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Development of Measures of Crew Coordination

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Dynamics Research Corporation

for

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This report describes the development of a reliable, objective, and quantitative set of metrics for measuring and assessing aircrew coordination in terms of aviator performance and safety. Based on a review of programs to evaluate aircrew coordination in the commercial and military sectors, three rating instruments were developed for specific application to UH-60 helicopter aircrews. These instruments included a military adaptation of the Cockpit Management Attitudes Questionnaire (CMAQ), the Aircrew Coordination Evaluation Checklist, and a revised set of Aircrew Training Manual (ATM) maneuver standards. All three instruments were used by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to evaluate UH-60 aircrews in May 1990 at Fort Campbell, Kentucky. Data from this experiment are being analyzed by ARI and will provide a basis for developing training standards and methods in this area.

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DEVELOPMENT OF MEASURES OF CREW COORDINATION

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SECTION 1.0

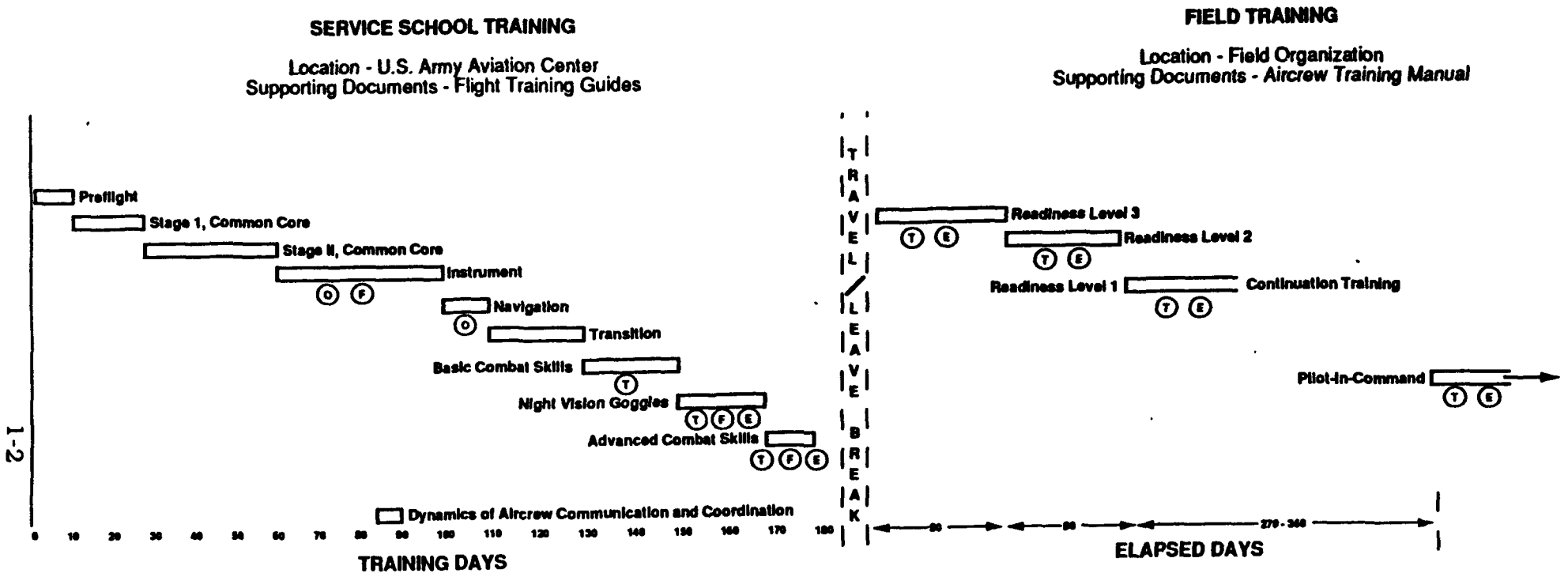
1.0 INTRODUCTION

In 1987, the Vice Chief of Staff of the Army asked the Army Research Institute (ARI) to initiate an R&D program aimed at reducing Army accident rates through better personnel selection, training, and system design. To this end, ARI established a safety research task as part of its overall MANPRINT methods R&D program.

ARI's analysis of Army aviation accidents showed that crew coordination errors represent a major category of human error-induced accidents in both aviation and ground operations. To date, however, the Army lacks a reliable, objective, and quantitative set of metrics for measuring and assessing crew coordination in terms of aviator performance and safety.

To improve crew coordination in aviation system operations, the Army adapted an Aircrew Coordination Training (ACT) program originally developed in the civilian airline industry. ACT is offered during the Initial Entry Rotary Wing (IERW) course Program of Instruction (POI) through a class entitled "Dynamics of Aircrew Communication and Coordination (DACC)." ACT is also offered to aviators in the field under the auspices of the US Army Safety Center (USASC) as a part of continuation training. USASC provides ACT training and materials to Unit Safety Officers who implement the program under local jurisdiction. Figure 1.0-1 depicts the various times in an aviator's career when he might receive ACT.

Army ACT programs have not been objectively evaluated in terms of their impact on crew performance. The Army Research Institute Aviation Research and Development Activity (ARIARDA) tasked Dynamics Research Corporation (DRC) to develop measures of Aircrew Coordination to assist the Army in evaluating the effectiveness of its ACT program.



Existing References to Aircrew Coordination Training (ACT) and Cockpit Team Work in Current Flight Training Guide - Air Training Manuals:

T = Defined as Task
O = Otherwise Defined
F = Listed in Flight Period Outline
E = Listed in Flight Evaluation Guide

Figure 1.0-1. Current Army Aircrew Coordination Training System

SECTION 2.0

2.0 AIRCREW COORDINATION: A CONCEPTUAL BASE

The main objective of this Delivery Order is to provide the Army with a means to assess Aircrew Coordination with a reliable, quantitative set of metrics. This section provides background on Aircrew Coordination and its salient factors. First, we discuss a basic model showing the essential functional responsibilities given to system operators in the operation of a vehicle - in our case it is an aircraft. We then expand the model to account for task partitioning and crew coordination actions which are essential to successful mission execution in crewed systems. A discussion is provided articulating our position on selecting crew coordination measures and why those instruments must assess particular aviator skills and attitudes. Finally, the methods for selecting and developing the particular instruments used in this Delivery Order are explained.

2.1 Basic Flying Responsibilities

Aviators undertake several major categories of behavior in all flying situations. Figure 2.1-1 shows the categories of the Basic Model of operator functions in their simplest forms. These elements include

1. Planning and plan revision (P)
2. Situation Awareness (SA)
3. Problem Solving/Decision Making (PS/DM)
4. Operational Task Execution (OTX)

All missions start with pre-mission planning (P). Throughout a mission, aviators continuously cycle through Situation Awareness (SA), Problem Solving/ Decision Making (PS/DM), and Operational Task Execution (OTX). When significant unforeseen events occur, the aviator may be forced back into the planning stage where the plan developed during the pre-mission planning stage is revised to accommodate new conditions. Note that some part of the aviator's attention must always remain focused on Situation Awareness. Specifically, the aviator must always maintain awareness of the status of key factors that can influence the mission. This emphasis on SA is one of the unique features of the model. It is an especially important issue in the area of safety since numerous aviation crashes have been attributed to the failure of crews and individual pilots to maintain adequate Situation Awareness as they sought solutions to relatively minor problems.

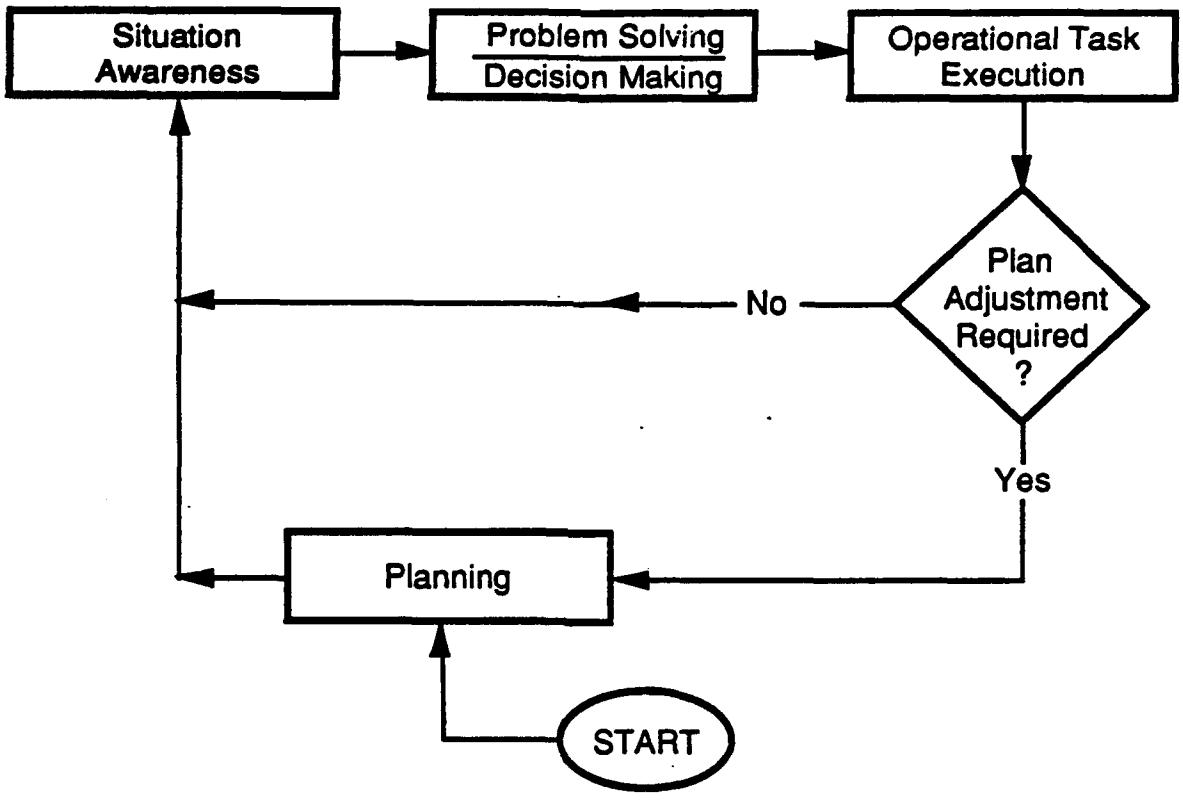


Figure 2.1-1. Basic Model of Operator Functions

The model holds true whether a single aviator or a crew controls an aircraft. In the next section, the Basic Model will be expanded to incorporate crew coordination and resource integration considerations within the framework. The major aviator control functions within the Basic Model are described below:

Planning comprises two phases depending on when the planning takes place. The first phase occurs during the pre-mission planning stage. Essential considerations of pre-mission planning include:

1. Mission objectives,
2. Aircraft status,
3. Current and predicted environmental conditions,
4. External support and interfaces,
5. Personnel status, and
6. Team member responsibilities (if crewed aircraft).

The second Planning phase occurs during the mission. This phase combines the above factors in a dynamic fashion and consists of modifying and refining the initial plan. These revisions to the plan occur intermittently as required by mission events.

The key outcome of Planning is a clear and shared understanding among the entire crew of the basic mission objectives, the implementing actions needed to attain those objectives, mission limits and constraints, and the functional responsibilities assigned to each crewmember during the mission.

Situation Awareness (SA) is defined as an aircrew's understanding of flight factors that impact on the success of the mission and the safety of the crew and aircraft at any given point in time. An operator who demonstrates SA is cognizant of each of the dynamic SA elements and its synergistic effect on other factors. The monitoring of all these factors simultaneously is a sophisticated integration activity. The five factors monitored in Situation Awareness include:

1. Mission objectives - The flight plan, purpose of the flight, standing operating procedures for mission accomplishment and flight safety;

2. Orientation in space - Altitude, airspeed, heading, geographical location, and mission time expended and remaining;

3. Environmental conditions - All relevant current and predicted weather information, status and location of other air traffic, and status and location of threats to the aircraft and personnel;

4. External support - The condition and readiness of external resources to support the mission including, for example, air traffic control, refueling points, navigational aids, ground guides, other aircraft in the flight, and ground support equipment;

5. Equipment status - Current and expected status of all mission equipment; and

6. Personnel capabilities status - Numerous human-related considerations including stress, fatigue, arousal level, workload, and individual skill and experience.

Problem Solving and Decision Making (PS&DM) synthesizes the elements of SA to influence action. In the context of this discussion, the terms PS and DM are used almost synonymously. A review of the literature did not reveal a sharp distinction between the two activities. However, we believe that Decision Making can best be conceptualized as a Problem Solving method. Consequently, whatever distinction might be made between DM and PS holds little value in our model. So, while PS may be a more generalizable term than DM, decisions must be made on a nearly continual basis when operating an aircraft. Decisions range from trivial and virtually automatic (e.g. how often one checks fuel consumption), to complex and deliberate (e.g., the choice of an alternate destination or an other-than-planned target due to mitigating circumstances). In the latter two examples, operators perform PS.

The literature review yielded several Decision Making models. For example, one is the DECIDE model. The Federal Aviation Administration (FAA) of the US Department of Transportation sponsored the development of a series of six curricula now in the public domain entitled "Aeronautical Decision Making for BLANK" where BLANK is 1) "Student and Private," 2) "Commercial," 3) "Instrument," 4) "Instructor," 5) "Helicopter," and 6) "Multi-Crew" (Jensen, 1989). The FAA curricula emphasize the DECIDE model (depicted in Table 2.1-1) in their training.

Table 2.1-1. Elements of the DECIDE Model

D	-	*Detect:*	The decision maker detects the fact that a change has occurred that requires attention.
E	-	*Estimate:*	The decision maker estimates the significance of the change to the flight.
C	-	*Choose:*	The decision maker chooses the desirable outcome for the flight.
I	-	*Identify:*	The decision maker identifies plausible actions to control the change.
D	-	*Do:*	The decision maker acts on the best option.
E	-	*Evaluate:*	The decision maker evaluates the effect of the action on the change and on the progress of the flight.

In our model, DECIDE breaks DM down into three components: Estimate, Choose, and Identify. Instead of proposing that decision-making be the key notion in aircrew coordination, as is suggested in the FAA series, we suggest that DM is only one activity of several others involved in aircrew coordination.

Our review of the literature on decision-making surfaced two other important concepts: "recognition - primed decision making" (takes into account the experience level of the decision maker), and "coupling" (takes into account the environment in which decision making takes place). With respect to the former (experience of the decision maker), Klein (1989) presents a cogent discussion of an entirely new perspective on DM. He argues that research on decision making has relied too heavily on analytical decision making processes and suggests a "recognitional model."

The recognitional model postulates that proficient decision makers use their experience to recognize a situation as familiar, which gives them a sense of what goals are feasible, what cues are important, what to expect next, and what actions are typical in that situation. Experienced decision makers do not perform concurrent deliberation (i.e., they do not use an analytical DM model in which the decision maker surfaces several decision options and compares them to arrive at the best alternative). Recognitional decision makers recognize patterns and understand the appropriate actions for each particular pattern.

Decision making processes differ depending on the experience base of the decision maker and whether decision making is an individual or group process. Regardless of the decision making process employed, either analytical or recognitional, the three elements of the DECIDE model, Estimate, Choose, and Identify, remain important.

The second (new) element of decision making that the model addresses is the concept of "coupling." Coupling refers to the amount of time available between an error and a response which could correct the error. Coupling also refers to the environment in which an event takes place. Coupling is dependent on flight phase or flight profile and involves the potential hazard that may be present and the probability of an event causing an accident. Central to the notion of coupling is whether an event occurs in a forgiving or unforgiving environment which directly defines the potential for safe recovery. Events can be either "loosely" or "tightly" coupled. When an event is loosely coupled, it occurs in a relatively forgiving environment with a relatively large amount of time to recover. Conversely, an event is tightly coupled when there is relatively little time to recover and the environment is unforgiving.

In relation to the problem solving and decision making process, an event is loosely coupled when a relatively generous amount of time is available to institute the decision making process and the mission is in no immediate danger. An example of a loosely coupled flight event could involve the following scenario: the crew of a westbound VFR flight in low traffic conditions descends from 6,500 feet Mean Sea Level (MSL) to 4,500 feet MSL, but unintentionally commands the aircraft beyond the desired altitude to 4,300 feet MSL. The crew recognizes the mistake and makes a correction, thus allowing them to continue their flight without mishap.

Conversely, a tightly coupled event exists when there is relatively little time to institute an analytical decision making process or to act. An example of a tightly coupled event might entail a similar altitude error (i.e., overshoot by 200 feet). However, in this instance, the situation is "unforgiving" such as could be expected during final approach, flight in mountainous terrain, or flying nap-of-the-earth (NOE). A catastrophic event is more likely to follow since the event occurs in a tightly coupled situation.

The issue of coupling is critical in considering Army aircrew coordination since a large percentage of Army flying is "tightly coupled" (e.g. NOE flight), as compared to the commercial aviation and transportation sector.

Operational Task Execution (OTX) concerns itself with decision implementation. At this stage of the model, the aviator executes a specific action resulting in a change

to one or more of the five elements comprising SA. In this framework, "doing nothing" could possibly result in a change to one of the SA factors since the aviator does not control all SA elements. Examples of OTX include changing altitude, attitude, switching to auxiliary fuel, firing a weapon, informing the crew or ground control of events, flying a precision approach, etc. The essential element of OTX is that the aviator engages in purposeful action. After OTX, the aviator reassesses the elements of Situation Awareness to determine whether the action produced the change he intended. When the preceding decisions and actions disrupt the mission plan, the plan must undergo revision to accommodate the changes.

2.2 Beyond the Basics - A Model for Crewed Systems

The Basic Model applies to all flying situations; it describes the major categories of behavior required of aviators. In this section, we overlay crew coordination on the Basic Model to incorporate additional activities essential to a crewed aircraft. Before factoring aircrew coordination into the model, a broader notion of cockpit resource management should be introduced. Cockpit Resource Management (CRM) is defined as the "effective utilization of all available resources--hardware, software, and liveware--to achieve safe, efficient flight operations" (Lauber, 1987; p.9). Figure 2.2-1 shows a CRM model. As the figure shows, we modified Lauber's definition to include additional factors. First, we include external resources such as air traffic control (ATC) procedures, ATC capabilities, other aircraft in formation, etc. Second, while the notion of aircraft resources was accepted at face value, i.e., hardware and software assets, we refined the notion of liveware to include three categories: personnel (the crew), individual aviator flying skills, and the crew's skills, knowledge, and attitudes regarding aircrew coordination. Two points can now be emphasized regarding the CRM model: (1) CRM and aircrew coordination are <u>not</u> synonymous, and (2) aircrew coordination is the cornerstone of CRM for crewed weapon systems. Furthermore, if one excludes the aircrew coordination techniques element in the CRM model, the model is equally applicable to single-operator weapon systems.

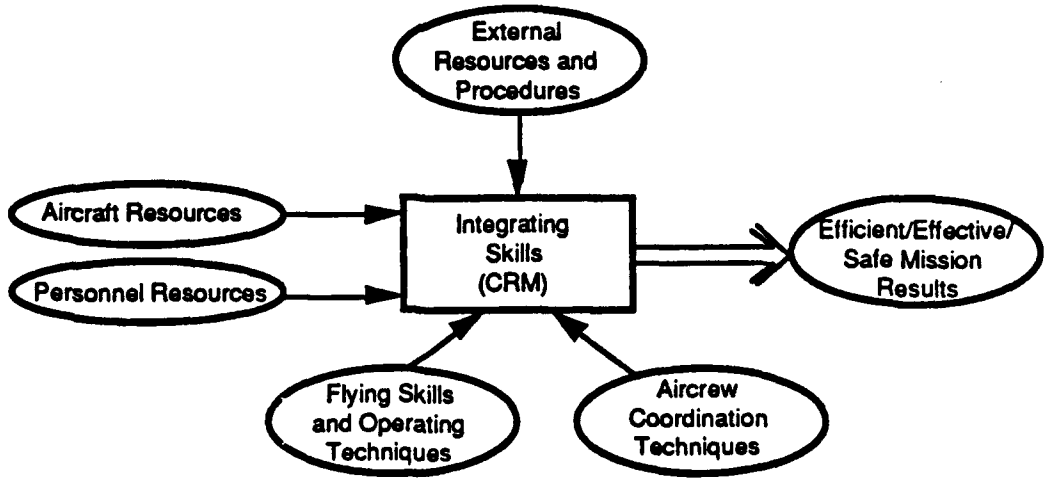


Figure 2.2-1. A Model of Cockpit Resource Management

Figure 2.2-2 depicts the Resource Integration for Crewed Systems (RICS) Model. A central concern in the development of the RICS Model was to maintain the integrity of the Basic Model while introducing and highlighting important elements of crew coordination.

Like the Basic Model (Figure 2.1-1), the flow of action in the RICS (Figure 2.2-2) is clockwise with several feedback loops. Unlike the Basic Model, crew factors are now incorporated within each of the major elements; i.e., Planning, SA, PS/DM, and OTX. For example, SA responsibilities are assigned and continuously maintained throughout the mission cycle by at least one crewmember. SA maintenance is critical to mission performance and safety. The notion of "coupling" is introduced by including a "time to respond" factor within the SA portion of the model directly effecting the PS&DM pathway that follows. This creates a situation in which the pilot-in-command may or may not have time to confer with his crew. In the event of the latter (i.e., a tightly coupled event), he must decide and act immediately which introduces the recognition-primed decision making concept discussed earlier.

The crew coordination objectives placed in the center of the RICS Model are crew coordination management and implementation activities permeating all four major elements (Plan, SA, PS&DM, and OTX) of the RICS Model. The development of the crew coordination objectives are discussed in Section 2.3.

2.3 Skills and Attitudes for Effective Aircrew Coordination

Adequate performance of aircrew coordination is a function of certain attributes of crew members including 1) personality, 2) skills (including flying skills, and coordination skills)[1], and 3) attitudes that promote an inclination to incorporate aircrew coordination in the cockpit. In other words, to effectively use the RICS Model, aircrews must possess the right mix of personality, skills, and attitudes.

A commonly accepted principle in psychology is that personality is relatively fixed by the time people are in their teenage years. While personality is an important variable in pilot selection, because of its stable nature it is not relevant to ACT. Moreover, ACT programs assume proficiency in basic piloting skills, thus ACT programs do not address pilot "stick-and-rudder" skills. Consequently, ACT programs tend to focus on skills and attitudes related to interpersonal coordination.

Figure 2.3-1 shows the fundamental relationship among beliefs, attitudes, skills, and behaviors. Beliefs provide the basic underpinning for attitudes. Attitudes provide 1) an inclination to develop Skills, and 2) an inclination to produce Behaviors. Skills provide the ability to produce Behaviors. Thus, Attitudes and Skills directly affect Behavior. This notion is widely accepted in psychology and serves as the basis for Aircrew Coordination Training and the selection of the aircrew coordination measurement suite for this Delivery Order.

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[1] Note: In this discussion, Knowledge is a subset of Skills.

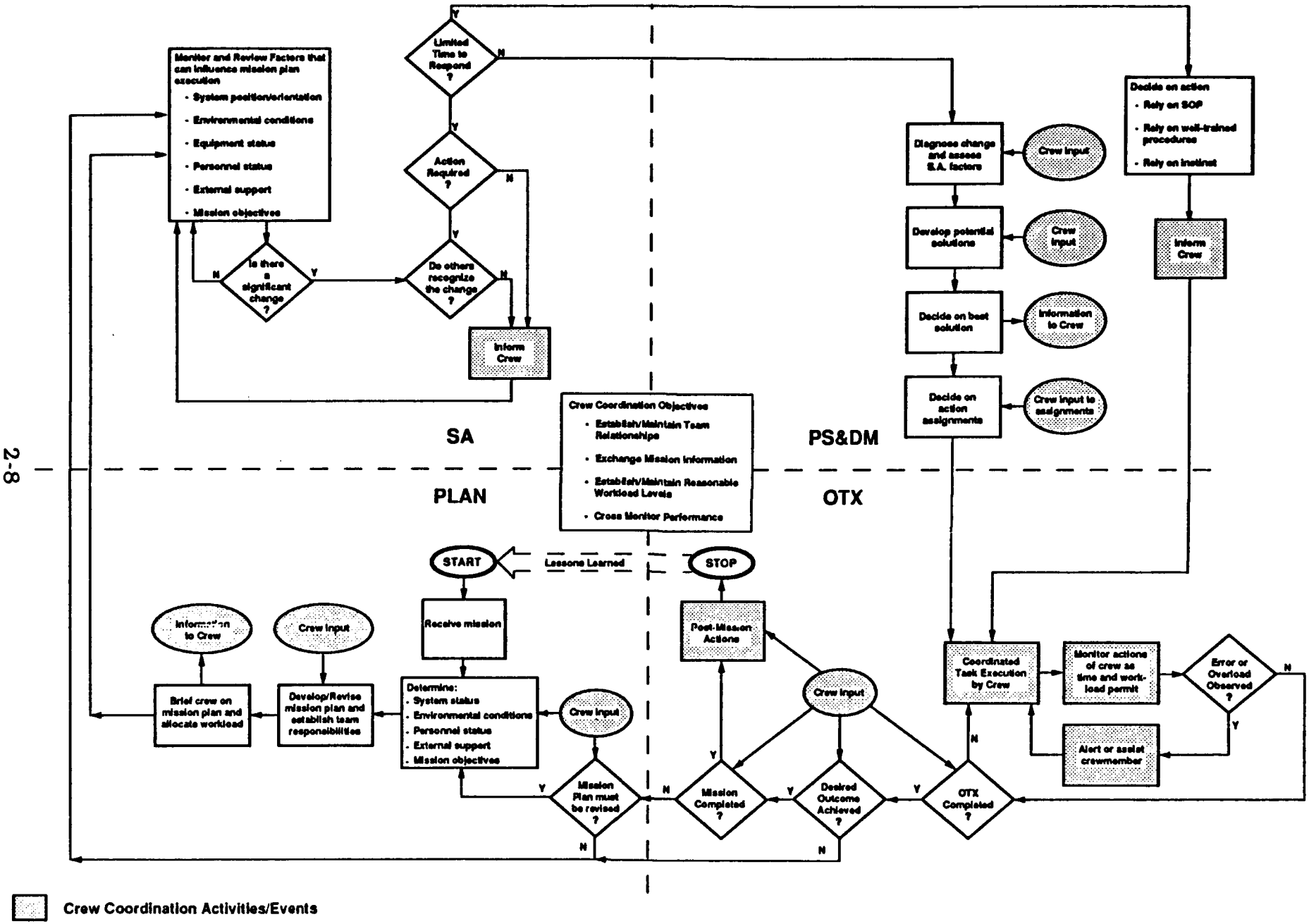

Figure 2.2-2. Resource Integration for Crewed Systems (RICS) Model

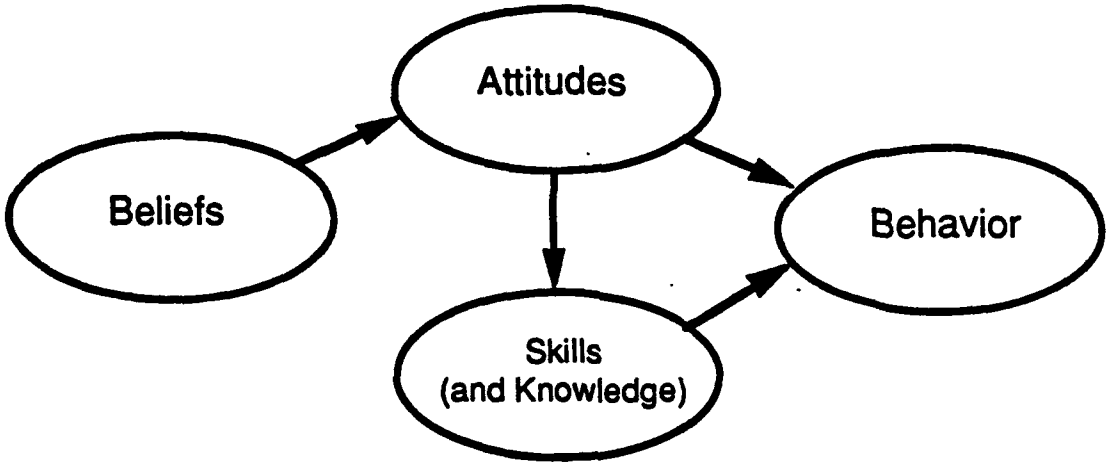

Figure 2.3-1. Relationship Among Beliefs, Attitudes, Skills, and Behavior

The methods used to inculcate the skills and attitudes necessary to effectively perform within the RICS Model vary. A number of commercial and military programs exist in the field. The next several tables show course outlines from three of the Department of Defense (DoD) military services. Table 2.3-1 displays the outline Geis (1987) used for training Army helicopter pilots in an experimental course. Table 2.3-2 presents a course outline used by the Air Force Military Airlift Command (Moody et al., 1987). Table 2.3-3 delineates a course outline used by the Navy (Allen Corporation/SimuFlite, undated).

