NATO STANDARD

ATP-3.2.49.4.3

DOWNED AIRCRAFT RECOVERY (DAR)

Edition A, Version 1

Final Draft
Date

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED TACTICAL PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

NATO STANDARDIZATION OFFICE (NSO)

NATO LETTER OF PROMULGATION

[Date]

1. The enclosed Allied Tactical Publication ATP-3.2.49.4.3, Edition A, Version 1, DOWNED AIRCRAFT RECOVERY (DAR), which has been approved by the nations in the Military Committee Land Standardization Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2662.

2. ATP-3.2.49.4.3, Edition A, Version 1, is effective upon receipt.

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4. This publication shall be handled in accordance with C-M(2002)60.

Dimitrios SIGOULAKIS
Lieutenant General, GRC (A)
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS

Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
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GENERAL INFORMATION

CONVENTIONS USED

Reservations and Observations

NATO Reservations and Partner/Global Helicopter Inter Service Working Group (HIS WG) Participating Nations' Observations will be delineated by their respective three-letter national country code within the margin. Refer to the Record of Reservations and Observations for details.

Change Symbols

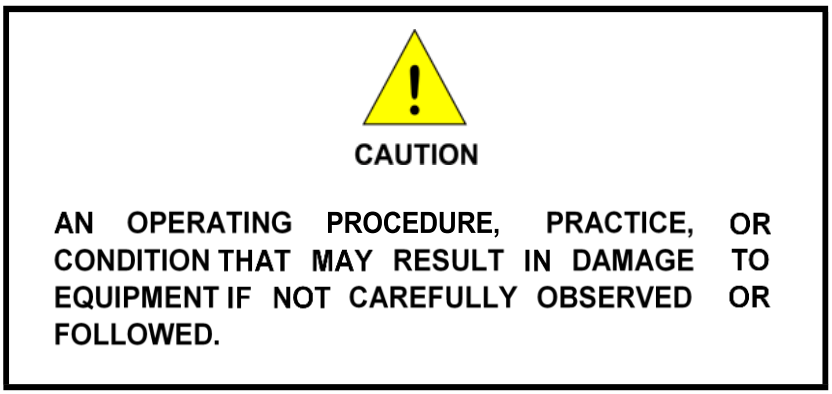
Revised text from new versions are indicated by a black vertical line in the margin of the page, like the one printed next to this paragraph. The change symbol indicates added or restated information. A change symbol in the margin adjacent to an annex number and title indicates a new or completely revised annex.

Warnings, Cautions, and Notes

1. The following symbols and definitions apply to warnings, cautions, and notes used in this publication:

2. **WARNING**

3. **CAUTION**



4. **NOTE**

AN OPERATING PROCEDURE, PRACTICE, OR CONDITION THAT REQUIRE EMPHASIS WORDING

5. Word usage and intended meaning throughout this publication is as follows:

   a. **"Shall"** indicates the application of a procedure is mandatory;

   b. **"Should"** indicates the application of a procedure is recommended;

   c. **"May"** and "need not" indicates the application of a procedure is optional;

   d. **"Will"** indicates future time. It never indicates any degree of requirement for application of a procedure.

Chapter 1 DAR PURPOSE, RESPONSIBILITIES AND ORGANISATION

Recovery operations are usually triggered by an initial notification to the main command post (CP) and, in order of priority, consist of:

1. Personnel Recovery (PR)
2. Downed aircraft site security
3. Downed aircraft recovery.

These operations may be conducted individually or simultaneously.

1.1 Aim.

The aim of this manual is to standardise priorities to be set, and actions to be taken in the process of assessment, repair, and retrieval of an aircraft which was forced down during a mission. This is not limited to combat operations recovery, but also covers recovery for incidents in non-combat situations.
Since AJP3.7 covers the PR event, the focus in this document lies on Downed Aircraft Recovery (DAR). Typical PR considerations are incorporated into this document only when absolutely necessary, or in order to improve the overall readability.

1.2 General.

DAR 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. A DAR mission typically takes place following the PR mission[1], if needed.

The DAR mission is complete upon the return of all personnel and either:

- Return of the aircraft through self-recovery or dedicated recovery utilising aerial or surface recovery methods and techniques;

- Selective cannibalization and destruction or abandonment of the aircraft.

