FM 3-04.513

Aircraft Recovery Operations

July 2008

Headquarters, Department of the Army

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

Field Manual
No. 3-04.513

Headquarters
Department of the Army
Washington, DC, 21 July 2008

Aircraft Recovery Operations

Contents

Page

PREFACE vi

Chapter 1 **Management** 1-1

Section I – Terms 1-1
Aircraft Recovery 1-1
Downed Aircraft Recovery Team 1-2
Assessor 1-2
Battle Damage Assessment and Repair 1-2
Maintenance Evacuation 1-2
Personnel Recovery 1-2

Section II – Responsibilities 1-3
Joint Personnel Recovery Center 1-3
Personnel Recovery Coordination Cell 1-3
Aviation Brigade Command Post 1-4
Operational Aviation Battalion/Squadron 1-4
Aviation Maintenance Company/Troop 1-5
Aviation Support Company/AVIATION SUPPORT TROOP 1-6
Aircraft Crew 1-7
Unmanned Aircraft Systems Recovery 1-7
Maintenance Personnel 1-8
Downed Aircraft Recovery Team 1-8
Accident Investigation Board 1-10

Section III – Maintenance Support Facilities 1-10
Aviation Classification Repair Activity Depot 1-10
Army Aviation Support Facility 1-11
Continental United States Aircraft Recovery Support 1-11

Chapter 2 **Operations** 2-1

Section I – General Aircraft Recovery Considerations 2-1
Triggering Conditions 2-1
Aircraft Recovery Operations 2-3
Missions Defined 2-4
Principles 2-5
Preparation 2-7
Environmental Considerations 2-8

***This publication supersedes FM 3-04.513, 27 September 2000.**

Section II – Mission-Specific Considerations 2-9
Battle Damage Assessment and Repair Training Program 2-9
Downed Aircraft Recovery Team Training Program 2-9
Aircraft Disposition 2-11

Chapter 3 Procedures 3-1

Section I – Recovery Alternatives 3-1
Self-Recovery 3-1
Dedicated Recovery (Aerial) 3-2
OnSite Recovery Challenges 3-2
Dedicated Recovery (Ground) 3-3
Ground Recovery Procedures 3-4
Salvage Recovery 3-4
Maintenance Evacuation 3-5

Section II – Rigging Considerations 3-5
Unit Maintenance Aerial Recovery Kit 3-5
Safety Considerations 3-6

Appendix A AVIATION BRIGADE DOWNED AIRCRAFT PROCEDURES A-1

Appendix B DOWNED AIRCRAFT RECOVERY TEAM STANDING OPERATING PROCEDURE B-1

Appendix C BATTLE DAMAGE ASSESSMENT AND REPAIR TOOLS, EQUIPMENT, AND KITS C-1

Appendix D AFTER-ACTION REPORT D-1

Appendix E HAND AND ARM SIGNALS E-1

GLOSSARY Glossary-1

REFERENCES References-1

INDEX Index-1

Figures

Figure 1-1. Downed aircraft recovery team recovers armed unmanned aircraft 1-7
Figure 1-2. Downed aircraft recovery team examines unmanned aircraft engine 1-8
Figure 1-3. Downed aircraft recovery team personnel and equipment for load out..... 1-10
Figure 2-1. Matrix for the execution of recovery missions 2-1
Figure 2-2. Rehearsal load out for ground recovery 2-10
Figure 3-1. Example of obstacles encountered at pickup site 3-3
Figure 3-2. Downed aircraft recovery team assembles for a ground recovery 3-4
Figure 3-3. CH-47 performs salvage recovery utilizing a flat rack and military demountable containers 3-5
Figure A-1. Contingency plan phases A-1
Figure E-1. Proceed to next ground guide E-1
Figure E-2. This way E-1
Figure E-3. Move ahead E-2
Figure E-4. Turn to left (port) E-2
Figure E-5. Turn to right (starboard) E-2
Figure E-6. Landing directions E-3
Figure E-7. Move upward E-3
Figure E-8. Hover E-3
Figure E-9. Move downward E-4
Figure E-10. Move to right E-4
Figure E-11. Move to left E-4
Figure E-12. Slow down E-5
Figure E-13. Stop E-5
Figure E-14. Brakes E-5
Figure E-15. Engage rotor(s) E-6
Figure E-16. Start engine(s) E-6
Figure E-17. Wave-off E-6
Figure E-18. Affirmative (all clear) E-7
Figure E-19. Negative (not clear) E-7
Figure E-20. Move back E-7
Figure E-21. Land E-8
Figure E-22. Clearance for personnel to approach aircraft E-8
Figure E-23. Personnel approach the aircraft (given by ground crewmember) E-8
Figure E-24. Up hook E-9
Figure E-25. Down hook E-9
Figure E-26. Slow down engine(s) on indicated side E-9
Figure E-27. Cut engine(s) or stop rotor(s) E-10
Figure E-28. Connect auxiliary power unit E-10
Figure E-29. Disconnect auxiliary power unit E-11
Figure E-30. Insert chocks/chocks inserted E-11
Figure E-31. Remove chocks E-11

Figure E-32. Hook up load E-12
Figure E-33. Release load E-12
Figure E-34. Load has not been released E-12
Figure E-35. Droop stops out E-13
Figure E-36. Droop stops in E-13

Tables

Table 1-1. Continental United States aircraft recovery responsibilities 1-11
Table 2-1. Battle damage assessment categories 2-10
Table A-1. Example of wingman actions and considerations A-2
Table A-2. Necessary planners A-4
Table B-1. Sample of a downed aircraft recovery team timeline B-1
Table B-2. Sample of a downed aircraft recovery report B-2
Table B-3. Example of a pre-execution checklist B-6
Table B-4. Example of a downed aircraft recovery team process checklist B-10
Table B-5. Downed aircraft recovery team mission brief B-11
Table B-6. Example of a downed aircraft report B-12
Table B-7. Example of a downed aircraft recovery team manifest and tasking B-13
Table B-8. Example of a medical evacuation request B-14
Table B-9. Example of a downed aircraft recovery team quick card B-15
Table B-10. Mission-specific items B-15
Table C-1. Special or fabricated tools C-1
Table C-2. Expendable supplies and materials list C-1

Preface

Field manual (FM) 3-04.513 is intended for use by commanders and U.S. military maintenance personnel operating and employing resources in an aircraft recovery operational environment.

This manual is the Army's doctrine for battlefield and garrison recovery operations. The operational concepts described in this manual are based on Army doctrine established in FM 1, FM 3-0, FM 3-04.111, FM 3-04.500, and FM 3-50.1. Emphasis is placed on modular force structure and the enhanced operational capability provided by Army aviation transformation.

This publication applies to the Regular Army, the Army National Guard/Army National Guard of the United States, and the United States Army Reserve unless otherwise stated. It builds on the collective knowledge and experience gained through recent operations, numerous exercises, and the deliberate process of informed reasoning. This publication is rooted in time-tested principles and fundamentals, while accommodating new technologies and evolving responses to the diverse threats to national security.

Aircraft recovery missions include the assessment, repair, and retrieval, if possible, of aircraft forced down due to component malfunction, accident, or combat-related damage that prevents the continued safe flight or operation of the aircraft. The aircraft recovery mission is complete upon the return of all personnel and either:

- The return of the aircraft through self-recovery or dedicated recovery utilizing aerial or surface recovery methods and techniques.
- The selective cannibalization and destruction or abandonment of the aircraft.

Aircraft recovery is a pre-planned mission for all units with assigned or operational control of Army aircraft and may require extensive coordination with supporting units. Aircraft recovery is time sensitive to the tactical situation. Aircraft recovery and maintenance evacuations are closely related, however, maintenance evacuation is the physical act of moving an aircraft from one maintenance location to another.

This manual is a guide and intended for use by commanders at all levels. Unless otherwise stated, use of the term battalion or company also refers to squadron or troop. Similarly, use of the term aviation maintenance company (AMC) refers to aviation maintenance troop (AMT). Also, the use of the term aviation support company (ASC) refers to aviation support troop (AST). In actual practice, the procedures outlined in this manual may be modified or augmented to account for force size; availability of aerial and ground assets; manpower, time and distance considerations; and the tactical situation.

The proponent of this publication is Headquarters, United States Army Training and Doctrine Command. Send comments and recommendations on Department of the Army (DA) Form 2028 (Recommended Changes to publications and Blank Forms) or automated link (http://www.usapa.army.mil/da2028/daform2028.asp) to Commander, U.S. Army Aviation Warfighting Center ATTN: ATZQ-TD-D, Fort Rucker, Alabama 36362-5263. Comments may be e-mailed to the Directorate of Training and Doctrine at av.doctrine@us.army.mil. Other doctrinal information can be found on the Internet at Army Knowledge Online or call Defense Switched Network 558-3551 or (334) 255-3551.

This manual implements portions of Standardization Agreements 2999 and 3117.

This publication has been reviewed for operations security considerations.

Chapter 1

Management

Recovery operations are usually triggered by initial notification to the main command post (CP) and consist of personnel recovery (PR) (which is the priority) and downed aircraft recovery. These operations may be conducted individually or simultaneously. Recovery operations may be initiated at the aircraft site and evolve into a dedicated aviation brigade-level missions.

SECTION I – TERMS

AIRCRAFT RECOVERY

Contents

Section I – Terms 1-1
Section II – Responsibilities 1-3
Section III – Maintenance Support Facilities 1-10

1-1. Joint publication (JP) 1-02 defines recovery as "actions taken to extricate damaged or disabled equipment for return to friendly control or repair at another location." Recovery is retrieving an immobile, inoperative, or abandoned aircraft from its current position and returning it to a mission-capable status or a maintenance site for repair. These actions typically involve—

- Expert assessment of the aircraft.
- Performance of standard or battle damage assessment and repair (BDAR) maintenance actions enabling aircraft to self-recover.
- Recommendation of actions and/or preparation of the aircraft for a dedicated recovery.

1-2. Unless specifically mentioned, recovery tactics, techniques, and procedures; doctrine; organization; training; materiel; leadership and education; personnel; and facilities considerations apply to operational themes from peacetime military engagement to major combat operations..

SELF-RECOVERY

1-3. Self-recovery is defined as actions required for the aircraft to fly out under its own power to either rejoin the mission or to a maintenance area for additional repairs or inspections. Self-recovery begins at the location where the aircraft became inoperable or disabled. It ends with the completion of standard and/or BDAR maintenance procedures correcting faults required for the aircraft to safely fly to a secure area or rejoin the air mission. This is typically a unit or aviation maintenance company/aviation maintenance troop (AMC/AMT) function.

DEDICATED RECOVERY

1-4. Dedicated recovery is defined as actions required to extract an aircraft by means of an aerial or surface recovery vehicle to a maintenance area for repairs and/or inspections. Dedicated recovery begins with the decision that the aircraft will not be able to self-recover. It ends with the movement of the aircraft by either aerial or ground vehicle to a maintenance area equipped to conduct required inspections and/or subsequent repairs. This is typically an aviation support company (ASC) or aviation support troop (AST) mission.

IMMEDIATE RECOVERY

1-5. Immediate recovery is performed by assets within a flight mission. These assets may include the aircraft's crew requiring recovery, other crews participating in the mission, or downed aircraft recovery team (DART) personnel accompanying and supporting the flight.

DELAYED RECOVERY

1-6. Delayed recovery is performed by a DART not in the flight. Delayed recoveries are categorized as deliberate and hasty.

- Deliberate–Personnel and assets remain on standby at a predetermined location for the duration of the mission.
- Hasty–Personnel and assets remain on-call and readily available awaiting notification of a mission requirement, while executing normal operations.

DOWNED AIRCRAFT RECOVERY TEAM

1-7. A DART is comprised of select personnel who perform assessment, repairs, and recovery of downed aircraft. This team is equipped, trained, and rehearsed to accomplish aircraft recovery in various environments and conditions.

ASSESSOR

1-8. An assessor is a technical expert who can evaluate aircraft battle damage. The assessor's mission is to provide the commander with an initial assessment of the downed aircraft. An assessor can be one, or a combination, of the following:

- Aircrew of the downed aircraft.
- Aircrew of another aircraft.
- PR aircrew.
- DART member.

1-9. The ability to determine rapidly that a one-time flight is feasible or a quick-fix repair is possible is important. It may prevent a situation in which the aircraft would otherwise be destroyed (in place) to prevent capture or compromise by the enemy.

BATTLE DAMAGE ASSESSMENT AND REPAIR

1-10. BDAR is the use of specialized aircraft damage assessment criteria, repair kits, and trained personnel to modify peacetime aircraft maintenance standards. This concept includes the return of damaged aircraft to a safe location and, eventually, to battle.

MAINTENANCE EVACUATION

1-11. Maintenance evacuation is the physical act of moving an aircraft from one maintenance location on the battlefield to another. Movement is either by fly-out or aerial/ground transportation. Evacuation is to effect repair, cross-level maintenance workloads, or relieve units of disabled aircraft during tactical moves.

PERSONNEL RECOVERY

1-12. The Army defines PR as "The sum of military, diplomatic, and civil efforts to effect the recovery and return of U.S. military, Department of Defense (DOD) civilians, DOD contractor personnel, or other personnel, as determined by the Secretary of Defense, who are isolated, missing, detained, or captured in an operational environment." For additional information, refer to FM 3-50.1.

1-13. Additionally, when directed by the President of the United States or Secretary of Defense, DOD shall provide PR support to other governments, agencies, organizations, and individuals in accordance with (IAW) all applicable laws, regulations, and memorandums of agreement or understanding. JP 3-50 provides further information.

1-14. PR may be performed by the DART. When this occurs, extraction of the crew is primary; aircraft assessment is secondary. The PR mission is undertaken to—

- Provide safe recovery of the downed aircrew.
- Return aircrews to Level II medical care, if appropriate.
- Re-integrate the aircrew into the unit.

1-15. According to FM 3-04.111, PR is the priority, followed by recovery of the downed aircraft and equipment. Equipment recovery operations may be conducted simultaneously with the PR operation or delayed until these operations are complete. Downed aircraft or equipment recovery operations must never compromise PR operations.

SECTION II – RESPONSIBILITIES

JOINT PERSONNEL RECOVERY CENTER

1-16. The Joint Personnel Recovery Center (JPRC) is responsible for coordinating all PR-related matters for the joint force commander (JFC), including missions employing joint, interagency, and multinational forces and capabilities. JPRC responsibilities include—

- Recommending PR courses of action to decisionmakers.
- Developing PR standing operating procedures (SOPs) for the joint force.
- Coordinating externally supported recoveries with interagency and multinational organizations (including host nation capabilities).
- Assisting personnel recovery coordination cells (PRCCs) in fulfilling their requirements.
- Coordinating for theater and national intelligence support.

PERSONNEL RECOVERY COORDINATION CELL

1-17. Army component commanders are responsible for PR within their area of operations (AO) unless directed otherwise by the JFC. To coordinate PR missions, these commanders establish a PRCC. For PR missions within their AO, these cells facilitate task organization of forces as necessary. When working with joint force components, these cells provide a PR capability only if directed by the JFC.

1-18. PRCC responsibilities include—

- Ensuring reliable communications with subordinate unit personnel recovery officers (PROs), other PRCCs, and the JPRC.
- Coordinating deliberate recoveries for the component.
- Reviewing accountability and movement reporting procedures of subordinate units.
- Airspace command and control deconfliction during PR missions.
- Assisting in immediate recoveries when requested by subordinate units.
- Coordinating for component fire support (FS) of the operation.
- Ensuring subordinate units have access to SOPs developed by the JPRC.
- Ensuring subordinate units have sufficient evasion aids.

AVIATION BRIGADE COMMAND POST

1-19. The aviation brigade CP provides overall command and control (C2) of recovery operations in their area of coverage. Due to the extensive communications, resource allocations, taskings, and situational awareness required for successful recovery operations, the brigade CP provides the most comprehensive organization for facilitating recoveries. Once initial mission, enemy, terrain and weather, troops and support, time available, and civil considerations (METT-TC) analysis is accomplished with the required representatives from each unit or area of expertise, the brigade CP may assign C2 to another organization. This may depend on several factors including aircraft assessment, the threat, and required mission time. A successful recovery operation is a highly coordinated effort between the aviation brigade CP, the controlling organization's CP, AMC/AMT, ASC/AST, the aviation support battalion (ASB), other supporting units, and the ground element in which the operation takes place.

OPERATIONAL AVIATION BATTALION/SQUADRON

1-20. The downed aircraft's controlling battalion or squadron is responsible for immediately notifying the aviation brigade CP and coordinating initial aircraft recovery plans with the battalion/squadron AMC/AMT. The AMC/AMT is generally responsible for conducting the recovery within its capabilities. If recovery is beyond the capabilities of the AMC/AMT, support is coordinated by the aviation brigade CP from the ASB's ASC or Squadron's AST.

COMMANDER

1-21. The operational battalion/squadron commander retains initial responsibility for aircraft recovery. Aircraft recovery operations are planned within the context and urgency of the mission, force size, and the density of recovery assets at the disposal of commanders. Aircraft recovery procedures are included in unit SOPs, contingency plans, operation orders, and air mission briefs (AMBs). Additional responsibilities include:

- Ensuring the DART team is trained, resourced, and rehearsed for all environments and mission profiles in which the unit operates.
- Authorizing deployment of the DART in a force application environment.
- Ensuring aircraft destruction decisions are made at the appropriate command level per SOP and guidance.
- Authorizing use of cannibalization techniques that permit quick and efficient removal of critical components and structures from nonreparable or unrecoverable aircraft.
- Authorizing use of BDAR procedures to affect temporary repairs to a specific aircraft in a force application environment.
- Ensuring DART and BDAR procedures are applied IAW applicable Army regulations (ARs), Field Manuals (FMs), technical manuals (TMs), and Department of the Army pamphlets (DA Pams); and are included in unit and subordinate unit SOPs.
- Ensuring BDAR repairs are corrected with standardized repairs as soon as practical, based on METT-TC.

AVIATION SAFETY OFFICER

1-22. The battalion/squadron aviation safety officer serves as the principle advisor to the commander and staff on aviation safety matters. The ASO assists the commander during the composite risk management (CRM) process and monitors the planning and execution of aircraft recovery missions.

AVIATION MAINTENANCE COMPANY/TROOP

1-23. The priority for the AMC/AMT is self-recovery and BDAR, with dedicated aircraft recovery as contingency operations. To preserve the AMC/AMT operational tempo, aerial or ground recovery should be conducted by the ASC/AST. The AMC/AMT provides mobile, responsive support to repair aircraft onsite or prepare them for evacuation. The AMC/AMT will conduct BDAR or standard repairs to self-recover the aircraft. The AMC/AMT commander and production control officer coordinate and schedule maintenance at locations forward of the battalion. In some cases, the unit commander may authorize use of aircraft combat maintenance and BDAR procedures. Aircraft combat maintenance and BDAR are generally AMC/AMT responsibilities with augmentation from the supporting ASC/AST when required.

