***TC 3-04.42** (TC 1-251)
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Aircrew Training Manual, Attack Helicopter, AH-64D

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Training Circular
No. TC 3-04.42

Headquarters
Department of the Army
Washington, DC, Publication Date

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Contents

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***This publication supersedes TC 1-251, dated 14 September 2005.**

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Preface

Training circular (TC) 3-04.42 standardizes aircrew training programs (ATP) and flight evaluation procedures. This aircrew training manual (ATM) provides specific guidelines for executing AH-64D aircrew training. It is based on the battle-focused training principles outlined on the Army Training Network (ATN) https://atn.army.mil . It establishes crewmember qualification, refresher, mission, continuation training, and evaluation requirements. This manual applies to all AH-64D crewmembers and their commanders in the Active Army, the Army National Guard (ARNG), the United States Army National Guard (USANG), and the United States Army Reserve (USAR).

This manual is not a stand-alone document. All of the requirements contained in Army regulation (AR) 600-105, AR 600-106, National Guard regulation (NGR) 95-2 10, and TC 3.04.11 must be met. The operator's manual is the authority for operation of the aircraft. Implementation of this manual conforms to AR 95-1 and TC 3-04.11. If differences exist between the maneuver descriptions in technical manual (TM) 1-1520-251-10-1, TM 1-1520-251-10-2, and this manual, the governing authority for training and flight evaluation purposes is this manual.

This manual (in conjunction with the ARs and TC 3-04.11) 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. Standardization officers, evaluators, and unit trainers will use this manual and TC 3-04.11 as the primary tools to assist the commander to develop and implement his aircrew training program. 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.

The proponent of this publication is U.S. Army Training and Doctrine Command (TRADOC). Send comments and recommendations on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) through the aviation unit commander to Commander, United States Army Aviation Center of Excellence (USAACE), ATTN: ATZQ-TDT-F , Building 4507, Andrews Avenue, Fort Rucker, Alabama 36362-5263. Recommended changes may also be e-mailed to ruck.atzq-tdt-f@conus.army.mil.

This publication has been reviewed for operations security considerations.

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 3-04.11, and other applicable publications. The tasks in this ATM enhance training in individual and aircrew proficiency. Training focuses on accomplishment of tasks supporting the unit's mission. The mission essential task list (METL) will dictate the scope and level of training to be achieved individually by crewmembers and collectively by aircrews. 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 (CTL) 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 (/) means one or the other <u>or both</u>. For example, IP/SP may mean IP <u>and</u> SP or may mean IP or SP.

b. Word Distinctions.

(1) Warnings, cautions, and notes. These words emphasize important and critical instructions.

(a) ***Warning*.** A warning is an operating procedure or practice that, if not correctly followed, could result in personal injury or loss of life.

(b) ***Caution*.** A caution is an operating procedure or practice that, if not strictly observed, could result in damage to or destruction of equipment.

(c) ***Note*.** A note highlights essential information of a non-threatening nature.

(2) Will, shall, must, should, may, and can. 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 nonmandatory but preferred method of accomplishment.

(c) May or can indicate 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 modernized target acquisition designation sight (MTADS)/modernized pilot night vision system (MPNVS).

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

(3) NVD refers to both NVG and NVS.

(4) MPD refers to the multipurpose display.

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 3-04.11, and this ATM.

2-1. QUALIFICATION TRAINING.

a. Aircraft qualification. Initial or series qualification training will be conducted at the United States Army Aviation Center of Excellence (USAACE) or a Department of Army (DA)-approved training site and according to a USAACE-approved program of instruction (POI).

b. NVG qualification. Initial NVG and AH-64D aircraft NVG qualification will be per this manual and TC 3-04.11.

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

- Both crewmembers must be NVS current.
- MPNVS and MTADS 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.

(1) Initial NVG qualification. Initial qualification will be conducted at the USAACE or DA approved training site, according to the USAACE approved POI, or locally using the USAACE NVG exportable training package (ETP). The USAACE NVG ETP may be obtained by writing to the Commander, U.S. Army Aviation Center of Excellence, 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 2-4, page 2-5. He will also receive training and demonstrate proficiency in any other base tasks specified for NVG that is on the task list for the crewmember's position. If designated to perform NVG duties, Task 2081 becomes a mandatory training and evaluation task and will be added to the aviators crew task list (CTL).

(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.

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.

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c. Aircraft software/hardware qualification. Crewmembers will receive software version specific and/or new hardware training when that version update results in procedural changes to aviator base tasks structure. After crewmembers complete this training, units will ensure that an entry is made on the crewmember's DA Form 7122 (Crewmember Training Record).

d. MTADS/MPNVS. Qualification will be according to appendix A of this manual.

2-2. REFRESHER/READINES LEVEL PROGRESSION TRAINING.

a. Aircraft refresher training. When designated RL 3, 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 commander designated crew stations, in accordance with TC 3-04.11 and FM 3-04.45, in each base task and in the modes marked with an X in the D, NS, I, and N columns of table 2-4, page 2-5. The crewmember will complete Gunnery Tables III and IV. 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/RL progression 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 Longbow Crew Trainer (LCT) training	4.0
Instrument evaluation	1.5
Total hours	5.5

b. NVG refresher training. The crewmember must complete the training outlined below.

(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, page 2-5, 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 specified tasks. When commanders determine a requirement for using NVG in mission profiles, they must develop a mission training program, specifying mission tasks. 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. MP and 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. 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.

Note. Crewmembers designated RL 3 will not perform any mission (2000-series) or additional (3000-series) or maintenance (4000-series) tasks until progressed RL2.

Table 2-3. MP/ME 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 REQUIREMENTS.

a. Semi-annual 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.

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

(a) FAC 1-70 hours, or 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. Semi-annual simulation device flying hour requirements. Trainers and evaluators may credit instructor/operator (I/O) hours toward their semi-annual simulation device flying hour requirements. All aviators may apply a maximum of 12 simulation hours flown in a semiannual period toward that period's semi-annual flying hour requirements for 2-4a(1) and (2) above. All Active and Reserve rated crewmembers (RCMs) with access to a Longbow Crew Trainer (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.

c. NVD requirements. All RL 1 aviators will have a minimum of 9.0 hours of NVD semiannually. If RL 1 in NVG and NVS, then a total of 9 hours semi-annually with a minimum of 3 hours in each device is required. This requirement may be conducted in the aircraft or longbow crew trainer. Hour requirements will be annotated on the DA Form 7120-R (Commander's Task List).

d. 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 longbow crew trainer. Hour requirements will be annotated on the DA Form 7120-R.

e. 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, page 2-5, and on the respective aviator's 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, page 2-5 in the LCT 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 maintenance test flight (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 BOLD type (table 2-4; table 2-5, page 2-7; and table 2-6, page 2-8).

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 regular title case and plain type throughout this manual.

Note. Task iteration condition code "I" (instrument), as used on DA Form 5484 (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

Legend:

D	Day	**N**	Night
NS	Night system	**NVG**	Night vision goggle evaluation
SIM	Simulator	**EVAL**	Mandatory annual proficiency and readiness test
	Standardization flight evaluation		Instrument
S		**I**	Mandatory annual task iteration requirement
NS	Night system	**X**	

Task	*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 IFR Flight	X					I
1010	Prepare a Performance Planning Card	X					S, I
1012	Verify Aircraft Weight and Balance	X					S, I
1013	Operate Mission Planning System	X					S
1022	Perform Preflight Inspection	X					S, I
1024	Perform Before Starting Engine through Before Leaving Helicopter Checks	X					S, I
1026	**Maintain Airspace Surveillance**	**X**					**S, I, N, NS, NVG**
1032	Perform Radio Communications Procedures	X					S, I
1034	**Perform Ground Taxi**	**X**	**X**	**X**	**X**	**X**	**S, N, NS**
1038	**Perform Hovering Flight**	**X**					**S, N, NS, NVG**
1040	**Perform VMC Takeoff**	**X**					**S, N, NS, NVG**

Table 2-4. Aviator base task list

Legend:

D	Day	**N**	Night
NS	Night system	**NVG**	Night vision goggle evaluation
SIM	Simulator	**EVAL**	Mandatory annual proficiency and readiness test
	Standardization flight evaluation		Instrument
S		**I**	Mandatory annual task iteration requirement
NS	Night system	**X**	

Task	***Task Title***	***D***	***N***	***NS***	***NVG***	***SIM***	***EVAL***
1048	Perform Fuel Management Procedures			X			S, I, NS, NVG
1058	**Perform VMC Approach**			**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, NS,**
1070	Respond to Emergencies			X			S,
1075	**Perform Single-Engine Landing**			**X**			**S, N, NS, NVG**
1079	**Respond to Engine Failure**			**X**			**S, I, N, NS, NVG**
1082	**Perform Autorotation**	**X**		**X**		**X**	**S, NS**
1085	**Perform Stability and Command Augmentation System-Off/Backup Control System-On Flight**	**X**		**X**		**X**	**S**
1110	**Perform ECU/DECU Lockout Procedures**	**X**		**X**		**X**	**S**
1114	**Perform Rolling Takeoff**	**X**		**X**	**X**	**X**	**S, NS**
1116	Perform Tactical Situation Display Operations			X			S
1122	Perform Target Store Procedures			X			
1132	Perform Integrated Helmet and Display Sight System Boresight			X			S, NS
1134	Perform Integrated Helmet and Display Sight System Operations			X			S, NS
1140	Perform Target Acquisition and Designation Sight Sensor Operations			X			S, NS
1142	Perform Digital Communications			X			S
1144	Perform Fire Control Radar 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 Conditions**			**X**			**S, I, NS, NVG**
1188	Operate Aircraft Survivability Equipment			X			S
1194	Perform Refueling/Rearming Operations						
1262	Participate in a Crew Level After Action Review			X			S, I, NS, NVG
1401	**Perform Basic Maneuvering Flight**	**X**		**X**		**X**	**S**
1402	Perform Tactical Flight Mission Planning			X			S

Table 2-4. Aviator base task list

Legend:
D Day — **N** Night
NS Night system — **NVG** Night vision goggle evaluation
SIM Simulator — **EVAL** Mandatory annual proficiency and readiness test
Standardization flight evaluation — Instrument
S — **I** Mandatory annual task iteration requirement
NS Night system — **X**

Task	*Task Title*	*D*	*N*	*NS*	*NVG*	*SIM*	*EVAL*
1404	Perform Electronic Countermeasures/Electronic Counter-Countermeasures Procedures			X			
1405	Transmit Tactical Reports (Digital/Voice)			X			S
1406	**Perform Terrain Flight**	**X**		**X**	**X**	**X**	**S**
1410	**Perform Masking and Unmasking**	**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 Semi-Active Hellfire			X			S
1459	Engage Target with Radar Frequency Hellfire			X			S
1462	Engage Target with Rockets			X			S
1464	Engage Target with Area Weapon System			X			S
1471	Perform Target Handover			X			S
1835	Perform Night Vision System Operational Checks			X			S, NS

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 LCT. If a LCT is not available, they are not considered mandatory evaluation tasks.

Table 2-5. Aviator mission task list

Task	*Title*
2010	**Perform Multi-Aircraft Operations**
2043	**Perform Team Tactical Employment Techniques**
2045	**Operate Infrared Laser Pointing Devices**
2050	Develop an Emergency GPS Recovery Procedure
2081	**Operate Night Vision Goggles**
2127	**Perform Combat Maneuvering Flight**
2128	**Perform Close Combat Attack**
2162	Call for Indirect Fire
2164	Call for a Tactical Air Strike
2412	**Perform Evasive Maneuvers**
2413	**Perform Actions on Contact**

Table 2-6. MP/ME mission task list

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 Starting Auxiliary Power Unit Checks
4010	Perform Starting Auxiliary Power Checks
4012	Perform After Starting Auxiliary Power Unit Checks
4088	Perform Starting Engine Checks
4090	Perform Engine Run-Up and Systems Checks
4110	Perform Before Taxi Checks
4112	**Perform Taxi Checks**
4114	**Perform Baseline and Normal Engine Health Indicator Checks**
4123	Perform Before Hover Checks
4144	**Perform Hover Checks**
4160	**Perform Hover Maneuvering Checks**
4162	**Perform Flight Management Computer/Altitude Hold Checks**
4182	**Perform Visionic Systems Checks**
4184	**Perform Hover Box Drift Check**
4208	**Perform Initial Takeoff Check**
4220	**Perform Maximum Power Check**
4221	**Perform Maximum Power Check (Non-Limiting Method)**
4222	**Perform Cruise Flight Checks**
4236	**Perform Autorotation Revolutions Per Minute Check**
4237	**Perform Autorotation RPM Check (Alternate Method)**
4238	**Perform Altitude 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 Checks
4264	Perform Sight/Sensor Checks
4266	Perform Weapon Systems Checks
4276	Perform Special/Detailed Procedures
4284	Perform Engine Shutdown Checks
4292	**Perform V_h 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 2-4, page 2-5. 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 LCT 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 a NS in the evaluation column of table 2-4, page 2-5.

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 an airworthiness release (AWR) approval for the use of day curtains in support of NVS currency requirements. Day System (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 co-pilot gunner (CPG) station), DS egress procedures, and other parameters (for example, auxiliary (AUX) tank restrictions, flight modes, or registration check procedures).

2-7. ANNUAL CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR REQUIREMENTS.

a. Per TC 3-04.11, 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 mission oriented protective posture level 4 (MOPP 4) CBRN gear.

- Task 1026, Maintain Airspace Surveillance.
- Task 1034, Perform Ground Taxi.
- Task 1038, Perform Hovering Flight.
- Task 1040, Perform VMC Takeoff.
- Task 1058, Perform VMC Approach.

Chapter 3

Evaluation

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 3-04.11, 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 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.

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 role reversal with the examinee. The examinee must be made aware of both the initiation and termination of role reversals. The examinee must know when he is being supported by a fully functioning crewmember.

Note. When evaluation a PC, IP, SP, ME, IE, or a 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 LCT. These tasks require evaluation in the aircraft or the AH-64D LCT. 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, aircraft performance) 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 EVALUATIONS. 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 (POI)/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 3-4.b. 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 3-3a(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 3-3a(2). In addition, he must be able to objectively instruct, evaluate, and document performance of the PI, PC, UT, and IE, using role-reversal for IP (for example, aircraft/NVD] currency evaluation), 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. Flight evaluation criteria.

(1) Aircraft proficiency flight evaluation (PFE). This evaluation will be conducted per AR 95-1 and the TC 3-04.11. Tasks to be evaluated will be designated by the commander.

(2) NVS PFE. This evaluation will be a minimum one-hour flight given at night or during the day with blackout curtains in the aircraft by an IP/SP. The aviator must demonstrate proficiency in all tasks with an NS in the evaluation column of table 2-4, page 2-5.

(3) NVG PFE. This evaluation will be a minimum one hour flight given at night in the aircraft by an IP/SP. The aviator must demonstrate proficiency in all tasks with an NVG in the evaluation column of table 2-4, page 2-5 as well as Task 2081.

(4) APART standardization evaluation D/N/NS. This evaluation will be conducted in the aircraft by an IP/SP. The aviator must demonstrate proficiency in all tasks with an S in the evaluation column of table 2-4, page 2-5, as well as any mission/additional tasks designated in the crewmembers CTL as mandatory evaluation tasks.

(5) APART Instrument evaluation. This evaluation will be conducted in the aircraft by an IE. The aviator must demonstrate proficiency in all tasks with an I in the evaluation column of table 2-4, page 2-5. The LCT may be used for the evaluation if approved by the commander.

(6) APART MP/ME evaluation. This evaluation will be conducted in the aircraft by an ME. The aviator must demonstrate proficiency in all 4000 series tasks indicated on the CTL.

(7) Annual NVG evaluation. This evaluation will be conducted in the aircraft by an IP/SP. The aviator must demonstrate proficiency in all tasks with an NVG in the evaluation column of table 2-4, page 2-5, as well as Task 2081.

(8) Other flight evaluations. These evaluations will be conducted in accordance with unit SOPs and local regulations.

c. Academic/oral evaluation criteria.

(1) PFE. This evaluation is conducted per AR 95-1 and TC 3-04.11. The commander (or his/her 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 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) Regulations and publications (AR 95-1, DA Pam 738-751, Department of Defense [DOD] FLIP, FM 3-04.203, TC 3-04.11, FM 3-04.240, 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 and usage.
- Flight plan preparation and filing.
- Weight and balance requirements.
- Visual flight rules (VFR) minimums and procedures.
- Crew coordination.
- Publications required in aircraft.
- Inadvertent instrument meteorological condition (IIMC) procedures.

(2) 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.
- Environmental control system.
- Flight instruments.
- Fuel system.
- Emergency equipment.
- Hydraulic system.
- Integrated pressurized air system (IPAS).

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

- Wind limitations.
- Power limits.
- Airspeed limits.
- Rotor limits.
- Engine limits.
- Pressure limits.
- Temperature limits.
- Flight envelope limits.
- Weather/environmental limitations/restrictions.
- MPD performance page/performance chart interpretation.
- Other limitations.

(4) 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 up-front display (UFD) messages.
- Engine malfunctions and restart procedures.
- Fires and hot starts.
- Electrical system failures.
- Hydraulic system failures.
- Fuel system malfunctions.
- Flight control failure/malfunctions.
- Rotor, transmission, drive system malfunctions.
- Tail rotor malfunctions.
- Environmental control system (ECS) malfunctions.
- Smoke and fume elimination.
- Mission equipment failures/malfunctions.
- Weapon system malfunctions.
- Emergency exits, equipment, egress and entrance.
- Landing and ditching.
- After emergency action.

(5) Aeromedical factors (AR 40-8, FM 3-04.301, and FM 3-04.203). Topics in this subject area are—

- Flight restrictions due to exogenous factors.
- Stress and fatigue.
- Spatial disorientation.
- Hypoxia.
- Middle ear discomfort.
- Principles of and problems with vision.

(6) Aerodynamics and maneuvering flight (FM 3-04.203 and TM 1-1520-251-10). Topics pertaining to this subject area are—

- Total aerodynamic force.
- Airflow during a hover.
- Effective translational lift (ETL).
- Transverse flow.
- Translating tendency.
- Dissymmetry of lift.
- Retreating blade stall.
- Compressibility.
- Dynamic rollover.
- Setting with power.
- Bucket speed.
- Transient torque (TQ).
- Conservation of angular momentum.
- Mushing.

(7) Night/NVS/NVG mission operation and deployment (FM 3-04.203, TC 3-04.93, TM 1-1520-251-10, TM 11-5855-313-10, NVG TSP, unit SOP). Topics in this subject area are—

- Unaided night flight.
- Visual illusions.
- Distance estimation and depth perception.
- Dark adaptation, night vision protection, and central blind spot.
- Night vision/NVS limitation and techniques.
- FLIR characteristics and symbology.
- Visual/Near IR Sight (VNSight)
- Parallax effect.
- NVG nomenclature, characteristics, limitations, and operations.
- Weapons effects on night vision.

(8) Mission systems operation and employment (FM 3-04.126, FM 3-04.140, and TM 1-1520- 25 1-10). Topics in this subject area are—

- Communication subsystem.
- Navigation subsystem.
- Tactical situation display (TSD) operations.
- Air-to-air to ground (AAG) video transmission system.
- Integrated helmet and display sight system (IHADSS) characteristics, operations, and boresight.
- Target acquisition, storing, management, and handover.
- Fire Control radar (FCR) characteristics, and operations.
- MTADS characteristics and operations.
- Unmanned aircraft system (UAS) integration.
- UFD, MPD, and high action display (HAD) messages.
- Flight/Weapons symbology.
- Aircraft survivability equipment (ASE) characteristics and operation.

(9) Weapon system operation and deployment (FM 3-04.126, FM 3-04.140, and TM 1-1520- 25 1-10, and FM 3-09.32). Topics in this subject area are—

- Hellfire missile, semi active laser (SAL)/radio frequency characteristics.
- Area weapon system characteristics.
- Aerial rocket system characteristics.
- Ordinance identification.
- Laser operations (range/designator).

- Combined weapons engagement.
- Weapon selection and effects.
- Danger close ranges.
- Weapons initialization, arming, and safety.
- Ballistics.

(10) Tactical and mission operations (FM 3-04.126, FM 1-116, FM 3-04.140, FM 1-400, FM 1-402, JP 3-50, TM 1-1520-251-10, and unit SOP). Topics in this subject area are—

- Firing techniques
- Tactical formations and fire control.
- Attack by fire (ABF), support by fire (SBF), firing position (FP) selection.
- Reconnaissance/security fundamentals.
- Tactical reports.
- Evasive maneuvers.
- Radar/Infrared (IR) countermeasure employment.
- Fire support.
- Tactical airstrike.
- Aviation mission planning.
- Downed aircraft/search and rescue (SAR) procedures.
- Fratricide prevention.

(11) ME and MP system operations—systems malfunction analysis and trouble-shooting (TM 1-1520-251-10, EM 0126 integrated electronic technical manual (ETM), TM 11-1520- Longbow/Apache, and TM 1-1520-25 1-MTF). Topics in this subject area are—

- Engine start.
- Electrical system.
- Power plant.
- Hydraulic system.
- Vibrations.
- Communications and navigation equipment.
- Sensors–MTADS and MPNVS.
- 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.
- Stability augmentation subsystem (SAS).
- Command augmentation system (CAS).
- Maintenance operation checks.
- Maintenance test flight (MTF) requirements.
- Built-in Test–power built-in test (PBIT), continuous built-in test (CBIT), and initial built-in test (IBIT).

(12) SP, IP, IE, ME, and UT—evaluator/trainer topics (TC 3-04.11, IP Handbook). Topics in this subject area are—

- Cognitive domain levels of learning.
- Thorndike and the laws of learning.
- Characteristics of learning.
- Theories of forgetting.

- Retention of learning principles.
- Obstacles of learning during flight instruction.
- Human factors that inhibit learning: defense mechanisms.
- Instructor professionalism.
- Student emotional reactions, anxiety, normal/abnormal reactions to stress.
- The teaching process steps.

(13) Instrument evaluation topics. The following is a guide for the administration of the evaluation. The examinee is allowed access to references during the oral evaluation (AR 95-1, FM 3-04.240, TM 1-1520-251-10, DOD Flight Information Publication (FLIP), Federal Aviation Regulation (FAR)/Aeronautical Information Manual (AIM), General Procedures (GP) guide, Area Procedures (AP), local regulations and unit SOPs). There is no requirement to cover each section, however the examinee will have a working knowledge of the subjects below. The topics in the subject area are—

- Departure procedures.
- Closing flight plans.
- Required weather for takeoff, on route, destination, and alternate.
- Position reports.
- Notices to airmen (NOTAMs).
- Visual flight rules (VFR) requirements.
- Terminal aerodrome forecasts (TAF).
- Aviation routine weather reports (METAR).
- Flight plan preparation.
- DOD FLIP symbology.
- Airspace—types, dimensions, and requirements in which to operate.
- Fuel requirements.
- En route weather services.
- Weather hazards.
- Transponder requirements.
- Arrival procedures.

c. Phase 3–Flight Evaluation. If this phase is required, the following procedures apply.

(1) Briefing. The evaluation 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 run-up procedures. The evaluator will evaluate the examinee's use of the appropriate technical manual (TM), checklists (CL), and MTF CL or the integrated electronic technical manual (ETM). 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 may randomly select for evaluation any tasks listed on the mission or additional task list on the CTL, IAW TC 3-04.11. 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/MTF CLs, and/or the integrated ETM.

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.

Chapter 4

Crewmember Tasks

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.

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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 statement specify the conditions under which the task will be performed. Conditions include common conditions listed below and may include task specific conditions. 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) When NVG are used to accomplish a task, standards will be the same as those described for performance of the task without the NVG.

(2) 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, simulated IMC or IMC

(c) Day, night, and NVD equipment

(e) In a 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)

Note. The PC may approve instances when wearing an HDU during task performance is not desired.

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

- **Task 1040, Perform Visual Meteorological Conditions Takeoff (confined area altitude over airspeed).**
- **Task 1058, Perform Visual Meteorological Conditions Approach (termination to an OGE hover).**
- **Task 1079, Respond to Engine Failure (OGE).**
- Task 1170, Perform Instrument Takeoff.
- **Task 1406, Perform Terrain Flight (nap of the earth [NOE] flight).**
- **Task 1410, Perform Masking and Unmasking (unmasking at a hover vertically).**

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.

(c) Utilize applicable terminology in accordance with (IAW) FM 1-02.1.

(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 ±ball width.

(g) Acknowledge the low altitude warning audio.

(4) All tasks with the auxiliary power unit (APU)/engines operating.

(a) Maintain airspace surveillance (Task 1026).

(b) Apply appropriate environmental considerations.

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 (percent torque) 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 the 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 hover.

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 that 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, 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*, P, PI, PLT (backseat crewmember), and CPG 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 of 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 SOP.

(c) The pilot that is not the PC (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 for deviation 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 possible, the P should complete those emergency procedure steps which do not directly involve manipulation of the flight controls. When duties permit, assist the P* with obstacle clearance. The P will acknowledge braking announcing "guarding."

(f) The PLT. The PLT is the backseat crewmember.

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

(h) The trainer/evaluator. When acting as pilot during the training and evaluations, the trainer/evaluator will act as a functioning crewmember and perform as required, unless he is training/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 o 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, 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 3-04.11. 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 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 MTADS/MPNVS may exhibit video characteristics that the operator should be aware of. Those 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 MPNVS 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. 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 MPNVS 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 day television (DTV) is selected, the sensor will change to forward looking infrared (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.”

(i) NOE coupling. This is a FLIR video effect that is predominantly observed throughout the terrain flight environment when viewing terrain or objects that are above the altitude of the sensor. Unlike legacy FLIR systems, this phenomenon is difficult to exploit. To overcome the negative effect, aircrews should utilize the ACM (automatic control mode).

(4) 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 NVG.

g. Training and evaluation requirements.

(1) Task groups.

(a) Performance task. These task measure a 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. 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, page 2-7, already have the applicable modes of flight specified. The mission tasks listed as performance tasks in table 2-5, page 2-7, 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 bold type on the CTL.

(b) Technical task. These task measure the crewmember's ability to plan, preflight, brief, run up, or operate the 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 CTL.

(2) Training and evaluation requirements define whether a task will be trained or evaluated in the aircraft, LCT, or academic environment. Training and evaluations will be conducted only in the listed environments. Listing aircraft and/or LCT 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).

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

- Task 1070, Respond to Emergencies.
- **Task 1075, Perform Single-Engine Landing.**
- **Task 1079, Respond to Engine Failure.**
- **Task 1082, Perform Autorotation.**
- **Task 1085, Perform Stability and Command Augmentation System-Off/Backup Control System-On Flight.**
- **Task 1110, Perform Electronic Control Unit/Digital Electronic Control Unit Lockout Procedures.**
- **Task 1182, Perform Unusual Altitude Recovery.** (An IP, SP, or IE may conduct the training/evaluation in the aircraft).

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

(7) Tasks requiring specialized equipment do not apply to aircraft that do not have the equipment installed. This consideration includes 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 LCT as an FCR surrogate when an actual AH-64D with radar is unavailable.

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 3-04.203.

(d) FM 3-04.230.

(e) TM 1-1520-251-10-1 and TM 1-1520-251-10-2/ TM 1-1520-251-CL-1 and TM 1-1520-251-CL-2/ 1-1520-251-MTF.

(f) DOD FLIP.

(g) FAR/host-country regulations.

(h) Unit/local SOPs.

(i) Aircraft logbook.

(j) DA PAM 738-751.

(k) New equipment training team (NETT) supplemental information.

(l) Current USAACE student handouts.

(2) All instrument tasks.

(a) AR 95-1.

(b) FM 3-04.240.

(c) FAAH-8261-1.

(d) FAAH-8083-15.

(e) DOD FLIP.

(f) Aeronautical information manual.

(3) All tasks with environmental considerations-FM 3-04.203.

(4) All tasks used in a tactical/weapons situation.

(a) TM 1-1520-251-10-1 and TM 1-1520-251-10-2/ TM 1-1520-251-CL-1 and TM 1-1520-251-CL-2.

(b) FM 3-40.140.

(c) FM 3-04.111-111.

(d) FM 3-04.126.

(e) FM 3-04.203.

(f) TC 1-400.

(g) Fire control training update.

(5) All medical tasks-FM 3-04.301.

4-2. TASK LIST. The following tasks apply to crewmembers.

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 LCT, and given DA Form 5484 (Mission Schedule/Brief) and a unit-approved crew briefing checklist.

STANDARDS: Appropriate common standards and the following:

1. The PC will actively participate in and acknowledge an understanding of DA Form 5484 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.

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 (AAR) that follows the mission's conclusion (see Task 1262).

2. Procedures. Brief the mission using a unit-approved crew mission briefing checklist (table 4-1, page 4-8). Identify mission and flight requirements that will demand effective communication and proper sequencing and timing of actions by the crewmembers.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

Table 4-1. Crew mission briefing checklist

1. Mission overview.			
2. Flight plan.			
3. Weather (departure, enroute, destination, and void time).			
4. Flight route.			
5. Airspace surveillance procedures (Task1026).			
6. Required items.			
	a. Personal.		
	b. Professional.		
	c. Survival/flight gear.		
7. Crew actions, duties, and responsibilities.			
	a. Transfer of flight controls.		
	b. Two challenge rule.		
	c. Aircrew coordination principles with supporting qualities:		
		(P1) Communicate effectively and timely.	
			(Q1) Announce and acknowledge decisions and actions.
			(Q2) Ensure that statements and directives are clear and timely.
			(Q3) Be explicit.
		(P2) Sustain a climate of ready and prompt assistance.	
		(P3) Effectively manage, coordinate, and prioritize planned actions, unexpected events, and workload distribution.	
			(Q4) Direct assistance.
			(Q5) Prioritize actions and equitably distribute workload.
		(P4) Provide situational aircraft control, obstacle avoidance, and mission advisories.	
			(Q6) Maintain situational awareness.
			(Q7) Manage mission changes and updates.
			(Q8) Offer assistance.
8. Emergency actions.			
	a. Dual engine failure.		
	b. Dual hydraulic (HYD) failure/emergency hydraulic button.		
	c. Fuel per square inch (PSI) engine (ENG) 1 and 2.		
	d. Engine failure OGE hover.		
	e. Loss of tail rotor.		
	f. Nr droop.		
	g. Single engine malfunctions without single engine capability.		
	h. Actions to be performed by P* and P.		
	i. Portable fire extinguisher .		
	j. First aid kits.		
	k. Egress procedures and rendezvous point.		
	l. Canopy jettison (JETT).		
	m. Emergency stores JETT.		
	n. Power level manipulation.		
	o. CHOP button.		
	p. Engine and APU fire buttons/extinguishing bottles.		

Table 4-1. Crew mission briefing checklist

	q. Loss of intercommunication system (ICS)/communications interface unit (CIU).		
	r. Unusual altitude recovery.		
	s. Simulated emergencies.		
	t. Power level manipulation.		
9. General crew duties.			
	a. P*.		
		(1) Fly the aircraft with primary focus outside when VMC, inside when IMC.	
		(2) Avoid traffic obstacles.	
		(3) Cross check HMD symbology/flight page, messages, limitation timers/limiting indications, torque/target, wind velocity/direction, and engine/system pages as appropriate.	
		(4) Monitor/transmit on radios as directed by the PC.	
	b. 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.	
		(5) Cross check MPD pages (ENG/SYS, PERF, FLT) and/or instruments (PLT).	
		(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 (VESL)/ acquisition (ACQ)/setting considerations.		
	b. Weapon/weapon system (WPN), FCR, and 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 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 watch for airfield.	
		(6) On breakout and landing environment in sight, notify 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.	

Table 4-1. Crew mission briefing checklist

12. Analysis of the aircraft.		
	a. Logbook and preflight deficiencies.	
	b. Performance planning (approved software, performance planning card [PPC], aircraft PERF page).	
		(1) Engine/aircraft torque factors (ETF/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-MIN/MAX SE true air speed (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.		

TASK 1004

Plan a Visual Flight Rules Flight

CONDITIONS: Prior to conducting a VFR flight in an AH-64D helicopter or in an AH-64D LCT, and given access to weather information, 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 PERF page IAW Task 1010.
2. Obtain weather briefing and confirm the weather will be at or above VFR minimums IAW AR 95-1.
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. TAS ±5 knots.
    d. Ground speed ±5 knots.
    e. Estimated time enroute (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 SOP, and thoroughly brief the other crewmember IAW Task 1000.
9. Complete and file the flight plan.

DESCRIPTION:

1. Crew actions.
    a. The 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, file it with the appropriate agency, and ensure it is closed upon completion of the mission.

NIGHT OR NIGHT VISION DEVICE 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 IFR flight in AH-64D helicopter or in an AH-64D LCT, 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 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 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 Air speed (TAS) ±3 knots.
    c. Ground speed (GS) ±5 knots.
    d. Flight time ±5 minutes.
    e. 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 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, 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 CG will remain within allowable

limits for the entire flight. Complete the appropriate flight plan and file it with the appropriate agency and ensure it is closed upon completion of the mission.

TRAINING AND EVALUATION REQUIREMENTS:

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

TASK 1010

Prepare a Performance Planning Card

CONDITIONS: This task includes the following conditions:

1. PERF page. Given approved software; a data transfer cartridge, Department of Defense (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 LCT.

2. DA Form 5701-64-R (AH-64 Performance Planning Card [PPC]). Given a completed DD Form 365-4 (Weight and Balance Clearance Form F-Transport/Tactical) or data that includes basic and gross aircraft weight; the planning pressure altitude (PA) and temperature for takeoff, en route, and destination, TM 1-1520-251-10, and a blank DA Form 5701-64-R (AH-64PPC).

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), PLT (backseat crewmember) and 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 PPC data using TM 1-1520-251-10-1 or TM 1-1520-251-10-2 (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. Apply necessary adjustments based on installed additional equipment in accordance with applicable AWR.

7. 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 1-1520-251-10-1 or TM 1-1520-251-10-2.

(2) Electronic PPC software.

b. The 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 1-1520-251-10-1 or TM 1-1520-251-10-2 and DA Form 5701-64-R method. 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 TQ 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 TQ dual engine is derived by the ATF and maximum TQ 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 will accomplish the following steps:

a. Validate 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 1038).

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. OGE hover capability can be determined from the PERF page by one of the following methods: comparing hover TQ OGE to maximum TQ (dual engine), comparing maximum GWT OGE to current GWT, or noting the color of hover TQ OGE or maximum GWT OGE.

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

Note 4. The dual engine maximum TQ status window indicates 30-minute limit 701, 10-minute limit 701C or 701D/CC engine. Single engine maximum TQ status window indicates 2.5-minute limit 701/701C or 701D/CC engine.

Note 5. The system processor calculates velocity safe single engine (VS SE) using equations derived from each cruise chart in the operator’s manual. The systems processor 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 METHOD. The procedures for correctly completing DA Form 5701-64-R (figures 4-1 and 4-2, pages 4-24 and 4-25) and the extrapolation of performance data from chapters 5, 7, and 9, TM 1-1520-251-10-1 and TM 1-1520-251-10-2, are explained below.

Note. Some AH-64D helicopters are equipped with T700-GE-701D/CC engines which have the same performance characteristics as the T700-GE-701C. When conducting performance planning for T700-GE-701D/CC equipped aircraft, utilize performance charts for the T700-GE-701C.

1. Departure.

a. Item 1—PA. Record the PA at the departure point at the estimated time of departure.

b. Item 2—FAT. Record the free air temperature (FAT) at the departure point at the estimated time of departure.

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 Mission (MSN). Record fuel weight with reserve required at takeoff to complete the 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 TAS.

f. Item 6—ATF. Record the ATF. The ATF is a ratio of individual aircraft TQ available to specification TQ 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 TQ factors. The ETF represents a ratio of individual engine TQ available to specification TQ 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—Torque Ratio (TR). TR is used to compute the actual single/dual engine maximum TQ available with ETFs other than 1.0. If the ETFs are 1.0, record 1.0 in TR (block 8). If the ETFs are other than 1.0, compute using the TQ factor chart.

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

Note. It essential to understand that while performance is planned using the maximum TQ available charts, the turbine gas temperature (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 TQ calculated from the maximum TQ available (either dual or single engine) chart.

CAUTION

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

(1) Maximum TQ available (dual engine). The maximum TQ available (dual engine) is the maximum TQ (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 TQ available (dual engine) correlates to the top end of the 30-minute TGT range for the 701 engine, and to the top end of the 10-minute TGT range for the 701C or 701D/CC 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 TQ available dual engine correlates to the maximum TQ output of the engine at fuel flow limiting or gas producer turbines speed (Ng) limiting conditions as set inside the hydro mechanical unit (HMU). Fuel flow or Ng limiting can be recognized by power limiting (power turbine speed (Np)/main rotor speed (Nr) droop) with no further TQ 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 PA (item 1) and temperature (item 2) that will be encountered at departure and the maximum TQ available 30-minute limit chart for the 701 or the Maximum TQ available Chart 10-Minute Limit chart for the 701C or 701D/CC, compute maximum TQ available and record the value in the maximum torque available (dual engine) (Item 9).

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

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

Note 3. It is important to note that the value computed in item 9 is the average TQ that the two engines will collectively produce. One engine may reach its limiting setting prior to the other engine due to varying ETFs (resulting in a torque split). Crew members must consider the effect each engines' ETF will have on the maximum TQ available.

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

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

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

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

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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 TQ available (not to exceed 100 percent), sufficient power is available for OGE or IGE maneuvers. Aircraft with an ATF of 1.0 or maximum TQ available (dual engine) equal to or greater than 100 percent (after use of the TQ conversion chart or multiplication by the TQ ratio) use the hover ceiling chart(30-MIN LIMIT for 701 or 10-MIN LIMIT for 701C or 701D/CC) or the hover chart as described below. Aircraft with an ATF less than 1.0 and a maximum TQ available (dual engine) less than 100 percent (after use of the Torque Conversion Chart or multiplication by the TQ ratio) use the Hover Chart as described below.

- Step 1. Using the PA that will be encountered at departure, enter the Hover Chart at the PRESSURE ALTITUDE-FEET. Move right to the FAT-°C that will be encountered at departure. Draw a line down to the bottom of the lower grid.
- Step 2. OGE. Enter the top left grid, TORQUE PER ENGINE-%Q, at the maximum TQ available, (dual engine) (item 9), or the maximum continuous dual engine TQ limit (100 percent), whichever is less. Move down to the 80 (OGE) WHEEL HEIGHT-FT line, and then move right to intersect the previously drawn line. Record the GROSS WEIGH-LB in maximum allowable GWT (OGE/IGE) (block 11).
- Step 3. IGE. Enter the top left grid, TORQUE PER ENGINE-% at the maximum TQ available (dual engine) (item 9), or the maximum continuous dual engine TQ limit (100 percent), whichever is less. Move down to the 5 (foot) WHEEL HEIGHT-FT line, and then move right to intersect the previously drawn line. Record the GROSS WEIGHT-LB in maximum allowable GWT (OGE/IGE) (block 12).

k. Items 13 and 14—GO/NO-GO TQ (OGE/IGE). GO/NO-GO TQ 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.

(a) Step 1. Using the departure PA, enter the Hover Chart at PRESSURE ALTITUDE-FEET. Move right to the departure FAT-°C line, and move down to the maximum allowable GROSS WEIGHT - LB OGE (as determined in item 11).

(b) Step 2. Move left to the desired WHEEL HEIGHT – FT line (normally the 5-foot line). Move up to TORQUE PER ENGINE- %Q. Record the TQ value in GO/NO-GO TQ (OGE/IGE) (Block 13).

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

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(2) IGE.

(a) Step 1. Using the departure PA, enter the Hover Chart at PRESSURE ALTITUDE-FEET. Move right to the departure FAT-°C line, and move down to the maximum allowable GROSS WEIGHT-LB IGE (as determined in item 12).

(b) Step 2. Move left to the desired WHEEL HEIGHT-FT line (normally the 5-foot line). Move up to TORQUE PER ENGINE- %Q. Record the TQ value in GO/NO-GO TQ (OGE/IGE) (block 14).

Note. This TQ correlates to dual engine operation at the lesser of the maximum TQ 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 -10-1 or-2 chapter 5 structural limit (20,260 lbs), this value should equal maximum TQ available (dual engine) (item 9).

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

(1) OGE.

(a) Step 1. Using the departure PA, enter the Hover Chart at PRESSURE ALTITUDE-FEET (item 1). Move right to the departure FAT-°C line (item 2), and move down to takeoff GROSS WEIGHT-LB (item 3).