1.3 Downed Aircraft Recovery (DAR).

Aircraft recovery needs to be a pre-planned mission, based on standardised procedures, for all units with assigned or operational control of helicopters. It may require extensive coordination with supporting units. DAR missions are operations that retrieve an immobile, inoperative, or abandoned aircraft from its current position and returns it to a mission-capable status or a maintenance site for repair. These operations typically involve;

[1] NATO PR doctrine is detailed in *STANAG 6511 / AJP-3.7 - Allied Joint Doctrine for Recovery of Personnel in a Hostile Environment*.
Planning considerations and procedures for NATO PR are described *in STANAG 7233 / AJP-3.3.7.7 - Personnel Recovery Tactics, Techniques and Procedures (TTPs)*.

- Expert assessment of the aircraft;

- Performance of standard or battle damage assessment and repair (BDAR) maintenance actions enabling aircraft to self-recover;

- Collection and securing of operational security and intelligence sensitive items;

- Control of CBRN-hazards and unexploded ordnance;

- Course of action recommendations and / or preparation of the aircraft for a dedicated recovery.

In practice, procedures 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 personnel conducting the recovery is normally trained as a team and known as the DART, Downed Aircraft Recovery Team.

1.3.1 Types of DAR.

Procedures used in the recovery of downed aircraft are dependent upon the severity of the damage and upon the **mission, enemy, terrain, troops available, time, and civilian considerations** (METT-TC). DAR operations are time sensitive to the tactical situation and they may vary based on the location of the aircraft, the ability of the adversaries to hinder recovery operations, and the capability of the aerial force to recover a downed aircraft. Aviation units must pre-plan the recovery for each situation and be prepared to execute the plan procedures quickly. It should also be clear when or where the unit will execute its own recovery and when dedicated recovery forces will be called upon. The different types of aircraft recovery are as follows.

1 Self-Recovery.

Self-recovery is defined as actions required for an aircraft to fly out under its own power to either re-join 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 completion of standard and / or Battle Damage Assessment and Repair (BDAR[2]) maintenance procedures correcting fault(s) required for the aircraft to safely fly to a secure area or re-join the air mission. This is typically performed by the organic unit or aviation maintenance support element.

2 Immediate Recovery.

Immediate recovery is performed without detailed planning and coordination by assets within a flight mission; but only if the tactical situation permits the recovery. The used assets may include the crew of the aircraft

[2] Not defined in NATOTerm

requiring recovery, other aircrews participating in the mission, or Downed Aircraft Recovery Team (DART) personnel accompanying and supporting the flight.

3 Deliberate Recovery.

Deliberate recovery is performed with detailed planning and coordination by a DART with the intent to repair / replace damaged components on the spot, in order to return the aircraft to an operational flying status.

4 Dedicated Recovery.

Dedicated recovery is defined as actions required to extract an aircraft by means of aerial- or surface recovery assets to a maintenance area for repairs and / or inspections. Dedicated recovery begins with the determination that the aircraft is unable to self-recover. It ends with the movement of the aircraft by either aerial or ground assets to a maintenance area equipped to conduct required inspections and / or subsequent repairs. This is typically at an aviation maintenance support facility.

4a Aerial Dedicated Recovery.

Aerial recovery involves rigging the downed aircraft with appropriate airlift recovery equipment, connecting it to a lifting helicopter and flying it to the maintenance collection point or maintenance facility. Usually this also includes ground assets for preparation of the aircraft (i.e. defueling) and the transport of parts that are needed to be removed from the aircraft (i.e. main rotor blades). Additional personnel may include a security team and engineers. The aircraft must be prepared and rigged in accordance with the applicable technical manual. Planning for this type of recovery entails a thorough analysis of the recovery site and the aircraft configuration (load, weapons, POBs) and the associated threat due to the relatively slow air movement over a battlefield.

4b Ground Dedicated Recovery.

Ground recovery involves rigging the aircraft with suitable equipment onto a transport vehicle to recover it by ground transport and driving it to the maintenance collection point or maintenance facility. Any disassembly of the aircraft required due to road obstacles, or the size of the transport vehicle is performed using procedures outlined in the appropriate aircraft technical manuals. Procedures outlined in the appropriate aircraft shipping manual are used to prepare any devices (cradles, shipping skids, etc.) required for loading the aircraft onto the transport vehicle. Personnel observe the same basic preparation and safety procedures (disarming, disconnecting batteries) as during aerial recovery. Recovery teams should perform a thorough reconnaissance and evaluation of available ground routes to and from the recovery site to determine the suitability of the route and the clearances required to transport the aircraft.