A close inspection of the three tables shows that the authors' methods and approaches vary. Training methods and approaches are equally varied among commercial airlines. While the route to effective aircrew coordination can take many paths, the desired results (as shown in the RICS Model) appear to be the same.

As mentioned previously, ACT programs do not address pilot personality or "stick-and-rudder" skills; they tend to focus on interpersonal coordination skills and attitudes. ACT course objectives relating to specific, teachable, measurable skills have not been well-articulated in the literature. No single clear, commonly agreed upon definition of ACT skills has yet emerged. Note, however, that Salas, et al. (1989) of the Naval Training Systems Center (NTSC) recently proposed a framework proscribing ACT skills (see Table 2.3-4). While the merits of the NTSC framework remain unknown at this time, one element of the NTSC work that seems particularly promising is a draft rating scale, the "Aircrew Coordination Behavioral Rating Device," which is based on critical incidents observed during team performance (Salas, et al., 1989). NTSC (Cannon-Bowers, 1989) is now

Table 2.3-1. Summary Course Outline for the Experimental ACT in the Army Training Program (Geis, 1987)

UNIT	TITLE
1	Introduction to Aircrew Resource Management Training
2	Decision Making
3	Communicating Effectively
4	Effective Listening
5	Open Mindedness
6	Resolving Conflict/Problems
7	Assertiveness
8	Feedback/Critique
9	Pilot Attitudes
10	Situational Awareness
11	Procedural Compliance
12	Pilot Judgement
13	Poor Judgement Chain
14	Problem Solving
15	Priority Analysis
16	Managing the Workload
17	Managing Stress
18	Cockpit Distractions
19	Incapacitation
20	Identification of Resources

Table 2.3-2. Summary Course Outline for ACT in the Air Force MAC Training Program (Moody et al., 1987)

UNIT	TITLE
1	Introduction
2	Communications
3	Situational Awareness
4	Leadership/Followership
5	Decision Making
6	Mission Analysis

Table 2.3-3. Summary Course Outline for ACT in the Navy (Allen Corporation/SimuFlite, undated)

UNIT	TITLE
1	Introduction and Orientation
2	Critical Success Factors
3	Policy and Regulations
4	Command Authority
5	Aircrew Communications
6	Planning
7	Operating Strategy
8	Workload Performance
9	Available Resources
10	Judgement and Decision Making
11	Risk Management
12	Situational Awareness
13	ACT Course Review
14	Simulator Event

Table 2.3-4. ACT Skills Defined by NTSC

Assertiveness	Effective assertiveness/decisiveness refers to the willingness/readiness to make decisions: demonstrating initiative and courage to act; taking action when called upon to do so; and defending decisions made.
Communication	Effective communication refers to the ability to clearly and accurately send and acknowledge information, instructions, or commands; and provide useful feedback.
Decision Making	Effective decision-making is considered the ability to use logical and sound judgement based on information available; identifying possible solutions; selecting the best alternatives; evaluating the consequences and effect of the solution selected; and gathering information prior to a decision.
Adaptation/Flexibility	Effective adaptation/flexibility refers to the ability to alter a course of action with more information; appropriately change actions; maintain constructive behavior under pressure; and adapt to internal and external environmental changes.
Situational Awareness	Effective situational awareness refers to the ability to identify source and nature of problems; extract and interpret essential information elements; maintain accurate perception of the external environment; and detect a situation requiring action.
Leadership/Followership	Effective leadership/followership is considered the ability to direct and coordinate the activities of other crew members; monitor and assess crew performance; assign tasks; take charge; stimulate crewmembers to give their best effort; assume responsibility; and communicate mission information.
Mission Analysis	Effective mission analysis refers to the ability to coordinate, allocate, and monitor crew and aircraft resources; structure tasks and objectives; prioritize tasks; anticipate results of mission; set goals and identify action requirements; identify contingency plans; and gather information in an effective manner.

refining the scale. Technical reports documenting the development and use of the scale are not yet available. After careful review of the NTSC rating device, DRC 1) determined that many of the items were already embedded in the ACE Checklist, and 2) where applicable, included several of the NTSC items in the current version of the ACE (see Section 5.2 for a description of ACE development).

In addition to skills, the other modifiable component of ACT is attitudes. In reviewing the literature on current Aircrew Coordination Training, little doubt exists that changing attitudes is a key element in the training. As Figure 2.3-1 shows, attitudes are based on a personal belief structure. For example, the attitude portrayed in Tom Wolfe's (1979) book, The Right Stuff, depicts the stereotype of the pilot as fearless, self-sufficient, technically qualified, egotistical, individualistic, unerring, and death-defying. The elements of the "Right Stuff" pilot were probably essential in the early days of flying when flight was not routine, aviation systems were not reliable, and the business of aviation was considerably more dangerous than in modern aircraft. These same characteristics continue to be admired [for some very good reasons] among combat aviators[2]. Helmreich and Foushee (1988) have postulated that over the years, an informal pilot culture developed and became institutionalized through 1) regulations governing pilot performance and 2) policies guiding pilot selection. They go on to say that advocates of ACT have faced at least two difficult tasks. First, there are doctrinal hurdles to overcome before institutionalizing aircrew coordination. Second, the current pilot population was selected more on the criteria of the "Right Stuff" and less on how favorably they are inclined to be good cockpit managers.

As previously stated, beliefs engender attitudes that directly influence skills and behaviors. Table 2.3-5 presents the linkages between the "Right Stuff" (old implicit beliefs) and the attitudes, skills, and behaviors required for modern aircrew coordination. As well be shown in Section 5, the measures developed for thisDelivery Order are designed to assess the attitudes and behaviors delineated in the third and fourth columns within Table 2.3-5.

In this section, we discussed the conceptual basis of ACT. The next sections extend these understandings to ACT evaluation and instrument development.

---

[2] Thus making the problem of institutionalizing aircrew coordination even more difficult within the Army aviation community.

Table 2.3-5. Linkages Between Beliefs - Attitudes - Behaviors

Old Implicit Beliefs ("Pilots are perfect.")	New Explicit Beliefs Based on Lessons Learned ("Crewmember's capabilities are limited & fallible.")	Essential Attitudes That Must Be Adopted By Individual Crewmembers	Behavioral Objectives in Crew Coordination
• Beyond the pilot the rest of the crew is backup and basically unimportant to the mission	• The entire crew is critical to mission success	My fellow crewmembers are an important resource; I need to use them and treat them with respect (Values crew)	Establish and maintain interpersonal relationships to create and maintain a harmonious team atmosphere and to execute mission objectives (Establish/maintain team relationships)
• Pilots are infallible in their flying skills	• All crew members make mistakes • Crewmembers can catch other crewmembers' mistakes before they have serious consequences	Human errors are a fact of life, everyone makes them; they should be corrected with minimum disruption to ongoing tasks, mission execution or to team relationships (Crew fallibility)	Check each other's actions for possible errors (Cross monitoring of crew performance)
• Pilots are aware of all available decision options	• A qualified crew will surface a greater range of decision options than the pilot alone will produce	I may have information which is important to another crewmember; I must take actions to ensure that he receives this information in a timely manner (Give information) Other crewmembers may provide important perspectives and information that I have not considered; I need to take actions to ensure the delivery of this information to the group (Get information)	Establish and maintain the same mission plan and a common frame of reference within each crewmember's mind in as much detail as possible (Mission Information Exchange) Expose the decision-maker to the full range of action options available at each important decision point (Mission Information Exchange)
• Pilots can collect and integrate all important decision information alone	• A more complete set of decision support information will be generated by the crew than by the pilot alone		
• Pilots operating alone make the best decisions	• On average, decisions which consider crew recommendations will be better than decisions made by the pilot alone		
• We can figure things out during the mission. We have to remain flexible.	• Once airborne, there may be little time to develop and coordinate actions and decisions. Contingencies and options should be developed and discussed before the need arises.		
• Pilots can handle all workload alone	• The quality of mission task performance is highest when the workload is effectively distributed across crewmembers • Crews can effectively distribute task execution responsibilities	Overloads increase the risk of errors and poor mission performance; providing support to overloaded crewmembers is essential to effective mission execution (Provide/Accept Help)	Allocate workload in a reasonable manner across crewmembers (Establish/maintain reasonable workload levels)

SECTION 3.0

3.0 APPROACH AND CONSTRAINTS FOR ARMY ACT EVALUATION

Upon receipt of the Delivery Order from ARIARDA, DRC instituted a program to determine the state-of-the-art in ACT evaluation. Evaluation programs within the commercial and military sectors were reviewed. Based on this review and the guidance in the Delivery Order Statement of Work[3], ACT evaluation instruments were developed using the following criteria:

1. **The measures should have a good research base.** Given that ACT (or Cockpit Resource Management (CRM), as it is called in the commercial world) has been extant since about 1979, there were several existing evaluation schemes. DRC determined that the best approach would involve tailoring existing instruments and then evaluating them for usability and appropriateness in the Army environment.

2. **The measures should be applicable within the Army's standard pilot evaluation process.** DRC developed a method to evaluate aircrew coordination within the Army's existing aviator evaluation program. All Army aviators are evaluated annually through the Annual Proficiency and Readiness Test (APART) program. APART involves flight physicals, written tests, and a checkride(s) with an Instructor Pilot (IP). When flying with the IP, the aviator must demonstrate proficiency in numerous Aircrew Training Manual (ATM) tasks.

3. **The measures should be performance-oriented.** Knowledge of the principles or attitudes toward aircrew coordination is not, of itself, sufficient evidence to ensure the manifestation of aircrew coordination behaviors.

Keeping these criteria in mind, several constraints influenced the development of the instruments:

1. The field of ACT/CRM has not matured to a point where there is a common theoretic base that underlies training. Each airline and military service has its own unique approach; no standardization exists. Early CRM implementation involved transitioning the principles of Organizational Development and front line management techniques into the cockpit. Since then, the field expanded along numerous independent paths with no organization able to show that its ACT/CRM implementation is superior to others.

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[3] Due to resource constraints, the Delivery Order SOW noted that this task will focus on the UH-60A. Nevertheless, attempts were made to develop widely applicable instruments. Consequently, two of the three instruments are generic, while one is specific to the UH-60A.

2. The Army's implementation of ACT is one of the least mature due to several factors:

   a. The course material in the Dynamics of Aircrew Coordination and Communication (DACC) course offered during Initial Entry Rotary Wing (IERW) training is highly abbreviated.

   b. DACC is offered during a time when student aviators are initially developing "stick-and-rudder" skills (see Figure 1.0-1). Most of the students' flying experience during the IERW course is directly involved with learning to control the aircraft; little attention is paid to coordinating an aircrew. Other organizations, including the Navy, Air Force, and commercial airlines, teach aircrew coordination after initial piloting proficiency is established.

   c. For most of IERW training, an IP in the role of trainer or evaluator is the full extent of the available crew. It is unreasonable to expect new, untrained aviators to "manage" their instructors or evaluators.

   d. There is no quality control on the continuation training ACT course offered in the field through unit Aviation Safety Officers (ASO). Once the ASO graduates and leaves the US Army Safety Center (USASC) with the ACT course training materials, he is free to tailor them. Since there is no Army-wide requirement stipulating that the ACT training be offered at all, the type or extent of exposure a unit aviator has had to ACT is not guaranteed.

   e. There is no planned coordination between the IERW DACC and field or continuation training. In other words, field training does not necessarily build upon the instruction provided in the DACC.

   f. Army terrain flight profiles and mission objectives require that aircraft fly in "unforgiving" circumstances (i.e., tightly coupled). For instance, Army aviators must perform NOE flight or maneuver within confined areas. The result of tight coupling is a strong, natural tendency to rely on 1) standing operating procedures (SOP), 2) well-trained responses to a given event, and/or 3) pilot experience and instinct. Given these circumstances, Army aviators may mistakenly perceive that, more often than not, they do not have the time to afford themselves the "luxury" of aircrew coordination.

SECTION 4.0

4.0 RATIONALE FOR INSTRUMENT SELECTION AND DEVELOPMENT

Once the approach and constraints for ACT evaluation instrument selection and development were established, a suite of aircrew coordination measures was identified and refined for use in the ARIARDA program. Three types of instruments were developed: 1) an attitude questionnaire, 2) an evaluation instrument to assess specific aircrew coordination skills, and 3) modified versions of Aircrew Training Manual (ATM) tasks that incorporate aircrew coordination behaviors. The latter will provide a mechanism for institutionalizing aircrew coordination in the Army aviator evaluation process. The following discussion addresses the rationale for developing the three instruments comprising the ACT measurement suite

4.1 Army Cockpit Management Attitudes Questionnaire (CMAQ)

As mentioned earlier, personality and attitudes are important behavioral motivators. Personality is largely fixed prior to Army enlistment and is not easily changed. It may be a factor to consider in aviator selection, but selection is beyond the scope of the current project. Attitudes, however, are amenable to change and can be influenced by training and experience. Foushee (1984) showed that attitudes influence the quality of cockpit resource management. The linkage between attitude and performance in the cockpit has been documented by Helmreich (Helmreich, 1984 and Helmreich, et al., 1986), who developed the Cockpit Management Attitudes Questionnaire (CMAQ) for the National Aeronautics and Space Administration (NASA). He identifies three major determinants of pilot performance: ability, personality, and attitude. He acknowledges that personality may play a large role in determining flight deck behavior, but points out that no practical training programs to substantially change personality exist. When aviators reach a point in their career when ACT is provided, [aviation/flying] ability and personality are a given. Consequently, Helmreich argues that only through modifying attitudes can we change observable behavior (Helmreich, 1986).

Recently, (Helmreich, et al. 1990) have been incorporating the Line/LOFT Worksheet into their evaluation of cockpit resource management. So it appears that the NASA/UT Crew Performance project has broadened its evaluation perspective since 1986. Likewise, our position accepts the importance of attitudes, but they are not sufficient in and of themselves to alter behavior. We contend (see Figure 2.3-1) that behavior is also directly influenced by aircrew interpersonal coordination-specific *skills*. Behavior is a result of both the person's choosing to do something (attitude-behavior link) and a person's knowing how to do something (skill-behavior link).

DRC modified the CMAQ for use in the Army environment. The CMAQ was selected because it has gained wide acceptance in the aircrew coordination field, it has evidence supporting its validity with respect to measuring salient aspects of aircrew coordination, and it has been used as an attitude measurement device in numerous aviation settings.

4.2 Aircrew Coordination Evaluation (ACE) Checklist

The literature review revealed that a change in the attitude of aviators toward aircrew coordination is a desirable outcome. In fact, in many aircrew coordination programs, attitude change serves as the single evaluation determinant to measure program worth. In addition to attitude change, however, it is also necessary to show a change in performance. There are several ways to show change in performance, only one of which is considered to be a reasonable approach at this time in the context of the current Delivery Order. Four of these approaches are discussed below.

1. **Change in accident rates** - measures the change in accident rates prior to and after ACT (cf. Alkov, 1989). This approach was ruled out since the Army's ACT program is not yet mature. Also, it is not currently possible to identify whether or not aircrews (involved in past mishaps) have received ACT.

2. **Repeated maneuvers** - assesses ACT while conducting actual or simulator checkrides (cf. Taggart & Butler, 1989). In this scheme, the number of repeated maneuvers required of an aircrew to pass various maneuvers or procedures on a checkride is collected. Then, comparisons are made between ACT-trained crews versus non ACT-trained crews. This strategy was ruled out because it requires a highly structured approach to field evaluations and it would cause excessive constraints on evaluation practices. Practical constraints precluded the ARIARDA team from imposing such a structure on Army aviation field units.

3. **Controlled simulator experiments** - measures performance in relation to defined outcomes within a simulator environment. Researchers have used several outcome measures such as target accuracy, safety of flight, and quality & quantity of communications (cf. Povenmire, et al. (1989), Foushee, et al. (1986), Foushee & Manos (1981), respectively) to assess aircrew performance. During the timeframe of this Delivery Order, DRC was not assured of the availability of aviators and a simulator with pre-defined, standardized mission profiles which would allow us to pursue these types of performance variables. Thus, this approach was not taken. During the next phase of the research program, ARIARDA has shown an interest in collecting data using this type of measure and DRC plans to support those efforts.

4. **Expert observation** - assesses the quality of aircrew coordination. Helmreich & Wilhelm (1987) developed and tested an instrument, the Line/LOFT Worksheet, which solicits expert ratings of aircrew coordination performance. The instrument has been successfully applied in several settings (cf. Helmreich, Wilhelm, Gregorich, & Chidester (1990), Helmreich, Wilhelm, & Gregorich (1989), Povenmire et al. (1989), and Taggart & Butler (1989)). The preponderance of evidence in the literature has shown that the use of the Line/LOFT Worksheet is an adequate performance measure. Helmreich (1986, p.16) summarizes a salient aspect of his research using the Line/LOFT Worksheet stating that "Check Airmen we have worked with display a high level of agreement or reliability not only

in their assessment of technical proficiency, which is to be expected, but also in the evaluation of resource management...This suggests that the formal assessment of crew coordination as part of proficiency evaluations is feasible." Consequently, the Line/LOFT Worksheet was improved and tailored for this program (see Section 5 below) and renamed the Aircrew Coordination Evaluation (ACE) Checklist.

4.3 Proposed Revisions to Aircrew Training Manual (ATM) Tasks

The rationale for modifying ATM tasks to incorporate aircrew coordination behaviors is quite simple. First, it was reasoned that if this program of research is to influence the way the Army "does business," then it is necessary to have an aircrew coordination evaluation methodology placed into the mainstream of the Army aviator evaluation program. The Army uses the ATM tasks in the Annual Proficiency and Readiness Test (APART) program. Second, the nature of ATM tasks requires aviators to demonstrate skills in performing real-life, observable behaviors. Thus, we determined that we would propose and test revisions to the ATM tasks, thereby allowing the Army a mechanism to institutionalize aircrew coordination considerations into aviator evaluations.

SECTION 5.0

5.0 INSTRUMENT DEVELOPMENT

This section describes the process used to develop the aircrew coordination measurement suite to its current status. The measurement suite consists of the three components discussed in the previous section and is depicted in Figure 5.0-1. The first component of the suite is based on the military version of the CMAQ. In addition to the CMAQ items, the Army CMAQ also includes additional attitude questions developed for this project together with background and experience questions for each aviator. The second component, the ACE Checklist, is an observation instrument to be administered by specially trained IPs to assess aircrew coordination skills. It also asks for information from the crew about the amount of previous experience they have had working together as a crew and contains questions on the nature of the flight. The third component of the measurement suite includes the proposed revisions to the ATM tasks.

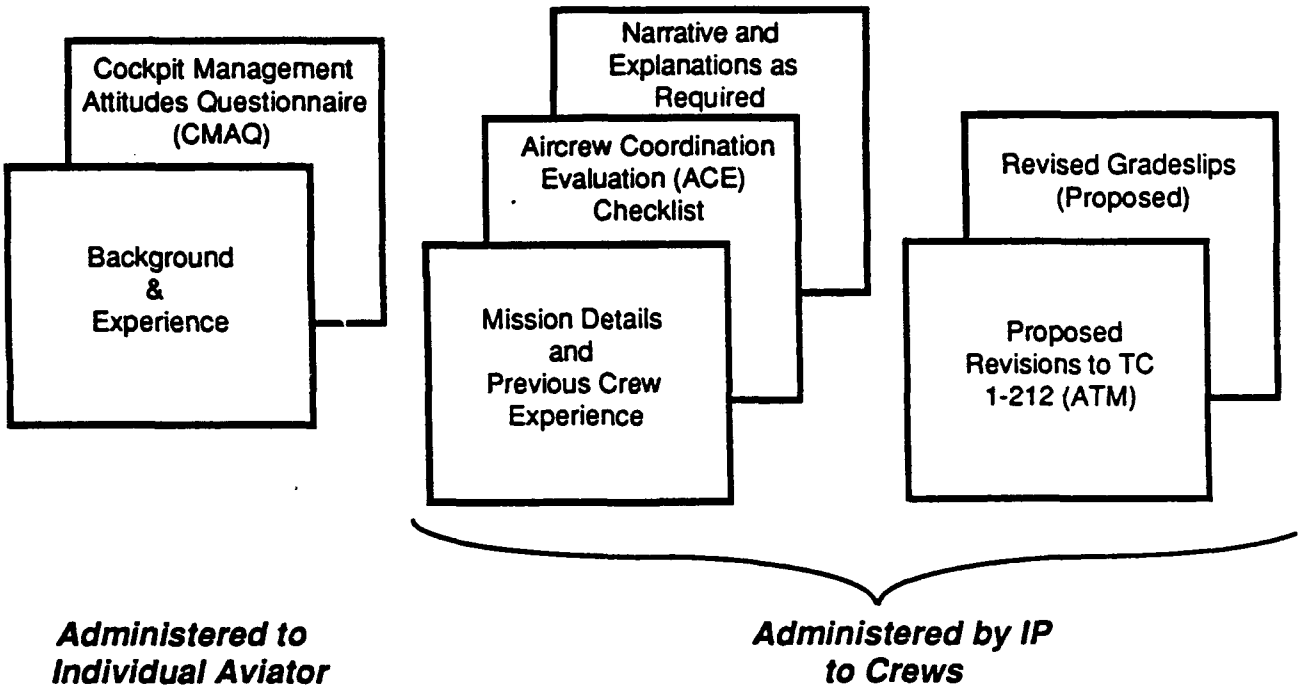

Figure 5.0-1. Components of ACT Assessment Suite

The measures were incorporated into a try-out testbed that took place with the 101st Airborne Division (Air Assault) at Ft. Campbell in May 1990. The next phase of this research program will be to analyze the data collected at Ft. Campbell, understand the psychometric properties of the measurement suite, and then refine

the measures. The expectation is that the instruments will show themselves to be reliable and that there will be positive correlations among all three instruments. If this is the case, then we will have initial evidence of the validity of the measures.

5.1. Army Cockpit Management Attitudes Questionnaire

The military version of the Cockpit Management Attitudes Questionnaire (CMAQ) (Helmreich, 1984, Helmreich & Wilhelm, 1987) was adapted for Army use. Several aspects of the CMAQ were altered:

1. Directions were re-written to make them easier to understand.

2. A background information section was included to solicit information regarding aviator experience, position, and previous exposure to ACT.

3. The language of several questions was changed to reflect the phraseology and position-naming conventions within Army aviation.

4. The 5-point Likert scale used in the CMAQ was expanded to a 7-point scale to better capture variability typically found in such settings.

A panel of subject matter experts (SMEs) reviewed the draft Army CMAQ at Ft. Rucker during the week of 30 October 1989. The SMEs recommended several changes to the background questions. These changes were incorporated into the draft Army CMAQ and provided to ARIARDA in the January 1990 draft of this report. Depending on the exact setting(s) in which the Army CMAQ is used in the future, the background questions may need further adjustment to reflect a unique set of circumstances, settings, or variables of interest.

Since submission of the 32-item draft Army CMAQ in January 1990, DRC has substantially revised the Army CMAQ. Working closely with ARIARDA, revisions were made for the following reasons:

1. Several items still were not in line with the Army aviation environment. Some items had incorrect terminology or had the appearance of contradicting Army doctrine.

2. Helmreich et al. (1986) pointed out that some CMAQ items worked better and some worse than others in differentiating among effective and ineffective cockpit managers.