(b) Step 2. Move left to the 80 (OGE) wheel height-foot line. Move up to TORQUE PER ENGINE-%Q. Record the TQ value in predicted hover TQ (block 15).

(2) IGE.

(a) Step 1. Enter the hover chart at departure PRESSURE ALTITUDE-FEET (item 1). Move right to the departure FAT-°C line (item 2), and move down to takeoff GROSS WEIGHT-LB (item 3).

(b) Step 2. Move left to the desired WHEEL HEIGHT-FT line (normally the 5-foot line). Move up to TORQUE PER ENGINE- %Q. Record the TQ value in predicted hover TQ (block 16).

Note. A change in GWT of approximately 200 pounds equates to a change in TQ 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, TQ, 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) knots true airspeed (KTAS). Compute and record using the airspeed operating limits chart.

d. Item 20—Maximum speed in level flight with maximum continuous power applied—horizontal velocity (V_h) KTAS. Enter the bottom of the applicable (items 17 and 18) cruise chart at either the MAX CONT TORQUE line (adjusted for the TQ ratio of the engine with the lesser ETF) or 100%. Follow the slant of the MAX CONT TORQUE line (or move straight up if at the 100% line) until the second intersection of the GWT~LB line (item 3), or the VNE line, whichever occurs first. Read left or right as appropriate to the TRUE AIRSPEED - KNOTS value and record.

Note. If the MAX CONT TORQ line is not shown on the cruise chart, this indicates that for an ATF of 1.0, continuous TQ available exceeds 100%. If the ATF is other than 1.0, the maximum continuous TQ available may be less than 100%, and the V_h speed derived above may be less than planned.

f. Item 21—TR. Using maximum environmental conditions for the cruise profile portion of the mission, compute as in item 8 above.

g. Item 22—Maximum TQ available (dual engine). Using maximum environmental conditions for the cruise profile portion of the mission, compute as in item 9 above.

h. Item 23—Maximum TQ available single engine (SE). Using maximum environmental conditions for the cruise profile portion of the mission, compute as in item 10 above.

i. Item 24—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).

j. Item 25—Cruise TQ (dual engine).

(1) Step 1. Enter the applicable cruise chart at the TAS in item 24. Move horizontally to the appropriate aircraft GWT-lb line (item 3).

(2) Step 2. Move down to the INDICATED TORQUE PER ENGINE-%Q to read cruise TQ. Record this value in cruise TQ (block 25).

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

k. Item 26—Cruise fuel flow (dual engine). Using the applicable cruise chart, record the predicted dual engine fuel flow.

(1) Step 1. Enter the applicable cruise chart at the TAS in item 24 above. Move horizontally to the appropriate aircraft GWT-lb line (item 3).

(2) Step 2. Move up to the TOTAL FUEL FLOW-LB/HOUR to read cruise fuel flow. Record this value in cruise fuel flow (block 26).

Note. To determine corrected fuel flow for other than baseline wing store configuration, read up from the corrected cruise TQ percent (item 25, step 2) and record TOTAL FUEL FLOW-LB/HOUR in cruise fuel flow (block 26).

l. Item 27— CONT TORQUE AVAILABLE. This TQ value represents the power required to maintain V_h (as previously computed in item 20). Record the TQ value obtained in item 20.

m. Item 28--Maximum rate of climb (R/C) or endurance TAS. Compute and record.

n. Item 29—Maximum range TAS. Compute and record.

o. Items 30 and 31—Single engine capability TAS (minimum/maximum). Minimum and maximum SE capability TAS is the minimum/maximum TAS at which the aircraft can maintain level flight with a SE under specific environmental conditions while operating at maximum TQ available (single engine item 23) .

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

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

Note 3. During training, the crew may elect to utilize the lower of the TQ value of item 23 or 122% in computing minimum and maximum SE airspeeds.

(1) Step 1. Enter the bottom of the applicable (items 17 and 18) cruise chart at 50 percent of the maximum single engine TQ available (item 23). Move up to the first intersection of INDICATED TORQUE PER ENGINE- %Q and the GWT-LB line (item 3).

(2) Step 2. Move horizontally to the TRUE AIRSPEED-KNOTS. Record this value in single engine capability as (minimum/maximum) (block 30).

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

(4) Step 4. Move horizontally to the TRUE AIRSPEED-KNOTS. Record this value in single engine capability as (minimum/maximum) (block 31).

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.

(5) 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 thru 4 above and record the TAS value in remarks (item 44).

Note 1. If after jettison, the GWT-LB line is not intercepted, there is insufficient power to maintain level flight with a SE at the current GWT. Refer to item 32 for maximum allowable GWT for SE flight, and note that as fuel is consumed, SE 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 SE airspeed and 1 knot greater maximum single engine airspeed.

p. Item 32—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. This GWT corresponds to Max RC/Endurance (END) airspeed with maximum TQ available-single engine applied.

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

(1) Step 1. Enter the bottom of the applicable cruise chart at 50 percent of the maximum SETQ available (item 23). Move up to intersect the MAX R/C OR MAX END line.

(2) Step 2. Interpolate maximum GWT for single engine flight. Record this value in maximum allowable GWT—single engine (block 32).

(3) Step 3. Move horizontally to TRUE AIRSPEED - KNOTS. Record this value in SINGLE-ENG MAX R/C TAS (MAX GWT) (block 33)

3. Fuel management (item 34). Use this space to record the in-flight fuel consumption check, to include fuel burnout and appropriate VFR or IFR reserve.

4. Arrival. Compute Arrival data if the environmental conditions at any of the destinations have increased by 5C, 1000 feet PA, or the aircraft weight increases 1000 pounds from takeoff point.

a. Item 35—PA. Record the forecast PA at the destination at ETA.

b. Item 36—FAT. Record the forecast FAT at the destination at ETA.

c. Item 37—Landing GWT. Record the estimated landing gross weight.

d. Item 38—TR. Using arrival environmental conditions, compute as in item 8 above.

e. Item 39—Maximum TQ available (dual engine). Using arrival environmental conditions, compute the maximum dual engine TQ available as described in item 9.

f. Item 40—Maximum TQ available (single engine). Using arrival environmental conditions, compute the maximum single engine TQ available as described in item 10.

g. Items 41 and 42—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 43—Predicted hover TQ (IGE). Using arrival environmental conditions and landing GWT, compute the TQ required to hover IGE as described in item 16.

i. Item 44—Predicted hover TQ (OGE). Using arrival environmental conditions and landing GWT, compute the TQ required to hover OGE as described in item 15.

Note 1. The same PPC will suffice for consecutive takeoffs and landings when the load or environmental conditions have not increased significantly (5C, 1000 feet PA, or 1000 pounds).

Note 2. If environmental conditions throughout the flight will vary significantly, it may be necessary to compute multiple PPC's for the same flight.

j. Item 45—Remarks. Use this area to record various pertinent performance planning remarks.

(1) When OGE power is not available or limited, use this area to record the minimum dual engine airspeed required to maintain level flight. 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 1064. The procedure provides a power (torque percent) margin to avoid, if applicable, TGT, fuel flow, or Ng limiting.

Note. Minimum dual-engine airspeed is defined as the minimum airspeed at which level sustained flight can be maintained under maximum dual engine TQ conditions. Airspeeds below this value require more power than the engines can collectively produce. To determine this TAS, perform the following steps.

(a) Step 1. Enter the bottom of the applicable cruise chart at 5 percent below the maximum TQ available (dual engine) (item 9), or at the maximum continuous dual engine TQ limit (100 percent), whichever is less. Move up to the first intersection of INDICATED TORQUE PER ENGINE- %Q and, as applicable the GWT-LB line (item 3 or 36).

(b) Step 2. From this point, read horizontally to obtain the minimum TRUE AIRSPEED-KNOTS required to maintain level flight or conduct a power limited/unavailable rolling takeoff or roll-on landing. Record the TQ required and TAS in the remarks section.

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

(3) (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 TQ represents the TQ 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.

AH-64 PERFORMANCE PLANNING CARD
For use of this form, see TC 3-04.42; the proponent agency is TRADOC.

DEPARTURE

PA (1)	FAT (2)	TAKEOFF GWT (3)

	DUAL ENGINE	SINGLE ENGINE #1	SINGLE ENGINE #2
LOAD (4) lb			
FUEL MSN (5) lb			
	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:
(45)

CRUISE DATA

PA (17)	FAT (18)	Vne (19)	Vh (20)

	DUAL ENGINE	SINGLE ENGINE #1	SINGLE ENGINE #2
	TR (21)	TR (21)	TR (21)
MAX TORQUE AVAILABLE	(22)	(23)	(23)
CRUISE SPEED TAS	(24)		
CRUISE TORQUE	(25)		
CRUISE FUEL FLOW	(26)		
CONT TORQUE AVAILABLE	(27)		
MAX R/C OR ENDURANCE TAS	(28)		
MAX RANGE TAS	(29)		
SINGLE-ENG CAPABILITY TAS *(MIN/MAX)*		(30) / (31)	
MAX ALLOWABLE GWT – SINGLE ENG		(32)	
SINGLE-ENG MAX R/C IAS *(MAX GWT)*		(33)	

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Figure 4-1. Sample DA Form 5701-64-R, page 1

FUEL MANAGEMENT (34)				
	FUEL/TIME	BURNOUT ____________________Z		
START	___________/___________	RESERVE ____________________Z		
STOP	___________/___________	CONSUMPTION RATE __________LB PER HR		

ARRIVAL				
PA (35)	FAT (36)	LANDING GWT (37)		
	DUAL ENGINE	SINGLE ENGINE #1	SINGLE ENGINE #2	
	TR: (38)	TR: (38)	TR: (38)	
MAX TORQUE AVAILABLE	(39)	(40)	(40)	
MAX ALLOWABLE GWT *(OGE/IGE)*	(41) / (42			
PREDICTED HOVER TORQUE *(IGE)*	(43)			
PREDICTED HOVER TORQUE *(OGE)*	(44)			

REMARKS:
(45)

DA FORM 5701-64-R, PAGE 2 OF 2

Figure 4-2. Sample DA Form 5701-64-R, page 2

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; in an AH-64D helicopter or AH-64D LCT with the appropriately loaded DTC.

STANDARDS: Appropriate common standards and the following:

1. Verify that 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 run-up, 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 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.

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 TADS and MPNVS 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, 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 variable message format (VMF)/high frequency (HF) messages.
8. Enter appropriate weapons, (FCR and aircraft survivability equipment 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. Crew Actions.

   a. PC is responsible for ensuring that pertinent data has been correctly entered into the approved software and subsequently loaded onto the 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.

   b. 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 operator's manual.

TRAINING AND EVALUATION REQUIREMENTS:

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

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 Inspection and Maintenance Record).

DESCRIPTION:

1. Crew actions.

   a. The 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 SOP as applicable.

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

NIGHT OR NIGHT VISION DEVICE 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. FM 3-04.203 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 LCT 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 Inspection and Maintenance Record) and the 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 PLT (backseat crewmember) will announce 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 run-up 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 MPD brightness are high enough to see the instruments and systems status easily.

   e. The P will call out before taxi, taxi, before takeoff, before landing, and after landing checks.

2. Procedures. TM 1-1520-251-10 and TM 1-1520-251-CL checks: Perform interior thru before leaving the helicopter checks in accordance with TM 1-1520-251-10 and TM 1-1520-251-CL. The checklist is designed for most checks to be performed with a degree of PLT/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.

NIGHT OR NIGHT VISION DEVICE 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 LCT.
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 LCT, and with the P* fitted with a boresighted 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 FCR airspace surveillance considerations specific to either the AH-64D with radar or the AH-64D without radar.

b. The 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). 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. 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 Scope (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.

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. 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.

c. 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.

d. 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 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 MTADS 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 1032

Perform Radio Communications Procedures

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

STANDARDS: Appropriate common standards and the following:

1. Check, set, and operate aircraft avionics.
2. Establish radio contact with the desired individual, unit, or 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 FLIP and/or local procedures.

DESCRIPTION:

1. Crew actions.

   a. The 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 P should monitor avionics, perform frequency changes, and establish initial contact. He will copy pertinent information and repeat information as requested by the 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 PLT (backseat crewmember)/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, 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 LCT.
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 LCT, on a suitable surface, with the before-taxi check completed, the aircraft cleared, and the P* fitted with a boresighted 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 TQ 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 the tail wheel is locked or unlocked as required before starting the ground taxi. The tail wheel will be unlocked prior to applying anti-TQ 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 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-TQ 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 TQ 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 TQ for terrain and gross weight. High GWTs, soft, rough, or sloping terrain may require the use of more than 30 percent TQ.

   b. 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 as necessary to maintain a level fuselage attitude. Rate of turn will be controlled by pressure and counter pressure on the anti-TQ pedals. HDU symbology 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. 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 2. 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 3. The P* may temporarily reduce taxi TQ 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 4. 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 5. During single engine ground taxi, double the required dual engine taxi TQ for a given condition.

NIGHT OR NIGHT VISION DEVICE 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 and composite video.

   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 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 FLIR cues and periodically toggle between transition and hover mode. Hover mode will provide a valid velocity vector through the EGI while the transition mode will provide a valid ground speed in the next waypoint status window.

   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 LCT.
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 LCT with the before-takeoff check completed, aircraft cleared, P* fitted with a boresighted HDU, PERF page selected when a hover power check will be accomplished, 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 near the takeoff point and in the direction of takeoff.
3. Determine without error that sufficient power is available to complete the mission.
4. Execute a smooth controlled descent with minimum drift at touchdown.

DESCRIPTION:

1. Crew actions.

a. The P* will announce his intent to perform a hover power check or 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 OGE hover or low speed OGE hovering operations, the P* will announce his forced landing or single engine flyaway plan.

b. The 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 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. Hover power check. An initial power check will be completed and pertinent environmental and load considerations will be applied throughout the flight. Perform a power check by referencing the PPC and validating the PERF CUR mode page calculations.

(1) The P* will announce his intent to bring the aircraft to a stationary hover, in the direction of takeoff, for a hover power check. Use a 5-foot stationary hover 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 TQ and predicted hover TQ.

(2) The P will monitor the aircraft instruments and verify the power check. He will compare the actual hover performance data to that of the PPC and PERF page and will announce the results to the P*. If the TQ required to maintain a stationary hover exceeds the GO/NO-GO TQ OGE but does not exceed the GO/NO-GO TQ IGE, the P* may attempt only IGE maneuvers.

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

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c. 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.

d. 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.

e. 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 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 apply sufficient power and execute a takeoff. If a takeoff 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.

NIGHT VISION SYSTEM CONSIDERATIONS:

1. Takeoff to a hover. Clear the aircraft by slewing the FLIR sensor within the available field of regard (FOR). Select visual references to aid in heading, position, and altitude control. Supplement visual references, as appropriate, with symbolic information. Orient the NVS LOS so that the selected references remain visible during the maneuver. Depress the NVS turret below level in order to perceive more ground cues. Maintain a fixed-head position during takeoff so that any movement perceived in the imagery is relative to the aircraft and not to the MPNVS or MTADS turret. Use imagery and appropriate symbology for heading, altitude, and drift control.

2. Hovering flight. Select the appropriate symbology mode (hover, bob-up, or transition). 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. 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 GS in hover mode and 60 knots GS in transition mode. Use imagery to maintain altitude and clearance, and crosscheck heading tape to maintain heading. Upon approaching the desired termination point begin decelerating, using acceleration cue and velocity vector, so as to arrive in a stabilized hover. Maintain altitude with FLIR imagery and a cross-check of radar altitude.

3. Hovering turns. Select the appropriate symbology mode (hover or bob-up). Stabilize the aircraft while referencing imagery-supplied close-in cues, the acceleration cue and velocity vector, and radar altitude symbology. Clear the aircraft by slewing the FLIR sensor within the field of regard. Use the acceleration cue and velocity vector to maintain a constant position and the altitude and VSI symbols to maintain a constant altitude. Depending on the rate of turn, the acceleration cue will show some displacement even when there is no velocity vector stemming from the centroid. To aid in determining the termination point, select a reference point visible within the instantaneous FOV of the FLIR. Prior to initiating hovering turns, the P* should interrupt the force trim until the desired heading is achieved. This will prevent undesirable and/or unsuspected yaw rates that may occur when force trim is overridden by anti TQ pedal displacement. During the turn, employ a cross-check that includes FLIR and symbolic cues. 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.

4. Landing from a hover. Select the desired mode of NVS symbology. Use imagery and symbology to control the descent rate, drift, and heading.

Note 1. The location and gimbal limits of the FLIR sensor prevent the P* from seeing the terrain directly beneath the aircraft. If conducting a landing from a hover, the P* must clear the intended touchdown point prior to positioning the aircraft over the landing area.

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. Slew rates for the MTADS are slower than that of the MPNVS. Slower head movements will prevent image overshoot and the possibility of an unusual attitude.

SNOW/SAND/DUST CONSIDERATIONS: Hovering in a snow/sand/dust condition reduces available ground references and may increase the possibility of spatial disorientation. If brown/whiteout conditions are expected, aircrew should consider use of hold modes prior beginning the ascent. If available ground references are lost during ascent, reference symbology/instruments and conduct altitude over airspeed takeoff.

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 LCT.
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 LCT with the hover power and before- takeoff checks completed, aircraft cleared, and P* fitted with a boresighted 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 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) TQ (%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 ENG page. The P* will consider snow, sand, and obstacle barrier clearance when he evaluates the power required versus power available.

b. The 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 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. 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 TQ or as necessary. Depending upon the configuration of the aircraft and the load, the P* may have to utilize 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 ETL to obtain the desired climb attitude and airspeed. 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. Upon achieving the desired airspeed, position the collective to establish the desired rate of climb (approximately 500 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 TQ above hover power or as necessary, not to exceed dual engine maximum TQ, 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 TQ, 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 flight controls upon reaching the desired 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.

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

d. VMC limited power takeoff (hover power). Environmental and helicopter loading may result in the helicopter hovering IGE at or near maximum TQ 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 crewmember 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 TQ 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. Use the pedals to place the aircraft in trim upon establishing a positive rate of climb.

(2) From a hover. Select reference points to maintain ground track. Apply forward cyclic to accelerate the aircraft while maintaining hover TQ. 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.

Note 4. When conducting limited power takeoffs, the P* should consider accelerating to MAX END/R/C airspeed prior to initiating the climb and maintaining that airspeed until achieving the desired altitude. This airspeed provides the greatest margin between power required and power available.

NIGHT OR NIGHT VISION DEVICE 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. NVS from the ground.

a. Select the hover mode symbology.

b. Use FLIR imagery and TQ symbology to establish the aircraft light on the wheels.

c. As the aircraft leaves the ground, verify the desired rate of forward movement by crosschecking 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 (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 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 TQ below hover power. Check the controls for proper response. Continue, smoothly increasing the collective to maximum TQ 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. 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 TQ 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 TQ 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 TQ 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. 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 LCT.
2. Evaluation will be conducted in an AH-64D aircraft.

REFERENCES: Appropriate common references.

TASK 1048

Perform Fuel Management Procedures

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

STANDARDS: Appropriate common standards and the following:

1. Determine fuel requirements for the mission based upon range or time as appropriate.

2. Verify fuel page subsystem correctly displays fuel type and quantity in each tank and that the desired fuel page options are correctly set for the mission.

3. Verify that the required amount of fuel is onboard at the time of takeoff.

4. Compute in-flight fuel consumption check within 15 to 30 minutes of leveling off or entering into the mission profile.

5. Manage the fuel system as directed by the PC IAW with this ATM task, the aircraft operator's manual, AWRs, and other applicable references.

6. Establish minimum fuel (Bingo fuel) requirements IAW AR 95-1 and METT-TC.

DESCRIPTION:

1. Crew actions.

a. The PC has overall command responsibility for fuel management however fuel management functions may be delegated to the opposite crew member.

b. Crewmembers will announce and acknowledge to the opposite crewmember when any fuel management action (fuel transfer, cross-feed) is taken. The crew will acknowledge the results of the fuel check.

c. The PC is responsible to ensure that the aircraft stays within longitudinal and lateral weight and balance CG limitations and to direct or perform manual fuel transfer if required to remain within CG.

d. The PC 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.

2. Procedures.

a. Pre-mission fuel requirements. During permission planning determine amount of fuel required for the mission. Total fuel requirements may be expressed in range (distance) required, time required or both. Additionally the crew will establish minimum fuel requirements IAW AR 95-1, mission requirements, and local SOPs. Two minimum fuel values are defined by FM 1-02.1:

- "Bingo" fuel: Bingo fuel is defined as the minimum amount of fuel necessary to fly to a refuel site at the appropriate cruise speed in order to land with the regulatory minimum required fuel reserve. As the VFR minimum regulatory requirement is 20 minutes of fuel in the tanks at landing, the Bingo fuel would be something more than 20 minutes of fuel. Because Bingo is driven by AR 95-1 and the physics of fuel consumption, it is not negotiable or extendable.
- "Joker" fuel: Joker fuel is a PC or unit defined fuel state above bingo. Joker fuel is the point where a training event is terminated or when the flight should begin to return to base or proceed to a refuel site. Since Joker fuel is set some amount higher than Bingo Fuel it can be exceeded at the discretion of the PC based upon the tactical situation.

b. Initial fuel check. Prior to takeoff, note fuel quantity and compare with mission fuel requirements determined during pre-mission planning. If fuel on board is inadequate, have the aircraft refueled or abort or revise the mission.

c. Fuel consumption check**.** After entering the mission profile conduct an initial fuel consumption check. The crew may utilize either a manual calculation or reference the aircraft's DMS (electronic fuel consumption check). Compute total pounds per hour, Bingo time of day, and burn out time of day. Evaluate the fuel consumption rate to ensure that the burn rate is nominal (or approximates predicted fuel flow rate) to ensure there is no evidence of combat damage, leaks, or mechanical malfunctions.

d. In-flight fuel management. The crew will optimize their aircraft fuel management based upon mission conditions. The crew should select maximum range or maximum endurance airspeeds whenever maximum distance or time aloft is required. Normally flying at max range airspeed is the most efficient method of commuting between points and should be considered an optimal power setting unless the tactical situation demands otherwise. Nap of the earth, high speed flight (as in responding to a troops-in-contact), or active/continual collective cycles (as in close formation flight) will result in the highest fuel consumption rate. During transitory high power demands or low power settings, simply referencing the aircraft's displayed TSD "Endurance" will result in an inaccurate apparent station time. After arriving at the objective, the crew should consider operating at max END airspeed to maximize available station time. The crew will ensure fuel is balance as required (automatically or manually) in order to maintain the aircraft within CG limitations.

e. Fuel time/distance management. Fuel consumption can be expected to vary proportionally to the aircraft's gross weight. As fuel reserves decrease so does the aircraft's total GWT. After burning 2,000 lbs. of fuel and expending ordinance, the actual fuel burn rate required may be significantly less than the pre-mission PPC value. When considering the time to break station, evaluate the max range airspeed at the actual (reduced) GWT in order to determine the time (and therefore fuel) required to return to the forward arming and refueling point (FARP).

f. Determining station time: Though the fuel page "Bingo" selection is set in pounds of JP-8, the crew may find it more useful to establish a Bingo value measured by either distance (to the FARP) or time (until relieved). For air-ground-integration purposes the crew should establish the aircraft's Bingo Fuel in hours and minutes remaining or into a hard time (time of day).

g. J-brevity fuel management terminology. The following fuel related terms may be found in FM 1-02.1 and are utilized for joint interoperability:

- Bingo: Fuel required to fly to refuel site and land with VFR or IFR reserve.
- Joker: Fuel designated above Bingo to terminate training or return to base.
- Buster: Fly at maximum continuous speed (V_H).
- Liner: Fly at maximum range airspeed.
- Saunter: Fly at best endurance airspeed (MAX END-R/C).

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references and FM 1-02.1.

TASK 1058

Perform Visual Meteorological Conditions Approach

CONDITIONS: In an AH-64D helicopter or an AH-64D LCT with the before-landing check completed and the P* fitted with a boresighted HDU.

STANDARDS: Appropriate common standards and the following:

1. Select a suitable landing area.
2. Evaluate power required versus power available for the type of approach selected.
3. 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.
4. Maintain ground track alignment with the landing direction with minimum drift.
5. Maintain rate of closure appropriate for the conditions.
6. Align aircraft with landing direction below 50 feet or as appropriate for obstacle avoidance.
7. 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 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 TSDs wind status window, PERF page wind status window, velocity vector with a comparison of TAS and 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, 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 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 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 ETL while 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.

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 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 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 LOS reticle on the intended landing point and reference the (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 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. 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.

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 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 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. (See Task 1064 for additional information.)

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: Select an approach angle, depending on the wind, density altitude, gross weight, and obstacles. Before beginning the approach, the crew will determine and brief an escape route in case a go-around is necessary. During the approach, continue to determine the suitability of the intended landing point. The rate of closure maybe difficult to determine until the aircraft is close to the landing area. Reduce airspeed to slightly above ETL, but not below the minimum dual engine airspeed when OGE power is not available, until the rate of closure can be determined. Before reaching the near edge of the landing area, the descent should be stopped and the rate of closure slowed. At this point, decide whether to continue the approach or make a go-around. If a go-around is required, it should be performed before decelerating below ETL. If the approach is continued, terminate in the landing area to a hover or to the surface. After touching down, check aircraft stability as the collective is lowered.

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 may minimize power requirements. During high wind and/or minimal power margin conditions, this may not be the preferred termination point do to the creation of a low pressure area resulting in excessive down-drafts.

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 LCT.
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 LCT with the aircraft cleared, with an A/C FLT page displayed on one multipurpose display in both crew stations, with before- landing checks completed, and the P* properly fitted with a 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 FLT page throughout the maneuver.

b. The P will assist in setting the parking brakes and clearing the aircraft. If the brakes must be set in flight, CPG (front seat crewmember) should be on the flight controls and will announce “guarding.” The 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 FLT 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. 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, apply cyclic as necessary to level the fuselage roll attitude. After achieving the desired roll attitude (level if possible), 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 no less than 25 percent TQ applied. Once the cyclic is neutralized, continue to lower the collective to the full down position. If 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 a minimum of 25 percent TQ, then begin applying cyclic into the slope to maintain the position of the upslope wheel. Continue to raise the collective and adjust the cyclic as necessary to achieve a hover attitude while maintaining heading with the pedals. As the aircraft leaves the ground, continue to 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 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 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 TQ effect.

Note 5. Aircrew should consider aborting the slope landing if the upslope landing gear begins to slide, the aircraft brakes do not hold, a physical cyclic stop is encountered, or a crewmembers comfort margin is exceeded.

NIGHT OR NVG CONSIDERATIONS:

1. 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.

2. When performing operations during unaided night flight, ensure that the searchlight or landing light (white light) is in the desired position. Using the white light will impair night vision for several minutes. Therefore, exercise added caution if resuming flight before reaching fully dark adaptation.

NVS CONSIDERATIONS:

1. The location and gimbal limits of the FLIR sensor prevent the crewmembers from seeing the actual touchdown point. The crew 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.

Note. 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 LCT.

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 LCT, with the before-landing check completed, and the P* properly fitted with a boresighted HDU.

STANDARDS: Appropriate common standards and the following:

1. Touchdown at or above ETL, or when IGE power is not available, at or above the calculated minimum dual engine airspeed as 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 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 TSDs wind status window, PERF page wind status window, or external wind cues. Select the desired HDU flight symbology format or the 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, 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 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. Below 50 feet AGL, align aircraft with the landing direction. Execute a controlled touchdown at or slightly above ETL. After landing, adjust the cyclic as necessary to maintain a level fuselage attitude, lower the collective, and, if desired, use aerodynamic braking to assist in stopping the rollout. Wheel brakes should be used if the safe outcome of the maneuver is in doubt. After stopping, center the cyclic before lowering the collective in order to avoid droop stop pounding.

> ***Note 1.*** Aerodynamic braking is accomplished by applying aft cyclic with no less than 30 percent dual engine TQ (%Q). The amount of %Q required will vary based on (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 IGE power is not available; for example, high density altitude or GWT. This may also be performed in an environment where obscurants such as sand, dust, or snow are present.

NIGHT OR NIGHT VISION DEVICE 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 CONSIDERATIONS: Referencing the FPV, the separation between the 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.

LIMITED POWER TRAINING CONSIDERATIONS: When simulating IGE power is limited or unavailable, establish a simulated power limit of 10% below hover power ±3%.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in an AH-64D aircraft or an AH-64D LCT. 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 IP/ IE, in an AH-64D LCT, 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 non-underlined 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 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 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 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 ATM task numbers.

Note. With the exception of approved 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 LCT 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft, AH-64D LCT, or academically.

REFERENCES: Appropriate common references.

TASK 1075

Perform Single Engine Landing

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

STANDARDS: Appropriate common standards and the following:

1. Maintain airspeed at or above 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 first 1/3 of the usable landing surface.
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 TQ or no less than 60 percent single engine. The amount of TQ required will vary based on gross weight of the helicopter and length of landing area.

   b. The 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, Nr droop, or engine operating limits (especially TQ 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-TQ 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 NOE approach or manual stabilator mode to enhance forward visibility during the descent. Once the descent has been initiated, use of the 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. 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 AGL, align the aircraft with the landing direction. Maintain minimum VSSE until 10 to 20 feet above touchdown, then coordinate cyclic, pedals, and collective to affect a touchdown without exceeding single engine TQ limits. Below 10 to 20 feet the aircraft may be decelerated as necessary based on the landing areas size, surface conditions, and power available.

   c. After landing, adjust the cyclic as necessary to maintain a level fuselage attitude, lower the collective, and, if desired, use aerodynamic braking to assist in stopping the rollout. Wheel brakes should be used if the safe outcome of the maneuver is in doubt. After stopping, center the cyclic before lowering the collective in order to avoid droop stop pounding.

Note 1. This task may be performed as a continuation of Task 1079.

Note 2. During the termination phase of this maneuver as the result of an actual engine failure, the P* should increase collective as necessary to cushion the landing. Nr droop can be expected.

LIMITED OR NO SINGLE ENGINE CAPABILITY: During these situations the aircrew will be unable maintain level flight and will be required to execute a forced decent and landing. P* will be required to adjust the collective as necessary to maintain Nr within limits and adjust airspeed to Max RC/END. This airspeed will provide the minimum rate of decent with maximum TQ available single engine applied.

NIGHT OR NIGHT VISION DEVICE CONSIDERATIONS: Rate of closure will be much more difficult to detect unaided or under NVDs.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft with an IP or in the AH-64D LCT. 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 1079

Respond to Engine Failure

CONDITIONS: In an AH-64D helicopter with an IP, or in an AH-64D simulator, with an ACFT ENG page displayed on one MPD in both crew stations, and P* properly fitted with a boresighted HDU. Out-of-ground effect power available, the before-landing check completed when performing simulated engine failures OGE.

Note. Performing engine failure IGE will only be accomplished in the simulator.

STANDARDS: Appropriate common standards and the following:

1. SE failure in cruise flight.
   a. Recognize the emergency and identify the appropriate corrective actions.
   b. Adjust airspeed to remain within SE airspeed limits.
   c. Adjust airspeed to max RC/END (no single engine capability).
2. OGE.
   a. Recognize the emergency and identify the appropriate corrective action.
   b. Establish single engine flight with minimum loss of altitude or effect a smooth and controlled touchdown in a suitable area.
   c. Establish entry altitude, +50 feet, -0 feet.
3. In-ground effect. Execute a smooth, controlled descent and touchdown with no lateral drift.

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 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 SE limitations. He will announce “simulated engine failure on ENG 1 or ENG 2” and whether or not single engine capability exists. The IP will reduce one power lever to IDLE or establish a simulated TQ limit 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 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 TQ to double. At high TQ settings, TQ doubling will result in extremely high TQ values on the engine carrying the load, followed by engine power limiting and rotor decay.

CAUTION

While performing this maneuver above maximum single engine airspeed, both power levers will remain in the fly position.

e. Out-of-ground effect.

(1) 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.

(2) The 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.

f. In-ground effect.

(1) 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.

(2) 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.

(3) 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.

(4) The 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.

a. Cruise flight.

(1) 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 TQ and rotor RPM within limits. Select an airspeed that is between minimum and maximum single engine airspeeds to prevent loss of rotor RPM and altitude. If single engine capability is announced as not available, the P* will adjust the flight controls to attain Max RC/END airspeed, maintain Nr, and select/announce a forced landing site.

(2) 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 TSDs wind status window, PERF page wind status window, or external wind cues.

(3) If the aircraft is above maximum single engine airspeed, the P* will reduce the collective to a TQ 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. The maximum airspeed with one engine inoperative (67% of Vne) is the speed beyond which an average pilot will not be capable of regaining Nr after the loss of the other engine due to excessive blade pitch and low inertial rotor blades. An actual engine failure at high TQ setting will be accompanied by the "**Engine 1 or 2 out**" warning, reduction in engine noise, engine auto page, 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 excessive loss of main rotor lift as well as tail rotor effectiveness, possible loss of electrical power, and subsequent loss of helicopter control.

b. Out-of-ground effect.

(1) Position the aircraft at an OGE hover in a location to make the force landing area or flyaway plan and note the TQ 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 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.

(2) 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 TQ 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 1-1520-251-1 0/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.

(3) 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 the MAX RC/END or an airspeed between 77 and 107 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.

CAUTION

When conducting forced landing plan, conditions of high density altitude (DA), high GWT, and crosswinds are conducive to developing high rates of descent with high torque requirements to recover. To avoid high rates of descent and possible over torque or Nr decay, collective shall be adjusted so that an acceptable compromise between simulating Nr control and rates of descent can be maintained. Rapid collective reduction will result in excessive high rates of descent. The primary consideration is that the P* will smoothly reduce the collective to maintain rotor RPM in the event of an actual engine malfunction.

(4) 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. As the aircraft approaches the ground, apply cyclic to achieve a level fuselage attitude. Avoid excessive application of aft cyclic as this will cause the tailwheel to contact the ground prior to the main landing gear, resulting in possible damage. Apply collective as necessary (exceeding previously established power setting, if warranted) to cushion the landing/minimize impact. During roll out, aerodynamic braking or wheel brakes may e used to stop forward movement. Apply a smooth, progressive reduction of collective.

Note 5. 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 6.: When this task is conducted in the aircraft at or above 400 feet 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 2.5 minute single engine torque limit (122%), or the actual maximum torque single engine, whichever is less. However, when this task is performed in the aircraft below 400 feet AGL, both power levers must remain in the FLY position. The IP should direct the P* to use a dual- engine torque that is derived from 50 percent of the maximum single-engine torque available. The IP will announce when making an input to or assuming the aircraft controls.

Note 7. With the combination of high density altitude and GWT, Nr may become uncontrollable under single engine conditions if an aircraft is allowed to enter a settling-with-power condition.

c. In-ground effect. 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.

d. Limited or no single engine capability. During situations where Single Engine Capability does not exist or is marginal, the aircrew will be unable maintain level flight, with MAX Torque Avail Single Engine applied, and will be required to execute a forced decent. The descent should be conducted at MAX END/RC airspeed, as flying at this airspeed with MAX Torque Available Single engine applied will result in the slowest rate of descent. If airspeed is allowed to increase or decrease away from MAX END/RC airspeed the rate of descent will increase.

1. The P* will adjust the collective as necessary to maintain Nr within limits and adjust airspeed to MAX RC/END airspeed. The P* will adjust the collective to achieve MAX TQ Single Engine, or the value established by the IP. The P* will select a suitable landing area and will use turns, as necessary, to maneuver the aircraft for a safe landing at the intended landing area. The P* will complete or simulate emergency procedures outlined in TM 1-520-251-CL and if time permits will direct the P to verify the procedures. The crew should plan each forced descent as continuing to the ground.

2. During training the IP will select, and announce to the P*, a torque value that ensures a controllable rate of descent is established. When coupled with MAX END/RC airspeed this torque setting should result in a rate of descent of no more than 500’/min. A value 3%-5% below the PERF. PAGE calculated MAX END/RC torque value should be sufficient.

3. If this method is selected for training/evaluation in conjunction with Task 1075, the IP will initiate this maneuver at an altitude and position which ensures the P* can safely reach the selected landing area.

4. When Task 1075 is not conducted in conjunction with this task, the IP will ensure the maneuver is terminated, power levers are returned to fly and a positive rate of climb is established prior to descending below 200‘ AHO.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training. Training of respond to engine failure in cruise flight and OGE will be conducted in the AH-64D aircraft or the AH-64D simulator. Training for responding to engine failure IGE will be conducted in the AH-64D simulator.

2. Evaluation. Evaluation of respond to engine failure in cruise flight and OGE will be conducted in the AH-64D aircraft. Both maneuvers will be performed during a standardization flight evaluation. Evaluation for respond to engine failure IGE will be conducted in the simulator.

REFERENCES: Appropriate common references.

TASK 1082

Perform Autorotation

CONDITIONS: In an AH-64D helicopter or in an AH-64D LCT IP, an AC ENG page displayed on one MPD in each crew station, before-landing check completed, given an entry altitude and airspeed, and the P* properly fitted with a boresighted HDU.

STANDARDS: Appropriate common standards and the following:

1. Select the correct entry point.
2. Visually check and call out Nr, airspeed, and aircraft trim.
3. Ensure that the airspeed at 130 feet AGL is not less than 80 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 P* will select an ENG page on one MPD and direct the 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 LCT, he will announce the emergency. The P* will smoothly lower the collective (at a moderate rate of travel) 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 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 of travel) as necessary to maintain Nr. 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 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 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 LCT). Prior to tail wheel contact, make initial pitch application to cushion the tail wheel touchdown. 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 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.

Note 3. 701C/D engines are equipped with Transient Droop Improvement (TDI). At low TQ settings, a collective increase may result in Nr increase. Care must be taken during power application to ensure Nr remains within limits.

NIGHT OR NIGHT VISION DEVICE 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 CONSIDERATIONS:

1. The flight characteristics of the aircraft remain the same for the performance of the task utilizing the FLIR systems. The crew will have greater situational awareness through the FLIR imagery and displayed 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 LCT.
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 PLT (backseat crewmember) and CPG (front seat crewmember) crew stations or when the CPG engages Back Up 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 LCT with an IP; P* fitted with a boresighted 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 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 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, collective, 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) UFD caution message(s).

(4) UFD advisory message(s).

(5) 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 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or in the AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1110

Perform Electronic Control Unit/Digital Electronic Control Unit Lockout Procedures

CONDITIONS: In an AH-64D helicopter with an IP or in an AH-64D LCT, with an A/C ENG page displayed on one 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 P* properly fitted with a boresighted 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 set torque 5 percent below the good engine, ±5 percent.

DESCRIPTION:

1. Crew actions.

a. The P*will acknowledge the simulated emergency. After recognizing and identifying the emergency, the P* will adjust the flight controls as necessary to maintain Nr. The P* will confirm proper execution of the immediate action steps. The P* will announce when his attention is focused inside the cockpit and the type of landing.

b. The P will acknowledge the simulated emergency and perform those emergency procedure steps not involving manipulation of the cyclic and/or collective. 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. The P will continually monitor the instruments and aircraft condition, the power lever for torque matching, and perform other actions as directed by the P*. 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 Np with collective fail, lock out the DECU/ECU and control the Np 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 Np, Ng, 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 lever 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 Np, Ng, 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 will cautiously advance the engine power control lever to the fly position while monitoring Np, Ng, TGT, and torque.

Note 1. The lockout position will electrically lock out DECU/ECU inputs to the hydro mechanical 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 Np 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 LCT. 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 Np failed low" on a specific engine. The IP/P will provide adequate warning for corrective action if engine operating limits (Np, TGT, and TQ) 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.

> ***Note.*** The IP may elect to have the P* complete all emergency procedure steps, based on assessment of P* proficiency.

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 LCT, with a suitable takeoff area, ground track reference points selected, before takeoff check completed, aircraft cleared, and P* fitted with a boresighted 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 IGE hover power is limited or not available, as described in the Task 1010 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 1010 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 R/C 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, PA, temperature (TEMP), 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 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 GWT, 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 MAX TQ derived the procedure described in Task 1010 ±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, commensurate with surface obstacles. Abrupt pedal input could cause TQ 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. Terminate the maneuver when the aircraft is established in a positive rate of climb, clear of all obstacles, and maximum rate of climb or desired airspeed is achieved.

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 TGT limiter setting and the onset of rotor droop when encountered. Determine TQ for the maneuver by applying collective, not to exceed dual engine torque limits, while observing the TGT on the ENG page. Turbine gas temperature limiting and MAX TQ available is indicated by a drop in rotor RPM with further increase in collective. The Np 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 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 TQ for the maneuver 5 percent below the dual engine maximum torque available as calculated on the PPC.