1.3.2. DAR Responsibilities.

1. **Aviation Unit Commander.** The first line of responsibility for a recovery operation is the aviation unit commander. DAR operations are planned within the context and urgency of the mission, force size, and availability/density of recovery assets at the disposal of the commander. DAR procedures are to be included in unit Standard Operating Procedures (SOPs), contingency plans, operation orders as well as the air mission briefs. The commander may have organic RW assets at his disposal, an on-call DART element and the lift assets necessary to recover a disabled aircraft. In such cases, the commander employs these assets to assess and conduct recovery operations within time constraints and as the tactical situation permits. When operating without external support, the aviation unit commander is responsible for the entire recovery operation. Additional responsibilities include:

    - Ensuring that the DART is trained, resourced and rehearsed for all environments and mission profiles in which the unit operates;
    - Authorizing deployment of the DART;
    - Ensuring aircraft destruction decisions are made at the appropriate command level as per SOP and guidance;
    - Authorizing use of cannibalization techniques that permit quick and efficient removal of critical components and structures from non-reparable or unrecoverable aircraft;
    - Authorizing use of BDAR procedures to affect temporary repairs to a specific aircraft;
    - Ensuring BDAR repairs are corrected with standardized repairs as soon as practical, based on METT-TC.

2. **Joint Personnel Recovery Center**. The Joint Personnel Recovery Center (JPRC) is responsible for coordinating all Personnel Recovery (PR) related matters for the Joint Forces Commander (JFC), including missions employing joint, interagency and multinational forces and capabilities. JPRC responsibilities include:

    - Recommending PR courses of action to decision makers;

    - Developing PR 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 tasks;

- Coordinating for theater and national intelligence support.

3. **Personnel Recovery Coordination cell**. When beyond the capability of the aviation unit commander, the responsibility to coordinate the DAR operations defaults to the Personnel Recovery Coordination Cell (PRCC). In this case, the PRCC is primarily a communications node for staff elements to receive voice, manual, and automated messages, coordinate resources and to coordinate battlefield functions of manoeuvre, fire support, air defence, intelligence and combat service in support of recovery operations.

   In a civil situation, the Rescue Coordination Centre (RCC) coordinates search operations.[3]

4. **Downed Aircraft Recovery Team** (DART). The DART normally comprises of select personnel who are trained and specially equipped to extract a downed aircraft from a remote location.
   The team is assembled to support immediate, deliberate or dedicated aircraft recovery.
   The DART is formed from aviation unit personnel and consists of maintenance personnel, technical inspectors, a maintenance test pilot, a trained repair, rigging and movement team, a radio operator and necessary protection forces.
   Additional team members can include airframe and component repair personnel based on the aircraft's status and condition.
   Depending upon the situation, the DART should be equipped with rigging and / or lifting devices to extract downed aircraft either by air or using ground transportation.

5. **Assessor/Evaluator.** Although every nation may have its own view on this, in general an assessor is considered to be a technical expert who can evaluate the damage sustained by an aircraft and provide mission commanders with an initial assessment for the aircraft's overall condition.
   An assessor can be one, or a combination, of the following (depending on the respective national requirements):

   - Aircrew of the downed aircraft; initial assessment

   - Aircrew of another aircraft; initial assessment

[3] NATO PR doctrine is detailed in *STANAG 6511 / AJP-3.7 - Allied Joint Doctrine for Recovery of Personnel in a Hostile Environment*.

Planning considerations and procedures for NATO PR are described *in STANAG 7233 / AJP-3.3.7.7 - Personnel Recovery Tactics, Techniques and Procedures (TTPs)*.

- PR aircrew; initial assessment

- DART member; full assessment

To prevent the unnecessary destruction or capture of a downed aircraft, the assessor must try to rapidly determine the feasibility to either repair, evacuate or recover the aircraft using field expedient repairs and techniques.

1.3.3 Battle Damage Assessment and Repair (BDAR).

BDAR is the use of specialized aircraft damage assessment criteria, repair kits, and trained personnel to deviate from normal aircraft maintenance standards. BDAR is used to rapidly return disabled aircraft/equipment to the operational commander by the field-expedient repair of structures and components. It may be 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.

Aircrew, maintenance support teams, maintenance repair teams or trained recovery teams may perform BDAR.

1. Battle-damaged aircraft are inspected, assessed and classified by a qualified assessor using a method similar to the medical “triage” concept (deferral, repairable and non-repairable). The assessment determines if the aircraft

   - can be readily returned to the flight,
   - can self-recover with BDAR maintenance,
   - needs a dedicated recovery by either ground or aerial methods,
   - should be sanitized, cannibalized and/or destroyed.