3. DRC determined that the Army CMAQ should be closely aligned with the essential crew coordination attitudes delineated in column three within Table 2.3-5. Consequently, the (draft) Army CMAQ items were partitioned among the five essential crew coordination attitudes. During this analysis, it was noted that:

   a. There were instances where items were not completely clear in the attitude(s) they were trying to capture, and

b. There was an insufficient number of items in several areas to reliably capture the aviator's attitude.

Based on these analyses, DRC eliminated five items, revised fourteen items, and added eighteen items. Attachment A contains the current version of the Army CMAQ, including the background information sheet and the 45-item attitude survey. Table 5.1-1 provides an audit trail of the items contained in the Army CMAQ (i.e., from where the items came) and shows the relationship between the Army CMAQ items and the attitude dimension each item is designed to address.

5.2 Aircrew Coordination Evaluation (ACE) Checklist (NASA/UT Line/LOFT)

The NASA/UT Line/LOFT Worksheet (Helmreich & Wilhelm, 1987) was adapted for Army use as the ACE Checklist. The Line/LOFT Worksheet, in becoming the ACE Checklist, was significantly altered. The changes include the:

1. Addition of a "Flight, Crew, and Equipment Information" section to provide details of the flight, type of equipment, mission particulars, crew composition, environmental conditions, and previous crew experience flying together.

2. Expansion of the 5-point scale for each item to a 7-point scale. Adjectives for each of the seven scale points were then developed. The Line/LOFT Worksheet has only two anchors, "poor" and "excellent," which are placed at the two scale end points. Helmreich, Wilhelm & Gregorich (1989) reported the initial results associated with the Line/LOFT Worksheet. In our review of that report, we noted two difficulties which the ACE is designed to avoid. First, there was a restricted range problem, i.e., raters did not regularly avail themselves of the scale end points; they tended to use only the three central points. Second, there was a tendency for raters to judge performance as above average. In answer to the first difficulty, assuming the raters resist using the extreme points on the scale, there are still 5 points remaining. In answer to the second difficulty, the adjectives associated with the 7-point scale have been skewed in a positive direction (i.e, of the 7-points, five are various degrees of acceptable behavior). Note: R.L. Helmreich (personal communication, June 6, 1990) stated that the NASA/UT Crew Performance project has addressed the problem of limited variability and the ceiling effect of the 5-point scale by improving the training provided to check airmen. The problem of evaluator training to assist in standardizing the evaluations has been addressed under a separate Delivery Order. Under that Delivery Order, DRC developed and provided training for Army IPs cooperating in the Ft. Campbell testbed.

3. "Anchoring" of the scale points 1, 4, and 7 with clear descriptions of the crew behaviors we expect to observe at those levels. Reliability of the scale should thus be improved since raters will operate on specific descriptions of behavior instead of global definitions of the rated behaviors. Also, in deference to the second difficulty noted in "2," above, we have attempted to anchor the points in a manner to improve

Table 5.1-1. Crosswalk of Army CMAQ Items to Essential Crew Coordination Attitudes

ESSENTIAL CREW COORDINATION ATTITUDES	ATTITUDE QUESTIONNAIRE ITEMS*				
	ORIGINAL CMAQ ITEMS**		ORIGINAL MILITARY CMAQ ITEMS**	NEW ITEMS (DRC GENERATED)	TOTAL
	EFFECTIVE***	INEFFECTIVE			
Values Crew	4 5 8 11 13 16 19 42 44	1 15 18	22 23 25 26 27	29 30 31 32 33 34 36 45	25
Crew Fallibility	2 10 11 13 14 21	6 12 15 17 20	22	28 31 35 36 37 38 39 41	20
Give Information	2 10 11 19 43	3 7 15	22 23 24 26	29 30 31 34	16
Get Information	11 13	6 7 15	23 26 27	31 32 33 34	12
Provide/Accept Help	9 14			35 36 37 39 40 41	8

* Note that some questionnaire items support more than one essential attitude.

** Note that some of the original CMAQ items were revised for Army use.

*** Based on Helmreich, Robert L., et al., Cockpit Resource Management: Exploring the Attitude-Performance Linkage, Aviation, Space & Environmental Medicine, Dec. 1986, p. 1198-1200.

variability. Points 1 and 7 are extreme. Point 4 describes a crew that practices aircrew coordination in a fully acceptable manner. Raters who are familiar with Officer Efficiency Reports (and similar rating forms) should therefore be discouraged from rating so many as outstanding and be more willing to rate aviators across the available scale points.

4. Improvement of the directions for use of the ACE. Part of the improved directions are the anchors mentioned in "3," above. Additionally, we have designed the form to be easy to use and self-explanatory. Use of the ACE Checklist will require initial training of raters, but is then designed to be quite easy, efficient, and portable in its employment.

The SME panel at Ft. Rucker reviewed a draft ACE Checklist at the same time as the Army CMAQ. Based on input from the SMEs, the "anchors" were slightly refined. The ACE Checklist submitted in the draft form of this paper reflected all the SME input. As in the CMAQ, some of the background questions may need to be tailored depending on the exact setting(s) in which the ACE Checklist is to be employed to reflect a unique set of circumstances or variables of interest.

Subsequent to the SME panel review, DRC took action to significantly refine the ACE Checklist. The primary consideration in making the revisions was to link the ACE dimensions to the aircrew coordination behavioral objectives delineated in column four of Table 2.3-5. Also, subsequent to the SME review, ARIARDA provided DRC the results of an analysis of all aircrew coordination-related Class A, B and C accidents that occurred from FY 1984 through FY 1989. That research helped to further refine our thinking and approach to the ACE dimensions. As a consequence, the following actions took place:

1. Several of the Line/LOFT Worksheet questions were edited to describe aircrew coordination performance in more explicit and discrete terms.

2. Each of the ACE dimensions was directly linked to the aircrew coordination behavioral objectives in column four of Table 2.3-5.

3. Anchors for the new ACE dimensions were written and several of the previous anchors were revised to incorporate the re-orientation of the dimensions.

Table 5.2-1 presents the relationship of the Line/LOFT Worksheet dimensions, the ACE Checklist dimensions, and the aircrew coordination objectives. The current version of the ACE Checklist is included as Attachment B. This attachment contains the ACE "Flight Crew and Equipment Information" sheet (designed for use with either aircraft or simulator), the ACE aircrew coordination rating dimensions form, and the instructions to evaluators on using the ACE, entitled "Instructions for Making Ratings on the ACE Checklist Dimensions." The instructions also include the behavioral anchors for each ACE dimension.

Table 5.2-1. Relationship of LINE/LOFT Worksheet, ACE Checklist, and Aircrew Coordination Objectives

LINE/LOFT Worksheet Dimensions	ACE Checklist Dimensions	Aircrew Coordination Objectives: Mission Information Exchange	Workload Management	Cross Monitoring	Team Relations Development/ Maintenance	Global workload & Performance
1. Briefing thorough, establishes open communications, addresses coordination, planning, team creation, and anticipates problems	1. Thorough pre-flight mission plan developed	X	X	X	X	
2. Communications timely, relevant, complete, and verified	2. Statements/directives clear, timely, relevant, complete, and verified	X				
3. Inquiry/questioning practiced	3. Inquiry/questioning practiced	X				
4. Advocacy/assertion practiced	4. Advocacy/assertion practiced	X				
5. Decisions communicated and acknowledged	5. Decisions communicated and acknowledged	X				
	6. Actions communicated and acknowledged	X				
6. Crew self-critique of decisions and actions	7. Crew self-critique of decisions and actions			X		
7. Concern for accomplishment of tasks at hand	8. Crewmember actions mutually cross monitored			X		
8. Interpersonal relationships/group climate	9 Interpersonal relationships/group climate				X	
9. Overall vigilance	10. Aircraft, personnel and mission status reported	X				
11. Distractions avoided or prioritized	11. Distractions avoided or prioritized		X			
12. Workload distributed and communicated	12. Workload effectively distributed/redistributed		X			
10. Preparation and planning for inflight activities	13. Support information/actions sought from crew		X			
	14. Support information/actions offered by crew		X			
14. Overall TECHNICAL proficiency	15. Overall technical proficiency					X
15. Overall CREW effectiveness	16. Overall crew effectiveness					X
13. Overall workload	17. Overall workload					X
16. Management of abnormal or emergency situation	18. Management of abnormal or emergency situation				X	
17. Conflict resolution	19. Conflict resolution				X	

5.3 Revised Aircrew Training Manual Tasks

The Delivery Order noted that this task would focus on the UH-60A helicopter. Consequently, the Aircrew Training Manual: Utility Helicopter, UH-60, TC 1-212, (Department of the Army, 1988) was adapted for use. For each task within the Aircrew Training Manual (ATM), standards, conditions, and descriptions were rewritten to incorporate crew coordination behaviors. It was subsequently decided, during the discussions of the SME panel, that only certain ATM tasks should be rewritten to include crew coordination behaviors (as opposed to the entire set of ATM tasks). The panel, however, did not provide specific suggestions or guidance on which tasks should be rewritten. DRC, therefore, decided upon a methodology using two criteria to identify ATM tasks for rewrite:

> The first criterion was an *a priori* judgement which identified those ATM tasks having significant aircrew coordination behaviors underlying their successful accomplishment; the second criterion comprised a set of two criteria to identify those ATM tasks cited in aviation accidents which could be influenced by inclusion of aircrew coordination behaviors.

A priori, ATM tasks 1001, 1002, and 1071 were selected for rewrite. Task 1001, Plan a VFR Flight, and Task 1002, Plan an IFR Flight, were selected because of their influence on all other subsequent tasks; and Task 1071, Perform as a Crew Member (Cockpit Teamwork), was selected due to its obvious relation to aircrew coordination. An added benefit to the selection and rewrite of Task 1071 was its ability to be incorporated by reference into any other task requiring aircrew coordination behaviors. Subsequent to the U.S. Army Safety Center (USASC) and Army Research Institute aircrew coordination error study, a fourth ATM task, 1028 (Perform VMC Approach), was added to the *a priori* list due to its citation in a significant number of accidents. Selection of tasks under the second criterion (actually two criteria employed as a set), which is explained below, required an intensive review of the aviation accident data base.

To identify those ATM tasks for rewrite using the Army aviation accident data base, the following procedure was used:

1. Data with respect to ATM tasks cited in aviation accidents was extracted from the USASC Army Safety Management Information System (ASMIS). Data covered the period from January 1983 (when ATM tasks being performed during accident sequences were first recorded on the DA Form 2397-Series) to the present. Data was restricted to Army Mishap Classification (AMC) codes A, B, and C (standard to all US military services), and only to those accidents incurred by the crew-served UH-1, CH-47, and UH-60 helicopter fleets.

2. The extracted data was compiled into a listing covering those ATM tasks being performed 1) at the <u>onset</u> of the emergency precipitating the accident and 2) the ATM task executed in <u>response</u> to the emergency. The list included the ATM task number, the AMC code, the mission, design, and series (MDS) of the aircraft, and total number of accidents by AMC.

3. The selection of the ATM tasks for aircrew coordination rewrite was then accomplished based on the two-criteria set previously mentioned. The first criterion of the set was that the ATM task had to have been cited in five or more accidents by AMC class, i.e., Class A, B, or C. The second criterion of the set was that the ATM task had to have been cited in ten or more accidents across AMC classes, i.e., A, B, and C. The ATM tasks selected for rewrite under the two-criteria set were:

Task No	Task Title
1007	Perform Engine-Start, Run-up, and Before-Takeoff Checks
1015	Perform Ground Taxi
1017	Perform Hovering Flight
1031	Perform Confined Area Operations
1035	Perform Terrain Flight
1038	Perform Terrain Flight Approach
1050	Perform Hovering Autorotation
1053	Perform Simulated Engine Failure at Altitude
1068	Describe or Perform Emergency Procedures
1098	Perform After-Landing Tasks
2009	Perform Multi-Aircraft Operations
2016	Perform External Load Operations

4. Of the twelve tasks selected from the compiled list, one task was not applicable to the UH-60 and was dropped, and two were redesignated from the base task series (1000-series) to the special task series (2000-series). The tasks so affected were:

Old Task No	New Task Number	Task Title
1035	2061	Perform Terrain Flight
1038	2064	Perform Terrain Flight Approach
1050	N/A to UH-60	Perform Hovering Autorotation

5. The resulting fifteen tasks selected for rewrite (four *a priori* and eleven from the ASMIS data analysis) are presented in Table 5.3-1.

Table 5.3-1. ATM Tasks Selected for Revision to Include Standards for Aircrew Coordination

ATM TASK NUMBER	TASK TITLE
1001	Plan a VFR Flight
1002	Plan an IFR Flight
1007	Perform Engine-Start, Run-up, and Before-Takeoff Checks
1015	Perform Ground Taxi
1017	Perform Hovering Flight
1028	Perform VMC Approach
1031	Perform Confined Area Operations
1053	Perform Simulated Engine Failure at Altitude
1068	Describe or Perform Emergency Procedures
1071	Perform as a Crewmember (Cockpit Teamwork)
1098	Perform After-Landing Tasks
2009	Perform Multi-Aircraft Operations
2016	Perform External Load Operations
2081	Perform Terrain Flight
2084	Perform Terrain Flight Approach

In summary, an analysis was conducted to identify those ATM tasks meeting two criteria: First, the task had to inherently require crew coordination behaviors for

successful accomplishment (*a priori* based). Second, the task had to be a "high driver," i.e., an ATM task frequently occurring during onset or recovery from an emergency resulting in an accident (accident based). The analysis resulted in fifteen tasks being selected for rewrite. Attachment C includes the proposed revisions to the ATM tasks.

SECTION 6

6.0 FUTURE STEPS IN MEASUREMENT DEVELOPMENT

Instrument development typically proceeds along a well structured path. Table 6.0-1 shows an outline of a typical structured approach and where we are in the process.

Following submission of this report, the next stage of the development process is to analyze the data collected at Fort Campbell to develop initial psychometric data to determine reliability and validity statistics and to locate items that do not function as expected. The instruments, including the directions, "anchors," and the items themselves, will be revised as necessary. The next version of the instruments will then be readied for the next round of field testing and collection of reliability and validity data. At the conclusion of field testing, the instruments will be refined into final form, at which time the psychometric properties will be well established.

Table 6.0-1 Status of Aircrew Coordination Measures in the Measurement Development Process

Development Step	Status
1) Develop draft measures	1) Completed
2) Review of measures by SMEs	2) Completed
3) Revise measures based on SME review	3) Completed
4) Tryout measures; collect initial empirical data on small sample	4) Completed
5) Revise measures based on try-out results	5) TBD
6) Field-test measures to collect reliability information and begin validity studies	6) TBD
7) Deploy measures for application in various settings and continue validity studies	7) TBD
8) Periodically update measures and supporting statistical information	8) TBD

SECTION 7

7.0 RECOMMENDATIONS ON A PROGRAMMATIC STRUCTURE FOR ARMY AIRCREW COORDINATION

Preliminary thoughts on a programmatic structure for Army aircrew coordination suggest that at least four basic elements must be addressed:

1. **A crew-team creation system** - a unit or organization responsible for ensuring that individuals are pre-selected and placed in crews based on aptitudes, attitudes, and skills and that such crews remain intact within units for sustained periods.

2. **A school-level aircrew coordination instruction and evaluation system** - classroom and simulator training to teach aviators basic crew coordination attitudes, skills, and behaviors. The bulk of such training should occur after aviators have mastered basic "stick-and-rudder" flying skills.

3. **A unit-level aircrew coordination training and evaluation system** - training activities and instructor pilot evaluations using standard ATM tasks modified to include aircrew coordination behaviors to train and reinforce aircrew coordination skills.

4. **An aircrew coordination program evaluation and development system** - to assess the effectiveness of aircrew coordination in each of the above mentioned elements. This should include development of management procedures, evaluation projects, research studies, and structured feedback to specific program elements on effectiveness and area for improvement.

Figure 7.0-1 shows the relationships between these elements. Note, that the Program Evaluation element provides measurement of aircrew coordination performance and supports feedback to school-level and unit-level program elements to facilitate adjustments in their instruction and evaluation systems. If an organization is assigned responsibility for crew-team creation, this organization would also receive feedback from the Program Evaluation element.

The Army CMAQ and ACE Checklist should be a part of the evaluation instruments used within the Program Evaluation element. The revised ATM tasks are part of the unit-level aircrew coordination training and (field) evaluation system.

Table 7.0-1 shows a general overview of the programmatic status of aircrew coordination in the Army. Hopefully, the implementation status of these elements will be strengthened over time.

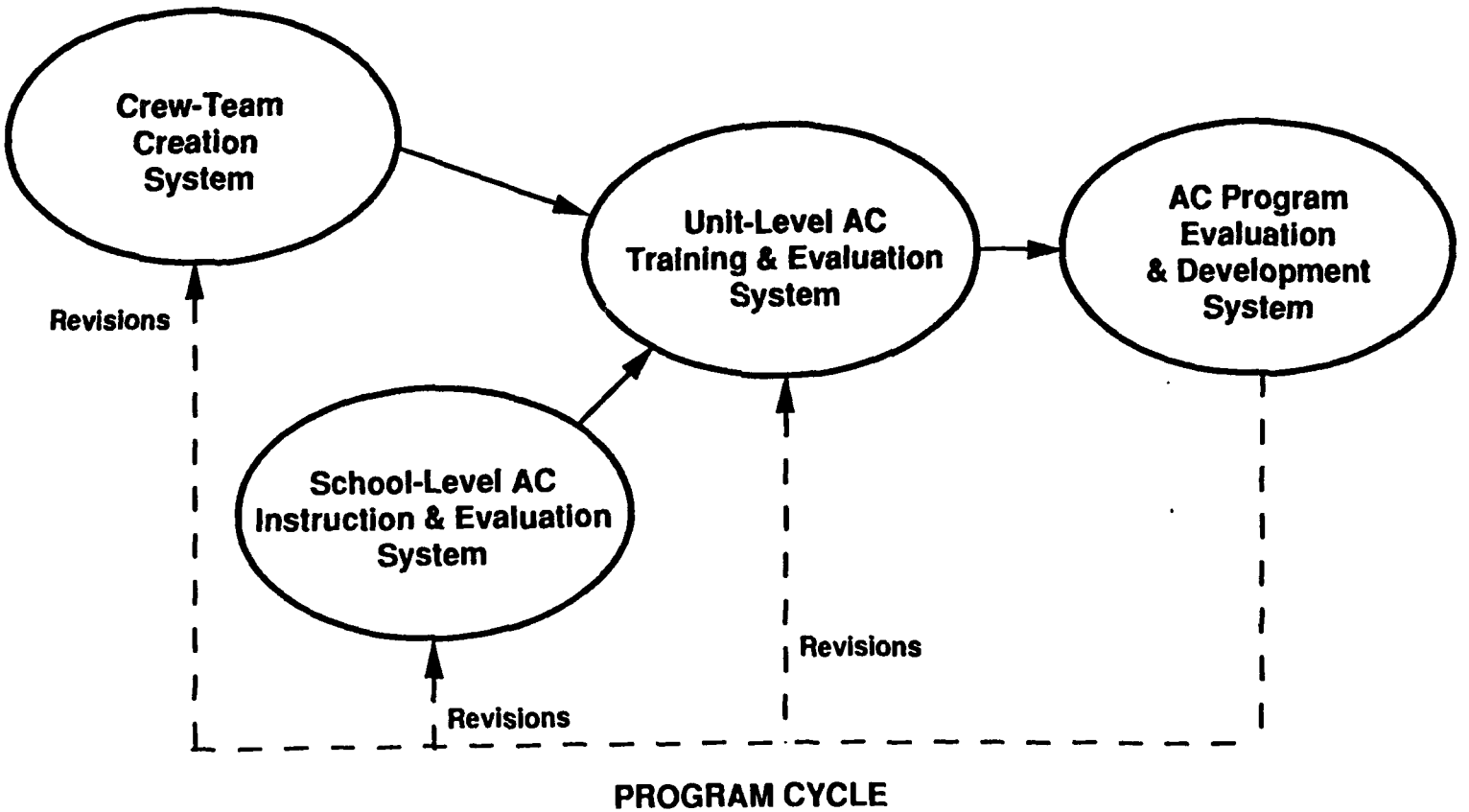

Figure 7.0-1. Army Aircrew Coordination (AC) System: Relationships Among Key Program Elements

Table 7.0-1. Programmatic Status of Aircrew Coordination in the Army

	Key Program Elements of Aircrew Coordination (AC)			
	Crew-Team Creation System	**School-Level AC Instruction & Evaluation System**	**Unit-Level AC Training & Evaluation System**	**AC Program Evaluation & Development System**
Supporting Policies	• AR 95-1 • TC-1-210	• Memo, CG USAAVNC	• Memo, CG USAAVNC	• AR 70-8 (PPTP)
Proponents/ Supporting Organizations	• DCSPER • MACOM • TRADOC USAAVNC • Units	• Branch	• USAAVNC - ATB? • MACOM/Units	• MACOM? • USAAVNC - DES? • ARI
Required Implementation Systems	• Battle rostering in units • Team creation based on attitudes, aptitudes, and skills	• Solid AC POIs • AC Course • A.C.T. Modules Embedded in Existing Courses • Flight Simulator Training for Crews	• AC Upgrades to ATM Tasks • Crew Task Evaluation Checklist • Training for IP's on Conducting Evaluations • Standardized Flight Simulator Training	• Evaluation Instruments • Training in Use of Instruments • Studies/Evaluations* • Feedback to Training & Team Creation Systems
Current Status of Implementation Systems	Weak	Weak	Weak, improvements initiated	Under Development

* Would include the use of flight simulators to conduct R&D projects and diagnostic evaluations of crew coordination

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APPENDIX A

Army Aviation Crewmember Questionnaire

Rev. 4

I. Background Information

(Please complete the following information regarding your personal experiences and current status.)

1. Aviation Experience (Flt. Hrs.)

2. Date *(day/mo/yr)* _____

	Lifetime Flying Experience		Experience over last 6 months	
	All Conditions	NV Devices (e.g., NVG)	All Conditions	NV Devices (e.g. NVG)
a. UH-60 hrs.	_____	_____	_____	_____
b. R/W hrs.	_____	_____	_____	_____
c. Fixed Wing hrs.	_____	_____	_____	_____

3. Current Rank _____

4. Current Unit (Co/Bn/Rgt) _____

5. Time in Current Unit (months) _____

6. Current Aviator Readiness Level (RL) 1 2 3 *(circle one number)*

7. Current primary duty assignment in unit *(check one)*:

IP____ SP____ UT____ IFE____ MTP____ Aviator____ Other____

8. Are you flight lead qualified *(circle one)*: Yes No

9. Have you had Aircrew Coordination Training? Y or N *(circle one: if yes, answer below .)*

Describe ACT training experiences: Course title, location of training, approximate date, # of hours of instruction, quality of course.

a. Experience #1: _____

_____

_____

b. Experience #2: _____

_____

_____

10. Cross-Indexing Code (*Note:* Your responses to this form will not be used to evaluate you and will not become a part of any permanent record relating to you. An individual identifier is necessary since you will be undertaking other related activities and we simply need a "cross-index' number to keep track of the participants in this research.)

Social Security #: _____ _____

Rev. 4

II. Opinion Survey

(Please circle the number on the agree-disagree dimension that best reflects your personal attitude toward each statement. There are no "right" or "wrong" answers. We are simply asking for your honest opinions.)