COMMANDER

1-24. The AMC/AMT commander plans, directs, and supervises company/troop operations and employment. The commander is also directly responsible for recovery operations within the unit's capabilities. The commander's responsibilities include—

- Selecting and organizing DART team members by military occupational specialty (MOS) and skill level.
- Resourcing all tools, special tools, and mission-specific combat equipment.
- Establishing a DART training program to ensure personnel are trained and rehearsed in BDAR and recovery procedures for all environments and mission profiles in which the unit operates. Training and rehearsals will include:
  - DART tactical operations and procedures.
  - Employment of unit maintenance aerial recovery kits (UMARKs) for all supported airframes.
  - BDAR inspection, serviceability, and deferability criteria. Use of BDAR kits and installation of BDAR components.
  - BDAR maintenance tasks and methods.
  - Expedient cannibalization techniques.
  - CRM procedures.
  - Hazardous communication (HAZCOM) procedures.
  - Hazardous materials (HAZMAT) procedures.
  - Biohazard (human remains) handling procedures.
- Briefing the DART team on each mission and its CRM to include risk analysis, safety, HAZCOM, and HAZMAT.
- Maintaining continuous communication with the dispatched DART.
- Ensuring BDAR and DART procedures are applied IAW applicable ARs, FMs, TMs, DA Pams, and the unit SOP.
- Ensuring all BDAR and DART procedures applied to aircraft systems and subsystems are properly documented in aircraft logbook.
- Ensuring all BDAR procedures applied to aircraft components are annotated on the component's forms and records.
- Ensuring BDAR repairs are corrected with standardized repairs as soon as practical, based on METT-TC.
- Coordinating postoperation mental health and/or nonaffiliated chaplain support as required.

PRODUCTION CONTROL OFFICER/NONCOMMISSIONED OFFICER IN CHARGE

1-25. The production control officer is the principal maintenance manager and coordinator for AMC/AMT DART missions. This officer acts as the AMC/AMT commander's primary maintenance advisor for company internal production and maintenance activities. The production control officer—

- Confirms the disabled aircraft's location.
- Coordinates and plans aircraft DART operations of assigned or attached airframes.
- Verifies/validates personnel qualifications ensuring team composition meets minimum requirements needed to conduct aircraft recovery operations.
- Ensures required tools and equipment accompany the DART.
- Verifies/validates serviceability of required equipment.
- Briefs the DART officer in charge (OIC)/noncommissioned officer in charge (NCOIC) on the tactical situation (if required) and recovery template/checklist.
- Briefs the DART OIC/NCOIC on airframe, mission, mission equipment, HAZMAT, and environmental conditions.
- Tracks aircraft recovery operations and identifies requests for additional support (personnel or equipment).
- Updates the maintenance commander, battalion aviation maintenance officer (AMO), and controlling unit commander on aircraft recovery status.
- Enforces safety procedures IAW the unit's tactical standing operating procedures (TACSOPs) and maintenance and aircraft recovery SOPs.
- Enforces environmental stewardship protection program procedures.
- Develops and updates the aircraft recovery operations SOP.
- Contacts, coordinates, and facilitates aircraft recovery operations support with the ASC/AST chain of command.
- Provides training development oversight for the DART OIC/NCOIC and personnel.
- Requests disposition of unrecoverable aircraft and equipment from the appropriate chain of command.
- Trains personnel on procedures for hasty destruction of all supported airframes.

1-26. The production control NCOIC coordinates all maintenance actions in the absence of the production control officer; however, they must function as a team. The production control NCOIC is also responsible for coordinating personnel and logistical assets required to form the DART.

QUALITY CONTROL OFFICER/NONCOMMISSIONED OFFICER IN CHARGE

1-27. The quality control (QC) OIC/NCOIC is responsible for training and designating QC personnel assigned to the DART who are qualified to perform duties as:

- Assessor.
- Logbook custodian, for duration of the recovery mission.
- DART NCOIC, in a permissive environment.

AVIATION SUPPORT COMPANY/AVIATION SUPPORT TROOP

1-28. Aircraft maintenance above aviation operational battalion/squadron level is provided by the ASB's ASC or Air Cavalry Squadron's AST. The ASC/AST is the only unit staffed and equipped to perform ground recovery of brigade or squadron's airframes. The ASC/AST is generally responsible for dedicated recovery missions, both air and ground. Additionally, the ASC/AST can facilitate self-recoveries and

perform BDAR as part of a DART mission. ASCs/ASTs may provide personnel and equipment to augment the AMC/AMT performing DART missions when directed by the aviation brigade CP.

1-29. The ASC/AST commander is responsible for forming a DART with rapid response times and robust capabilities mirroring the requirements of an AMC/AMT DART program. The ASC/AST DART program should expand beyond the AMC/AMT program by including the primary responsibility for conducting aerial and ground dedicated recovery missions. Additionally, the ASC/AST will generally support recovery missions for aircraft in the aviation brigade area of coverage not assigned to the brigade, transitioning the operational environment or operating in the brigade area of coverage. The priority for the ASC/AST DART program is dedicated aircraft recovery, with self-recovery and BDAR as contingency operations.

AIRCRAFT CREW

1-30. When an aircraft is forced down, the air mission commander, pilot in command (PC), a crewmember, or another aircraft will notify the aviation brigade CP and/or controlling unit CP to request DART assistance. This information may be relayed through other aircraft operating in the area as METT-TC allows.

UNMANNED AIRCRAFT SYSTEMS RECOVERY

1-31. The ASC/AST DART may be employed when time, threat, and capabilities dictate. This type of mission will usually come from the aviation brigade or squadron's CP directly to the ASB/AST. The aviation brigade CP will resource the mission the same way as a brigade manned aircraft recovery mission. The team's main goals are to recover aircraft electronics and preserve information regarding the causal factors of the accident. Figure 1-1 and figure 1-2 (page 1-8) depict an armed unmanned aircraft recovery operation. The ASC/AST DART and unmanned aircraft system (UAS) unit should conduct contingency planning for this type of recovery taking into consideration the size of the system, HAZMAT, ordnance, and the rapid timeline associated with UAS recovery requirements. Further information is contained in field manual interim (FMI) 3-04.155.

Figure 1-1. Downed aircraft recovery team recovers armed unmanned aircraft

Figure 1-2. Downed aircraft recovery team examines unmanned aircraft engine

MAINTENANCE PERSONNEL

BRIGADE /BATTALION AVIATION MAINTENANCE OFFICER

1-32. The brigade aviation maintenance officer (BAMO)/battalion AMO will provide continuous maintenance and logistics information to the commander and staff on matters pertaining to aviation and aviation-related systems. Based on the current maintenance posture, the BAMO/battalion AMO informs the command of current and future capabilities and plans maintenance actions based on operational needs. The BAMO participates in recovery planning and risk assessments at the aviation brigade CP, before, during, and after recovery operations.

DOWNED AIRCRAFT RECOVERY TEAM

OFFICER IN CHARGE

1-33. The DART OIC retains responsibility for the successful recovery of the aircraft. Due to the number and complexity of the systems and operations involved in a DART mission, the OIC should be a qualified aviator or officer with strong air ground integration skills. Typically, the OIC controls tactical vehicle operations, aircraft operations, or both; as well as security requirements. The OIC performs onsite C2 of the operation. Given the tactical situation, and if surface recovery is required, the DART OIC verifies/validates the best ground vehicle route for aircraft recovery. The OIC also coordinates FS (if required) or aerial coverage with the intelligence staff officer (S-2)/operations staff officer (S-3) based on the tactical situation along the recovery route. Other responsibilities include—

- Serving as the air or ground mission commander
- Conducting DART rehearsals.
- Briefing the tactical situation and aircraft recovery operation mission specifics.
- Ensuring safety procedures are observed and used IAW the TACSOP, unit maintenance SOP, and aircraft recovery operations SOP.

- Ensuring environmental stewardship procedures are observed and used IAW the tactical standing operating procedure (TACSOP), unit maintenance SOP HAZMAT annex, and aircraft recovery operations SOP.
- Providing updates to the chain of command and production control officers regarding ongoing aircraft recovery operations, to include recovery timelines (completed and pending), as well as additional personnel and equipment needs.
- Providing security instructions and establishing local security at the recovery site.
- Supervising rigging and loading of disabled aircraft (surface/aerial).

NONCOMMISSIONED OFFICER IN CHARGE

1-34. The DART NCOIC trains and prepares the team for mission execution. The NCOIC conducts precombat checks (PCCs) and precombat inspections (PCIs), directs repair and rigging operations, and provides personnel oversight during all phases of the DART. The NCOIC also directs local security at the recovery site based on instructions received from the DART OIC. Other responsibilities include—

- Performing DART OIC duties when in charge of the mission.
- Developing and executing DART rehearsals.
- Assisting the DART OIC in selecting recovery methods.
- Assisting in the recovery of disabled aircraft IAW the TACSOP and unit maintenance and aircraft recovery SOP.
- Assisting during BDAR assessment to determine if repairs will permit a one-time flight of disabled aircraft to a unit maintenance collection point (UMCP).
- Employing safety procedures as briefed by the DART OIC and IAW the TACSOP and unit maintenance and aircraft recovery SOP.
- Employing environmental stewardship procedures IAW the TACSOP and unit maintenance (HAZMAT annex) and aircraft recovery SOP.
- Directing rigging operations to ensure successful aircraft loading.
- Ensuring trained biohazard (human remains) recovery personnel are assigned as required.

PERSONNEL

1-35. DART personnel maintain security while en route (if surface recovery operation is used) to the recovery site. They may also provide local security at the recovery site based on instructions received from the DART OIC/NCOIC. Other responsibilities include (figure 1-3, page 1-10)—

- Rigging disabled aircraft (surface/aerial) IAW the DART NCOIC instructions.
- Performing required standard repairs (if needed) or BDAR repairs onsite (when possible).
- Tracking inspections and repairs on DA forms (hard copies). Hard copy entries are transferred to the Standard Army Management Information System of record at the first opportunity available.
- Assisting in the recovery of disabled aircraft to the UMCP or maintenance facility.

Figure 1-3. Downed aircraft recovery team personnel and equipment for load out

ACCIDENT INVESTIGATION BOARD

1-36. According to AR 385-10, the first commander to become aware of an Army aircraft accident places a guard at the scene. This prevents anyone from moving or disturbing the aircraft or detaching parts until it is released by the Accident Investigation Board president; and if participating, the United States Army Combat Readiness Center. It may not be possible to comply fully with this requirement in the combat environment. Further, aircraft damaged as a direct result of hostile fire are considered a "combat loss" rather than an accident. Situation permitting, the recovery operation will not begin until one of the following occurs:

- The commander of the unit to which the aircraft is assigned orders that an accident investigation board is not required as prescribed by AR 385-10.
- The Accident Investigation Board president releases the aircraft.

SECTION III – MAINTENANCE SUPPORT FACILITIES

AVIATION CLASSIFICATION REPAIR ACTIVITY DEPOT

1-37. The Army National Guard's (ARNG) Aviation Classification Repair Activity Depots (AVCRADs), based in the continental United States (CONUS), provides limited depot repair activities. Their primary mission is to repair and return materiel to the supply system. Secondary missions include providing backup direct support to supported units; training of military and civilian personnel in select skills; and supporting other DOD, governmental and nongovernmental agencies, and multinational forces in theater. These activities must provide the same or expanded sustainment maintenance capabilities during contingency operations. In addition, AVCRADs may provide BDAR and estimated cost of damage assessments. AVCRAD personnel and assets, when deployed, augment the theater aviation sustainment maintenance group.

ARMY AVIATION SUPPORT FACILITY

1-38. ARNG facilities provide for aircraft storage, field maintenance, air operations planning and coordination, and unit training in CONUS. Most Army aviation support facilities (AASFs) consist of hangars, armories, operations buildings, and associated administrative facilities. AASFs provide recovery support for units assigned within their state and assist transient aircraft with component failure occurring in the vicinity of the AASF.

CONTINENTAL UNITED STATES AIRCRAFT RECOVERY SUPPORT

1-39. AR 5-9 indicates activities designated with providing aircraft recovery assistance and services in CONUS (table 1-1).

Table 1-1. Continental United States aircraft recovery responsibilities

INSTALLATION	*AREA OF RESPONSIBILITY*
Fort Rucker, AL	FL, GA, SC, TN, AL, and MS
Fort Bragg, NC	NC
Fort Bliss, TX	NM, TX, and counties west of Crane, Crockett, Ector, and Val Verde
Fort Hood, TX	LA, OK, AR, TX, and counties east of Pecos, Terrell, Ward, and Winkler
Fort Campbell, KY	KY, OH, IL, WI, and MI
Fort Eustis, VA	VA
Fort Riley, KS	KS, MO, NB, IA, and MN
Fort Carson, CO	CO, UT, ID, WY, MT, ND, and SD
Fort Lewis, WA	WA and OR
CA AVCRAD	CA and NV
CT AVCRAD	CT, JY, RI, MA, VT, NH, and ME
Army Avn Spt Fac	PA, WV, MD, DE, and Annville, PA
Army Avn Spt Fac	AZ and Phoenix, AZ
Fort Drum, NY	NY

This page intentionally left blank.

Chapter 2
Operations

Garrison and battlefield aircraft recovery place unique challenges on commanders. This chapter focuses on general procedures used to develop, coordinate, and execute safe recovery and/or evacuation of aircraft for return to operational status.

SECTION I – GENERAL AIRCRAFT RECOVERY CONSIDERATIONS

2-1. Varying degrees of aircraft damage can be sustained during periods of intense combat. To ensure maximum availability for future missions, aircraft must be assessed and repaired quickly. In addition to ballistic damage, a higher number of component failures can occur due to increased flying hours and higher stress levels.

Contents

Section I – General Aircraft Recovery Considerations 2-1
Section II – Mission-Specific Considerations 2-9

TRIGGERING CONDITIONS

2-2. The visual sighting of an aircraft going down or a report of an aircraft going down within the area of coverage are triggering conditions for a recovery operation. The PR trigger initiates the DART mission process. Missions normally proceed consecutively (figure 2-1).

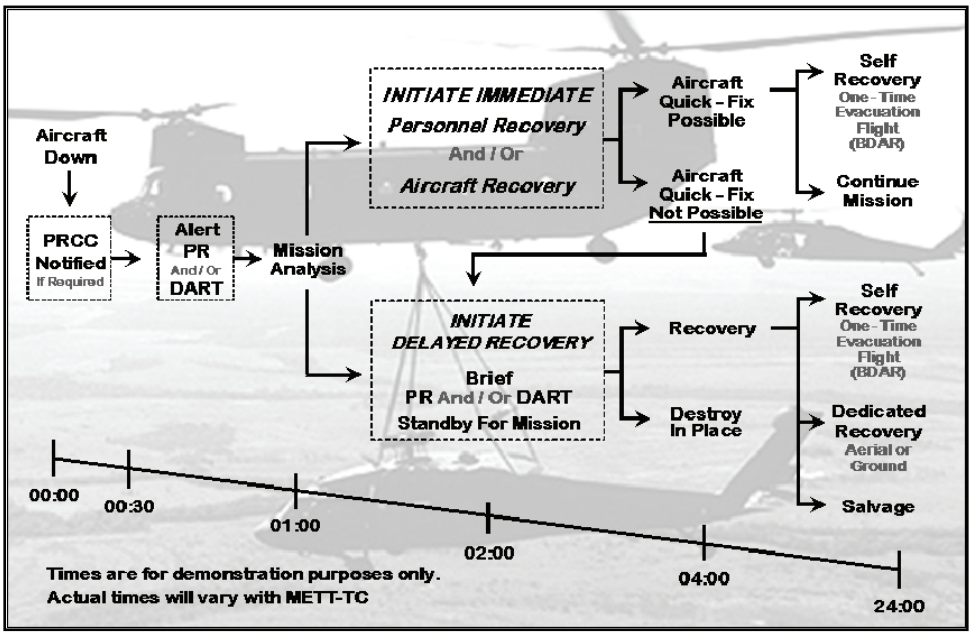


Figure 2-1. Matrix for the execution of recovery missions

2-3. One of two different circumstances may trigger planning for aircraft recovery operations. They include the following—

- Mission planning for any flight will trigger contingency planning for immediate and/or delayed aircraft recovery operations by the aviation unit. Planning will be implemented if one of the aircraft taking part in the operation goes down.
- Recovery assets may be directed by higher headquarters to recover aircraft belonging to other units, services, or coalition forces. DART operations include contingency planning for these circumstances and considerations.

REQUEST FOR ASSISTANCE

2-4. The first step in the assessment process is providing the aviation brigade CP with key critical information. A request for assistance should include the following information.

Critical Information

2-5. Critical information includes—

- Threat situation.
- Aircraft location.
- Friendly ground unit responsible for the terrain.
- Site security and suitability (including existing weather conditions, for DART insertion).
- Aircraft damage, to the extent possible for BDAR personnel, equipment, and parts requirements to be estimated.
- Personnel status, to determine their ability to assist in repairing damage (for example, injured personnel will be unable to provide assistance in repair actions).
- Information provided by air traffic controllers.

Minimum Information for In-Flight Emergencies

2-6. Minimum information includes—

- Aircraft identification and type.
- Nature of emergency.
- Pilot's desires.
- Aircraft position (grid or latitude and longitude coordinates).

Other Information

2-7. Depending on the aircraft communication's status and urgency of the emergency, the following items may be obtained from the pilot or aircraft operator:

- Aircraft altitude, airspeed, and last known heading.
- Fuel remaining in time.
- Pilot reported weather.
- Pilot capability for instrument flight, if required.
- Time and place of last known position.
- Navigation equipment capability and navigational aid signals received.
- Visible landmarks.
- Aircraft color.

- Number of people onboard.
- Point of departure and destination.
- Emergency equipment on hand, and weapons and ammunitions available.

AIRCRAFT RECOVERY OPERATIONS

2-8. Aircraft recovery operations can be placed into two separate categories: immediate or delayed. Commanders must recognize and prepare for both types. METT-TC will be the primary factor for mission analysis. Mission analysis determines whether recovery will be immediate or delayed (figure 2-1, page 2-1).

IMMEDIATE RECOVERY

2-9. Immediate recovery is any recovery that can be conducted immediately by aircraft in the flight under the control of the air mission commander. Immediate recovery of aircraft is possible when aircraft at the scene of the forced landing can be assessed, fixed, and returned to service, or prepared for a one-time evacuation mission to a maintenance site in a minimal amount of time. The time required to repair the aircraft at the scene depends on the tactical situation and condition of aircraft, which may result in a delayed recovery operation. Aircraft designated as maintenance aircraft should be thoroughly integrated into all plans.

Example of Immediate Recovery

During an air assault, a UH-60 aircraft experiences a bird strike on the main rotor system. The aircrew departs the flight and lands the aircraft without incident. The PC radios the air mission commander and advises him of the emergency. A maintenance test pilot (MP) participating in the flight assesses and determines that the aircraft was not damaged by the bird strike. The air mission commander directs the PC to rejoin the flight and continue the mission.