2. Following assessment, some aircraft are returned to service immediately through deferral. More seriously damaged aircraft are repaired using approved BDAR techniques.

3. The actual composition of BDAR personnel and equipment depends on the type and extent of maintenance work required of the damaged aircraft. BDAR assessment criteria and modified repair procedures are established for each type of aircraft by the aircraft’s owning nation.

The BDAR procedures should provide information such as

- combat damage inspection and assessment techniques,
- combat area maintenance serviceability and deferral criteria,
- cannibalisation techniques that permit quick, efficient removal of sensitive or classified components and structures from unrepairable and unrecoverable aircraft.

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Chapter 2 DAR PLANNING, ALERT AND SEARCH

General.

Conducting DAR operations must be considered for both permissive and non-permissive operations. In permissive operations, preserving the crash site for investigation takes priority over aircraft recovery. In non-permissive operations, DAR is a mission resulting from one or more aircraft experiencing combat, unanticipated / accidental component damage or failure, resulting in a forced landing in the Area of Operations (AOO). In combat, aircraft may sustain varying degrees of damage which will require rapid assessment and repair to ensure the maximum availability of assets for future missions. Based upon the assessment, the aircraft is either repaired or flown out, recovered to a maintenance site by either aerial or ground means or destroyed or abandoned.

2.1 Contingency Planning.

Regardless of the operational situation, a contingency plan is necessary in the event of a downed aircraft. An aircraft may be downed as a result of enemy action, controlled flight into terrain or mechanical problems. Pre-planning will help to give insight in the possibilities, difficulties and challenges of a DART mission in the AOO.

In combat, downed aircraft recovery is detailed in SOPs, operations orders and standardised agreements.

Generally, the primary concern is to optimise the conditions for recovering of both personnel and aircraft as soon as possible following an aircraft incident.

Downed aircraft recovery plans are conducted on order and utilise the appropriate task organised DART during day, night, hostile and peace operations to repair / recover assets.

Planning considerations and operational procedures for phased downed aircraft recovery operations are outlined in Annex A of this manual.

2.2 DAR Pre-mission Planning.

Within the aviation unit's Area of Operations (AOO), C2 relationships, unit responsibilities and coordination are planned in advance to the maximum extent possible and included in standing operating procedures (SOPs) and operation orders (OPORDs).

Personnel Recovery (PR) assets should be available to ensure that recovery capabilities are fully mission capable when operations begin. PR missions will mostly be executed by dedicated recovery teams under the command of a JPRC or a PRCC. However, if no PR assets are available or if the aviation unit is operating self-reliant, limited PR capabilities and recovery capabilities should be planned for, using the aviation unit's organic assets.

Because of training and equipment limitations, personnel recovery operations at the aviation unit level may be limited to the recovery of its own pilots and personnel within the AOO. Internal recovery is conducted in a permissive environment with the