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Crewmembers should avoid disagreeing with others because conflicts create tension and reduce crew effectiveness.	1	2	3	4	5	6	7
2. Crewmembers should feel obligated to mention their own psychological stress or physical problems to other crewmembers before or during a mission.	1	2	3	4	5	6	7
3. It is important to comment about the procedures and techniques of other crewmembers.	1	2	3	4	5	6	7
4. Pilots-in-command should not dictate flight techniques to other crewmembers.	1	2	3	4	5	6	7
5. Casual social conversation during periods of low workload can improve crew coordination.	1	2	3	4	5	6	7
6. Each crewmember should monitor other crewmembers for signs of stress or fatigue, and should discuss the situation with the crewmember.	1	2	3	4	5	6	7
7. Good communications and crew coordination are as important as technical proficiency for the safety of the flight.	1	2	3	4	5	6	7
8. Crewmembers should be aware of and sensitive to the personal problems of other crewmembers.	1	2	3	4	5	6	7
9. The pilot-in-command, time and situation permitting, should take control and fly the aircraft in all emergency and non-standard situations.	1	2	3	4	5	6	7
10. The pilot flying the aircraft should verbalize plans for procedures or maneuvers and should be sure that the information is understood and acknowledged by crewmembers affected.	1	2	3	4	5	6	7
11. Pilots and other crewmembers should not question the decisions or actions of the pilot-in-command except when these actions obviously threaten the safety of the flight.	1	2	3	4	5	6	7
12. Even when fatigued, I perform effectively during most critical flight maneuvers.	1	2	3	4	5	6	7
13. Pilots-in-command should encourage pilots and crew chiefs to question procedures and flight profile deviations during normal flight operations and in emergencies.	1	2	3	4	5	6	7
14. There are no circumstances where the pilot should take the aircraft controls without being directed to do so by the pilot-in-command.	1	2	3	4	5	6	7

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
15. A debriefing and critique of procedures and decisions after each mission is an important part of developing and maintaining effective crew coordination.	1	2	3	4	5	6	7
16. Training is one of the pilot-in-command's important responsibilities.	1	2	3	4	5	6	7
17. Under high stress, good crew coordination is more important than it is under low stress conditions.	1	2	3	4	5	6	7
18. Effective crew coordination requires crewmembers to take into account the personalities of other crewmembers.	1	2	3	4	5	6	7
19. The pilot-in-command's responsibilities include coordination of inflight crew chief activities.	1	2	3	4	5	6	7
20. Most crewmembers can leave personal problems behind when flying a mission.	1	2	3	4	5	6	7
21. My decision making ability is as good in emergencies as in routine mission situations.	1	2	3	4	5	6	7
22. Leadership of the crew team is solely the responsibility of the pilot-in-command.	1	2	3	4	5	6	7
23. Crew chief questions and suggestions should be considered by the pilots.	1	2	3	4	5	6	7
24. When joining a unit , a new crewmember should not offer suggestions or opinions unless asked.	1	2	3	4	5	6	7
25. The rank differences between officer and enlisted crewmembers can create barriers that threaten mission safety and effectiveness.	1	2	3	4	5	6	7
26. Because crew chiefs have no pilot training, they should limit their attention to their formally defined crewchief duties	1	2	3	4	5	6	7
27. Pilots-in-command who accept and implement suggestions from the crew are lessening their stature and reducing their authority.	1	2	3	4	5	6	7
28. Crewmembers should monitor the pilot-in-command's performance for possible mistakes and errors	1	2	3	4	5	6	7
29. Corrections to crew mistakes should be implemented directly by the pilot-in-command whenever physically possible.	1	2	3	4	5	6	7
30. The best way to correct an error is to alert the error maker so that he can correct the problem.	1	2	3	4	5	6	7

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
31. Crewmember errors and mistakes during the mission, including the pilot-in-command's mistakes, should be a significant part of post flight crew discussions.	1	2	3	4	5	6	7
32. The pilot-in-command should seek advice from crewmembers in updating mission plans.	1	2	3	4	5	6	7
33. The pilot-in-command should use his crew to help him maintain situation awareness.	1	2	3	4	5	6	7
34. It is solely the responsibility of the pilot-in-command to maintain awareness of crew capabilities.	1	2	3	4	5	6	7
35. Only when the pilot-in-command is overloaded should he pass workload to other crewmembers.	1	2	3	4	5	6	7
36. Crewmembers should be aware of the workload placed on other crewmembers.	1	2	3	4	5	6	7
37. If a crewmember is having difficulties executing his responsibilities, other crewmembers should provide assistance.	1	2	3	4	5	6	7
38. Task overload does not occur for highly competent pilots.	1	2	3	4	5	6	7
39. A crewmember should offer task help to another crewmember only if he is sure the crewmember needs it.	1	2	3	4	5	6	7
40. A pilot-in-command should not get involved with the execution of responsibilities assigned to other crewmembers.	1	2	3	4	5	6	7
41. Task overloads of crewmembers usually occur because the overloaded crewmember is not very competent.	1	2	3	4	5	6	7
42. Pilots-in-command should employ the same style of management in all situations and with all crewmembers.	1	2	3	4	5	6	7
43. Pilot-in-command instructions to other crewmembers should be general and non-specific so that each individual can practice self-management and can develop individual skills.	1	2	3	4	5	6	7
44. A relaxed attitude is essential to maintaining a cooperative and harmonious cockpit.	1	2	3	4	5	6	7
45. Reprimands are more effective than discussions in eliminating a poor flying habit in a crewmember.	1	2	3	4	5	6	7

APPENDIX B
UH-60 Aircrew Coordination Evaluation (ACE) Checklist
(To Be Completed By Evaluator Observing the Mission)

Rev. 4

I. Flight, Crew, and Equipment Information

1. Date: _____
2. Reporting Time: _____
3. Mission Total Flying Hours: _____
4. Mission Completion Time: _____
5. Mission Total Time: _____ *(Subtract item #2 from item #4)*
6. Type Equipment: Acft Simulator *(circle one)*
7. Type Mission: SVC MTF TRNG *(circle one)*
8. NVG Used: Y or N *(circle one)* % Illumination Predicted: _____ Estimated Actual: _____
9. Mission Purpose/Description (include a listing of ATM Tasks Performed when appropriate): _____
10. Type Flight Plan: VFR IFR Composite *(circle one)*
11. Predicted Condition: VMC IMC *(circle one)*
12. Actual Condition: VMC IMC *(circle one)*
13. Crew Composition *(checkmark for each crewmember present)*

    PC _____ PI _____ CP _____ CC _____

14. Previous experience of individuals as crewmembers flying together regardless of previous seat position; for example, for a two person crew, one pair would be marked; for a three person crew, three pairs would be marked. *(Mark all pairings as appropriate.)*

Position Pairing	Estimated # Missions	Estimated # Hours
a. PC - PI	_____	_____
b. PC - CP	_____	_____
c. PC - CC	_____	_____
d. PI - CP	_____	_____
e. PI - CC	_____	_____
f. CP - CC	_____	_____

15. Cross-Indexing Code (Explain to aircrew that responses will not be used to evaluate individual aviators. Results will not become a part of the aviator's record. However, an individual identifier is necessary since most aviators will be completing other forms to support the research project.)

    Social Security Number

    a. PC _____
    b. PI _____
    c. CP _____
    d. CC _____

16. Evaluator Name: _____
17. Qualification: IP___ SP___ IE___ ME___ *(Check One)*

II. Crew Communications and Coordination

(Circle the one number on each dimension which best describes the behavior of the crew during the mission. Consult the "Instructions for Making Ratings on the ACE Checklist Dimensions" before making ratings.)

CREW COORDINATION BEHAVIORS	Very Poor	Poor	Borderline/ Marginal	Fully Acceptable	Good	Very Good	Superior
1. Thorough pre-flight mission plan developed	1	2	3	4	5	6	7
2. Statements/directives clear, timely, relevant, complete, and verified	1	2	3	4	5	6	7
3. Inquiry/questioning practiced	1	2	3	4	5	6	7
4. Advocacy/assertion practiced	1	2	3	4	5	6	7
5. Decisions communicated and acknowledged	1	2	3	4	5	6	7
6. Actions communicated and acknowledged	1	2	3	4	5	6	7
7. Crew self-critique of decisions and actions	1	2	3	4	5	6	7
8. Crewmember actions mutually cross monitored	1	2	3	4	5	6	7
9. Interpersonal relationships/group climate	1	2	3	4	5	6	7
10. Aircraft, personnel, and mission status reported	1	2	3	4	5	6	7
11. Distractions avoided or prioritzed	1	2	3	4	5	6	7
12. Workload effectively distributed/redistributed	1	2	3	4	5	6	7
13. Support information/actions sought from crew	1	2	3	4	5	6	7
14. Support information/actions offered by crew	1	2	3	4	5	6	7
OVERALL MISSION PERFORMANCE AND WORKLOAD	Very Low						Very High
15. Overall technical proficiency	1	2	3	4	5	6	7
16. Overall crew effectiveness	1	2	3	4	5	6	7
17. Overall workload	1	2	3	4	5	6	7

III. **Special Circumstances:** This section provides data on non-standard situations or behaviors that may influence crew performance. If abnormal emergency situations arose, rate the overall management of the situation. If conflicts occurred, rate how effectively they were resolved.

	Very Poor	Poor	Borderline/ Marginal	Fully Acceptable	Good	Very Good	Superior
18. Management of abnormal or emergency situation	1	2	3	4	5	6	7
19. Conflict resolution	1	2	3	4	5	6	7

20. Individual Ratings: In some cases the actions of a particular crewmember may be particularly significant to the outcome of the mission. In cases where this happens, enter the relevant item number from the above items (1-14), check the position of the crewmember rated, and circle the appropriate number on the dimension which reflects that individual's performance.

	Very Poor	Poor	Borderline/ Marginal	Fully Acceptable	Good	Very Good	Superior
_____ Item_____ /_____ /_____ /_____ PC PI CP CC	1	2	3	4	5	6	7
_____ Item_____ /_____ /_____ /_____ PC PI CP CC	1	2	3	4	5	6	7
_____ Item_____ /_____ /_____ /_____ PC PI CP CC	1	2	3	4	5	6	7

IV. **Comment on any extreme or unusual (especially 1 or 7) ratings on any item in Section II or III.**

Item #	Comments
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

V. **Comments on Extreme or Unusual Conditions or Behaviors:** Describe conditions, conflicts, or unusual individual behaviors which occurred during the mission.

_____

_____

_____

_____

_____

VI. Supplementary Information: Conditions which significantly influenced the flight (include weather, ATC information, pre-existing mechanicals, etc.) Describe below.

_____

_____

_____

_____

_____

VII. Post Flight Questions (Ask the following questions of each crewmember after completion of the flight. Record the responses below.)

1. Were you aware that this specific mission or scenario would be used prior to reporting to the flight line today? Response options are as follows:

   0 - No Information about any aspect of the mission or scenario

   1 - Slight Familiarity with the mission and/or scenario

   2 - Considerable Familiarity with the mission and/or scenario

   3 - Detailed Information on the mission and scenario

   (Circle one response for each participating crew member, (e.g., PC: (0)))

	No Information	Slight Familiarity	Considerable Familiarity	Detailed Information
1. PC:	0	1	2	3
2. PI:	0	1	2	3
3. CP:	0	1	2	3
4. CC:	0	1	2	3

2. To what extent did you experience motion sickness during this simulator session/flight? (Circle one response for each participating crewmember.)

	None	Scarcely any	Very Little	A little	Some	Quite a bit	A great deal
1. PC:	0	1	2	3	4	5	6
2. PI:	0	1	2	3	4	5	6
3. CP:	0	1	2	3	4	5	6
4. CC:	0	1	2	3	4	5	6

INSTRUCTIONS FOR MAKING RATINGS ON THE ACE CHECKLIST DIMENSIONS

Crew Communication and Coordination: Dimensions, Rating Scales, and Behavioral Anchors

I. The Basic Rating Scale

The following generic rating scale is used to assess the level of behavior observed crew exhibits for each behavioral dimension shown in the ACE Checklist. Each dimension is a seven-point scale. The scale values range from 1 (very poor) to 7 (superior). The labels for the scale values follow:

Very Poor	Poor	Borderline/ Marginal	Fully Acceptable	Good	Very Good	Superior
1	2	3	4	5	6	7

Descriptions of the types of behaviors and levels of performance for specific rating values are shown for rating values 1, 4, and 7. These descriptions serve as behavioral "anchors." These anchors are designed to assist you in evaluating crew performance for each dimension. To ensure reliable ratings, refer to these anchors in making rating responses until you are completely confident that you fully understand how to use each rating dimension.

In completing a dimension, you should decide whether the behaviors observed fall into the low end of the dimension range (values 1 or 2), the middle of the range (values 3, 4, or 5), or the high end of the range (values 6 or 7). Once you have selected the general range of response use the anchors to help select the final rating value. For example, if a crew did an adequate job of communicating, the rating would come from the middle of the range (3, 4, or 5). After making this selection, you would review the behavioral description (anchor) associated with value 4 to determine if the crew performance resembled this description (4 value), was somewhat less than this description (3 value), or was a little better than this description (5 value). The end point anchors are used in a similar fashion to help make judgements which fall near the end points of dimensions.

Army aviator crews with little or no training in aircrew coordination techniques will most frequently score in the lower parts of the scale. Beyond that, most crews will fall into the middle area of the scale. In general, keep in mind that although Army aviators are highly competent with respect to basic flying skills, as a group their coordination and communication skills will be much like the rest of the population - a few groups will have strong coordination/communication skills, a few will have weak skills, and a significant number will possess moderate skills.

II. The Dimensions and Anchors for Sections II and III

Dimension #1

Thorough pre-flight mission plan developed.

Explanation:

This dimension refers to the preflight planning executed by the crew. During this period the mission is described, mission responsibilities are partitioned, open communications are established, coordination, planning, and team creation are addressed, and problems are anticipated. Although the Pilot-in-Command (PC) has responsibility for leading this activity and setting the "tone" for the crew, the rating includes the extent and manner in which the crew participates in this preparation.

Superior Rating (7)

A clear, detailed description of the mission is provided to the entire crew through a combination of pilot-in-command briefing, and comments and questions from the crew. All mission responsibilities are partitioned and clearly assigned to specific individuals. Mission tasks are clearly specified in terms of what is to be done, why it is to be done, how well, by whom, in what priority, and with what resources and information. Questions regarding mission and specific responsibilities are encouraged and crewmembers thoroughly discuss them. All crewmembers verbally acknowledge their specific responsibilities. Potential mission problems are noted and discussed in detail and courses of action and individual responsibilities established in the event that these problems actually occur. At the close of the preflight briefing the pilot-in-command briefly summarizes the decisions made. All crewmembers speak and actively contribute to the preflight planning. At the end of the briefing it is clear that individuals completely understand their responsibilities, the responsibilities of the other members of the crew, and have a clear sense of how responsibilities are to be re-allocated based on foreseeable contingencies. The tone of the interaction is friendly and professional with some humor shown. There are no verbal attacks during the planning; all crewmembers are accorded respect. There is a reasonable amount of redundancy in the transmission of the information, thus ensuring that the mission plan and mission responsibilities are understood.

Fully Acceptable Rating (4)

A brief description of the mission is provided to the entire crew through a combination of pilot-in-command briefing and comments and questions from the crew. The mission responsibilities are partitioned and assigned to specific individuals. Potential mission problems are only briefly discussed prior to the flight. Crewmembers make several comments during the course of the meeting. There is limited redundancy in the presentation of information. There is adequate preparation for contingencies. The tone of the interaction is generally friendly and businesslike.

Very Poor Rating (1)

The mission is very briefly presented by the pilot-in-command with little or no attendant explanation. In the preflight meeting there is little or no discussion of responsibilities or their assignments to specific crewmembers. Crewmembers tend not to ask questions about the mission during the meeting. Each crewmember assumes he knows his responsibilities without checking with other members to verify and coordinate responsibilities. There is little or no mention of any potential problems or complications which may arise. The tone of the interaction is business-like, abrupt, and impersonal. Questions tend to be cut off, only briefly addressed, or ignored by the other crewmembers. In this crew environment, the questioner may be verbally attacked or belittled for persisting. These "put-downs" may be very subtle, but they affect the crew. Limited information is presented and there is little or no redundancy in presentation of the information.

Dimension #2

Statements/directives clear, timely, relevant, complete, and verified

Explanation:

Rate the completeness, timeliness, and quality of information transfer. Carefully consider the feedback techniques employed by the crew to verify information transfer. Particular evaluator attention should be focused on the quality of instructions and statements that are associated with obstacle clearing activities and instrument readouts.

Superior Rating (7)

Crewmembers communicate frequently. Senders almost always provide clear, concise information. Receivers verbally acknowledge nearly all messages in sufficient detail so that the sender can verify that the receiver understands the message. Both senders and receivers use standard terminology for nearly all communications. Receivers ask for clarification when they do not understand. Senders pursue feedback when no response is forthcoming. Whenever a workload shift or task responsibility transfer occurs during the mission, the change is communicated and acknowledged by the crew. All obstacle clearing and "inside" cockpit duties are clearly stated, acknowledged and updated.

Fully Acceptable Rating (4)

Crewmembers communicate about the mission as required. Receivers verbally acknowledge most messages. Receivers ask questions when they do not understand. Senders usually pursue feedback when no response is forthcoming. Standard terminology is usually used. Crewmembers are appraised of changes to responsibilities during the flight. "Inside" and "outside" cockpit duties are precisely specified and communicated to others.

Very Poor Rating (1)

Crewmembers fail to make statements regarding critical information. Sender messages are inappropriately delayed or irregular and may be confusing. Receivers usually do not verbally acknowledge the receipt of messages. Receivers do not ask questions. Senders do not pursue feedback when no response is forthcoming. Non-standard terminology is used or standard terminology is used inappropriately. Changes in responsibilities during the mission are often not communicated and may result in confusion over who has a task responsibility. Descriptions of the locations of obstacles to be avoided may be incomplete or confusing. There are times when "inside" or "outside" cockpit responsibilities are not clearly communicated among the crew.

Dimension #3

Inquiry/questioning practiced

Explanation:

This dimension captures the extent to which crewmembers raise questions during the flight regarding plans, revisions to plans, actions to be taken and the status of key mission information. It addresses the extent to which crewmembers maintain situational awareness and contribute to decision making through such practices. When inquiry/questioning is practiced, the crew presents the pilot-in-command (PC) with alternative actions and, likewise, the PC fairly considers crew input.

Superior Rating (7)

During the flight crewmembers often raise questions regarding plans or changes to plans and actions. Virtually all of these inquiries surface information that contribute to the mission decision making process. Crewmembers respond to these inquiries with sound, task-focused discussions and clear answers that are provided in a timely manner. Crewmembers inquiries are never ignored. All crewmembers encourage such questioning.

Fully Acceptable Rating (4)

During the flight, crewmembers occasionally raise questions regarding plans or actions whenever they are unclear regarding decisions being made. Most of these inquiries provide information that is relevant to the mission decision making process. Crewmembers usually respond to these inquiries with brief but reasonable answers. Crewmembers' inquiries are encouraged by other crewmembers most of the time.

Very Poor Rating (1)

During the flight crewmembers almost never raise any questions regarding plans, actions, or changes to plans. The few inquiries that are made are generally ignored or abruptly answered. The pilot-in-command makes mission decisions without seeking inputs from other crewmembers. Crewmembers may suppress question asking by other crewmembers by their tone of voice and lack of response.

Dimension #4

Advocacy/assertion practiced

Explanation:

This dimension measures the extent to which crewmembers advocate a course of action they consider best, even when it may be in disagreement with others. (Except under extreme emergency conditions, where time is absolutely critical, it is usually in the crew's best interest to hear the full range of options available.)

Superior Rating (7)

During missions, crewmembers state to the rest of the crew the course of action they consider best. They clearly explain their reasons for believing this to be the best course. Other crewmembers listen to the argument before presenting any criticism or proposing alternate courses. Arguments focus on the strengths and weaknesses of the proposed course of action, not on the personality of the action proposer. Other crewmembers concur with proposed actions when the supporting argument is sound. Crewmembers are frequently encouraged or asked by other crewmembers to state their ideas. In addition, crewmembers speak out whenever they have a piece of information important to another's decision process or task execution and actively seek assurances that presented information has been received.

Fully Acceptable Rating (4)

During missions, crewmembers state to the rest of the crew the course of action they consider best. Each crewmember makes an effort to explain his position and convince others to concur with him on the course of action to be taken. Each crewmember also speaks out when he has a piece of information that is essential to the proper execution of another crewmember's task. He provides this information in a clear and timely manner. Other crewmembers expect such open comments and view them as positive contributions to mission performance.

Very Poor Rating (1)

During missions, crewmembers almost never suggest a course of action. The pilot-in-command makes nearly all decisions without requesting ideas on possible courses of action from his crew. Crewmembers attempting to propose a course of action are frequently cut off before they can propose an action or explain the rationale for that action. Proposed courses of action may be met with personal attacks on the proposers. Crewmembers are not encouraged by other crewmembers to present their ideas. Crewmembers may even fail to intervene when risks such as obstacles and poor visability arise.

Dimension #5

Decisions communicated and acknowledged

Explanation:

Rate the extent to which decisions are actually made and announced to the crewmembers after input is solicited from them. Crewmembers should acknowledge and understand when a decision has been made and what it is. Failure to do this may confuse crews and lead to uncoordinated operation. Note: Due to time constraints in certain situations, often there is little or no time for crew input to a decision. In this case, raters should focus on the extent to which a decision has been acknowledged verbally or through coordinated, pre-planned action.

Superior Rating (7)

Pilot-in-command states his decision and, time permitting, provides an explanation of the reasons for his decision. Crewmembers acknowledge awareness of the decision with a clear verbal response. Crewmembers ask questions to clarify any confusion. The pilot-in-command answers all questions in a clear, positive, straight-forward manner. Pilot-in-command requests acknowledgement of decision if no response is forthcoming from crewmembers. Crewmembers are particularly attentive to the communication of workload responsibilities.

Fully Acceptable Rating (4)

Pilot-in-command states his decisions along with a brief explanation of the reasons for this decision. Crewmembers acknowledge their awareness of the decisions and ask questions to clarify any confusion. The pilot answers questions regarding his decision clearly and quickly.

Very Poor Rating (1)

The decisions and actions are often not passed on to the crew. The crew is often not aware that a decision has been made. The crew only infrequently asks questions of clarification. The pilot-in-command usually does not acknowledge or respond to questions when asked. Crewmembers are often unsure what responsibilities have been assigned to them.

Dimension #6

Actions communicated and acknowledged

Explanation:

Rate the extent to which actions are announced to the crewmembers. Crewmembers should respond verbally or with the appropriate adjustment to their behaviors, actions or control inputs.

Superior Rating (7)

Pilot-in-command states his actions and, time permitting, provides an explanation of intent. Crewmembers keep PIC informed of the results of their activities and changing responsibilities - especially when there are changes in visual area of responsibility or task focus. Results of actions, or changes in task and visual responsibility are clearly acknowledged by the crew who then state their intended adjustments based on the information provided. If no acknowledgement or adjustment is made by other crewmembers, the PIC requests acknowledgement. When assuming control of the aircraft or making control inputs, notification is always given and acknowledgement received.

Fully Acceptable Rating (4)

Pilot-in-command states his actions along with a brief explanation of the reasons for his actions and informs crew of the adjustments they are expected to make. The crew acknowledges PIC directions and asks questions for clarification if necessary. The pilot answers questions clearly and quickly and the crew rapidly makes adjusts to the new situation. When assuming control of the aircraft or making control inputs, notification is given.

Very Poor Rating (1)

Pilot-in-command takes unilateral action and does not explain or inform crew of its intended purpose. Crew may or may not know how to react to changed circumstances. Crewmembers may take uncoordinated actions without stating intentions or results. Two pilots may attempt to simultaneously take control of the aircraft when flight control authority is unclear.

Dimension #7

Crew self-critique of decisions and actions

Explanation:

This rating evaluates the extent to which the crew reviews and critiques their actions during or following a flight segment, or during the post flight debrief.

Superior Rating (7)

Following a flight segment, during low workload periods, or during post-flight debrief, crewmembers review their decisions and actions. They note any additional options that should have been included in the decision process. They review factors considered in making each of the decisions. They point out to each other information that should have been considered and factors that should have been weighted more heavily in the decision process. All discussions focus on behaviors and information and carefully avoid any "finger pointing" tones. The focus is clearly on education and understanding in order to improve future crew performance.

Fully Acceptable Rating (4)

Following a flight segment or during post-flight debrief, crewmembers review their decisions and actions. They note other options that may have been possible that were overlooked. They make recommendations regarding other decision options and improvements to coordination that should occur in future flights. The interactions are positive and remain focused on the behaviors and decisions. There is no "finger pointing."

Very Poor Rating (1)

Crewmembers do not review their decisions and actions either during or after a flight segment or during post-flight debrief. Where discussions of previous actions or decisions do occur, they often focus on "pointing the finger" at the party who made an error or poor decision. There is little effort to learn from the previous decisions.

Dimension #8

Crewmember actions mutually cross monitored

Explanation:

Crewmembers are capable of catching each other's errors. This dimension captures the extent to which a crew uses cross monitoring as a mechanism to avoid errors. Such redundancy is likely to be particularly important when crews are fatigued or overly focused on critical task elements, and thus more prone to make errors. Note, however, that this dimension does not imply that task responsibilities are not clearly defined. It asks the question "To what extent do crewmembers help an individual assigned a primary task/action responsibility by reviewing the quality of that individual's task execution and alerting him to any mistake noted?"

Superior Rating (7)

Each crewmember is concerned that all tasks are properly executed and checks both his tasks and those of others to be sure that tasks have been properly executed. Such checks are a normal and continuous part of crew operations. When mistakes are noted, the crewmember making the error is quickly informed in a concise manner without excessive formality. The mistake maker accepts this review and feedback as a normal part of flight operations.

Fully Acceptable Rating (4)

Crewmembers often check each other's task performance for errors. Mistake makers are informed and quickly make the needed corrections. Only occasionally are mistake makers annoyed at being checked and corrected.

Very Poor Rating (1)

Crewmembers seldom, if ever, check each other's task execution. Crewmembers are insulted if they are corrected by another crewmember.

Dimension #9

Interpersonal relationships/group climate

Explanation:

This rating assesses the quality of relationships among the crew and the overall climate of the flight deck. Note that periods of low workload, personal, non-mission related conversation is appropriate and acceptable as part of the process of developing and maintaining relationships. Such casual conversations should not, however, occur during periods of high workload.

Superior Rating (7)

The crewmembers have very good interpersonal relationships. They respect each others' skills and appear to enjoy being with each other. The climate is very open; crewmembers freely talk and ask questions. During periods of low workload, crewmembers casually discuss non-operational issues (e.g., family outings, sports, music, food.) There is a genuine concern for good working relationships. There are significant amounts of humor in the interactions. There are no degrading comments or negative voice tones used in interactions.

Fully Acceptable Rating (4)

The crewmembers have sound interpersonal relationships and seem to respect each others' skills. The climate is an open one and crewmembers are free to talk and ask mission questions as necessary.

Very Poor Rating (1)

The crewmembers do not appear to like or respect each other. The crew interactions are often awkward and uncomfortable. Crewmembers may be curt and impolite to each other. During periods of low workload crewmembers generally remain silent. Requirements for assistance are made as commands rather than as requests for support.

Dimension #10

Aircraft, personnel, and mission status reported

Explanation:

This dimension captures the extent to which crew members keep each other informed regarding the status of the aircraft and mission completion. This information reporting helps maintain a high level of situation awareness among the flight crew. Information reported includes:

- o Aircraft position/orientation,
- o Environmental/battlefield conditions,
- o Equipment status,
- o Personnel status, and
- o Changes to mission objectives.

Crew-wide situation awareness is an essential element of safe flying and effective crew performance.

Superior Rating (7)

Crewmembers frequently provide each other with updates regarding the status of the elements of situation awareness and the status of the mission. Crewmembers anticipate situation awareness needs of others, and will always request information when the needed information is not forthcoming. Crewmembers are aware of the mental and physical states of one another and are not hesitant to alert crew members to personal problems that could undermine effective performance. Personnel status is voluntarily shared without fear of sanctions by other crewmembers. Significant changes in the elements of situation awareness are verbalized and acknowledged. Crewmembers are particularly attentive to the need to alert other crewmembers of the presence of obstacles.

Fully Acceptable Rating (4)

Crewmembers occasionally provide updates on the status of elements of situation awareness and the status of the mission. Changes to the situation awareness elements are verbalized. Obvious changes in personnel status are noted and acknowledged without fear of sanctions.

Very Poor Rating (1)

Crewmembers do not routinely provide updates on the status of the aircraft or the status of the mission. Generally, updates are provided only upon request, not voluntarily. Personnel problems such as fatigue or lack of attention are never mentioned.