2-10. Immediate recovery is desirable, as friendly aircraft are usually in the area and enemy forces have probably not had the opportunity to react. The commander must consider certain factors when planning for immediate recovery such as—

- **Continuation of mission.** Immediate recovery may take aircraft away from the primary mission. Commanders must consider mission intent and decide if it is feasible to take an aircraft away from an ongoing mission to conduct an immediate recovery. If the mission is an air assault, the aviation commander must consult with the air assault task force commander before executing immediate recovery. The aviation commander may designate an aircraft, piloted by maintenance officers, to conduct the recovery if required.
- **Pickup aircraft.** A commander may designate specific aircraft, crewed by maintenance personnel, to conduct immediate recovery. This responsibility may also fall on the nearest aircraft in support of the downed aircraft. The commander must specify and select the aircraft to be used for immediate recovery during the planning process. The selected crew must receive specific, detailed instruction on aircraft recovery execution.
- **Recovery aircraft location.** The aircraft designated for immediate recovery should be part of the mission and formation. The recovery aircraft should be positioned where it can best support the operation.
- **Airspace command and control.** Separate airspace control measures may be developed to allow immediate recovery aircraft to perform operations without interfering with the ongoing mission. Effective C2 must be established to deconflict the immediate recovery aircraft and the ongoing mission aircraft.

DELAYED RECOVERY

2-11. Delayed recovery is any recovery that cannot be conducted immediately by aircraft in the flight under the control of the air mission commander. Delayed recovery will be necessary when—

- Utility or cargo aircraft are not available in the flight.
- Enemy activity in the vicinity of the downed aircraft makes an immediate recovery too risky.
- Immediate recovery cannot be executed without adversely affecting the mission; for example, an air assault formation loaded with ground troops en route to the landing zone (LZ) has no dedicated maintenance aircraft.
- Location of the downed aircraft is not precisely known.
- Damage to the aircraft is extensive rendering it nonflyable.
- Location of the aircraft does not facilitate an aerial insertion/recovery.

2-12. This operation would be planned as a separate operation and may involve JPRC assets. When planning separate PR or aircraft recovery missions, procedures for immediate and delayed PR DART should be included. For example, planning for a separate PR mission should include a contingency plan if an aircraft goes down while the PR mission is being conducted.

Example of Delayed Recovery

During an air assault, a UH-60 aircraft experiences a bird strike on the main rotor system. The aircrew departs the flight and lands the aircraft without incident. The PC radios the air mission commander and advises him of the emergency. An MP participating in the flight assesses the aircraft and cannot determine if the damage is within specified tolerances. The air mission commander notifies the combat aviation brigade (CAB) CP and requests DART support. The DART responds and upon arrival the assessor/technical inspector (TI) determines the blade damage is within tolerance and releases the aircraft for flight. The air mission commander directs the PC to return to base.

MISSIONS DEFINED

AIRCRAFT RECOVERY

2-13. The aircraft recovery mission extracts an aircraft from a downed location to a safe area using recovery kits, a trained recovery team, and recovery aircraft or tactical vehicles. BDAR-trained repair personnel can augment a DART using BDAR procedures to expedite self-recovery and safe return of aircraft and personnel. Furthermore, they prevent enemy retrieval of the aircraft retaining control for future use and eventual reintegration into the battle. DART should recover the airframe if—

- The tactical situation allows for recovery.
- The aircraft is worth recovering.
- The aircraft can be recovered successfully.

DOWNED AIRCRAFT RECOVERY TEAM

2-14. DARTs perform the following functions:

- Assessing repair requirements.
- Repairing aircraft, or preparing it for a one-time evacuation mission.
- Recommending recovery by aerial or ground means.

- Rigging aircraft for recovery.
- Serving as ground crew for helicopter lift.
- Serving as crew to secure the load aboard a vehicle.

2-15. Typically, there are two types of DART operations: deliberate and hasty.

- Deliberate DART:
  - Performs standby in a predetermined location until the mission is complete.
  - Participates in the air mission brief.
  - Assembles all organic and attached personnel at the standby location.
  - Preloads all ground recovery assets.
  - Prepositions all aerial recovery assets for rapid loading.
  - Ensures PCCs/PCIs are complete.
  - DART OIC/NCOIC positioned at the controlling CP or appropriate supporting CP.
- Hasty DART:
  - Continues normal duties until notified of a requirement, and then executes a predetermined recall time line.
  - Upon notification, assembles all organic and attached personnel at the standby location.
  - Upon notification, loads all air or ground recovery assets as required.
  - Conducts PCCs/PCIs.
  - DART OIC/NCOIC remains in contact per the unit SOP to ensure rapid response.

2-16. If the aircraft is unrecoverable, the DART—

- Determines parts, subsystems, or components for cannibalization and removes them.
- Destroys, or takes part in the destruction of, a disabled aircraft to be abandoned.
- Performs salvage recovery to sterilize the area and remove the aircraft in part, or in total, for investigation or disposal.

PRINCIPLES

2-17. The following defines DART requirements and procedures. DART discussion relates to both the AMC/AMT and ASC/AST levels. AMC/AMT DART should focus their efforts on BDAR and self-recovery while the ASC/AST should focus on dedicated recovery operations.

DOWNED AIRCRAFT RECOVERY TEAM COMPOSITION

2-18. The DART is initially formed from aviation brigade assets. The DART is generally comprised of preselected ASC/AST and/or AMC/AMT personnel trained in BDAR and aircraft recovery tactics, techniques, and procedures. DART members normally include an OIC and/or an NCOIC; an MP; a mission design series (MDS)-specific technical inspector and assessor; and a trained repair, rigging, and movement team. One of the riggers must be a qualified rigging inspector able to certify each load. This team member does not perform rigging tasks. Air/ground integration and the tactical situation will dictate the leadership and composition of the team. Additional team members can include ASC/AST and AMC/AMT airframe and component repair personnel based on the aircraft status, as well as a radio operator and security force based on the tactical situation.

2-19. Upon arrival at the downed aircraft, the DART completes the assessment and recommends a course of action based on the condition of the aircraft and the tactical situation. DART members may be authorized to utilize BDAR criteria to expedite the return of the aircraft to the fight by enabling a self-recovery, or perform a dedicated recovery of the aircraft, by ground or air, to a maintenance area for repairs.

2-20. These teams may respond to the recovery of an aircraft from within the unit, a supported or adjacent unit, or any aircraft disabled within sector. Normally, these teams are transported with their equipment by air to the scene of the disabled aircraft. They are then extracted by air upon mission completion.

BATTLE DAMAGE ASSESSMENT AND REPAIR

2-21. Combat operations make expediting normal maintenance procedures imperative. In such cases, the unit commander may authorize use of BDAR procedures. BDAR is the procedure used to rapidly return disabled equipment to the operational commander by the field-expedient repair of components. BDAR may be a technique used to facilitate a DART mission, or to repair a damaged or failing system identified by aircrews or maintenance personnel during inspections or operation. BDAR restores the minimum essential capabilities necessary to support a specific combat mission, or to enable equipment self-recovery. BDAR is accomplished by bypassing components or safety devices; fabricating repair parts; modifying standard maintenance procedures; and using substitute fluids, materials, or components. Depending on the repairs required and amount of time available, repairs may not return the aircraft to a fully mission-capable status. Operators/crew chiefs, aircraft maintenance personnel teams, maintenance support teams, contact maintenance repair teams, or trained recovery teams may perform BDAR.

2-22. Battle-damaged aircraft will be inspected and then assessed and classified by a damage assessor using a method similar to the medical concept of "triage" (deferment, repair, nonrepair). The assessment determines if the aircraft—

- Can be readily returned to the fight.
- Can self-recover with BDAR maintenance.
- Will need a dedicated recovery by either ground or aerial method.
- Should be sanitized, cannibalized, and destroyed.

2-23. Following assessment, some aircraft are returned to service immediately through deferment. More seriously damaged aircraft will be repaired using approved BDAR techniques.

2-24. BDAR personnel are typically AMC/AMT Soldiers (normally 15-series MOS). These personnel may serve as integral participants in the DART mission and are chosen depending on requirements. The actual composition of BDAR personnel and equipment depends on the type and extent of maintenance work required of the damaged aircraft.

Battle Damage Assessment and Repair Manuals

2-25. BDAR manuals contain aircraft damage assessment criteria and modified repair procedures. These manuals are formally processed and validated publications for use in combat environments, as authorized by the unit commander (see bibliography for applicable manuals). Each aircraft type has its own BDAR manual that provides information such as—

- Combat damage inspection and assessment techniques.
- Combat area maintenance serviceability and deferability criteria.
- Cannibalization techniques that permit quick, efficient removal of critical components and structures from unreparable and unrecoverable aircraft.

2-26. BDAR procedures differ with the various MDS. The following technical manuals (TMs) indicate procedures applied to each airframe:

- TM 1-1520-237-BD (UH-60A/L/E).
- TM 1-1520-240-BD (CH-47D).
- TM 1-1520-251-BD (AH-64A/D).
- TM 55-1520-244-BD (AH-1 AH-1E/F).

KITS

Recovery Kits (Downed Aircraft Recovery Team)

2-27. DARTs use UMARKs for aerial and ground aircraft recoveries. With UMARK tools and materials, team members can make quick combat extractions of downed aircraft. Recovery kits are transported by helicopter internally or externally (slingload) and are manportable.

Combat Repair Kits (Battle Damage Assessment and Repair Kit)

2-28. BDAR personnel use specially-designed combat repair kits for repairing major aircraft systems. The tools and materials found in these kits permit quick, temporary combat-damage repairs. Kits are man-portable (suitcase-sized). Furthermore, mission and environmental considerations will determine additional materials and equipment required not resident in these prepackaged kits.

PREPARATION

2-29. Preparation generally occurs in two phases: predeployment preparation and individual mission phases. Both phases include PCCs and PCIs. The predeployment preparation phase should be integrated into the unit's pre-accident plan and includes addressing the items in the following paragraphs. Preparation for each individual mission phase should include PCCs/PCIs from the predeployment preparation phase with the addition of mission-specific variables.

PRECOMBAT CHECKS AND INSPECTIONS

Downed Aircraft Recovery Team

2-30. DART PCCs/PCIs include, but are not limited to—

- Personnel qualified/trained/rehearsed.
- Inventoried/inspected UMARKs.
- Security teams.
- Weapons/ammunition.
- Explosive ordnance disposal (EOD) support.
- Communications equipment/communications plan with ground unit responsible for terrain.
- Aircraft weight estimates for downed aircraft.
- Battle graphics on maps.
- Safety procedures for armed downed aircraft.
- Drop-off areas for recovered aircraft identified.
- Sustainment equipment and supplies.

Battle Damage Assessment and Repair

2-31. BDAR PCCs/PCIs include but are not limited to—

- Personnel management. Considerations include—
  - The number of personnel and skill level by MOS required.
  - Personnel qualified/trained/rehearsed.
  - Identifying critically short MOSs.
  - Appropriate logistics assistant representative support for difficult maintenance decisions and letters of exception (if required).
- Expendable and consumable supplies availability.

  - Ensure adequate quantities remain on hand.
- BDAR and other kits.
- Equipment.
  - Tool boxes inventoried and complete.
  - Special tools and test equipment within calibration.
  - Commonly required parts (chip detectors, filters, packing).

COMPOSITE RISK MANAGEMENT

2-32. CRM is a vital instrument employed during the preparation phase. It is the Army's primary decisionmaking process for identifying hazards and controlling risks across the entire spectrum of Army missions, functions, operations, and activities. CRM assists commanders in mitigating risks associated with hazards having the potential to injure or kill personnel, damage or destroy equipment, or otherwise impact mission effectiveness. In the past, the Army separated risk into two categories, tactical risk and accident risk. While these two areas of concern remain, the primary premise of CRM is that it does not matter where or how the loss occurs, the result is the same—decreased combat power or mission effectiveness. The CRM process will be incorporated in all recovery operations. For more CRM information, refer to FM 5-19.

ENVIRONMENTAL CONSIDERATIONS

ENVIRONMENTAL PROTECTION

2-33. Fuel, oil, and other mechanical fluids spilled on the ground during recovery operations can damage the environment. As with many recovery considerations, the level of environmental protection is mission dependent. During periods of heightened conflict, simple procedures can help to preserve and protect the environment. All practical efforts should be made to avoid environmental contamination. Spills of more than one gallon should be reported through the chain of command to the unit's logistical element, such as the battalion logistics staff officer (S-4). Local policy or state laws may require spills of even lesser amounts be reported.

OPERATIONAL CONSIDERATIONS

2-34. Climate extremes must be considered in recovery operations to include—

- Extreme cold or hot weather conditions. These conditions pose a threat to successful mission completion if Soldiers are not acclimated properly. When operating in these conditions, rigging normally takes longer.
- Dusty environments reduce visibility and impair normal breathing.
- Night operations reduce visibility and require artificial lighting.

CONTAMINATED ENVIRONMENTAL CONSIDERATIONS

2-35. Aircraft recovery teams must be trained in chemical, biological, radiological, and nuclear (CBRN) defense procedures, monitoring, and detection techniques. Teams should have additional decontamination equipment, decontaminating agents, and protective clothing. Contaminated recovery equipment could spread an agent along the evacuation route posing a hazard to uncontaminated units and equipment. Commanders must keep in mind that equipment used to recover contaminated equipment will also be contaminated. If recovery of equipment is not possible, personnel should keep BDAR to a minimum, recover to a decontamination area, and finish the BDAR or recovery task. Contaminated equipment must not be evacuated to uncontaminated areas until fully decontaminated.

BIOHAZARDS

2-36. During recovery operations, caution must be taken with respect to human remains and non-CBRN pathogens. Recovery personnel should receive training from medical and mortuary affairs experts in the proper procedures and protective measures when collecting and handling these hazards. Ensure adequate protective equipment including gloves, masks, coveralls, and specialized containers are available and utilized.

SECTION II – MISSION-SPECIFIC CONSIDERATIONS

BATTLE DAMAGE ASSESSMENT AND REPAIR TRAINING PROGRAM

2-37. AR 750-1 requires maintenance unit commanders, including ASC/AST, AMC/AMT commanders, to conduct nondestructive peacetime BDAR training that simulates combat conditions as closely as possible. Soldiers must become familiar with BDAR repair kit components. Each maintainer should know how to perform battle damage assessment for assigned MDS and MOS skill sets.

2-38. Maintenance standards are based on TMs and preventive maintenance checks and services (PMCS). Commanders can direct the employment of BDAR for normal maintenance failures to evaluate training or validate new procedures. Maintenance unit commanders should develop sustainment training in which aircraft maintainers and crew chiefs conduct BDAR, when applicable. BDAR-required skills are found in individual and collective training tasks. Maintenance unit commanders and leaders should be aware of which MOSs require knowledge of BDAR. Company and battalion unit task lists, especially in the AMC/AMT and ASC/AST, require BDAR training.

DOWNED AIRCRAFT RECOVERY TEAM TRAINING PROGRAM

2-39. Training is essential to successful completion of the DART operation. UMARK familiarity reduces the time required to complete a DART operation. Training should be conducted utilizing every available opportunity. Garrison recoveries may be enhanced by simulating combat conditions with safety measures applied. Simulated conditions are as follows:

- Performing security operations.
- Placing time constraints on rigging procedures to simulate enemy threat.
- CBRN simulations using mission-oriented protective posture (MOPP).
- Route planning with simulated threat.

REHEARSALS

2-40. Rehearsals (figure 2-2, page 2-10) are conducted to enhance proficiency and address last-minute details and any unforeseen adjustments. Rehearsals should be conducted for DART assembly, onsite security operations, aircraft assessment, aircraft repair (BDAR), rigging procedures, and loading and unloading of the aircraft.

Figure 2-2. Rehearsal load out for ground recovery

BATTLE DAMAGE ASSESSMENT

2-41. The assessor on the scene performs an evaluation of the aircraft and determines if BDAR principles may be applied or a recovery operation is required. The assessor will then transmit a report to the aviation brigade CP. This report covers the following items:

- Aircraft condition (table 2-1).

Table 2-1. Battle damage assessment categories

CAT I	The aircraft is reparable. The aircraft can be repaired onsite by bringing resources to it depending on the tactical situation. (In other words, there is inadequate time to perform repairs before the amount of support [tactical] exceeds what is available and on hand.)
CAT II	The aircraft is recoverable and still has intrinsic value. For example, assume during landing that an aircraft lost all hydraulic fluid. The crew managed to shut down engines, but the landing was a little hard. No sudden stoppages were involved. In this instance, both engines, as well as the gear boxes, transmission, and drive shaft, are in good working order. Weapon systems subcomponents are also in working order. All these items are recoverable. The fuselage sustained only minor damage on landing. The entire airframe is an asset and a prime candidate for aerial recovery.
CAT III	The aircraft is destroyed. The aircraft is assessed as destroyed and crews have been recovered.

- Aircraft location.
- Eight- to ten-digit grid (artillery destruction mission).
- Brief description of remaining components identified for cannibalization.

AIRCRAFT DISPOSITION

2-42. The disposition of the aircraft is determined by the degree of damage sustained. The assessment determines if the aircraft will be—

- Repaired and flown from the site.
- Rigged and recovered by aerial or ground applications.
- Destroyed.
- Salvaged for future investigation or disposal.

DESTRUCTION OF AIRCRAFT

2-43. The DART must request disposition of unrecoverable aircraft and equipment from the chain of command up to the approval authority. The team may cannibalize useable aircraft components and equipment. Other responsibilities include—

- Prepares aircraft and equipment for destruction IAW TM 750-244-1-5, the TACSOP, unit maintenance and aircraft recovery SOP, and battalion and brigade commander's guidance.
- Destroys aircraft on order from the appropriate authority or designated representative.
- Employs safety procedures during aircraft destruction operations as briefed by the DART OIC and IAW the TACSOP, the unit maintenance (safety annex) SOP, and the aircraft recovery operations SOP.
- Employs environmental stewardship procedures during aircraft destruction operations IAW the TACSOP, the unit maintenance (HAZMAT annex) SOP, and the aircraft recovery operations SOP.

SANITIZATION

2-44. Sanitization prevents the compromise of aircraft systems and critical information in the aircraft or in the possession of crewmembers and passengers. This requires clearing the downed aircraft site of all sensitive or significant equipment and documents. Sanitization must be completed prior to abandonment of an airframe. If onsite sanitization is not possible, destruction of the aircraft by extended-range fire support systems should be considered as part of the abandonment process.

2-45. The DART OIC/NCOIC should address the following actions—

- Identify and mitigate immediate dangers (for example: fire, armament, fuel leakage, HAZMAT, and electrical sparks).
- Safe weapons and external stores.
- Disarm and safe all crew-served and/or gunner weapons on the aircraft.
- Remove or zeroize all aircraft survivability, communications, and navigation equipment.
- Remove all maps, kneeboards, strip maps, and documentation from the aircraft and surrounding area.

This page intentionally left blank.

Chapter 3

Procedures

This chapter covers recovery alternatives and the rigging considerations used when performing recovery of disabled aircraft. Unfortunately, not all downed aircraft are able to self-recover or are in a condition to enable UMARK-assisted dedicated recovery. Critical attachment points and/or the airframe itself may not be structurally sound. Therefore, fabrication of equipment may be required to utilize UMARK for an aircraft recovery. This operation will enable the return of aircraft for logistical considerations or to complete extensive repairs.