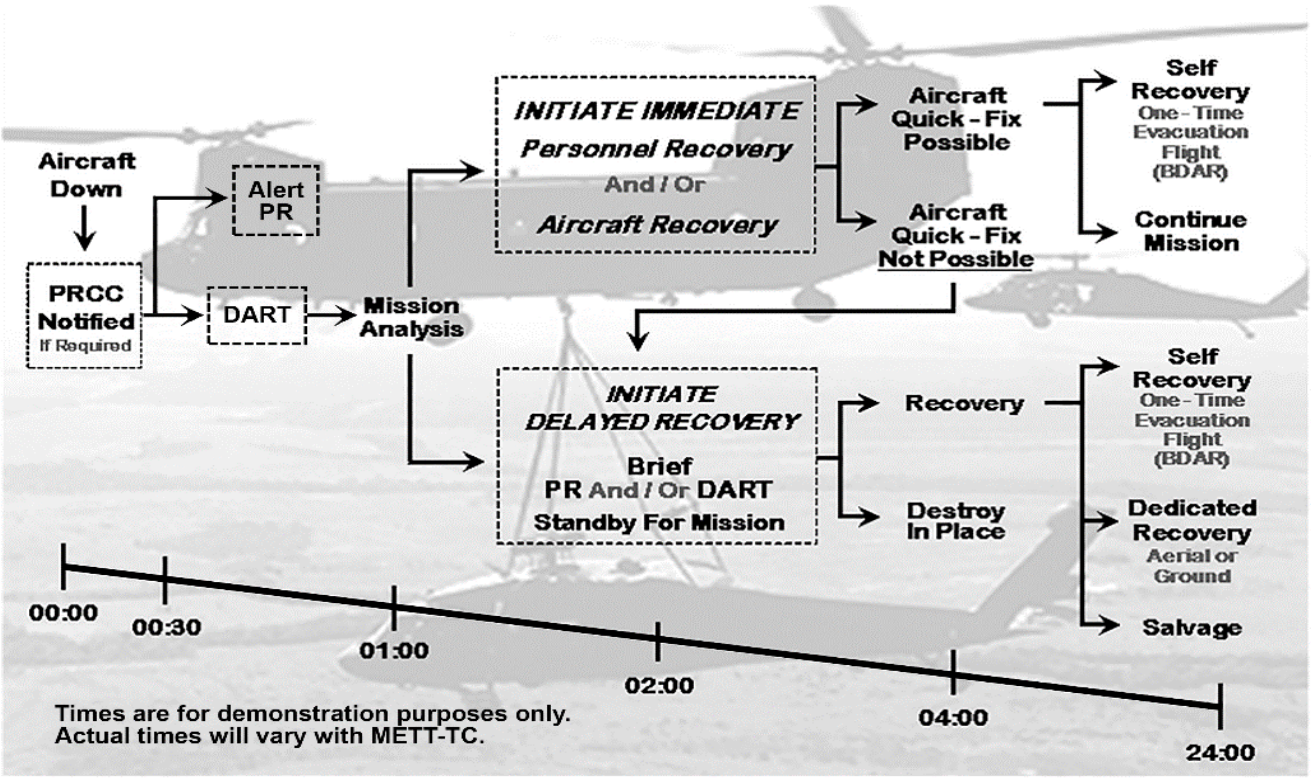
permission of the regional commander. When working in an uncertain environment, procedures will basically be the same, but a thorough METT-TC assessment should be executed prior to executing the mission.

1. Once in the AOO, the aviation unit will establish a POC- list of the following organisations:

    a. Regional JPRC and/or PRCC;
    b. Appropriate civilian SAR Point of Contact / Rescue Co-ordination Centre (RCC) of the region in which the aviation unit is operating;
    c. Associated air traffic control services of that specific RCC.

2.3 Triggering Conditions.

The visual sighting of an aircraft going down or a report/notification of a downed aircraft within the area of coverage is a triggering condition for a recovery operation.
The PR trigger initiates the DART mission process.
Missions normally proceed consecutively as illustrated in Figure 2.3.1.



BDAR - battle damage assessment and repair
DART - downed aircraft recovery team
METT-TC - mission, enemy, terrain and weather, troops and support, time available, and civil considerations
PR - personnel recovery
PRCC - personnel recovery coordination cell

Figure 2.3.1: Execution of DAR Missions

2.4 Initial Notification.

Mission planning begins upon notification of an aircraft taking part in an operation going down or as directed by higher headquarters to recover an aircraft belonging to other units, services, or coalition forces. A decision to conduct either immediate or delayed aircraft recovery operations is dependent upon the information gathered upon initial notification.

2.4.1 Pre mission Information.

This mission-critical information includes:

- aircraft location;
- threat situation ;
- friendly ground unit responsible for site security;
- terrain condition (surface, weather etc.);
- aircraft damage, to the best extent possible (to aid DART personnel in estimating the equipment and parts requirements);
- personnel status (to determine their ability to assist in repairing damage);
- information provided by air traffic controllers.

2.4.2 Minimum Information for In-Flight Emergencies.

Minimum information includes:

- Aircraft identification and type
- Nature of emergency
- Pilot's requests/intentions
- Aircraft position (grid or latitude and longitude coordinates).
- Persons on Board (POB)

2.4.3 Other Information.

Depending on the aircraft's communication status and urgency of the emergency, the following information should be obtained:

- Aircraft altitude, airspeed, and last known heading
- Amount of fuel remaining, expressed 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 receive
- Visible landmarks
- Aircraft color
- Point of departure and destination
- Emergency equipment on hand, and weapons and ammunitions available.

2.5 Flight following.

Air Operation Centres (AOCs) are responsible for maintaining flight following with aircraft in their Area of Responsibility (AOR). To ensure the timely reaction to possible incidents, AOC's will precisely monitor the Actual Time of Departure (ATD) and Estimated Time of Arrival (ETA).

Emergency signals or information that recovery is required may come from a variety of sources such as the aircrew themselves, via the radio or a satellite telephone, ATC, ground manoeuvre forces, COSPAS/SARSAT or other aircraft. AOC's will take appropriate immediate actions upon receipt of this information rather than waiting for confirmation.