Dimension #11

Distractions avoided or prioritized

Explanation:

This is a rating of the effectiveness of time and work management and the ability of the crew to avoid being distracted from essential activities.

Superior Rating (7)

Virtually all distractions are avoided. Each crewmember understands precisely what information is relevant to the mission and what is simply a distraction. If a crewmember becomes mildly distracted, other crewmembers remind him to return to a mission task focus. Non-critical duties are prioritized and delayed until low workload periods or post-flight periods.

Fully Acceptable Rating (4)

Most distractions are avoided. The crew performs well in deciding what information and activities are essential to the mission. Most non-essential information is ignored. Non-critical duties are prioritized and delayed until low workload periods or post-flight periods.

Very Poor Rating (1)

The crew is easily distracted. The crew is unable or unwilling to decide what is important and relevant to the immediate mission. There is little prioritizing of duties or actions. Time and energy are wasted on low priority tasks. Risks to crew safety may occur as a result of crew attention being focused on minor tasks when critical tasks require immediate attention. (e.g., setting a radio frequency when attention should be focused on clearing an obstacle.)

Dimension #12

Workload effectively distributed/redistributed

Explanation:

This is a rating of how well the crew as a team managed to distribute the workload and avoid individual crewmember overload.

Superior Rating (7)

Crewmembers are aware of build ups of workload on individual crewmembers. They seek to redistribute workload to others whenever it appears that an individual crewmember is beginning to acquire responsibility for a disproportionate part of the workload. All tasks are accomplished in a concerted manner with crewmembers cooperatively readjusting the workload by assuming emerging, unassigned tasks appropriate for their duty station. Overloads do not occur; the crew is always "ahead of the aircraft."

Fully Acceptable Rating (4)

Crewmembers are aware of individual crewmember workloads during each phase of the mission. When an individual crewmember appears to be experiencing an overload, other crewmembers take on part of the workload to reduce the overload situation.

Very Poor Rating (1)

Workload overloads for individual crewmembers occur. No actions are taken to eliminate the overload condition either by the overloaded party or other crewmembers. The crew makes little or no effort to redistribute task responsibilities as mission changes occur and new tasks arise.

Dimension #13

Support information/actions sought from crew

Explanation:

This is a rating of the extent to which support information and support actions are sought from the crew by a crew member, usually the pilot-in-command.

Superior Rating (7)

When the pilot-in-command realizes there is a decision to be made during planning or in-flight, for which there is not a clear standardized answer, he immediately alerts the crew to the situation and seeks suggestions on possible solutions and important information to consider. The pilot-in-command is very open to all suggestions. He provides encouragement if the crew is hesitant to speak out with suggestions or information. He acknowledges appreciation for their input and asks clarification questions as necessary. When he asks for assistance with actions he clearly states what assistance is required. He provides quick, clear feedback if the crewmember response is not what he expects. He is patient but focused. He usually asks for assistance well before becoming overloaded.

Fully Acceptable Rating (4)

The pilot alerts the crew to the need for decision input. He listens to suggestions without interruption or criticism. He asks for clarification as necessary. He only asks for assistance when he has become overloaded.

Very Poor Rating (1)

The pilot does not request decision support information from the crew. He does not even alert them that he is in the process of making a decision. Decision-making and planning are accomplished by one individual with little or no discussion - an observer will have difficulty noting this dimension for "very poor" crews since it is hard to detect individual decision making. The pilot-in-command may not ask for crew assistance with tasks even when he is overloaded to the point where he may fail to properly execute his tasks. Such overloads are particularly critical when the pilots are attempting to clear obstacles, takeoff, land, or are operating in confined areas.

Dimension #14

Support information/actions offered by crew

Explanation:

This is a rating of the extent to which crew members anticipate and offer support information and support actions to the decision maker, usually the pilot-in-command, when it becomes apparent that a decision must be made or an action taken.

Superior Rating (7)

The crew recognizes that a decision must be made and offers suggestions and information to the pilot-in-command. The information is repeated, as necessary, to be sure the PIC has understood the input. The crew checks for responses from the PIC indicating that he understands. PIC responses can be verbal or non-verbal actions. Clearly the crew seeks information and provides it to support PIC decisions and actions. The crew frequently offers task execution support. The support offered is always in synchrony with PIC task needs. Crews are quick to offer support to particularly difficult tasks such as obstacle clearing.

Fully Acceptable Rating (4)

The crew recognizes that a decision or action must be made and offers suggestions and information to the pilot-in-command. The crew sometimes offers task execution support.

Very Poor Rating (1)

The crew does not offer suggestions and inputs to support decision making or actions. Moreover, it often appears that the crew often does not even realize that a decision is being made. The crew generally does not offer their services to support task execution for other crewmembers. Crewmembers may fail to offer obstacle clearing support.

Dimension #15

Overall technical proficiency

Explanation:

This is a rating of how well the crew as a unit discharged the technical aspects of the flight. For example, this covers adherence to regulations and procedures and "stick and rudder" proficiency. Technical proficiency is enhanced by aircrew coordination, but it is mostly a measure of the combined skills of the individual crewmembers.

Very High Proficiency Rating (7)

This crew demonstrated exceptional flying skills and adhered to all fundamental regulations and procedures. Fewer than five crews in one hundred will be this good or better. If one crewmember is technically weak, the others are able to compensate and take advantage of the situation to teach a new skill or improve one that is weak.

Fully Acceptable Proficiency Rating (4)

Sound flying skills are demonstrated. The crew adheres to all fundamental regulations and procedures.

Very Low Proficiency Rating (1)

Flying skills are relatively weak. There are instances where fundamental regulations and procedures may be overlooked, ignored, or violated. Only five crews in one hundred will be this poor or poorer.

Dimension #16

Overall crew effectiveness

Explanation:

This rating is a composite judgement of how effectively the crew conducted the mission. It includes both the technical and the resource management aspects of the operation. This dimension asks that the rater to reflect on the previous judgements and then provide a "global" impression of the effectiveness of the crew.

Very High Effectiveness Rating (7)

All mission requirements are met to standard, or time, and with very little unnecessary stress for the individual crewmembers. The overall mission execution is judged to be highly successful. The crew demonstrates superior aircrew coordination and the technical execution of the mission is exemplary. Only five crews in one hundred will be this effective or more effective.

Fully Acceptable Effectiveness Rating (4)

All mission requirements are met to standard and are completed on time. The overall mission performance is perceived to be entirely adequate. The crew demonstrates fully adequate aircrew coordination and technical execution of the mission.

Very Low Effectiveness Rating (1)

Mission is completed but one or more standards are not met or violated. The mission execution time may be longer than expected. The crew's effectiveness was significantly below that expected. The crew does not demonstrate adequate aircrew coordination techniques. Overall mission performance is perceived to be weak. Only five crews in one hundred will be this poor or poorer.

Dimension #17

Overall workload

Explanation:

This rating describes how heavy the workload of the crew was over the course of the mission when contrasted with other possible missions. This rating is related to the basic complexity of the mission. The rating is not defined by the behaviors of the crew.

Very High Workload Rating (7)

High levels of workload occur for most crewmembers throughout the mission. Fewer than five in one hundred missions have workload levels this high or higher.

Average Workload Rating (4)

Most crewmembers have moderate levels of workload throughout the mission with occasional peaks. This is the workload level that typically occurs for missions.

Very Low Workload Rating (1)

Most crewmembers have relatively low levels of workload during the mission. Only five in one hundred missions have workload requirements this low or lower.

III. Special Circumstances Section of ACE Checklist

Dimension #18

Management of abnormal or emergency situation

Explanation:

This rating evaluates the crew's performance under unusual circumstances that may involve high levels of stress. This judgement includes both the technical and managerial aspects of coping with the situation. Describe the abnormal or emergency situation in Section V and comment on any aspects of behavior in Section IV.

Superior Rating (7)

The crew remains calm during the situation. Each crewmember seeks to understand the problem and provides the pilot-in-command with essential information. Each crewmember immediately takes on particular workload responsibilities based on prior discussions of potential deviations which could occur during the mission. The crew effectively communicates their actions and results to others and feedback is given by others to ensure complete coordination of crew efforts. Each crewmember handles his own responsibilities and seeks to support the crewmember having the greatest workload. The crew rapidly imposes the maximum amount of control possible over the situation given the limits of the resources available. The crew makes excellent use of the time and resources available. A high level of situation awareness is maintained throughout the event.

Fully Acceptable Rating (4)

The crew responds to the problem immediately. The pilot-in-command's requests for information are met by immediate feedback from the crew. The crew takes actions to reduce the overload that is occurring on the pilot-in-command and provides all necessary information even if it is not specifically requested. The pilot and crew make good use of the resources available to them. The crew is intense but not flustered by the situation. Adequate situation awareness is maintained throughout the event.

Very Poor Rating (1)

The crew becomes disorganized and flustered. The pilot-in-command's requests for information elicit inadequate responses. Crewmembers may focus on the wrong issues. Often these crews may focus on only one solution to an event, not consider other plausible alternatives, or choose an inappropriate solution. Lack of coordination of actions adds to the confusion. The pilot and crewmembers make poor use of the resources available to them to resolve the problem. Situation awareness appears to significantly decay during the situation.

Dimension #19

Conflict resolution

Explanation:

If crewmembers encounter conflict in attempting to decide a course of action, rate the crew's effectiveness in resolving the conflict.

Superior Rating (7)

The crew directly confronts the issues over which the disagreement began. Disagreements are perceived as a normal part of crew interactions. Mission performance/effectiveness is addressed in another dimension. Arguments focus on behaviors rather than personality. Each crewmember carefully listens to the other's comments. Senior crewmembers are accepting of challenges from junior crewmembers. Alternative solutions are explored. The solution produced is a "win-win" situation in which the feelings of all crewmembers are considered. There are no hard feelings among the crewmembers at the conclusion of the incident.

Fully Acceptable Rating (4)

The crew directly confronts the issues over which the disagreement began. There is a primary focus on behaviors and no personal attacks in the heat of the discussion. The solution is generally seen as reasonable. Problem resolution ends on a positive note with very little hostility or grumbling between crewmembers. Mutual respect is clearly intact.

Very Poor Rating (1)

The crew fails to directly confront the situation-at-hand. There are personal attacks on each other. Senior crewmembers are highly resistant to recommendations from junior crewmembers. Crewmembers do not explore the range of possible solutions. They may shout and argue without finding a solution or one crewmember may decide (given the personal "put-downs") to retreat to a hostile silence. The crewmembers show very little respect for one another with the exception of deferring to formal rank. A "win-lose" situation develops where one crewmember is shown to be right and the other to be wrong.

Dimension #20

Individual Ratings

Explanation:

In some circumstances, particular individuals may stand out from other crewmembers. For example, a pilot-in-command might be particularly insensitive to other crewmembers and or a copilot might show extremely effective use of "advocacy" in getting decision alternatives across. In such situations, indicate the relevant item number (e.g. #3) and assign a rating for the particular crewmember. These ratings are particularly important to us in attempting to understand the processes that crews use. Please fill out these ratings whenever an individual's behavior is unusual or noteworthy.

Comment and Supplementary Information Sections

IV. & V. Comments on Extreme or Unusual Behavior: This section provides space for comments on extremely good or poor performance as well as specific observations by the rater that can provide insight into the performance of the observed crew. Because the whole process of crew evaluation is under development, this is an extremely important source of data for the research program.^C

VI. Supplementary Information: This section is to provide information on any special circumstances which influenced the flight, including weather, ATC problems, pre-existing mechanicals, etc. Please be as specific as possible.

ATTACHMENT C: REVISED AIRCREW TRAINING MANUAL TASKS

Enclosure 1 to this attachment contains the original ATM tasks extracted from TC 1-212 with proposed changes highlighted to identify the modifications necessary to include aircrew coordination behaviors. Enclosure 2 provides both the instructions for use of the modified ATM tasks and the rewritten tasks incorporating all changes.

ENCLOSURE 1

ATM TASKS SELECTED FOR REWRITE TO INCLUDE AIRCREW COORDINATION BEHAVIORS WITH MODIFICATIONS HIGHLIGHTED

1. Within Enclosure 1, the ATM tasks selected for rewrite are in their original format with the changes made to incorporate aircrew coordination behaviors highlighted. Highlighting was accomplished in two different ways:

a. For material added, the lettering is in capital letters; e.g., Task 1001, Standards paragraph 9.

b. For material deleted, the lettering is in stikeout format; e.g., Task 1071, Standards paragraph 1.

2. The revised ATM tasks in final format with modifications incorporated are at Enclosure 2 to this attachment.

TASK: Plan a VFR flight.

CONDITIONS: Prior to flight in a UH-60 helicopter or a UH60FS and given access to weather information; NOTAMs; flight planning aids; necessary charts, forms, and publications; and weight and balance information.

STANDARDS:

1. Determine if the aircrew and aircraft are capable of completing the assigned mission.

2. Determine if the flight can be performed under VFR according to AR 95-1.

3. Check applicable publications and determine, without error, if there are any restrictions on departure, en route, and at destination.

4. Select course(s) and altitude(s) which best ensure mission completion, and correctly compute magnetic heading(s) within ±5 degrees.

5. Determine distance ±1 nautical mile, ground speed ±5 knots, and ETE ±3 minutes for each leg of the flight.

6. Determine fuel requirement from takeoff to destination, plus fuel reserve, ±40 pounds.

7. Without error, verify that the aircraft will remain within weight and CG limitations for the duration of the flight.

8. Complete and file the flight plan according to AR 95-1 and the DOD FLIP.

9. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

10. CREWMEMBERS ARE BRIEFED ON ALL ASPECTS OF THE MISSION.

DESCRIPTION: EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. In planning a VFR flight, first ensure that all crew-members are current and qualified to accomplish the mission. Then ascertain that the aircraft is capable of completing the mission. Using USAF, FAA, or host country weather facilities, obtain information about the weather. After ensuring that the flight can be completed under VFR, check NOTAMs and the Army Aviation Flight Information Bulletin for any restrictions applicable to the flight. Obtain charts that cover the entire flight area, and allow for changes in routing that may be required because of the weather or terrain. Select the course(s) and altitude(s) that will best facilitate mission accomplishment. Use a CPU-26A/P computer/Weems plotter (or equivalent) to plot the flight, and determine magnetic heading, ground speed, and ETE for each leg. Compute total distance and flight time, and calculate required fuel using the appropriate charts in TM 55-1520-237-10. Ensure weight and

balance forms kept in the aircraft logbook apply to aircraft load and CG limitations per AR 95-16. Verify that the aircraft weight and CG will remain within allowable limits for the entire flight. Complete DD Form 175 (Military Flight Plan) or an equivalent form, and file the flight plan. BRIEF CREWMEMBERS ON THE RESULTS OF THE PLANNING EFFORT AND THE MISSION PROFILE TO BE FLOWN; AND DISCUSS CONTINGENCIES THAT MAY ARISE. ASSIGN DUTIES AND RESPONSIBILITIES FOR THE ENTIRE MISSION AND OBTAIN CREWMEMBER ACKNOWLEDGEMENT. DISCUSS TASK 1071 AND HOW IT APPLIES TO THIS MISSION.

REFERENCES:

AR 95-1
AR 95-10
AR 95-14
AR 95-16
AR 95-50
FM 1-204
FM 1-230
FM 1-240
FM 1-300
TM 55-1500-342-23
TM 55-1520-237-10
DOD FLIP
FAR/host country regulations
Local SOPs and regulations

TASK: Plan an IFR flight.

CONDITIONS: Prior to IFR flight in a UH-60 helicopter or a UH60FS and given access to weather information; NOTAMs; flight planning aids; necessary charts, forms, and publications; and weight and balance information.

STANDARDS:

1. Determine if the aircrew and aircraft are capable of completing the assigned mission.

2. Determine if the flight can be performed according to AR 95-1.

3. Check applicable publications and determine, without error, if there are any restrictions on departure, en route, and at destination.

4. Select route(s) which avoid severe weather hazards, conform to known preferred routing, and are within the capability of aircraft equipment. If off-airway, determine course(s) within ±5 degrees.

5. Select altitude(s) which avoid icing level and turbulence, are above minimum altitudes, conform to the semicircular rule (when applicable), and do not exceed aircraft or equipment limitations.

6. Select an approach which is compatible with the weather, approach facilities, and aircraft equipment, and determine if an alternate airfield is required.

7. Determine distance ±1 nautical mile, true airspeed ±3 knots, ground speed ±5 knots, and ETE ±3 minutes for each leg of the flight.

8. Determine fuel requirement from takeoff to reach the destination and alternate airfield (if required), plus fuel reserve, ±40 pounds.

9. Without error, verify that the aircraft will remain within weight and CG limitations for the duration of the flight.

10. Complete and file the flight plan according to AR 95-1 and the DOD FLIP.

11. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

12. CREWMEMBERS ARE BRIEFED ON ALL ASPECTS OF THE MISSION.

DESCRIPTION: EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. In planning an IFR flight, first ensure that all crew members are current and qualified to accomplish the mission. Then ascertain that the aircraft is capable of completing the mission. Using USAF, FAA, or host country weather facilities, obtain information about the weather. Compare destination forecast and approach minimums, and determine if an alternate airfield is required. Ensure

that the flight can be completed according to AR 95-1. Check NOTAMs and the Army Aviation Flight Information Bulletin for any restrictions applicable to the flight. Obtain 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 routing. Use a CPU-26A/P computer/Weems plotter (or equivalent) to plot the flight, and determine magnetic heading, ground speed, and ETE for each leg, including flight to the alternate airfield if required. Compute total distance and flight time, and calculate required fuel using the appropriate charts in TM 55-1520-237-10. Ensure weight and balance forms kept in the aircraft logbook apply to aircraft load and CG limitations per AR 95-16. Verify that the aircraft weight and CG will remain within allowable limits for the entire flight. Complete DD Form 175 or an equivalent form, and file the flight plan. BRIEF CREWMEMBERS ON THE RESULTS OF THE PLANNING EFFORT AND THE MISSION PROFILE (INCLUDING ALTERNATES) TO BE FLOWN; AND DISCUSS CONTINGENCIES THAT MAY ARISE. ASSIGN DUTIES AND RESPONSIBILITIES FOR THE ENTIRE MISSION AND OBTAIN CREWMEMBER ACKNOWLEDGEMENT. DISCUSS TASK 1071 AND HOW IT APPLIES TO THIS MISSION.

REFERENCES:

AR 95-1
AR 95-10
AR 95-14
AR 95-16
AR 95-50
FM 1-204
FM 1-230
FM 1-240
FM 1-300
TM 55-1500-342-23
TM 55-1520-237-10
DOD FLIP
FAR/host country regulations
Local SOPs and regulations

TASK: Perform engine-start, run-up, and before-takeoff checks.

CONDITIONS: In a UH-60 helicopter or a UH60FS with TM 55-1520-237-CL.

STANDARDS:

1. Without error, perform procedures and checks according to TM 55-1520-237-CL.

2. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. Start the engine according to TM 55-1520-237-CL, and accomplish aircraft system checks in the appropriate sequence. REQUEST PILOT NOT FLYING TO ASSIST IN COMPLETING REQUIRED CHECK(S). ~~Record~~ ENSURE appropriate information IS ENTERED on applicable aircraft logbook forms. ENSURE EXTERNAL COMMUNICATIONS ARE ESTABLISHED, REQUIRED CONTACTS MADE, AND CLEARANCES VERIFIED. REQUEST CREWMEMBERS ASSIST IN PASSENGER SECURITY AND IN KEEPING AIRCRAFT CLEAR OF HAZARDS WHILE UNDERWAY.

NOTE: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

NIGHT OR NVG CONSIDERATIONS:

1. Before starting the engines or performing the run-up check, ensure all internal and external lights are operational and properly set. Lighting levels must be high enough so ~~aviator~~ CREWMEMBERS can easily see the instruments and start the engines without exceeding operating limitations. ~~The aviator not on the controls~~ CREWMEMBERS should ALSO assist in clearing the aircraft~~. As necessary, he should also assist~~; AND in completing AND VERIFYING all required checks.

2. MAINTAIN A HIGH LEVEL OF INTRA-CREW COMMUNICATION TO ENSURE THAT ALL FLIGHT PARAMETERS ARE ACCEPTABLE AND SAFETY MARGINS ARE OBSERVED.

REFERENCES:

AR 95-1
TM 55-1520-237-10
TM 55-1520-237-CL
Engine HIT log
Unit SOP

TASK: Perform ground taxi.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-taxi check completed and aircraft cleared.

STANDARDS:

1. Maintain a constant speed appropriate for conditions.

2. Maintain desired track.

3. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS WILL MAINTAIN VIGILANCE AND INFORM OF OBSTRUCTIONS, OTHER AIRCRAFT, OR SIMILAR HAZARDS. IF ROTOR CLEARANCE IS IN DOUBT, OBTAIN GROUND GUIDE OR DISMOUNT A CREWMEMBER TO VERIFY CLEARANCE. REQUEST PILOT NOT FLYING TO MONITOR ENGINE/FLIGHT INSTRUMENTS. Initiate taxi by centering the cyclic and then increasing the collective to start forward movement while applying sufficient left pedal to minimize side loading on the tail wheel lockpin. Avoid droop-stop contact. Ensure both sets of brakes operate properly, and control heading with the pedals. Make taxi turns to the right or left using slight lateral cyclic into turns to maintain level cabin attitude. Make minimum radius test turns by applying brake on the inside of the turn. Regulate taxi speed with a combination of cyclic, collective, and brakes. (Soft or rough terrain may require the use of more collective than would normally be required.)

REFERENCES:

TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform hovering flight.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-takeoff check completed and aircraft cleared.

STANDARDS:

1. Takeoff to a Hover.
   a. Establish a vertical ascent to a hover altitude of 10 feet, ±3 feet.
   b. Maintain heading ±10 degrees.
   c. Do not allow drift to exceed 3 feet.
2. Hovering Flight.
   a. Stationary.
      (1) Maintain altitude 10 feet, ±3 feet.
      (2) Maintain heading ±10 degrees.
      (3) Do not allow drift to exceed ±3 feet.
   b. Forward, sideward, or rearward.
      (1) Maintain altitude 10 feet, ±3 feet.
      (2) Maintain heading ±10 degrees.
      (3) Maintain a constant hover speed.
      (4) Maintain ground track ±2 feet.
3. Hovering Turns.
   a. Maintain altitude 10 feet, ±3 feet.
   b. Do not allow drift to exceed 3 feet from pivot point.
   c. Maintain a constant rate of turn, not to exceed 30 degrees per second.

4. Landing from a Hover.

a. Execute a smooth and controlled descent with drift minimized at touchdown.

b. Maintain heading ±10 degrees.

5. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION:

1. Takeoff to a Hover. EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. REQUEST CREWMEMBERS ASSIST IN KEEPING THE AIRCRAFT CLEAR. REQUEST PILOT NOT FLYING ASSIST IN MONITORING ENGINE INSTRUMENTS, DRIFT, AND HOVER HEIGHT. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS. With collective full down, place the cyclic in neutral position. Increase the collective with a smooth, positive pressure; apply pedals to maintain heading; and coordinate the cyclic for a vertical ascent. As the aircraft leaves the ground, check for proper control response and aircraft CG. DISCUSS CONTROL RESPONSIVENESS WITH CREWMEMBERS.

2. Hovering Flight. Adjust the cyclic to maintain a stationary hover or to go in the desired direction. Control heading with the pedals, and maintain altitude with the collective. Rate of movement should be appropriate for existing conditions. Should circumstances dictate velocities in excess of an apparent brisk walk, increase hover altitude and remain within sideward or rearward velocity limitations as specified in TM 55-1520-237-10. To return to a stationary hover, apply cyclic in the opposite direction while maintaining altitude with the collective and heading with the pedals. DISCUSS CONTROL RESPONSIVENESS WITH CREWMEMBERS. IF ROTOR CLEARANCE IS IN DOUBT, OBTAIN GROUND GUIDE OR DISMOUNT A CREWMEMBER TO VERIFY CLEARANCE.

3. Hovering Turns. Apply pressure to the desired pedal to begin the turn. Use pressure and counterpressure 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. However, turns other than about the mast will increase the turn radius proportionately. DISCUSS CONTROL RESPONSIVENESS WITH CREWMEMBERS.

4. Landing from a Hover. From a stationary hover, lower the collective to effect a smooth descent to touchdown. Make necessary corrections with the pedals and cyclic to maintain a constant heading and position. Upon ground contact, ensure the aircraft remains stable. Continue decreasing the collective smoothly and steadily until the entire weight of the aircraft rests on the ground. Reduce the collective to the full-down position, and neutralize the pedals and cyclic. However, if surface conditions are suspected to produce forward or aft roll after touchdown, REQUEST PILOT NOT FLYING set the parking brake prior to initiating the descent. DISCUSS CONTROL RESPONSIVENESS WITH CREWMEMBERS.

NOTE: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

NIGHT OR NVG CONSIDERATIONS:

1. Movement over areas of limited contrast, such as tall grass, water, or desert, tends to cause spatial disorientation. Seek hover areas which provide adequate contrast, and use proper scanning techniques to avoid spatial disorientation. If disorientation occurs, STATE THE PROBLEM OR UNCERTAINTY AND REQUEST PILOT NOT FLYING ASSIST ON/TAKE THE CONTROLS; OR apply sufficient power and execute a takeoff. If a takeoff is not feasible, AND THE PILOT NOT FLYING CANNOT ASSIST ON/TAKE THE CONTROLS, STATE INTENTION AND attempt to maneuver the aircraft forward and down to the ground to limit the possibility of touchdown with sideward or rearward movement.

2. MAINTAIN A HIGH LEVEL OF INTRA-CREW COMMUNICATION TO ENSURE THAT ALL FLIGHT PARAMETERS ARE ACCEPTABLE AND SAFETY MARGINS ARE OBSERVED.

REFERENCES:

FM 1-203
FM 1-204
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform VMC approach.

CONDITIONS: In a UH-60 helicopter or a UH-60FS with before-landing check completed.