SECTION I – RECOVERY ALTERNATIVES

3-1. The assessor recommends to the commander which recovery method to use. Numerous considerations are taken into account when making this determination to include enemy situation, the unit's mission status, and the location and condition of the aircraft. For example:

Contents

Section I – Recovery Alternatives 3-1
Section II – Rigging Considerations 3-5

- An aircraft received small arms fire that severed a hydraulic line and the pilot was able to make a controlled landing in a friendly area. The DART assessed the aircraft as able to be quickly repaired using a BDAR kit, allowing the aircraft to self-recover or rejoin the air mission.
- An aircraft's rotor blades struck trees as it was descending into a battle position. The aircraft landed hard but upright near the top of a steep ridge. The DART assessed the aircraft for a dedicated aerial recovery due to the extent of damage and the inability of a transport vehicle to access the site.
- An aircraft received rocket-propelled grenade and small arms fire as it flew over a city. One engine and the vertical fin were severely damaged but the pilot was able to land the aircraft in a field on the edge of a town near an infantry company's location. The DART assessed the aircraft for a dedicated ground recovery due to the extent of damage, site security, and the ability of a transport vehicle to access the site.

3-2. When performing a recovery, the structural soundness of the aircraft must be evaluated and a dedicated recovery may require strengthening before extraction. This examination assists in determining the effects of removed/damaged components upon structural integrity. If necessary, components should be removed to relieve structural stress.

SELF-RECOVERY

3-3. Self-recovery is the preferred method for recovering an aircraft. It may involve dispatching the DART to the aircraft site with the needed repair parts, equipment, and materials identified by the initial aircrew assessment. The DART will make necessary repairs (standard or BDAR) to enable the aircraft to continue the mission, or return to a maintenance collection point or nearest maintenance facility for additional inspections and maintenance. Normally, the risk to aircrews, DART, and security personnel is decreased by the shorter duration of a self-recovery and the aircraft is quickly returned to service.

DEDICATED RECOVERY (AERIAL)

3-4. Aerial recovery involves attaching the aircraft to suitable airlift recovery equipment, connecting it to the lifting helicopter, and flying it to the maintenance collection point (MCP) or maintenance facility. All downed aircraft must be rigged according to applicable TMs. Planning for this type of recovery entails thorough analysis of the recovery site and the associated threat due to relatively slow air movement over a battlefield. Medium-lift helicopters will be required for heavier-type aircraft aerial recoveries.

3-5. High altitude considerations are a vital part of planning. The power required versus power available is reduced significantly with high altitude operations. Soldier performance is also degraded without acclimation to this environment.

ADVANTAGES

3-6. Aerial recovery reduces the time that recovery assets are engaged and exposed to the battlefield. Route reconnaissance and security escort requirements are considerably less intense than during surface recovery. In addition, the need for aircraft disassembly is greatly reduced. Recovery site accessibility requirements are not as rigid; however, the distance from which recovery assets may be obtained is greater.

DISADVANTAGES

3-7. The possibility exists for complete loss of aircraft through failure of recovery equipment. Although exposure time is less, the distance from which recovery activities are detectable is greater. Loss of recovery assets through enemy action will be more severe, effectively degrading total force fighting capabilities. This is due to the multi-use value and relative low density of airlift helicopters, particularly medium-lift helicopters, compared to ground recovery vehicles.

ONSITE RECOVERY CHALLENGES

OBSTACLES

3-8. Trees must be cut so they fall away from the aircraft when clearing an area. This is accomplished through appropriate tree notching or by a constraint applied to the tree using positioning straps and rope. Tension is applied before starting the cut by stretching the nylon straps or rope as much as possible.

3-9. All trash should be removed before the recovery helicopter arrives. Small pieces of the disabled aircraft, small tree limbs and roots, and loose recovery equipment can all become airborne, endangering the recovery helicopter and ground crew.

VISIBILITY

3-10. Recovery helicopter pilots must be aware of conditions that might restrict visibility such as dust or snow. This information enables rapid climb out planning if visibility deteriorates to a point where ground reference is lost. A variety of dust control agents exists; however, natural turf is considered the best control measure. Efforts should be made to preserve the natural turf cover while working in the pickup area. Note in figure 3-1 how blowing dust degrades visibility at the pickup site.

Figure 3-1. Example of obstacles encountered at pickup site

RADIO COMMUNICATION

3-11. The recovery helicopter will not normally proceed to the recovery site until the ground crew communicates that the disabled aircraft is rigged and ready for hookup. This precludes endangering the recovery helicopter for a longer period than necessary and minimizes flight time. The ground crew should also include a radio operator collocated with the signalman. This individual should be in direct contact with the recovery aircraft to advise the aircrew on the status of the aircraft extraction.

DEDICATED RECOVERY (GROUND)

3-12. Rigging aircraft for ground recovery is essentially the same as for aerial recovery (figure 3-2, page 3-4). The major difference is that the device used to perform the lift is a crane, team of cranes, or similarly capable pieces of equipment, instead of a helicopter. Any disassembly of the aircraft required due to road obstacles—or size of the transport vehicle—is performed using procedures outlined in the appropriate aircraft TM. Procedures outlined in the appropriate aircraft shipping manual are used to prepare any devices (e.g., cradles, shipping skids, etc.) required for loading the aircraft onto the transport vehicle. Personnel observe the same basic safety procedures (disarming, disconnecting batteries, etc.) as during aerial recovery.

3-13. An aircraft may have severe crash damage; that is, major portions of the aircraft such as the engine, transmission, and rotor system were torn from the aircraft. If so, rigging procedures may require modification to recover the aircraft. In this situation, ground personnel determine the method used to lift the aircraft. Primary concerns are to minimize further aircraft damage and ensure ground crew safety.

Figure 3-2. Downed aircraft recovery team assembles for a ground recovery

ADVANTAGES

3-14. Surface recovery restricts the enemy's ability to detect movement of recovery assets to an area relatively close to movement routes. It can be used when weather conditions prohibit flight. In addition, the threat of total loss of the aircraft during transport due to recovery equipment malfunction is low.

DISADVANTAGES

3-15. Surface recovery may tie up route security assets needed elsewhere. The time needed for surface recovery is much greater than that required for aerial recovery. Recovery personnel and equipment assets are unavailable for longer periods during surface recovery. This high exposure time on the battlefield with slow-moving equipment increases the threat.

3-16. In addition, a significant amount of aircraft disassembly or modification is often required to adapt the aircraft to surface travel; for example, shortening height dimensions to accommodate overhead road clearances or the fabrication of extensions for trailers because the aircraft wheelbase is too wide. Ground routes must be accessible, and meticulous reconnaissance of the route is required. Loading procedures and travel on rough terrain can further damage the aircraft.

GROUND RECOVERY PROCEDURES

3-17. Ground recovery and evacuation use ground equipment and wheeled vehicles to move disabled aircraft to an MCP or maintenance facility. When planning a surface recovery—

- Evaluate the aircraft.
- Determine the equipment and transportation requirements needed for recovery.
- Perform a thorough reconnaissance and evaluate available ground routes to and from the recovery site.

SALVAGE RECOVERY

3-18. A salvage recovery occurs when the aircraft is damaged beyond the ability to utilize the UMARK and effect ground or aerial recovery. The chain of command may direct salvage recovery operations to facilitate an investigation, sterilize the battlefield, or for other reasons necessitating the complete recovery of a severely damaged airframe. In these situations, the use of flat racks, military demountable containers, and rough terrain forklifts may significantly reduce the time required to consolidate and transport the various components of a severely damaged aircraft (figure 3-3, page 3-5).

Figure 3-3. CH-47 performs salvage recovery utilizing a flat rack and military demountable containers

MAINTENANCE EVACUATION

3-19. Maintenance evacuation, a preplanned operation, is performed by preparing the aircraft for a one-time evacuation mission to the unit's maintenance support facility or movement by aerial or ground means. Maintenance evacuations between maintenance units are coordinated between the commanders of the units involved; they are assisted in some cases by the staff maintenance officer arranging supporting equipment assets.

3-20. Evacuation of groups of aircraft is often driven by unit relocations on the battlefield or reconstitution of aviation units. These evacuations would likely be controlled by the aviation brigade staff maintenance officer/S-4 in coordination with division and corps staff. Coordination and tasking of division and corps assets may also be necessary.

3-21. Nonflyable aircraft may be transported between maintenance facilities or moved due to relocation of the maintenance facility. When this occurs, the aircraft will be prepared and loaded for ground transport as specified in the applicable shipping manual. Procedures outlined in shipping manuals are used when shipping flyable aircraft over extended distances. The same procedures are effective for moving aircraft that are intact but not flyable due to maintenance. Use of these procedures will minimize the possibility of aircraft damage that may occur as a result of movement. Sling loading is an option in this situation; however, the potential damage occurring to the transported aircraft is much greater than with ground transport. The availability of transportation assets and the urgency of the situation are factors in determining the method of movement.

SECTION II – RIGGING CONSIDERATIONS

UNIT MAINTENANCE AERIAL RECOVERY KIT

3-22. The UMARK is a system of slings, tie-downs, stabilizing equipment, and interconnecting hardware that can be assembled in multiple configurations to affect the safe aerial recovery of damaged helicopters. Helicopter damage may include, but is not limited to—

- The destruction of the main rotor head.
- The main rotor shaft or mast bent, broken, or loose in the transmission.

- The main transmission case cracked, broken, loose, or separated from the airframe.
- Damage to the tail boom to such an extent that it is not suitable as a lifting point.
- Bending or buckling of the airframe so as to create aerodynamic instabilities that could result in additional damage during the recovery flight.
- Engine(s) severely damaged or separated from the airframe.

3-23. UMARK is designed to allow three ground personnel to rig a disabled helicopter for aerial recovery in minimal time depending on team proficiency and the condition of the disabled aircraft. An exception to this time frame would be the aerial recovery of a CH-47 helicopter, which requires the installation of components from two UMARK kits. Disabled or damaged helicopters may not require stripping of components, defueling or disarming, or need additional maintenance actions performed prior to aerial recovery.

3-24. Personnel wearing combat, MOPP-4, or cold weather protective gear can install the UMARK under all environmental conditions, day or night (using artificial illumination or night vision equipment). The UMARK can be transported internally by a UH-1, UH-60, or CH-47 helicopter or larger utility/cargo aircraft, or on the ground by the high-mobility multipurpose vehicle and larger vehicles.

MAINTENANCE AND FORMS/RECORDS

3-25. Preventative maintenance and inspections must be performed to ensure the UMARK kit components are in serviceable condition. Detailed preventative maintenance checks are outlined in TM 1-1670-260-12&P.

3-26. Each UMARK kit contains a usage log that shall be annotated after each usage. The maintenance forms and records which are required by personnel who perform the inspections and maintenance functions prescribed in this manual are those prescribed by DA Pam 738-751.

3-27. Do not use the kit if the usage log indicates lifts in excess of 20 aerial lifts, 16 cumulative flight hours or 100 static lifts (crane/hoist). Upon reaching any of the above restrictions contact the Aviation Ground Support Equipment Office (SFAE-AVAS-AG) at AMCOM, and turn in UMARK kit for post field analysis (TM 1-1670-260 12&P).

3-28. FM 4-20.197 provides basic procedures for rigging, hooking up loads, and safety procedures.

AFTER-USE INSPECTIONS AND PACKING

3-29. After a completed recovery mission, UMARK equipment must be returned to a ready for issue condition. All recovery equipment should be dried, cleaned, inspected, and replaced in the UMARK container. Any damaged components must be replaced.

SAFETY CONSIDERATIONS

3-30. Safety is the first consideration in the recovery of aircraft. Soldiers should be briefed on safety requirements and HAZMAT considerations prior to each mission. Safety equipment is available to minimize the risks associated with rigging and lifting damaged aircraft. The following paragraphs describe some of the safety equipment used while performing these missions.

GROUND CREW EQUIPMENT

3-31. Ground crewmembers involved in helicopter aerial recovery operations are exposed to the hazards of helicopter noise, rotor downwash creating blowing debris, and static electricity. Therefore, they should wear eye protection, hearing protection, and gloves when performing their duties. Depending on the mission, they may need additional personnel protective equipment.

Static Electricity Discharge Equipment

3-32. In flight, a helicopter generates and stores a charge of static electricity. This static electricity is discharged to the ground when the helicopter lands. While the helicopter is in flight, however, this charge remains stored unless a path is provided to channel it to the ground. A ground crewmember provides this path by contacting the helicopter cargo hook when it is positioned over a cargo hookup point. Although this charge may not cause an electrical burn, it can cause a muscular reaction (cramps or spasms), which may result in a fall if the individual is on unsure footing.

3-33. To prevent static electricity shock, the ground crewmember uses either a reach pendant which provides the hookup person with insulation while connecting the sling assembly to the aircraft, or a discharge wand to discharge the static electricity to ground. For added protection, the ground crewmember should also wear 5,000-volt shock-proof gloves, if available, when using the wand.

3-34. The wand consists of an insulated plastic tube with a metal hook on one end with a wire attached leading to a ground rod. The entire length of wire must be insulated to prevent severe shock. In use, the ground rod is driven into the earth, and a ground crewmember holds the wand. As the helicopter hovers over the load, the assistant hookup man holds the wand against the cargo hook; this grounds the stored electrical charge. Meanwhile, the hookup man places the clevis on the hook.

This page intentionally left blank.

Appendix A

Aviation Brigade Aircraft Recovery Procedures

This appendix provides guidance and coordination for procedures regarding aircraft recovery within the aviation brigade's area of responsibility (AOR). Specifically, the intent is to standardize aircrew and aircraft recovery methods within the brigade AOR.

CONTINGENCY PLAN

A-1. A contingency plan is executed in the event of a downed aircraft which may result in isolated personnel. Procedures and considerations remain very similar if the downed aircraft is the result of enemy action, controlled flight into terrain, or maintenance problems. Deliberate PR in the brigade AOR falls under the purview of the Personnel Rescue Coordination Center. This plan affects immediate aircrew recovery (hasty extraction) before, or in lieu of, deliberate PR (planned/executed by PR specialists). Downed aircraft recovery is the responsibility of the aviation brigade within its AOR. The intent is to focus aviation brigade and brigade combat team (BCT) forces to maximize the potential recovery of both personnel and aircraft as soon as possible following an aircraft incident. Aviation brigade forces conduct a battle handover with coordination center elements if a rescue proves impractical prior to the coordination center's response. The contingency plan is divided into four phases (figure A-1).

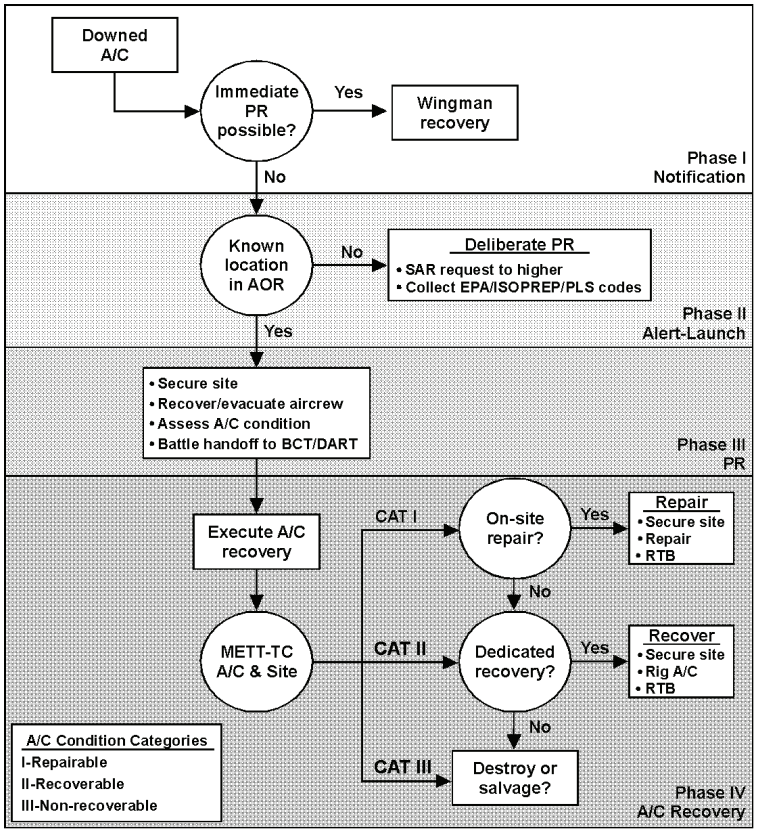


Figure A-1. Contingency plan phases

PHASE I-NOTIFICATION

A-2. This phase begins at the incident and ends upon notification of the aviation brigade headquarters of an incident involving a downed aircraft and/or isolated persons. Immediate PR can occur during this phase. Isolated persons are defined as U.S. military, DOD civilian, and/or DOD contractor personnel (and others designated by the President or Secretary of Defense) separated from their unit while participating in a U.S. sponsored military activity or mission in a situation where they must survive, evade, resist, or escape. Notification of the incident will come, most likely, from the wingman of a downed aircraft. It can also come from coalition ground forces, host-nation military, or police elements. At this time, the senior person on scene with the ability to best command and control the situation becomes the on-scene commander (OSC).

A-3. The information reported will be instrumental in planning the personnel and aircraft recovery. In most cases, the wingman (table A-1) will be in the best position to report, command and control the scene, execute immediate aircrew recovery, and develop the situation for follow-on operations.

Table A-1. Example of wingman actions and considerations

Aviate	
	Determine enemy activity and note positions.
	Determine injuries.
	Secure the scene.
	Neutralize threats detrimental to PR/DART.
	Assess possibility of self-extraction.
	Execute as appropriate.
Navigate	
	Check all assets on station time, ordnance, and other relevant factors.
	Attempt to locate via electronic means (survival radio, global positioning system [GPS] and/or chart position transmitted over radio by survivor, direction finding).
	Determine signal devices.
	Report general terrain description.
	Locate isolated personnel position within one nautical mile.
	Determine ingress and egress routes.
Communicate	
	Prioritize communication based on METT-TC (BCT, CAB, theater aviation brigade, close air support [CAS], or sheriff).
	Report to the appropriate ground HQ, as well as AVN HQs: Number and condition of isolated personnel. Terrain, ingress and egress routes, and isolated personnel signal devices. Isolated personnel location (grid or distance from known landmark). Elevation of recovery area. Wind speed and direction. Known or suspected enemy activity. Emergency safe landing area. Condition of downed aircraft. Cause of aircraft incident (If known).
	Direct isolated personnel to: Authenticate as necessary. Prepare signaling devices for use and/or ignition, but use only as prebriefed or when directed by authenticated rescue forces. Call threatening enemy positions. Vector security force, if necessary. Approach the helicopter only when directed by the recovery force and follow their instructions.

A-4. Key tasks in this phase are:

- Securing the site.
- Executing an immediate aircrew recovery by whatever means available.
- Gathering and reporting information in an accurate and timely manner to ground elements and aviation brigade headquarters.