Note 1. To replicate situations requiring a rolling takeoff, use 10 ±3 percent below hover torque as simulated maximum TQ available.

Note 2. A rolling takeoff may be performed during approved flight missions where IGE power is not available (high density altitude or high 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 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. 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 FPV to reference longitudinal trim and velocity.

f. Use VSI symbology (R/C 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. 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 LCT and given a condition to conduct 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.
   d. Abbreviation (ABR) page functions.
2. TSD report functions. Review, send, and request TSD Reports as appropriate.
3. Perform TSD map operations.
   a. Select appropriate type of map and map display options as appropriate for the mission.
   b. Select show options as appropriate for the mission.
   c. Pan functions.
4. Priority fire zone/no fire zone operations. Create, delete, assign, and transmit priority fire zone/no fire zones.
5. Navigation.
   a. Select appropriate route.
   b. Determine the position of the aircraft along the route of flight within 100 meters.
   c. Arrive at checkpoints ±30 seconds of planned estimated time of arrival (ETA).

DESCRIPTION:

1. Crew action.
   a. The P* will primarily remain focused outside the aircraft, clearing the aircraft during TSD operations. The P* will fly the programmed navigation course using appropriate navigation cues provided through the HDU, MPD, or as directed by the P.
   b. The P will perform TSD operations. 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 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.

2. Procedures. Conduct operations in accordance with the operator's manual, TM 1-1520-251-10/TM 1-1520-251-CL and unit SOPs.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in an AH-64D aircraft, AH-64D LCT, or using an approved TSD emulation software.
2. Evaluation will be conducted in an AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1122

Perform Target Store Procedures

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

STANDARDS: Appropriate common standards and the following:

1. Store a target/threat to the coordinate file using the MTADS or HMD.
2. Store a target or threat to the coordinate file using the TSD flyover method.
3. Store a target or threat to the coordinate file using the FCR single, all, or next to shoot (NTS).
4. Store a target utilizing the cursor acquisition method (TRN, SA).

DESCRIPTION:

1. Crew actions.

   a. The 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 MTADS.

   b. The P performs duties as assigned.

2. Procedures. 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:

   a. MTADS/HMD target or threat coordinate file store method.

   b. TSD target or threat storing (flyover method).

   c. TSD target storing utilizing the cursor acquisition method.

   d. FCR target or threat storing.

      (1) FCR single target storing.

      (2) Storing all FCR targets.

      (3) FCR NTS target storing.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCE: Appropriate common references.

TASK 1132

Perform Integrated Helmet and Display Sight System Video Adjustments and Boresight

CONDITIONS: In an AH-64D helicopter or an AH-64D LCT and given TM 1-1520-251-10/ TM 1- 1520-251-CL with IHADSS.

STANDARDS: Appropriate common standards and the following:

1. Adjust the video and symbology for optimum image quality.
2. Align the image using the image rotation collar.
3. Set the focus collar to achieve infinity focus.
4. Perform boresight procedures, in the proper sequence, for the appropriate crew station.

DESCRIPTION:

1. Crew actions. Each crewmember must adjust the IHADSS video and boresight their Integrated Helmet Unit (IHU) independently. Boresighting requires selection of the HMD as LOS.

2. Procedures.

a. 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.

(1) Sight SEL (select) switch. Position the sight SEL switch on the collective mission grip (PLT/CPG) or the sight select switch on the TADS Electronic Display and Control (TEDAC) right handgrip (CPG) to helmet mounted display (HMD). If the CPG's selected sight is FCR or TADS, BRT/CON adjustments will affect the TEDAC display and not the HDU.

(2) WPN page. Select the 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 as a reference, note the image's orientation and adjust the image rotation collar on the HDU until the display image is level with the reference.

(3) IHADSS video BRT and CONT controls. Sizing and centering. Adjust the display brightness (DSPL BRT) control on the TEDAC control panel (CPG) or the IHADSS BRT control knob on the video control panel (PLT) from minimum to maximum. Adjust the display control (DSPL CONT) on the TEDAC control panel (CPG) or the IHADSS CON 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 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 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.

b. Grayscale adjustment. Adjust the DSPL BRT control on the TEDAC 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 TEDAC 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 TEDAC 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 TEDAC 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.

c. 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.

(1) 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.

(2) 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

d. Symbol brightness (SYM BRT) control. With the grayscale deselected, adjust the SYM BRT control on the TEDAC 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 a chemical, biological, radiation, and nuclear (CBRN) protective mask.

Note 4. Aircraft equipped with IHADSS -21 do not have the ability to adjust sizing, centering, or focus from the pilot station.

e. Boresighting.

(1)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 1134). 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 DP and WP.

(2) 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 "B/S Now" button will appear on the Boresight page. Align the HMD LOS reticle to the BRU.

(3) Select the "B/S Now" button on the BORESIGHT 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 bore sight page button. If the first bore sight 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 bore sight requirement can be overridden by depressing the "REMOVE MESSAGE" selection after which the cueing dots will disappear; however, the select fail indication shall remain.

Note 1. The IHADSS boresight maintained button is used to boresight the IHADSS in either crew station. The IHADSS button is not available when internal boresight mode is 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 MPNVS/MTADS-NVS is slaved to the IHADSS LOS sight SEL switch in NVS and the boresight mode is selected, the pilot NVSMPNVS/MTADS NVS will slave to the BRU LOS (0 degrees in azimuth and -15 degrees in elevation).

NIGHT VISION GOGGLES CONSIDERATIONS:

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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1134

Perform Integrated Helmet and Display Sight System Operations

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

STANDARDS: Appropriate common standards and the following:

1. Select the appropriate LOS.
2. Use the cueing function.

DESCRIPTION:

1. Crew actions. Either crewmember can accomplish target acquisition with their respective IHADSS by acquiring the ACQ source's cueing dots. The HMD sight select mode establishes both crewmembers' IHADSS as the LOSs. The PLT's pilot helmet sight (PHS) and CPG's gunner helmet sight (GHS) LOSs 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 MPNVS 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) 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 MPNVS FLIR is coupled to the PLT's LOS and overlaid with independent PLT flight symbology. When the NVS mode switch is selected to NVS NORM, the PLT's HAD sight select status field will display the message "HMD." This mode also enables the NVS switch on the collective (MPNVS or MTADS).

(3) PLT HMD and NVS NORM acquisition sources.

(a) 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, FLT, ENG, TSD, or FCR page as desired through the ACQ multistate button.

(b) 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.

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 MTADS WFOV FLIR is coupled to the CPG's LOS and overlaid 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, ENG, FLT, FCR, or WPN pages. This mode will also enable the NVS switch on the collective (MPNVS or MTADS).

(3) MTADS sight select with GHS ACQ selected and slaved option. Although not technically an IHADSS mode, the MTADS is operational and slaved to the IHADSS LOS. If the IHADSS LOS is detected as invalid, the MTADS will freeze until valid IHADSS LOS data is obtained. To unslave the MTADS for manual control, depress the slave pushbutton on the right handgrip (TEDAC RHG). The MTADS will uncouple from the IHADSS LOS, and the manual tracker (MAN TKR) thumb force controller is enabled to control the MTADS. The WP will use MTADS 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 TEDAC right handgrip to HMD or select the NVS mode switch to NORM. In the HMD mode, the MTADS is commanded to fixed forward 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, FLT, ENG, 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 TEDAC 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 TEDAC 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

(5)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 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1140

Perform Target Acquisition Designation Sight Sensor Operations

CONDITIONS: In an AH-64D helicopter, or an AH-64D LCT, with MTADS operational check and MTADS boresight complete.

STANDARDS: Appropriate common standards and the following:

1. Without error, perform MTADS operational checks and boresights IAW TM 1-1520-251-10/TM 1-1520-251-CL.
2. Correctly determine the operational status of the MTADS.
3. Employ MTADS sensors DTV, and FLIR.
4. Acquire a target manually or through an acquisition source using MTADS slaving or linking.
5. Track a target with the most appropriate MTADS mode available.

DESCRIPTION:

1. Crew actions.

a. The CPG will perform operational checks and boresights as required to determine whether the MTADS is operating properly. The CPG will determine the effects of any MTADS discrepancies against the needs of the mission**.**

b. The PLT flies the aircraft and maintains obstacle clearance while the CPG performs 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 may have the CPG's video underlay displayed on one MPD. The PLT will announce any intentions of taking control of MTADS through the FCR link function prior to actually selecting MTADS link.

c. The CPG will operate the MTADS in a manner that will take full advantage of the sensor's optimum capabilities.

2. Procedures. The CPG will perform the operational checks and boresights IAW TM 1-1520-251-10/TM 1-1520-251-CL and determine the operational capability of the MTADS and if malfunctions will affect the assigned mission.

Note. 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 SAL missile target engagements and for all weapons engagements where the laser is the range source.

a. 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 WPN UTIL page while the TADS slews to the boresight position, completes an automatic cue update, and is ready for boresight. At initial power up, the automatic cue update will take approximately 90 seconds with the entire internal boresight procedure taking approximately 2 minutes. Subsequent internal bore sights, 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 update, three dots (boresight targets) will appear on the 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 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. If the DTV boresight has been successfully completed and the FLIR boresight fails, the DTV boresight is valid. If the DTV bore sight fails, FLIR boresight will not be completed.

Note 2. 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 3. 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.

b. DTV. The CPG will move the FOV switch to the desired FOV position Wide (W), Narrow (N), or Zoom (Z). DTV has no Medium (M) FOV; selection of the M position will select the wide field of view (WFOV). Field of View gates will appear in W and N. The zoom field of view is actually an electronic underscan of the center 50 percent of the NFOV; therefore, some resolution will be lost. The DP processes the video, superimposes symbology in conjunction with the WP, and routes the video to the MPDs and TEDAC for display. The message DTV will appear in the upper left portion of the display to indicate that the DTV sensor has been selected.

c. 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 M-TEU and symbol generator to the TEDAC, MPDs, and 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, Medium (M), N, and Z by moving the FOV select switch. The M-TEU adds the TADS LOS reticle and Multi-Target Tracker (MTT) 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 or NFOV are normally used for target acquisition, while NFOV or ZFOV are used for target identification and engagement.

Note 1. The MPD video (VID) page VSEL display option provides additional electronic FOV capabilities, which should be used in conjunction with the 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 MPD 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.

Note 2. The 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 3. In the event of horizontal lines in the MTADS FLIR video, a FULL (standard process) scene assisted non-uniformity correction (SANUC) initialization can be initiated to clear these lines.

Note 4. While maneuvering and tracking a target with LMC, an accurate dynamic range must be maintained to target. LMC should be used anytime the aircraft, target or both are moving.

Note 5. Use of the ACM in MTADS/MPNVS equipped aircraft does not disable FLIR level and gain adjustment controls. FLIR image may be further adjusted with ACM on. Use of the ACM will result in higher image quality and reduce image blooming.

Note 6. Use of Range Focus allows the CPG to refine the displayed image resulting in higher image resolution.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 1142

Perform Digital Communications

CONDITIONS: In an AH-64D helicopter or an AH-64D LCT and given the requirement to perform 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 as the situation dictates.

DESCRIPTION:

1. Crew actions.
   a. The PC will ensure all digital communications networks are configured for the mission.
   b. The PI will assist as directed by the PC in ensuring all digital communications networks are configured for the mission.
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 conduct digital communications 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1144

Perform Fire Control Radar Operations

CONDITIONS: In an AH-64D helicopter with radar or an AH-64D LCT and given TM 1-1520-251-10/TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the following:

1. Perform the FCR operational checks without error in accordance with TM 1-1520-251-10 or 1-1520-251-CL.
2. Operate the FCR to search for and detect target(s)/threat equipment.
3. Operate FCR in cued search mode into operation.
4. Operate FCR in Air Surveillance Mode.
5. Utilize FCR terrain profile mode.
6. Enable FCR C-Scope.

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. Either the PLT or 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 PC, 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 P* or the P will announce, and/or coordinate, sight selecting the FCR.

2. Procedures. Complete the operational check as per the TM 1-1520-251-10/TM 1-1520-251-CL and verify FCR Built-In Test (BIT) is complete and no faults are displayed on the DMS fault page or the EUFD. 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).

a. FCR targeting. Set the sight select switch on the right TEDAC handgrip or collective mission grip to FCR. Set the FCR mode switch on the left TEDAC handgrip or collective mission grip to ground targeting mode (GTM), radar mapping (RMAP), or air targeting mode (ATM), as desired. Set FCR scan size switch on the right TEDAC handgrip or collective mission grip to wide, medium, narrow, or zoom, as desired. Check the FCR scan footprint on the TSD. Select the centerline left or centerline right buttons on the FCR page, use the manual thumbforce controller or slave the FCR to the selected acquisition source, as required to align the FCR with the desired search area. Cueing, via the cued LOS Dot in the FCR, 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.

(1) Target data on the FCR page is displayed as a “snapshot.” Some information and displayed target icons may change based on aircraft movement. However, specific target information is not continuously updated.

(2) 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 NTS target for computing LOS data and ballistic solutions for gun, rocket, and radar frequency (RF) missile engagements. Subsequently selecting other targets, as NTS will provide that target’s information for processing.

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 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 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. Current aircraft software or mission planning system software may or may not allow aircrew programming of priority schemes.

Note 3. Terrain sensitivity setting (TSS) determines whether or not detected targets are presented when using the FCR in GTM and RMAP. TSS has no effect on the detection or classification of moving target indicator (MTI) targets in GTM, RMAP, or ATM. Terrain Sensitivity Settings (TSS) can dramatically affect FCR STI performance. To disable STI processing completely, use the 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 a radio frequency interferometer (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 ASE footprint on the TSD and ASE page.

(1) Perform auto cued search: Press the cued search button on the TEDAC or collective mission grip. The FCR will automatically orient toward the RFI #1 emitter, select the appropriate targeting mode, choose the appropriate scan size, and complete a single scan burst in an attempt to correlate the azimuth of the emitter with the position of an FCR detected target. 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 for ground emitters). If the desired emitter is not within ±90 degrees of the nose of the aircraft, the cued search will not function, instead a "LIMITS" message will be displayed. If a second scan burst is desired on a particular emitter, select the FCR scan switch on the collective mission grip to single scan (SS) burst or continuous scan (CS) burst. If the cued search button is pressed during a normal FCR scan, the scan will stop and a cued search initiated.

(2) Perform manual cued search: Select the desired RFI threat symbol from the periphery of the FCR page using the cursor control on the collective grip or TEDAC left handgrip. The FCR centerline will orient to the emitter, select the appropriate targeting mode, choose the appropriate scan size, but the scan will not occur. Set the FCR scan switch on the collective mission grip or TEDAC right handgrip to SS or CS. To repeat the scan, reselect SS. To select additional RFI targets, repeat the steps. If the desired emitter is not within ±90 degrees of the nose of the aircraft for ground emitter, the ability to cursor select it will not function.

Note 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.

Note 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. A cued search may be performed on either “coarse” or “fine detect” ground emitters that are within an area ±90 degrees off the nose of the aircraft and air emitters within 180 degrees of 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 coarse detect, the FCR scan size will be set to wide.

Note 3. During the process of a cued search the FCR will automatically determine targeting mode based on type of emitter. For ground emitters the FCR will mode to RMAP (unless in GTM). For air emitters the FCR will mode to ATM.

c. Terrain Profile Mode (TPM). Set the sight select switch to FCR. The FCR page will be displayed on the left MPD unless it is already displayed on the right MPD. Set the FCR mode switch to TPM. The FCR page will display TPM format. Select the profiles (PROF) button, desired profile range interval geometric (GEOM), arithmetic (ARITH) , 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. Execute CS.

Note. See Task 1155 for use of the FCR for wire strike detection and avoidance.

d. C-SCP. FCR target symbology is processed for overlay on the MTADS/MPNVS video by the selection of the C-SCP button. Target symbols appear on the HMD in the pilot station and on the HMD and TEDAC in the CPG station and are virtual in their position. Selecting the C-SCP button, when using the TPM, will cause the display of virtual profile line symbols and obstacles on the HMD in the pilot station, and on the HMD and TEDAC in the CPG station.

e. Air Surveillance Mode (ASM) provides the capability of detecting airborne hazards. ASM is not a targeting mode and cannot be selected when either crew member has FCR as their selected LOS. Place the FCR into ASM by selecting “AIR SURV” option on the FCR page, choosing the appropriate FOV, and executing continuous scan. Hazards will be displayed as FCR target icons, however no targeting information is provided to the WP.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 1155

Negotiate Wire Obstacles and Under Obstacle Flight

CONDITIONS: In an AH-64D helicopter or AH-64D LCT, or academically.

STANDARDS: Appropriate common standards and the following:

1. Locate and accurately estimate the height of the obstacle
2. Determine the best method to negotiate the obstacle.
3. Negotiate the obstacle, minimizing the time unmasked.
4. Select obstacle crossing point references (visual and/or electronic).
5. Select appropriate speed to negotiate obstacle.
6. Use correct crew coordination and communication procedures.

DESCRIPTION:

1. Crew actions.

a. The P* maintains focus outside the aircraft and maintains aircraft clearance from obstacles and supporting structures by flying the selected ground path utilizing visual reference points. The P* announces the obstacle crossing method prior to execution.

b. The P is primarily responsible for obstacle detection and early warning through head's down monitoring of cockpit displays such as the TSD and FCR. While negotiating obstacles the P is responsible for heads-out monitoring of obstacle clearance and providing adequate warning to avoid hazards, wires, and poles or supporting structures to the P*. Once the aircraft has negotiated the obstacle the P will announce when the aircraft is clear of obstacles.

2. General Procedures.

a. The crew must search for both known and unknown wires and other hazards to flight and announce when wires and other obstacles are seen.

b. Locate guy wires, top-level support wires, and supporting poles

c. Confirm the location of wire obstacles with the other crewmember.

d. Accurately estimate the amount of available clearance between the obstacle and the ground to determine the method of crossing.

e. The crew will select and announce the method of negotiating the obstacles.

f. Select crossing point visual references.

g. When possible, program all known wire hazards and other obstacles to the DTC before flight. During terrain flight operations display a TSD to provide hazard proximity warning. Programmed TSD hazards can be used to cue onboard sensors (MTADS/MPNVS or HDU) by selecting a waypoint (WPT) or hazard (HAZ) as an acquisition source.

h. The FCR can provide warning and cueing of wires and towers utilizing radar map (R-Map) mode or TPM. During conditions of reduced visibility the raw radar video visible in R-Map should be scanned for the characteristic bright-spots, "stacked" side-lobes, and geometric spacing of large power poles (figure 4-3, page 4-86). By cross referencing this video signature with the analog range display lines the crew can gain significant early warning. At 100 knots ground speed the aircraft will cover 1km every 20 seconds; therefore, power-poles displayed at the closest horizontal line (2 kilometers) are 40 seconds away.

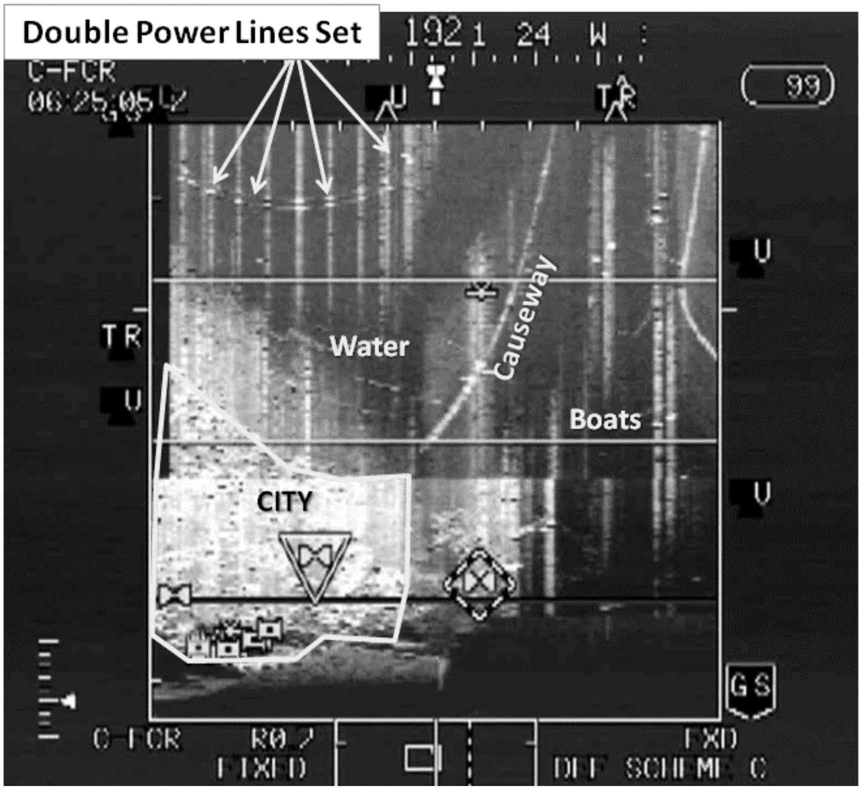

Figure 4-3. R-map depiction

i. Over obstacle flight techniques: Identify the point of crossing the obstacle and the optimal ground track up to, over, and beyond the obstacle considering the tactical situation. In general crossing near a pole will aid in estimating the highest point and obstacle clearance from standoff ranges thereby increasing flight safety however this makes the aircraft's flight path very predictable. Enemy forces have use poles as aiming stakes and trigger points for attacking aircraft with direct fire weapons or anti-helicopter improvised explosive devices.

j. Under obstacle techniques:

(1) Underflight-general. When the tactical situation and/or weather conditions demand under obstacle flight, the crew must first determine that adequate vertical and horizontal clearance exists. The crew selects an appropriate ground path and altitude that will ensure clearance is maintained. The crew employs visual and/or electronic reference points (heading/velocity vector, radar altimeter [RADALT]) that lead up to, under, and beyond the obstacle to ensure the aircraft stays upon the desired ground track during the maneuver. Prior to under-obstacle flight select a ground reference point beyond the obstacle that will ensure that the aircraft is well clear and can be safely climbed.

(2) Clearance determination (see Training Considerations for single ship techniques). During multi-ship/tactical operations the preferred method to rapidly and accurately judge vertical and horizontal clearance is for the crew to utilize the "mirror image" technique. This is accomplished by observing the wingman's aircraft in proximity to the obstacle crossing site. Approximately twice the vertical and horizontal size of an Apache helicopter will ensure clearance while negotiating under obstacle flight. When using bounding overwatch the lead aircraft bounds up to, and holds short of the proposed crossing site. At that point the CPG utilizes the MTADS/FCR to search for the enemy and secure the next tactical bound, while the P* performs a close range visual confirmation that the selected crossing site is suitable and free of undetected guy wires or other hazards. The lead aircraft then calls forward the wingman. As the wingman approaches the under-obstacle crossing site they confirm that adequate horizontal and vertical clearance exits by referencing the apparent size of the lead aircraft in comparison to the obstacle.

If sufficient clearance is available the wingman transitions under the obstacle without hesitation and proceeds to the next tactical bound (figure 4-4).

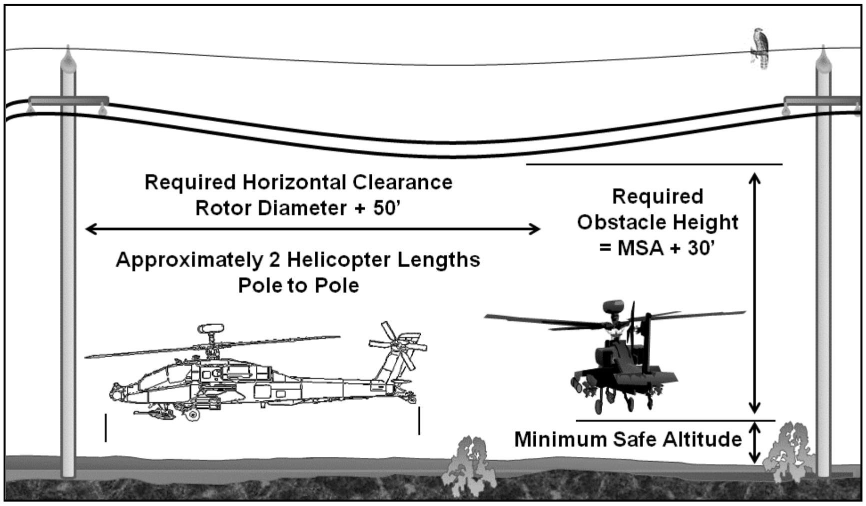

Figure 4-4. Clearance determination

(3) Underflight–speed selection. Select a ground speed appropriate for the tactical situation, the selected altitude, and the environmental conditions. If clearance is minimal select a speed slow enough to abort under obstacle flight without a significant change in pitch attitude. Obstacles with 50 feet or less clearance should only be under flown at slow speeds. If the obstacle is high, and the reconnaissance proves that the obstacle can be safely negotiated, the crew may select a higher speed based upon tactical and environmental conditions. Special caution should be exercised in conditions of blowing sand, dust, snow, and loose vegetation (cut grass, crops). In such conditions the obstacle must be negotiated at a speed above ETL to minimize the likelihood of encountering white-out/brown-out conditions as these conditions cannot be mitigated through an Instrument Take-Off when wires are present. When higher speeds are appropriate the crew should fly a close-range validation/reconnaissance of the selected underwire crossing site. After validating that the selected site is suitable, the lead element should execute a 270 degree turn to approach the under-obstacle crossing site at a nearly perpendicular angle (figure 4-5, page 4-88).

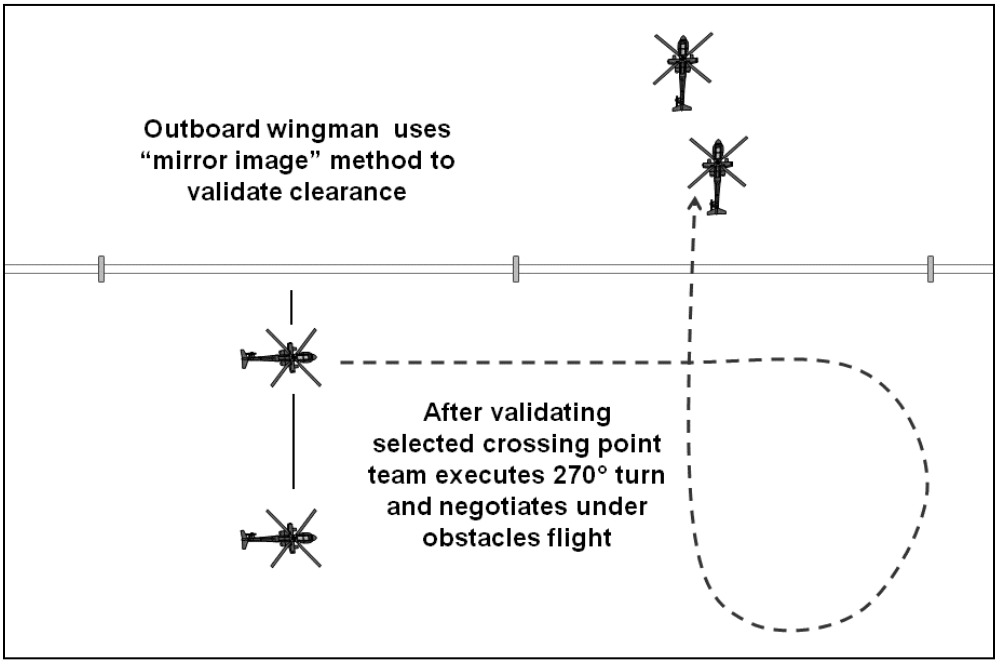

Figure 4-5. Underflight

(4) Ground taxi. When vertical clearance is limited, and the surface conditions allow, the aircraft may be ground taxied under the obstacle.

NIGHT OR NIGHT VISION DEVICE CONSIDERATIONS: Wires may be difficult to detect with NVDs. In general FLIR will see power poles and wires before they are visible under NVG. The FOR limits of NVDs and visual FOV limits of from the cockpit affect nighttime underwire flight techniques. MTADS can look down farther than MPNVS. MPNVS can look farther up than MTADS. Night Vision Goggles (NVG) can look farther up and to the side than either NVS however NVG cannot look down as well as either MPNVS or MTADS. Night Vision System FOR limits makes it impossible to see the obstacle once the aircraft has started to cross underneath. Therefore, under NVS conditions it is critical to ensure prior to crossing that the aircraft will have sufficient clearance throughout the maneuver. Select one or more FLIR/NVG reference points well clear (minimum 2 helicopter lengths beyond the obstacle) to ensure adequate clearance prior to climbing. The crew may backup these visual reference points by utilizing the bob-up box or other electronic means. Night Vision Goggles can be utilized by the P to monitor clearance when the aircraft is under the obstacle however a disciplined commitment by the P* to stay on the selected ground track and altitude is the best method to ensure clearance. Team tactics employing the mirror image techniques described above will provide the crew with high confidence of clearance and external warning of any undetected drift.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D LCT.
2. Evaluation will be conducted in the AH-64D aircraft or academically
3. Under obstacle (wires or bridges) flight requirements:
    a. This task must be approved by appropriate mission approval authority.
    b. Approved under obstacle flight location or training site.
    c. Prior reconnaissance completed IAW local regulations and SOPs.

d. For training, nighttime underflight of wires will not be performed unless the location has been checked during daylight conditions and all hazards have been identified.

e. Comply with minimum vertical and horizontal clearance. For training the minimum vertical clearance from the ground is 30feet; the minimum horizontal clearance from pole to pole or span to span is rotor diameter plus 50feet. Determine the height of the obstacle by utilizing the “mirror image” technique as described above when operating multi-ship. When operating single ship in a training environment the crew can estimate the height of the wires by hovering with the aircraft wheels abeam the lowest portion of the obstacle and noting the RADALT. Add 30 feet to the displayed hover height to determine if sufficient vertical clearance exists (for example; if the MSA to fly under a set of wires is 1 foot, then the wires must be 31feet above the ground). This will give approximately a 12-foot clearance between the top of the aircraft and the wire.

f. Special care must be exercised when underflying road or highway bridges that have civilian traffic. In these cases bridges should only be underflown if the entire maneuver to include the approach, underflight, and departure can be completed without being within the LOS of vehicle traffic to avoid alarming automobile drivers.

REFERENCES: Appropriate common references.

TASK 1160

Operate Video Recorder

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

STANDARDS: Appropriate common standards and the following:

Initialize the video recorder.

Select a video source.

Record and play back video on the desired displays, monitor audio, and employ the event mark. recorder.

DESCRIPTION:

1. Crew actions. The PLT (backseat crewmember) or 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 DP operation, and the VCR is automatically set to off and a non-selectable barrier is displayed.

(2) If at any time the VCR is unable to enter a commanded state, it will enter a stop condition from which the crew can send it to play, record, or be placed in a standby condition. The accuracy of the tape counter is dependent on the correct length being set. Elapsed time, displayed in minutes, is based on the amount of tape used.

b. Video source selection.

(1) TADS: The TADS button sets the VCR to record the TADS selected sensor composite video (DTV or FLIR). If the TADS power is off or the turret is stowed, no imagery will be recorded. Flight symbology will be recorded when the NVS mode switch is on or fixed and TADS is the selected NVS sensor.

(2) 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–composite video is recorded.

(c) HMD–composite video is recorded.

(3) HMD: 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.

(4) FCR: 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.

Note. At aircraft power-up, the VCR is initialized to record CPG sight as the video source.

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c. Record. Press the video RCD (record) pushbutton on the TEDAC left handgrip (CPG). 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 VID page. If selected, 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 TEDAC left handgrip (CPG). 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 display 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) TEDAC 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 CTR DISP button. The CTR DISP button is only displayed on the CPG MPD format. It is only displayed when the play option has been selected. Selection of the CTR DISP option will display the recorded video playback on the TEDAC. The CTR DISP option will remain selected when the VCR page format is deselected. However, recorded video playback will be displayed on the TEDAC only if the VCR page is once again selected.

(3) TEDAC VCR playback video removal. If it is desired to remove VCR playback video from the TEDAC, deselect the CTR DISP playback option, or deselect the VCR page format from the CPG MPD, or mode the VCR out of play. Select the desired video for display on the VID SEL buttons on the TEDAC (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.

Note. After video rewind, it is possible that a negative count on the elapsed time indication may be displayed. Selection of the reset button on the VCR page will reset elapsed time indication to zero. Failure to select reset may cause the recording to stop when elapsed time indication reaches zero.

TRAINING AND EVALUATION REQUIREMENTS:

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

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 LCT, with power check and before-takeoff checks completed and aircraft cleared.

STANDARDS: Appropriate common standards and the following:

1. Select the FLT page.
2. Maintain required takeoff power.
3. Maintain accelerative climb attitude ±2 bar width.
4. Maintain the aircraft in trim after ETL.

DESCRIPTION:

1. Crew actions.

a. The P* will focus primarily outside the aircraft during the VMC portion of the maneuver. He will enable the FLT page on one of the 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. 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 FLT 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 VSI 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.

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 FLT 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 VSI 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 OGE hover power is not available.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 1172

Perform Radio Navigation

CONDITIONS: In an AH-64D helicopter under IMC or simulated IMC or in an AH-64D LCT, 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 (NAVAIDs).
3. Determine aircraft position.
4. Intercept and maintain the desired course ±10 degrees
5. Identify station passage.

DESCRIPTION:

1. Crew actions.

   a. The P* will remain focused inside the aircraft and will monitor radios and ATC information. He will acknowledge all directives given by ATC or the 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 run-up before conducting flight into IFR conditions. Also conduct navigation equipment operational checks if flight operations are expected to be conducted in marginal visual flight rules (MVFR) 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 surveillance mode during simulated and actual IMC flight. (Refer to Task 1042.)

Note 2. IFR use of the current AH-64D EGI is not authorized; however, the crew should consider and plan for its use as an emergency backup system.

Note 3. With the common missile warning system (CMWS) control panel (CP) installed, the audio selection must be in the down position (NAV) in order to hear automatic direction finder (ADF) audio.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 1174

Perform Holding Procedures

CONDITIONS: In an AH-64D helicopter under IMC or simulated IMC or in an AH-64D LCT, given an altitude, holding instructions, and the appropriate navigational publications.

STANDARDS: Appropriate common standards and the following:

1. Correctly tune and identify the appropriate NAVAID.
2. Correctly enter the holding pattern.
3. Correctly time and track holding pattern legs.

DESCRIPTION:

1. Crew actions.

   a. The P* will fly headings and altitudes and will adjust inbound and outbound times as directed by ATC or the 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 TSD wind status window or 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 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. 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 tactical situation display navigation (TSD NAV).

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 1176

Perform Nonprecision Approach

CONDITIONS: In an AH-64D helicopter under IMC, or simulated IMC in an AH-64D LCT, with navigational equipment operational checks completed as applicable, given the appropriate 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 3-04.240, and the DOD FLIP.
2. Intercept and maintain Nondirectional Beacon (NDB) courses within 10 degrees of course centerline.
3. During airport surveillance radar (ASR) approaches, make immediate heading and altitude changes issued by ATC and maintain heading ±5 degrees.
4. Comply with descent minimums prescribed for the approach.
5. Execute the correct missed approach procedure.

DESCRIPTION:

1. Crew actions.

   a. The 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 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 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 NAVAID and communication frequencies, instrument (INST) page, and TSD NAV show pages are properly set, as required.

Note. FM 3-04.240 describes approach procedures.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 1178

Perform Precision Approach

CONDITIONS: In an AH-64D helicopter under IMC, or simulated IMC, or in an AH-64D LCT, before landing check completed and given the appropriate 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 ATC.
4. Comply with the decision height prescribed for the approach.
5. Execute the correct missed approach procedure.

DESCRIPTION:

1. Crew actions.

a. The 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 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 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 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 NAVAID and communication frequencies, INST) page, and TSD NAV show pages are properly set, as required.

Note 1. FM 1-240 describes approach procedures.

Note 2. The use of the FCR and 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1180

Perform Emergency Global Positioning System Recovery Procedures

CONDITIONS: In an AH-64D helicopter under IMC, simulated IMC, or in an AH-64D LCT.

> ***Note.*** Use of the global positioning system (GPS) as an 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 PC will review the approach with the other crewmember before initiating the procedure. The PC will confirm with the 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 P* will focus primarily inside the aircraft on the instruments. He will follow the heading/course, altitude, and missed approach directives issued by 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 HMD, FLT page, TSD, and FCR to the conduct of the emergency 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 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, FLT page, TSD, and FCR to the conduct of the emergency GPS approach.

2. 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) way point hazard(WPTHZ)/control measure (CTRLM).

b. Enroute to the FAF to 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 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 FLIR and FCR may be used to assist in identifying the landing area. When FCR equipped, the P can use the 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 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 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 NDB approach or ground controlled approach (GCA) is not available. IFR use of the current AH-64D 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 or RMAP) can be used both prior to, and during, the approach to assist in clearing obstacles that may be in the intended landing area.

NIGHT OR NIGHT VISION SYSTEM 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1182

Perform Unusual Attitude Recovery

CONDITIONS: In an AH-64D helicopter with the P* properly fitted with a boresighted 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 IMC.

   b. The 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 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 MPD FLT page may be accessed by the Z-axis of the cyclic flight symbology select switch.

NIGHT OR NIGHT VISION DEVICE CONSIDERATIONS: IMC is not a prerequisite for an unusual attitude. Low-level ambient light may induce visual illusions and spatial disorientation. During NVG operations, video noise may contribute to loss of visual cues.

NIGHT VISION SYSTEM 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 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 OGE hovers or masking procedures. This is sometimes combined with undesirable drift.

a. Hover or bob-up symbology recovery.

(1) Orient the MPNVS/M TADS turret toward the nose of the aircraft and minimize head movement during the recovery. Cross-check the positional relationship of the 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 PMNVS/MTADS 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, VMC, or in the AH-64D LCT.
2. Evaluation will be conducted in the AH-64D aircraft, VMC, or in the AH-64D LCT.

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 Conditions

CONDITIONS: In an AH-64D helicopter under IMC or simulated IMC, in an AH-64D LCT, with the P* properly fitted with a boresighted 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 ATC as appropriate, and comply with ATC instructions, local regulations, and 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 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 CPG front seat crewmember/PLT backseat crewmember) or standby attitude indicator (PLT). Change flight symbology to either transition or cruise if using the 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 NOE mode could manifest itself in exaggerated aircraft pitch altitudes. When the stabilator is not in AUTO, reset it.

Note 2. Crews should consider using aircraft hold modes when encountering deteriorating weather.

Note 3. 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 CONSIDERATIONS: Entering IMC with the searchlight on may induce spatial disorientation. The NVG may be removed or flipped up once stable flight is established. When using NVG, 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 NVG. The NVG 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 CONSIDERATIONS: When IMC are encountered, use the HDU, 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: IIMC may be encountered in environments where obscurants (such as sand, dust, snow, rain, and smoke) are present.

MOUNTAIN CONSIDERATIONS: During periods of reduced visibility, aircraft equipped with an FCR should consider the use of TPM with C-SCP enabled to aid in terrain avoidance. Aircraft equipped with moving map displays and loaded with accurate digital terrain elevation data (DTED) should consider the use of color banding in order to aid in terrain avoidance.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 1188

Operate Aircraft Survivability Equipment

CONDITIONS: In an AH-64D helicopter, AH-64D LCT, 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 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 IBIT as necessary for all installed ASE equipment. 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 Inspection and Maintenance Record) b. Either the PLT (backseat crewmember) or 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, FCR or TSD page, and voice indications.

2. Procedures.

a. Setting up the ASE suite begins during pre-mission planning with the programming of the 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, proper settings, and loads as appropriate for installed equipment. The crew should also verify the proper settings and load of the installed transponder.

c. During the after starting APU checks, the PLT will load applicable DTC data to the aircraft. The crew will verify that the correct (CHAFF) settings are displayed, and verify the power on condition radar laser warning receiver (RLWR), 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.

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d. The crew can use the RFI to rapidly orient a sight (FCR, [MTADS], or 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 acquisition(ACQ) source when the sight select is MTADS or HMD will provide slaving and cueing, as appropriate, of the MTADS or HMD to the azimuth of the #1 emitter. Modernized Target Acquisition Designator Sight or HMD slaving and cueing is also possible to an “other than #1 emitter” through the 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. This function is crew station independent.

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 Air Defense Unit (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 LCT or academically.
2. Evaluations will be conducted in the AH-64D aircraft, AH-64D LCT, 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, and 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 LCT 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 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 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 Inspection and Maintenance 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)/CPG (front seat crewmember) procedural training/evaluation may still be conducted from the aircraft. This will satisfy the conditions of this task.

