical mile
no	number
NOE	nap of the earth
NORMA	nature of target, obstacles, range, multiple firing positions, area to maneuver.
norm	normal
NOTAM	notice to airman
N_P	power turbine speed
N_R	main rotor speed
NR	night vision imaging system for class A night vision goggles
NS	night system
NTS	next to shoot
NVD	night vision device
NVG	night vision goggles
NVS	night vision system
OAT	outside air temperature
OCONUS	outside continental United States
OGE	out-of-ground effect
OIP	operation in progress
ops	operations
OROCA	off route obstruction clearance altitude–CONUS

ORT	optical relay tube
ORTCA	off route terrain clearance altitude–OCONUS
outbd	outboard
P	pilot not on the controls
P*	pilot on the controls
PA	pressure altitude
PAN PAN	International radiotelephony urgency signal. When repeated three times, indicates uncertainty or alert followed by the nature of the urgency.
PAS	pressurized air system
PC	pilot in command
pen	penetration
perf	performance
PFE	proficiency flight evaluations
PGUN	pilot controls gun
PH	probability of hit
PHS	pilot helmet sight
PI	probability of incapacitation
PLGR	precision light-weight global positioning system receiver
plrt	polarity
PLT	pilot (backseat crewmember)
PMSL	pilot controls missile
PNVS	pilot night vision system
POI	program of instruction
pos	position
PP	present position
PPC	performance planning card
PRF	pulse repetition frequency
prof	profile
PSI	pounds per square inch
PSP	programmable signal processor, processor select panel
PTWS	point target weapon system
pwr	power
qty	quantify, quantity
R1 – R6	designators for right column bezel pushbuttons
RAD ALT	radar altitude, radar altimeter
R/C	rate of climb

RCM	radar crewmember
rcd	record, recorder
RF	radio frequency
RFHO	radar frequency missile handover
RFI	radar frequency interferometer
RHG	right handgrip
RIPL	ripple
RJAM	radar jammer
rkt	rocket
RL	readiness level
RLWR	radar laser warning receiver
RMAP	radar mapping
rnd	round
ROC	required obstacle clearance
ROE	rules of engagement
RPM	revolutions per minute
rpt	report
rqst	request
RT	right or remote terminal
rte	route
RX	receive
SAL	semiactive laser
SALUTE	size, activity, location, uniform, time, and equipment
SAM	surface to air missile
SAS	stability augmentation subsystem
SAT	systems approach to training
SCAS	stability and command augmentation system
SE	single engine
SEL	select
SELECT	selection
SEU	sight electronics unit
sim	simulated
SINCGARS	single-channel ground and airborne radio system
sit	situation
skr	seeker
SM	statue miles
SOI	signal operation instructions

SOP	standing operating procedure
SP	standardization instructor pilot
SP1/SP2	system processor position 1 or 2
SIT	situation report
SPOT	A concise narrative report of essential information covering events or conditions that may have an immediate and significant effect on current planning and operations that is afforded the most expeditious means of transmission consistent with requisite security. Also called SPOTREP. (Note: In reconnaissance and surveillance usage, spot report is not to be used.) See Joint Tactical Air Reconnaissance/Surveillance Mission Report. (JP 1-02)
SPQ	super quick fusing
SS	single scan burst
STANAG	standardization agreement
stat	status
STI	stationary target indicator
SYM BRT	symbol brightness
SYM SEL	symbology select
sys	system
TACFIRE	tactical fire-computer
TACP	tactical air control party
TADS	target acquisition and designation sight
TAS	true airspeed
TC	training circular
TED	trailing edge down
temp	temperature
TERPS	terminal instrument procedures
TESS	tactical environmental support system
TEU	target acquisition and designation sight electronics unit
tgt	target
thrt	threat
tkr	tracker
TM	technical manual
TMP	technical management plan
TOF	time of flight
TOT	time on target
TPM	terrain profiles mode
TPM-R	technical pattern munition-range

%Q	torque
TR	torque ratio
TRADOC	United States Army Training and Doctrine Command
traj	trajectory
trig	trigger
trk	track
TSD	tactical situation display
TSOP	tactical standing operating procedure
TTT	time to target
TXX	transmit
UFD	up-front display
UHF	ultra high frequency
updt	update
U.S.	United States
USAAVNC	United States Army Aviation Center
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
UT	unit trainer
util	utility
UTM	universal transverse Mercator
VCR	videocassette recorder
VFR	visual flight rules
VHF	very high frequency
Vh	maximum airspeed in level flight with maximum continuous power being applied
vid	video
VMC	visual meteorological conditions
Vne	velocity not to exceed
VOX	voice actuation (keying) (JP 1-02)
VSEL	video select
VSI	vertical speed indicator
VSSE	velocity safe single engine
WAS	weapons action switch
WFOV	wide field of view
WP	weapons processor
wpt	waypoint

wpn	weapon
WPTHZ	waypoint hazard
wt	weight
WXX	waypoint/hazard (option button)
XPNDR	transponder
XX	test symbol
ZFOV	zoom field of view

References

SOURCES USED

Sources quoted or paraphrased in this publication.