A-5. Units, on the scene, will carefully monitor the enemy situation, terrain, and environmental factors while providing observation; security; and command, control, and intelligence. If, during this phase, a recovery of personnel is affected by either a friendly aircraft or ground forces, they will continue to provide security of the site until handoff to ground forces or the aviation brigade DART. This will be based on analysis of medical condition of recovered personnel as well as the overall security situation.

PHASE II-ALERT/LAUNCH

A-6. This phase begins upon notification to the aviation brigade of an incident involving isolated persons or downed aircraft. It includes actions at aviation brigade headquarters and ends with the launch of aviation brigade elements to execute PR. During this phase, aviation brigade elements will plan simultaneously for PR and DART operations. PR is the main effort. Upon notification, the brigade S-3 retains initial C2 responsibility, and delegates duties and C2 as necessary to the appropriate elements.

A-7. Operations carried over from the notification phase can include, but are not limited to, direct coordination with maneuver forces on the ground, security of the site, attempts to affect aircrew recovery, and development of the situation/troubleshooting. During this phase, while executing the current CP battle drill, the battle captain ensures all entities within the CP remain engaged to develop the situation, gather information, and make recommendations to the commander.

A-8. Aviation brigade PR elements should include, but are not limited to:

- An attack/cavalry security element.
- An airborne C2 element.
- An assault element.
- An air inserted dedicated ground security element, to affect the actual linkup and recovery.

A-9. Aviation brigade DART elements should include, but are not limited to:

- An attack/cavalry security element.
- An airborne C2 element.
- An assault element.
- A trained safety officer or shoot down investigator.
- Appropriate medical personnel.
- An air inserted DART/assessment element, to affect the actual linkup and recovery.

A-10. Key tasks in this phase are:

- Accurately recording all information from the OSC.
- Attempting verification of OSC information by additional means.
- Rapid mission analysis; notification of brigade chain of command and all subordinate units playing a role in the recovery operation.
- Reporting to higher headquarters.
- Launching aviation elements in support of recovery efforts by appropriate launch authority.

A-11. The general sequence of events are as follows:

- The battle captain immediately notifies the maneuver unit owning the operational environment. The captain may also divert aviation brigade units already in the vicinity.
- Tactical operations requests Air Force X-CAS (airborne) and/or G-CAS (ground alert).
- The battle captain ensures the medical evacuation (MEDEVAC) unit covering the AO is notified of the event and passes 9-line reports as necessary.
- The battle captain calls necessary planners to brigade HQs (table A-2).

Table A-2. Necessary planners

PR	*DART*
Attack (security)	Attack (security)
Assault (lift)	Assault (lift)
General support aviation battalion (GSAB) (A2C2S)*	GSAB (CH)**
Security element	ASB commander
	ASC/AST commander
	Affected unit AMC/AMT commander
	Security element
*A2C2S-Army airborne command and control system **CH-cargo helicopter	

- The brigade S-2 assesses the enemy situation in the area.
- The S-2 develops the "enemy most likely" and "most dangerous" courses of action.
- The S-2 gathers available isolated personnel report data for handover to recovery forces.
- The air defense and airspace management (ADAM) immediately requests appropriate airspace control measures.
- The ADAM cell coordinates and deconflicts UAS coverage of scene.
- The brigade fire support cell requests no-fire areas to facilitate the recovery.
- The brigade communications-electronics staff officer initiates nonsecure internet protocol router blackout as necessary.
- The automatic surface observing system element provides pertinent weather data affecting the recovery.
- The subordinate units possessing the capability to contribute to a recovery effort receive notification, an intelligence assessment, mission, and launch time.

A-12. This phase ends when aircrew recovery elements launch.

PHASE III-PERSONNEL RECOVERY

A-13. This phase begins at launch and ends when the recovery mission is completed or terminated. If the PR operation is a result of a downed aircraft, this phase will end when the secured scene is turned over to DART elements.

A-14. Key tasks for this phase are:

- Maintaining communications with the aviation brigade headquarters and OSC during the en route portion thorough battle handover to, or integration of, the recovery element by the OSC.
- Accurate reporting as the situation continues to develop.

A-15. The general sequence of events during this phase are:

- Launch of security element.
- Launch of recovery element.
- Link up of security element with OSC.
- Clearance into the LZ.

A-16. Preference for recovery is (brevity code PACE):

- Primary–ground force recovery.
- Alternate–aviation brigade PR mission.
- Contingency–wingman recovery.
- Emergency–echelons above division PR mission.

A-17. The security element will secure the air route and the airspace surrounding the proposed recovery site. Launch of the recovery aircraft will be timed to balance the time available for the security element to secure the site, maximize surprise, and minimize station time for lift elements. The security element will link up with the OSC via secure communications when possible. The decision to transfer overall responsibility of the scene will be based on rank, available station time, and the ability to control the battle. The security element will also identify potential LZs for recovery, and verify/recommend ingress and egress routes to those LZs. Once all elements are reasonably synchronized, the OSC will clear lift assets to enter an LZ and conduct recovery. This phase ends when aircrew members are recovered and secure within friendly territory.

PHASE IV-DOWNED AIRCRAFT RECOVERY

A-18. Although DART activities have been ongoing to this point, the main effort will transition to DART only after aircrews are recovered and the site is permissive enough for the DART. This phase ends when the downed aircraft is delivered to a secure location. Key tasks during this phase include: site security; accurate situation reports to higher headquarters; site investigation; assessment of maintenance problems and solutions; gathering parts and tools required; movement to location; and physical recovery of aircraft.

A-19. The controlling aviation task force battalion commander will generally receive delegated command and control from the aviation brigade command post for the DART effort until it is deemed impossible for that battalion to recover the aircraft within their means. Assault/GSAB battalions provide the recovery unit transportation of DART personnel and equipment.

A-20. If the controlling aviation battalion commander cannot affect a recovery with organic assets, C2 returns to the brigade and main effort shifts to the ASC/AST commander.

A-21. There are three options for aircraft recovery:

- Self-recovery.
- Dedicated recovery-air.
- Dedicated recovery-ground.

A-22. Aircraft destruction or abandonment is the last resort for the aircraft. Abandoned aircraft must be sanitized or destroyed by any available means to prevent enemy exploitation of the asset and its components.

A-23. The DART effort will minimally consist of a security element, a recovery team, a transportation means, and a C2 element. The exact makeup of the DART effort and the method used to recover the aircraft will be based on analysis of:

- Enemy situation.
- Security of the site.
- Current aircraft condition.

- Analysis of information from the aircrew on scene.
- Accessibility by ground recovery assets.
- Accessibility by air recovery assets.
- Availability of parts and tools for repair.
- Type of ground recovery equipment available.

A-24. If an air recovery is to take place, all recovery equipment will likely come from the aviation brigade. Depending on the enemy situation, multiple trips to the site may be required to align problem, people, parts, plan, time, tools, and technical assistance (P4T3). If a ground recovery is preferable, recovery equipment will come from the closest unit with the appropriate transportation assets. The special tools and Soldiers needed come from the aviation brigade and will generally move via air to the supporting ground transportation unit or aircraft scene as required.

A-25. Minimum required equipment for ground recovery is a crane, or pair of cranes, capable of lifting 30,000 pounds; a trailer to transport the cranes; a 40-foot trailer capable of carrying 25,000 pounds; and armored convoy security vehicles equipped with current countermeasures commensurate with the threat. Disabled CH-47s, in most downed aircraft scenarios, require either repair or aerial recovery.

Appendix B

Downed Aircraft Recovery Team Standing Operating Procedure

This appendix outlines standard operating procedures for DART operations. It is a representative "how to" guide to standardize DART operations within Army aviation.

GENERAL

B-1. The purpose of this document is to establish standard procedures for the recovery of damaged or disabled aircraft IAW this manual and FM 3-04.500.

B-2. PR is not aircraft recovery or a DART/BDAR mission; therefore, it is not included in this SOP. Security elements are addressed and identified due to attempts by hostile forces to obtain friendly force equipment for technological gain or propaganda. Security personnel may be needed to maintain security for an unknown time until the airframe is repaired or recovered.

B-3. Battlefield aircraft recovery is an operation resulting from one or more aircraft experiencing combat, unanticipated/accidental component damage, or failure, resulting in a forced landing in the AO. Based on an assessment, the aircraft is destroyed or abandoned, repaired and flown out, or recovered to a maintenance site by either aerial or ground means.

B-4. This SOP is a guide and intended for use by commanders and teams at all levels. Procedures outlined may be modified or augmented to account for force size, aerial and ground asset availability, manpower, time and distance considerations, and the tactical situation.

MISSION

B-5. The aviation brigade, on order and utilizing the appropriate task force combination, conducts downed aircraft recovery in the AOR during day, night, hostile, and peace operations to repair or recover organic or transitioning assets. The DART is primarily used for aircraft extraction to a secure area. The DART mission may be augmented with BDAR personnel (METT-TC dependent) for the sole purpose of BDAR procedures. See table B-1 for a typical DART timeline.

Table B-1. Sample of a downed aircraft recovery team timeline

General Scenario	***Timeframe Sequence of Events:***
H-4:00	DART receives mission warning order. Initiate and submit initial RFIs. DART assembled.
H-3:30	DART receives map location, overhead images, photos of damaged aircraft, damage report, submit secondary RFIs. Brief DART on situation report.
H-3:00	DART one-time flight/ground/air evacuation decision.
H-2:30	PCCs/PCIs completed.
H-2:30	Preparation of mission-specific equipment.
H-1:30	Final S-2 update.
H-1	DART arrives at air/ground movement location.
H-45 min	DART loaded.
H -Hour	DART departs.

RESPONSIBILITIES

A. **Commander**: Responsible for developing an aircraft recovery program. Ensures the DART program is effectively implemented within the unit. Appoints an officer to function as the task force DART OIC.

B. **S-3/Main CP**: Provides or delegates command and control of recovery operations as required. Tasks appropriate brigade assets to support all requirements for the aircraft recovery task force, including transportation of the DART to and from the location of the downed aircraft. Receives and disseminates information on the downed aircraft in an expeditious manner. Coordinates any required infantry, engineer, or other nonbrigade support. Coordinates for an interpreter as needed.

C. **S-2**: Rapidly evaluates the enemy situation within the downed aircraft area and briefs aircrews and DART OIC on current enemy threat prior to DART mission departure. Updates intelligence as required.

D. **Headquarters Unit Commander**: Responsible for assigning medical personnel to respond separately or in conjunction with the DART, as directed by the main CP. Provides the headquarters with communication capabilities when required. Provides a primary and alternate radio telephone operator, if required. Ensures assigned RTOs participate in all DART rehearsals and training.

E. **AMC/AMT/ASC/AST Commander**: Provides DART support personnel and security team, if not provided by outside units. Resources all necessary mission equipment. Ensures assigned personnel participate in all DART training.

F. **DART OIC**: Ensures the DART is complete, comprehensive, and that all team members are trained to standards and fully integrated. Develops and implements new and/or additional procedures for the DART. Responsible for directing DART operations for the entire mission. Executes actions on the objective keeping team members and higher headquarters appraised of the situation.

G. **Quality Control**: Provides TI support for the DART to perform assessor duties. An MP accompanies the team when required.

H. **Production Control**: Aids in evaluating repairs/parts required for aircraft evacuation. Responsible for providing the liaison between maintenance personnel and the DART OIC to coordinate all support activities and parts requisitions. Monitors the recovery operation throughout its entirety.

I. **Flight Company**: Responsible for providing an MP when the maintenance company MP is unavailable. Provides an accurate accounting of aircrews onboard and completes table B-2. Provides security for the aircraft until DART arrival and ensures information required in table B-2 is relayed to the S-2/S-3.

Table B-2. Sample of a downed aircraft recovery report

Line 1- Location and type of aircraft				
Line 2- Injuries requiring immediate attention				
Line 3- Reason aircraft went down				
Line 4- Tail number				
Line 5- Date time group (DTG) aircraft went down				
Line 6- Sierra (secured) or November (not secured)				
Line 7- Call sign of downed aircraft				
Line 8- Personnel:	A- Onboard	B- Wounded in Action	C- Killed in Action	D- Missing in Action
Line 9- Aircraft:	A- Communications security (COMSEC) status destroyed/ recovered/zeroized	B- Accessibility by vehicle/by air (closest LZ)	C- Damage assessment recoverable/not recoverable/fire	
Line 10- Threat situation at site				
Line 11- Call sign of sender				

PERSONNEL REQUIREMENTS

A. The DART is comprised of AMC/AMT/ASC/AST personnel depending on METT-TC. The team successfully extracts an aircraft from a downed location to a safe location using the UMARK, a trained recovery team and recovery assets. Augmentation of the DART mission with trained repair personnel can recover downed aircraft using standard repair or BDAR measures. The team must contain personnel skilled in BDAR and UMARK use.

B. Team composition is modified for each mission depending on the situation and tactical considerations. The protection warfighting function is of the highest importance when determining team configuration.

MEMBER RESPONSIBILITIES AND DUTIES

A. **DART OIC**: Establishes criteria for selecting and training DART members and ensures necessary mission essential-equipment is serviceable and on-hand. OIC responsibilities include coordinating DART deployments, receiving briefings from higher headquarters, and briefing team members prior to deployment. The DART OIC must plan for all possible contingencies and be proficient in integrating aerial and ground assets. Significant resources including Soldiers, aircraft, vehicles, and sensitive items enable orchestration of successful DART missions. DART OICs should be capable of integrating these assets from different organizations.

B. **Maintenance officer (MO) or MP**: Orchestrates maintenance and troubleshooting requirements during aircraft recovery. The MO's presence may be required when determining if a one-time flight is required and/or authorized. The MO/MP should be placed on downgrade RED X orders to facilitate aircraft recovery. The MO/MP may perform primary duties as the DART OIC.

C. **DART NCOIC:** Trains, and prepares the team for mission execution. He conducts precombat checks (PCCs) and precombat inspections (PCIs), directs repair and rigging operations, and provides personnel oversight during all phases of the DART. The NCOIC also directs local security at the recovery site based on instructions received from the DART OIC. Performs DART OIC duties when responsible for the mission.

D. **Aircraft TI**: Responsible for ensuring safe and correct maintenance operations. The TI also makes assessments and recommendations to the chain of command and pilot-in-command on one-time flight authorization. Responsible for all mission forms and records.

E. **Aircraft mechanic/specialty MOS repairer**: Performs the majority of repairs encountered during typical DART missions. Certain aircraft damage or malfunctions may require the services of a specialty MOS (sheet metal, power train, pneudraulics, engine, etc). These and other specialty MOSs will participate as needed based on the type of aircraft malfunction.

F. **Armament specialist**: Responsible for clearing the downed aircraft, when required. Additionally, the specialist can affect the majority of armament and electrical repairs required to recover an aircraft. The armament specialist can also provide additional security when completed with this task.

G. **Radio operator**: Responsible for establishing and maintaining communications with the controlling CP throughout mission duration. He is the link between the DART OIC and the main CP. The radio operator is cross-trained on UMARK use and may be utilized to facilitate recovery. He can also provide additional security between tasks.

H. **Security element**: Provides security to the aircrew, DART, and aircraft to include the transporting aircraft if applicable. The security element is under the direction of the DART OIC.

TEAM EQUIPMENT– PROTECTION WARFIGHTING FUNCTION

A. Maintenance/security team will carry their assigned weapon with full combat load of ammunition and gear to sustain them for 48 hours.

B. Medical personnel will carry a medic bag, folding stretcher, and full combat gear.

C. Supporting aircrews will carry combat gear and wear appropriate flight gear.

D. Appropriate crew-served weapons will accompany the DART to combat the possible threat.

E. All members will carry night vision goggles (NVG) (one set per team member) and spare batteries.

F. Critical equipment includes communications radio with current secure fill, global positioning system (GPS), maps of objective area and routes, and spare batteries for all required systems.

G. The DART OIC will employ the battalion tactical SOP and current battalion communications card.

TEAM EQUIPMENT–MAINTENANCE SUPPORT

A. Required TMs, forms, and records.

B. Technical inspector kit.

C. Mechanics tool box and special tools as required.

D. Hardened computers for forms and records data processing.

E. Portable lighting.

F. UMARK.

G. Aircraft headset for team leader.

H. BDAR kits.

I. Special tools, test equipment, and power units required for recovery.

J. Powered saw with extra blades, gasoline, and oil for component reduction.

K. Tow bar and tow vehicle with all vehicle basic issue items (BIIs).

SPECIAL CONSIDERATIONS

A. **Protection warfighting function**: All personnel selected for downed aircraft recovery will consider the protection warfighting function as the first priority. Commanders will resource team members with any unique requirements (such as, shorter automatic rifle barrels/buttstocks and carbines) to facilitate efficient team member movement within vehicles and aircraft. Personnel not required to perform repair tasks are placed on the perimeter and assigned fields of fire. The NCOIC adjusts the perimeter defense and modifies fields of fire as personnel are moved on and off the perimeter.

B. **Additional personnel augmentation**: Additional forces may be required to augment the DART depending on the situation. This augmentation force may not be organic to the company, battalion, or brigade. A security element may be provided to reinforce the DART. This may require the DART OIC to be of sufficient rank and experience to not only lead the DART, but the augmentation forces as well.

C. **Mortuary personnel**: If a downed aircraft is known or suspected to have human remains onboard, mortuary affairs will be notified and taken to the site with the DART if available. Team members will receive adequate mortuary affairs training prior to assuming duties on the DART.

D. **Recovery versus salvage:**

1. **A dedicated recovery mission** is defined as the aerial recovery of a downed aircraft or the use of the UMARK to lift a downed aircraft onto a trailer. Generally, when the DART launches, it will consist of a rigging team, security element, and transportation assets.

2. **A salvage mission** typically refers to an aircraft which is beyond economical repair, broken into many pieces, or burned beyond recognition. This type of operation will require additional specialized equipment not typically utilized in an aerial recovery. Transporting rough terrain forklifts, light materiel handling equipment, all-terrain utility vehicles, flat racks, and military demountable containers to the recovery site significantly expedites this type of recovery.

PROCEDURES

A. **Premission planning:**

1**. S-3/Main CP:** Uses the recovery report (table B-2, page B-2) to record all pertinent information upon notification of a downed aircraft. Notifies the chain of command, PRO, ASB, DART OIC, production control, and all supporting recovery and security elements.

2. **S-2:** Evaluates the current enemy situation to determine threat levels at the sight/area of the downed aircraft. Prepares imagery and intelligence to brief aircrews and the DART upon arrival.

B. **Aircrew of the downed aircraft:** Performs the following actions based on the threat brief or actual threat situation.

1. **Little/no possibility of capture by enemy:**

a. Remove aircraft key.

b. Remove data transfer cartridge (DTC).

c. Lock aircraft.

2. **Possibility of capture:**

a. Perform above actions.

b. Destroy flight pack.

c. Zeroize aircraft.

d. Remove videotape.

e. Sterilize maps.

3. **Imminent capture:**

a. Perform above actions.

b. Master zeroize.

c. Destroy DTC.

d. Disable aircraft per air mission brief with the following priority:

(1) Identification, friend or foe/classified electronic equipment.

(2) Armament.

(3) Engine assembly.

(4) Airframe.