2.6 Alerting Procedures.

Although the following alert procedures are based upon ICAO standards and as such, civil sector oriented, aviation units can utilize a similar process. Mentioned times and considerations may differ from civil standards due to SOP, operational necessity and agreements for any specific operation. There are three internationally recognized phases of an emergency: the uncertainty-, alert- and distress phase.

1. **Uncertainty Phase (INCERFA).**
   During this phase of an alert, doubt exists as to the safety of the helicopter or the persons on board. The uncertainty is based upon the knowledge of possible difficulties, the lack of information regarding an aircraft's progress or position, or when information suggests that a helicopter is operating in unusual or unexplained manner.

   a. The uncertainty phase is declared under the following conditions.

      (1) No communications received within 30 minutes following the time at which a scheduled report or communications should have been received or from the time at which an unsuccessful attempt to establish communications with the helicopter was first made, whichever is the earlier;

      (2) A helicopter fails to arrive within 30 minutes of its last known ETA or the arrival time estimated by air traffic services, whichever is the later;

      (3) The evaluation of other circumstances (e.g. knowledge that the helicopter is experiencing difficulties) renders it advisable to declare the uncertainty phase;

      (4) An ELT/EPIRB transmission has been reported but there is no reason to suspect that an actual distress situation exists.

b. Actions to be undertaken**:**

(1) Verify the information received if considered necessary;

(2) Maintain close liaison with the air traffic services to update information obtained through communications search, verification of flight path details, weather reports, etc.;

(3) As SAR action becomes more likely, the aviation unit staff may decide to inform the appropriate SAR facilities when they exist or establish / alert his own SAR/recovery party.

2. Alert Phase (ALERFA).

Apprehension exists for the safety of the helicopter or the persons on board because of definite information that serious difficulties exist that do not amount to a distress or because of a continued lack of information concerning the progress or position of the helicopter.

a. The alert phase occurs under the following conditions.

(1) The attempts made during the uncertainty phase to establish contact with the helicopter or to obtain reports regarding the aircraft from other sources have failed and the aircraft is clearly overdue;

(2) A helicopter which has been cleared to land has failed to land within five minutes of the estimated landing time and communications with the aircraft has not been re-established;

(3) Information has been received that confirms that the operating efficiency of the helicopter for which the uncertainty phase was declared is impaired, but not to the extent that a forced landing is likely.

b. Action to be undertaken:

(1) Continue communications search with other helicopters in the area and ensure that other stations monitor the frequency of the last transmission of the helicopter in distress.

(2) Obtain all relevant information concerning the helicopter in distress.

(3) Estimate and plot the most probable position, pre-plan search areas, obtain weather forecasts covering the search areas, select suitable search patterns.

(4) If under your control, brief the SAR / recovery units, place them on alert and, if necessary, designate an on scene commander.

(5) Notify the RCC which may be of assistance or is likely to be involved.

3. **Distress Phase** (DETRESFA). Immediate assistance is required for helicopter or persons on board because of grave or imminent danger or due to the continued lack of information regarding the progress or position of the aircraft after executing the alert phase procedures.

a. The distress phase exists when:

(1) Attempts made during the alert phase to establish contact with the helicopter and to obtain information through more widespread inquiries have failed and the helicopter is clearly missing and probably in distress;

(2) The fuel on board is considered to be exhausted or insufficient for the helicopter to reach safety;

(3) Information is received which indicates that the operating efficiency of the helicopter has become impaired to the extent that the lives of those aboard are likely endangered;

(4) Information is received, or it is reasonably certain, that the helicopter is about to make or has made a forced landing or has crashed;

(5) Confirmation of a reported ELT signal and the source has not been located or otherwise accounted for.

b. Actions to be taken. Immediately alert SAR / Crash, Fire and Rescue (CFR) / Personnel Recovery (PR) and the Downed Aircraft Recovery Team (DART) and, as soon as possible, activate the crash rescue plan to coordinate efforts to locate and rescue survivors. In addition to previous:

(1) Brief a detailed search plan;

(2) If possible, request additional SAR capabilities;

(3) Send a notification of action taken to any previously alerted RCCs;

(4) Continually check the conduct of the SAR / recovery operation;

(5) Amend plans in the light of new developments, including changes in weather;

(6) Request viewing and study of playback facilities on radar and communications;

(7) Advise accident investigating authorities;

(8) When assistance is no longer necessary, notify all RCCs, commands and facilities alerted or requested to assist.