Army Regulations

AR 95-10. *Department of Defense (DOD) Notice to Airmen (NOTAM) System.* 1 January 1997.
AR 600-106. *Flying Status for Nonrated Army Aviation Personnel.* 8 December 1998.

Department of Defense Airman's Information Manual

DOD AIM 86-100. *Operation and Maintenance Overview General Triservice Mode 4 Handbook.* May 1987.
This publication is available from Commanding Officer, ATTN: Code 2111, Naval Electronic Systems Engineering Activity, St. Inigoes, MD 20684-0010, or WR-ALC/MMAM-AIMS, ATTN: DOD AIMSPO, Robins AFB, Georgia 31098-5609.

Field Manuals

FM 3-04.111 (FM 1-111). *Aviation Brigades.* 21 August 2003.
FM 3-04.300 (FM 1-300). *Flight Operations Procedures.* 26 April 2004
FM 3-3. *Chemical and Biological Contamination Avoidance.* 16 November 1992.
FM 3-3-1. *Nuclear Contamination Avoidance.* 9 September 1994.
FM 3-11.4 (FM 3-4). *Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection.* 2 June 2003.
FM 3-11 (FM 3-100*). Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical Defense Operations.* 10 March 2003.
FM 3-25.26 (FM 21-26). *Map Reading and Land Navigation.* 20 July 2001.
FM 6-02.72 (FM 11-1). *Tactical Radios Communications Procedures for Tactical Radios in a Joint Environment.* 14 June 2002.
FM 7-1 (FM 25-101). *Battle Focused Training.* 15 September 2003.
FM 10-67-1 (FM 10-68). *Concepts and Equipment of Petroleum Operations.* 2 April 1998.
FM 17-95. *Cavalry Operations.* 24 December 1996 (will be revised as FM 3-20.95).
FM 21-31. *Topographical Symbols.* 19 June 1961 (will be revised as FM 3-34.31).
FM 21-60. *Visual Signals.* 30 September 1987 (will be revised as FM 3-21.60).

International Standardization Agreement

STANAG 3114 AMD (Edition Seven). *Aeromedical Training of Flight Personnel.* 22 May 2003.

Technical Bulletin

TB MED 524. *Occupational and Environmental Health: Control of Hazards to Health From Laser Radiation*. 20 June 1985.
TB 11-5895-1632-10. *Operator's Manual for Improved Data Modem (IDM) MD-1295/A*. 1 October 2003.
TB 11-7010-301-10-3. Operator's Manual for the Aviation Mission Planning Station.

Technical Manuals

TM 1-1500-328-23. *Aeronautical Equipment Maintenance Management Policies and Procedures.* 30 July 1999.

TM 1-1520-251-10. *Operator's Manual for Helicopter, Attack, AH-64D Longbow Apache.* 29 March 2002.

TM 1-1520-251-CL. *Operator's Checklist For Helicopter, Attack, AH-64D Longbow Apache.* 15 March 1998.

TM 1-1520-251-MTF. *Maintenance Test Flight Manual for Helicopter, Attack, AH-64D Longbow Apache.* 15 March 1998.

TM 1-2840-248-23. *Aviation Unit and Intermediate Maintenance Manual for Engine, Aircraft Turboshaft; Models T700-GE-700, T700-GE-701, and T700-GE-701C.* 1 June 1999.

TM 11-5810-262-10. *Operator's Manual for Speech Security Equipment KY-58 (NSN 5810-00-449-0154)* 31 May 1990.

TM 11-5841-281-12. *Operator's and Organizational Maintenance Manual for Doppler Navigation Set, AN/ASN-128 (NSN 5841-01-064-9738) (EIC: JK4).* 30 May 1979.

TM 11-5841-283-12. *Aviation Unit Maintenance Manual for Radar Signal Detecting Set, AN/APR-39(V) (NSN 5841-01-023-7112).* 9 August 1983.

TM 11-5855-263-10. *Operator's Manual for Aviator's Night Vision Imaging System (ANVIS), AN/AVS-6(V)1 (NSN 5855-01-138-4749) (EIC: IPR) and AN/AVS-6(V)2 (NSN 5855-01-138-4748) (EIC: IPQ), AN/AVS-6(V)1A (5855-01-439-1745) (EIC: IPW).* 1 February 2004.

TM 11-5865-200-12. *Operator's and Aviation Unit Maintenance Manual for Aviation Unit Maintenance (AVUM) Countermeasures Sets, AN/ALQ-144A(V)1 (NSN 5865-01-299-5859) and AN/ALQ-144(V)3 (5865-01-299-5860).* 15 March 2002.