(5) Nonsecure radios.

(6) Hydraulic systems.

Note. The tactical situation dictates if the recovery will be handled via BDAR. BDAR can result in high risk. Usually, aviation brigade commanders must approve a high risk mission. Aircrew members without injuries will not be evacuated from the site until initial aircraft assessment is complete.

4. **DART Members:** On notification, assemble at a prebriefed location with all equipment ready for loading onto the designated aircraft/vehicle for departure. The DART OIC will complete the actions IAW the DART pre-execution checklist (table B-3) and brief the team.

Table B-3. Example of a pre-execution checklist

DART/BDAR PRE-EXECUTION CHECKLIST (To be completed by DART/BDAR NCOIC)			
	YES	***NO***	***N/A***
Personnel:			
All present			
Fighter management/risk management			
Manifest completed			
Personal Equipment:			
Identification (ID) tags and ID cards			
License for all equipment to be operated			
Proper uniform for mission with overnight bag			
Required TA-50 for mission on hand			
Individual body armor, advanced combat helmet, and ear plugs			
Canteen/camel-back full			
Flashlight (extra batteries)and chemical lights			
Rules of engagement card, MEDEVAC communications card			
Blood chit			
Weapon functional checks completed			
Sensitive Items and COMSEC:			
Weapon serial numbers confirmed			
Basic ammunition load			
Pyrotechnics, grenades and explosives			
COMSEC			
Special instructions briefed			
Personnel recovery information on file and reviewed			
NVG with spare batteries			
Intelligence:			
Mission briefed (S-2)			
All personnel have maps, grids, and protractors			
All personnel know sign and counter sign			
All personnel know current threat situation			
CBRN Equipment:			
MOPP suit			
Protective mask with inserts			

Table B-3. Example of a pre-execution checklist

DART/BDAR PRE-EXECUTION CHECKLIST ***(To be completed by DART/BDAR NCOIC)***			
	YES	***NO***	***N/A***
M256, M258 kits, and M9 paper			
Communications:			
All personnel have frequencies/net IDs, communications card			
Manpack radio keyed with extra batteries			
All personnel have assigned call signs			
All COMSEC loaded if required			
All antennas up or tied per mission required			
Vehicle and Equipment:			
Vehicle properly dispatched			
Load plans in logbook			
Basic Issue Item serviceable and loaded			
PMCS completed IAW applicable TMs			
Fuel topped off and fuel cans full, vehicle packaged POL on-hand			
Water cans full and loaded			
Camouflage netting serviceable and loaded			
Air lines and safety chains properly connected to trailer			
Weapons and mounts on and operational			
Miscellaneous:			
Meals-ready to eat			
Additional ammunition issued if required			
Required tools on hand and inventoried			
Special tools on hand			
All keys on hand			
All required safety briefs completed			
All required TMs, FMs, and pubs (on laptop)			
Generator with light set (when required)			
Medical bags			
GPS (with spare batteries), map with compass/protractor			
Parts/petroleum, oils, and lubricants needed for suspected problem			
Long range comms (Cell, Satellite, Beyond line of sight)			
Environmental protection items (rain, heat, sun, snow protection)			
Mine markers			
Powered saw with spare blades, oil, and gas			
Individual survival kits (as required)			
Comments:			

5. **Production Control:** Coordinates for any special tools, parts, or procedures required to affect recovery.

6. **Brigade Staff:** Assembles all potential participating unit representatives to establish a tentative plan. Begins resource allocation to the DART OIC.

7. **Ground Vehicle Recovery:** Required when the situation does not support DART insertion or extraction by helicopter, or weather conditions prohibit aircraft operations. The DART OIC will follow all procedures required for movement of the convoy. Special attention is placed on route selection and reaction to civilians and hostile forces during movement.

8. **Recovery by Aerial Assets:** Conducted when time is critical, threat conditions place the convoy in danger, or ground movement is not possible due to road conditions.

9. **DART OIC:** Conducts a precombat inspection (PCI) and team briefing prior to departure. At a minimum, the DART PCI checklist (table A-4, page A-7) will be followed.

10. **Aircraft Inspection:** Depending on enemy situation, debriefs and inspections must be accomplished in as much detail as possible to determine the extent of damage to the downed aircraft. The appropriate BDAR manual and BDAR/DART crash site checklist are used. If the DART OIC determines the aircraft is recoverable, the OIC directs personnel to accomplish the appropriate repairs and recover the aircraft. The OIC may employ BDAR techniques if more extensive repairs are required and the enemy situation permits. The DART OIC will direct ground or aerial recovery with focused support from the main CP, if the downed aircraft is too badly damaged to permit onsite repair.

11. **Special Notes:**

a. Upon arrival at the downed aircraft site, immediately establish security.

b. Remain vigilant for antipersonnel mines and pyrotechnics at the downed aircraft site. If explosives or mines are identified, place a mine marker (nonferrous) in close proximity to the object and alert the team to keep a safe distance. Notify or employ (if assigned) EOD.

COMMUNICATIONS AND CONTROL

A. The initial report of a downed aircraft occurs on the secure command net.

B. Notification of downed aircraft to internal offices is accomplished on secure internal phone lines or by runner.

C. En route communications are conducted on a predetermined secure frequency separate from the command net as briefed by the S-3.

D. A man-pack radio, satellite communication, or any other long-range system provides communications between the team, support aircraft on the objective, and the CP.

E. Division assets will be briefed on frequencies and reporting procedures, as required.

F. A direct line to higher headquarters is established during the initial recovery process. This ensures positive communication in the event the enemy situation changes and immediate permission to destroy the downed aircraft is needed.

RECOVERY PROCESS

A. **Security Team:** When arriving at the downed aircraft, the security team immediately positions themselves 50 meters out to the 10, 2, 4, and 8 o'clock positions in relation to the nose of the downed aircraft.

B. **DART OIC:** Ensures all weapon systems on the airframe are safed by armament personnel.

C. **Medic/Combat Lifesaver (CLS):** If the aircrew has not been evacuated, the medic/CLS—

1. Checks the condition of the crew.

2. Provides medical assistance.

3. Reports findings to the DART OIC.

D. Evacuate injured crewmembers (if required).

E. **DART MP/TI and Airframe Specific Crew Chief**: Immediately evaluates the condition of the aircraft to determine air worthiness.

RECOVERY CONDITIONS

A. **Low/No Threat:**

1. Repair of the airframe and systems shall be limited to four hours.

2. Safety **WILL NOT** be jeopardized to return an aircraft to service.

3. Repair of the aircraft to a ONE-TIME EVACUATION (Circle X) STATUS is acceptable and can only be authorized by the appropriate commander or the designated representative.

4. The appropriate level commander may authorize a longer on station time not to exceed eight hours.

5. Once determined repairs will take longer than four hours, and the aircraft is reparable and flyable, production control will coordinate with other units for any additional maintenance support.

B. **High Threat:**

1. First priority on the objective is to **SAFELY** evacuate the aircrews.

2. Repair of the airframe and systems shall be limited to 30 minutes on station time and the decision to extend should be based on enemy situation.

3. Repair of the aircraft to a ONE TIME EVACUATION (Circle X) STATUS is acceptable, and under HIGH THREAT conditions shall be pre-authorized by the appropriate commander or the designated representative when the MP and TI agree the airframe is stable enough for flight.

4. Safety **WILL NOT** be jeopardized to return the aircraft to service.

5. Should the aircraft be deemed nonreparable, the DART OIC will contact the CP and request disposition to destroy or abandon (temporarily or permanently) the downed aircraft.

POST PROCEDURES

A. Report status of downed aircrews and the aircraft to higher headquarters.

B. Conduct a post-DART inspection of personnel, weapons, and sensitive items.

C. Clean, inventory, store, and replenish items used from the UMARK and/or BDAR kits.

D. Debrief personnel (including Chaplain and Mental Health sessions as required) and perform after-action review (AAR).

E. Collect recommendations for SOP changes from all sources, internal and external, for consideration on future DART missions.

REPORTS AND CHECKLISTS

B-6. Table B-4 to table B-10 should be utilized by the DART OIC and members to ensure key planning considerations are completed.

Table B-4. Example of a downed aircraft recovery team process checklist

Actions prior to notification:
Assemble all team members at the beginning of the shift
Verify assignment of aircraft and crew for DART mission, complete PMCS for all vehicles, trailers and equipment
Ensure DART members file PR information with the S-2
Conduct PCIs
Conduct a crew passenger briefing, rehearse entering and exiting aircraft, loading and unloading vehicles, and trailering material handling equipment
Actions upon notification:
Assemble all DART members at predetermined location
Pick up downed aircrew recovery report (table B-2, page B-2)
Receive situational update from the CP and S-2
Assemble and upload equipment on DART transportation
Review DART mission brief (table B-5, page B-11) with team and brief succession of responsibilities
Review actions on contact
Ensure DART aircraft are equipped with two headsets (one for DART OIC and one for security team NCOIC)
Conduct final precombat check with personnel
Deliver DART manifest and equipment list to operations
Actions at downed aircraft site:
Conduct surveillance of site for mines and pyrotechnics
Establish communications with aircraft and CP (DART OIC or security team NCOIC)
Safe and clear aircraft (check for fire, improvised explosive devices, fuel leaks, electrical sparks)
Perform first aid if required.
Assess aircraft damage/malfunction.
Perform maintenance or rig aircraft for recovery, complete forms and records.
Ensure all sensitive items are accounted for prior to departure.
If the aircraft must be abandoned or destroyed in place, the unit DART destruction checklist (unit develops based on MDS) is followed after receiving appropriate higher headquarters authorization.
Security Team NCOIC (if applicable)
Actions prior to notification:
Rehearse actions at downed aircraft recovery site
Rehearse C2 signals between team members
Brief succession of responsilities
Actions upon notification:
Brief security team on situation
Draw NVG
Annotate downed aircraft on map and note terrain
Actions at downed aircraft site:
Establish communications with aircraft and CP (DART OIC or security team NCOIC)
Establish perimeter
Place crew-served weapons on enemy avenues of approach
Utilize door gunners on perimeter if available
Designate fields of fire

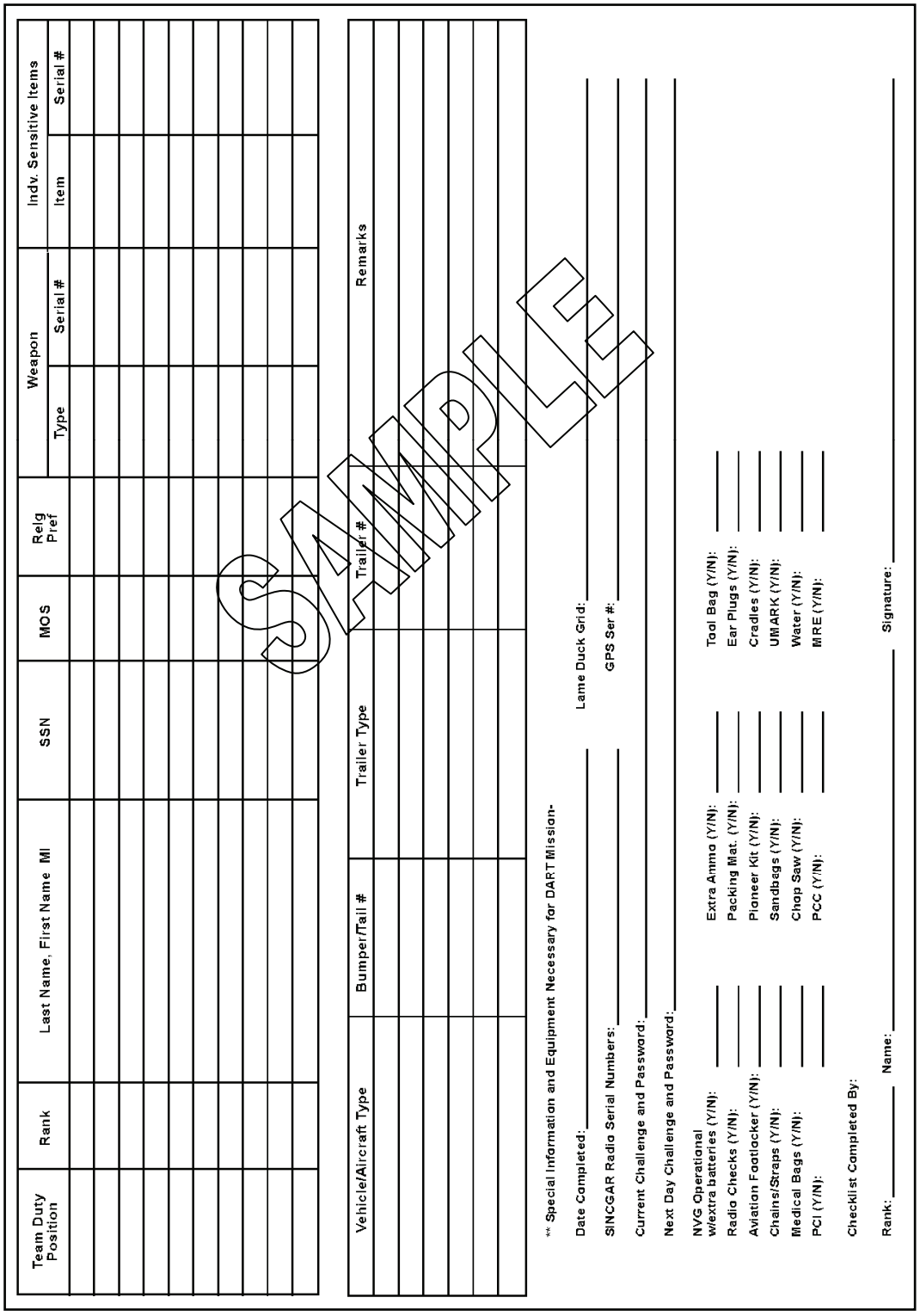
Table B-5. Downed aircraft recovery team mission brief

Assemble DART for briefing around sand table and map
Develop a route if deployment by ground
Team roll call Aircraft tail number and type, location of downed aircraft (table A-7, page A-12) Map briefing of surrounding area Enemy situation Hazards (mines, weather, traffic) Friendly situation Main CP update
Method of recovery: (vehicle/air or repair and release) (distance and obstructions if by ground)
DART mode of transportation to downed aircraft Convoy brief and request Aircraft tail number and parking pad takeoff time?
P4T3: Problem: What is wrong with the aircraft? People: Who and how many people will be going? Parts: What is broken? Plan: How to fix or recover? Time: How long will it take to fix or recover? Tools: What tools are needed? Calibrated, current, etc. Technical Assistance: As required.
Weather forecast for next 24 to 48 hours
Communications frequencies and call signs
Recovery aircraft frequencies
Communications check prior to departure
Sensitive items check prior to departing DART site
Closure report to AMC on return

Table B-6. Example of a downed aircraft report

		DTG:_____									
Line 1	A/C type & tail #										
Line 2	Location grid or ref point (distance/direction from major landmark)										
Line 3	Threat level	Low	Med	High	Unknown	Secure					
Line 4	Number of injuries/casualties	Litter/Urgent	Critical	Ambulatory	Fatalities						
Line 5	Person on board (include any codes listed in the aviation procedures guide)										
Line 6	Reason	Enemy Action	Mechanical Failure	Other							
Line 7	Landing type	Precautionary	Emergency	Hard	Crash						
Line 8	Fire/fuel spillage	Fire	Fuel Spill								
Line 9	A/C systems affected	Airframe	Engine	Trans	Hyd	Fuel Sys	Electric				
		Main Rotor	Tail Rotor	Ldg Gear	Drive/Input Shafts	APU	Other				
Line 10	Problem	Leak	Fire	Crack	Dent	Hole	Bent				
		Msn Comps	Over Speed	Over Temp	Over Trq						
Line 11	Accessibility & Hazards	Open	Confined (Two or less A/C)	Very Confined (One A/C)							
		Ordnance	Trees	Wires	Slope	Dust	Snow				
		Smoke	Fog	Rain	Water	Ice	Fire				
Remarks: Reported by (Name):											
A/C tail #/radio frequency/phone number:											
Sensitive items/ammunition on board:											
Location of individual who can guide rescue party:											
Rcvd By (Name):	**Rank:**	**Battle CPT (Name):**	**Rank:**								

Table B-7. Example of a downed aircraft recovery team manifest and tasking



Team Duty Position	Rank	Last Name, First Name MI	SSN	MOS	Relg Pref	Weapon		Indv. Sensitive Items	
						Type	Serial #	Item	Serial #

Vehicle/Aircraft Type	Bumper/Tail #	Trailer Type	Trailer #	Remarks

** Special Information and Equipment Necessary for DART Mission-

Date Completed: _____ Lame Duck Grid: _____

SINCGAR Radio Serial Numbers: _____ GPS Ser #: _____

Current Challenge and Password: _____

Next Day Challenge and Password: _____

NVG Operational w/extra batteries (Y/N): _____ Extra Ammo (Y/N): _____ Tool Bag (Y/N): _____

Radio Checks (Y/N): _____ Packing Mat. (Y/N): _____ Ear Plugs (Y/N): _____

Aviation Footlocker (Y/N): _____ Pioneer Kit (Y/N): _____ Cradles (Y/N): _____

Chains/Straps (Y/N): _____ Sandbags (Y/N): _____ UMARK (Y/N): _____

Medical Bags (Y/N): _____ Chop Saw (Y/N): _____ Water (Y/N): _____

PCI (Y/N): _____ PCC (Y/N): _____ MRE (Y/N): _____

Checklist Completed By:

Rank: _____ Name: _____ Signature: _____

Table B-8. Example of a medical evacuation request

Line 1: Location of Landing Zone: Grid _____

Line 2: Radio Frequency/Call Sign _____

Line 3: Number of Patients by Precedence _____
- A-Urgent
- B-Urgent Surgical
- C-Priority
- D-Routine
- E-Convenience

Line 4: Special Equipment Required _____
- A-None
- B-Hoist
- C-Extraction equipment
- D-Ventilator

Line 5: Number of Patients by Type _____
- L + # Litter
- A + # Ambulatory

Line 6: Security of LZ _____
- N=No Enemy
- P=Possible Enemy
- E=Enemy In Area (Use Caution)
- X=Enemy In Area (Escort Required)

Line 7: Method of Marking LZ _____
- A=Panels
- B=Pyro
- C=Smoke
- D=None
- E=Other

Line 8: Patient Nationality _____
- A=U.S. Military
- B=U.S. Civilian
- C=Non U.S. Military
- D=Non U.S. Civilian

Line 9: Description of Terrain or Hazard _____

Table B-9. Example of a downed aircraft recovery team quick card

	Exact location of downed aircraft.
	Estimated or verified condition of aircraft.
	Ongoing PR mission(s) status.
	Last 48 hours/next 48 hours intelligence estimate of the downed aircraft sector.
	Call signs and frequencies of security on-site and anticipated time remaining on station.
	Call signs and frequencies of en route security.
	Call signs and frequencies of sectors that the convoy route crosses (Sheriff's net).
	S-2 provides minimum risk routes and safe areas along anticipated route for checkpoints/rally points.
	UAS support: Obtain most current imagery and task available UAS assets for overwatch.