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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 LCT and given TM 1-1520-251-10/TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and the PC will ensure a crew debrief is conducted and DA Form 5484 (Mission Schedule/Brief) is completed.

DESCRIPTION:

1. Crew actions.

a. Both crewmembers will complete the required checks pertaining to their assigned crew duties.

b. Both crewmembers will participate in a crew-level debrief.

2. Procedures.

a. 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).

b. Crew debrief. The pilot in command (PC)/air mission commander (AMC) will ensure the DA Form 5484 is completed and conduct a crew debrief using a checklist similar to the one shown in table 4-2, page 4-108. 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 LCT.

2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

Table 4-2. 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. Each crewmember states in his own words.
a. Lessons learned.
b. Individual level.
c. Crew level.
d. Unit level.
6. Dismiss crewmembers.
7. Advise commander of significant lessons learned.
8. Incorporate significant lessons learned in subsequent missions.

Task 1401

Perform Basic Maneuvering Flight

CONDITIONS: In an AH-64D helicopter in an approved training area or simulated tactical environment, with a properly fitted HDU, engine page displayed in both cockpits, low altitude warning set as necessary to recover by 200 feet AHO, and aircraft cleared.

STANDARDS:

1. Establish entry altitude ±100 feet.
2. Establish entry airspeed ±10 KTAS.
3. Initiate training at altitudes that will ensure recovery prior to 200 feet AHO.
4. Perform LOW ALTITUDE WARNING RECOVERY if aircraft is allowed to descend below predetermined recovery altitude.

CAUTION

Do not exceed G limits versus gross weight and airspeed limitations outlined in TM 1-1520-251-10, Chapter 5, and applicable AWRs.

Note 1. To avoid undesired control inputs (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 P* will remain primarily focused outside the aircraft to clear the aircraft throughout the maneuvers. 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 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.

b. The P will help clear the aircraft and monitor aircraft attitude and trim. He will also announce when his attention is focused inside the cockpit; for example, when monitoring airspeed, altitude, attitude, or Nr.

c. 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. These maneuver characteristics demonstrated in this task are designed to highlight basic rotary wing flight characteristics, and provide a building block for more advanced maneuvers. Knowledge of and proficiency in these maneuvers is required for almost all flight maneuvers executed in the aircraft. They are not intended to replace Combat Maneuvering Flight (CMF).

b. Transient torque. The purpose of this maneuver is to demonstrate the torque changes that may occur with lateral cyclic inputs. To demonstrate transient torque, establish the aircraft at straight-and-level flight at 110 KTAS with cruise power applied and note the torque required to maintain level flight. The P* will initiate a deliberate left turn to desired bank angle, not to exceed aircraft limits, with no adjustment to the collective. Note torque increase. Upon recovery reestablish aircraft at 110 KTAS and cruise torque. Execute a deliberate turn to the right to desired bank angle, not to exceed aircraft limits, with no adjustment to the collective note torque decrease.

c. Rotor coning/induced flow effects. The purpose of this maneuver is to demonstrate how conservation of angular momentum (coriolis) affects Nr and torque during times when the rotor is loaded and unloaded. The P* will establish straight-and-level flight at 120 KTAS. Note torque to maintain level flight. The P* will reduce collective sufficiently to reduce torque by 10%. After reducing power the P* will apply deliberate aft cyclic and begin cyclic climb to the point rotor begins to build (not to exceed 2 percent increase) while maintaining collective in the same position. The crew will note drop in torque and rotor increase. Following the cyclic climb, the P* will initiate a cyclic push-over. The crew will note the increase of torque over the value that was established prior to maneuver initiation.

d. Pitch-down tendency. The purpose of this maneuver is to demonstrate the pitch down tendency of the aircraft when entering steep turns and the high rates of descent that must be overcome if allowed to develop.. The P* will establish the aircraft at straight and level flight at 90 KTAS and appropriate cruise torque. The P* will Initiate a smooth turn with only lateral cyclic (minimize fore and aft) to the desired bank angle, not to exceed aircraft limits. As the turn increases, the nose of the aircraft will naturally pitch down. The P* will recover aircraft to straight and level flight before exceeding aircraft limits.

e. Weight vs. lift correlation in turns. The purpose of this maneuver is to demonstrate the increased power requirement in turns. The P* will establish the aircraft at straight-and-level flight at 110 KTAS and appropriate cruise torque. The P* then initiates a smooth turn, without increasing power. The aircraft will descend. This demonstrates the necessity to increase power or trade altitude/airspeed when executing steep turns. The P* will then enter a 45 degree angle of bank turn while maintaining airspeed and apply power as necessary to maintain altitude.

f. Airspeed and altitude trade off/correlation. This maneuver demonstrates the ability to maintain aircraft altitude by trading airspeed. Deceleration through a turn is used to change direction of the aircraft while maintaining altitude, especially at low-level altitudes. The P* initiates the maneuver from straight-and-level flight at 110 KTAS with cruise torque established. 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 torque within limits. Recover from the maneuver as aircraft passes through max rate of climb airspeed. To recover apply opposite and forward cyclic and reduce collective to maintain torque within limits as the rotor system unloads.

Note. Airspeed reduction below max rate of climb speed will not result in increased lift and may cause aircraft to descend.

CAUTION

Excessive nose-down attitudes that result in high rates of descent will significantly add to the altitude required for recovery. This is aggravated by high gross weight and high DA. Do not allow descent rates to build excessively during demonstrations.

CAUTION

Most transient over torques occur as the aircraft unloads during maneuver recovery, e.g., as coning dissipates with left cyclic applied.

CAUTION

Excessive bank angles during recovery offset lift from weight, requiring additional recovery altitude. Rolling wings level will optimize lift and reduce recovery times.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training. 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.

TASK 1402

Perform Tactical Flight Mission Planning

CONDITIONS: Before a tactical flight in an AH-64D helicopter or an AH-64D LCT, 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 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 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 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 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 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 CONSIDERATIONS: More detailed flight planning is required when the flight is conducted in reduced visibility, at night, or in the NVD flight environment. Field manual (FM) 3-04.203 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 LCT 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 PC will assign radio frequencies per SOI and mission requirements during the crew briefing. The PC will indicate which crewmember will establish and maintain primary communications.

   b. The 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), HF) and/or change the frequency modulation power setting to HIGH. Changes must be coordinated with other aircraft per the unit 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1405

Transmit Tactical Reports (Digital/Voice)

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

STANDARDS:

1. Transmit the appropriate report using the proper format and current SOI.
2. Transmit tactical reports using tactical standing operating procedures (TACSOPs).
3. Transmit/receive digital reports.

DESCRIPTION:

1. Crew actions.

a. The 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 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 TACSOPs 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 (BD) 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 BD assessment 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.

- S–size.
- A–activity.
- L–location.
- U–unit (if known).
- T–time.
- 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) 1 0 minutes after burst.

(n) If NBC-1, cloud width 1 0 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) 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.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D LCT.

2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1406

Perform Terrain Flight

CONDITIONS: In an AH-64D helicopter or AH-64D LCT, with sufficient power available.

STANDARDS: Appropriate common standards and the following:

1. Terrain flight takeoff.
   a. Evaluate winds, aircraft traffic and obstacles prior to take off.
   b. Select appropriate terrain flight take off technique based upon conditions
   c. Maintain takeoff flight path until clear of obstacles.
   d. Apply power as required to clear obstacles.
2. Terrain flight approach.
   a. Maintain desired approach angle to clear obstacles.
   b. Maintain ground track alignment with the selected approach path with minimum drift.
   c. Maintain an appropriate rate of closure.
   d. Make a smooth, controlled termination at the intended approach point.
3. Terrain flight deceleration.
   a. Maintain alignment with the desired flight path or NOE trim.
   b. Maintain desired obstacle clearance.
   c. Decelerate to the desired speed or to a full stop at the selected location.
4. Terrain Flight.
   a. Low-level flight.
      (1) Maintain altitude±50 feet.
      (2) Maintain airspeed ±10 KTAS.
      (3) Maintain the aircraft in trim.
   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 aerodynamic trim.
   c. NOE flight.
      (1) OGE power required.
      (2) Fly as close to the earth's surface as obstacles and visibility will permit.
      (3) Maintain airspeed appropriate for the terrain, enemy situation, weather, and visibility.
      (4) Maintain the aircraft in NOE trim as required.

DESCRIPTION:

1. Crew actions.
   a. P* will remain focused outside the aircraft and will acknowledge all navigational and obstacle clearance advisories. The P* will announce his intentions and actions (e.g. whether a takeoff is from the ground or from a hover, intent to abort or alter the takeoff, the intended direction of flight, and if a landing is to the ground, hover OGE/IGE, and any deviation from advisories given by the P).

b. The P will provide adequate warning to avoid obstacles detected in the flight path or identified on the map or TSD. The P will announce when a performance limit is about to be exceeded. The P will announce when his attention is focused inside the cockpit (for example, when monitoring aircraft systems).

c. Crewmembers should set the radar altimeter altitude warnings to an altitude AGL that best supports the tactical situation and mode of flight.

d. The stabilator NOE approach or manual mode will enhance forward visibility and raise the aircraft's tail during terrain light. The P* will announce his intentions to use the manual stabilator.

TERRAIN FLIGHT TAKE OFF TECHNIQUES

1. Terrain flight takeoff general procedures. For all terrain flight take offs determine the optimum direction of takeoff by analyzing the effects of the tactical situation, wind, long axis of the takeoff area, and obstacles. If available engine power is marginal and the possibility exists of exceeding a limit, the crew should have an (A/C ENG page selected and the P should monitor and announce impending performance limiters. The P* selects visual reference points to assist in maintaining the takeoff flight path and remains focused outside the aircraft during the maneuver. If required, reposition the aircraft to maximize the advantages of the long axis and effects of wind. Align the aircraft with the takeoff reference point and adjust power as required to initiate the takeoff. The FPV provides an indication of the aircraft's flight path and can assist the crew in determining obstacle clearance. Ensure the FPV remains above the obstacles until the aircraft is clear. Once obstacles are cleared, adjust the flight controls as required to transition into the desired terrain flight mode (NOE, contour, or low level)

2. Continuous angle–terrain flight takeoff. This takeoff technique should only be attempted with robust OGE power available (power available >10% above OGE power required). Select a desired flight path that progresses from the wheels to a point in space above the selected departure path obstacles. Simultaneously apply collective and directional cyclic to perform a continuous climb to clear the obstacles. As the aircraft clears the obstacles reduce power as necessary and transition into the appropriate terrain flight mode. This technique can be performed in whatever direction of flight provides the crew with the optimum visibility and obstacle clearance. This technique is particularly useful in very confined spaces and/or where the tactical situation demands that the aircraft be oriented in a particular direction to minimize the aircraft visual, radar, infra-red signature and/or to maintain the weapons, sensors, and ASE oriented in a particular direction. This technique provides the least maneuver area in the event of an engine malfunction or Nr droop.

3. Altitude over airspeed–terrain flight takeoff. Select an altitude over airspeed takeoff in an area where maneuver space is limited and/or OGE hover power is marginally available (power available ≤ 10% above OGE power required). This takeoff allows the P* to safely abort the takeoff and descend back to the point of origin should there be insufficient power to complete the takeoff. This also maximizes the available maneuver area, in the event of contingencies, if aircraft is repositioned to the furthest extent from departure path obstacles. The crew will select reference points to, clear the aircraft and ascend vertically to an altitude above the obstacles. When the aircraft is above a crew determined minimum safe maneuvering altitude, cautiously accelerate into forward flight. As the rotor disk tilts forward the crew should be prepared for a potential decrease in aircraft altitude as the lift vector shifts away from the vertical. The crew should have sufficient altitude margin to account for any altitude loss prior to accelerating through ETL. When OGE power is marginal and the necessary altitude cannot be reached or maintained to clear the obstacles, the crew should be prepared to descend back into the confined area and reevaluate the departure plan.

4. Airspeed over altitude terrain flight takeoff. Select an airspeed over altitude takeoff when OGE power is not available and/or when sufficient maneuver area exists. The crew must overcome limited power by making optimum use of available maneuver space and environmental conditions (winds). The crew repositions as necessary to ensure that there will be sufficient room not only to execute the takeoff but also to abort the takeoff and safely stop the aircraft prior to reaching the departure end barriers. The crew will select and announce the abort point at which the aircraft must be through effective translational lift and on a flight path to clear the obstacles. The takeoff abort point must allow adequate area to decelerate and terminate safely without impacting the ground, obstacles or exceeding aircraft limits. If the crew is still unable to execute the confined area takeoff utilizing this technique they must reduce aircraft weight (burn-off fuel/down-load ammo) or wait for more favorable environmental conditions (figure 4-6, page 4-120).

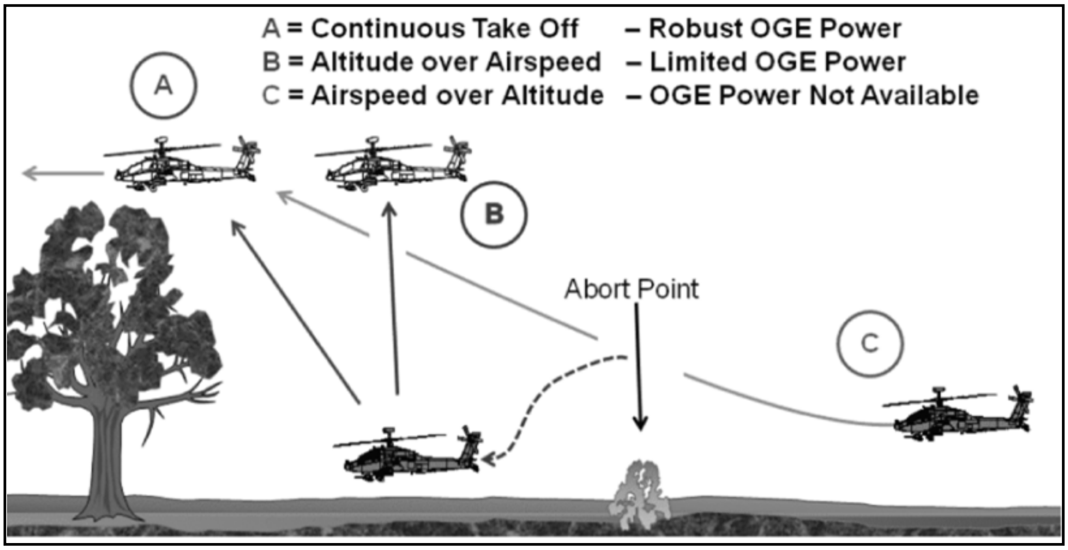

Figure 4-6. Airspeed over altitude terrain flight takeoff

TERRAIN FLIGHT APPROACH

1. Initiate the approach from a straight-in or modified pattern, as required by the tactical situation, wind, long axis of the landing area, obstacles, and arrival path. Evaluate the wind direction and magnitude, noting TSD or PERF page wind status window, or external wind cues.

2. Do not land into a confined area if taking off out of it is in doubt due to environmental or power limitations.

3. Announce 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.

4. Utilize the FPV to provide an indication of the aircraft's flight path to aid in obstacle clearance. 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 HDU symbolic cues in conjunction with visual cues.

5. Maneuver the aircraft as required (straight-in or circle or selected ground track) to intercept the desired approach path. Adjust the AS and A/C attitude as necessary and keep the landing area in sight. Start the approach upon intercepting an angle appropriate for tactical situation and that ensures obstacle clearance. The P* may utilize tail rotor controls to place the helicopter out of NOE-trim to view the landing area or intended touchdown point through the side canopy. The crew must ensure that the aircraft's tail will remain clear of all obstacles in this sideslip condition.

6. Aborting the Terrain Flight Approach: If a successful landing is doubtful or visual reference with the touchdown point is lost the crew must decide whether to initiate a go-around. With adequate OGE power available a go-around can be executed at any time at the discretion of the crew. If OGE power is not available then a decision to execute the go-around must be made before the aircraft's airspeed drops below ETL or minimum dual engine airspeed whichever is higher and/or before the aircraft descends below obstacles.

TERRAIN FLIGHT DECELERATION. Rapidly slowing or stopping the aircraft at terrain flight altitudes requires specialized techniques to ensure tail rotor clearance and power management. At very low altitudes the primary consideration is maintaining clearance of the tail rotor. The crew adjusts the flight controls to ensure that the center of rotation during the deceleration is controlled. How this is done varies based upon conditions of airspeed, altitude and power available.

1. Below 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. Referencing the HDU rate of climb indicator during the maneuver will assist in altitude control.

2. 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. Referencing the HDU rate of climb indicator during the maneuver will assist in altitude control.

TERRAIN FLIGHT TECHNIQUES.

1. Low-level flight. Low-level flight is usually performed at a constant airspeed and at a constant low altitude. The low-level flight altitude (generally 80 to 200 feet AHO) is selected so that the terrain still provides a meaningful tactical advantage of preventing or reducing the chance of detection by enemy forces. The low-level flight altitude is selected so that the aircraft can be flown at a constant airspeed.

2. Contour flight. Contour flight generally follows the contours of the earth. It is characterized by varying altitude (generally 25 to 80 feet AHO) that is at or just above the altitude of nearby terrain or obstacles. Contour flight is generally flown at a relatively constant airspeed, commensurate with the terrain, vegetation, obstacles, and ambient light.

3. 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. During NOE flight the crew usually selects a flight path over the area of lowest terrain within the surrounding area. NOE is generally flown at or below the altitude of highest surrounding terrain and obstacles (generally up to 25 feet AHO) so as to ensure direct terrain masking from enemy observation.

NIGHT OR NIGHT VISION GOGGLE CONSIDERATIONS: the crew’s downward visibility is significantly restricted under night unaided and NVG conditions. This will require the P* to either select a shallower approach angle to see over the nose, or alternatively, to utilize pedals to offset the helicopter heading enough to view the landing area through the side canopies. At night the crew may be adversely affected by ground based lights masking their ability to see the ground and/or unlit obstacles. When operating in urban confined areas or when landing at lit airfields or helipads ground based artificial lights may be significantly degraded NVG. In these instances the crew can “fight light with light” by activating the aircraft search light. This will fill in shadow areas and minimize the impact of ground based light sources that would otherwise shut down the goggles allowing the P* to keep the landing area in sight.

NIGHT VISION SYSTEM CONSIDERATIONS: The techniques below can assist the crew in overcoming the challenges of limited FOV and slew rates of NVDs:

1. Night terrain flight. Maximize NOE trim (the aircraft longitudinally along the NOE flight path/ground track) will diminish the possibility of striking an obstacle with the tail. The AH-64D provides symbolic cues that can be used day or night to maintain NOE trim. The symbolic cue for maintaining longitudinal trim during NOE flight has been termed “NOE trim.” Establish and maintain NOE trim by maneuvering the aircraft to maintain the HMD velocity vector extended at the 12:00 position from the LOS as follows: Apply anti-torque pedal pressure corresponding to the direction of the displaced velocity vector (“Step on the Velocity Vector”). Apply slight cyclic pressure opposite the side of velocity vector displacement if exact ground track is to be maintained.

2. Night terrain flight approach. During terrain flight approach monitor on final while all critical obstacles in and around the landing area are visible within the instantaneous FOV. Briefly reconnoiter beyond the landing

area for a potential go-around route. Utilize the landing area reconnaissance to confirm that a safe takeoff path can be executed after landing. Obtain rate of closure information from the forward FLIR imagery. Relative motion cues are most reliable when the NVS is offset from the aircraft centerline (looking left, right, or down). A deceleration may be required prior to reaching the desired approach angle to arrive on the angle with the correct rate of closure. Cross-check imagery-supplied perception of motion with symbology information such as the velocity vector and HDU ground speed indications. When obstacles are near, maintain NOE (nose-to-tail) trim with the pedals and ground track with the cyclic.

3. Night terrain flight deceleration. Avoid making abrupt changes in aircraft attitude or direction. To overcome the limits of NVD FOV and FOR, the nose of the aircraft rises, lower the NVS FOV 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. During the recovery lead with the collective and level the aircraft with cyclic to avoid settling with power.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft or AH-64D LCT.

2. Evaluation will be conducted in the AH-64D aircraft. Terrain flight, approach, takeoff and terrain flight deceleration will be evaluated to satisfactorily complete this task.

REFERENCES: Appropriate common references.

TASK 1410

Perform Masking and Unmasking

CONDITIONS: In an AH-64D helicopter or an AH-64D LCT, the P* properly fitted with a boresighted HDU, and OGE power available for unmasking at a hover (vertically).

STANDARDS: Appropriate common standards and the following:

1. Perform a map reconnaissance.
2. Mask the aircraft from enemy visual and electronic detection.
3. Use the masking and unmasking technique appropriate for the conditions
4. Ensure that weapons, sensors, ASE are properly configured for immediate and effective use prior to unmasking
5. Maintain a sufficient distance behind obstacles to allow for safe maneuvering.
6. Move to a new location, if available, before subsequent unmasking.

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 and obstacle avoidance while viewing his assigned sector. When operating at high gross weights and limited power margins, the P* will monitor engine performance to prevent possible rotor decay.

b. The P will perform a map/TSD reconnaissance and utilize UAS video or other off-board systems available to identify likely enemy locations before unmasking the helicopter. 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 announce the single engine contingency plan.

d. The crew must ensure that weapons, sensors, and ASE are properly configured for immediate and effective use prior to unmasking.

e. The crew establishes and maintains security by dividing duties. The PC will assign observation sectors to maximize the areas scanned during the time unmasked with the P* usually clearing the area around the aircraft, while the CPG searches outward using onboard sensors.

2. Procedures.

a. Masking/unmasking the aircraft. The crew must take maximum advantage of terrain, vegetation and man-made structures to prevent exposure of the aircraft to enemy visual observation or electronic detection. Masking may provide cover or concealment. Concealment may be achieved with either direct or indirect masking. Indirect terrain masking provides a visual, infrared, or radar backdrop that makes the aircraft blend in with its background and limits the enemy's ability to detect or successfully target the aircraft. Concealment will not protect the aircraft from fire. Cover protects the aircraft from enemy fire, where concealment only protects the aircraft from enemy observation and aimed fire. Direct terrain masking places terrain, vegetation, or man-made objects between the aircraft and the enemy. The difference between cover and concealment must be considered, particularly during remasking. Remasking behind thin vegetation will provide no protection from long bursts of enemy anti-aircraft artillery fire.

b. Masking/unmasking the sensors. Unmask only enough of the helicopter to perform the mission. Unmasking only the FCR or MTADS will allow the Apache crew to successfully target the enemy while providing maximum protection to the aircraft and crew. The P will evaluate the R-MAP raw video to determine when sufficient amount of the FCR's mast-mounted assembly (MMA) is unmasked to paint the engagement area. When utilizing the MTADS the gunner will announce when the sensor is unmasked and direct the P* to move up/down or laterally as required. When the sensor is unmasked he will announce

"Mark Altitude" or "Mark Position". The P* may select the MTADS as an acquisition source and cross reference the C-SCP indication to determine/anticipate when the MTADS is masked or unmasked without having look heads-down at an MPD. When masked behind light vegetation it is often possible to observe the target area with the MTADS by looking through or beside tree branches. In these cases it is important the crew fully unmask the weapons prior to engaging targets. The crew should ensure the video recorder is on or ready to employ. The CPG should be prepared to scan, record, and store areas/objects of interest with the MTADS or FCR.

c. Masking/unmasking the weapons. Unmask the weapons enough to ensure a clear field of fire. Hellfire missiles have minimum launch altitude constraints for terrain clearance. The RF missiles have horizontal clearance requirements when engaging stationary targets due to Doppler beam sharpening.

(1) In flight (running fire) masking/unmasking. Unmasking in flight. Keep aircraft exposure time to a minimum to prevent enemy visual observation or electronic detection. Take advantage of the aircraft's performance to unmask and remask the helicopter when it is necessary to minimize aircraft exposure time.

(2) Hover masking/unmasking techniques.

(a) Hover masking considerations. The crew should designate a MSA for operations below the mask and a minimum maneuver altitude (MMA) for operations above the mask. The crew should employ attitude and altitude hold modes during this maneuver to minimize crew workload. Unmask at a safe distance from the mask to allow a rapid descent to a masked condition if detected or fired upon. The P* 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. Maintaining 500 meters from the mask will provide tactical standoff from undetected or dismounted enemy forces equipped with rifles or RPGs. Hover tactics generally maximize stealth and ground clutter to avoid detection. The aircraft's visual and electronic signature can be minimized by executing slow vertical and horizontal movement and maintaining a flat rotor disk perpendicular to the enemy's line of sight (figure 4-7).

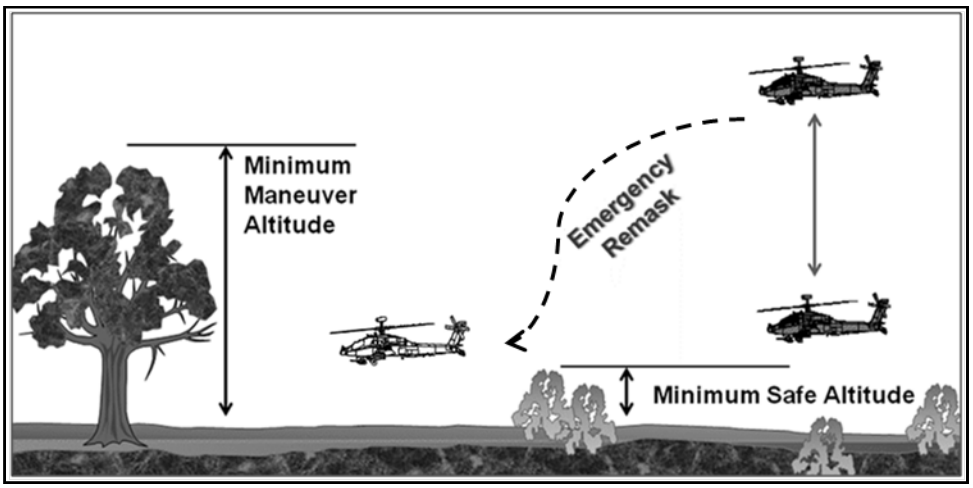

Figure 4-7. Masking techniques

(b) Hover remasking considerations. Prior to unmasking the helicopter again select a new location if feasible to avoid unmasking into the enemy's weapon sight field of view. The distance to reposition varies based upon range. If the target area is a 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. If the target area is close to the unmasking position, repositioning as little as 100 meters will make a significant difference visually and may defeat mounted enemy gunners. Note however that at close ranges (inside 2,000 meters) the helicopter's general position can be easily determined by dismounted personnel based upon the helicopter's audio signature.

(c) Vertical Masking/Unmasking. OGE hover power is required for vertical unmasking. Ensure that sufficient power is available by referencing the PERF page or performance planning data prior to unmasking. Apply collective until sufficient altitude is obtained to unmask the MTADS or FCR. Establish visual reference points and utilize hover or bob-up mode to assist in maintaining position during ascents and descents. A common tendency when masking/remasking vertically is to move forward or rearward while performing this maneuver. To avoid settling with power when remasking vertically the P* should not descend at a rate faster than can be stopped with available engine power. This can be determined by referencing the climb/descent chart in Chapter 7. Utilize the delta between engine power available and OGE power required to determine the expected rate of climb and consider that the maximum safe vertical descent speed for remasking. As a general rule when vertically remasking with limited power margins do not reduce power below the IGE hover value.

(d) Horizontal Masking/Unmasking. Often unmasking can be accomplished by moving laterally from the mask. Lateral unmasking has many potential advantages including keeping the aircraft within ground clutter, and may require substantially less power when utilizing a low altitude mask. When operating in an urban environment unmasking above the 10th story can significantly limit the ability of enemy armor to engage the aircraft due to limitations on tank main gun elevation. When unmaking laterally hover the aircraft sideward enough to unmask and fire weapons.

(e) Desert Considerations. During desert masking/unmasking operations rotor wash management is critical, once started a dust cloud will continue to grow. When possible select an area where the dust cloud can be masked. Hovering out of ground effect can reduce the development of a dust cloud (figure 4-8).

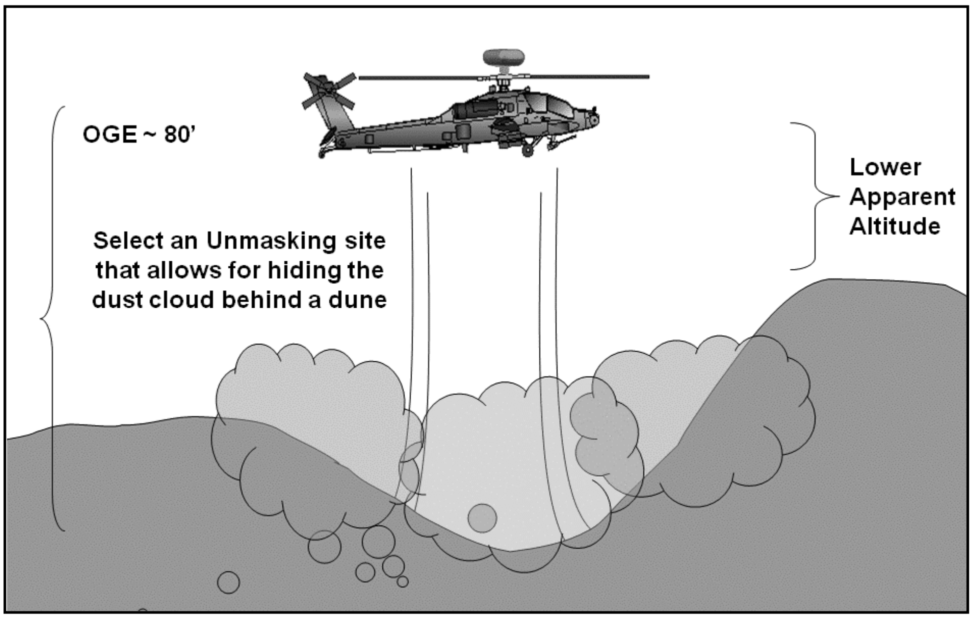

Figure 4-8. Dust/cloud reduction

NIGHT OR NIGHT VISION DEVICE 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 manmade 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 CONSIDERATIONS

1. Masking.

a. Using FLIR imagery and 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 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 climb. 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 FLIR imagery to verify the position.

b. Reduce collective to initiate a descent while referencing torque and the VSI.

c. Use FLIR image cues inclusive of NOE coupling to remask. Attitude (position) hold may be used during the remasking. Ensure that the composite video position box and/or LOS reticle indicates a return to a vertical position over the place of origin unless it is unsafe to do so.

d. Continue the descent to remask the aircraft, descending no lower than the established MSA.

e. 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft.

REFERENCES: Appropriate common references, Task 1414, Task 1422, and Task 2043.

TASK 1414

Perform Firing Position Operations

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

STANDARDS: Appropriate common standards and the following:

1. Select attack by fire, support by fire, and battle positions based upon METT-TC.
2. Select the firing positions which maximize attack helicopter effectiveness and survivability.
3. Enter the firing position, keeping the aircraft masked from visual or electronic detection.
4. Engage targets as appropriate and reposition as required.
5. 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 P* will remain focused outside the aircraft and maintain aircraft orientation toward the target. The P* will announce any maneuver or movement prior to execution. The P* will evaluate the wind and analyze the firing position for the availability of forced landing areas/flyaway plan.

c. The P will set the RADALT warning altitude selection to a minimum maneuvering or minimum safe altitude. The P will direct the P* to maneuver the aircraft as necessary to maintain target orientation, utilizing standard crew terminology.

d. The crew will announce all visually or electronically detected threats.

2. Procedures. This task guides the crew during deliberate and hasty attack planning. The crew utilizes NORMA as a starting guide to select optimum attack by fire (ABF) for multiple attack helicopters and background, range to target, altitude, sun, shadows, cover and concealment, rotorwash, adequate maneuver area, fields of fire (BRASSCRAF) to select optimal individual attack helicopter firing positions. Both friendly and enemy weapon systems are affected by their respective WEZ. A WEZ (figure 4-9, page 4-128) has four dimensions (3-D + Time) defined as:

- R-$_{MIN:}$ Minimum engagement range.
- R-$_{MAX:}$ Maximum engagement range.
- Azimuth (left/right) limits: Lateral engagement limits or fields of fire modified by surrounding terrain and natural or man-made obstacles.
- Elevation limits: Vertical engagement limits of the system modified by surrounding terrain and natural or man-made obstacles.

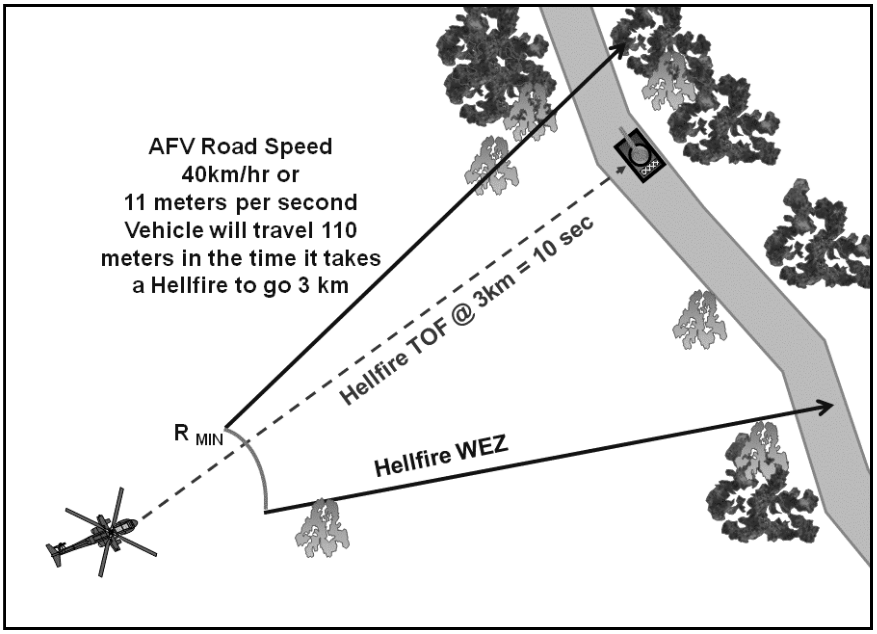

Figure 4-9. Weapons engagement zone

a. NORMA. ABF/support by fire (SBF) and battle position (BP) selections should support multiple primary firing positions and alternate firing positions.

b. ABF/SBF selection should be based on the following considerations:

(1) Nature of the target.

(a) Primary target: type, quantity, location.

(b) Target vulnerability: Desired aimpoints selected to cause maximum damage.

(c) Target signatures: visual, FLIR, NVG, or radar cues to identify target.

(d) Target passive defenses: camouflage, concealment, and deception (CCD) techniques expected.

(e) Target active defenses: Define enemy weapons engagement zone (WEZ).

(2) Obstacles.

(a) Physical obstacles to target attack such as intervening terrain and vegetation.

(b) Man-made structures such as power lines highway, noise walls.

(c) ATO “No-Strike List” protected sites or other restrictions to attack directions or ordinance.

(d) Civilian population/collateral damage concerns in close proximity to possible target area.

(e) Environmental restrictions: cloud ceilings, visibility, icing excessive winds, heat, and density altitude.

(3) Range to target.

(a) Determine weapon system to be employed in attack.

(b) Determine friendly weapons engagement zone (WEZ) in 4-dimenstions.

(c) Does proposed ABF allow for maximum standoff distance from the target?

(d) Does proposed ABF allow for adequate maneuver area for unexpected contacts or events.

(e) Consider exposure time, element of surprise, and time required to engage target.

(4) Multiple firing positions/lanes.

(a) ABF 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.

(b) 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.

c. Firing position. Selection of firing positions should be based on the following considerations:

(1) Background. The crew should utilize indirect terrain masking to ensure the helicopter is not 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.

(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. It may not be possible to engage targets above the aircraft.

(4) Sun or full moon. Plan to attack with the sun/moon behind or to the side of the helicopter to restrict enemy aided or unaided vision.

(5) Shadow. The firing position should be within an area covered by sun shadow, moon shadow, or artificially produced shadow.

(6) Concealment. Terrain, man-made objects or 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 signature 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. The field of fire must allow for the time of flight of the helicopter's weapons to impact before the enemy can transition to cover. The chart below (table 4-3) can aid in engagement area/WEZ validation.

Table 4-3. Weapons/target speed cross reference

Time Of Flight & Time to Impact Comparison (minutes:seconds)										
Range to target (km)	1km	2km	3km	4km	5km	6km	7km	8km	9 km	10 km
V-Sound (331 mps)	0:03	0:06	0:09	0:12	0:15	0:18	0:21	0:24	0:27	0:30
30-mm	0:02	0:5.8	0:12.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6PD	0:02	0:04	0:6.5	0:10	0:15.5	0:20.7	0:28	N/A	N/A	N/A
MPSM*	0:11	0:14	0:18	0:21	0:27	0:32	0:37	N/A	N/A	N/A
Hellfire	0:03	0:07	0:10	0:14	0:19	0:24	0:29	0:36	N/A	N/A
Target Speeds (km/hr–meters per second)										
Running Man	14.4 km/hr 4 mps	***Wheeled Vehicle***	80 km/hr 22 mps	***Tracked Vehicle***	40 km/hr 11 mps					

NIGHT OR NVG CONSIDERATIONS: The use of NVG will aid in detecting enemy activity within the engagement area and will greatly assist in evaluating friendly aircraft light discipline. The crews should keep in mind that enemy NVG will probably not have "minus-blue" filters and will therefore be more likely to detect apache cockpit lights if they are turned up excessively bright.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the AH-64D aircraft or AH-64D LCT.

2. Evaluation will be conducted in the AH-64D aircraft. Evaluation may be conducted using live fire, TRAIN mode, or a combination of the modes.

REFERENCES: Appropriate common references.

TASK 1415

Perform Diving Flight

CONDITIONS: In an AH-64D helicopter or an AH-64D LCT with a 180-degree clearing turn completed.

STANDARDS: Appropriate common standards and the following:

1. Establish entry altitude 1,500 feet AGL (minimum), ±100 feet.
2. Establish entry airspeed 110 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 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 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 RADALT 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 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 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 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 NVD CONSIDERATIONS: Altitude, apparent ground speed, and rate of closure are difficult to estimate at night.

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 LCT.
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-mm gun turret area and the wing pylons clear, or in an AH-64D LCT.

STANDARDS: Appropriate common standards and the following:

1. Conduct weapons operational check in accordance with TM 1-1520-251-10TM 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 CPG (front seat crewmember) will control the coordination of weapon initialization procedural checks unless the 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 Inspection and Maintenance Record).

2 Procedures.

a. The initialization of the weapon systems begins during pre-mission planning with the programming of the 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 PLT (backseat crewmember) will load applicable DTC data into the aircraft.

c. After the 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 applicable 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 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 related DMS weapons 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, 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 LCT. 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 LCT.

REFERENCES: Appropriate common references.

TASK 1422

Perform Firing Techniques

CONDITIONS: In an AH-64D helicopter or an AH-64D LCT, with aircraft weapons operational checks completed, and given a target to engage.

STANDARDS: Appropriate common standards and the following:

1. Identify the target.
2. Select the appropriate munitions for the required target effect.
3. Employ appropriate firing techniques.
4. Select appropriate pull-off technique.
5. Set low altitude warning on the radar altimeter to the desired recovery altitude (if appropriate).
6. Perform low altitude warning recovery if aircraft is allowed to descend below the recovery altitude.

DESCRIPTION:

1. Crew duties.

   a. The P will operate the SAFE/ARM button.

   b. The crew will identify the target and/or target area IAW the ROE prior to firing.

   c. 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 safeing are defined as:

   - Weapons trigger switch released.
   - Weapons action switch deselected.
   - SAFE/ARM button – SAFE.

   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 inter communication system (ICS) shall cease until the P* states "BACK ABOVE" to the P.

2. Procedures.

   a. Techniques of fire. The crew pairs the appropriate weapon and munition to the target based upon the target effect required. The goal is to use the best weapon that achieves the required target effect and maximizes aircraft survival.

   b. Destruction is a decisive engagement that puts a target out of action permanently. Destruction is achieved by killing enemy personnel or destroying enemy equipment. It requires weapons to strike within lethal range of the target. Hellfire missiles are well suited for destructive fires.

   c. Neutralization requires weapons effects to hit the target and cause damage to it. Unlike suppressive fire, target neutralization cannot be achieved by rounds that miss the target. Neutralizing damage to a target can temporarily remove it from the battle. High explosive (HE) and multipurpose sub-munitions (MPSM) rockets as well as 30-mm high explosive dual purpose (HEDP) are capable of target neutralization.

   d. Suppression of a target limits the ability of enemy personnel to perform their mission. Suppressive fire is used to defend friendly forces from accurate enemy attack. It limits enemy movement and observation and increases friendly freedom to maneuver. Any available weapon or munition can be used to suppress the enemy. Lethal suppressive fire reduces enemy combat effectiveness by creating apprehension or surprise and causes enemy vehicle crews to button up and dismounts to seek cover. To be effective, suppressive fire must force a change in enemy behavior. Suppressive fire may be used to either fix the enemy in place or force him to move from a position. Suppressive effects may also be created by smoke or illumination rounds. Suppressive fire can be preplanned and can be used preemptively or reactively as required. All rockets and 30mm are capable of target suppression.

e. Techniques of fire

(1) Hover fire. Hover fire is delivered when the helicopter is below ETL, IGE or OGE. Hover fire is used when the enemy possesses a significant anti-aircraft threat system composed of radar directed Air Defense Units (ADU) or anytime standoff must be maintained. When using hover fire techniques, 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.