STANDARDS:

1. Select a suitable landing area.

2. Establish the proper altitude to clear obstacles on final approach, and maintain altitude ±100 feet.

3. Establish entry airspeed ±10 KIAS.

4. Maintain a constant approach angle to clear obstacles.

5. Maintain ground track alignment with the landing direction with minimum drift.

6. Maintain apparent rate of closure, not to exceed the speed of a brisk walk.

7. Execute a smooth and controlled termination to a hover or to the ground.

8. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION:

1. To a Hover. EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. ENSURE EXTERNAL COMMUNICATIONS ARE ESTABLISHED, REQUIRED CONTACTS MADE, AND CLEARANCES VERIFIED. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE PILOT FLYING OF HAZARDS. REQUEST PILOT NOT FLYING MONITOR ENGINE INSTRUMENTS AND CALL OUT SPECIFIED ALTITUDES. Determine an approach angle which allows safe obstacle clearance while descending to the intended point of landing. Once the approach angle is intercepted (on base or final), adjust the collective as necessary to establish and maintain the angle. Maintain entry airspeed until apparent ground speed and rate of closure appear to be increasing. Progressively decrease the rate of descent and rate of closure until appropriate hover is established over the intended termination point. Maintain ground track alignment with the landing direction by maintaining the aircraft in trim above 50 feet AGL and aligning the aircraft with the landing direction below 50 feet AGL. BRIEF CREWMEMBERS ON CONTINGENCIES THAT MAY ARISE. REQUEST PILOT NOT FLYING ASSIST IN COMPLETING THE AFTER LANDING CHECK(S). DISCUSS ACTIONS WITH CREWMEMBERS.

2. To the Ground. Proceed as for an approach to a hover, except continue the descent to the ground. Make the touchdown with minimum ground movement. After the landing gear contacts the ground, ensure the aircraft remains stable with

all movement stopped. REQUEST CREWMEMBERS CONFIRM AIRCRAFT STABLE. CREWMEMBERS CONFIRM AIRCRAFT STABILITY. Smoothly reduce the collective to the full-down position, and neutralize the pedals and cyclic. REQUEST PILOT NOT FLYING ASSIST IN COMPLETING THE AFTER LANDING CHECK(S). DISCUSS ACTIONS WITH CREWMEMBERS.

NOTE 1: The decision to go-around should be made before descending below obstacles or decelerating below ETL.

NOTE 2: For training, the recommended entry airspeed is 80 KIAS.

NOTE 3: Refer to FM 1-202 for procedures to reduce the hazards associated with the loss of visual references during the landing because of blowing snow or dust.

NIGHT OR NVG CONSIDERATIONS:

1. Night.

a. 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 slower than during the day to avoid abrupt attitude changes at low altitudes. After establishing the descent, reduce airspeed to approximately 50 knots until apparent ground speed and rate of closure appear to be increasing. Progressively decrease the rate of descent and forward speed until termination.

b. Be aware that surrounding terrain or vegetation may decrease contrast and cause a degradation of depth perception during the approach to the landing area. Before descending below obstacles, determine the need for artificial lighting.

2. NVG. See Task 2096.

3. MAINTAIN A HIGH LEVEL OF INTRA-CREW COMMUNICATION TO ENSURE THAT ALL FLIGHT PARAMETERS ARE ACCEPTABLE AND SAFETY MARGINS ARE OBSERVED.

REFERENCES:

FM 1-202
FM 1-203
FM 1-204
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform confined area operations.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-landing check completed.

STANDARDS:

1. Prior to the approach--
   a. Establish entry altitude ±100 feet.
   b. Establish entry airspeed ±10 KIAS.
   c. Properly perform a landing area reconnaissance.
2. During the approach--
   a. Maintain ground track alignment with the selected approach path with minimum drift.
   b. Maintain a constant approach angle.
   c. Maintain an appropriate rate of closure.
   d. Properly perform a low reconnaissance.
   e. Execute a smooth and controlled termination in the forward one-third of the landing area.
3. Prior to takeoff--
   a. Properly complete the ground reconnaissance, and select a suitable takeoff path.
   b. Perform a hover power check if required, and complete the before-takeoff check without error.
   c. Properly clear the aircraft.
4. Prior to clearing obstacles--
   a. Maintain heading ±10 degrees.
   b. Maintain ground track alignment with minimum drift.
   c. Use power as required to clear obstacles safely while not exceeding aircraft limitations.

5. After clearing obstacles--

a. Establish climb airspeed ±10 KIAS.

b. Maintain rate of climb ±100 FPM.

c. Maintain aircraft in trim.

d. Maintain ground track alignment with selected takeoff path with minimum drift.

6. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION:

1. EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. ENSURE EXTERNAL COMMUNICATIONS ARE ESTABLISHED AND REQUIRED CONTACTS MADE. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS. Upon approaching the area, evaluate the overall suitability of the terrain. Select a flight path, an airspeed, and an altitude that afford best observation. If approaching the area in the terrain flight mode, it is not necessary to increase altitude to perform the landing area reconnaissance. If landing is intended, determine if the landing area is suitable, identify obstacles, and estimate the effects of the wind. Select a touchdown point in the forward one-third of the landing area and a tentative flight path for the approach and departure. BRIEF CREWMEMBERS ON CONTINGENCIES THAT MAY ARISE.

2. REQUEST PILOT NOT FLYING MONITOR ENGINE INSTRUMENTS AND CALL OUT SPECIFIED ALTITUDES. On final approach, perform a low reconnaissance and confirm the suitability of the selected landing area. Evaluate obstacles which constitute a possible hazard, and confirm the suitability of the departure path selected during the landing area reconnaissance. DISCUSS ACTIONS WITH CREWMEMBERS. If a successful landing is doubtful, initiate a go-around before reducing airspeed below ETL or before descending below obstacles. Maintain the aircraft in trim above obstacles, and maintain landing area alignment below obstacles. REQUEST CREWMEMBERS ASSIST IN DETERMINING AIRCRAFT STABILITY DURING THE LANDING AND If instability is detected ~~during the landing~~, reposition the aircraft. After landing, REQUEST PILOT NOT FLYING ASSIST IN COMPLETING THE AFTER LANDING CHECK(S). ~~and before~~ BEFORE takeoff or movement in the landing area, perform a ground reconnaissance to determine the suitability of the area for ground operations or to formulate the takeoff plan. (The ground reconnaissance may be performed from the cockpit.) Formulate the takeoff plan by evaluating the wind, obstacles, and shape of the area. Select the route to the takeoff point, and ensure adequate main and tail rotor clearance while maneuvering. For takeoff over an obstacle, it may be necessary to move the aircraft as far downwind from the obstacle as possible. BRIEF CREWMEMBERS ON CONTINGENCIES THAT MAY ARISE. REQUEST PILOT NOT FLYING ASSIST IN COMPLETING ~~Complete~~ the before-takeoff check, and perform a hover power check if required. REQUEST PILOT NOT FLYING MONITOR

ENGINE INSTRUMENTS. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS. During takeoff, ~~clear the aircraft. Use~~ USE power as necessary to clear the obstacle safely while maintaining a constant ground track and climb angle. DISCUSS ACTIONS WITH CREWMEMBERS.

NOTE 1: Hover OGE power is required for confined area operations.

NOTE 2: Depending on the simulated threat or type of terrain flight being conducted, this maneuver may be initiated from either a straight-in or a circling pattern.

NIGHT OR NVG CONSIDERATIONS:

1. Night.

a. Confined areas are more difficult to evaluate at night because of low contrast. Success requires a knowledge of the various methods of determining the height of obstacles.

b. Before conducting confined area operations at night, ensure the searchlight/landing light (white light) is in the desired position. If the white light is used, night vision will be impaired for several minutes. Therefore, exercise extra caution if flight is resumed before full dark adaptation is reached.

2. NVG. See Task 2097.

3. MAINTAIN A HIGH LEVEL OF INTRA-CREW COMMUNICATION TO ENSURE THAT ALL FLIGHT PARAMETERS ARE ACCEPTABLE AND SAFETY MARGINS ARE OBSERVED.

REFERENCES:

FM 1-203
FM 1-204
TC 1-201
TM 55-1520-237-10
Unit SOP

TASK: Perform simulated engine failure at altitude.

CONDITIONS: In a UH-60 helicopter with an IP or in a UH60FS.

STANDARDS:

1. Recognize the emergency, determine the appropriate corrective action, and perform, from memory, all immediate action procedures described in TM 55-1520-237-CL.

2. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: IP WILL ENCOURAGE AIRCREW COORDINATION BY ALLOWING THE PI TO ASSUME THE ROLE OF PC AND BY PROVIDING ASSISTANCE AS REQUESTED. PC WILL EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. Upon detecting engine failure, ADVISE CREWMEMBERS OF THE SITUATION, evaluate the emergency and respond according to procedures outlined in TM 55-1520-237-CL. STATE ~~Advise the IP of~~ intentions as procedural steps are performed. SIMULATE EXTERNAL COMMUNICATIONS ESTABLISHED AND REQUIRED CONTACTS MADE. REQUEST THE PILOT NOT FLYING CALL OUT/VERIFY SPECIFIED ALTITUDES. As soon as possible, REQUEST THE PILOT NOT FLYING TO ASSIST IN verifyING the procedure with TM 55-1520-237-CL. Continue to fly the aircraft until the task is terminated ~~by the IP~~. DISCUSS ACTIONS WITH IP/CREWMEMBERS. If the IP elects to terminate with a roll-on landing, refer to Task 1029.

NOTE 1: When the task is conducted in the aircraft, the IP will initiate the maneuver by announcing, "Simulated single-engine failure." Both ENG POWER CONT levers must be in the FLY position before the aircraft descends below 300 feet AGL.

NOTE 2: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

NIGHT OR NVG CONSIDERATIONS: If conducted in the aircraft, this is an NVG-prohibited training task.

REFERENCES:

AR 95-1
FM 1-203
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform or describe emergency procedures.

CONDITIONS: In a UH-60 helicopter with an IP or an IE, a UH60FS, or orally in a classroom environment; given a specific emergency condition.

STANDARDS:

1. Without error, perform or describe the appropriate emergency procedures.

2. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: IF USING THE AIRCRAFT OR SIMULATOR, IP/IE WILL ENCOURAGE AIRCREW COORDINATION BY ALLOWING THE PI TO ASSUME THE ROLE OF PC AND BY ASSISTING AS REQUESTED. PC WILL EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. IF IN A CLASSROOM ENVIRONMENT, DESCRIBE HOW AIRCREW COORDINATION WOULD BE ACCOMPLISHED. Perform or describe the appropriate emergency procedures as outlined in TM 55-1520-237-10. Request appropriate emergency assistance as described in the FIH. REQUEST PILOT NOT FLYING TO CROSS-CHECK INSTRUMENTS TO VERIFY EMERGENCIES AND MAKE ALL RADIO CALLS, DISCUSS ACTIONS/DESCRIPTIONS WITH IP/IE/CREWMEMBERS.

NOTE: Those emergency procedures that cannot be practiced in the aircraft will be performed in the UH60FS or discussed orally.

REFERENCES:

FM 1-400
TM 55-1520-237-10
TM 55-1520-237-CL
FIH

TASK: PERFORM AIRCREW COORDINATION ~~Perform as a crew member (Cockpit Teamwork)~~

CONDITION: In a UH-60 helicopter or UH-60FS

STANDARDS:

1. ALL CREWMEMBERS ACTIVELY PARTICIPATE IN THE PREFLIGHT/INFLIGHT MISSION PLANNING. ~~Properly conduct a thorough crew briefing.~~

2. A DETAILED AIRCREW BRIEFING IS ACCOMPLISHED PRIOR TO TAKEOFF. ~~Communicate effectively using standard phraseology.~~

3. EACH CREWMEMBER ACKNOWLEDGES HIS ROLE, RESPONSIBILITIES, AND TASKS FOR THE ENTIRE MISSION.

4. TWO-WAY COMMUNICATION IS ESTABLISHED AND MAINTAINED USING STANDARD PHRASEOLOGY AND VISUAL SIGNALS.

5. DIFFERENCES OF OPINION ARE ENCOURAGED AND JUDICIOUSLY RESOLVED IN AN ATMOSPHERE OF MUTUAL RESPECT.

6. ALL ESSENTIAL INFORMATION IS SHARED BETWEEN CREWMEMBERS.

7. ALL CREWMEMBERS PARTICIPATE IN THE PROBLEM-SOLVING PROCESS.

8. SITUATIONAL AWARENESS IS DEMONSTRATED AT ALL TIMES BY EACH CREWMEMBER WITH RESPECT TO MISSION OBJECTIVES, AIRCRAFT POSITION, EQUIPMENT STATUS, ENVIRONMENTAL CONDITIONS, AND PERSONNEL CAPABILITIES.

9. ALL CREWMEMBERS COORDINATE TASK EXECUTION TO ENSURE THAT CRITICAL TASK TIMING AND TASK SEQUENCING IS ACHIEVED.

10. ALL CREWMEMBERS PARTICIPATE IN THE CRITIQUE PROCESS BY OFFERING CRITICISM IN A CONSTRUCTIVE, SUPPORTIVE MANNER.

11. CREWMEMBERS WORK SMOOTHLY AS A TEAM COMMITTED TO SAFE, MISSION-ORIENTED FLYING.

DESCRIPTION: Close and continuous ~~crew~~ coordination ~~and teamwork are~~ BETWEEN CREWMEMBERS IS essential to MISSION ~~the~~ success ~~of the utility mission.~~ AIRCREW COORDINATION ~~Crew teamwork~~ begins with thorough ~~mission~~ PREFLIGHT planning FOLLOWED BY A DETAILED AIRCREW BRIEFING. The PC, AS THE COCKPIT RESOURCE MANAGER, MUST DEFINE EACH CREWMEMBER'S ROLE, DELEGATE RESPONSIBILITIES, AND ASSIGN TASKS COVERING BOTH

ROUTINE AND EMERGENCY SITUATIONS ~~determines which duties are to be performed by the other crew members in given situations; for example, emergency procedures or inadvertent IMC. He must also ensure that duties are clearly understood by the other crew members.~~ THE AIRCREW BRIEFING COVERS SPECIFIC RESPONSIBILITIES AND DUTIES DURING THE ENTIRE MISSION. OF SPECIAL SIGNIFICANCE IS THE ASSIGNMENT OF CLEARANCE RESPONSIBILITIES. CLEARANCE RESPONSIBILITY IS PARAMOUNT AND IS NOT ABANDONED IN LIEU OF OTHER TASKING(S) WITHOUT ANNOUNCEMENT, ACKNOWLEDGEMENT, AND ASSUMPTION OF THE CLEARANCE SECTOR BY ANOTHER CREWMEMBER. THE PILOT FLYING, UNLESS UNDER ACTUAL IMC, IS ALWAYS "OUTSIDE" THE COCKPIT DURING TERRAIN AND AIDED FLIGHT. "INSIDE" COCKPIT DUTIES, E.G., INSTRUMENT MONITORING, FREQUENCY CHANGES, NAVAID PROGRAMMING, AND PASSENGER CONTROL, ARE TASKED TO THE PILOT NOT FLYING OR NON-FLYING CREWMEMBER(S). IF UNABLE TO DIVIDE ATTENTION BETWEEN CLEARING AND "INSIDE" COCKPIT DUTIES, THE AFFECTED CREWMEMBER ADVISES THE PILOT FLYING SO THAT WORKLOAD MAY BE REDISTRIBUTED. CREWMEMBERS DISCUSS EXPECTED HAZARDS, E.G., HIGH TRAFFIC AREAS, CONVERGING AIRWAYS AND REPORTING POINTS, WIRES, DESCENT CORRIDORS, AND MULTI-AIRCRAFT FORMATIONS, AND PLAN THEIR OBSERVATIONAL COVERAGE ACCORDINGLY. NON-FLYING CREWMEMBER(S) POSITION THEMSELVES TO BEST OBSERVE THE HAZARD(S). WHERE FEASIBLE, AIRCRAFT CONTROL IS PASSED TO THE PILOT BEST ABLE TO OBSERVE THE HAZARD(S). HAZARDS OBSERVED BY CREWMEMBERS ARE DESCRIBED TO THE PILOT FLYING IN TERMS OF TYPE, DIRECTION, AND DISTANCE. EACH CREWMEMBER CLEARLY UNDERSTANDS AND ACKNOWLEDGES HIS ROLE, RESPONSIBILITIES AND TASKS FOR THE ENTIRE MISSION BEFORE THE MISSION BEGINS. TWO-WAY COCKPIT COMMUNICATION IS ESTABLISHED USING STANDARD PHRASEOLOGY AND COMMONLY ACCEPTED NONVERBAL SIGNALS. OF SPECIAL IMPORTANCE IS THE POSITIVE TRANSFER OF AIRCRAFT CONTROLS. UNDER NO CIRCUMSTANCES DOES THE PILOT NOT FLYING ASSIST ON, OR ASSUME, THE CONTROLS WITHOUT POSITIVELY ANNOUNCING SUCH ACTION AND THE PURPOSE THEREFORE. WHEN ASSUMPTION OR ASSISTANCE IS ANNOUNCED, CONFIRMATION IS MADE BY THE PILOT FLYING. ~~Common phraseology should always be used by crew members to transmit maximum information in the shortest possible time with the least possible confusion. Task 2070 discusses techniques that the crew can use when performing terrain flight navigation.~~ INQUIRY/QUESTIONING IS CARRIED ON FREELY BETWEEN CREWMEMBERS; AND ADVOCACY/ASSERTION PRACTICED AS REQUIRED WITHOUT FEAR OF CENSURE. DIFFERENCES OF OPINION ARE ENCOURAGED AND JUDICIOUSLY RESOLVED; AND ALL CREWMEMBERS PARTICIPATE IN THE PROBLEM SOLVING/DECISION-MAKING EFFORT IF THE SITUATION ALLOWS AND TIME IS AVAILABLE. FINAL DECISIONS ARE ANNOUNCED BY THE PC, ACKNOWLEDGED, AND COLLECTIVELY IMPLEMENTED IN A COOPERATIVE FASHION. WHERE TIME PRECLUDES ANNOUNCING A DECISION, CREWMEMBERS CALL FOR A DECISION REVIEW WHEN CIRCUMSTANCES ALLOW. PLANS/INTENTIONS ARE ALWAYS VERBALIZED AND PRESENTED IN A TIMELY MANNER; AND INFORMATION IS SHARED BETWEEN CREWMEMBERS AT APPROPRIATE DECISION POINTS. THE PILOT NOT FLYING ANTICIPATES REQUIREMENTS FOR INFORMATION OR TASKING AND REQUESTS DIRECTION FROM THE PILOT FLYING. UNDER NO CONDITION DOES THE PILOT NOT FLYING UNILATERALLY EXECUTE AN UNASSIGNED TASK

WITHOUT THE KNOWLEDGE OF THE PILOT FLYING. CHECKLISTS ARE USED TOGETHER WITH FIXED PROCEDURAL TERMINOLOGY AND THE PROPER CHALLENGE AND RESPONSE. EACH CREWMEMBER IS AWARE OF THE CURRENT SITUATION AT ALL TIMES WITH RESPECT TO MISSION OBJECTIVES, AIRCRAFT POSITION, EQUIPMENT STATUS, ENVIRONMENTAL CONDITIONS, AND THE CAPABILITIES OF FELLOW CREWMEMBERS. CREWMEMBERS ARE SENSITIVE TO THE MENTAL AND PHYSICAL STATES OF ONE ANOTHER AND ARE NOT HESITANT TO ADVISE OF PERSONAL PROBLEMS INHIBITING EFFECTIVE PERFORMANCE. STRESS IS MANAGED TO MAINTAIN A RELAXED, BUSINESS-LIKE ATMOSPHERE EMPLOYING CASUAL CONVERSATION AND HUMOR TO MAINTAIN A MODERATE LEVEL OF AROUSAL DURING PERIODS OF LOW WORKLOAD. ALL TASKS ARE ACCOMPLISHED IN A CONCERTED MANNER WITH CREWMEMBERS COOPERATIVELY READJUSTING THE WORKLOAD BY ASSUMING UNASSIGNED TASKS. TASK TRANSFERS ARE ACKNOWLEDGED BY THE PILOT FLYING AND THE TRANSFERRING CREWMEMBERS. TASKS ARE VOLUNTARILY ASSUMED IN ORDER TO HELP ONE ANOTHER BECAUSE OF PERCEIVED TASK SATURATION ESTABLISHED THROUGH OBSERVATION OR ERROR CHECKING. ERROR CHECKING IS ROUTINELY ACCOMPLISHED AND REPORTED TO THE RESPONSIBLE CREWMEMBER. ERRORS ARE SPECIFICALLY DESCRIBED AND ANNOUNCED IN A CONCISE MANNER WITHOUT EXCESSIVE PROFESSIONAL COURTESY, E.G., 100' ABOVE ASSIGNED ALTITUDE; AND THE TWO-CHALLENGE RULE IS EMPLOYED PRIOR TO ASSUMING THE AIRCRAFT CONTROLS, IF NECESSARY. TOP-DOWN/BOTTOM-UP CONSTRUCTIVE CRITIQUES ARE ACCOMPLISHED AS REQUIRED EITHER DURING OR AFTER THE MISSION TO ENSURE ALL CREWMEMBERS ARE PERFORMING OR ARE BEING TRAINED TO ACCEPTED STANDARDS. CREWMEMBERS EXHIBIT MUTUAL SUPPORT AND ARE POSITIVELY MOTIVATED BY THE PC TO CONTINUOUSLY IMPROVE UPON PAST PERFORMANCE.

NIGHT OR NVG CONSIDERATIONS:

1. During NIGHT OR NVG operations, AIRCREW COORDINATION IS ESPECIALLY CRITICAL TO SUCCESSFUL MISSION ACCOMPLISHMENT. UNDER SUCH CONDITIONS, IT IS OF THE UTMOST IMPORTANCE THAT OUTSIDE VISUAL SEARCH SECTORS BE ASSIGNED AND DEFINED FOR EACH CREWMEMBER. WHENEVER THE CREWMEMBER RESPONSIBLE FOR A GIVEN SECTOR IS UNABLE TO SCAN HIS SECTOR; E.G., CHANGING RADIO FREQUENCIES, HE WILL SO ANNOUNCE AND ANOTHER CREWMEMBER WILL BE ASSIGNED THE RESPONSIBILITY DURING THE INTERIM. DURING NIGHT/NVG OPERATIONS, the pilot on the controls is responsible for maintaining aircraft control, ~~avoiding~~ ENSURING obstacles AVOIDANCE, and requesting assistance from the other crewmembers. The pilot not on the controls performs all equipment and instrument checks, selects radio frequencies, ASSISTS IN CLEARING THE AIRCRAFT, and serves as the navigator. The crew chief performs THOSE duties assigned ~~directed~~ by the PC.

2. During actual or simulated emergencies, each crewmember performs as briefed. Normally, the pilot on the controls will initiate those immediate action steps to maintain aircraft control. He must determine whether to remain goggled or make the transition to unaided visual flight. The pilot not on the controls will assist as requested.

REFERENCES:

FM 1-203
FM 1-204
TC 1-201
TM 55-1520-237-10
Unit SOP

TASK: Perform after-landing tasks.

CONDITIONS: Given a UH-60 helicopter or a UH60FS and TM 55-1520-237-CL.

STANDARDS:

1. Without error, perform after-landing tasks according to TM 55-1520-237-CL.

2. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. REQUEST PILOT NOT FLYING ASSIST IN MAKING THE APPROPRIATE CHECK(S). ENSURE EXTERNAL COMMUNICATION ESTABLISHED, REQUIRED CONTACTS MADE, AND CLEARANCES VERIFIED. ENSURE ACCOMPLISHMENT ~~Accomplish~~ OF after-landing tasks as required, to include after-landing, engine-shutdown, and before-leaving aircraft checks. REQUEST CC SECURE AIRCRAFT AND SUPERVISE REFUELING, IF NECESSARY. Close the flight plan. DISCUSS RESULTS OF MISSION WITH CREWMEMBERS. DEBRIEF TASKING AUTHORITY ON MISSION ACCOMPLISHMENT AND SUBMIT COMPLETED DA FORM 5484.

NOTE: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

REFERENCES:

AR 95-1
AR 385-95
DA Pamphlet 738-751
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform multiaircraft operations.

CONDITIONS: In a UH-60 helicopter.

STANDARDS:

1. Correctly maneuver into the flight formation.

2. Correctly change position in the flight formation when required.

3. Maintain proper horizontal and vertical separation for the type of formation flight being conducted.

4. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: Perform formation flight per TC 1-201, AR 95-1, and the unit SOP. EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. REQUEST CREWMEMBERS ASSIST IN KEEPING THE AIRCRAFT CLEAR OF OTHER AIRCRAFT. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS. IF REQUIRED, CONTROLS SHOULD BE TRANSFERRED TO THE Pilot BEST ABLE TO VIEW THE FORMATION AND MAINTAIN POSITION. DISCUSS ACTIONS WITH CREWMEMBERS.

NOTE: When operating near heavy aircraft, be aware of the possibility of encountering wake turbulence.

NIGHT OR NVG CONSIDERATIONS: Increase the interval between aircraft to a minimum of three rotor disks, and keep changes in the formation to a minimum. All crew members must avoid fixation by using proper scanning techniques. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS.

a. Night. During unaided night flight, formation lights, as well as position lights, should be used.

b. NVG.

(1) An additional crew member, wearing NVG, will supplement the crew flying the aircraft. This crew member will position himself in the aircraft so that he can observe other aircraft in the formation and assist in maintaining aircraft separation and obstacle clearance.

(2) The following limitations apply while en route:

(a) Over 200 feet AHO. Only straight trail, staggered trail, and echelon formations are authorized.

(b) 100 to 200 feet AHO (Low level). Maximum speed is 100 KIAS. Only free cruise, staggered trail, and echelon formations are authorized.

(c) 25 to 100 feet AHO (contour). Maximum airspeed is 70 KIAS. Only free-cruise formation, together with techniques of movement, is authorized.

(d) Less than 25 feet AHO with wheels above trees and vegetation in the flight path (NOE). Maximum airspeed is 40 KIAS. Only free-cruise formation, together with techniques of movement, is authorized.

REFERENCES:

AM 95-1
FM 1-204
TC 1-201
Unit SOP

TASK: Perform external load operations.