Table B-10. Mission-specific items

NSN/Model #	*NOMEN*	*UI*	*Special Remarks*
4020-01-047-6815	Fiber rope, assembly, single leg	EA	For multiple sling load operations
4030-01-048-4047	Grab hook assembly	EA	For multiple sling load operations
1670-01-235-0907	Spacer, apex fitting	EA	For multiple sling load operations
5306-00-944-2659	Bolt, shear	EA	For multiple sling load operations
5315-00-234-1864	Pin, cotter	HD	For multiple sling load operations
1670-01-192-5535	Discharger, electrostatic	EA	For multiple sling load operations
5305-00-724-7222	Screw hex	EA	For multiple sling load operations
5310-01-280-6749	Nut plain	EA	For multiple sling load operations
5305-00-821-3869	Screw, cap, hexagon head	HD	For multiple sling load operations
3040-00-773-9380	Shaft shouldered	EA	For multiple sling load operations
5306-00-333-0473	Bolt, U	EA	For multiple sling load operations
5310-00-763-8911	Nut, plain, hexagon	EA	For multiple sling load operations
5310-00-167-0680	Washer lock	HD	For multiple sling load operations
4030-01-048-4044	Shackle assembly	EA	For multiple sling load operations
4240-01-513-4519	Lens, goggles, industrial	EA	Eye protection
4240-01-301-3200	Respirator, air filtering	EA	For HAZMAT/Biohazard removal
8415-01-445-6568	Coverall disposable	PR	For HAZMAT/Biohazard removal
4240-01-504-7863	Goggles, industrial	PR	For HAZMAT/Biohazard removal
8115-01-444-0206	Pallet base, shipping box	EA	Multipack boxes to categorize parts, components & equipment
8115-01-444-0212	Sleeve, box	EA	Multipack boxes to categorize parts, components & equipment

This page intentionally left blank.

Appendix C

Battle Damage Assessment and Repair Tools, Equipment, and Kits

Due to the variety of BDAR component requirements on different airframes, this appendix provides a generic list of special tools and expendables contained in most kits (tables C-1 and C-2). Refer to the appropriate BDAR TM for a complete listing of repair parts, special tools, and expendable supplies and materials.

Table C-1. Special or fabricated tools

Repair Kit (Nomenclature)	*Cage Number Part Number*	*National Stock Number*
Composite Structures Repair Kit		
Repair Kit, connector (Special tools for electrical connector repair)	(03950)/11-12-13QA	5845-01-014-3534
Emergency Repair Kit (Special and common tools for electrical repair, including repair parts)	(11851)/DMC895	4920-01-266-7534
Repair Kit, fluid line (Special and common tools for tubing and hose)	(78286)	4920-01-266-7534
Repair Kit, fuel cell	(73842)/2F1-3-20031GP3	1560-00-020-8856
Repair Kit, rotor blade	(29183)/K747-40-1	4920-01-035-0324
Parts Kit, rotor blade	(84955)/K747-202-119	1615-01-089-0437
Repair Kit, A/C skin	(76381)/8999K5	4920-01-549-1320
Repair Kit, test equipment (Electrical test equipment)	(78286)/ 70700-0638-041	4920-01-266-7536
Repair Kit, wire (Special tools used for electrical wiring repair, Including repair parts)	(06090)/MK-0015-1	5935-01-254-1688
Repair Kit, aircraft, maintenance	(76381)/8999K6	4920-01-549-1321

Table C-2. Expendable supplies and materials list

Item Description (Nomenclature)	*Cage Number/Part Number*	*National Stock Number*
Acetone, technical	(81346)/ASTM D329	6810-00-184-4796
Cleaning compound, solvent	(81349)/MIL-PRF-680	6850-01-472-2717
Cleaning solvent, general	(81755)/DS-108	7930-01-367-0996
Cloth, abrasive	(80204)/ANSI B74.18, 80 Grit	5350-00-192-5047
Cloth, abrasive	(80204)/ANSI B74.18, 100	5350-00-161-9066

Table C-2. Expendable supplies and materials list

Item Description (Nomenclature)	*Cage Number/Part Number*	*National Stock Number*
	Grit	
Cloth, abrasive	(80204)/ANSI B74.18, 150 Grit	5350-00-192-5050
Cloth, abrasive	(80204)/ANSI B74.18, 220 Grit	5350-01-352-6214
Cloth, abrasive	(80204)/ANSI B74.18, 240 Grit	5350-00-161-9715
Cloth, abrasive	(80204)/ANSI B74.18, 280 Grit	5350-00-229-3081
Cloth, abrasive	(80204)/ANSI B74.18, 320 Grit	5350-00-246-0330
Cloth, abrasive	(80204)/ANSI B74.18, 400 Grit	5350-00-174-0986
Cloth, abrasive	(80204)/ANSI 74.18, Assorted	5350-00-271-5950
Cloth, cheesecloth	(81348)/CCC-C-440	8305-00-237-3015
Cloth, cleaning	(83582)/8938	7920-01-180-0556
Cloth, satin	(81349)/MILC9084, Class 2	5305-00-082-6135
Fiberglass repair kit	(78286)/S1607-7021	1560-00-856-9222
Hydraulic fluid, fire resistant	(81349)/MIL-PRF-83282	9150-00-149-7432
Hydraulic fluid, petroleum base	(77988)/AVREX904	9150-00-935-9808
Hydraulic fluid, petroleum base	(07950)/ROYCO 756 (gal) (07950)/ROYCO 756 (qt)	9150-00-223-4134 9150-00-252-6383
Insulation sleeving	(26055)/728-057-001	5970-00-063-1500
Insulation sleeving	(18876)/8034661-3	5970-00-881-8200
Isopropyl, alcohol, technical	(81348)/TT-I-735	6810-01-220-9907
Leak detecting fluid	(24855)/HECK/CHECK, Type III	6850-00-935-4068
Pad, scouring	(27293)/86	7920-00-934-3469
Paper, abrasive	(80204)/ANSI B74.18, 120 Grit	5350-00-721-8115
Paper, abrasive	(80204)/ANSI B74.18, 150 Grit	5350-00-721-8116
Paper, abrasive	(80204)/ANSI B74.18, 220 Grit	5350-00-224-7209
Paper, abrasive	(80204)/ANSI B74.18, 120 Grit	5350-00-221-0882
Paper, abrasive	(80204)/ANSI B74.18, 150 Grit	5350-00-186-8821
Paper, abrasive	(08204) ANSI B74.18, 220 Grit	5350-00-186-8819
Paper, abrasive	(08204) ANSI B74.18, 360 Grit	5350-00-224-7202
Sealing compound	(81349)/MIL-S-8516	8030-00-174-2579
Sealing compound	(77247)/3D	8030-00-656-1426

Table C-2. Expendable supplies and materials list

Item Description (Nomenclature)	*Cage Number/Part Number*	*National Stock Number*
Tape, pressure sensitive adhesive	(52170)/232, 1 ½ in.	7510-00-266-6709
Tape, pressure sensitive adhesive	(52170)/232, 2 in.	7510-00-266-6710
Tape, pressure sensitive adhesive	(52170)/232, 3 in.	7510-00-266-6707
Tape, pressure sensitive adhesive	(19203)/8783476	7510-00-266-6712
Towel, machinery wiping	(81348)/DDD-T-541	7920-00-260-1279

This page intentionally left blank.

Appendix D

After-Action Review

D-1. AARs must follow each recovery mission. They validate effective practices and reveal problems encountered during the mission. AARs generate observations, insights, and lessons to improve future recovery operations.

D-2. The AAR should contain the following information—

- Recovery unit, phone number, and e-mail address.
- Date.
- Type of aircraft recovered.
- Type of recovery equipment used.
- Condition of recovered aircraft.
- Conditions at recovery site (if combat conditions, so state).
- Recovery team composition (by number and MOS).
- Method of recovery.
- Narrative of recovery (time required, failures, and shortcomings noted in equipment, remarks, recommendations).

D-3. The S-3 is the approval authority for the release of all AARs.

D-4. Send completed AARs to the Lessons Learned Integration (L2I) division at Commander, United States Army Aviation Center of Excellence, ATTN: ATZQ-TD L2I, Fort Rucker, AL 36362-5000, or e-mail: rucker.avtactics@conus.army.mil.

This page intentionally left blank.

Appendix E

Hand and Arm Signals

This appendix implements portions of Standardization Agreements 2999 and 3117. See FM 3-04.104 for weapons arming hand signals.

HAND AND ARM SIGNALS

PROCEED TO NEXT GROUND GUIDE

E-1. Both arms extended on same side of shoulder level to indicate direction of next ground guide (figure E-1).

Figure E-1. Proceed to next ground guide

THIS WAY

E-2. Arms above head in vertical position with palms facing inward (figure E-2).

Figure E-2. This way

MOVE AHEAD

E-3. Arms a little apart with palms facing backward and repeatedly moved upward and backward from shoulder height. Indicate the aircraft speed desired by rapidity of arm motions (figure E-3).

Figure E-3. Move ahead

TURN TO LEFT (PORT)

E-4. Position right arm down, and point to left wheel or skid; move left arm repeatedly upward and backward. Indicate rate of turn by rapidity of arm motions (figure E-4).

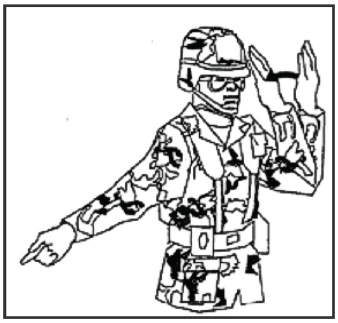


Figure E-4. Turn to left (port)

TURN TO RIGHT (STARBOARD)

E-5. Position left arm down and point to right wheel or skid; move right arm repeatedly upward and backward. Indicate rate of turn by rapidity of arm motions (figure E-5).

Figure E-5. Turn to right (starboard)

LANDING DIRECTIONS

E-6. Ground guide stands with arms raised vertically above head and facing toward the point where the aircraft is to land. The arms are lowered repeatedly from a vertical to a horizontal position, stopping finally in the horizontal position (figure E-6).

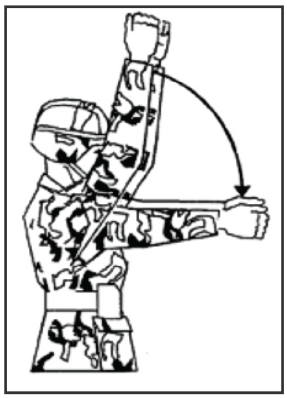


Figure E-6. Landing directions

MOVE UPWARD

E-7. Extend arms horizontally to the side, beckoning upward with palms turned up. Indicate rate of ascent by speed of movement (figure E-7).

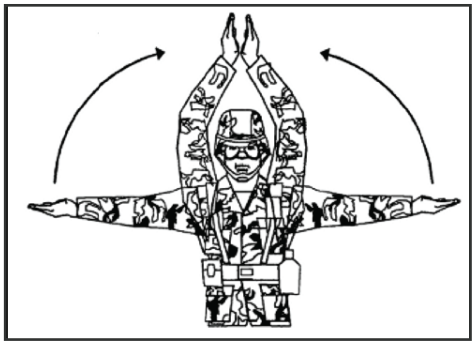


Figure E-7. Move upward

HOVER

E-8. Extend arms horizontally sideways with palms turned down (figure E-8).

Figure E-8. Hover

MOVE DOWNWARD

E-9. Extend arms horizontally to the side, beckoning downward with palms turned down. Indicate rate of descent by rapidity of arm motions (figure E-9).

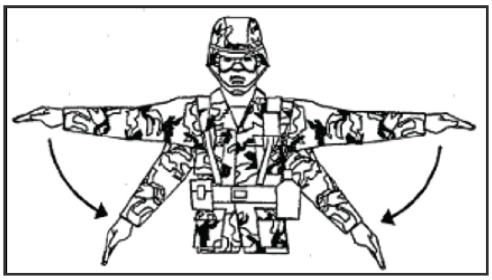


Figure E-9. Move downward

MOVE TO RIGHT

E-10. Left arm extended horizontally sideways in direction of movement and right arm swung over the head in same direction in a repeating movement (figure E-10).

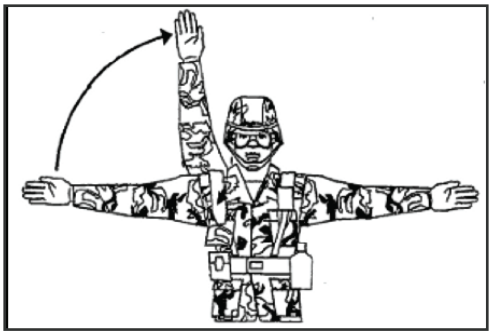


Figure E-10. Move to right

MOVE TO LEFT

E-11. Right arm extended horizontally sideways in direction of movement and left arm swung over the head in same direction in a repeating movement (figure E-11).

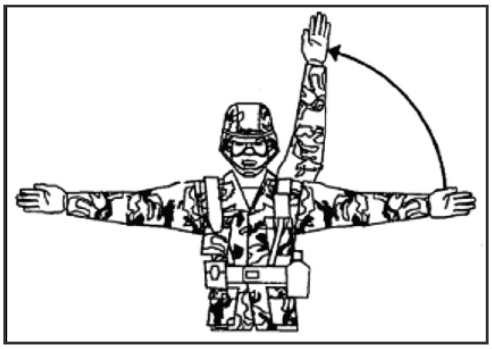


Figure E-11. Move to left

SLOW DOWN

E-12. Arms down with palms toward ground and then move up and down several times (figure E-12).

Figure E-12. Slow down

STOP

E-13. Cross arms above head with palms facing forward (figure E-13).

Figure E-13. Stop

BRAKES

E-14. The following graphic depicts hand signals for "brakes" (figure E-14).

- **On (Day).** Arms above head, open palms, and fingers with palms toward aircraft, and then fist closed.
- **On (Night).** Arms above head and then wands crossed.
- **Off (Day).** Reverse of above.
- **Off (Night).** Crossed wands and then uncrossed.

Figure E-14. Brakes

ENGAGE ROTOR(S)

E-15. Circular motion in horizontal plane with right hand above head (figure E-15).

Figure E-15. Engage rotor(s)

START ENGINE(S)

E-16. The following graphic depicts hand signals for "start engine" (figure E-16).

- **Day.** Left hand overhead with appropriate number of fingers extended to indicate the number of the engine to be started and circular motion of right hand at head level.
- **Night.** Similar to day signal except that the wand in the left hand will be flashed indicating the engine to be started.

Figure E-16. Start engine(s)

WAVE-OFF

E-17. Waving of arms over the head (figure E-17).

Figure E-17. Wave-off

AFFIRMATIVE (ALL CLEAR)

E-18. Hand raised with thumb up (figure E-18).

Figure E-18. Affirmative (all clear)

NEGATIVE (NOT CLEAR)

E-19. Arm held out, hand below waist level, and thumb turned down (figure E-19).

Figure E-19. Negative (not clear)

MOVE BACK

E-20. Hold hands down by side; face palms forward; and, with elbows straight, repeatedly move arms forward and upward to shoulder height (figure E-20).

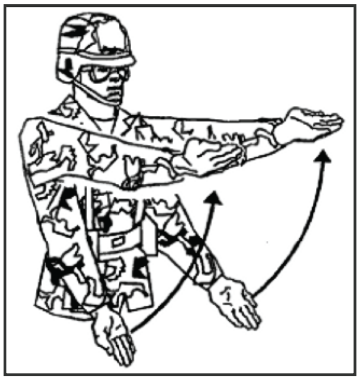


Figure E-20. Move back

LAND

E-21. Cross hands and extend arms downward in front of the body (figure E-21).

Figure E-21. Land

CLEARANCE FOR PERSONNEL TO APPROACH AIRCRAFT

E-22. A beckoning motion with right hand at eye level (figure E-22).

Figure E-22. Clearance for personnel to approach aircraft

PERSONNEL APPROACH THE AIRCRAFT (GIVEN BY GROUND CREWMEMBER)

E-23. Left hand raised vertically overhead with palm toward aircraft. The right hand indicates the persons concerned and gestures toward aircraft (figure E-23).

Figure E-23. Personnel approach the aircraft (given by ground crewmember)

UP HOOK

E-24. Right fist, thumb extended upward, raised suddenly to meet horizontal palm of left hand (figure E-24).

Figure E-24. Up hook

DOWN HOOK

E-25. Right fist, thumb extended downward, lowered suddenly to meet horizontal palm of left hand (figure E-25).

Figure E-25. Down hook

SLOW DOWN ENGINE(S) ON INDICATED SIDE

E-26. Arms down, palms toward the ground with either the right or left arm waved up and down to indicate left- or right-side engines, respectively, should be slowed down (figure E-26).

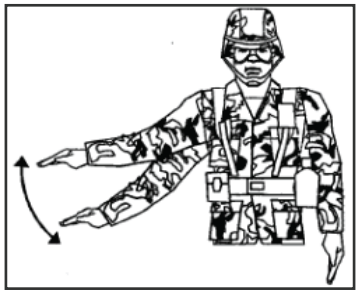


Figure E-26. Slow down engine(s) on indicated side

CUT ENGINE(S) OR STOP ROTOR(S)

E-27. Either arm or hand level with shoulder, palm down; draw extended hand across neck in a "throat-cutting" motion (figure E-27).

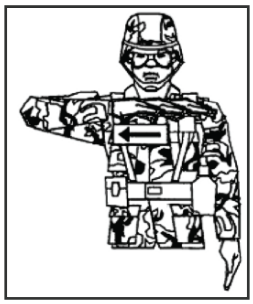


Figure E-27. Cut engine(s) or stop rotor(s)

CONNECT AUXILIARY POWER UNIT

E-28. The following depicts hand signals for "connect auxiliary power unit" (figure E-28).

- **Day.** Extend hands overhead; push first two fingers of right hand into fist of left hand.
- **Night.** Same movement with the left-hand lighted wand vertical and right-hand lighted wand horizontal.

Figure E-28. Connect auxiliary power unit

DISCONNECT AUXILIARY POWER UNIT

E-29. The following depicts hand signals for "disconnect auxiliary power unit" (figure E-29).

- **Day.** Extend hands overhead; pull first two fingers of right hand away from left fist.
- **Night.** Same movement except that left-hand lighted wand is vertical and right-hand lighted wand is horizontal.

Figure E-29. Disconnect auxiliary power unit

INSERT CHOCKS/CHOCKS INSERTED

E-30. Arms down, fists closed, and thumbs extended inward. Swing arms from extended position inward (figure E-30).

Figure E-30. Insert chocks/chocks inserted

REMOVE CHOCKS

E-31. Arms down, fists closed, and thumbs extended outward. Swing arms outward (figure E-31).