(2) 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 when air defense threats prevent the use of diving fire. Running fire is performed at airspeeds above 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.

(3) Diving fire. Diving fire is the most accurate type of fire for unguided ordnance. 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.

(4) Low-altitude bump. This profile maximizes the benefits of both running and diving fire involving a low-altitude run-in with a 300- to 1,000-foot climb ***(Bump)*** about 1,500 to 2,000 meters prior to the target. From the apex of the climb ***(Perch)*** the crew enters a diving profile in order to deliver ordnance in a nose-down angle to achieve smaller beaten zones. In mountainous terrain there may be no need for a Bump as the relative position of the sloping terrain provides the same effect to an aircraft in level flight.

(5) Diving/running fire initial point. To provide time and space to set up a running or diving fire attack the AMC selects an Initial Point (IP). Normally the IP is selected about 8 to 10 kilometers from the target acts as a starting point for the attack run. The initial point should be either a readily identifiable terrain feature or a TSD/C-Scope icon.

f. Stable firing platform (4-Ts): Regardless of the engagement technique used, the aircrew must strive for accurate fires onto the target by providing a stable firing platform. By verifying "*4-Ts—target, torque, trim, and target*" sequence prior to firing the P* ensures a stable and accurate weapons platform.

- 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.
- 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 vertical trim.
- 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.
- Target re-verified. Finally, the crew re-verifies the correct target and symbology alignment.

g. The pull-off: After weapon's release the crew executes a turn away from the target. This maneuver is called the "pull-off". Formerly referred to as the "break", the joint term "pull-off" is now preferred for inter-service clarity and to avoid confusion with the J-Brevity term “Break” meaning to execute a maximum performance evasive maneuver. The pull-off is employed to enable attack helicopter the safest possible departure from the target area. There are three basic pull-offs: descending, level, and climbing. Each has its own advantages and disadvantages. The AMC selects and briefs the pull-off most appropriate for the situation.

(1) Descending pull-off.

(a) Advantages:

- Descending 3dimenentional movement for which an enemy gunner must compensate.
- The aircraft readily regains airspeed.
- The G-loading is lower on a heavily loaded airframe.
- Permits return to NOE flight.

(b) Disadvantages:

- More time required to return to an attacking altitude (if required).
- Caution must be executed in maintaining terrain clearance.

(2) Level pull-off.

(a) Advantages:

- Maintains airspeed.
- Maintains altitude.
- Allows for terrain clearance.

(b) Disadvantages:

- Requires enemy gunners to compensate only for range and turn rate, but not altitude.
- G-loading is significantly increased.

(3) Climbing pull-off.

(a) Advantages:

- One more parameter for which an enemy gunner must compensate.
- Quick return to altitude and vertical standoff.
- Terrain clearance is enhanced.
- Minimum time spent in small arms environment.

(b) Disadvantages:

- Climb is generally at slow airspeed.
- G-loading is significantly increased.

(4) Pull off distance. The Pull Off distance is based upon the aircraft weapon’s fragmentation envelopes and E-WEZ. The target pull off should be initiated in order to ensure that the aircraft will be completely clear of fragmentation effects from own munitions. It may be survivable to deliver ordnance from within these ranges if the situation necessitates, but should never be attempted during training. In general do not penetrate your own weapon’s danger close risk estimate distance (RED) as indicated in the current J-Fire manual. The crew should keep in mind that primary and secondary fragmentation can continue to fall for several seconds after weapons impact.

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 LCT.

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 Semi-Active Laser (SAL) Hellfire Missile

CONDITIONS: This task includes the following three conditions:

1. In an AH-64D helicopter with the weapon train mode enabled and SAL Hellfire training missiles installed, TADS internal boresight completed, weapons systems initialization completed, and if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

2. In an AH-64D helicopter on a gunnery range with live missiles loaded, TADS internal boresight completed, weapons systems initialization completed, and, if installed, FCR operational checks completed and the P* fitted with a bore sighted HDU.

3. In an AH-64D LCT with TADS internal 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.

STANDARDS: Appropriate common standards and the following:

1. Select the SAL missile type appropriate for the target.

2. Select the SAL missile lock on before launch (LOBL) or lock on after launch (LOAL) means of delivery as appropriate for the engagement.

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.

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 SAL missile selected, 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 HAD or one MPD with the opposite crewmember's pertinent video displayed.

c. The P* may access his independent weapons page and review the aircraft's active missile status, verifying it is appropriate for 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.

d. The CPG will direct the Pilot as necessary to align the missile into firing constraints.

e. Crewmembers should consider selecting the opposite stations video on one MPD when the situation allows. F. Opposite crew station video selection increases situational awareness and allows for quality control during the execution of this task.

2. Procedures.

a. Initialization. At some point prior to actioning the missile system, the crewmember desiring to perform the missile engagement must validate the SAL missile system control/status (MSL) page option settings prior to engaging the target.

(1) Type options. The firing crewmember must confirm that the active missile type is SAL. If FCR is the selected sight this option will display RF and be barriered. The crewmember must select TADS as the active sight and then select SAL.

Note. 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. The weapon's processor (WP) continuously reads the TYPE data field for the independent weapon's pages of both crewmembers.

(2) CHAN options. The crewmember performing the Hellfire engagement must verify that the SAL missile status window (CHANNEL) displays the correct codes available for selection. These codes represent the 4 laser PIM/PRF frequencies available for use, thru PRI/ALT selection, by the SAL missile. The crewmember accesses the CHAN page and selects one of the 16 available codes (A-R excluding I and O) for each of the 4 channels.

(3) CODE Options.

(a) FREQ: Prior to initiating autonomous or remote laser designation, the crewmember performing the engagement must verify that the appropriate laser frequencies are loaded into the 16 available code positions located on the CODE page. These frequencies may be loaded via the DTC or manually through the FREQ button. Crewmembers change the frequency by selecting the FREQ button, then selecting the position requiring editing. The crewmember then inputs the desired 4 digit frequency for that position.

(b) SET: Prior to initiating autonomous or remote laser designation, the crewmember performing the engagement verifies the LRFD and LST are set to the appropriate laser code. The set button displays either LRFD or LST. The code selected for the displayed option (LRFD/LST), of the 16 displayed will be boxed. To change the desired code, the crewmember selects the SET button until the desired option is displayed, then selects the code desired.

(4) Primary (PRI)/alternate (ALT) options.

(a) The PRI/ALT buttons are used to designate the channels for encoding SAL missiles. The PRI selection determines the laser code on which missiles will search and track. In the normal (NORM) mode the WP will encode three missiles for the priority channel, regardless of the actual inventoried quantity, before any missiles will be allocated to the alternate channel. Alternate channel missiles cannot be fired; they are maintained in a ready (R) or tracking (T) status for the Ripple (RIPL) fire mode only. To launch an ALT CHAN TRACK missile, the firing crewmember will first have to select the ALT channel as the PRI channel.

(b) The crewmember performing the engagement must confirm that the PRI and ALT display the desired missile channel. Selecting PRI or ALT will allow the crewmember to select one of the four missile codes as set up on the CHAN page. If a channel different from the four available is desired, the crewmember must return to the CHAN page and change the selections there.

Note 1. PRI/ALT selections are common to both crewstations.

Note 2. 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 continuously reads the PRI and ALT laser channel data fields.

Note 3. The WPN missile channel logic is set for three missiles and cannot be altered by the crew. 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 4. SAL missile 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 avoid confusion with the numbers one (1) and zero (0).

(5) SAL SEL. Based on the available onboard SAL missile inventory, the firing crewmember will select the appropriate setting.

(6) SAL missile mode options: The crewmember performing the Hellfire target engagement will confirm that the correct missile firing MODE is selected for the engagement. The crewmember will choose NORM, RIPL or MAN as appropriate.

(a) Normal (NORM) firing Mode: In the NORM firing mode the aircraft automatically encodes and advances missiles to the PRI channel as missiles are expended. The WP selects missiles for encoding based upon the WP's preferred firing order and SAL SEL settings.

(b) Ripple (RIPL) fire mode: Ripple fire employs multiple missiles launched on different laser codes. Ripple fire engagements require at least two laser designators.

- Ripple fire is employed during autonomous/remote and remote/remote engagements using LOBL, LOAL, or some combination thereof. Ripple fire engagements can be accomplished automatically (mode RIPL) or manually (mode NORM). If RIPL is selected the WP automatically reverses the PRI and ALT channels after each missile launch. If NORM is selected the firing crewmember must manually reverse the PRI and ALT channels after each missile launch.
- In the RIPL mode, the missiles are evenly divided between the two channels, with the priority channel assigned the extra missile in the case of an odd number of missiles available.

(c) Manual fire mode: In the MAN mode the WP selects and encodes only one missile at a time. The WP's missile selection is based on the default preferred firing order and SAL SEL settings. The Manual Advance (MAN ADV) button is enabled allowing the crewmember to select the desired missile for firing. Only one missile will be displayed, as ready or tracking when the manual mode has been selected.

Note 1. The MAN ADV buttons are only enabled when MAN mode is selected.

Note 2. When multiple SAL variants (K2, N, FA etc.) are onboard, the MAN mode is preferred. This will allow the firing crewmember to rapidly weaponeer and choose the best missile for the target.

Note. Rapid fire is a subset of the NORM and MAN firing modes. It is controlled by the firing crewmember and not the WP. Rapid Fire involves firing multiple SAL missiles with the same laser code. It is used to rapidly engage multiple targets, within the constraints of the tactical situation, in the shortest span of time. Rapid-fire engagements may be employed autonomously or remotely during LOBL and LOAL engagements. Rapid fire timing is controlled by the crewmember's weapons trigger pull rate.

(7) SAL missile trajectory (TRAJ) options: The TRAJ button allows the crewmember to select the desired missile LOAL flight trajectory. Available options are: direct (DIR); low (LO), and high (HI), respectively. 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.

Note. During a SAL missile LOAL 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. In this case the constraints box is driven by the missile seeker.

Note. LOAL DIR SAL missiles will automatically default to LOBL anytime a priority channel missile acquires and locks onto properly coded laser energy prior to missile launch. This automatic function occurs without regard to the TRAJ button.

Note. Certain SAL II missile variants are locked out from receiving laser energy when the LO or HI trajectories are selected during a remote firing profile. Aircrew desiring to conduct LOBL Remote engagements must select the DIR firing mode with these missiles installed.

(8) First or last LRFD options. The first/last options allow the LRFD system to gain a certain amount of integrity for range solutions (whether first or second detent) when there are multiple reflected returns detected for any individual pulse. Each pulse that is sent from the LRFD will receive its reflected

return/returns before the next pulse is sent whether first or second detent. When the WP receives more than one return from a single pulse, the WP computes as follows. With first in the LRFD data field, the first laser return pulse 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 pulse. Unless altered through the DTC, the aircraft defaults LRFD/first at startup. During normal situations crewmembers' should use the LAST position, in order to automatically defeat backscatter. If either crewmember observes unrealistic changes in the laser range being displayed (for example, range changes that cannot be reasonably attributed to the aircraft e.g. overspill), the first position can be selected.

(9) SAL missile engagements. SAL missile engagements are conducted against a direct target designated by the own ship (autonomous) or against a target designated by another source (remote). Engagements may be conducted against numerous target types ranging from armor to personnel. Aircrews must determine the appropriate method of engagement as well as the appropriate type of SAL missile to employ.

Note. Specific SAL missile variants and their individual performance against various target types are covered in the FM 3-04.45(FM3-04.140).

Note. The PC is the final approval authority for all weapons firing. The PC should announce "Cleared to Fire" prior to all firing of the aircraft's weapon systems.

Note. When loading mission 2 data, codes must be checked, as they will change from what is loaded currently (msn 1 from master load) to whatever was programmed via the AMPS for mission 2. This could lead to the firing of a missile on the wrong code.

(a) Autonomous SAL missile engagements. Autonomous engagements occur when the ownship fires, and designates for, the missile. Autonomous engagements require the TADS to be the selected LOS, the missile PRI channel and LRFD channel to match and the aircraft's laser to be on.

Note. 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 lases the target with the same LRFD channel that the PLT has selected for the priority channel missile.

(b) Autonomous engagement general (LOAL and LOBL pre-launch): The aircrew initially acquires a potential SAL missile target through any of the aircraft's acquisition sources, or by any of the various methods of voice, digital, and laser seeker (SKR) target handovers. The aircrew then identifies the target, and determines the appropriate SAL missile employment parameters (SAL missile type, TRAJ, MODE, DPI, range etc.).

Note. If the FCR was initially used to acquire the target, change RF missile type to SAL.

(c) The CPG then tracks the target's Desired Point of Impact (DPI) with the TADS and prepares to designate the target with matching LRFD and missile coded laser energy. When ready, the CPG actions the missiles.

(d) Upon actioning the missile the WP commands the aircraft's missile pylons to articulate into position as commanded by the WP. A LOAL (±7.5º) pre-launch constraints box will initially be displayed until the CPG designates the target with properly coded laser energy. With a priority missile spun up, the CPG will initially observe one of the following messages in his HAD weapon status field. These messages are relative to the LOAL trajectory and firing mode selected on the MSL page, and will change when the missile detects properly coded laser energy:

- DIR, LO, or HI MAN.
- DIR, LO, or HI NORM.
- DIR, LO, or HI RIPL.

(e) The pilot will begin to align the aircraft into pre-launch firing constraints when the CPG initially actions the missiles. Refinement of constraints will occur prior to missile launch. This will reduce the time necessary to complete the engagement.

Note. "Constraints" symbology provides a graphic representation of the missile's ability or inability to maneuver to the target. Presence of "in-constraints" symbology does not guarantee the missile is capable of maneuvering to the target, especially during dynamic flight profiles. Firing the missile near the edge of constraints reduces the missiles probability of hit (Ph). Aircrews should attempt to align the missile as close as possible, both horizontally and vertically, to the gun target line prior to firing. An offset of 3º to 5º, to the firing side, should be used when possible to preclude the missile flying through the FOV of the TADS.

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(10) LOBL engagement.

(a) With the TADS LOS correctly placed on the desired point of impact (DPI), the CPG initiates laser designation by pulling the LRFD trigger to the second detent. The CPG verifies the presence of coded laser energy by noting the presence of an asterisk, adjacent to the displayed laser range, and the Laser Firing Indicator symbology adjacent to the LOS. When the priority channel's missile seeker acquires and locks onto the reflected laser energy, the CPG's HAD weapons status section message will change to PRI CHAN TRACK.

(b) Both crewmembers will be provided with a LOBL (±20º) constraints box display on their symbology. When ready, he CPG will alert the Pilot to align the aircraft into firing constraints by announcing "Constraints". The Pilot turns towards the constraints box as necessary to bring the missile into firing constraints. The CPG uses verbal commands to aid the pilot as necessary.

Note. LOBL constraints are ±20º as referenced from the tracking missile seeker's LOS and aircraft centerline. The box will remain dashed until the tracking missile seeker and aircraft centerline are within 20º of one another. Crewmembers should reference the CPG LOS Bearing, displayed in the weapons symbology, to aid in aligning the aircraft with the missile seeker bearing. Turning the aircraft until the symbolic lubber line touches the CPG LOS bearing will bring the aircraft to within 5º of the missile seeker bearing. This will ensure azimuth constraints are met for both LOBL and LOAL engagements.

(c) Once the aircraft is maneuvered into pre-launch constraints and the crew has confirmed that all prelaunch parameters have been met, the CPG initiates the firing sequence by announcing "firing missile" then pulling the weapons trigger to the first detent. Missile launch normally occurs two seconds after weapons trigger activation. The CPG continues to designate the until missile impact.

Note 1. If after missile launch it becomes necessary to abort the engagement, due to possible collateral damage, the CPG should smoothly move the LOS (shift cold) to an acceptable area while continuing to designate. Designation should not terminate until missile impact. Termination of designation will result in the missile becoming ballistic and impacting in an area out of the CPG's control.

Note 2. Missile firing is inhibited anytime the HAD "BACKSCATTER" message is present. 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. During running/diving fire the "BACKSCATTER" message indicates that an obscurant is present somewhere between the aircraft and target. It may be impossible for the aircrew to determine the point where the obscurant exists. Firing LOAL is not recommended in this instance.

Note 3. 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.

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(11) LOAL engagement.

(a) LOAL engagements involve firing of the SAL missile prior to designating the target with properly coded laser energy. The CPG delays designation of the target based upon environmental considerations and range to target. FM 3-04.45(FM3-04.140) addresses delay times for various engagement ranges.

(b) LOAL engagements may utilize one of three missile trajectories; Direct (DIR), low (LO) and High (HI). The aircrew must consider the tactical situation and desired engagement parameters to determine the best trajectory for the specific engagement.

(12) LOAL-DIR.

(a) A 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).

(b) The CPG will select DIR as the TRAJ option on the MSL page. Upon actioning the missile system a LOAL missile constraints box symbol will display on both crewmembers' HDU and on the TEDAC. With a priority missile spun up, the CPG will observe one of the following LOAL DIR messages in his HAD weapon status field: 1) DIR MAN; 2) DIR NORM; or 3) DIR RIPL. The pilot's HAD weapon control field message will display CMSL.

(c) Missile constraints box symbology will display to both the PLT and CPG, indicating the direction to steer the helicopter to meet launch constraints. Under certain LOAL conditions, tighter constraints standards may have to be met than what the constraints box actually depicts. Normally, the PLT should attempt to center the constraints box within the composite video to increase the probability of target hit.

(d) Once the aircraft is maneuvered into pre-launch constraints and the crew has confirmed that all prelaunch parameters have been met, the CPG initiates the firing sequence by announcing "Firing Missile" then pulling the weapons trigger to the first detent. Missile launch normally occurs two seconds after weapons trigger activation. The CPG then begins designating the target DPI after the pre-determined delay time. The CPG continues to designate the DPI until missile impact.

Note. LOAL-DIR constraints are ±7.5º as referenced from the firing crewmember's selected LOS bearing and aircraft centerline. The box will remain dashed until the selected LOS bearing and aircraft centerline are within 7.5º of one another. Crewmembers should reference the CPG LOS Bearing, displayed in the weapons symbology, to aid in aligning the aircraft. Turning the aircraft until the symbolic lubber line touches the CPG LOS bearing will bring the aircraft to within ±5º of the missile seeker bearing. This will ensure azimuth constraints are met for both LOBL and LOAL engagements.

(13) LOAL-LO/HI.

(a) LOAL LO/HI allow the missile to be fired from a masked position. After launch the missile climbs to a predetermined altitude above the launch platform in order to clear possible obstructions. LO/HI engagements require "standoff" from the mask/obstruction.

(b) The crew may choose to autonomously engage a target from a masked position with a laser delay and elect to employ LOAL-LO or LOAL-HI in this and other situations. To perform an autonomous LOAL-LO/HI engagement the CPG selects LO or HI as the trajectory on the MSL page.

(c) The CPG will confirm that a LO or HI NORM, LO or HI RIPL, or LO or HI MAN message is present and that the desired ACQ source is displayed in his HAD. The PLT will note that a CMSL message is displayed in his weapon control status field message field.

(d) When ready the P* will maneuver the aircraft into missile firing constraints by turning towards the target, ensuring missile firing parameters are met. The CPG will initiate the engagement by announcing "Firing Missile" then pulling the weapon's trigger.

(e) Based upon range to target and desired designation delay times the crew must time the point at which they unmask the aircraft and begin designation. The CPG will announce “unmask” when the appropriate time has elapsed. The crew must ensure they are able to launch, unmask, reacquire the target and designate the target in the time determined.

(f) Upon unmasking, the CPG reacquires the target and begins laser designation at the appropriate delay time. The CPG continues designating the target until missile impact.

Note 1. Minimum range of the SAL LOAL hellfire missile is affected by the missile’s post launch trajectory and the seeker’s look-down angle and scan pattern. Minimum engagement ranges must be increased based upon the aircraft’s height above the target. LOAL engagements should not be conducted when the aircraft is greater than 1000’ above the target as Ph will be greatly reduced.

Note 2. The LOAL LO/HI missile constraints box represents a 7.5º angular displacement between the aircraft center line and the selected target’s bearing. The selected acquisition source must be represented by a grid within the aircraft’s “POINT” file. This point may be the active acquisition source or present in B5 within the ACQ grouped options. The box will remain dashed until the selected ACQ source bearing and aircraft centerline are within 7.5º of one another.

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(13) Remote SAL missile target engagements.

(a) The designation of a target by a remote aircraft or ground designator potentially allows the launch aircraft to increase the standoff range from the target or possibly defeat battlefield obscurants. 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.

(b) The aircrew will coordinate with the remote ground or aircraft designator and develop the techniques and procedures necessary to properly handover 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.

(c) All remote target handovers must also provide target location. The location may in the form of a grid, distance and bearing, or a digitally transmitted point.

Note. 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, and stored as a control measure, when the PP RQST is answered. This will aid the crew that initiated the query in determining if certain firing requirements can be met.

(d) Remote SAL missile engagements may be conducted using any missile trajectory or mode. Considerations for determining which remote SAL missile TRAJ to employ include; range to target, minimum cloud ceiling, horizontal/vertical separation between shooter and designator.

(e) The crewmember desiring to action the missile system will ensure the missile being fired matches the code requested by the remote designator. In order that proper “remote” messages display the firing aircrafts LRFD code must not match the requested code. If the selected sight is HMD, or the laser is off, the WP will assume a “remote” engagement and proper symbology will be displayed.

(f) After receiving the target handover the crew adjusts the MSL page options as desired/required for the engagement ensuring the PRI channel is set to the requested code, and that a missile is ready on that code. The crew then initially aligns the aircraft with the target.

(g) After initial alignment is completed the firing crewmember actions missiles and aligns the aircraft into firing constraints. With a priority missile spun up, the pilot who actioned the missiles will initially observe one of the following messages in his HAD weapon status field:

- DIR, LO, or HI MAN.

- DIR, LO, or HI NORM.
- DIR, LO, or HI RIPL.
- PRI CHN TRACK.

(h) A LOAL missile constraints box symbol will display on both crewmembers' HDUs as well as the TEDAC. The LOAL constraints box will be driven by the appropriate source as determined by the firing crewmember's TRAJ settings. Typically LOAL remote engagements are easiest to conduct utilizing the LO or HI trajectory option if the target location was passed in grid format or transmitted digitally. If the target was passed through distance and bearing (wingman handover) LOAL-DIR may provide the best option.

(i) Once prelaunch constraints and parameters have been met the firing crewmember will initiate the launch sequence by announcing "firing missile". The firing crewmember will use fire and control measures, coordinated with the designator, to control laser on time and other aspects of the engagement (figure 4-10, page 4-147).

Note. A LOBL constraints box will display any time the priority channel missile's seeker locks on to properly coded laser energy.

DESIGNATING AIRCRAFT—BLUE 6

LAUNCH AIRCRAFT—BLUE 4

(1) BLUE 4, THIS IS BLUE 6, ONE ALPHA, OVER.

(2) BLUE 6, THIS IS BLUE 4, ONE ALPHA, OUT.

(3) GRID AA 12345678, ALTITUDE 1,078, LTL 160, RANGE 4,000 CALL READY, OVER. (GRID HANDOVER)

or

(3) BEARING 180 DEGREES, 5000METERS (WINGMAN DISTANCE AND BEARING HANDOVER)

(4) GRID AA 12345678, ALTITUDE 1,078, LTL 160, RANGE 4,000, ROGER, OUT.

(5) READY, TIME OF FLIGHT 14SECONDS.

(6) TOF 20 SECONDS (STANDBY OR FIRE) FIRE, OVER.

(7) RIFLE AWAY, OVER. (CM fires missile after receiving “Rifle Away Out” transmission)

(8) RIFLE AWAY, OUT.

(9) BDA: 1 T-72 DESTROYED, GRID AA 12345678, TIME: 2115.

(10) BDA: 1 T-72 DESTROYED, GRID: AA 12345678, TIME: 2115

Note: The numbers in parentheses denote the sequence of radio transmissions.

Figure 4-10. Sample remote Hellfire request–voice

(14) SAL missile aimpoints. Due to the performance traits of the various Hellfire variants, it is important that the proper aimpoint be selected for engaging. Failure to strike the target at its most vulnerable point may result in a decreased probability of kill (Pk), resulting in the need for additional engagements. When engaging with the Hellfire missile the CPG should always track and designate the target in the narrowest TADS FOV possible, allowing the CPG to detect the slightest movement of the LOS away from the desired impact point.

(15) Vehicle target aim point selection.

(a) Armored/tactical vehicles: For engaging armored vehicles the gunner should aim at the critical elements of the vehicle.

(b) Technical/non-tactical vehicles: The gunner should choose an aimpoint that is free of glass that may affect the laser’s performance. He must also consider the desired terminal effects of the weapon and choose the appropriate aimpoint to achieve the desired effect.

(16) Anti-personnel aim point selection: The probability of incapacitating enemy personnel depends on missile flight path at impact, type of warhead (blast, anti-tank, or fragment sleeve), fuse (point detonating or delay) and selected impact point. The gunner should choose an aimpoint slightly short of and offset from of the target. This aimpoint will result in the greatest portion of blast and fragmentation effect being focused on the target. Missiles with delay fuzes should not be used against personnel in the open. The CPG should utilize ZOOM FOV and “post” the target on the tip of the LOS 12’oclock probe, then offset slightly left or right as desired.

(17) Building aim point selection: Fixed-time delay penetrator fuses are optimal for attacking enemy personnel inside buildings or bunkers. Gunners should select a point that will provide maximum damage to the structure while still focusing the warhead's terminal effects in the proper place. Corners, wall tops (near roof or next floor), and support beams are a few examples. When desiring to affect personnel within the structure gunners should select an aimpoint that allows the missile to enter the structure near, and preferably slightly above, the target personnel. This will provide the greatest target effect from the warhead.. Crews must take into consideration the type of material being targeted and its effects on fuze function.

Note 1. The WP will accurately calculate the missile's TOF based on range, trajectory, and outside temperature.

Note 2. SAL missile icons and status messages are covered in TM 1-1520-251-10.

Note 3. Whenever the CPG actions 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.

Note 4. Software version specific HAD messages, and MSL Page format are covered in the operator's manual.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training. Training may be conducted in the AH-64D aircraft or AH-64D LCT. When not conducting live firing, 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 LCT. Evaluation may be conducted using train mode. Tactical evaluation support system (TESS) may be used to evaluate weapon system proficiency.

REFERENCES: Appropriate common references.

TASK 1459

Engage Target with Radar Frequency (RF) Hellfire Missile

CONDITIONS: This task includes the following three conditions:

1. In an AH-64D helicopter with the weapon train mode enabled and, TADS internal boresight completed, weapons systems initialization completed, and if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

2. In an AH-64D helicopter on a gunnery range with live missiles loaded, TADS internal boresight completed, weapons systems initialization completed, and, if installed, FCR operational checks completed and the P* fitted with a bore sighted HDU.

3. In an AH-64D LCT with TADS internal 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.

STANDARDS: Appropriate common standards and properly engaging targets with the RF missile using one of the following methods:

- Autonomous RF with FCR selected as sight.
- Autonomous RF with TADS selected as sight.
- 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, 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 video selected through the video select (VSEL) display option.

c. 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.

2. Procedures.

a. Initialization. At some point prior to WASing the missile system, the crewmember desiring to perform the missile engagement must validate the RF Missile System Control/Status (MSL) page option settings prior to engaging the target.

(1) Type options. 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.

(2) MODE options. 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.

(3) Missile (MSL) power (PWR) 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.

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.

(4) 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.

(5) 2nd Target inhibit. (FCR aircraft's own ship target only) button will inhibit the handover of secondary target data during RF missile LOAL engagements. The employment of the second target inhibit should be considered when engaging targets in close proximity to friendly troops or when collateral damage may be a concern. Select the 2ND TARGET inhibit button, if desired.

Note. 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 TSD page.

b. RF missile engagements.

(1) 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). Engagements may be LOBL, where the missile acquires and tracks the target prior to launch, or LOAL where the missile searches for the target after launch.

(2) The RF missile is optimized to engage moving targets. The crew provides the RF missile with the best targeting data by centering the desired target area within the smallest FCR field of view and conducting a fresh scan prior to target engagement.

(a) LOBL moving targets have been acquired, and are being tracked by, the missile's MMW seeker and should be unable to escape missile impact. The crew must consider the missile's time of flight and determine if the target may move behind cover prior to missile impact.

(b) LOAL engagements against moving targets require the missile's MMW seeker to acquire the target after missile launch. The FCR evaluates the target velocity (speed and direction) compared to expected missile time of flight (TOF), then transfers a NED to the missile relative to the target's predicted position. The crew must account for target movement and speed to decide whether a LOAL engagement is feasible. The target may change direction or speed, prior to reaching the predicted point, after missile launch and before the missile is capable of acquiring and tracking it.

(3) The RF missile has a demonstrated ability to engage stationary targets. However, STI have a lower probability of hit (Ph) compared to MTI. Avoid shooting at stale FCR STI targets as this greatly reduces the probability of target detection by the RF missile. Stationary Targets are processed in one of three ways based upon their range from the ownship. At ranges greater than 6 km RF missiles only process a target handed over from the M-TADS or via RFHO as the FCR is unable to process stationary targets at ranges greater than 6000 meters.

(4) RF missile LOAL/LOBL determination.

(a) Lock on before launch (LOBL).

- LOBL is when the RF missile's own millimeter wave (MMW) seeker has locked onto the target while the missile is still on the launcher rail. LOBL provides the highest percentage Ph, and provides the crew with a good indication that the RF MSL will hit the target. LOBL requires the launch aircraft to be un-masked and the missile must maintain direct line of sight with the target until launch.

- The missile can achieve a solid LOBL target track against *moving* targets from 0.5km to 8.0 km. The missile will make up to three attempts to acquire the target, radiating for approximately 3 seconds during each LOBL attempt. 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 between 1.0 kilometer and 2.5 kilometers, the missile will radiate and attempt LOBL. If the target is not detected the missile will revert to LOAL.
- 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. At this range the missile must achieve LOBL. If the target is not detected or track is subsequently lost, the message “NO ACQUIRE” will be displayed and firing will be inhibited.

Note. If the missile’s MMW is unable to acquire a selected target after 3 attempts, the crew may re-WAS missiles. This will command the missile to attempt to acquire the target again.

(b) Lock On After Launch (LOAL):

- LOAL is when the RF missile’s own MMW seeker is not tracking the target at time of launch. When the RF missile receives precise target location information it can successfully engage targets, in the LOAL mode, between 1km- 8kms. The RF missile’s INU navigates the missile to a predicted intercept point (position in time and space) to place the target within RF missile seeker’s field of view. The INU alone is not accurate enough to hit a tank-sized target; therefore the missile’s own MMW seeker must lock onto the target prior to impact. Because the crew cannot know if the missile will actually lock onto the desired target and cannot affect the missile after it is launched, the LOAL mode requires the crew to pay greater attention to the quality of the target handover to the missile.
- The RF missile FCR LOAL range limitation is from 1.0 kilometer to 6.0 kilometers if detected by the firing aircraft’s own FCR.
- The missile is capable of servicing LOAL targets via the TADS and through RFHOs to a maximum range of 8.0 kilometers.

Note. Stationary targets between 2,500 and 8,000 meters are engaged LOAL using a Doppler beam sharpening (DBS) missile fly-out profile to create target movement. The crew may control the direction the missile conducts DBS by pointing the nose of the aircraft in the desired direction.

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(5) RF missile messages. The crew confirm the missile’s status by cross checking the High Action Display for the appropriate messages as follows:

(a) RF MSL TRK: The RF missile’s own MMW radar seeker is locked onto, and is actively tracking the target. The missile receives continuously updated inertial navigation guidance. A solid LOBL constraints box provides the crew high confidence that the target will be hit.

(b) NO ACQUIRE: RF missile has completed its attempts to acquire the target has been unable to lock onto the target, and has returned to the standby mode (LOAL). If the target is within 1 km the “No ACQUIRE” message will inhibit RF missile launch.

(c) LOBL INHIBIT: RF missile is commanded by the crew to stay in a LOAL mode.

(d) LOAL NORM: RF missile is in a LOAL mode.

(e) LOAL MAN: RF missile is in a manual mode.

(f) TARGET DATA. The selected sight is not FCR and the RF missile has not received target location data.

(6) RF missile constraints boxes.

(a) LOAL. Small box representing 20º referenced from the aircraft centerline and the selected target's bearing. The box will remain broken until the aircraft is aligned to within 20º of the selected target's bearing.

(b) LOBL. Large box representing 20º referenced from the aircraft centerline and the selected target's bearing. The box will remain broken until the aircraft is aligned to within 20º of the selected target's bearing.

(c) LOBL <1km. The constraints box appears the same as above, but the allowable alignment differential is 5º. The box will remain broken until the aircraft is aligned to within 5º of the selected target's bearing.

(7) FCR RF missile engagements (pilot & CPG).

(a) FCR RF missile engagements are conducted against the Next-to-Shoot (NTS) target as selected by the aircraft during/after an FCR target acquisition scan. Four things are required to conduct an RF missile engagement using the FCR as the selected LOS, they are; 1) Aircraft Armed, 2) RF Missiles WASed, 3) A valid NTS, and 4) The aircraft in pre-launch constraints.

(b) The PLT or CPG will select the appropriate FCR mode (RMAP, GTM, or ATM), activate a scan, and accept the displayed or select a different NTS target from the FCR page.

(c) With the WPN system armed the pilot performing the target engagement will WAS MSL. The opposite crewmember will note the pertinent CMSL or PMSL message displayed in his weapon control status field HAD message.

(d) Constraints symbology, as appropriate, will be displayed on the TEDAC, FCR page, and HMD. The NTS target symbol border will change from dashed to solid.

(e) With the weapons system armed and missiles WASed, the P* will 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.

(f) To de-WAS 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 blanks and 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.

Note 1. Consideration should be given to link the TADS to the FCR NTS in order to validate that the NTS is the proper target.

Note 2. The RF missile should only be WASed 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 WASed during a scan, the FCR will hand over the highest priority detected target.

Note 3. When multiple FCR targets are displayed on the FCR and TSD page, the Alternate Next-to-Shoot (ANTS) target will become the NTS target after missile launch. If additional RF missiles are available, HAD messages and constraints symbology will be referenced to the new NTS target.

Note 4. Constraints symbology is referenced to the FCR NTS target.

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(8) TADS to RF missile handover engagements (CPG).

(a) With TADS as the selected sight, and the weapons system armed the CPG WASes RF missiles. 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.

(b) The CPG tracks the target with a centered LOS and engages the Linear Motion Compensator (LMC) when ready.

(c) 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. 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 RF missile messages will be displayed in the weapon status field of the HAD.

(d) 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 initiate the engagement when ready.

Note 1. 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.

Note 2. Secondary target information is not applicable to TADS handover RF missile engagements.

Note 3. Failure to perform an internal boresight prior to a TADS to RF missile handover could result in an erroneous location being transmitted to the missile and a subsequent missile miss. This is more likely to occur when firing in the LOAL mode than in the LOBL mode.

Note 4. Once the target data handover is complete, the crew must ensure that missile launch is performed as soon as possible to increase probability of hit. 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.

Note 5. The WP gives PLT-activated missiles priority over the CPG.

Note 6. If conducting a TADS to RF missile hand over, 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.

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(9) Engaging an RFHO target with RF missiles.

(a) After the RFHO has been properly received, the PLT or CPG (regardless of whether the aircraft is FCR equipped or not) must sight select the FCR to transfer target data to an RF missile.

(b) Upon sight selecting the FCR, 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 TEDAC 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 exceeded.

(c) The PLT or CPG can now engage the NTS target as explained in paragraph 7.

Note 1. Sending and receiving RFHOs is aircraft software specific. See the operator’s manual for detailed procedures.

Note 2. FCR target symbols do not change after receipt of an RFHO. Targets will display as they were when transmitted to the receiver. It is imperative that an RFHO be engaged immediately as the firing aircraft has no indication of target latency.

Note 3. Crews must ensure the RFHO target is within allowable RF missile engagement ranges. Excessive range will not inhibit the missile from firing.

Note 4. RFHOs must be received within 6 minutes of arriving in the IDM buffer. After 6 minutes, the weapon inhibit "DATA INVALID" will be present and will prevent the crew from accepting the RFHO.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training. Training may be conducted in the AH-64D aircraft or AH-64D LCT. 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 LCT. Evaluation may be conducted using train mode. Tactical evaluation support system (TESS) may be used to evaluate weapon system proficiency.

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, TADS internal boresight completed, and weapons systems initialization completed, and if installed, FCR operational checks completed and the P* fitted with a boresighted HDU.

2. In an AH-64D helicopter on a gunnery range with live rockets loaded, TADS internal boresight completed, weapons systems initialization completed, and, if installed, FCR operational checks completed and the P* fitted with a bore sighted HDU.

3. In an AH-64D LCT with TADS internal 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.

STANDARDS: Appropriate common standards and the following:

1. Place the system into operation.
2. Engage the target with the independent mode of aerial rocket system (ARS) firing (NORM or FXD).
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. Initialization.

(1) 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 (COOP) engagements. During COOP mode, settings displayed on the PLT's WPN's page will change to match 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.

(2) Inventory options. The firing crewmember selects the desired rocket type for the engagement. RKT inventory can be 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. PLT/CPG RKT inventory selection changes, on the LOAD page, will override LMP and DTC settings.

Note. 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.

Note. Up to five rocket inventory option data fields will be displayed for each of the five possible zones. When like rocket types are loaded into more than one zone only one button will be presented for that rocket type.

(3) Quantity (QTY) options. The firing crewmember selects the quantity of rockets he desires to fire for each weapon's trigger pull. Upon selecting the QTY multistate button, the rocket QTY option group will display the options 1, 2, 4, 8, 12, 24, and ALL.

(4) MODE options. The firing crewmember selects the desired mode of rocket employment. This button allows the crewmember to set either the normal (NORM) or fixed (FXD) mode of operation. In NORM the pylons are commanded to articulate based on the WP ballistic solution within an articulation range of -4.9 to +15 degrees. In the FXD mode the pylons are commanded to a fixed position of +3.48 degrees.

(5) Penetration (PEN) options. The firing crewmember selects the desired fuse penetration setting. Upon selecting the PEN button, the penetration page will appear with the penetration group options bunker fusing (BNK) 10, 15, 20, 25, 30, 35, 40,45 and super quick fusing (SPQ). The PEN button is only displayed when rockets with PEN warhead/fuse capabilities are loaded.

Note. The RKT inventory, QTY, and PEN settings are independent in each crew station. However, when firing rockets in the COOP mode settings displayed on the PLT's WPN's page will mirror those made by the CPG. Once either crewmember deselects rockets, the PLT selections will again be displayed on the PLT WPN's page.

(6) Sight selection. The firing crewmember will select sight most appropriate for the mode of fire and type of engagement being conducted. The PLT and CPG may utilize HMD and the FCR as lines of sight. The CPG may additionally utilize the TADS. HMD is used when conducting independent engagements in both NORM and FXD modes. The PLT will utilize HMD while the CPG utilizes TADS in the Cooperative (COOP) mode. FCR is used as the LOS when conducting indirect rocket engagements from either station.

(7) Range selection. The firing crewmember will select the most appropriate range source for the engagement being conducted, and verify its accuracy. 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 may utilize LASER ranging as well as those selections available to the pilot.

Note. 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.

(8) 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 WAS rockets as desired.

b. Rocket symbology. The rocket steering cursor is a dynamic I-beam symbol which indicates the delivery mode and how to point the aircraft for the rocket delivery. The top and bottom horizontal legs of the rocket steering cursor indicate articulation constraints (+4.9º to -15º). The solid I-beam also indicates the helicopter orientation required to meet the WP-calculated firing constraints. If the CPG has actioned rockets, the rocket steering cursor is presented on both pilot and CPG formats. If the pilot has actioned rockets, the rocket steering cursor is presented only on the pilot's displays. The cursor moves about in the format to indicate the azimuth and elevation position of the helicopter in relation to the selected sight LOS to provide steering cues to the crewmember.