CONDITIONS: In a UH-60 helicopter with an operational cargo hook or in a UH60FS; required briefings and checks completed; and aircraft cleared.

STANDARDS:

1. Hookup and Hover.
   a. Maintain vertical ascent heading ±10 degrees.
   b. Maintain altitude of load 10 feet AGL, ±5 feet.
   c. Do not allow drift to exceed 5 feet.
2. Takeoff (Below 100 Feet AGL).
   a. Maintain takeoff heading ±10 degrees.
   b. Maintain ground track alignment with takeoff direction.
   c. Maintain power as required to clear obstacles safely.
3. Takeoff (Above 100 Feet AGL).
   a. Maintain aircraft in trim.
   b. Maintain airspeed ±10 KIAS.
   c. Maintain rate of climb ±100 FPM.
4. En Route.
   a. Maintain aircraft in trim.
   b. Maintain airspeed ±10 KIAS.
   c. Maintain safe load obstacle clearance (minimum 50 feet AHO).
5. Approach and Load Release.
   a. Maintain a constant approach angle to ensure the load safely clears obstacles.
   b. Maintain ground track alignment with the selected approach path.
   c. Execute a smooth and controlled termination over the intended point of landing.

d. Maintain vertical descent heading ±10 degrees.

6. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. ENSURE EXTERNAL COMMUNICATIONS ESTABLISHED AND REQUIRED CONTACTS MADE. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS.

1. Hookup and Hover. REQUEST PILOT NOT FLYING TO Pplace the cargo release switch in the ARM position and the EMER REL switch in the NORM position. Follow hand signals from the signalman to hover over the load. IF SIGNALMAN IS OBSCURED FROM VIEW, REQUEST NON-FLYING CREWMEMBER PROVIDE DIRECTIONS. Apply cyclic, collective, and pedals as required to remain vertically clear of and centered over the load. When the signalman indicates the load is hooked up, slowly apply collective until all slack is taken out of the sling. Make necessary corrections with the cyclic to remain centered over the load. Maintain heading with the pedals. Apply additional collective to raise the load vertically to 10 feet AGL. REQUEST PILOT NOT FLYING Mmonitor aircraft instruments to ensure aircraft limitations are not exceeded.

2. Takeoff.

a After receiving the signal for takeoff, smoothly apply forward cyclic while increasing collective pitch to begin a coordinated acceleration and climb. Adjust pedals as necessary to maintain desired heading. Adjust cyclic and collective as necessary to attain a constant angle of climb that will permit safe obstacle clearance. Continue the climbout at that attitude and power until obstacles are cleared.

b. Above 100 feet or obstacle clearance, adjust attitude and power as required to establish the desired rate of climb and airspeed. Make small control movements to prevent load oscillation. After passing 300 feet AGL, REQUEST PILOT NOT FLYING place the cargo release switch in the SAFE position.

NOTE: Ensure the cargo switch is in the ARM position when operating at altitudes below 300 feet AHO.

3. En Route. Maintain desired altitude with the collective and desired flight path and airspeed with the cyclic. Maintain aircraft in trim with the pedals. Make smooth control applications to prevent load oscillation. If a lateral load oscillation occurs, reduce airspeed. If a fore-and-aft oscillation occurs, begin a shallow bank while reducing airspeed.

4. Approach and Load Release. When the approach angle is intercepted, decrease the collective to establish the descent. Maintain entry airspeed until apparent ground speed and rate of closure appear to be increasing. When passing 300 feet AGL, REQUEST PILOT NOT FLYING place the cargo release switch in the ARM position. Progressively decrease the rate of descent and forward airspeed

until a stationary hover is attained with the load 10 feet above the intended release point. (A go-around should be made before descending below obstacles or decelerating below ETL.) Slowly reduce the collective until the load rests completely on the ground, and then release it. If ground personnel are not available, confirm load release by hovering to a point that is higher than the sling length.

NOTE 1: Avoid flight over populated areas.

NOTE 2: Hover OGE power is required for external load operations. (Task 1004 discusses how to compute maximum allowable gross weight (OGE).)

NOTE 3: Before the mission, the PC will ensure that all crewmembers are familiar with the hand-and-arm signals shown in TC 1-201 and forced landing procedures. In case of a forced landing, the pilot flying will land the aircraft to the left of the load. The hookup man will move to the right of the aircraft and lie facedown on the ground. The signalman will remain in place and lie facedown on the ground.

NIGHT OR NVG CONSIDERATIONS:

1. For unaided night flight, the landing light and searchlight should be operational. If an NVG filter is installed, it should be removed.

2. Hovering with minimum drift is difficult and requires proper scanning techniques and crewmember coordination. REQUEST PILOT NOT FLYING CHECK FOR DRIFT AND HOVER HEIGHT. If possible, an area with adequate ground contrast and reference points should be used.

NOTE: Excessive drift may position the sling so it cannot be jettisoned if required.

3. Treat visual obstacles the same as physical obstacles.

4. The rate of descent and rate of closure should be slightly slower to avoid abrupt attitude changes at low altitudes.

5. MAINTAIN A HIGH LEVEL OF INTRA-CREW COMMUNICATION TO ENSURE THAT ALL FLIGHT PARAMETERS ARE ACCEPTABLE AND SAFETY MARGINS ARE OBSERVED.

REFERENCES:

AR 95-16
FM 1-203
FM 1-204
FM 55-450-1
TC 1-201
TM 55-1520-237-10
Unit SOP

TASK: Perform terrain flight.

CONDITIONS: In a UH-60 helicopter or a UH60FS; given a mission briefing and required maps and materials.

STANDARDS:

1. NOE Flight.

a. Fly as close to the earth's surface as vegetation, obstacles, and ambient light will permit.

b. Maintain airspeed appropriate for the terrain, enemy situation, weather, and ambient light.

2. Contour Flight.

a. Maintain a safe obstacle clearance altitude while generally conforming to the contours of the earth.

b. Maintain airspeed appropriate for the terrain, enemy situation, weather, and ambient light.

c. Maintain aircraft in trim.

3. Low-Level Flight.

a. Maintain altitude ±50 feet.

b. Maintain airspeed ±10 KIAS.

c. Maintain aircraft in trim.

4. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION:

1. EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS. DISCUSS ACTIONS WITH CREWMEMBERS.

2. Terrain flying involves flight close to the earth's surface. The modes of terrain flight are NOE, contour, and low-level. Aviators will seldom perform pure NOE or contour flight. Instead, they will go from one technique to another while maneuvering over the desired route. During terrain flight, the pilot on the controls

is primarily concerned with threat and obstacle avoidance. The ~~other~~ pilot NOT FLYING is normally responsible for navigating and monitoring aircraft systems.

a. 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.

b. Contour flight. Contour flight is characterized by varying altitude and relatively constant airspeed, depending on the vegetation, obstacles, and ambient light. It generally follows the contours of the earth.

c. Low-level flight. Low-level flight is usually performed at a constant airspeed and altitude. It generally is conducted at an altitude which avoids or reduces the chance of detection by enemy forces.

NOTE: Hover OGE power is required for NOE/contour flight.

NIGHT OR NVG CONSIDERATIONS:

1. Proper scanning techniques must be used to ensure obstacle avoidance.

2. Airspeed and altitude limitations and ambient light criteria described in paragraph 6-2 must be observed during the NVG terrain flight training.

3. MAINTAIN A HIGH LEVEL OF INTRA-CREW COMMUNICATION TO ENSURE THAT ALL FLIGHT PARAMETERS ARE ACCEPTABLE AND SAFETY MARGINS ARE OBSERVED.

REFERENCES:

FM 1-203
FM 1-204
FM 1-240
FM 1-400
FM 21-26
TC 1-201

TASK: Perform terrain flight approach.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-landing check completed.

STANDARDS:

1. Maintain a constant approach angle to clear obstacles.

2. Maintain ground track aligned with the selected approach path with minimum drift.

3. Maintain appropriate rate of closure.

4. Make a smooth and controlled termination at the intended approach point.

5. EMPLOY AIRCREW COORDINATION TECHNIQUES IN ACCORDANCE WITH TASK 1071.

DESCRIPTION: EMPLOY AIRCREW COORDINATION TECHNIQUES THROUGHOUT THE ATM TASK. REQUEST CREWMEMBERS ASSIST IN KEEPING AIRCRAFT CLEAR. CREWMEMBERS MAINTAIN VIGILANCE AND ADVISE OF HAZARDS. The approach may be initiated from a straight-in or modified pattern, depending on the tactical situation, wind, long axis of the landing area, lowest obstacles, and arrival path. Maneuver the aircraft as required (straight-in or circle) to intercept the desired approach path. Adjust airspeed as necessary, and keep the landing area in sight at all times. REQUEST PILOT NOT FLYING MONITOR ENGINE INSTRUMENTS AND CALL OUT SPECIFIED ALTITUDES. Start the approach upon intercepting an angle which ensures obstacle clearance. ADVISE CREW WHEN BEGINNING DESCENT. Maintain ground track aligned with the selected approach path. Progressively decrease the rate of descent and forward speed, using collective and cyclic, as necessary, to the intended point of landing. The decision to terminate at a hover, to the ground with zero forward speed, or with a roll-on landing will depend on aircraft loading and environmental conditions. A go-around should be made before descending below obstacles or decelerating below ETL. It should also be made if visual reference with the touchdown point is lost. DISCUSS ACTIONS WITH CREWMEMBERS..

NIGHT OR NVG CONSIDERATIONS:

1. Night. Movement over areas of limited contrast, such as tall grass, water, or desert, tends to cause spatial disorientation. Seek hover areas which provide adequate contrast. If disorientation occurs, STATE THE PROBLEM OR UNCERTAINTY AND REQUEST PILOT NOT FLYING ASSIST ON/TAKE THE CONTROLS; OR apply sufficient power and execute a takeoff. If a takeoff is not feasible, AND THE PILOT NOT FLYING CANNOT ASSIST ON/TAKE THE CONTROLS, STATE INTENTION AND attempt to maneuver the aircraft forward

and down to the ground to limit the possibility of touchdown with sideward or rearward movement.

2. NVG. See Task 2096.

3. MAINTAIN A HIGH LEVEL OF INTRA-CREW COMMUNICATION TO ENSURE THAT ALL FLIGHT PARAMETERS ARE ACCEPTABLE AND SAFETY MARGINS ARE OBSERVED.

REFERENCES:

FM 1-203
FM 1-204
TC 1-201
TM 55-1520-237-10

ENCLOSURE 2

INSTRUCTIONS FOR THE USE OF REVISED ATM TASKS; AND ATM TASKS INCORPORATING AIRCREW COORDINATION BEHAVIORS

INSTRUCTIONS FOR THE USE OF THE REVISED ATM TASKS

1. Use of the revised ATM tasks will differ in small but important ways from current use. The primary difference in the use of the revised tasks from the tasks being replaced is that they now provide a basis for rating aircrew coordination behaviors. While the use of the revised ATM tasks in the research effort reflects a specialized usage, they are being studied for use in a much broader application. As such, the revised ATMs might serve as the means to institutionalize aircrew coordination training in the IERW course, during ARL progression training, and in continuation training.

a. **For use in the IERW course**, crew coordination behaviors may be deemphasized when incorporating the ATM revised tasks into the commensurate tasks in the Flight Training Guides. The fact that the student aviator is primarily engaged in developing basic flying skills and realistically has no crew to coordinate underlie the rationale for such an approach. This does not, however, preclude the IP from introducing aircrew coordination principles as training progresses. Introduction of aircrew coordination skills during IERW will assist the student aviator in developing a positive attitude toward aircrew coordination and influence performance as a rated Army Aviator. Grading of the revised ATM tasks should not differ from those guidelines currently provided in USAAVNC REG 350-16.

b. **For use in ARL progression training**, the revised ATM tasks provide aircrew coordination behaviors that the IPs should instill in the rated student aviator. Progress in developing the requisite aircrew coordination skills will be determined and recorded in accordance with the guidelines provided in Chapter 8 of the appropriate ATM.

c. **For use in continuation training**, the revised tasks provide the aviator with guidelines to personally develop his aircrew coordination skills. Commanders should continue to assign iterations of the revised ATM tasks and to evaluate progress in accordance with TC 1-210. IPs should continue to check and record progress in developing aircrew coordination skills in accordance with the appropriate ATM during proficiency flight evaluations, annual NVG standardization flight evaluations, no-notice flight evaluations, post-accident flight evaluations, and commander's flight evaluations.

d. **For evaluation flights during ARL and continuation training**, it is recommended that after emergency procedures have been completed, the IP locate himself to a position other than the cockpit to evaluate aircrew coordination. This will mitigate the artificiality of imposing himself as a front-seat crewmember and expecting the PI (acting PC) to manage him as any other crewmember. It is recognized that the IP is always, by regulation, the PC; however, for purposes of evaluation, this role must be delegated to the PI until the evaluation has been completed or an emergency occurs which dictates the IP reassume control of the aircraft.

2. The revised ATM tasks follow these instructions.

TASK: Plan a VFR flight.

CONDITIONS: Prior to flight in a UH-60 helicopter or a UH60FS and given access to weather information; NOTAMs; flight planning aids; necessary charts, forms, and publications; and weight and balance information.

STANDARDS:

1. Determine if the aircrew and aircraft are capable of completing the assigned mission.
2. Determine if the flight can be performed under VFR according to AR 95-1.
3. Check applicable publications and determine, without error, if there are any restrictions on departure, en route, and at destination.
4. Select course(s) and altitude(s) which best ensure mission completion, and correctly compute magnetic heading(s) within ±5 degrees.
5. Determine distance ±1 nautical mile, ground speed ±5 knots, and ETE ±3 minutes for each leg of the flight.
6. Determine fuel requirement from takeoff to destination, plus fuel reserve, ±40 pounds.
7. Without error, verify that the aircraft will remain within weight and CG limitations for the duration of the flight.
8. Complete and file the flight plan according to AR 95-1 and the DOD FLIP.
9. Employ aircrew coordination techniques in accordance with Task 1071.
10. Brief crewmembers on all aspects of the mission.

DESCRIPTION: Employ aircrew coordination techniques. In planning a VFR flight, first ensure that all crew-members are current and qualified to accomplish the mission. Then ascertain that the aircraft is capable of completing the mission. Using USAF, FAA, or host country weather facilities, obtain information about the weather. After ensuring that the flight can be completed under VFR, check NOTAMs and the Army Aviation Flight Information Bulletin for any restrictions applicable to the flight. Obtain charts that cover the entire flight area, and allow for changes in routing that may be required because of the weather or terrain. Select the course(s) and altitude(s) that will best facilitate mission accomplishment. Use a CPU-26A/P computer/Weems plotter (or equivalent) to plot the flight, and determine magnetic heading, ground speed, and ETE for each leg. Compute total

distance and flight time, and calculate required fuel using the appropriate charts in TM 55-1520-237-10. Ensure weight and balance forms kept in the aircraft logbook apply to aircraft load and CG limitations per AR 95-16. Verify that the aircraft weight and CG will remain within allowable limits for the entire flight. Complete DD Form 175 (Military Flight Plan) or an equivalent form, and file the flight plan. Brief crewmembers on the results of the planning effort and the mission profile to be flown; and discuss contingencies that may arise. Assign duties and responsibilities for the entire mission and obtain crewmember acknowledgement. Discuss Task 1071 and how it applies to the mission.

REFERENCES:

AR 95-1
AR 95-10
AR 95-14
AR 95-16
AR 95-50
FM 1-204
FM 1-230
FM 1-240
FM 1-300
TM 55-1500-342-23
TM 55-1520-237-10
DOD FLIP
FAR/host country regulations
Local SOPs and regulations

TASK: Plan an IFR flight.

CONDITIONS: Prior to IFR flight in a UH-60 helicopter or a UH60FS and given access to weather information; NOTAMs; flight planning aids; necessary charts, forms, and publications; and weight and balance information.

STANDARDS:

1. Determine if the aircrew and aircraft are capable of completing the assigned mission.
2. Determine if the flight can be performed according to AR 95-1.
3. Check applicable publications and determine, without error, if there are any restrictions on departure, en route, and at destination.
4. Select route(s) which avoid severe weather hazards, conform to known preferred routing, and are within the capability of aircraft equipment. If off-airway, determine course(s) within ±5 degrees.
5. Select altitude(s) which avoid icing level and turbulence, are above minimum altitudes, conform to the semicircular rule (when applicable), and do not exceed aircraft or equipment limitations.
6. Select an approach which is compatible with the weather, approach facilities, and aircraft equipment, and determine if an alternate airfield is required.
7. Determine distance ±1 nautical mile, true airspeed ±3 knots, ground speed ±5 knots, and ETE ±3 minutes for each leg of the flight.
8. Determine fuel requirement from takeoff to reach the destination and alternate airfield (if required), plus fuel reserve, ±40 pounds.
9. Without error, verify that the aircraft will remain within weight and CG limitations for the duration of the flight.
10. Complete and file the flight plan according to AR 95-1 and the DOD FLIP.
11. Employ aircrew coordination techniques in accordance with Task 1071.
12. Brief crewmembers on all aspects of the mission.

DESCRIPTION: Employ aircrew coordination techniques throughout the ATM Task. In planning an IFR flight, first ensure that all crew members are current and qualified to accomplish the mission. Then ascertain that the aircraft is capable of completing the mission. Using USAF, FAA, or host country weather facilities,

obtain information about the weather. Compare destination forecast and approach minimums, and determine if an alternate airfield is required. Ensure that the flight can be completed according to AR 95-1. Check NOTAMs and the Army Aviation Flight Information Bulletin for any restrictions applicable to the flight. Obtain 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 routing. Use a CPU-26A/P computer/Weems plotter (or equivalent) to plot the flight, and determine magnetic heading, ground speed, and ETE for each leg, including flight to the alternate airfield if required. Compute total distance and flight time, and calculate required fuel using the appropriate charts in TM 55-1520-237-10. Ensure weight and balance forms kept in the aircraft logbook apply to aircraft load and CG limitations per AR 95-16. Verify that the aircraft weight and CG will remain within allowable limits for the entire flight. Complete DD Form 175 or an equivalent form, and file the flight plan. Brief crewmembers on the results of the planning effort and the mission profile (including alternates) to be flown; and discuss contingencies that may arise. Assign duties and responsibilities for the entire mission and obtain crewmember acknowledgement. Discuss Task 1071 and how it applies to this mission.

REFERENCES:

AR 95-1
AR 95-10
AR 95-14
AR 95-16
AR 95-50
FM 1-204
FM 1-230
FM 1-240
FM 1-300
TM 55-1500-342-23
TM 55-1520-237-10
DOD FLIP
FAR/host country regulations
Local SOPs and regulations

TASK: Perform engine-start, run-up, and before-takeoff checks.

CONDITIONS: In a UH-60 helicopter or a UH60FS with TM 55-1520-237-CL.

STANDARDS:

1. Without error, perform procedures and checks according to TM 55-1520-237-CL.

2. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: Employ aircrew coordination techniques throughout the ATM Task. Start the engine according to TM 55-1520-237-CL, and accomplish aircraft system checks in the appropriate sequence. Request pilot not flying to assist in completing required checks. Ensure appropriate information is entered on applicable aircraft logbook forms. Ensure external communications are established, required contacts made, and clearances verified. Request crewmembers assist in passenger security and in keeping aircraft clear of hazards while underway.

NOTE: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

NIGHT OR NVG CONSIDERATIONS:

1. Before starting the engines or performing the run-up check, ensure all internal and external lights are operational and properly set. Lighting levels must be high enough so crewmembers can easily see the instruments and start the engines without exceeding operating limitations. Crewmembers should also assist in clearing the aircraft and in completing and verifying all required checks.

2. Maintain a high level of intra-crew communication to ensure that all flight parameters are acceptable and safety margins are observed.

REFERENCES:

AR 95-1
TM 55-1520-237-10
TM 55-1520-237-CL
Engine HIT log
Unit SOP

TASK: Perform ground taxi.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-taxi check completed and aircraft cleared.

STANDARDS:

1. Maintain a constant speed appropriate for conditions.
2. Maintain desired track.
3. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: Employ aircrew coordination techniques throughout the ATM Task. Request crewmembers assist in keeping aircraft clear. Crewmembers will maintain vigilance and inform of obstructions, other aircraft, or similar hazards. If rotor clearance is in doubt, obtain ground guide or dismount a crewmember to verify clearance. Request pilot not flying to monitor engine/flight instruments. Initiate taxi by centering the cyclic and then increasing the collective to start forward movement while applying sufficient left pedal to minimize side loading on the tail wheel lockpin. Avoid droop-stop contact. Ensure both sets of brakes operate properly, and control heading with the pedals. Make taxi turns to the right or left using slight lateral cyclic into turns to maintain level cabin attitude. Make minimum radius test turns by applying brake on the inside of the turn. Regulate taxi speed with a combination of cyclic, collective, and brakes. (Soft or rough terrain may require the use of more collective than would normally be required.)

REFERENCES:

TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform hovering flight.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-takeoff check completed and aircraft cleared.

STANDARDS:

1. Takeoff to a Hover.
   a. Establish a vertical ascent to a hover altitude of 10 feet, ±3 feet.
   b. Maintain heading ±10 degrees.
   c. Do not allow drift to exceed 3 feet.
2. Hovering Flight.
   a. Stationary.
      (1) Maintain altitude 10 feet, ±3 feet.
      (2) Maintain heading ±10 degrees.
      (3) Do not allow drift to exceed ±3 feet.
   b. Forward, sideward, or rearward.
      (1) Maintain altitude 10 feet, ±3 feet.
      (2) Maintain heading ±10 degrees.
      (3) Maintain a constant hover speed.
      (4) Maintain ground track ±2 feet.
3. Hovering Turns.
   a. Maintain altitude 10 feet, ±3 feet.
   b. Do not allow drift to exceed 3 feet from pivot point.
   c. Maintain a constant rate of turn, not to exceed 30 degrees per second.
4. Landing from a Hover.
   a. Execute a smooth and controlled descent with drift minimized at touchdown.

b. Maintain heading ±10 degrees.

5. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION:

1. Takeoff to a Hover. Employ aircrew coordination techniques throughout the ATM Task. Request crewmembers assist in keeping the aircraft clear. Request pilot not flying assist in monitoring engine instruments, drift, and hover height. Crewmembers maintain vigilance and advise of hazards. With collective full down, place the cyclic in neutral position. Increase the collective with a smooth, positive pressure; apply pedals to maintain heading; and coordinate the cyclic for a vertical ascent. As the aircraft leaves the ground, check for proper control response and aircraft CG. Discuss control responsiveness with crewmembers.

2. Hovering Flight. Adjust the cyclic to maintain a stationary hover or to go in the desired direction. Control heading with the pedals, and maintain altitude with the collective. Rate of movement should be appropriate for existing conditions. Should circumstances dictate velocities in excess of an apparent brisk walk, increase hover altitude and remain within sideward or rearward velocity limitations as specified in TM 55-1520-237-10. To return to a stationary hover, apply cyclic in the opposite direction while maintaining altitude with the collective and heading with the pedals. Discuss control responsiveness with crewmembers. If rotor clearance is in doubt, obtain ground guide or dismount a crewmember to verify clearance.

3. Hovering Turns Apply pressure to the desired pedal to begin the turn. Use pressure and counterpressure 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. However, turns other than about the mast will increase the turn radius proportionately. Discuss control responsiveness with crewmembers.

4. Landing from a Hover. From a stationary hover, lower the collective to effect a smooth descent to touchdown. Make necessary corrections with the pedals and cyclic to maintain a constant heading and position. Upon ground contact, ensure the aircraft remains stable. Continue decreasing the collective smoothly and steadily until the entire weight of the aircraft rests on the ground. Reduce the collective to the full-down position, and neutralize the pedals and cyclic. However, if surface conditions are suspected to produce forward or aft roll after touchdown, request pilot not flying set the parking brake prior to initiating the descent. Discuss control responsiveness with crewmembers.

NOTE: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

NIGHT OR NVG CONSIDERATIONS:

1. Movement over areas of limited contrast, such as tall grass, water, or desert, tends to cause spatial disorientation. Seek hover areas which provide adequate contrast, and use proper scanning techniques to avoid spatial disorientation. If disorientation occurs, state the problem or uncertainty and request pilot not flying assist on/take the controls; or apply sufficient power and execute a takeoff. If a takeoff is not feasible, and the pilot not flying cannot assist on/take the controls, state intention and attempt to maneuver the aircraft forward and down to the ground to limit the possibility of touchdown with sideward or rearward movement.

2. Maintain a high level of intra-crew communication to ensure that all flight parameters are acceptable and safety margins are observed.

REFERENCES:

FM 1-203
FM 1-204
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform VMC approach.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-landing check completed.

STANDARDS:

1. Select a suitable landing area.
2. Establish the proper altitude to clear obstacles on final approach, and maintain altitude ±100 feet.
3. Establish entry airspeed ±10 KIAS.
4. Maintain a constant approach angle to clear obstacles.
5. Maintain ground track alignment with the landing direction with minimum drift.
6. Maintain apparent rate of closure, not to exceed the speed of a brisk walk.
7. Execute a smooth and controlled termination to a hover or to the ground.
8. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION:

1. To a Hover. Employ aircrew coordination techniques throughout the ATM task. Ensure external communications are established, required contacts made, and clearances verified. Request crewmembers assist in keeping aircraft clear. Crewmembers maintain vigilance and advise pilot flying of hazards. Request pilot not flying monitor engine instruments and call out specified altitudes. Determine an approach angle which allows safe obstacle clearance while descending to the intended point of landing. Once the approach angle is intercepted (on base or final), adjust the collective as necessary to establish and maintain the angle. Maintain entry airspeed until apparent ground speed and rate of closure appear to be increasing. Progressively decrease the rate of descent and rate of closure until appropriate hover is established over the intended termination point. Maintain ground track alignment with the landing direction by maintaining the aircraft in trim above 50 feet AGL and aligning the aircraft with the landing direction below 50 feet AGL. Brief crewmembers on contingencies that may arise. Request pilot not flying assist in completing the After Landing Check(s). Discuss actions with crewmembers.