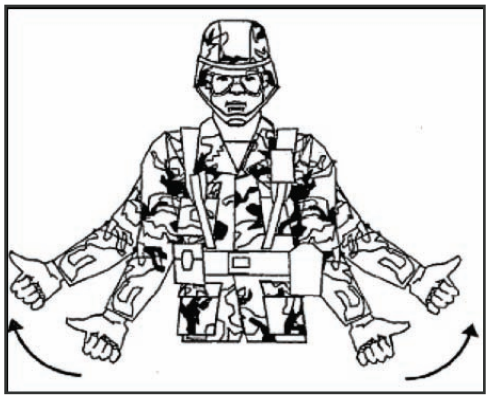


Figure E-31. Remove chocks

HOOK UP LOAD

E-32. Rope climbing motion with hands (figure E-32, page E-12).

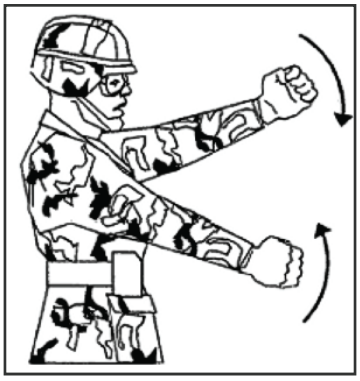


Figure E-32. Hook up load

RELEASE LOAD

E-33. Left arm forward horizontally with fists clenched; extended right hand making horizontal slicing motion below left arm with palm down (figure E-33).

Figure E-33. Release load

LOAD HAS NOT BEEN RELEASED

E-34. Bend left arm horizontally across chest with fist clenched and palm turned down; open right hand pointed up vertically to center of left fist (figure E-34).

Figure E-34. Load has not been released

DROOP STOPS OUT

E-35. When rotor starts to "run down," ground guide stands with both hands raised above head, fists closed, and thumbs pointing out (figure E-35).

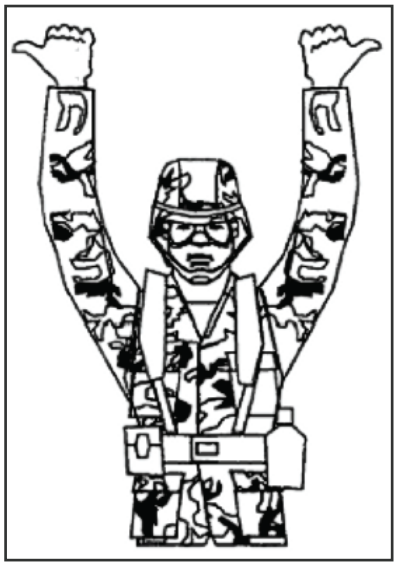


Figure E-35. Droop stops out

DROOP STOPS IN

E-36. When droop stops go in, ground guide turns thumbs inward (figure E-36).

Figure E-36. Droop stops in

This page intentionally left blank.

Glossary

A2C2S	Army airborne command and control system
AAR	after-action review
AASF	Army aviation support facility
ADAM	air defense and airspace management
AMC	aviation maintenance company
AMO	aviation maintenance officer
AMT	aviation maintenance troop
AO	area of operation
AOR	area of responsibility
AR	Army regulation
ARNG	Army National Guard
ASB	aviation support battalion
ASC	aviation support company
AST	aviation support troop
AVCRAD	Aviation Classification Repair Activity Depot
BAMO	brigade aviation maintenance officer
BCT	brigade combat team
BDAR	battle damage assessment and repair
C2	command and control
CAB	combat aviation brigade
CAS	close air support
CBRN	chemical, biological, radiological, and nuclear
CH	cargo helicopter
CLS	combat lifesaver
COMSEC	communications security
CONUS	continental United States
CP	command post
CRM	composite risk management
DA	Department of the Army
DA Pam	Department of the Army pamphet
DART	downed aircraft recovery team
DOD	Department of Defense
DTC	data transfer cartridge
DTG	date time group
EOD	explosive ordnance disposal
FM	field manual
FMI	field manual interim
FS	fire support

GPS	global positioning system
GSAB	general support aviation battalion
HAZCOM	hazardous communication
HAZMAT	hazardous materials
IAW	in accordance with
ID	identification
JFC	joint force commander
JP	joint publication
JPRC	Joint Personnel Recovery Center
L2I	Lessons Learned Integration
LZ	landing zone
MCP	maintenance collection point
MDS	mission design series
MEDEVAC	medical evacuation
METT-TC	mission, enemy, terrain and weather, troops and support, time available, and civil considerations
MO	maintenance officer
MOPP	mission-oriented protective posture
MOS	military occupational specialty
MP	maintenance test pilot
NCOIC	noncommissioned officer in charge
NVG	night vision goggles
OIC	officer in charge
OSC	on-scene commander
P4T3	problem, people, parts, plan, time, tools, and technical assistance
PC	pilot-in-command
PCI	precombat inspection
PMCS	preventive maintenance checks and services
PR	personnel recovery
PRCC	personnel recovery coordination cell
PRO	personnel recovery officer
QC	quality control
S-2	intelligence staff officer
S-3	operations staff officer
S-4	logistics staff officer
SOP	standing operating procedure
TACSOP	tactical standing operating procedure
TI	technical inspector
TM	technical manual
UAS	unmanned aircraft system
UMARK	unit maintenance aerial recovery kit

UMCP unit maintenance collection point

This page intentionally left blank.

References

These publications are sources for additional information on the topics in this FM. Find most JPs at http://www.dtic.mil/doctrine/doctrine.htm. Most Army publications are found online at http://www.army.mil/usapa.

SOURCES USED

These are the sources quoted or paraphrased in this publication.

JOINT PUBLICATIONS

JP 1-02. *Department of Defense Dictionary of Military and Associated Terms.* 12 April 2001.

JP 3-50. *Personnel Recovery*. 5 January 2007.

ARMY PUBLICATIONS

AR 5-9. *Area Support Responsibilities*. 16 October 1998.

AR 750-1. *Army Materiel Maintenance Policy*. 20 September 2007.

DA Pam 385-10. *Army Safety Program*. 23 May 2008.

DA Pam 738-751. *Functional Users Manual for the Army Maintenance Management System-Aviation (TAMMS-A)*. 15 March 1999.

FM 1. *The Army.* 14 June 2005.

FM 3-0. *Operations*. 27 February 2008.

FM 3-04.104. *Tactics, Techniques, and Procedures for Forward Arming and Refueling Point*. 3 August 2006.

FM 3-04.500. *Army Aviation Maintenance*. 23 August 2006.

FM 3-50.1. *Army Personnel Recovery*. 10 August 2005.

FM 4-20.197. *Multiservice Helicopter Sling Load: Basic Operations and Equipment*. 20 July 2006.

FM 5-19. *Composite Risk Management*. 21 August 2006.

FMI 3-04.155. *Army Unmanned Aircraft System Operations*. 4 April 2006.

TM 1-1520-237-BD. *Aviation Unit and Intermediate Maintenance for Battlefield Damage Assessment & Repair for Army Model Helicopters UH-60A (NSN 1520-01-035-0266) (EIC:RSA), UH-60L (NSN 1520-01-298-4532) (EIC:RSM), EH-60A (NSN 1520-01-082-0686) (EIC:RSB) , HH-60A (NSN 1520-01-459-9468) (EIC:RSN), HH-60L (NSN 1520-01-471-6773) (EIC:RSI), UH-60M (NSN 1520-01-492-6324) (EIC:RSP), HH-60M (NSN 1520-1-515-4615) (EIC:N/A)*. 1 November 2007.

TM 1-1520-240-BD. *Aviation Unit and Intermediate Maintenance Battlefield Damage Assessment and Repair for Army CH-47D Helicopter (NSN 1520-01-088-3669) (EIC:RCD)*. 15 April 1997.

TM 1-1520-251-BD. *Battlefield Damage Assessment and Repair for Helicopter, Attack, AH-64A Apache (NSN 1520-01106-9519) (EIC:RHA) and AH-64D Longbow Apache (NSN 1520-01-355-8250) (EIC:RHB)*. 7 October 2005.

TM 1-1670-260-12&P. *Operator's and Aviation Unit Maintenance Manual Including Repair Parts and Special Tools List for Unit Maintenance Aerial Recovery Kit (UMARK)*. 20 March 2003.

TM 55-1520-228-BD. *Battlefield Damage Assessment and Repair for Helicopter, Observation OH-58A and OH-58C (NSN 1520-00-169-7137) and (NSN 1520-01-020-4216)*. 4 January 1991.

TM 750-244-1-5. *Procedures for the Destruction of Aircraft and Associated Equipment to Prevent Enemy Use*. 12 November 1971.

DOCUMENTS NEEDED

These documents must be available to the intended users of this publication.

DEPARTMENT OF THE ARMY FORMS

DA forms are available on the APD website (www.apd.army.mil).

DA Form 2028. *Recommended Changes to Publications and Blank Forms*.

READINGS RECOMMENDED

These Sources contain relevant supplemental information.

JOINT PUBLICATIONS

JP 3-0. *Joint Operationn*. 17 September 2006.

JP 4-0. *Doctrine for Logistic Support of Joint Operations*. 6 April 2000.

ARMY PUBLICATIONS

AR 385-10. *The Army Safety Program*. 23 August 2007.

FM 1-100. *Army Aviation Operations*. 21 February 1997.

FM 3-04.111. *Aviation Brigades*. 7 December 2007.

FM 3-04.113. *Utility and Cargo Helicopter Operations*. 7 December 2007.

FM 3-04.300. *Flight Operations Procedures*. 26 April 2004.

FM 4-30.3. *Maintenance Operations and Procedures*. 28 July 2004.

FM 4-30.31. *Recovery and Battle Damage Assessment and Repair*. 19 September 2006.

FM 7-0. *Training the Force*. 22 October 2002.

FM 7-1. *Battle Focused Training*. 15 September 2003.

FM 10-450-4. *Multiservice Helicopter Sling Load: Single-Point Rigging and Procedures*. 30 May 1998.

FM 10-450-5. *Multiservice Helicopter Sling Load: Dual-Point Rigging Procedures*. 30 August 1999.

TM 1-1500-204-23-1. *Aviation Unit Maintenance (AVUM) and Aviation Intermediate Maintenance (AVIM) Manual for General Aircraft Maintenance (General Maintenance and Practices) Volume 1*. 31 July 1992.

TM 1-1500-250-23. *Aviation Unit and Aviation Intermediate Maintenance for General Tie-down and Mooring on all Series Army Models, AH-64, UH-60, CH-47, UH-1, AH-1, OH-58 Helicopters*. 24 August 1990.

TM 1-1520-248-10. *Operator's Manual for Army OH-58D Helicopter*. 2 July 2007.

Index

A

Accident Investigation Board, 1-10

aerial recovery, 1-5, 2-5, 2-10, 3-1, 3-3, 3-4, 3-5, 3-6, A-6, B-4, B-5, B-8

after-action review (AAR), B-9, D-1

air assault task force commander (AATFC), 2-3

air defense and airspace management (ADAM), A-4

air mission brief (AMB), 1-4, B-5

airspace command and control (AC2), 1-3

area of operations (AO), 1-3, A-4, B-1

area of responsibility (AOR), A-1, B-1

Army airborne command and control system (A2C2S), A-4

Army aviation support facility (AASF), 1-11

Army National Guard (ARNG), 1-10, 1-11

assessor, 2-4

Aviation Classification Repair Activity Depot (AVCRAD), 1-10

aviation maintenance company (AMC), vii, 1-1, 1-4, 1-5, 1-6, 1-7, 2-5, 2-6, 2-9, A-4, B-2, B-3, B-11

aviation maintenance officer (AMO), 1-6, 1-8

aviation maintenance troop (AMT), vii, 1-1, 1-4, 1-5, 1-6, 1-7, 2-5, 2-6, 2-9, B-2, B-3

aviation safety officer (ASO), 1-4

aviation support battalion (ASB), 1-4, 1-6, A-4, B-5

aviation support company (ASC), 1-1, 1-5, 1-6, 2-5, 2-9, A-4, A-5, B-2, B-3

aviation support troop, 1-5, 1-6

aviation support troop (AST), vii, 1-4, 1-5, 1-6, 1-7, 2-5, 2-9, A-4, A-5, B-2, B-3

B

basic issue item (BII), B-4

battle damage assessment (BDA), 2-9

battle damage assessment and repair (BDAR), 1-1, 1-2, 1-4, 1-5, 1-6, 1-9, 1-10, 2-2, 2-4, 2-5, 2-6, 2-7, 2-8, 2-9, 2-10, 3-1, B-1, B-4, B-6, B-8, B-10, C-1

brigade aviation maintenance officer (BAMO), 1-8

C

cannibalization, vii, 1-4, 1-5, 2-5

chemical, biological, radiological, and nuclear (CBRN), 2-8

close air support (CAS), A-2
G-CAS, A-4
X-CAS, A-4

combat aviation battalion (CAB), 2-4

combat lifesaver (CLS), B-8

combat repair kit, 2-7

command and control (C2), 1-4, 1-8, 2-3, A-3, A-5, B-10

command post (CP), 1-1, 1-4, 1-7, 1-8, 2-2, 2-4, 2-5, 2-10, A-3, B-2, B-3, B-5, B-8, B-9

commander, vii, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 1-8, 1-10, 2-1, 2-2, 2-3, 2-4, 2-6, 2-8, 2-9, 2-11, 3-1, 3-5, A-2, A-3, A-4, A-5, B-1, B-4, B-6, B-8, B-9

composite risk management (CRM), 1-4, 1-5, 2-8

course of action (COA), 1-3

D

data transfer cartridge (DTC), B-5

dedicated recovery, vii, B-4

delayed recovery, 1-2, 2-3, 2-4

deliberate, 1-2, 2-5, A-1

downed aircraft recovery team (DART), 1-2, 1-4, 1-5, 1-6, 1-7, 1-8, 1-9, 2-1, 2-2, 2-4, 2-5, 2-6, 2-7, 2-9, 2-11, 3-1, A-2, A-3, A-4, A-5, B-1, B-2, B-3, B-4, B-5, B-6, B-8, B-9, B-10, B-11

E

estimated cost of damage (ECOD), 1-10

explosive ordinance disposal (EOD), 2-7, B-8

F

fire support (FS), 1-3

G

general support aviation battalion (GSAB), A-4, A-5

global positioning system (GPS), A-2, B-4, B-7

ground recovery, 1-5, 1-6, 2-5, 3-1, 3-2, 3-3, 3-4, A-5, A-6

H

hasty, 1-2, 2-5

hazardous communication (HAZCOM), 1-5

hazardous materials (HAZMAT), 1-5, 1-6, 1-7, 1-9, 2-11, 3-6, B-15

I

identification, friend or foe (IFF), B-5

immediate recovery, 1-2, 2-3

improvised explosive device (IED), B-10

intelligence staff officer (S-2), 1-8, A-4, B-1, B-2, B-5, B-6, B-10, B-15

isolated personnel report (ISOPREP), B-6, B-10

isolated, missing, detained, or captured (IMDC), 1-2

J

joint force commander (JFC), 1-3

Joint Personnel Recovery Center (JPRC), 1-3, 2-4
joint, interagency, and multinational (JIM), 1-3

L

landing zone (LZ), 2-4, A-5, B-2, B-14
logistics staff officer (S-4), 2-8

M

maintenance collection point (MCP), 3-2
maintenance evacuation, vii, 1-2, 3-5
maintenance officer (MO), B-3
maintenance test pilot (MP), 2-3, 2-4, 2-5, B-2, B-3, B-9
materiel handling equipment (MHE), B-5
medical evacuation (MEDEVAC), A-4
military demountable container (MILVAN), B-5
military occupational specialty (MOS), 1-5, 2-6, 2-7, 2-9, B-3, D-1
mission design series (MDS), 2-5, 2-6, 2-9
mission, enemy, terrain and weather, troops and support, time available, and civil considerations (METT-TC), 1-4, 1-5, 1-7, 2-3, A-2, B-1, B-3
mission, enemy, terrain and weather, troops and support, timeavailable, and civil considerations (METT-TC), 1-4
mission-oriented protective posture (MOPP), 2-9
MOPP-4, 3-6

N

night vision goggles (NVG), B-4, B-6, B-10
noncommissioned officer in charge (NCOIC), 1-6, 1-9, 2-5, 2-11, B-3, B-4, B-10

O

officer in charge (OIC), 1-6, 1-8, 1-9, 2-5, 2-11, B-2, B-3, B-4, B-5, B-6, B-8, B-9, B-10
on-scene commander (OSC), A-2, A-3, A-4, A-5
operations staff officer (S-3), 1-8, A-3, B-2, B-5, B-8, D-1

P

PACE, A-5
personnel recovery (PR), 1-1, 1-2, 1-3, 2-1, 2-4, A-1, A-2, A-3, A-4, A-5, B-1, B-15
personnel recovery coordination cell (PRCC), 1-3
personnel recovery officer (PRO), 1-3
pilot-in-command (PC), 1-7, 2-3, 2-4
precombat check (PCC), 1-9, 2-5, 2-7, B-1, B-3
precombat inspection (PCI), 1-9, 2-5, 2-7, B-1, B-3, B-8
preventive maintenance checks and services (PMCS), 2-9
problem, people, parts, plan, time, tools, and technical assistance (P4T3), A-6
problem, people, parts, plan, time, tools, technical assistance (P4T3), B-11
production control, 1-5, 1-6, 1-9, B-2, B-5, B-9

R

radio telephone operator (RTO), B-2
range of military operations (ROMO), 1-1
ready for issue (RFI), B-1
recovery kits, 2-4
rocket-propelled grenade (RPG), 3-1

S

salvage
mission, B-5
recovery, 2-5, 3-4
secured, A-4, B-2
self recovery, vii, 1-5, 1-7, 2-4, 2-5, 3-1
signal operation instructions (SOI), 2-11
situation report (SITREP), B-1
situational awareness (SA), 1-4
slingload, 3-5, B-15
Standard Army Management Information System (STAMIS), 1-9
Standardization Agreement (STANAG), vii, E-1
standing operating procedure (SOP), 1-3, 1-4, 1-5, 1-6, 1-8, 1-9, 2-5, 2-11, B-1, B-4
surface recovery, vii, 1-1, 1-8, 1-9, 3-2, 3-4

T

tactical operations (TACOPS), A-4
tactical standing operating procedure (TACSOP), 1-6, 1-8, 1-9, 2-11
tactics, techniques, and procedures (TTP), 1-1
technical inspector (TI), 2-4, B-2, B-3, B-9
theater aviation brigade (TAB), A-2
theater aviation sustainment maintenance group (TASMG), 1-10

U

unit maintenance aerial recovery kit (UMARK), 1-5, 2-7, 2-9, 3-1, 3-4, 3-5, 3-6, B-3, B-4, B-9
unit maintenance collection point (UMCP), 1-9
unmanned aircraft (UA), 1-7
unmanned aircraft system (UAS), 1-7, A-4, B-15

Z

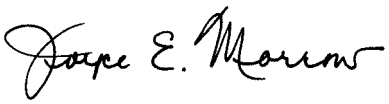
zeroize, 2-11, B-2, B-5

FM 3-04.513
21 July 2008

By order of the Secretary of the Army:

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

Official:



JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0818901

DISTRIBUTION:

Active Army, Army National Guard, and U.S. Army Reserve: To be distributed in accordance with the initial distribution number (IDN) I114384, requirements for FM 3-04.513.