(1) Normal rocket steering cursor. The cursor is displayed with a solid vertical line when pylon articulation is in process. The pylons articulate as needed to adjust for the correct rocket impact point.

(2) Ground stow rocket steering cursor. A gap in the center vertical line indicates the pylons are in ground stow position. The pylons are fixed at -4.9 degrees, a position that would align the pylons parallel to the ground if the aircraft landed.

(3) Fixed rocket steering cursor. A gap in the center vertical line with a circle filling the gap indicates the pylons are in the FXD mode. The pylons are fixed at +3.48º in elevation. The circle represents the continuously computed impact (CCIP) point of the rockets. The cursor's vertical position in the field of view is determined by the range provided. Increasing the range will move the cursor down within the field of view, indicating the need to elevate the nose of the aircraft conversely decreasing the range will move the cursor up indicating the need to lower the nose of the aircraft.

Note 1. The WP/DP generated rocket steering cursor's accuracy and sensitivity is a true 1 to 1 real world representation.

Note 2. The cursor will be dashed when a safety or performance inhibit is in effect, indicating crew action is required prior to firing rockets.

Note 3. 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).

Note 4. 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.

Note 5. 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.

Note 6. The position of the rocket pylons when in the FXD mode is based on the following inputs and assumptions; -20º dive angle, 1063m slant range to target, 110KTAS forward airspeed at trigger pull, 6PD rockets selected and inputs from the Air Data System.

c. Direct fire engagements. Direct fire attacks can be conducted at a hover, or through moving, running, or diving fire. Direct firing is conducted whenever the fire aircraft has inter-visibility with the target. The firing crewmember must acquire and track the target as necessary to deliver rounds on the Desired Mean Point of impact (DPMI).

d. Direct fire independent rocket engagements (PLT and CPG).

(1) Normal mode.

(a) The crewmember that actioned the rockets must acquire and track the target while maintaining the selected HMD's LOS reticle on the target.

(b) 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 applying anti-torque pedal in the direction of the cursor until the cursor's center line overlays the 3 and 12 O'clock probes of the LOS. The top and bottom horizontal legs of the solid I-beam must be above and below the center of the LOS reticle, respectively. This indicates the pylons are able to articulate as necessary to meet the range and elevation requirements for the engagement.

(c) 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.

(d) 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 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). Displayed time of flight will be determined by the firing crewmember’s active range at the time of firing. 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.

(e) To deselect the ARS, select another weapon system or reselect the rockets using the cyclic WAS (PLT/CPG) or center the TADS LHG WAS switch (CPG). In any case, the crew should note that rocket symbology has disappeared along with pertinent HAD messages.

(2) Fixed (FXD) mode.

(a) FXD mode provides the crewmembers with another method for engaging targets independently utilizing HMD as the selected LOS. In the FXD mode the pylons remain approximately aligned to the armament datum line (ADL) of the aircraft and do not articulate. Additionally the NORM rocket steering cursor changes to the FXD rocket steering cursor.

(b) The FXD mode is best utilized in a diving or running flight profile against targets at 2000m or less. This mode allows the firing crewmember to adjust rocket fires onto target by maneuvering the aircraft and reduces errors caused by pylon articulation and LOS movement.

(c) After actioning rockets the firing crewmember maneuvers the aircraft as necessary to position the FXD rocket steering cursor’s CCIP over the target. Once aligning the CCIP over the target the firing crewmember fires rockets as desired.

(d) 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 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). Displayed time of flight will be determined by the firing crewmember’s active range at the time of firing. 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.

(e) Adjustments are made by maneuvering the aircraft to move the CCIP left, right, up or down as required.

(f) To deselect the ARS, select another weapon system or reselect the rockets using the cyclic WAS (PLT/CPG) or center the TADS LHG WAS switch (CPG). In any case, the crew should note that rocket symbology has disappeared along with pertinent HAD messages.

Note. When rockets are WAS’d with HMD as the selected LOS, range will automatically default to the selected manual range of the firing crewmember. If NAV range is desired the crewmember must select the appropriate ACQ source after WASing rockets.

e. Cooperative rocket engagements.

(1) Cooperative engagements allow the crewmembers to share the workload for the engagement. Cooperative engagements utilize the CPG’s LOS and range for ballistic solution calculations, and provide the PLT with steering data. During cooperative engagements the CPG will track and provide range to target while the PLT aligns the aircraft for the engagement and fires the rockets.

(2) 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 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.

(3) 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 PLT to scan as necessary without impacting the firing solution.

(4) During direct-fire COOP engagements (LOS established with the target), laser range, coordinate data range (NAV), or autonomous FCR range should be used. During indirect COOP rocket engagements laser range, autonomous FCR radar range, RFHO radar range, NAV range, or MAN range may be employed.

(5) Procedures.

(a) The PLT will select HMD on his cyclic and the CPG will select the TADS or FCR via the sight SEL switch on the CPG's ORT right handgrip.

(b) The CPG indicates the intent to conduct a cooperative engagement by announcing "Go COOP". This is the cue for both crewmembers to WAS rockets. When the CPG positions the TEDAC LHG WAS to rockets and the PLT positions the cyclic WAS to rockets, all displays will display the rocket steering cursor. With the cooperative rocket mode requirements met, weapon status field message will change to "RKT COOP".

(c) If sight selected TADS the CPG will track the desired mean point of impact (DMPI). If sight selected FCR the CPG will ensure the displayed NTS is the correct target.

Note. If sight selected FCR the CPG should link the TADS (FCR-L), to the target when conducting direct fire engagements with FCR as the selected sight. This allows the CPG to quickly change his LOS to TADS and provide engagement corrections in the direct fire mode.

(d) If utilizing TADS the CPG will provide range to target for the engagement. During hover fire engagements 1st detent laser ranging or NAV should be used. During dynamic (target, aircraft or both moving) continuous laser ranging or NAV should be utilized.

(e) The CPG will announce "Match and Shoot" when ready for the PLT to fire rockets. This indicates he has a valid range to the target and is tracking it as appropriate. This command indicates the PLT may fire rockets when ready.

Note. The crew may impose engagement parameter constraints based on factors such as range, altitude, time. The "Match and Shoot" command may include the restriction. Example; "Match and shoot at 3,000m."

(f) In the hover fire mode the PLT will align the rocket steering cursor to his HMD LOS by applying anti-torque pedal as necessary until the cursor's center line overlays the 12 and 6 O'clock probes of the LOS. During running fire, align the helicopter into firing constraints with the cyclic while maintaining aircraft trim. The top and bottom horizontal legs of the solid I-beam must be above and below the center of the LOS reticle, respectively.

(g) Once the aircraft is maneuvered to meet launch constraint alignment, the PLT (using the cyclic trigger) may fire the rockets. The weapon's trigger should be held to the first or second detent until the selected rocket QTY has fired. If the trigger is released before the selected quantity is fired, firing stops and the ARS resets for the next salvo. The message "RKT COOP" in the HAD weapons status section is replaced by a decreasing time of flight (RKT TOF = NN). 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.

(h) After rockets are fired, the CPG should "sense" their impact by selecting a wider FOV on the TADS and detecting the rocket impact. Subsequent corrections must be made in the field of view the CPG "sensed" in. Once corrections are made, the CPG indicates he is ready to fire again by repeating the "Match and Shoot" command.

(i) To de-WAS the ARS, select another weapon system, reselect the rockets using the cyclic WAS (PLT/CPG) or center the TADS TEDAC WAS switch (CPG). In all cases, the rocket symbology and pertinent HAD messages will disappear.

f. Indirect rocket engagements.

(1) Indirect fire is fire that is delivered on a target that cannot be directly viewed by the firing aircraft. This may be due to intervening terrain, vegetation or structures. Additionally indirect fire techniques may be utilized when the target is beyond visual range (BVR) due to conditions of limited visibility such as smoke, fog, dust, battlefield obscurants, or adverse weather. The indirect fire capability provides a significant survivability advantage to the firing aircraft and allows the crew to place effective suppressive fire onto a target while remaining fully masked from enemy observation or return direct fire.

(2) Indirect fires may be conducted in the independent or COOP rockets modes. However, COOP should be utilized as it will provide the most accurate information and ballistic solution.

(3) To place indirect fire on targets the crew conducts a COOP engagement against the FCR NTS, or against a stored target coordinate as discussed in para 3.c).

(4) If possible, the aircraft should be unmasked in time for the crew to observe the rocket's impact. Corrections and subsequent direct fire engagements can be conducted from this point.

Note. To minimize LOS jitter when the TADS is slaved to a target the CPG may utilize an offset aimpoint by slightly moving the LOS after slaving to the target. If an offset aimpoint is utilized care should be taken to ensure target range remains correct.

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g. Corrections.

(1) When engaging in the direct fire mode the crew may need to make corrections in order to adjust rocket impact onto target. Methods for correcting rockets vary based on the LOS utilized, mode of fire employed and type of rocket warhead fired. Corrections cannot be made when utilizing FCR as the LOS. In this case the crewmember must select another sight (TADS/HMD) prior to correcting.

(2) After firing corrected rockets the LOS should always be moved back to the target, so as to observe the effectiveness of the correction based on target location.

(3) Azimuth corrections. If using TADS or HMD as the selected sight, the crewmember corrects azimuth error by "sensing" the rocket's impact point and estimating their distance left or right of the target. The crewmember then moves the LOS and equal distance in the direction the required.

(4) Range corrections.

(a) Range corrections vary based on the type of rocket being fired. In most cases editing the range used for the engagement is best. The firing crewmember determines how short/long the rockets impacted and adjusts the displayed range as necessary. This may accomplished by inputting a manual range, updating the laser range or repositioning the aircraft. If using TADS as the selected LOS the CPG should laze the rocket's impact point, note the difference between that displayed range and the original range used, and then update range for the next engagement based on the difference. In this case the CPG must use the same LOS elevation as was used during the previous engagement, as changing range and LOS elevation will result in a "double" correction.

(b) Range adjustments for point detonating (PD) fused rockets can be made by raising or lowering the LOS as required. While this technique provides a quick method for adjusting range, it is not as accurate as actually adjusting the range utilized by the WP, and should not be utilized when engaging individual targets. This method will not work for resistance capacitance (RC) fused rockets.

Note 1. In the event of a rocket misfire, misfired rockets will not be available for firing. In this case, the rocket inventory for that type will indicate the numbers actually available for firing. The total number of that type rocket 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 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 will have to select another rocket inventory type. 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 a rocket or missile launch is in progress all other 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.

Note 4. 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 5. As rockets are fired, the WPN's RKT page inventory will count down by type, indicating the rocket inventory.

TRAINING AND EVALUATION REQUIREMENTS:

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

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 or LCT and with operational checks and boresights completed for applicable sighting systems (HDU, M-TADS, and FCR).
2. Weapons systems initialization completed.
3. Live or synthetic ammunition (train mode) loaded.

STANDARDS: Appropriate common standards and the following:

1. Correctly initialize and place the system into operation.
2. Conduct area weapon system (AWS) dynamic harmonization procedure IAW TM 1-1520-251-CL if required.
3. Correctly employ the gun to achieve the desired target effect (destruction/neutralization/suppression).

DESCRIPTION:

1. Crew actions.

a. Complete the gun dynamic harmonization if required IAW aircraft operator's manual and current AWR.

b. 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 as necessary to position the gun within its limits.

c. The P will assist in monitoring the aircraft's position while the P* maneuvers the aircraft and will provide adequate warning for obstacle avoidance when required.

d. The crewmember 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. He will confirm the actions of the crewmember performing the target engagement when practicable based upon other mission demands. Selection and display of the opposite crewmember's video and sight improves crew coordination and increases situational awareness.

2. Procedures.

a. General. The gun is activated by pressing the WAS to the 12:00 o'clock "G" position. Each crewmember has equal priority when activating the gun. The last crewmember to activate the gun controls it. When activated by the crewmember the gun moves from the stowed position to the commanded LOS as computed by the WP. The crewmember controlling the gun will have the message "RNDS NNNN" in the weapons status section. 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 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 TEDAC WAS was used, place the WAS in the center position.

b. Burst selection. The crew will select appropriate burst count based upon target characteristic and desired effects. Burst count selection is based upon the range to target, target type, desired target effect, available ammo supply and the gun duty cycle limits. Short bursts are optimum for ammo conservation and to minimize the aircraft's firing signature. Longer bursts are more useful when engaging area targets or when destructive fires are necessary on fleeting targets. If the gun is fired using a software burst limit setting (as set WPN's gun page) that exceeds the physical burst limit setting of the turret control box gun the weapon status field message in the HAD will display "gun fail". If the gun fails under this condition turn the gun OFF and then back ON to clear the fault.

c. Sight selection. The crew will select the appropriate sighting system based upon the tactical situation and aircraft status. Considerations for each sight are as follows:

(1) HMD. The HMD can be used to aim the gun in the NORM (flex-gun) mode by either the pilot or CPG. HMD provides the fastest gun slew rates. The HMD is an excellent choice for rapid engagement of close range targets in a highly dynamic environment. When used in the NVS mode the HMD allows the crew to accurately engage close-range targets obscured by the aircraft fuselage. When HMD/NVS are selected the crew utilizes a unity magnification (1:1) display that provides no assistance in identifying long range targets. Since the HMD is driven by the pilot's or CPGs IHU it is inherently less stable than other sighing systems and may prove inaccurate for engaging point targets beyond of 800 meters. The weapon's processor provides elevation (range) corrections to the gun but will not correct for target or aircraft movement.

(2) FCR. The FCR can be used to aim the gun in the NORM mode by either the pilot or CPG. When the FCR is the selected sight the gun will slave to the NTS target regardless of whether the target is detected autonomously with the ownship FCR or via radar frequency handover (RFHO). The weapons processor will utilize the NTS radar range (RX.X) whenever the crewmember sight is selected to FCR. Until an FCR scan is executed, and an NTS target is detected, the HAD's weapon status will display the message "SIGHT?" and the weapon safety inhibit will displayed "LOS INVALID".

(3) MTADS. The MTADS is used by the CPG to provide highly accurate fires at all ranges. When utilized with accurate laser ranging, linear motion compensation and weapons processer ballistics the M-TADS provides the most accurate method of aiming the gun. This sight is used in the NORM mode for direct fires when the CPG is actively tracking a target, or indirect fires when slaved to a valid target.

d. Range and range source selection.

(1) The maximum effective range of the 30-millimeter varies based upon target type and desired effect. Point targets can be accurately engaged out to 1,500 to 1,700 meters. The WP will provide a ballistic solution up to a range of 4,200 meters. The WP will use the range data from the crew station in which the AWS was activated. If the range provided to the AWS exceeds the maximum elevation or azimuth limit, the message "EL/AZ LIMITS" will appear in the HAD.

(2) Both crewmembers are able to employ MAN, AUTO, radar (autonomous FCR and RFHO), and NAV coordinate as a range/range source. Only the CPG is able to utilize the MTADS laser ranging capability. During dynamic engagements where the aircraft and/or target are moving, continuous laser ranging will provide the most accurate WP computed ballistic solution.

e. Gun mode selection. The crew will select the appropriate gun mode (NORM or FXD) on the WPN's GUN page based upon the tactical situation and aircraft status.

f. Delivery mode selection. The crew selects the appropriate employment delivery mode (direct or indirect fire) based upon the tactical situation.

g. AWS dynamic harmonization. If the AWS requires harmonization accomplish the following:

(1) Maintain a heading to target of ±5 degrees, at a range of 500-1500 meters.

(2) Using the procedure outlined in TM 1-1520-251-CL, place 5 of 10 rounds in the target. (BMP frontal)

(3) Accurately transcribe the dynamic harmonization data to the aircraft logbook. (Electronic and/or paper as appropriate)

h. NORM gun mode engagements. The normal mode allows the gun to flex in azimuth and elevation. In the NORM mode the gun is aimed by any sighting systems. The NORM mode is utilized for both direct and indirect target engagements. When used in concert with the MTADS, NORM mode takes maximum advantage of the weapons processors ballistic solutions and provides the most accurate method of employing the gun. The NORM mode allows the crew to maintain maximum tactical standoff by facilitating off axis engagements. The HMD/MTADS LOS reticle is the aiming reference for the gun in the NORM mode.

i. FXD-gun mode engagements. Fixed gun can be used at any time; however it is most useful for engaging targets of opportunity at shorter ranges during running or diving fire. During fixed gun engagements the P* maneuvers the constantly computed impact point (CCIP) over the desired mean point of impact (DMPI).

(1) Fixed gun may also be utilized during degraded systems operations, such as when engaging targets at long range when the M-TADS or FCR are not available or unsuitable. Helmet sights are inherently inaccurate at long range due to aircraft vibration, and therefore have a low probability of hit against point

targets beyond 1,000 meters. When engaging point targets beyond 1,000 meters without the use of the M-TADS or FCR the crew should select fixed gun.

(2) FXD-gun employment techniques. The P* or P will announce: the fixed-gun engagement, when ready to engage, and when the engagement is completed. Action the gun by momentarily placing the WAS on the cyclic forward to the gun (G) position. When WASed, the gun will relocate and remain at the fixed position (0 degrees azimuth and +0.87degrees elevation) until de-WASed.

(a) The P* utilizes the CCIP reticle to aim the gun in the fixed mode. The P* maneuvers the aircraft to place the fixed-gun CCIP reticle over the desired aimpoint. The CCIP is “fixed” horizontally to the aircraft armament datum line (ADL) and is visible when the crewmember looks forward in the vicinity of the head tracker. The CCIP’s position will vary vertically, based upon the current range provided to the WP.

Note. When FXD is selected by the pilot the CCIP will only be displayed in the PLT Format symbology. When FXD is selected by the CPG both crewmembers will have the CCIP displayed in their respective formats.

(b) CCIP accuracy is highly dependent on accurate range inputs from the weapons processor. NAV range will provide an accurate, dynamic range, and is generally preferable to MAN range for running or diving fire engagements. Utilizing MAN range requires the firing pilot to accurately judge at what point to pull the weapon’s trigger. Inaccurate assessment of range will result in rounds falling long or short of the target. Automatic range (with HMD LOS) is not recommended in the FXD mode because of the dynamically changing LOS driven range. The resultant fluctuation in the CCIP makes alignment and subsequent corrections difficult during maneuvering flight.

(c) For maximum firing platform (aircraft) stability the crew should consider using running or diving fire. Use of slower forward speed (40 to 80 knots) will provide a stable firing platform, yet support standoff. The 30-mm round’s slow velocity and high time of flight to the target make adjusting bursts onto target during fixed gun running fire challenging.

j. Direct fire engagements. Direct fire attacks can be conducted at a hover, or through moving, running, or diving fire. Direct firing is conducted whenever the fire aircraft has inter-visibility with the target. During direct fire engagements the firing crewmember’s LOS reticle, or the CCIP is the aiming reticle. The firing crewmember must acquire and track the target as necessary to deliver rounds on the DMIP.

k. Aimpoint Selection. The crew will select an optimal aimpoint based upon target characteristic and desired target effects (destruction, neutralization, or suppression). The 30-mm AWS has inherent dispersion. Below 1,500 to 1,700 meters the effects of dispersion are minimal and the gun is effective for engaging point targets such as vehicles or even individual personnel targets. Dispersion continues to expand beyond 1,700, and at long ranges the AWS is best suited to engage area targets. Dispersion between individual rounds means that the selected aimpoint represents the DMPI of the burst fired. DMPI selection varies for stationary or moving targets. The crew apply following additional considerations to ensure optimal aimpoint selection:

(1) Personnel targets. When engaging personnel targets the crew selects a DMPI that optimizes the fragmentation pattern of the individual rounds. Anti-personnel fragmentation effectiveness falls off rapidly outside 4 meters. When viewed from above the fragment pattern of each individual round is a flattened “><” shape with the majority of the fragments moving to the side and slightly forward with the highest concentration, spiking at the 2:00 and 10:00 o’clock positions. To ensure effective fragment performance when engaging troops in the open the crew selects a DMPI slightly short of personnel targets. In complex terrain (urban, mountainous, or forest) it may be possible to optimize fragment performance against personnel behind cover by selecting a DMPI at head height on a nearby vertical surface such as a wall, rock, or tree. Striking vertical surfaces within 4 meters of enemy personnel may provide an air-burst like effect and will generate additional secondary fragmentation (spall).

(2) Light skinned vehicle targets. When engaging vehicle targets the crew selects a DMPI to optimize the shape charge penetration performance and blast effects of the individual rounds. Armored vehicle armor is the thinnest on the top and rear so attacking from these directions optimizes armor penetration.

To counter the effects of dispersion the crew selects a DMPI oriented on the center of mass of vehicle targets.

(3) Heavy armored targets. Though roof armor on main battle tanks may be as thin as 20 to 30mm, generally HEDP is ineffective against tanks. However, HEDP can effectively suppress tank crews, forcing them to close their hatches and making it much more difficult for them to acquire friendly aircraft. Additionally HEDP strikes may detonate explosive reactive armor (ERA) panels as well as damage vehicle sighting systems, making the tanks more vulnerable to follow-on attack by combined arms. When engaging tanks the DMPI should be oriented on top, of or slight short of, the tank to optimize anti-personnel, anti-material, and suppressive effects.

(4) Other point targets. Engaging ADUs, tactical ballistic missiles (TBM), and fast attack craft (FAC) [missile boat] targets is similar to engaging vehicle targets except that the crew orients the DMPI on the target's weapon or sighting systems vice the vehicle itself. 30-mm HEDP-shaped charge strikes on a target's ordnance will cause a secondary detonation resulting in a catastrophic kill ("K-kill") of the entire target. Additionally 30-mm blast/fragmentation effects will damage radar or sighting systems thereby achieving a "Firepower Kill" (F-kill) on ADUs.

(a) Moving Targets:

- MTADS and FCR. When utilizing the MTADS or FCR as the active LOS the weapon's processor can accurately predict an appropriate lead for a moving target. This allows the gunner to maintain his aimpoint on the selected target impact point while the WP calculates the appropriate lead angle and points the gun the appropriate distance in front of the target. The target state estimator (TSE) will correct for steady state target movement when the MTADS or FCR sights are used however, the TSE assumes that the gunner is smoothly tracking the target. Excessive or inconsistent target tracking by the gunner is misinterpreted by the TSE as target movement and will result in erroneous ballistic solutions being applied. The gunner must establish a smooth, consistent track and maintain an accurate and continual target range to ensure that the TSE properly predicts and applies an appropriate lead.
- HMD. Lead must be manually applied for gun engagements utilizing the HMD as the LOS. Proportional lead tracking requires establishing and maintaining an aiming point ahead of the target's movement. In these cases the gunner does not aim at the target's center of mass but rather maintains an aimpoint a fixed distance in front of the target. During fixed lead tracking the gunner estimates target movement and predicts the position of the target at weapons impact to establish an aimpoint. The gunner then maintains the LOS on the predicted point and fires at the appropriate time to achieve target effect.

(b) Buildings. The 30mm is a minimum collateral damage weapon which has limited effect upon buildings since the fragmentation effects are generally expended upon the outside of masonry, brick, concrete, or steel structures. The 30-mm shaped charge will produce a hole in concrete approximately the length and diameter of an index finger. With sufficient rounds fired the 30mm can knock down thin brick walls but will be unable to breach steel reinforced-concrete. When engaging enemy forces in buildings the crew should select windows and other apertures as their DMPI.

(c) Plunging Fire. Plunging fire involves engaging targets from the vertical axis, allowing crews to attack targets in defilade. Both anti-personnel and anti-armor effectiveness can be optimized through plunging fire because HEDP effectiveness improves significantly as the round's impact angle approaches vertical. Plunging fire can be achieved when the aircraft is using a diving fire profile or when the gun is fired from long range.

l. Indirect fire engagements. Indirect fire is fire that is delivered onto a target that cannot be directly viewed by the firing aircraft. Indirect fire provides a significant survivability advantage to the firing aircraft and allows the crew to place effective suppressive fire onto a target while remaining fully masked from enemy observation or direct fire. This capability is critical when engaging sophisticated air defense threats. During irregular warfare (IW), the ROE may limit the ability to employ unobserved fires. Under restrictive ROE the crew may utilize other observation sources to maintain positive identification (PID) of the target area.

(1) MTADS indirect fire procedures. The crew utilizes stored targets for indirect fire missions. These may be preplanned targets or targets acquired by the crew in flight. These targets must be coordinate

based targets stored in the current mission file. The crew may conduct indirect fires against TSD targets utilizing the MTADS as the active LOS. When conducting indirect fires against TSD targets the firing crewmember must first select the desired target as the acquisition source. The CPG then slaves the sensor to the selected target and actions the 30mm. The gun will be provided range and azimuth ballistic solutions via the WP, and point as appropriate. The CPG then engages as necessary to achieve the desired target effect.

Note. The actual target may or may not be visible when the sensor is slaved. If the target is visible it may be best to conduct a direct fire engagement.

(2) FCR indirect fire procedures. The pilot and CPG have the same capability to accurately engage FCR targets using indirect fire. These targets can be autonomously acquired by the aircraft's FCR or an RFHO. The crew places indirect fire onto FCR by actioning the gun with the FCR as the selected LOS. The gun will be given a ballistic solution and align as appropriate relative to the NTS.

(3) Sequencing indirect fire attacks. When the crew must unmask the helicopter for direct visual or FCR observation of the target area to adjust fire or for follow-up direct fire attacks, they should time their indirect gunfire attack so as to have rounds impacting around the enemy locations as their aircraft unmasks.

a. Simultaneous weapons engagements. The crew may perform simultaneous wing store pylon weapon (missiles or rockets) and gun engagements. The gun will be inhibited from firing during any wing store pylon weapons launch for 2 seconds. Attempts to fire the gun during this time period, will result in an "ALT launch" message being displayed in the HAD weapon control status field. Gun firing will also inhibit wingstore firing for 2 seconds.

TRAINING AND EVALUATION REQUIREMENTS:

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

Note. Live fire is not required for training and evaluation of this task.

REFERENCES: Appropriate common references, current gunnery manual, current J-FIRE manual and applicable AWRs.

TASK 1471

Perform Target Handover

CONDITIONS: In an AH-64D helicopter or AH-64D LCT and given a condition to perform a target handover. Determination of the selection of appropriate handover methods is by the type of equipment, unit 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. 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 (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 P* may send/receive a target handover.
   b. The 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 PLT (backseat crewmember) can use the 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 (PHS or FCR) from the ACQ button on the TSD page. Press the slave switch on the TEDAC right

handgrip to slave or activate cueing. 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 overlaid. 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 LOS (GHS, FCR, or TADS) from the TSD, FLT, ENG, or FCR 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 overlaid. 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 LASER to pass targets, for LST handovers, to other aircraft in the flight. If receiving an LST handover the CPG uses the LST to acquire targets that are handed over via coded laser energy from another aircraft or compatible ground designator. When passing a target to another aircraft the CPG acquires, tracks, and designates the target. The CPG then provides a handover alert, and the target's location, along with description, to the receiving aircraft. The target location may be passed in the form of range/bearing or position relative to a known/stored point. The receiving aircraft orients the TADS towards the target's location and utilizes the LST to acquire the sender's laser spot. This may be accomplished using either the AUTO or MAN laser spot tracker modes. The CPG will announce "Spot" to the designator when the LASER spot is acquired by the LST, "Talley" when the target is identified, and "Terminate" when lasing is no longer required. If the target is not detected, the CPG will announce "Negative LASER."

EXAMPLE LST Handover between aircraft: *LEAD: "Wolf 32 ….Wolf 25……LASER On, 320° 4700 meters, technical vehicle"* WING: "Wolf 25…..Wolf 32…..SPOT, Talley technical vehicle, TERMINATE"

Note 1. There is no symbolic representation to allow the crew to know when the LST is on in either mode.

Note 2. The LST is not boresighted to the DTV or FLIR LOS; as a result, the selected sensor LOS may not be directly over the intended target once the LST captures the designator's LASER spot.

Note 3. Sensor heading to targets will vary based on the separation between aircraft within the flight. Acquiring aircraft must take this into consideration and adjust as necessary when searching for the other aircraft's laser spot.

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 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 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft or AH-64D LCT.

REFERENCES: Appropriate common references.

TASK 1835

Perform Night Vision System Operational Checks

CONDITIONS: In an AH-64D helicopter or an AH-64D LCT, with grayscale IHADSS optimization completed, and given TM 1-1520-251-10/TM 1-1520-251-CL.

STANDARDS: Appropriate common standards and perform NVS operational checks IAW TM 1-1520-251-CL.

DESCRIPTION:

1. Crew actions.

a. The crew will perform the NVS operational checks, to include turning on the system and adjusting the FLIR.

b. The P* or P will announce when he takes control of the alternate sensor and when he completes the check.

c. When troubleshooting, the PLT (backseat crewmember) or CPG (front seat crewmember) will coordinate with the opposite crewmember before activating the IB IT.

2. Procedures.

a. Optimization. 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. There will be no picture present until the system has completed its initial SANUC. Each will then accomplish the following adjustments. Adjust the FLIR LVL (level) control, on the video control panel (PLT) or TEDAC (CPG), to full counter clockwise (CCW). Adjust the FLIR gain control, on the video control panel (PLT) or TEDAC (CPG), to full CCW. Adjust the FLIR LVL control, on the video control panel (PLT) or TEDAC (CPG), clockwise (CW) until the FLIR imagery begins to bloom. Adjust the FLIR gain control, on the video control panel (PLT) or TEDAC (CPG), CW until contrast or FLIR imagery is acceptable. Adjust the FLIR LVL control, on the video control panel (PLT) or TEDAC (CPG), to optimize FLIR imagery. Adjust the FLIR gain control, on the control panel (PLT) or TEDAC (CPG), to optimize FLIR imagery. Set the ACM switch, on the video control panel (PLT) or TEDAC (CPG), to on. With the ACM on, adjust the LVL and Gain controls as necessary to optimize the FLIR image.

Note. Use of the ACM in MTADS/MPNVS equipped aircraft does not disable FLIR level and gain adjustment controls. Use of the ACM will result in higher image quality and reduce image blooming.

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 RHG. 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 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 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 bore sighting, 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 at 90 feet. Some elevation error may be present do to the parallax of the sensor location and its vertical displacement from the pilots eye position. The open center position(inside edge to inside edge of three and nine o'clock LOS probs) of the LOS reticle is equivalent to 2 feet 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' 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.

Note. In the event of horizontal lines in the MTADS FLIR video, a FULL (standard process) scene assisted non-uniformity correction (SANUC) initialization can be initiated to clear these lines.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references.

TASK 2010

Perform Multiaircraft Operations

CONDITIONS: In an AH-64D helicopter and given a unit 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 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 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 IMC are encountered, execute 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 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 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 to rally 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 air control point (ACP) along the route, a passage point (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 target reference point (TRP)/priority firing zone (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**.**

Note 1. The P* must keep the P thoroughly informed to what he is observing and doing throughout the formation flight or multiship operation. Normally, the PLT (backseat crewmember) will be on the controls, using the PNVS. The CPG (front seat crewmember) may be out of the NVS normal (NORM) position using TADS or TADS ACQ-GHS on occasions in the narrow and zoom 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 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.

Note 2. 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.

Note 3. 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 (table 4-4, page 4-175).

Table 4-4. Multi-aircraft 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. IIMIC procedures.
9. Actions on contact.
10. Downed aircraft procedures.

NIGHT OR 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 PNVS formation flights challenging tasks initially. The PNVS and NVS NORM TADS-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.

NVS/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 FM 3-04.203 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 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. 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 aircraft. To counter the effects of AC coupling in an MTADS equipped aircraft, ensure ACM is on.

4. 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 staggered 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 that takes full advantage of the NVS' 40-degree field of view. The formation requires a great deal of P* skill and attention. A 20-degree offset 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 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 METT-TC. Vertical separation of teams and sections will vary with terrain, obstacles, and the tactical situation.

5. 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).

6. When one crewmember is using NVG during formation flight, the opposite crewmember should acquisition select the opposite crewmember's HMD.

7. When using NVG 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).

Note 1. 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.

Note 2. 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.

Note. Instructor pilots may demonstrate Task 2010 during crewmember refresher training provided the crewmember undergoing the refresher training is not on the flight controls during conduct of the task.

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

REFERENCES: Appropriate common references.

TASK 2043

Perform Team Tactical Employment Techniques

CONDITIONS: In an AH-64D helicopter or AH-64D LCT, with one or more other aircraft.

STANDARDS:

1. Maintain situational awareness of objective, enemy, friendly ground forces and team members.
2. Assign team member responsibilities and flight position.
3. Conduct tactical movement procedures.
4. Select, transmit and execute attack technique, pattern, munition, range, (TPM-R) plan.
5. Correctly respond to threats to the team and mission accomplishment.

DESCRIPTION:

1. Crew actions.

a. The P* will remain primarily focused outside the aircraft throughout the engagement. 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.

b. The 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 MTADS or FCR.

2. Procedures. The air mission commander (AMC) selects the appropriate team employment techniques based upon the factors of METT-TC. The AMC may select hover/NOE tactics or running/diving fire tactics as appropriate to the mission and that maintains mutual protection.

a. TPM-R brief: The AMC formulates and briefs the attack plan to the aerial weapons team (AWT) utilizing the “TPM-R” format below.

(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. Patterns 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.

(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.

RUNNING/DIVING FIRE TEAM EMPLOYMENT:

1. Attack pattern calls. The AMC assigns team member responsibilities within the team based upon the tactical situation. When assigning roles the AMC utilizes joint service standardized terminology shown below. For clarity the lead aircraft’s duty is called out first and the #2 aircraft’s role is called out second.

a. Shooter/cover.

(1) When used the lead aircraft is responsible for target confirmation and accurate fires on the target while the wingman is responsible for maintaining protective overwatch of the lead aircraft, and providing suppressive fires if necessary.

(2) The distance between lead and wing aircraft should allow the lead aircraft unhindered room to maneuver yet keep the wingman in position to provide immediate and effective covering fire for the lead aircraft.

(3) Primary disadvantage is that it results in a 50% reduction of effective fires and precludes placing the maximum weight of fires onto the enemy on one pass.

(4) Primary advantage is that it provides covering/suppressive fires for the lead aircraft when attacking a point target. In this case the wingman stays outside of the enemy weapons engagement zone, for his survivability but is able to placed suppressive fires on pop-up threats or on the target during lead's break.

b. Shooter/shooter.

(1) Provides maximum weight of fire on the target in one pass.

(2) Used when all team members are expected to provide accurate/effective fires onto the target nearly simultaneously.

c. Looker/shooter.

(1) This is the inverse of classic shooter/cover profile,

(2) The technique is used when the contact of interest has not yet been PIDed as enemy. On the first track inbound the lead aircraft closes with the contact to perform PID. The second aircraft remains in position to immediately put fires onto the "contact" as soon as the "looker" aircraft is able to confirm PID.

(3) This TTP is utilized when performing movement to contact or reconnaissance missions when the lead aircraft can be anticipated to be too close to a target to satisfactorily engage it once the target is identified.

ATTACK PATTERNS:

1. Attack patterns can be preplanned for known enemy locations, but are normally briefed prior to the attack. The attack should be adjusted to take advantage of the terrain, weather, enemy weaknesses, and employ the aircraft to gain the advantage. The attack pattern selected should also make it difficult for the enemy to engage attacking aircraft. Good suppression by the cover element will complicate the enemy's ability to engage effectively. Key considerations in pattern selection include the number of attacking aircraft, target characteristics, weapon capabilities, friendly forces in the immediate area, disposition of enemy defenses, and the desire to remain unpredictable on each attack.

2. At night or during reduced visibility, attack patterns must become methodical and more tightly controlled. Some patterns are better suited for night operations.

3. Patterns should be flown to maximize employment ranges and deliver accurate fires while preventing prolonged flight within E-WEZ or into ordnance fragmentation patterns.

a. Lead will announce type of engagement pattern and direction of turns

b. The wingman will acknowledge the formation.

c. 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 by calling the J-Brevity term "Saddled".

d. 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.

4. Racetrack pattern (figure 4-11, page 4-179). The racetrack pattern 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.

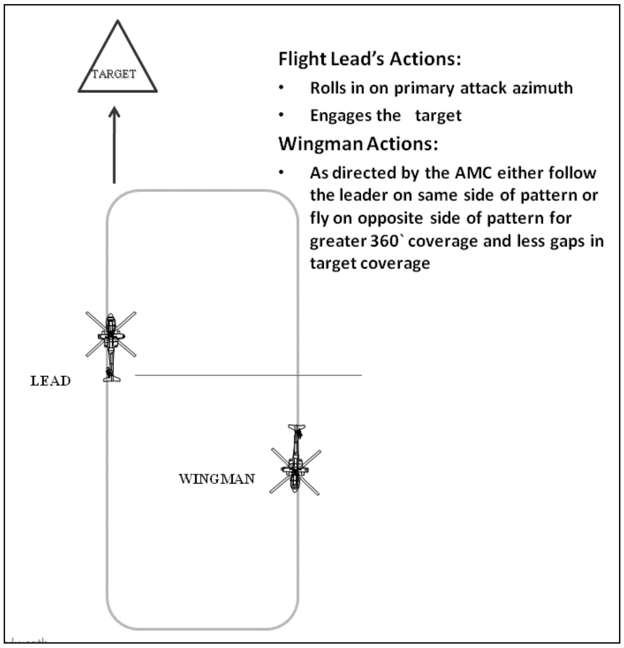

Figure 4-11. Racetrack pattern

a. Advantages.

(1) Any number of aircraft may be used in the pattern.

(2) Continuous fire may be placed on the target, using any type of weapon.

(3) Engagement range, disengagement range, and timing are flexible.

(4) Easily controlled.

b. Disadvantages.

(1) Target is covered from only one direction at a time.

(2) Enemy is able to place enfilade fire on the entire attack formation from one position.

(3) Only one attack element can engage the target at a time.

(4) Pattern is predictable.

5. Butterfly pattern. This is two mirror image racetrack patterns. The Butterfly pattern is particularly well suited for convoy escort missions. To safely execute a butterfly pattern requires a prominent reference point such as a road. The road can assist in safely deconflicting team/element members. The Butterfly pattern allows more than one team to be used. The inbound and outbound runs should be coordinated to provide continual target area coverage and team/element mutual security.

6. 45-degree attack pattern (figure 4-12, page 4-180). The 45-degree attack pattern allows the wingman to place effect fire upon the target from a different angle and fire nearly simultaneously with the lead aircraft if required. The wingman displaces in azimuth and elevation to force the enemy to redirect and attenuate his defense.

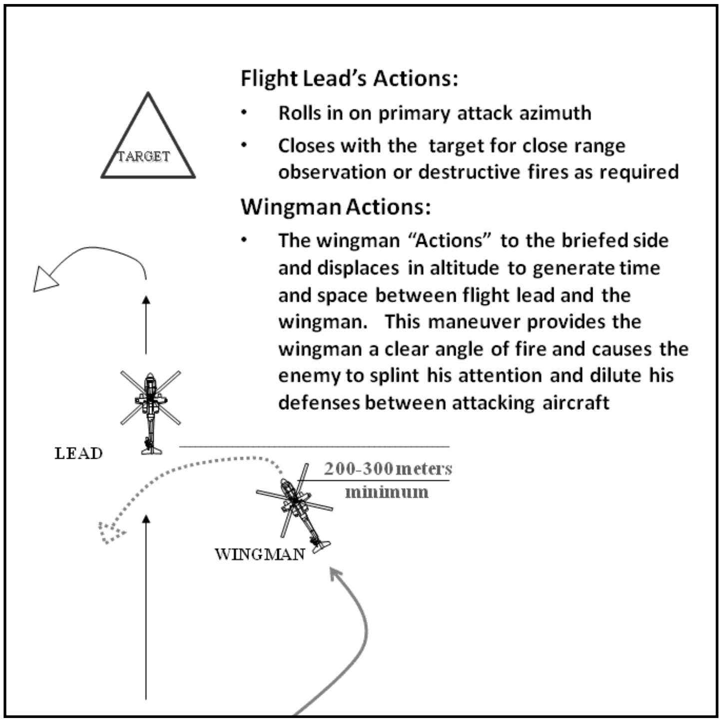

Figure 4-12. 45-degree attack pattern

7. Circular/Wheel Pattern. The wheel pattern is often utilized for reconnaissance of a point target or area of interest such as a suspected IED site. It is suitable for observation, target designation and the use of off axis weapons.