2. To the Ground. Proceed as for an approach to a hover, except continue the descent to the ground. Make the touchdown with minimum ground movement.

After the landing gear contacts the ground, ensure the aircraft remains stable with all movement stopped. Request crewmembers confirm aircraft stable. Crewmembers confirm aircraft stability. Smoothly reduce the collective to the full-down position, and neutralize the pedals and cyclic. Request pilot not flying assist in completing the After Landing Check(s). Discuss actions with crewmembers.

NOTE 1: The decision to go-around should be made before descending below obstacles or decelerating below ETL.

NOTE 2: For training, the recommended entry airspeed is 80 KIAS.

NOTE 3: Refer to FM 1-202 for procedures to reduce the hazards associated with the loss of visual references during the landing because of blowing snow or dust.

NIGHT OR NVG CONSIDERATIONS:

1. Night.

a. 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 slower than during the day to avoid abrupt attitude changes at low altitudes. After establishing the descent, reduce airspeed to approximately 50 knots until apparent ground speed and rate of closure appear to be increasing. Progressively decrease the rate of descent and forward speed until termination.

b. Be aware that surrounding terrain or vegetation may decrease contrast and cause a degradation of depth perception during the approach to the landing area. Before descending below obstacles, determine the need for artificial lighting.

2. NVG. See Task 2096.

3. Maintain a high level of intra-crew communication to ensure that all flight parameters are acceptable and safety margins are observed.

REFERENCES:

FM 1-202
FM 1-203
FM 1-204
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform confined area operations.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-landing check completed.

STANDARDS:

1. Prior to the approach--
   a. Establish entry altitude ±100 feet.
   b. Establish entry airspeed ±10 KIAS.
   c. Properly perform a landing area reconnaissance.
2. During the approach--
   a. Maintain ground track alignment with the selected approach path with minimum drift.
   b. Maintain a constant approach angle.
   c. Maintain an appropriate rate of closure.
   d. Properly perform a low reconnaissance.
   e. Execute a smooth and controlled termination in the forward one-third of the landing area.
3. Prior to takeoff--
   a. Properly complete the ground reconnaissance, and select a suitable takeoff path.
   b. Perform a hover power check if required, and complete the before-takeoff check without error.
   c. Properly clear the aircraft.
4. Prior to clearing obstacles--
   a. Maintain heading ±10 degrees.
   b. Maintain ground track alignment with minimum drift.
   c. Use power as required to clear obstacles safely while not exceeding aircraft limitations.

5. After clearing obstacles--

   a. Establish climb airspeed ±10 KIAS.

   b. Maintain rate of climb ±100 FPM.

   c. Maintain aircraft in trim.

   d. Maintain ground track alignment with selected takeoff path with minimum drift.

6. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION:

1. Employ aircrew coordination techniques throughout the ATM Task. Ensure external communications are established and required contacts made. Request crewmembers assist in keeping aircraft clear. Crewmembers maintain vigilance and advise of hazards. Upon approaching the area, evaluate the overall suitability of the terrain. Select a flight path, an airspeed, and an altitude that afford best observation. If approaching the area in the terrain flight mode, it is not necessary to increase altitude to perform the landing area reconnaissance. If landing is intended, determine if the landing area is suitable, identify obstacles, and estimate the effects of the wind. Select a touchdown point in the forward one-third of the landing area and a tentative flight path for the approach and departure. Brief crewmembers on contingencies that may arise.

2. Request pilot not flying monitor engine instruments and call out specified altitudes. On final approach, perform a low reconnaissance and confirm the suitability of the selected landing area. Evaluate obstacles which constitute a possible hazard, and confirm the suitability of the departure path selected during the landing area reconnaissance. Discuss actions with crewmembers. If a successful landing is doubtful, initiate a go-around before reducing airspeed below ETL or before descending below obstacles. Maintain the aircraft in trim above obstacles, and maintain landing area alignment below obstacles. Request crewmembers assist in determining aircraft stability during the landing and if instability is detected, reposition the aircraft. After landing, request pilot not flying assist in completing the after-landing check(s). Before takeoff or movement in the landing area, perform a ground reconnaissance to determine the suitability of the area for ground operations or to formulate the takeoff plan. (The ground reconnaissance may be performed from the cockpit.) Formulate the takeoff plan by evaluating the wind, obstacles, and shape of the area. Select the route to the takeoff point, and ensure adequate main and tail rotor clearance while maneuvering. For takeoff over an obstacle, it may be necessary to move the aircraft as far downwind from the obstacle as possible. Brief crewmembers on contingencies that may arise. Request pilot not flying assist in completing the before-takeoff check, and perform a hover power check if required. Request pilot not flying monitor engine instruments. Request crewmembers assist in keeping aircraft clear. Crewmembers maintain vigilance and advise of hazards. During

takeoff, use power as necessary to clear the obstacle safely while maintaining a constant ground track and climb angle. Discuss actions with crewmembers.

NOTE 1: Hover OGE power is required for confined area operations.

NOTE 2: Depending on the simulated threat or type of terrain flight being conducted, this maneuver may be initiated from either a straight-in or a circling pattern.

NIGHT OR NVG CONSIDERATIONS:

1. Night.

a. Confined areas are more difficult to evaluate at night because of low contrast. Success requires a knowledge of the various methods of determining the height of obstacles.

b. Before conducting confined area operations at night, ensure the searchlight/landing light (white light) is in the desired position. If the white light is used, night vision will be impaired for several minutes. Therefore, exercise extra caution if flight is resumed before full dark adaptation is reached.

2. NVG. See Task 2097.

3. Maintain a high level of intra-crew communication to ensure that all flight parameters are acceptable and safety margins are observed.

REFERENCES:

FM 1-203
FM 1-204
TC 1-201
TM 55-1520-237-10
Unit SOP

TASK: Perform simulated engine failure at altitude.

CONDITIONS: In a UH-60 helicopter with an IP or in a UH60FS.

STANDARDS:

1. Recognize the emergency, determine the appropriate corrective action, and perform, from memory, all immediate action procedures described in TM 55-1520-237-CL.

2. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: IP will encourage aircrew coordination by allowing the PI to assume the role of PC and by providing assistance as requested. PC will employ aircrew coordination techniques throughout the ATM Task. Upon detecting engine failure, Advise crewmembers of the situation, evaluate the emergency and respond according to procedures outlined in TM 55-1520-237-CL. State intentions as procedural steps are performed. Simulate external communications established and required contacts make. Request the pilot not flying call out/verify specified altitudes. As soon as possible, request the pilot not flying to assist in verifying the procedure with TM 55-1520-237-CL. Continue to fly the aircraft until the task is terminated. Discuss actions with IP/crewmembers. If the IP elects to terminate with a roll-on landing, refer to Task 1029.

NOTE 1: When the task is conducted in the aircraft, the IP will initiate the maneuver by announcing, "Simulated single-engine failure." Both ENG POWER CONT levers must be in the FLY position before the aircraft descends below 300 feet AGL.

NOTE 2: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

NIGHT OR NVG CONSIDERATIONS: If conducted in the aircraft, this is an NVG-prohibited training task.

REFERENCES:

AR 95-1
FM 1-203
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform or describe emergency procedures.

CONDITIONS: In a UH-60 helicopter with an IP or an IE, a UH60FS, or orally in a classroom environment; given a specific emergency condition.

STANDARDS:

1. Without error, perform or describe the appropriate emergency procedures.

2. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: If using the aircraft or simulator, IP/IE will encourage aircrew coordination by allowing the PI to assume the role of PC and by assisting as requested. PC will employ aircrew coordination techniques throughout the ATM Task. If in a classroom environment, describe how aircrew coordination would be accomplished. Perform or describe the appropriate emergency procedures as outlined in TM 55-1520-237-10. Request appropriate emergency assistance as described in the FIH. Request pilot not flying to cross-check instruments to verify emergencies and make all radio calls. Discuss actions/description with IP/IE/crewmembers.

NOTE: Those emergency procedures that cannot be practiced in the aircraft will be performed in the UH60FS or discussed orally.

REFERENCES:

FM 1-400
TM 55-1520-237-10
TM 55-1520-237-CL
FIH

TASK: PERFORM AIRCREW COORDINATION

CONDITION: In a UH-60 helicopter or UH-60FS

STANDARDS:

1. All crewmembers actively participate in the preflight/inflight mission planning.
2. A detailed aircrew briefing is accomplished prior to takeoff.
3. Each crewmember acknowledges his role, responsibilities, and tasks for the entire mission.
4. Two-way communication is established and maintained using standard phraseology and visual signals.
5. Differences of opinion are encouraged and judiciously resolved in an atmosphere of mutual respect.
6. All essential information is shared between crewmembers.
7. All crewmembers participate in the problem solving process.
8. Situational awareness is demonstrated at all times by each crewmember with respect to mission objectives, aircraft position, equipment status, environmental conditions, and personnel capabilities.
9. All crewmembers coordinate task execution to ensure that critical task timing and task sequencing is achieved.
10. All crewmembers participate in the critique process by offering criticism in a constructive, supportive manner.
11. Crewmembers work smoothly as a team committed to safe, mission-oriented flying.

DESCRIPTION: Close and continuous coordination between crewmembers is essential to mission success. Aircrew coordination begins with thorough preflight planning followed by a detailed aircrew briefing. The PC, as the cockpit resource manager, defines each crewmember's role, delegates responsibilities, and assigns tasks covering both routine and emergency situations. The aircrew briefing covers specific responsibilities and duties during the entire mission. Of special significance is the assignment of clearance responsibilities. Clearance responsibility is paramount and is not abandoned in lieu of other tasking(s) without announcement, acknowledgement, and assumption of the clearance sector by another crewmember. The pilot flying, unless under actual IMC, is always "outside" the cockpit during terrain and aided flight. "Inside" cockpit duties, e.g., instrument

monitoring, frequency changes, NAVAID programming, and passenger control, are tasked to the pilot not flying or non-flying crewmember(s). If unable to divide attention between clearing and "inside" cockpit duties, the affected crewmember advises the pilot flying so that workload may be redistributed. Crewmembers discuss expected hazards, e.g., high traffic areas, converging airways and reporting points, wires, descent corridors, and multi-aircraft formations, and plan their observational coverage accordingly. Non-flying crewmember(s) position themselves to best observe the hazard(s). Where feasible, aircraft control is passed to the pilot best able to observe the hazard(s). Hazards observed by crewmembers are described to the pilot flying in terms of type, direction, and distance. Each crewmember clearly understands and acknowledges his role, responsibilities and tasks for the entire mission before the mission begins. Two-way cockpit communication is established using standard phraseology and commonly accepted nonverbal signals. Of special importance is the positive transfer of aircraft controls. Under no circumstances does the pilot not flying assist on, or assume, the controls without positively announcing such action and the purpose therefore. When assumption or assistance is announced, confirmation is made by the pilot flying. Inquiry/questioning is carried on freely between crewmembers; and advocacy/assertion practiced as required without fear of censure. Differences of opinion are encouraged and judiciously resolved; and all crewmembers participate in the problem solving/decision-making effort if the situation allows and time is available. Final decisions are announced by the PC, acknowledged, and collectively implemented in a cooperative fashion. Where time precludes announcing a decision, crewmembers call for a decision review when circumstances allow. Plans/intentions are always verbalized and presented in a timely manner; and information is shared between crewmembers at appropriate decision points. The pilot not flying anticipates requirements for information or tasking and requests direction from the pilot flying. Under no condition does the pilot not flying unilaterally execute an unassigned task without the approval or request of the pilot flying. Checklists are used together with fixed procedural terminology and the proper challenge and response. Each crewmember is aware of the current situation at all times with respect to mission objectives, aircraft position, equipment status, environmental conditions, and the capabilities of fellow crewmembers. Crewmembers are sensitive to the mental and physical states of one another and are not hesitant to advise of personal problems inhibiting effective performance. Stress is managed to maintain a relaxed, business-like atmosphere employing casual conversation and humor to maintain a moderate level of arousal during periods of low workload. All tasks are accomplished in a concerted manner with crewmembers cooperatively readjusting the workload by assuming unassigned tasks. Task transfers are acknowledged by the pilot flying and the transferring crewmembers. Tasks are voluntarily assumed in order to help one another because of perceived task saturation established through observation or error checking. Error checking is routinely accomplished and reported to the responsible crewmember. Errors are specifically described and announced in a concise manner without excessive professional courtesy, e.g., "100' above assigned altitude;" and the two-challenge rule is employed prior to assuming the aircraft controls, if necessary. Top-down/bottom-up constructive critiques are accomplished as required either during or after the mission to ensure all crewmembers are performing or are being trained to accepted standards. Crewmembers exhibit mutual support and are positively motivated by the PC to continuously improve upon past performance.

NIGHT OR NVG CONSIDERATIONS:

1. During night or NVG operations, aircrew coordination is especially critical to successful mission accomplishment. Under such conditions, it is of the utmost importance that outside visual search sectors be assigned and defined for each crewmember. Whenever the crewmember responsible for a given sector is unable to scan his sector; e.g., changing radio frequencies, he will so announce and another crewmember will be assigned the responsibility during the interim. During night/NVG operations, the pilot flying is responsible for maintaining aircraft control, ensuring obstacle avoidance, and requesting assistance from the other crewmembers. The pilot not flying performs all equipment and instrument checks, selects radio frequencies, assists in clearing the aircraft, and serves as the navigator. The crew chief performs those duties assigned by the PC.

2. During actual or simulated emergencies, each crewmember performs as briefed. Normally, the pilot flying will initiate those immediate action steps to maintain aircraft control. He must determine whether to remain goggled or make the transition to unaided visual flight. The pilot not flying will assist as requested.

REFERENCES:

FM 1-203
FM 1-204
TC 1-201
TM 55-1520-237-10
Unit SOP

TASK: Perform after-landing tasks.

CONDITIONS: Given a UH-60 helicopter or a UH60FS and TM 55-1520-237-CL.

STANDARDS:

1. Without error, perform after-landing tasks according to TM 55-1520-237-CL.

2. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: Employ aircrew coordination techniques throughout the ATM Task. Request the pilot not flying assist in making the appropriate check(s). Ensure external communication established, required contacts made, and clearances verified. Ensure accomplishment of after-landing tasks as required, to include after-landing, engine-shutdown, and before-leaving aircraft checks. Request CC secure aircraft and supervise refueling, if necessary. Close the flight plan. Discuss results of mission with crewmembers. Debrief tasking authority on mission accomplishment and submit completed DA Form 5484.

NOTE: TM 55-1520-237-10 contains details about procedures outlined in TM 55-1520-237-CL.

REFERENCES:

AR 95-1
AR 385-95
DA Pamphlet 738-751
TM 55-1520-237-10
TM 55-1520-237-CL

TASK: Perform multiaircraft operations.

CONDITIONS: In a UH-60 helicopter.

STANDARDS:

1. Correctly maneuver into the flight formation.
2. Correctly change position in the flight formation when required.
3. Maintain proper horizontal and vertical separation for the type of formation flight being conducted.
4. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: Perform formation flight per TC 1-201, AR 95-1, and the unit SOP. Employ aircrew coordination techniques throughout the ATM Task. Request crewmembers assist in keeping the aircraft clear of other aircraft. Crewmembers maintain vigilance and advise of hazards. If required, controls should be passed to the pilot best able to view the formation and maintain position. Discuss actions with crewmembers.

NOTE: When operating near heavy aircraft, be aware of the possibility of encountering wake turbulence.

NIGHT OR NVG CONSIDERATIONS: Increase the interval between aircraft to a minimum of three rotor disks, and keep changes in the formation to a minimum. All crew members must avoid fixation by using proper scanning techniques. Request crewmembers assist in keeping aircraft clear. Crewmembers maintain vigilance and advise of hazards.

a. Night. During unaided night flight, formation lights, as well as position lights, should be used.

b. NVG.

(1) An additional crew member, wearing NVG, will supplement the crew flying the aircraft. This crew member will position himself in the aircraft so that he can observe other aircraft in the formation and assist in maintaining aircraft separation and obstacle clearance.

(2) The following limitations apply while en route:

(a) Over 200 feet AHO. Only straight trail, staggered trail, and echelon formations are authorized.

(b) 100 to 200 feet AHO (Low level). Maximum speed is 100 KIAS. Only free cruise, staggered trail, and echelon formations are authorized.

(c) 25 to 100 feet AHO (contour). Maximum airspeed is 70 KIAS. Only free-cruise formation, together with techniques of movement, is authorized.

(d) Less than 25 feet AHO with wheels above trees and vegetation in the flight path (NOE). Maximum airspeed is 40 KIAS. Only free-cruise formation, together with techniques of movement, is authorized.

REFERENCES:

AM 95-1
FM 1-204
TC 1-201
Unit SOP

TASK: Perform external load operations.

CONDITIONS: In a UH-60 helicopter with an operational cargo hook or in a UH60FS; required briefings and checks completed; and aircraft cleared.

STANDARDS:

1. Hookup and Hover.
   a. Maintain vertical ascent heading ±10 degrees.
   b. Maintain altitude of load 10 feet AGL, ±5 feet.
   c. Do not allow drift to exceed 5 feet.
2. Takeoff (Below 100 Feet AGL).
   a. Maintain takeoff heading ±10 degrees.
   b. Maintain ground track alignment with takeoff direction.
   c. Maintain power as required to clear obstacles safely.
3. Takeoff (Above 100 Feet AGL).
   a. Maintain aircraft in trim.
   b. Maintain airspeed ±10 KIAS.
   c. Maintain rate of climb ±100 FPM.
4. En Route.
   a. Maintain aircraft in trim.
   b. Maintain airspeed ±10 KIAS.
   c. Maintain safe load obstacle clearance (minimum 50 feet AHO).
5. Approach and Load Release.
   a. Maintain a constant approach angle to ensure the load safely clears obstacles.
   b. Maintain ground track alignment with the selected approach path.
   c. Execute a smooth and controlled termination over the intended point of landing.

d. Maintain vertical descent heading ±10 degrees.

6. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: Employ aircrew coordination techniques throughout the ATM Task. Ensure external communications established and required contacts made. Request crewmembers assist in keeping aircraft clear. Crewmembers maintain vigilance and advise of hazards. Request pilot not flying to monitor engine instruments.

1. Hookup and Hover. Request pilot not flying to place the cargo release switch in the ARM position and the EMER REL switch in the NORM position. Follow hand signals from the signalman to hover over the load. If signalman is obscured from view, request non-flying crewmember provide directions. Apply cyclic, collective, and pedals as required to remain vertically clear of and centered over the load. When the signalman indicates the load is hooked up, slowly apply collective until all slack is taken out of the sling. Make necessary corrections with the cyclic to remain centered over the load. Maintain heading with the pedals. Apply additional collective to raise the load vertically to 10 feet AGL. Request pilot not flying monitor aircraft instruments to ensure aircraft limitations are not exceeded.

2. Takeoff.

a. After receiving the signal for takeoff, smoothly apply forward cyclic while increasing collective pitch to begin a coordinated acceleration and climb. Adjust pedals as necessary to maintain desired heading. Adjust cyclic and collective as necessary to attain a constant angle of climb that will permit safe obstacle clearance. Continue the climbout at that attitude and power until obstacles are cleared.

b. Above 100 feet or obstacle clearance, adjust attitude and power as required to establish the desired rate of climb and airspeed. Make small control movements to prevent load oscillation. After passing 300 feet AGL, request the pilot not flying place the cargo release switch in the SAFE position.

NOTE: Ensure the cargo switch is in the ARM position when operating at altitudes below 300 feet AHO.

3. En Route. Maintain desired altitude with the collective and desired flight path and airspeed with the cyclic. Maintain aircraft in trim with the pedals. Make smooth control applications to prevent load oscillation. If a lateral load oscillation occurs, reduce airspeed. If a fore-and-aft oscillation occurs, begin a shallow bank while reducing airspeed.

4. Approach and Load Release. When the approach angle is intercepted, decrease the collective to establish the descent. Maintain entry airspeed until apparent ground speed and rate of closure appear to be increasing. When passing 300 feet AGL, request pilot not flying place the cargo release switch in the ARM position. Progressively decrease the rate of descent and forward airspeed until a stationary hover is attained with the load 10 feet above the intended release point.

(A go-around should be made before descending below obstacles or decelerating below ETL.) Slowly reduce the collective until the load rests completely on the ground, and then release it. If ground personnel are not available, confirm load release by hovering to a point that is higher than the sling length.

NOTE 1: Avoid flight over populated areas.

NOTE 2: Hover OGE power is required for external load operations. (Task 1004 discusses how to compute maximum allowable gross weight (OGE).)

NOTE 3: Before the mission, the PC will ensure that all crew members are familiar with the hand-and-arm signals shown in TC 1-201 and forced landing procedures. In case of a forced landing, the pilot flying will land the aircraft to the left of the load. The hookup man will move to the right of the aircraft and lie facedown on the ground. The signalman will remain in place and lie facedown on the ground.

NIGHT OR NVG CONSIDERATIONS:

1. For unaided night flight, the landing light and searchlight should be operational. If an NVG filter is installed, it should be removed.

2. Hovering with minimum drift is difficult and requires proper scanning techniques and crewmember coordination. Request pilot not flying check for drift and hover height. If possible, an area with adequate ground contrast and reference points should be used.

NOTE: Excessive drift may position the sling so it cannot be jettisoned if required.

3. Treat visual obstacles the same as physical obstacles.

4. The rate of descent and rate of closure should be slightly slower to avoid abrupt attitude changes at low altitudes.

5. Maintain a high level of intra-crew communication to ensure that all flight parameters are acceptable and safety margins are observed.

REFERENCES:

AR 95-16
FM 1-203
FM 1-204
FM 55-450-1
TC 1-201
TM 55-1520-237-10
Unit SOP

TASK: Perform terrain flight.

CONDITIONS: In a UH-60 helicopter or a UH60FS; given a mission briefing and required maps and materials.

STANDARDS:

1. NOE Flight.
   a. Fly as close to the earth's surface as vegetation, obstacles, and ambient light will permit.
   b. Maintain airspeed appropriate for the terrain, enemy situation, weather, and ambient light.
2. Contour Flight.
   a. Maintain a safe obstacle clearance altitude while generally conforming to the contours of the earth.
   b. Maintain airspeed appropriate for the terrain, enemy situation, weather, and ambient light.
   c. Maintain aircraft in trim.
3. Low-Level Flight.
   a. Maintain altitude ±50 feet.
   b. Maintain airspeed ±10 KIAS.
   c. Maintain aircraft in trim.
4. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION:

1. Employ aircrew coordination techniques throughout the ATM Task. Request crewmembers assist in keeping aircraft clear. Crewmembers maintain vigilance and advise of hazards. Request pilot not flying monitor engine instruments. Discuss actions with crewmembers.

2. Terrain flying involves flight close to the earth's surface. The modes of terrain flight are NOE, contour, and low-level. Aviators will seldom perform pure NOE or contour flight. Instead, they will go from one technique to another while maneuvering over the desired route. During terrain flight, the pilot flying is primarily concerned with Threat and obstacle avoidance. The pilot not flying is normally responsible for navigating and monitoring aircraft systems.

a. 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.

b. Contour flight. Contour flight is characterized by varying altitude and relatively constant airspeed, depending on the vegetation, obstacles, and ambient light. It generally follows the contours of the earth.

c. Low-level flight. Low-level flight is usuallv performed at a constant airspeed and altitude. It generally is conducted at an altitude which avoids or reduces the chance of detection by enemy forces.

NOTE: Hover OGE power is required for NOE/contour flight.

NIGHT OR NVG CONSIDERATIONS:

1. Proper scanning techniques must be used to ensure obstacle avoidance.

2. Airspeed and altitude limitations and ambient light criteria described in paragraph 6-2 must be observed during the NVG terrain flight training.

3. Maintain a high level of intra-crew communication to ensure that all flight parameters are acceptable and safety margins are observed.

REFERENCES:

FM 1-203
FM 1-204
FM 1-240
FM 1-400
FM 21-26
TC 1-201

TASK: Perform terrain flight approach.

CONDITIONS: In a UH-60 helicopter or a UH60FS with before-landing check completed.

STANDARDS:

1. Maintain a constant approach angle to clear obstacles.
2. Maintain ground track aligned with the selected approach path with minimum drift.
3. Maintain appropriate rate of closure.
4. Make a smooth and controlled termination at the intended approach point.
5. Employ aircrew coordination techniques in accordance with Task 1071.

DESCRIPTION: Employ aircrew coordination techniques throughout the ATM Task. Request crewmembers assist in keeping aircraft clear. Crewmembers maintain vigilance and advise of hazards. The approach may be initiated from a straight-in or modified pattern, depending on the tactical situation, wind, long axis of the landing area, lowest obstacles, and arrival path. Maneuver the aircraft as required (straight-in or circle) to intercept the desired approach path. Adjust airspeed as necessary, and keep the landing area in sight at all times. Request pilot not flying monitor engine instruments and call out specified altitudes. Start the approach upon intercepting an angle which ensures obstacle clearance. Advise crew when beginning descent. Maintain ground track aligned with the selected approach path. Progressively decrease the rate of descent and forward speed, using collective and cyclic, as necessary, to the intended point of landing. The decision to terminate at a hover, to the ground with zero forward speed, or with a roll-on landing will depend on aircraft loading and environmental conditions. A go-around should be made before descending below obstacles or decelerating below ETL. It should also be made if visual reference with the touchdown point is lost. Discuss actions with crewmembers.

NIGHT OR NVG CONSIDERATIONS:

1. Night. Movement over areas of limited contrast, such as tall grass, water, or desert, tends to cause spatial disorientation. Seek hover areas which provide adequate contrast. If disorientation occurs, state the problem or uncertainty and request pilot not flying assist on/take the controls; or apply sufficient power and execute a takeoff. If a takeoff is not feasible, and the pilot not flying cannot assist on/take the controls, state intentions and attempt to maneuver the aircraft forward and down to the ground to limit the possibility of touchdown with sideward or rearward movement.

2. NVG. See Task 2096.

3. Maintain a high level of intra-crew communication to ensure that all flight parameters are acceptable and safety margins are observed.

REFERENCES:

FM 1-203
FM 1-204
TC 1-201
TM 55-1520-237-10