TM 11-5865-202-12. *Operator's and Aviation Unit Maintenance Manual for Countermeasures Set, AN/ALQ-136(V)1 (NSN 5865-01-127-6880), AN/ALQ-136(V)5 (5865-01-186-9130).* 1 August 1986.

TM 11-5895-1199-12. *Operator's and Organizational Maintenance for Mark-XII IFF System.* 1 July 1984.

TM 11-5895-1733-13&P. *Operator, Aviation Unit (AVUM) and Aviation Intermediate (AVIM), Maintenance Manual Including Repair Parts and Special Tools List (RPSTL),Transponder Set, AN/APX-118(V) Receiver-Transmitter, Radio, RT-1836(C)/APX-118(V) (NSN: 5895-01-504-0407) (EIC: N/A) (This Item is Included on EM 0140).* 1 June 2004.

TM 55-1500-342-23. *Army Aviation Maintenance Engineering Manual for Weight and Balance.* 29 August 1986.

Other

EM 0126. *TM 1-1520-LONGBOW/APACHE, Interactive Electronic Technical Manual for Longbow/Apache.* 15 November 2004.

DOCUMENTS NEEDED

These documents must be available to the intended users of this publication.

Army Regulations

*AR 40-8. *Temporary Flying Restrictions Due to Exogenous Factors.* 17 August 1976.

∗AR 95-1. *Flight Regulations.* 1 September 1997.

* This document was also used to develop this publication.

*AR 95-2. *Air Traffic Control, Airspace, Airfields, Flight Activities, and Navigational Aids.* 10 August 1990.
AR 95-20. *Contractor's Flight and Ground Operations.* 13 November 2002.
∗AR 600-105. *Aviation Service of Rated Army Officers.* 15 December 1994.

Department of the Army Forms

DA Form 2028. *Recommended Changes to Publications and Blank Forms.*
DA Form 2408-12. *Army Aviator's Flight Record*.
DA Form 2408-13. *Aircraft Status Information Record*.
DA Form 2408-13-1 *Aircraft Maintenance and Inspection Record*.
DA Form 4186. *Medical Recommendation for Flying Duty.*
DA Form 5484-R. *Mission Schedule/Brief.*
DA Form 5701-R. *UH-60/AH-64 Performance Planning Card.*
DA Form 5701-64-R. *AH-64 Performance Planning Card*.
DA Form 7120-R. *Commander's Task List.*

Department of the Army Pamphlet

∗DA Pam 738-751. *Functional Users Manual for the Army Maintenance Management System-Aviation (TAMMS-A).* 15 March 1999.
DA Pam 350-38. *Standards in Weapons Training.* 1 October 2002.

Department of Defense (DOD) Flight Information Publications

Flight Information Handbook. DOD FLIPs are available from Director, US Army Aeromedical Services Agency, ATTN: ATAS-AI, 9325 Gunston Road, Suite N319, Fort Belvoir, VA 22060-5582.
NIMA: Digital Aeronautical Flight Information File
http://164.214.2.62/products/digitalaero/index.html

Department of Defense Forms

DD Form 365-4. *Weight and Balance Clearance Form F-Transport/Tactical.*
DD Form 1972. *Joint Tactical Air Strike Request.*

Federal Aviation Administration Publications

Airman's Information Manual FAR Part 91. *General Operating and Flight Rules.* March 1974.
Available from Director, US Army Aeronautical Services Agency, ATTN: MOAS-AI, Cameron Station, Alexandria, Virginia 22304-5050.
Aviation Instructor Pilot Handbook, AC 60-14.
Note: AC 60-14 is issued to all U.S. Army IP students with a USAAVNC cover and Aviation Training Brigade listed as the proponent.
FAA Handbook 8261-1. *Instrument Procedures Handbook*.
FAA Handbook 8083-15. *Instrument Flying Handbook*.
FAA Order 7130.3A. *Holding Pattern Criteria*.
FAA Order 8260.3. *Terminal Instrument Procedures (TERPS) Handbook*.
FAA Order 84260.42A. *Helicopter Global Positioning System Non-precision Approach Criteria*.

* This document was also used to develop this publication.