8. Cloverleaf pattern (figure 4-13, page 4-181). The cloverleaf attack pattern 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. The petals of the cloverleaf are modified as required for effective management of the sensor field of regard and weapon engagement zone.

a. The crew coordinates and communicates their actions to ensure optimal sensor field of regard (FOR) and WEZ management.

b. Minimize aircraft ownship vulnerability presenting minimum target or minimize exposure time.

c. Continuous fire to fix the enemy, deny enemy reposition/escape, maintain PID, present the enemy with multidirectional attacks to dilute enemy return fire.

d. Provide enhanced opportunities to place enfilading fires on the targets long (or vulnerable) axis.

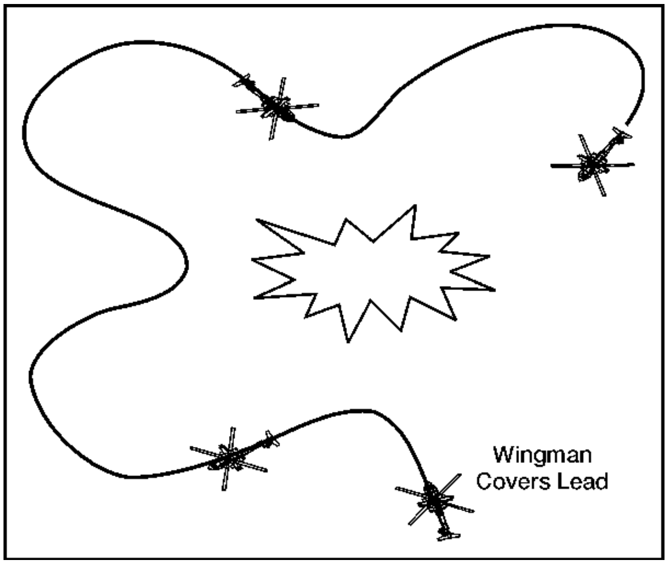

Figure 4-13. Cloverleaf pattern

9. Figure-8 pattern (figure 4-14). The Figure-8 pattern 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.

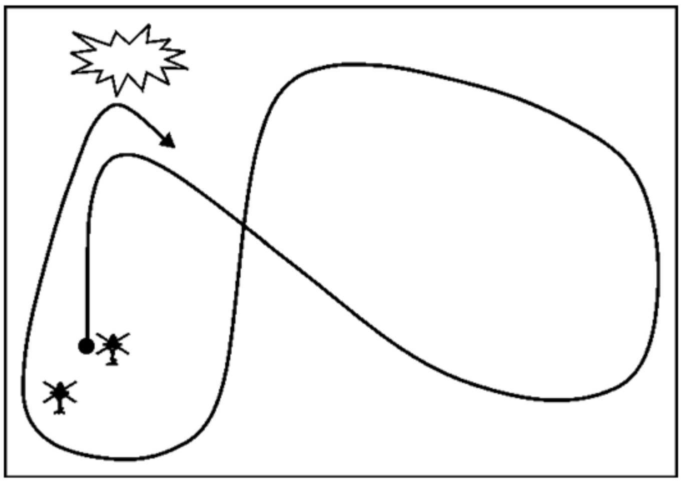

Figure 4-14. Figure-8 pattern

10. L-pattern (figure 4-15, page 4-182). The L-pattern 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.

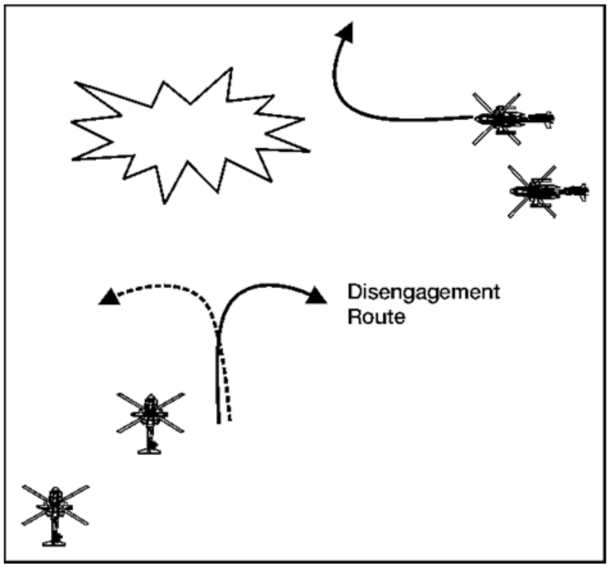

Figure 4-15. L-pattern

NIGHT/NIGHT VISION DEVICE 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 TADS wearing NVG in the front seat could greatly enhance the 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 LCT with one or more additional aircraft.
2. Evaluations will be conducted in the AH-64D aircraft.

REFERENCES: TM 1-1520-251-10-1 and TM 1-1520-251-10-2.

TASK 2045

Operate Infrared Laser Pointing Devices

CONDITIONS: In an AH-64D helicopter with IR laser installed, MTADS internal weapons systems initialization completed, and the pilot using the IR laser (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. Employ the IR laser for target designation and pointing.
3. 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 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 IR laser, and when completing the operation. The opposite crewmember will acknowledge all announcements and will confirm the actions of the crewmember performing IR laser operations through one MPD) displaying the opposite crewmember's 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 IR 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 NORM) The gun mode is initialized by the aircraft default in the NORM mode unless set to FXD on the DTC.

WARNING

The IR Laser is a Class IV invisible non-eye-safe laser. All personnel should be alerted to the hazards specific to the gun mounted laser. 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.

Note 1. During operations with the laser, and 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.

Note 2. Flight testing revealed that the laser boresight relative to the gun is not maintained during AWS engagements.

b. Normal laser operations. The gun mode that may be employed with the laser is NORM. The normal mode allows the gun to flex in azimuth and elevation as directed by the 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 PLT or CPG desiring to use the laser will action the gun and sight SEL HMD on his collective mission grip's sight SEL switch. The CPG will turn the IR laser 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 TEDAC 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 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).

Note 1. The purpose of the IR Laser is to provide the crew the capability to confirm target location with ground forces and thereby minimize the potential for fratricide. The laser should be limited to target illumination/pointing and not be used as a means of directing AWS fire.

Note 2. Energy from the 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 laser should only be powered when the AWS is the weapon actioned and a target is being designated.

Note 3. To designate targets with the 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.

Note 4. Proper crew coordination must occur between the pilot and for activating and deactivating the IR Laser, as the laser 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, AWR 2004D-A5 1, JP 3-09.3, JP 3-09.32, Task 1140, and Task 1464.

TASK 2050

Develop an Emergency Global Positioning System (GPS) Recovery Procedure

WARNING

This procedure is strictly for recovery under VMC for training and for IIMC use only and will not be used for a planned IFR flight unless approved by United States Army Aeronautical Services Agency (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 chart updating manual (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, FAF, MAP, intermediate approach fix (IF), 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 MSL, all waypoints are LAT/LONG, all distances are NM, and visibility is SM. All obstacles are MSL unless otherwise noted. The Flight Information Handbook (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 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 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 (table 4-5)**.** 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).

Table 4-5. MAHF altitude calculation

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

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 off route obstacle clearance altitude (OROCA) or off route terrain clearance altitude (ORTCA) elevation from the enroute 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° and with sector obstacle clearance having a 4 NM overlap. Table 4-6 provides the solution for determining MSA.

Table 4-6. MSA calculation

Solution: (A) _____ (rounded up nearest 100 ft) + (B) 1,000 ft = (C) _____ (MSA) ***Note***: (A) = Highest obstacle within 30 NM centered on the MAP

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 MDA, visibility, and the height above landing (HAL). Use table 4-7 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, at a minimum, all items included in the following diagram.

Table 4-7. Landing visibility minimum

	250 – 475 ft	***476 – 712 ft***	***713 – 950 ft***
Landing visibility minimum (SM)	1/2	3/4	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, Doppler/GPS navigation system (DGNS), embedded GPS/INS (EGI), precision lightweight GPS receiver (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, FAA Handbook 8260.3, FAA Order 8460.42A, and FAA Order 7130.3.

TASK 2081

Operate Night Vision Goggles

CONDITIONS: In an AH-64D helicopter.

STANDARDS:

1. Inspect the NVG prior to use.
2. Perform or describe the low battery indicator check
3. Perform or describe the outdoor focus adjustment procedures.
4. Operate NVG.
5. Identify or describe indications of impending NVG failure.
6. Perform or describe emergency procedures for NVG failure.

DESCRIPTION:

1. Crew actions.

   a. The crew may utilize NVG for flight operations, navigation and obstacle avoidance.

   b. The P will acknowledge NVG failure when announced by the P*.

   c. The PC will determine if the mission must be modified or aborted after NVG failure.

2. Procedures.

   a. Ensure the NVG are within inspection dates, and check for serviceability. Conduct low battery indicator check, adjust for proper fit and focus, and ensure there are no operational defects that cause for rejection outlined in TM 11-5855-313-10. After use, ensure batteries are removed and store the NVG in the carrying case as required.

   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 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 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 MPNVS/MTADS.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training will be conducted in the AH-64D aircraft at night.

Note. Crewmembers may perform this task while undergoing NVG refresher training.

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2. 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 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.
2. Correctly compensate for transient torque.

CAUTION

Do not exceed gravity force (G) limits versus GWT and airspeed limitations outlined in TM 1-1520-251-10, chapter 5 and the applicable AWR.

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 TGT limiting, which will result in rapid rotor decay that may not be recoverable.

b. The 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 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 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 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

Most transient over-torques occur as the aircraft unloads during maneuver recovery (for example, as coning dissipates with left cyclic applied).

CAUTION

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

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

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

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 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

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

Excessive nose down attitudes will significantly add to recovery altitude required. This is aggravated by high GWT and high density altitude.

CAUTION

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

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 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.

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 decent of the dive.

Note 2. 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.

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 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 NVG without symbology display will require greater crew coordination to monitor torque, airspeed, trim, and rates of descent information not present in the NVG.

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 LCT 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 LCT, and an approved collective training device, or academically.

STANDARDS: Appropriate common standards and the following:

1. Perform CCA communications IAW current J-Fire and J-Brevity manuals.
2. Perform CCA to effectively support the ground commander's intent.
3. Transmit the attack plan to the team members using TPM-R format or unit SOP.
4. Correctly identify friendly locations.
5. Deliver accurate and effective fires ISO ground commander.
6. Comply with danger close procedures and risk estimate distances IAW current J-Fire manual.

DESCRIPTION:

1. Crew actions.

a. The P* maintains focus outside the aircraft, maintains aircraft clearance from terrain, obstacles and other aircraft while maneuvering the aircraft to place effective fires onto the target. The P* must maintain SA on the location of friendly ground forces, no-fire areas, and other aircraft.

b. The P is primarily responsible for head's down monitoring of cockpit displays such as the TSD, MTADS video, recording CAA call-for-fire information, plotting friendly and enemy locations, configuring communications systems, and transmitting and receiving digital information between CCA team members. The P must maintain SA on the location of friendly ground forces, no-fire areas, and other aircraft and providing adequate warning to avoid hazards to the P*.

2. Procedures.

a. Close combat attack general. CCA is defined as a coordinated attack by Army aircraft against targets that are in close proximity to friendly forces. Targets may range from tens of meters to a few thousand meters from friendly forces. CCA is coordinated and directed by the supported ground unit (down to team, platoon, or company-level) using the standard CCA brief. CCA may be performed from a hover or using running or diving fire. The most important factor is the proximity of the enemy forces to the friendly forces and the importance of accurately delivered fires. Once the AMC receives the mission from the ground commander, he/she develops a plan and maneuvers the aerial weapons team to engage the enemy force, while maintaining freedom to maneuver.

Note. The CCA communications formats in this document are shown as examples. Prior to combat operations, crews must consult the latest issue of FM 3-09.32 for currently approved CCA communications formats, and danger close information.

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b. Close combat attack communications. Once the AMC is given the mission to conduct CCA he/she will establish direct communication with the ground commander on the scene. This direct communication between the ground commander and the AMC conducting the attack is the central tenant of CCA TTP; it is crucial in the prevention of fratricide and to insure the destruction of the enemy. Generally CCA communications are executed in four phases.

(1) CCA check-in brief (air to ground).

(2) CCA 5-line attack brief (ground to air).

(3) TPM-R brief (air to air).

(4) Air/ground integration (air to ground/ground to air).

c. CCA check-in brief (table 4-8): the air-to-ground CCA check-in brief gives the ground commander information on aerial weapons team's (AWT's) capabilities and restrictions.

Table 4-8. Close combat attack check-in brief

(Aircraft Transmits to Ground Unit)
1. Aircraft: "____________________, this is ________________." (*Ground unit in contact)* *(Aircraft Call Sign)* 2. Aircraft team composition and location. 3. Munitions available (rockets/guns/missiles). 4. Night vision capability and type (if appropriate). 5. Station time (in minutes remaining or hard time of day).

d. CCA 5-line attack briefing (table 4-9): The ground-to-air CCA 5-line attack briefing is a fragmentary order **(**FRAGO) given from the ground force to the aerial weapons team conducting the CCA. The CCA 5-line contains all the information needed to complete the mission and paints a clear picture of the current friendly and enemy situation, assigns a clear task and purpose, and communicates the identification (friend or foe) signals utilized. The CCA 5-line is issued to the AWT as early as possible to allow the AMC to formulate an attack plan.

Table 4-9. Close combat attack briefing—ground to air (5-line)

1. Observer/Warning Order. **"____________________, this is _________________, Fire Mission, Over"** (Aircraft Call Sign) (Observer Call Sign) 2. Friendly Location/Mark. **"My position ________________, marked by _____________________"** (TRP, Grid) (Strobe, Beacon, IR Strobe) 3.Target Location. **"Target Location _______________________________________"** (Bearing [magnetic] and Range [meters], TRP, Grid) 4.Target Description/Mark. **"____________________, marked by ______________________"** (Target Description) (IR Pointer, Tracer) 5. Remarks (Threats, Danger Close Clearance, Restriction, At My Command). **"Over"**
CCA 5-Line continued: **Clearance of Fires:** Transmission of the 5-Line CCA Brief is clearance to fire. When fires are Danger Close the senior ground force must accept responsibility for increased risk. State "Cleared Danger Close" (with initials) in line 5. Danger Close clearance may be preplanned. At My Command: For positive control of the aircraft, state **"At My Command"** on line 5. The aircraft will call **"Ready for Fire"** when ready.

e. TPM-R briefing: The AMC will formulate an attack plan and transmit it to other AWT team members utilizing the air-to-air TPM-R briefing format in accordance with ATM Task 2043 and applicable SOPs. As a minimum, friendly location, as well as techniques, patterns, munitions, and ranges will be briefed and understood.

f. Air/ground integration calls: For optimum air/ground integration (AGI) during CCA engagements continuous communication and coordination between friendly ground and air elements is required. The aircrew will request any missing required information using the CCA briefing checklist. The aircrew will positively identify friendly unit locations utilizing the correct radio prowords IAW the current J-Fire and J-

Brevity manuals. The AMC will enforce disciplined use of correct radio terminology paying particular care to only use the term “Talley” to refer to enemy locations and “Visual” to refer to friendly locations. In addition, the AMC should specifically request the ground force to perform the following actions throughout the CCA:

(1) Transmit an immediate cease fire call if aircraft ordinance lands too close to friendlies or neutrals.

(2) Mark targets only when the Attack aircraft are in a position to see the mark.

(3) Inform the ground force that the aircrew is unable to hear incoming enemy SAFIRE. Direct the ground force to listen for, and locate, SAFIRE directed against the attacking aircraft and provide warning to the aircraft when they are under fire.

(4) Provide suppressive fire on known or suspected SAFIRE POO, particularly while aircraft are likely to be exposed to enemy fire such as after their break.

(5) Provide fixing fires onto the enemy when aircraft are outbound to limit the enemy’s ability to reposition between aircraft firing runs.

(6) Provide fire corrections to the aircraft after each pass to ensure accurate fire is directed onto the enemy, and that changes in enemy locations are attacked as quickly as possible.

g. Marking: 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.

(1) Friendly marks. Methods for marking friendly locations include visual marking and electronic marking. Visual marking includes but is not limited to smoke grenades, signal mirrors, VS- 17 panels, infrared (IR) strobe lights, or chemical sticks. Electronic/digital situational awareness (SA) systems include Blue Force Tracker (BFT), variable message format (VMF), cooperative and non-cooperative target ID systems and navigational waypoints programmed into the aircraft.

Note. at no time should the crew insert a friendly location as a target/threat icon; only insert the friendly location as a waypoint or control measure during the conduct of a CCA. Electronic SA type systems such as BFT may have significant latency. Do not fire CCA fires solely relying upon BFT icons.

(2) Enemy marks. Methods for marking enemy locations include visual marking and electronic marking. Visual marking includes but is not limited to laser designators, laser pointers, smoke grenades, tracer fire, marking rounds (40-mm grenades, HE/WP/RP rockets, flares or mortars). Electronic/digital SA systems such as Blue Force Tracker (BFT), variable message format (VMF), as well as targets programmed into the aircraft can also be used to designate targets or target areas.

h. Danger close procedures. CCA will often require Aircrews to deliver weapons dangerously close to friendly forces. Danger close does not restrict fires, but represents a decision point warning for both the ground commander and the aircrew that there is an increased risk of fratricide. To maximize ground force safety a RED is established for all weapons.

(1) If CCA fires are expected to land within the JFIRE risk estimate distance of friendly forces, the senior ground commander will be informed that this is a danger close engagement. It is then up to the senior ground commander on scene to approve danger close fires. Commanders must carefully weigh the choice of ordnance, accuracy, capability of the aircraft and proficiency of the aircrew in relation to the risk of fratricide. Taking steps to protect friendly Soldiers (prone, behind cover) can reduce the risk. The ground commander acknowledges the risk and provides his informed consent and approval to continue the engagement by passing his initials to the firing crew. Danger close can be preapproved in the CCA call for fire or in an operation order.

(2) The approved RED for each weapon system is found in FM 3-09.32. (J-FIRE manual). REDs are expressed as a radius from the target to the friendlies. Danger close distances are a summation of several factors: the type of weapon being fired, the type of ammunition being fired, and the range from the shooter to the target. To keep the danger close decision point as simple as possible, REDs are defined as a 2-D circle (radius) measured from the Friendly location. However, typical aviation delivered weapons

have an elliptical beaten zone, therefore REDs are only valid when shooting parallel to friendly locations (figure 4-16).

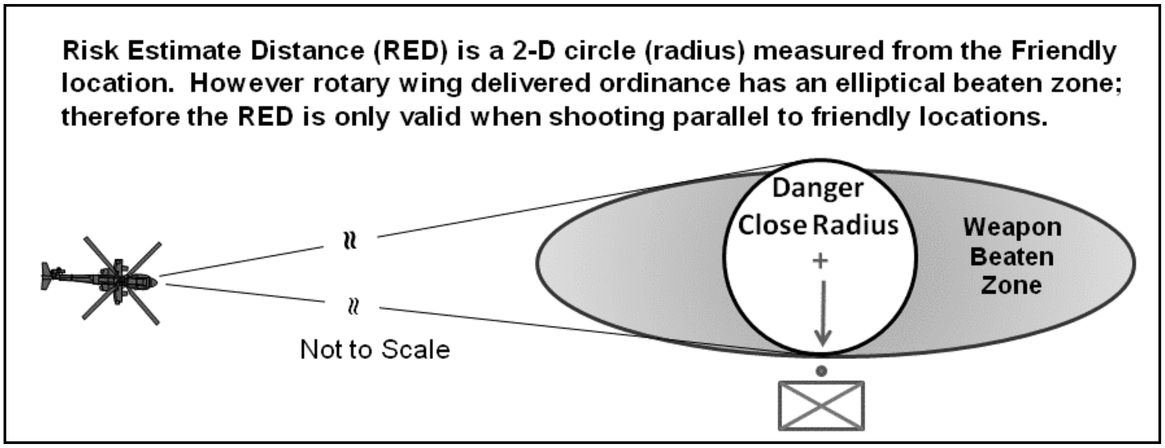

Figure 4-16. Risk estimate distance versus beaten zone

(3) Danger close risk estimate distances only account for the weapon's primary fragments and do not account for secondary fragmentation or secondary explosions. Secondary fragmentation from targeted building glass is a major factor in urban casualties. In the urban environment it is important to keep in mind that the Danger Close REDs do not account for weapons impacts on elevated or vertical surfaces. REDs make no account for mitigating factors such as walls, buildings, armored vehicles or any other cover from fragmentation effects. Though these mitigating features may support close fires the commander should realize that both primary and secondary fragments can continue to fall for up to 30 seconds after detonation, thereby potentially exposing otherwise protected ground forces to falling debris and falling fragmentation (figure 4-17).

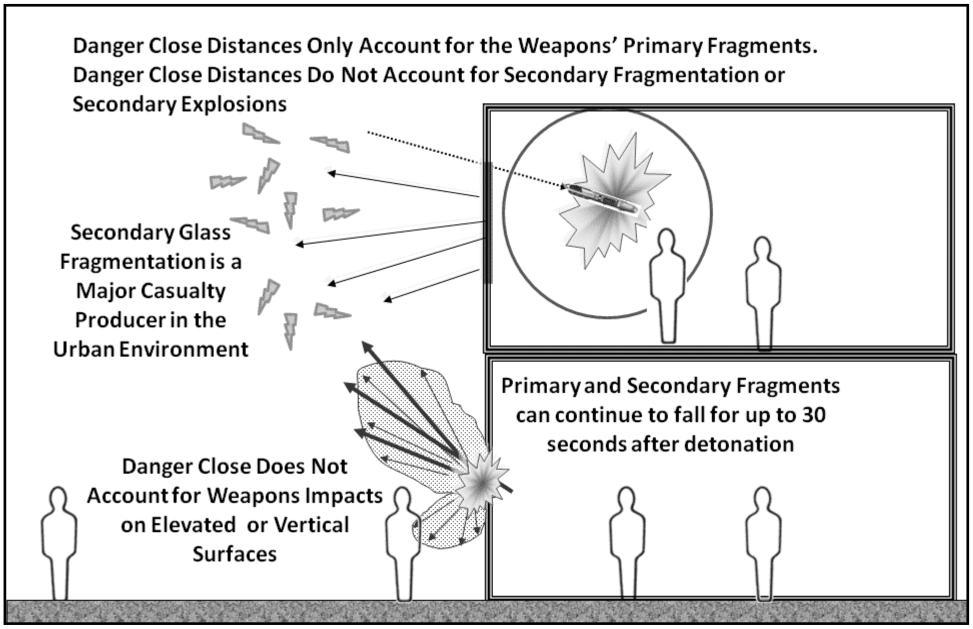

Figure 4-17. Urban danger close considerations

i. Close air support (CAS). The Army does not consider its attack helicopters a CAS platform. Due to the capabilities of Army aircraft, the enhanced situational awareness of Army aircrews, and the habitual relationship with Army ground forces, Army Aviation units conducting CCA do not require terminal control from joint terminal attack controllers (JTAC) or forward air controllers (FAC).

Note. CCA is not synonymous with CAS.

(1) CCA differs from CAS in crucial ways. CCA is “Friendly Centric” and focuses first and foremost on identifying the friendly locations and then shifting towards the enemy location. In contrast, close air support, like artillery call’s for fire (CFF), is “Target Centric” focusing first and foremost on the target location and then adding amplifying information on nearby friendly locations. CAS requires that the aircraft be under the direct control of a specially trained, certified, and current J-TAC or FAC. CCA allows maximum flexibility of the air mission commander and does not mandate any J-TAC requirements onto the supported ground force unit.

(2) The Army’s preferred employment methodology is CCA; however, Army attack helicopters may conduct attacks employing CAS TTP when tasked to support Joint or Coalition forces not familiar with U.S. Army CCA procedures. When directed to supported ground units that only utilize CAS procedures (9-line CAS brief) Army attack helicopter crews should consult the current J-Fire manual for further guidance.

NIGHT/NVD CONSIDERATIONS: Night vision goggles (NVG) will aid in identifying friendlies marked by near infrared signaling devices. IR pointers can be effectively used by ground personnel and aircraft to point out potential targets. The type and capability of IR pointers varies greatly. IR pointer’s effectiveness will be seriously degraded during high light levels, high humidity, or battlefield obscurants. The low grazing angle inherent with 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.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references and the following: FM 3-09.32, FM 3-04.126, and FM 1-02.1.

TASK 2162

Call for Indirect Fire

CONDITIONS: In an AH-64D helicopter, an AH-64D LCT, 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]/30mm) 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 EGI capabilities of the AH-64D and advanced weapons processors allows for precise indirect fire engagements with rockets, 30-millimeter, remote SAL Hellfire engagements, and other laser guided munitions (for example, the Copperhead).

1. Crew actions.

   a. The 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 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 (RKT/30-mm), 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. 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.

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 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 TSD and then lase, store, and send the necessary correction.

c. Call-for-fire elements. The CFF 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. See Task 1458 and FM 3-04.140 for remote SAL Hellfire requests.

NIGHT OR 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 LCT, or academically.
2. Evaluation will be conducted in the AH-64D aircraft, in the LCT, or academically.

REFERENCES: Appropriate common references.

TASK 2164

Call for a Tactical Air Strike

CONDITIONS: In an AH-64D helicopter, an AH-64D LCT, 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 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.

b. 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 (table 4-10).

Table 4-10. 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 may be abbreviated for brevity and/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)

(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) (figure 4-18, page 4-203) 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.

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 readback 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 coordinates to include map datum
[for example: WGS-84], offsets or visual description.)
7. *Type Mark: "___________" Code: "___________________"
(WP, Laser, R, 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, additional target 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 operations, include map data. Grid coordinates must include 100,000 meter grid identification.

Figure 4-18. CAS check 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 (table 4-11, page 4-204).

Table 4-11. 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 antiaircraft 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) In Type III, 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/NVD CONSIDERATIONS: The crew must exercise care when observing the impact of rounds because the flash signature may momentarily degrade the capability of the 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 LCT.
2. Evaluation will be conducted in the AH-64D aircraft, AH-64D LCT, or academically.

REFERENCES: Appropriate common references, FM 3-09.32, FM 17-95, FM 90-21, JP 3-09.03, FM3-04.203, and the unit SOP.

TASK 2412

Perform Evasive Maneuvers

CONDITIONS: In a helicopter or appropriate simulator, in a simulated tactical environment, familiar with classified evasive tactics techniques and procedures (TTP) and all organic ASE, having received simulated enemy fire.

STANDARDS: Appropriate common standards and the following:

1. Perform appropriate evasive maneuver (EVM) communications.
2. Perform appropriate EVM for the type of threat.
3. Evaluate any damage to aircraft.
4. Recommend or execute a course of action.

DESCRIPTION:

1. EVMs consist of a combination of classified and unclassified 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.

2. Consult with local TACOPS Officer for latest area of operations (AOR) threat systems. If the enemy cannot be avoided through tactical flight procedures, then EVMs are used to avoid or minimize exposure in the enemy's weapon 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 tactical flight mission planning, tactical flight procedures, and 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 limit enemy weapon effectiveness, and exit the WEZ as quickly as possible by applying the appropriate EVM, and suppress the system if able.** Aircrews should anticipate the possibility of multiple weapons systems arrayed with interlocking fields of fire when conducting EVM. Aircrews must also be aware of the difference between cover and concealment during tactical flight.

3. Considerations: When tactics are insufficient, the crew will select and apply the appropriate EVM. Any EVM must be used in concert with aircraft survivability equipment (ASE), onboard weapon systems, and other TTP to minimize the SAFIRE threats to the aircraft. EVM are broadly categorized by whether the enemy weapon is guided or unguided. Generally, the aircrew must defeat the weapon system for guided weapons and defeat the gunner for unguided weapons. Both guided and unguided weapons require time to get to the target based on weapon to target range and projectile velocity. At some ranges, the TOF can be exploited to allow the pilot to maneuver the aircraft out of danger. However, the time required varies greatly depending on the type of weapon and TOF. Tank main gun rounds and automatic antiaircraft (AAA) cannons have extremely high velocities and very short TOF whereas rocket propelled grenades (RPG) and certain antitank guided missiles (ATGMs) have comparatively slow TOF.

4. Communication. Intra-cockpit and inter-flight 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 by providing early warning and reaction time, and perhaps maneuver space, with the goal of minimizing other aircrews exposure to the WEZ if not enabling them to avoid the WEZ altogether. The "threat call" must be both directive (telling the flight what you want them to do) and descriptive (telling the flight why) to 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. Aircrew coordination throughout the EVM sequence is of paramount importance. Crews should brief and practice actions during EVM to ensure efficiency and communication effectiveness. In any case, the person observing the enemy fire must communicate to the P* in order for the P* to be able to effectively execute

EVM. The aircrew must communicate the threat information to other aircraft in the flight, and after the immediate danger is past, to the appropriate outside agencies for battlefield situational awareness (SA).

b. The first crewmember to realize enemy fire will announce the nature and direction of the threat by the most immediate means available.

c. The pilot on the controls (P*) will announce the direction of threat to other aircraft and his intent. The P* will remain focused outside the aircraft during the event and should be aware that crewmembers involved in returning suppressive fire may be unavailable for assisting in obstacle avoidance or noting other threat sources. The P* is responsible for safe performance of evasive maneuvers and AIRCRAFT CONTROL.

d. The P will be alert for obstacles and new threat sources encountered during the event. The P will remain oriented on threat location and assist clearing the aircraft and will announce warning to avoid obstacles and when attention is focused inside the aircraft. The P should note location of the threat quickly and as accurately as the situation allows. **It is imperative that all applicable crewmembers are able to quickly and accurately locate and transmit threat data in order to maintain individual and collective situational awareness during quickly changing situations.** Not storing/reporting an enemy location may be more detrimental than the risk of taking time to note the location when contact occurs. The crew will transmit a report, (as required) to other aircraft within the flight, higher HQ, and the owning ground unit/tactical commander.

e. Other crewmembers will remain oriented on the threat location and employ appropriate countermeasures or suppressive fire as appropriate. They will announce when their attention is focused inside the cockpit; for example, when firing the weapons.

Note. Crewmembers will not use friendly affiliated graphic control measures/icons/symbols to mark enemy locations and vice-versa to avoid fratricide and other unnecessary confusion.

5. Maneuvers.

a. **Unguided weapons**. 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 barrage 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, jink until the aircraft exits the enemy WEZ, while suppressing with organic weapons if feasible. Jinking is defined as deliberate, controlled changes of multiple axes in order to elude effective enemy fire. Turns can be lateral or vertical, and are most effective when combined; i.e., changing direction and altitude simultaneously. 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, jinking maximizes errors in the enemy weapon system's firing solution by forcing the gunner to correct for azimuth, range, altitude, and changing velocity constantly and simultaneously. This maneuver incorporates a change in direction with a (optional) climb or descent every several seconds. Jinks should be random in direction so as not to become predictive. The jinking maneuver is accomplished with positive flight control inputs, but should not be a violent maneuver. **Jinking 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 aircraft's 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 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 5c.

(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 in paragraph 5d

c. Semi-Automatic Command to Line Of Sight (SACLOS) Missiles. 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.

d. Radar guided weapons. See Classified Army Aviation TTP.

e. Heat seeking (IR) missiles. See Classified Army Aviation TTP.

f. Fixed wing. 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) Be predictable to friendly fighters by being on the air tasking order (ATO) and squawk the appropriate transponder codes/modes to avoid fratricide.

(2) Be unpredictable to enemy fighters by using night and/or adverse weather to avoid detection when possible.

(3) In daylight, avoid flying over areas of high contrast such as bodies of water or open fields if possible.

Note 1. If fighters are observed circling, rapidly climbing, or turning towards the aircraft, the crew should consider a fighter attack imminent.

Note 2 (AH64D). 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.

(4) If hostile fighter activity is observed:

(a) Take defensive (passive) protection measures; for example, verify IFF is operational.

(b) Take offensive (active) protective measures if fighters are identified as enemy (see classified special instructions [SPINS]).

(c) See classified Army Aviation TTP for further crew procedures:

(5) 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 to 3 seconds to execute a gun or rocket engagement due to their high speed and the limited effective range of their gun or rockets.

(6) 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.

(7) IR/radar missile evasive maneuvers: See classified Army Aviation TTP.

g. Helicopters. 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.

(1) Maintain maximum maneuver energy and do not decelerate below "bucket speed" (approximately maximum endurance/maximum rate of climb airspeed).

(2) Maintain the enemy helicopter in sight until it is destroyed if able and appropriate.

(3) Vector other friendly helicopters onto the enemy.

(4) 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.

(5) All organic weapons systems should be considered based on their individual characteristics and effectiveness against mobile thin-skinned targets.

Note. Friendly locations must be considered prior to firing.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Threat elements will be harder to detect. Crewmembers must maintain situational awareness.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft or a suitable simulator.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references, FM 3-90, FM 3-54.10, FM 3-04.140, and http://www.usaace.army.smil.mil/ttps/approvedttp.html.

Task 2413

Perform Actions on Contact

CONDITIONS: In a helicopter or simulator, in a simulated tactical environment given a simulated tactical mission briefing and map with graphics, and enemy contact.

STANDARDS:

1. Use the correct actions on contact consistent with the mission briefing.

2. Transmit tactical report per signal operating instructions (SOI), unit standing operating procedure (SOP), and or mission briefing.

DESCRIPTION:

1. Actions on contact are a series of combat actions taken to develop the situation upon contact with the enemy or situation that warrants or demands action. (FM 3-90) Due to the fluid nature of tactical situations, it is impossible to give a “one size fits all” prescriptive solution for all types of contact. Therefore, it is imperative that actions on contact be described in the operation order (OPORD)/FRAGO/mission briefing and or unit SOP and framed in terms of the mission objective and commander’s intent, for example end state, task, expanded purpose. (FM 5-0) Actions on contact are important because they allow the mission to maintain its tempo of operation by rapidly developing the situation and taking action before the threat can gain the initiative and force friendly forces to react. The desired outcome of the mission will often dictate the type of actions to perform on contact. For example, actions on contact when performing a movement to contact will vary significantly from actions on contact during a hasty attack or an air assault.

2. Contact can be defined as confirmed awareness of enemy/threat presence through any detection method. Contact can be detected and announced through any crewmember, another aircraft in the flight, or onboard sights/sensors/systems. Generic postures are described below and should be considered during the mission planning process and provide actions in lieu of specific guidance in the OPORD/mission briefing.

3. All mission roles.

a. Aircrew coordination throughout the actions on contact sequence is of paramount importance. Crews should brief and practice actions on contact to ensure efficiency and communication effectiveness. In any case, the person observing the enemy must communicate to the P* in order for the P* to be able to effectively maneuver. The aircrew must communicate the threat information to other aircraft in the flight, and after the immediate danger is past, to the appropriate outside agencies for battlefield situational awareness (SA).

b. The first crewmember to realize enemy contact will announce the nature and direction of the threat by the most immediate means available.

c. The pilot on the controls (P*) will announce the direction of threat to other aircraft and his intent. The P* will remain focused outside the aircraft during the event and should be aware that crewmembers involved in returning suppressive fire may be unavailable for assisting in obstacle avoidance or noting other threat sources. The P* is responsible for safe performance of evasive maneuvers and AIRCRAFT CONTROL.

d. The P will be alert for obstacles and new threat sources encountered during the event. The P will remain oriented on threat location and assist clearing the aircraft and will announce warning to avoid obstacles and when attention is focused inside the aircraft. The P should note location of the threat quickly and as accurately as the situation allows. **It is imperative that all applicable crewmembers are able to quickly and accurately locate and transmit threat data in order to maintain individual and collective situational awareness during quickly changing situations.** Not storing/reporting an enemy location may be more detrimental than the risk of taking time to note the location when contact occurs. The crew will transmit a report, (as required) to other aircraft within the flight, higher HQ, and the owning ground unit/tactical commander.

e. Other crewmembers will remain oriented on the threat location and employ appropriate countermeasures or suppressive fire as appropriate. They will announce when their attention is focused inside the cockpit; for example, when firing the weapons.

Note. Crewmembers will not use friendly affiliated graphic control measures/icons/symbols to mark enemy locations and vice-versa to avoid fratricide and other unnecessary confusion.

4. Defensive role. Defensive posture is independent of mission type. Even attack aircraft may be in a defensive posture enroute to and from their objective. Proper pre-mission planning and intelligence data may aid in developing flight profiles and route selection to avoid hostile fire. Contact undetected by the enemy usually results in a standard spot report and continuance of the mission.

a. Undetected by threat.

- Continue to avoid enemy detection within capabilities.
- Locate threat.
- Report. (SALT-W, SALUTE)
- Recommend or execute a course of action.

b. Detected by threat. Detection by the threat is usually determined by threat actions ranging from hostile fire to a change in threat disposition – for example, deploying to cover or orienting on the aircraft.

- If fired upon, execute evasive maneuvers IAW Task 2412 suppressing as appropriate.
- Prevent enemy's capability to engage aircraft while deploying to cover or concealment, if available and appropriate.
- Locate threat.
- Report. (SALT-W, SALUTE)
- Recommend or execute a course of action.

5. Offensive role. Offensive posture is also independent of mission type. An offensive posture may result from a defensive posture once an element is engaged and cannot break contact, in which case immediate mission focus is on breaking contact so the flight can continue the original mission. Actions on contact during an offensive posture should be clearly stated in the mission brief. Sighting the enemy can be a trigger for offensive actions ranging from a hasty attack to initiation of massed fires depending on the mission and phase of the operation. Different phases of the mission may require different actions. For example, actions enroute to an objective may require forces to bypass and report while actions on the objective may require destroying all enemy within the fire distribution plan. Situations not covered in the mission brief should consider generic actions as outlined in FM 3-90:

- Deploy to cover and report.
- Maintain contact and develop the situation.
- Recommend or execute a COA.

NIGHT OR NIGHT VISION DEVICE (NVD) CONSIDERATIONS: Threat elements will be harder to detect. Crewmembers must maintain situational awareness.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft or a suitable simulator.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references, FM 5-0, and FM 3-90.

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, page 2-4). 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 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, LCT, 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:

- Aircraft logbook and historical records.
- AR 700-138.
- DA Pam 738-751.
- FM 3.04-500 (FM 1-500).
- TM 1-1500-328-23.
- TM 1-1520-251-10.
- TM 1-1520-251-CL.
- TM 1-1520-251-MTF.
- TM 1-1520-LONGBOW/APACHE.
- TM 1-1500-204-23 series manuals.
- TM 1-2840-248-23.
- TM 1-6625-724-13&P.
- TM 9-1090-208-23 series manuals.
- TM 9-1230-416-20 series manuals.
- TM 9-1230-476-1.
- TM 9-1230-476-20.
- TM 9-1230-476-23.
- TM 9-1230-476-30.
- TM 9-1270-221-23.
- TM 9-1270-416-20 series manuals.
- TM 9-1427-475-23.
- TM 9-1270-476-30.
- 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), NVS, or 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 1-1520-25 1-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 (Mission Schedule/Brief). Designated briefing officers will use risk management techniques according to AR 95-1 and TC 3-04.11.
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, air, 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. Table 5-1, page 5-6, provides 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.

Table 5-1. 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 to include 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.

Table 5-1. MOC/MTF crew briefing checklist

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. ASPI installed equipment (1) Main Rotor blade placement for rotor lock starts (2) Manual/In flight HIT check procedures for ASPI installed aircraft f. Special mission equipment considerations. 10. Risk assessment considerations. 11. Ground crewmember. a. Duties required b. Emergency actions (those affecting the NCM)

Table 5-1. MOC/MTF crew briefing checklist

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, AR 95-1, FM 1-300, TM 1-1520-251-10, TM 1-1520-251-CL, and the unit SOP.

TASK 4004

Perform Interior Checks

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

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 CPG station.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D LCT, 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 LCT.

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 CPG compartment for test circuits 1 and 2.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D LCT, 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 LCT.

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 review the Fault Page messages. Verify hydraulic pressures, system pressures, and temperatures are in the normal range for the conditions (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 LCT, 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 LCT.

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 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 PLT station crewmember will also verify that the pedals are firm and do not bottom out. 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, verifying that the brake pedals are firm and do not bottom out, 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 (Legacy ECS).

(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 1. Crewstation ECS CKPIT page indications may not change as indicated below if cockpit air temperature is within 2 degrees of set temperature.

Note 2. The ECS page supply and return temperature displays and actual operation of components such as the Heat Modulation Valves, Heat Shutoff Valve and the Thermal Control Valves will differ depending on Aircraft Block number and ECS DCU Software version based on MWO's applied to the aircraft.