2.7 Search Procedures.

When an Aviation unit has an aircraft under DETRESFA conditions and cannot depend on other organizations to assist in a search for the downed aircraft, it will coordinate a search on its own. There will be differences in procedures when working in a permissive versus an uncertain environment.

1. Search party and equipment.

a. An aviation unit will complete a PR Incident Report (PRIR), as is depicted in TAM 40 in Figure 2.7.1, once a SAR / DART mission is activated.

b. The PRIR will initiate the search.

#	ACTION	DATA
1	Reporter ID	*Call sign, name, unit, etc. identification of the person reporting the incident*
2	Cause of incident	*IED, shot down, (mid-air) collision, flame out, etc., otherwise "unknown"*
3	DTG of incident	*If known state it, otherwise add "approximately" or state "unknown"*
4	Location of incident	*Preferably use coordinates, otherwise "in the vicinity of (name of village, etc.)"*
5	ISOP ID / Nationality	*Call sign, name, unit, etc. identification of the ISOP and nationality if known, otherwise "unknown"*
6	# ISOPs total	*Total number of ISOPs if known, otherwise add "approximately" or state "unknown"*
7	# ISOPs injured	*Total number of injured ISOPs if known, other-wise add "approximately" or state "unknown"*
8	Comms with ISOP	*Frequency, telephone number, SAR A, authentication, etc. or state "negative"*

Figure 2.7.1: TAM 40 - Personnel Recovery Incident Report (PRIR)

c. The unit will coordinate an organic search party out of the available resources (exp. RW assets, UAS, etc).

d. The composition of the search party will influence the likelihood of finding the downed aircraft and the number of isolated personnel recovered.

e. The unit can search for the downed aircraft with the stand-by DART, or it can execute the search with the helicopters needed to execute the recovery of all isolated personnel and possibly the downed helicopter. If prioritised as such in the Operational Order (OPORD), the unit will focus its efforts on the SAR operation, prioritising this mission ahead of all others. The following documents and equipment should be available to the search party.

(1) PR Incident Report (PRIR);
(2) Isolated Personnel Report (ISOPREP) for ALL isolated personnel;
(3) Evasion Plan of Action (EPA);
(4) ELT and Quick Draw.

f. Search and Rescue Personnel and Equipment.
Combat Search and Rescue (CSAR) teams normally consists of aircraft with specialized rescue equipment and lifesaving personnel. These mission specific aircraft and teams are equipped with the tools and personnel to extricate, extract and perform medical triage on crewmembers of a downed aircraft.

g. DART Personnel and Equipment. Downed Aircraft Recovery Teams use specially designed combat repair kits to repair aircraft systems. The tools and materials found in these kits permit quick, temporary combat-damage repairs. Kits are man-portable (suitcase-sized) and are supplemented with additional materials and equipment required by the mission and/or environmental conditions. DART personnel and equipment include, but are not limited to, the following.

- Qualified, trained and rehearsed personnel;
- Inventoried and inspected aircraft recovery kits;
- Security teams;
- Weapons and ammunition;
- Explosive ordnance disposal 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;
- Sustainment equipment, supplies and common repair parts;
- Expendable and consumable supplies (fluids, filters, packings, etc);
- Maintenance tools and equipment;
- Engineer and pioneer equipment to clear trees and vegetation from the landing site.

2. Search procedures.

The position where the distress occurred is referred to as the initial position. Since helicopters fly at low levels, drift corrections are normally not taken into consideration. During the search, the search party will try to contact the target on the last known frequencies and on the UHF A and / or B frequencies that were loaded in the survival radio. To aid in the search, search teams will monitor Quick Draw, which can be used to send messages. Based upon this initial position, search parties will use one of the following patterns.

(1) **Last Known Position (LKP) or Sector Search**. This search pattern is used when the incident is witnessed, reported by radar, observed by another aircraft or reported by the distressed aircraft itself. The search pattern is constructed around the LKP. If the target is not located, the area may be expanded.