∗FM 1-112. *Attack Helicopter Operations.* 2 April 1997 (will be revised as FM 3-04.112).
∗FM 1-114. *Air Cavalry Squadron and Troop Operations.* 1 February 2000 (will be revised as FM 3-04-114).
∗FM 1-202. *Environmental Flight.* 23 February 1983 (will be revised as FM 3-04.202).
∗FM 1-203. *Fundamentals of Flight.* 3 October 1988 (will be revised as FM 3-04.203).
∗FM 1-230. *Meteorology for Army Aviators.* 30 September 1982 (will be revised as FM 3-04.230).
∗FM 1-240. *Instrument Flying and Navigation for Army Aviators.* 15 December 1984 (will be revised as FM 3-04.240).
∗FM 1-400. *Aviator's Handbook.* 31 May 1983 (will be revised as FM 3-04.400).
∗FM 1-564. *Shipboard Operations.* 29 June 1997 (will be revised as FM 3-04.564).
∗FM 3-04.140 (FM 1-140). *Helicopter Gunnery.* 14 July 2003.
∗FM 3-04.301 (FM 1-301). *Aeromedical Training for Flight Personnel.* 29 September 2000.
∗FM 3-04.508 (FM 1-508). *Aviation Life Support System Maintenance Management and Training Programs.* 23 April 2004.
∗FM 3-04.513 (FM 1-513). *Battlefield Recovery and Evacuation of Aircraft.* 27 September 2000.
FM 3-09.32. (J-Fire) Multiservice Procedures for the Joint Application of Firepower, 15 November 2002.
∗FM 6-30. *Tactics, Techniques, and Procedures for Observed Fire.* 16 July 1991 (will be revised as FM 3-09.3).
∗FM 90-21. (JAAT) *Multi-Service Procedures for Joint Air Attack Team Operations.* 3 June 1998 (will be revised as FM 3-09.33).

Joint Publications

JP 3-04.1. *Joint Tactics, Techniques and Procedures for Shipboard Helicopter Operations.* 10 December 1997.
JP 3-09.03. *Joint Tactics, Techniques, and Procedures for Close Air Support (CAS)*, 3 September 2003.

National Guard Regulation

∗NGR 95-210. *Army National Guard: General Provisions and Regulations for Aviation Training.* 1 July 1991.
National Guard Bureau publications are available from Chief, National Guard Bureau, ATTN: NSB-DAY, Washington, DC 20310-2500.

U.S. Navy and Coast Guard Publications

Commandant Instruction (COMDTINST) M3710.2. *Shipboard Helicopter Operation Procedures Manual*.
Naval Air Training and Operatinal Procedures Standardization (NATOPS) manuals.
NWP-42, *Shipboard Helicopter Operating Procedures*.

Training Circulars

∗TC 1-201. *Tactical Flight Procedures.* 20 January 1984.
∗TC 1-204. *Night Flight Techniques and Procedures.* 27 December 1988.
∗TC 1-210. *Aircrew Training Program Commander's Guide to Individual and Crew Standardization*. 3 October 1995.

∗ This document was also used to develop this publication.

Index

This page intentionally left blank.

AH-64 PERFORMANCE PLANNING CARD

For use of this form, see TC 1-251; the proponent agency is TRADOC.

DEPARTURE

PA /	FAT /	TAKEOFF GWT

	DUAL ENG	SINGLE ENG #1	SINGLE ENG #2
LOAD			
FUEL MSN			
	ATF	ETF	ETF
	TR	TR	TR
MAX TORQUE AVAILABLE			
MAX ALLOWABLE GWT *(OGE/IGE)*	/		
GO/NO-GO TORQUE *(OGE/IGE)*	/		
PREDICTED HOVER TORQUE *(OGE/IGE)*	/		

REMARKS:

CRUISE DATA

PA	FAT	Vne	Vh

	DUAL ENG	SINGLE ENG	
	TR	TR	TR
MAX TORQUE AVAILABLE			
CRUISE SPEED TAS			
CRUISE TORQUE			
CRUISE FUEL FLOW			
CONT TORQUE AVAILABLE			
MAX R/C OR ENDURANCE TAS			
MAX RANGE TAS			
SINGLE-ENG CAPABILITY TAS *(MIN/MAX)*		/	
MAX ALLOWANCE GWT - SINGLE ENG			
SINGLE-ENG MAX R/C IAS *(MAX GWT)*			

This page intentionally left blank.

FUEL MANAGEMENT

	FUEL/TIME		
START	______ / ______	BURNOUT	______ Z
STOP	______ / ______	RESERVE	______ Z
		CONSUMPTION RATE	______ LB PER HR

ARRIVAL

PA	FAT	LANDING GWT

	DUAL ENG	SINGLE ENG #1	SINGLE ENG #2
	TR	TR	TR
MAX TORQUE AVAILABLE			
MAX ALLOWABLE GWT *(OGE/IGE)*	/		
PREDICTED HOVER TORQUE *(IGE)*			
PREDICTED HOVER TORQUE *(OGE)*			

REMARKS:

This page intentionally left blank.

TC 1-251
14 September 2005

By order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

SANDRA R. RILEY
Administrative Assistant to the
Secretary of the Army
0523602

DISTRIBUTION:

Active Army, Army National Guard, and U.S. Army Reserve: To be distributed in accordance with the initial distribution number 115953 requirements for TC 1-251.

This page intentionally left blank.

PIN: 082702-000