(2) The RCM in the CPG station will adjust temperature to full cold (50° 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 (50° 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 (90° 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 (90° F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE indicates 0 percent. HEAT MODULATION valve for ECS 2 should read a positive percentage.

(b) 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 (50° 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. Environmental control system (ECS) check (ECS Defog MWO applied).

(1) The RCM in the CPG station will adjust temperature to full cold (50° 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.

(2) The RCM in the PLT station will adjust the temperature to full cold (50° 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) The APS Blower will not turn on until both crewmembers have been out of the heating mode for two minutes. The Heat shutoff valve will close after both crewmembers have been out of the heating mode for five minutes.

(3) The RCM in the CPG station will adjust the temperature to full hot (90° F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE indicates approximately 55 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 OFF.

(4) The RCM in the PLT station will adjust the temperature to full hot (90° F) and note the appropriate changes indicated below:

(a) THERMAL CONTROL VALVE indicates approximately 55 percent.

(b) HEAT MODULATION valve for ECS 2 should read a positive percentage (software dependant).

(c) The HEAT SHUTOFF should show OPEN, the INTERCONNECT CLOSED, and the APS BLOWER should show OFF.

(5) The RCM in the CPG station will adjust the temperature to full cold (50° 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) The Heat Shutoff should be OPEN, the INTERCONNECT CLOSED and the APS BLOWER OFF.

(6) Both crewmembers adjust the crew station temperatures to comfortable ranges on the AIRCRAFT UTIL page. Note appropriate indications on the ECS pages.

Note. If the ambient temp is less than 40°F (4°C) the Heat Shutoff Valve will never close and the full MOC may have to be completed when ambient conditions permit.

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f. 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.

(3) Return the cyclic to the center position. Both crewmembers will verify cyclic stick movement correlation through full range of travel.

(4) 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 and no binding. The ground crewmember should confirm smooth motion in and out of the tail rotor swash plate assembly with no ratcheting.

(5) Pull the collective full up and then full down. Verify freedom of movement no binding and correlating blade movement outside.

(6) 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. Displace pedals full left and full right verifying freedom of movement and the feel spring tension in each direction.

(7) 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.

(8) Repeat steps 1 through 6 in the opposite crew station. Trim checks in the opposite crew station should check the two opposite quadrants.

g. Collective friction check.

Note. With the collective in the full up position, verify and note maximum travel. This maximum travel should not be reached during the inflight V_h check.

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(1) Pilot and CPG collective friction set at zero.

(2) Collective. Move through full range of travel. Check for smoothness. With a spring scale attached to the pilots collective head, check for breakaway force of 4 to 6 lbs of pull.

(3) Pilot collective friction. Full on. Verify collective can be moved through full range of travel. With the collective in the full up position, have the CPG apply upward pressure and verify that his collective is in the full up position with no main rotor blade movement. With the collective in the full down position, have the CPG apply downward pressure and verify that his collective is in the full down position with no main rotor blade movement.

(4) Pilot collective friction. Set at zero.

(5) CPG collective friction. Full on. Verify collective can be moved through full range of travel. With the collective in the full up position, have the PLT apply upward pressure and verify that his collective is in the full up position with no main rotor blade movement. With the collective in the full down position, have the PLT apply downward pressure and verify that his collective is in the full down position with no main rotor blade movement

(6) CPG collective friction. Set at zero.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D LCT, 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 LCT.

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. Prior to start initiation, MTP must ensure the ENG page and ENG SYS pages are selected on the MPD's. Monitor ENG page during the start sequence to ensure an acceptable start. Upon completion of the engine start sequence and before recording time to idle and idle speed, verify the appropriate nose gearbox pressure increases as well as transmission pressure increase if the rotor is not locked during start (ENG SYS page).

CAUTION

For ASPI installed aircraft, the main rotor blades must be moved so that the exhaust does not heat the blades during rotor locked starts.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D LCT, 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 LCT.

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 LCT, 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 LCT, 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 LCT, 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 LCT, on a suitable surface, with the before-taxi checks completed, the aircraft cleared, and the P* fitted with a boresighted 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.

   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 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.

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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references and Task 1034.

TASK 4114

Perform Baseline and Normal Engine Health Indicator Test

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

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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references and AWR for added equipment, such as ASPI.

TASK 4123

Perform Before Hover Checks

CONDITIONS: In an AH-64D, or AH-64D LCT.

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 LCT, 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 LCT, with performance planning information available, at an appropriate hover height, and the P* fitted with a boresighted 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, position confidence, date and time.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references and Task 1038.

TASK 4160

Perform Hover Maneuvering Checks

CONDITIONS: In an AH-64D helicopter, or AH-64D LCT, and the P* fitted with a boresighted 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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references and Task 1038.

TASK 4162

Perform FMC/Attitude Hold Checks

CONDITIONS: In an AH-64D helicopter, or an AH-64D LCT, and the P* fitted with a boresighted HDU.

STANDARDS: Appropriate common standards plus the following:

1. Maintain hover at a 5- to 10-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 conducive to settling with power.

TRAINING AND EVALUATION REQUIREMENTS:

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

REFERENCES: Appropriate common references and Task 1038.

TASK 4182

Perform Visionic Systems Checks

CONDITIONS: In an AH-64D helicopter, or AH-64D LCT, with TADS drift null check completed, and the P* fitted with a boresighted 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 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-degree 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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references and Task 1038.

TASK 4184

Perform Hover Box Drift Checks

CONDITIONS: In an AH-64D helicopter, or AH-64D LCT, and the P* fitted with a boresighted 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 and note aircraft position for reference. Hover the aircraft for 1 minute and note the amount of hover box and aircraft 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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references and Task 1038.

TASK 4208

Perform Initial Takeoff Checks

CONDITIONS: In an AH-64D helicopter, or AH-64D LCT, with the hover power and before takeoff checks completed, and the aircraft cleared, and the P* fitted with a boresighted 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. Ensure that the hold modes are disengaged. If the aircraft is FCR equipped, either crewmember should select FCR air surveillance mode and initiate continuous scan (CS). Both crewmembers should select CSCP 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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references, Task 1026, Task 1038, and Task 1040.

TASK 4220

Perform Maximum Power Checks

CONDITION: In an AH-64D helicopter, or an AH-64D LCT with ENG ETF page selected, and the P* fitted with a boresighted 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 Nr droop being established with TGTs lower than the normal TGT limiter 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 performed in conjunction with the maximum power check provided 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. 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) Reduce the collective and/or 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 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 LCT, with ENG ETF page selected, and the P* fitted with a boresighted 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 TGT limiter/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.

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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.

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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 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 LCT, 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 LCT, and P* fitted with a boresighted 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 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 and note any unusual vibrations, noises or instrument systems indications. 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 LCT, 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 an AH-64D LCT, with the before landing check completed, at a predetermined entry altitude and airspeed, the ENG page selected in each crewstation, and the P* fitted with a boresighted 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.
7. Maintain trim ±1 ball width.
8. 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.

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   b. Select the FLT SET button and set the altimeter to 29.92 in Hg, or select ENG ETF page for PA reference or select the PERF 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 the TM 1-1520-251-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 single 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 FLIR sensors.

NIGHT VISION SYSTEM 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 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. Use 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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4237

Perform Autorotation RPM Check (Alternate Method)

CONDITIONS: In an AH-64D helicopter, or an AH-64D LCT, with the before landing check completed, at a predetermined entry altitude and airspeed, the ENG page selected in each crewstation, and the P* fitted with a boresighted 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.

Note 1. If target autorotational RPM based on DA and minimal aircraft weight is greater than or equal to 110% NR then the following procedure may be utilized.

Note 2. The intent of this procedure is to confirm available NR during autorotational descent without exceeding 110% NR with the understanding that target NR may be above 110% in high DA environments.

Note 3. Application of forward cyclic during the recovery will aid in reducing the Nr prior to increasing the collective during the recovery process.

Note 4. Ensure a continuous positive increase in torque during collective application. A decrease in torque followed by an increase indicates negative pitch in the blades at flat pitch.

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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 5. Do not engage altitude or attitude hold during this maneuver.

Note 6. Failure to disable ASE AUTO PAGE may result in loss of the ENG page during the maneuver.

Note 7. 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 or ENG PERF 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.

c. Climb a minimum of 1,000 feet above the record altitude and establish level flight at 90 KTAS.

d. With both POWER levers remaining in the FLY position, establish and maintain a stabilized 90 KTAS autorotational descent, in trim and verify that NR has a positive increase and will exceed 110% if not arrested. Do not allow NR to exceed 110%. Note any abnormal vibrations and verify that aircraft controllability remains normal. If limits for NR, aircraft trim, or airspeed may be exceeded, announce any corrective actions you intend to take.

e. Record the percent NR and fuel remaining.

f. Sign off the MTF until ambient conditions permit completion of an autorotational RPM check with a target NR of 110% or less.

g. Enter a Red Dash with the following entry on the 2408--13--1: "Autorotational RPM check IAW TM 1--1520--251--MTF required as soon as ambient conditions allow; not to exceed DDMMMYY." (DDMMMYY is 90 days from date of entry)

Note 8. A 2 percent to 4 percent NR droop during the recovery is acceptable. Excessive rotor decay during a normal power recovery may indicate an inoperable or misadjusted collective potentiometer.

Note 9. 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 FLIR sensors.

NIGHT VISION SYSTEM 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 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. Use 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 LCT, 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 an AH-64D LCT, with an AIRCRAFT UTIL page selected in crew station of pilot not on the controls (P), and the P* fitted with a bore sighted 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 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 LCT, 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 an AH-64D LCT, with FLT page and ENG page selected, and the P* fitted with a boresighted 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 LCT, 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 an AH-64D LCT, with the AIRCRAFT UTIL and ENG SYS page, and the P* fitted with a boresighted 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.

Note 3. Actual stabilator scheduling is based on calibrated airspeeds as determined by the FMC. In high DA conditions stabilator scheduling may occur at higher true airspeeds.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D LCT, 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 an AH-64D LCT, with ENG page selected, and the P* fitted with a boresighted 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.

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   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, whichever 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.

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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 degrees 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^{o} above the normal limiter setting, monitor the NP/NR to verify there is no excessive NP/NR droop.

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h. Reduce the collective and/or 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 LCT, 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 an AH-64D LCT, and the P* fitted with a boresighted 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 CPG will perform waypoint update and target store procedures.

TRAINING AND EVALUATION REQUIREMENTS:

1. Training may be conducted in the aircraft, an AH-64D LCT, 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 an AH-64D LCT, the P* fitted with a boresighted 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.

   a. PNVS system check. Verify the PNVS system operational capability as required.

   b. TADS system check. Verify the TADS system operational capability as required.

   c. 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 LCT, 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 an AH-64D LCT.

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 LCT, 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 an AH-64D LCT (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 LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

TASK 4284

Perform Engine Shutdown Checks

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

STANDARDS: Perform procedures and checks in sequence per TM 1-1520-251-MTF and appropriate common standards, and 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 LCT, 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 an AH-64D LCT, with ENG page selected, and the P* fitted with a boresighted 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. 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, an AH-64D LCT, or academically.
2. Evaluation will be conducted in the aircraft.

REFERENCES: Appropriate common references.

Chapter 6

Aircrew Coordination

This chapter describes the background of aircrew coordination development. It also describes the aircrew coordination principles 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 enhanced ability for either pilot to perform most aircraft/system functions from his or her crew station breaks down the standard delineation of duties and has added capabilities, and potential distractions, in training and in combat. This could mean that during an unforeseen event, one pilot may attempt to resolve the situation rather than seeking assistance from or even communicating that action with 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. BACKGROUND AND PLANNING STRATEGY. An analysis of U.S. Army aviation accidents revealed that a significant percentage of aircraft accidents resulted from one or more aircrew coordination errors committed during and even before the flight mission. 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 crews actually avoided potential accidents, these same errors could result in degraded *performance that jeopardized mission success.* A systematic analysis of these error patterns identified specific areas where crew-level training could reduce the occurrence of such faults and break the *chain of errors* leading to accidents and poor mission performance.

a. Aircrew coordination patterns begin with the accomplishment of crew-level pre-mission planning, rehearsal, and after action reviews. Pre-mission planning includes all preparatory tasks associated with accomplishing the mission. This would include assigning crewmember responsibilities and conducting all required briefings and brief-backs. Pre-mission rehearsal involves the crew collectively visualizing and discussing expected and potential unexpected events for the entire mission. Through this process, all crewmembers discuss and think through contingencies and actions for difficult segments, equipment limitations and failures, or unusual events associated with the mission, and develop strategies to cope with possible contingencies (METT-TC).

b. Each crewmember must actively participate 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. Crewmembers must then mentally rehearse the entire mission by visualizing and discussing potential problems, contingencies, and assigned responsibilities. The PC ensures that crewmembers take advantage of periods of low workload to review or rehearse upcoming flight segments. Crewmembers should continuously review remaining flight segments to identify required adjustments, making certain their planning is consistently ahead of critical lead times.

c. After a mission or mission segment, the crew should debrief, review, and critique major decisions, their actions, and task performance. This should include identifying options and factors that were omitted from earlier discussion and outline ways to improve crew performance in future missions. Remember, this discussion and critique of crew decisions and actions must remain professional. "Finger pointing" is not the intent and shall be avoided; the emphasis should remain on education with the singular purpose of improving crew and mission performance.

6-2. PRINCIPLES. Broadly defined, aircrew coordination is the cooperative interaction between crewmembers necessary for the safe, efficient, and effective performance of flight tasks. The essential principles and qualities of aircrew coordination are described in figure 6-1, page 6-2:

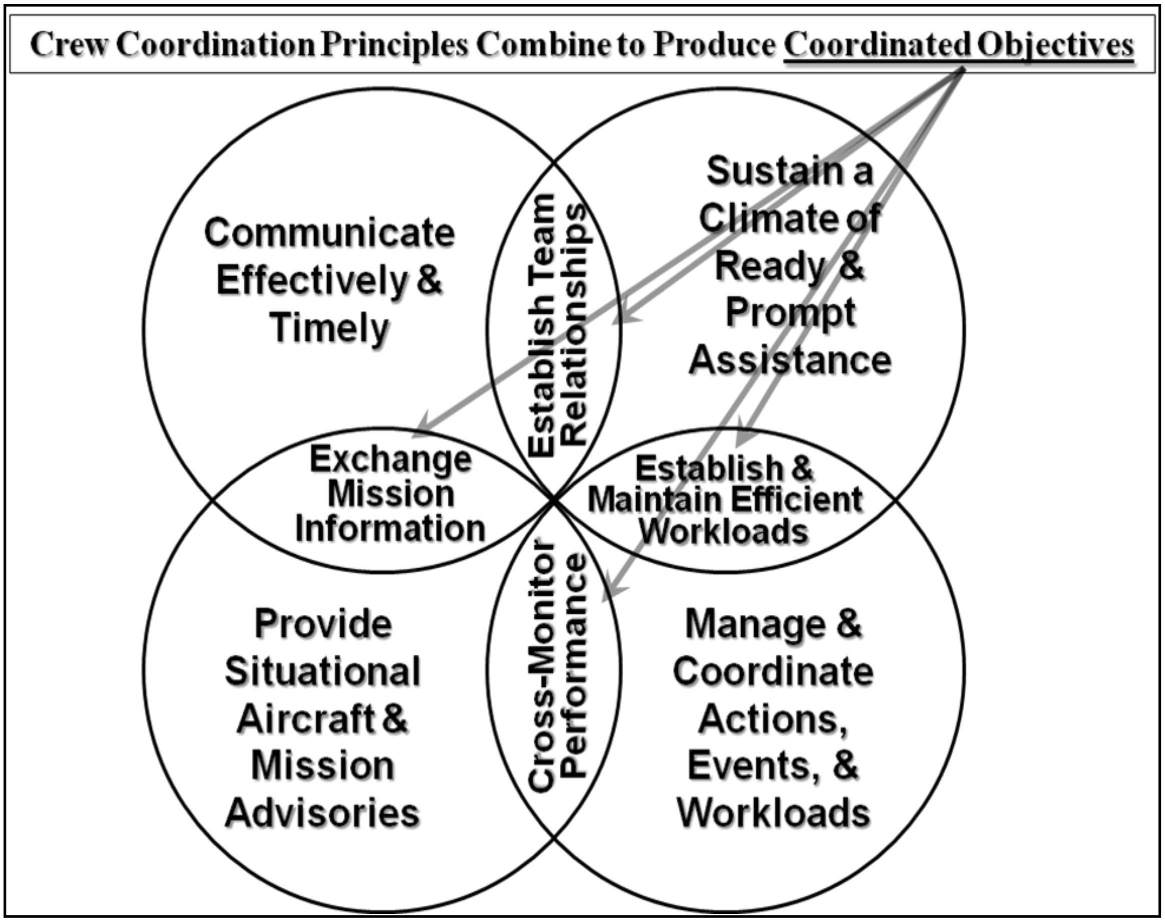

Figure 6-1. Aircrew coordination principles

a. Communicate Effectively and Timely. Good team relationships begin with effective communication among crewmembers. Communication is effective when the sender directs, announces, requests, or offers information; the receiver acknowledges the information; and the sender confirms the receipt of information, based on the receiver's acknowledgment or action. This enables the efficient flow and exchange of important mission information that keeps a crew on top of any situation that arises.

(1) Announce and Acknowledge Decisions and Actions. To ensure effective and well-coordinated actions in the aircraft, all crewmembers must be kept informed and made aware of decisions, expected movements of crew and aircraft, and the unexpected individual actions of others. Each crewmember will announce any actions that may affect the actions of other crewmembers. In turn, communications in the aircraft must include supportive feedback that clearly indicates that crewmembers acknowledge and correctly understand announcements, decisions, or directives of other crewmembers.

(2) Ensure that statements and directives are clear, timely, relevant, complete, and verified. These are qualities that must describe the kind of communication that is effective. Considering the fleeting moments of time in a busy aviation environment, only one opportunity may exist to convey critical and supporting information before tragedy strikes. That information must be clearly understood, not confusing, and said at the earliest opportunity possible. It must be applicable to the events at hand to support the needs and security of the mission. The information must include all elements needed to make the best decision based on its urgency; and the communication must come with ability of proven confirmation and without redundancy. It must also include the crew's use of standard terminology and feedback techniques that accurately validate information transfer. Emphasis is on the quality of statements associated with navigation, obstacle clearance, instrument readouts, and emergencies. Specific goals include the following:

(a) Crewmembers consistently make the required callouts. Their statements and directives are always timely. Their response to unexpected events is made in a composed, professional manner.

(b) Crewmembers actively seek feedback when they do not receive acknowledgment from another crewmember. They always acknowledge the understanding of intent and request clarification when necessary.

(3) Be explicit. Crewmembers should use clear, concise terms, standard terminology, and phrases that accurately convey 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."

b. Sustain a Climate of Ready and Prompt Assistance. The requirement to maintain a professional atmosphere by all members of the team begins with the team leadership of the PC. However, all crewmembers must equally respect the value of other crewmember's expertise and judgment regardless of rank, duty, or seniority. Every member has a responsibility to maintain situational awareness for mission requirements, flight regulations, operating procedures, and safety. Each crewmember must be willing to practice advocacy and assertiveness should the situation demand a different course of action, as time permits. It is critical to maintain this crew climate that enables opportunity to apply appropriate decision-making techniques for defining the best course of action when problems arise. Courses of action may demand that assistance be directed to other crewmembers or could be voluntary assistance that is offered in a timely manner, depending on time constraints and information available. All crewmembers must remain approachable, especially in critical phases of flight when reaction time is at a premium.

Note. The two-challenge rule allows one crewmember to assume the duties of another crewmember who fails to respond to two consecutive challenges automatically. 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.

c. Effectively Manage, Coordinate, and Prioritize Planned Actions, Unexpected Events, and Workload Distribution. The crew performing as a team should avoid distractions from essential activities while distributing and managing the workloads equally. Both the technical and managerial aspects of coping with normal and unusual situations are important. Proper sequencing and timing guarantees that the actions of one crewmember support and mesh with the actions of the other crewmembers. Responsible effort must be used to ensure that actions and directives are clear, timely, relevant, complete, verified, and coordinated with minimal direction from the PC.

(1) Direct Assistance. A crewmember will direct or request assistance when he cannot maintain aircraft control, position, or clearance. A crewmember will also direct assistance when being overloaded with tasks or unable to properly operate or troubleshoot aircraft systems without help from the other crewmembers. The PC ensures that all crew duties and mission responsibilities are clearly assigned and efficiently distributed to prevent the overloading of any crewmember, especially during critical phases of flight. Crewmembers should also watch for workload buildup on others and react quickly to adjust the distribution of task responsibilities.

(2) Prioritize Actions and Equitably Distribute Workload. 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 tasks that are more critical. Crewmembers consistently avoid nonessential distractions so that these distractions do not affect task performance (i.e. sterile cockpit) or ability to help another crewmember. Crew actions should reflect extensive review of procedures in prior training and pre-mission planning and rehearsal.

d. Provide Situational Aircraft Control, Obstacle Avoidance, and Mission Advisories. Although the pilot on the controls (P*) is responsible for aircraft control, the other crewmembers may need to provide aircraft control information regarding aircraft position (airspeed, altitude, etc), orientation, obstacle avoidance, equipment and personnel status, environmental and battlefield conditions, and changes to mission objectives or evolving situations of the mission (situational awareness). Crewmembers must anticipate and offer supporting information and actions to the decision-maker, which is usually the PC or may be the AMC in a mission related situation. Specific goals include the following:

(1) Situational Awareness. Crewmembers must anticipate the need to provide information or warnings to the PC or P* during critical phases of the flight or mission. The PC must encourage crewmembers to exercise the freedom to raise issues or offer information about safety or mission related matters. In turn, the crewmembers will provide the required information and warnings in a timely and professional manner. None of this could be accomplished without cross-monitoring performance and crew tasks.

(2) Mission Changes and Updates. Crewmembers should routinely update each other while highlighting and acknowledging mission changes. They must take personal responsibility for scanning the entire flight environment, considering their assigned workload and areas of scanning. Each crewmember needs to appropriately adjust individual workload and task priorities with minimal verbal direction from the PC when responding to emergencies and unplanned changes of the mission.

(3) Offer Assistance. A crewmember will provide assistance, information, or feedback in response to another crewmember. A crewmember will also offer assistance when he detects errors or sees that another crewmember needs help. In the case where safety or mission performance is at risk, immediate challenge and control measures must be assertively exercised. A crewmember should quickly and professionally inform and assist the other crewmember committing the error. When required, they must effectively implement the two-challenge rule with minimal compromise to flight safety. This means that you must continually cross-monitor other crewmember's actions and remain 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. Crewmembers must discuss conditions and situations that can compromise situational awareness. These include, but are not limited to, stress, boredom, fatigue, and anger.

6-3. OBJECTIVES. Aircrew coordination principles and objectives originate from and are fundamentally supported by a set of individual, professional skills. Each crewmember is responsible for attaining the leadership skills of effective communication, resource management, decision-making, situational awareness, team building, and conflict resolution. When crewmembers are actively using these skills and practicing aircrew coordination principles, results can be seen and measured to determine if the objectives of the aircrew coordination program are being met. The goals of the program have been defined by four aircrew coordination objectives. The four objectives are as follows:

a. Establish and maintain team relationships. Establish a positive working relationship that allows the crew to communicate openly, freely, and effectively in order to operate in a concerted manner where a climate of professional assistance is easily found and promptly provided.

b. Establish and maintain efficient workloads. Manage and coordinate priorities and execute the mission workload in an effective and efficient manner with the redistribution of task responsibilities as the mission situation changes. Flight duty responsibilities are performed in a timely manner where mission needs are always anticipated.

c. Exchange mission information. Establish all levels of crew and mission communications using effective patterns and techniques that allow for the flow of essential data and mission advisories among all crewmembers in a timely and accurate manner.

d. Cross-monitor performance. Cross-monitor each other's actions and decisions to ensure workloads and crew actions are performed in a coordinated manner and to standard. Cross-monitoring crewmember performance keeps a crew ready to provide aircraft and mission advisories to each other and helps to reduce the likelihood of errors affecting mission performance and safety.

6-4. STANDARD CREW TERMINOLOGY. To enhance communication and aircrew 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 publication (FLIP) contains standard terminology for radio communications. Operator's manuals contain standard terminology for items of equipment. Brevity should be in accordance with FM 1-02.1 J and the specific terminology in table 6-1, page 6-5.

Table 6-1. Examples of standard words and phrases

Standard word or phrase	***Meaning of standard word or phrase***
Abort	Terminate a preplanned aircraft maneuver.
Affirmative	Yes.
Bandit	An identified enemy aircraft.
Bingo	Fuel state needed for recovery.
Blind	No visual contact of friendly aircraft/ground position. Opposite of VISUAL.
Break	Immediate action command to perform an emergency maneuver to deviate from the present ground track; will be followed by the word “right,” “left,” “up,” or “down.”
Call out	Command by the pilot on the controls for a specified procedure to be read from the checklist by the other crewmember.
Cease fire	Command to stop firing but continue to track.
Clear	No obstacles present to impede aircraft movement along the intended ground track. Will be preceded by the word “nose,” “tail,” or “aircraft” and followed by the direction (for example, “left,” “right,” “slide left,” or “slide right”). Also indicates that ground personnel are authorized to approach the aircraft.
Come up/down	Command to change altitude up or down; normally used to control masking and unmasking operations.
Contact	1) Establish communication with (followed by the name of the element). 2) Sensor contact at the stated position. 3) Acknowledges sighting of a specified reference point (either visually or via sensor). 4) Individual radar return within a GROUP or ARM.
Controls	Refers to aircraft flight controls.
Deadeye	Laser designator system inoperative.
Drifting	An alert of the unintentional or undirected movement of the aircraft; will be followed by the word “right,” “left,” “backward,” or “forward.”
Egress	Command to make an emergency exit from the aircraft; will be repeated three times in a row.
Execute	Initiate an action.
Expect	Anticipate further instructions or guidance.
Firing	Announcement that a specific weapon is to be fired.
Fly heading	Command to fly an assigned compass heading. (This term generally used in low-level or contour flight operations.)
Go ahead	Proceed with your message.
Go AJ	Directive to activate anti-jam COMMs.
Go plain/red	Directive to discontinue secure operations.
Go secure/green	Directive to activate secure COMMs.
Hold	Command to maintain present position.
Hover	Horizontal movement of aircraft perpendicular to its heading; will be followed by the word “left” or “right.”

Table 6-1. Examples of standard words and phrases

Standard word or phrase	***Meaning of standard word or phrase***
Inside	Primary focus of attention is inside the cockpit for longer than 5 seconds.
Jettison	Command for the emergency or unexpected release of an external load or stores; when followed by the word "door," will indicate the requirement to perform emergency door removal.
Laser On	Start/acknowledge laser designation.
Lasing	The speaker is firing the laser.
Maintain	Command to continue or keep the same.
Mask/unmask	To conceal aircraft by using available terrain features and to position the aircraft above terrain features.
Mickey	A HaveQuick time-synchronized signal.
Monitor	Command to maintain constant watch or observation.
Move back	Command to HVR back, followed by distance in feet.
Move forward	Command to HVR forward, followed by distance in feet.
Negative	Incorrect or permission not granted.
Negative contact	Unable to establish communication with (followed by name of element).
Negative laser	Aircraft has not acquired laser energy.
No joy	Aircrew does not have positive visual contact with the target/bandit/traffic/obstruction/landmark. Opposite of TALLY.
Now	Indicates that an immediate action is required.
Offset (direction)	Maneuver in a specified direction with reference to a target.
Outside	Primary focus of attention is outside the aircraft.
Put me up	Command to place the P* radio transmit selector switch to a designated position; will be followed by radio position numbers on the intercommunication panels (1, 2, 3). Tells the other crewmember to place a frequency in a specific radio.
Release	Command for the planned or expected release of an external load.
Remington	No ordnance remaining except gun or self-protect ammunition.
Report	Command to notify.
Roger	Message received and understood.
Say again	Repeat your transmission.
Slide	Intentional horizontal movement of an aircraft perpendicular to its heading; will be followed by the word "right" or "left."
Slow down	Command to reduce ground speed.
Speed up	Command to increase ground speed.
Splash	1) (air-to-surface) Weapons impact. 2) (surface-to-surface) Informative call to observer or spotter five seconds prior to estimated time of impact. 3) (air-to-air) Target destroyed.
Stand by	Wait; duties of a higher priority are being performed and request cannot be complied with at this time.
Stop	Command to go no further; halt present action.
Strobe	Indicates that the aircraft AN/APR-39 has detected a radar threat; will be followed by a clock direction.
Tally	Sighting of a target, non-friendly aircraft, enemy position, landmark, traffic, or obstruction positively seen or identified; will be followed by a repeat of the word “target,” "traffic," or "obstruction" and the clock position. Opposite of No Joy.

Table 6-1. Examples of standard words and phrases

Standard word or phrase	***Meaning of standard word or phrase***
Target	An alert that a ground threat has been spotted.
Target/object captured	Specific surface target/object has been acquired and is being tracked with an on-board sensor.
Traffic	Refers to friendly aircraft that present a potential hazard to the current route of flight; will be followed by an approximate clock position and the distance from your aircraft with a reference to altitude (high or low).
Transfer of controls	Positive three-way transfer of the flight controls between the crewmembers (for example, "I have the controls", "You have the controls," and "I have the controls").
Turn	Command to deviate from present ground track; will be followed by words "right" or "left," specific heading in degrees, a bearing ("Turn right 30°"), or instructions to follow a well-defined contour ("Follow the draw at 2 O'clock").
Unable	Indicates the inability to comply with a specific instruction or request.
Up on	Indicates primary radio selected; will be followed by radio position numbers on the intercommunication panels ("Up on 1, up on 3").
Visual	Sighting of a friendly aircraft/ground position. Opposite of BLIND.
Weapons hot/cold/off	Weapon switches are in the ARMED, SAFE, or OFF position.
Wilco	I have received your message, I understand and I will comply.
Winchester	No ordnance remaining.
Zoom In/Out	Increase/decrease the sensor's focal length. ZOOM IN/OUT is normally followed by "ONE, TWO, THREE or FOUR": to indicate the number of FOVs to change. (Note: It is recommended only one change in or out at a time be used for the FOV.)

Appendix A

Modernized Target Acquisition and Designation Sight/Pilot Night Vision Sensor

QUALIFICATION TRAINING

A-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

A-2. Academic training as developed by the MTADS new equipment fielding team (NET) will be completed prior to flight training.

FLIGHT TRAINING

A-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.

Note. The RCM must also show proficiency in performing the Scene Assisted Nonuniformity Correction (SANUC) according to TC 1-1520-251-10.

Note. Any portion of the entire requirement of paragraph B-3 above is waiverable by the first O6 in the chain of command.

Note. Flight using the MTADS suffices for MPNVS qualification.

TRAINING DOCUMENTATION

A-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

SECTION I – ACRONYMS AND ABBREVIATIONS

AC	alternating current
ACCUM	accumulator
ADF	automatic direction finder
ADMIN	administrative
AFCS	automatic flight control system
AFMS	auxiliary fuel management system
AGL	above ground level
AHO	above highest obstacle
AIM	aeronautical information manual
ALSE	aviation life support equipment
ALT	altitude, altimeter
AMC	air mission commander
AMCOM	aviation and missile command
AMP	amplifier
ANVIS	aviator's night vision imaging system
APART	annual proficiency and readiness test
APU	auxiliary power unit
ARNG	Army national guard
ASE	aircraft survivability equipment
ASR	airport surveillance radar
ATC	air traffic control
ATF	aircraft torque factor
ATIS	automatic terminal information service
ATM	aircrew training manual
ATP	aircrew training program
AUTO	automatic
AVA	aviation vibration analyzer
AWR	airworthiness release
BATT	battery
BIT	built-in test
C	Celsius
CBAT	computer based ASE trainer
CBRN	chemical, biological, radiological, nuclear
CBT	computer based trainer
CDU	central display unit
CE	crew chief
CEFS	crashworthy external fuel system

CG	center of gravity
CHUM	chart updating manual
CI	cockpit indicators
CIS	command instrument system
CL	checklist
CLC	calculator
CMWS	Common Missile Warning System
COM	communication
COMSEC	communication security
CONTR	control
CT	critical torque
CTL	commander’s task list
DA	Department of the Army
DAC	Department of the Army civilian
DAT	data
DC	direct current
DCU	dispenser control unit
DD	Department of Defense
DECR	decrease
DECU	digital electronic control unit
DEG	degree
DF	direction finder
DGNS	Doppler global positioning system navigation system
DA	density altitude, decision altitude
DH	decision height
DIR	direct
DME	distance measuring equipment
DOD	Department of Defense
DOT	Department of Transportation
DSP	droop stop pounding
DTAC	Digital Training Access Center
DTD	data transfer device
DTG	date-time group
DTS	data transfer system
DTU	data transfer unit
EAT	external air transportability
ECCM	electronic counter-countermeasures
ECM	electronic countermeasures
ECS	environmental control system
ECU	electronic control unit
EDM	electronic data module

EGI	embedded global positioning system/inertial navigation system
EICAS	engine instrument caution advisory system
ELA	en route low altitude
ENG	engine
EPW	enemy prisoner of war
ERFS	extended range fuel system
ESSS	external stores support system
ETA	estimated time of arrival
ETE	estimated time en route
ETF	engine torque factor
ETL	effective translational lift
FAA	Federal Aviation Administration
FAC	flight activity category
FAF	final approach fix
FAR	Federal Aviation regulation
FARE	forward area refueling equipment
FARP	forward arming and refueling point
FAT	free air temperature
FD	flight director
DCP	display control panel
FH	frequency hopping
FI	nonrated crewmember instructor
FIH	flight information handbook
FLIP	flight information publication
FLIR	forward looking infrared
FM	field manual
FMS	flight management system
FOV	field of view
FPN	flight plan
FPS	flight path stabilization
FRAGO	fragmentary order
FRIES	fast-rope insertion and extraction system
GEN	generator
GPS	global positioning system
GWT	gross weight
HAL	height above landing
HIT	health indicator test
HMMWV	high-mobility multipurpose wheeled vehicle
HP	pressure altitude (height pressure)
HQ	headquarters
HR	hour

HSI	horizontal situation indicator
HVR	hover
HVR VHLD	hover velocity hold
HUD	heads-up display
IAF	initial approach fix
IAS	indicated airspeed
IATF	individual aircrew training folder
ICP	interface control panel
ICS	intercommunication system
IE	instrument examiner
IF	intermediate fix
IFF	identification, friend or foe
IFR	instrument flight rules
IGE	in ground effect
IIMC	inadvertent instrument meteorological condition
ILS	instrument landing system
IMC	instrument meteorological condition
INI	initialization
IP	instructor pilot
IR	infrared
IRP	intermediate rated power
ITO	instrument takeoff
IVHMS	integrated vehicle health monitoring system
JOG	joint operations graphic
JSIR	joint spectrum interference resolution
KIAS	knots indicated airspeed
km	kilometer
KPH	kilometers per hour
kts	knots
LAT	latitude
LONG	longitude
LSE	landing signal enlisted
LZ	landing zone
MAHF	missed approach holding fix
MAP	missed approach point
MAX	maximum
MCP	maximum continuous power
MDA	minimum descent altitude
ME	maintenance test pilot evaluator
MEDEVAC	medical evacuation
MEDIC	medical education and demonstration of individual competence

MEF	maximum elevation figures
METL	mission essential task list
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, civil considerations
MFD	multifunction display
MFSC	multifunction slew controller
MIJI	meaconing, interference, jamming, and intrusion
MIN	minimum
MISC	miscellaneous
MO	medical officer (flight)
MOI	method of instruction
MOPP	mission-oriented protective posture
MOS	military occupational specialty
MP	maintenance test pilot
MSA	minimum safe altitude
MSL	mean sea level
MTF	maintenance test flight
MRP	maximum rated power
NA	not applicable
NAV	navigation
NAVAID	navigational aids
NCM	nonrated crewmember
NDB	nondirectional beacon
NET	new equipment training
Ng	engine gas generator speed
NGR	National Guard regulation
NM	nautical mile
NOE	nap of the earth
NOTAM	notice to airmen
NVD	night vision device
NVG	night vision goggle
NVS	night vision system
O2	oxygen
OBOGS	onboard oxygen generation system
ODS	oxygen delivery system
OEI	one engine inoperative
OGE	out of ground effect
OPORD	operation order
OR	observer
OROCA	off route obstruction clearance altitude–continental United States
ORTCA	off route terrain clearance altitude–outside the continental United States

P	pilot not on the controls
P*	pilot on the controls
PA	pressure altitude
PAR	precision approach radar
PC	pilot in command
PDU	pilot display unit
PFD	primary flight display
PFE	proficiency flight evaluation
PI	pilot
PLGR	precision lightweight global positioning system receiver
PLS	personnel locater system
POI	program of instruction
PPC	performance planning card
PPS	precise positioning system
PWR	power
PZ	pickup zone
QTY	quantity
R/C	rate of climb
RCM	rated crewmember
RETRAN	retransmission
RL	readiness level
ROC	required obstacle clearance
ROE	rules of engagement
RPG	rocket-propelled grenade
RPM	revolutions per minute
RPM R	revolutions per minute rotor
SA	situational awareness
SAS	stability augmentation system
SCATMINWARN	scatterable minefield warning
SE	single engine
SEL	select
SFTS	synthetic flight training systems
SI	nonrated crewmember standardization instructor
SM	statute mile
SMGW	simulated maximum gross weight
SOI	signal operating instructions
SOP	standing operating procedure
SP	standardization instructor pilot
SPIES	special patrol infiltration/exfiltration system
SQ FT	square feet
STS	status

TACAN	tactical air navigation
TAS	true airspeed
TC	training circular
TDH	time distance heading
TEMP	temperature
TERPS	terminal instrument procedures
TGT	turbine gas temperature
TM	technical manual
TR	torque ratio
TRANS	transmit
TRQ	torque
TSP	training support package
U.S.	United States
USAASA	United States Army Aeronautical Services Agency
USAASD-E	United States Army Aeronautical Services Agency Detachment-Europe
USAACE	United States Army Aviation Warfighting Center
USAR	United States Army Reserve
UT	unit trainer
VFR	visual flight rules
VMC	visual meteorological conditions
Vne	velocity never exceed (airspeed limit)
VOR	very high frequency omnidirectional range radio beacon
VREF	velocity reference
VSI	vertical situation indicator
XFD	crossfeed

SECTION II – TERMS

ΔF	change in flat plate drag area
ΔTRQ	change in torque
DRAG	force of aerodynamic resistance caused by the violent currents behind the shock front
MACH	the ratio of an aircraft's true speed as compared to the local speed of sound at a given time or place
Np	power turbine speed
Nr	rotor speed
ram-air	any air system which uses the air pressure created by vehicle motion to increase the air pressure inside of the engine.
V_h	maximum airspeed in level flight with maximum continuous power being applied

References

These publications are sources for additional information on the topics in this TC. Most JPs are found at http://www.dtic.mil/doctrine/doctrine.htm. Most Army publications are found online at http://www.apd.army.mil.

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DOCUMENTS NEEDED

These documents must be available for the intended users of this publication.

DA Form 759. Individual Flight Record and Flight Certificate-Army.

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 Inspection and Maintenance Record.

DA Form 4186. Medical Recommendation for Flying Duty.

DA Form 5484. Mission Schedule/Brief.

DA Form 5701-64-R. AH-64 Performance Planning Card.

DA Form 7120-R. Commander's Task List.

DA Form 7122-R. Crew Member Training Record.

DD Form 365-4. Weight and Balance Clearance Form F - Transport/Tactical

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DEPARTURE			
PA	FAT)	TAKEOFF GWT	
LOAD lb FUEL MSN lb	DUAL ENGINE	SINGLE ENGINE #1	SINGLE ENGINE #2
	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 ENGINE	SINGLE ENGINE #1	SINGLE ENGINE #2
	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 ALLOWABLE GWT – SINGLE ENG			
SINGLE-ENG MAX R/C IAS *(MAX GWT)*			

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FUEL MANAGEMENT					
	FUEL/TIME		BURNOUT ________________________Z		
START	____________/____________		RESERVE ________________________Z		
STOP	____________/____________		CONSUMPTION RATE ____________LB PER HR		
ARRIVAL					
PA	FAT		LANDING GWT		
		DUAL ENGINE	SINGLE ENGINE #1	SINGLE ENGINE #2	
		TR:	TR:	TR:	
MAX TORQUE AVAILABLE					
MAX ALLOWABLE GWT *(OGE/IGE)*		/			
PREDICTED HOVER TORQUE *(IGE)*					
PREDICTED HOVER TORQUE *(OGE)*					
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