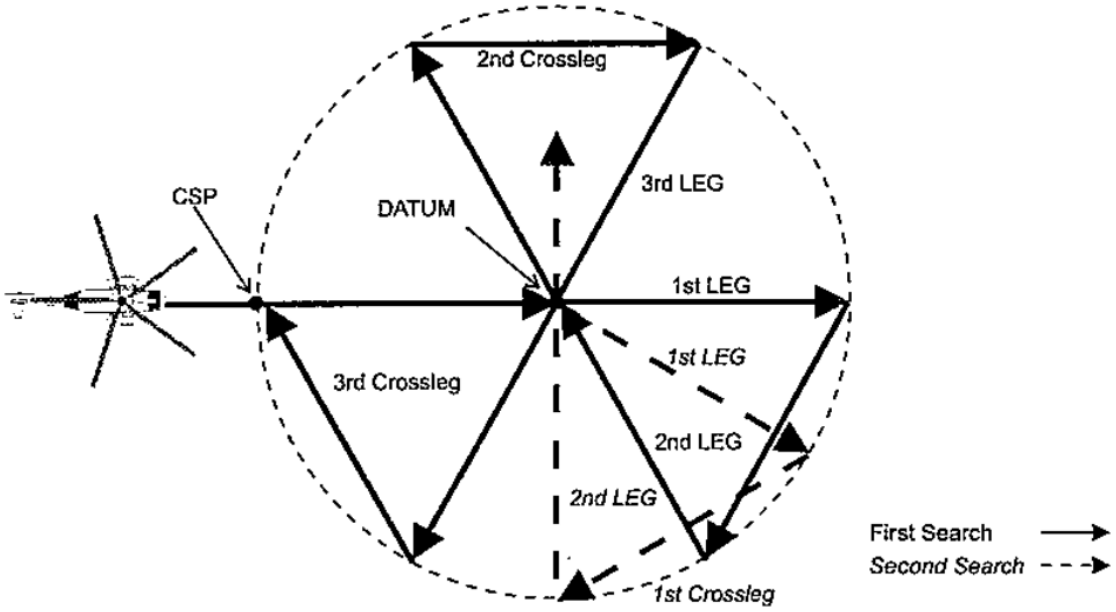


Figure 2.7.2: Last Known Position Search Pattern (Sector Search)

(2) **Expanding Square**. If doubt exists regarding the actual last known position of the distressed aircraft, an expanding square pattern is used. This pattern provides a more uniform coverage than a sector search and may be expanded. The distance S is defined as the track spacing and is the distance between two adjacent search legs and directly influences the ability to detect the target. It also depends on the altitude flown by the search party, weather conditions and other environmental factors.

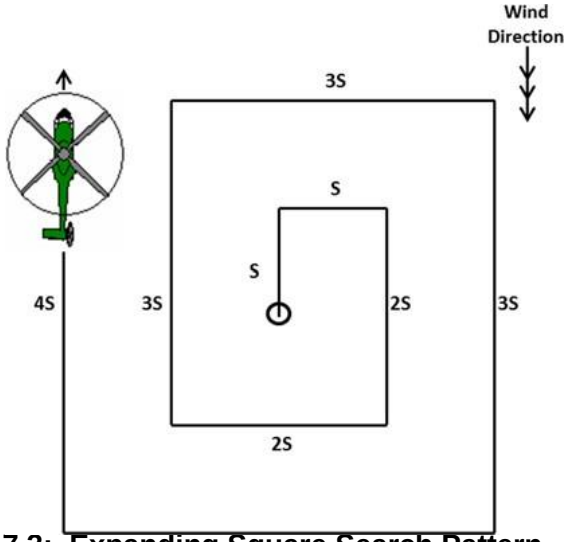


Figure 2.7.3: Expanding Square Search Pattern

(3) **Known Track.** This search pattern is used when the intended track is known but the aircraft's position along the track is unknown. The search will be conducted along the track and can be extended to the left and right of the track as necessary.

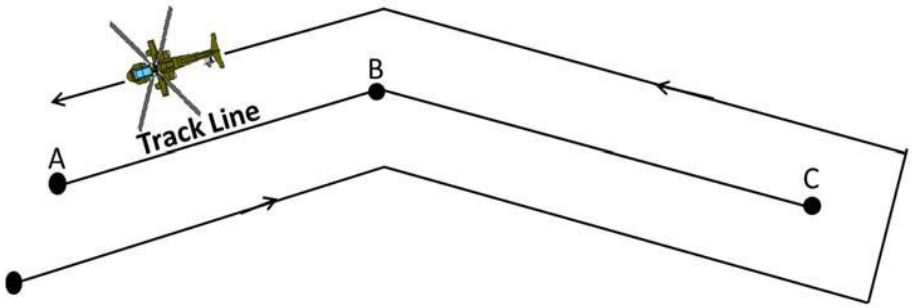


Figure 2.7.4: Known Track Search Pattern

(4) **Contour Search**. This Search method is used in mountain areas.

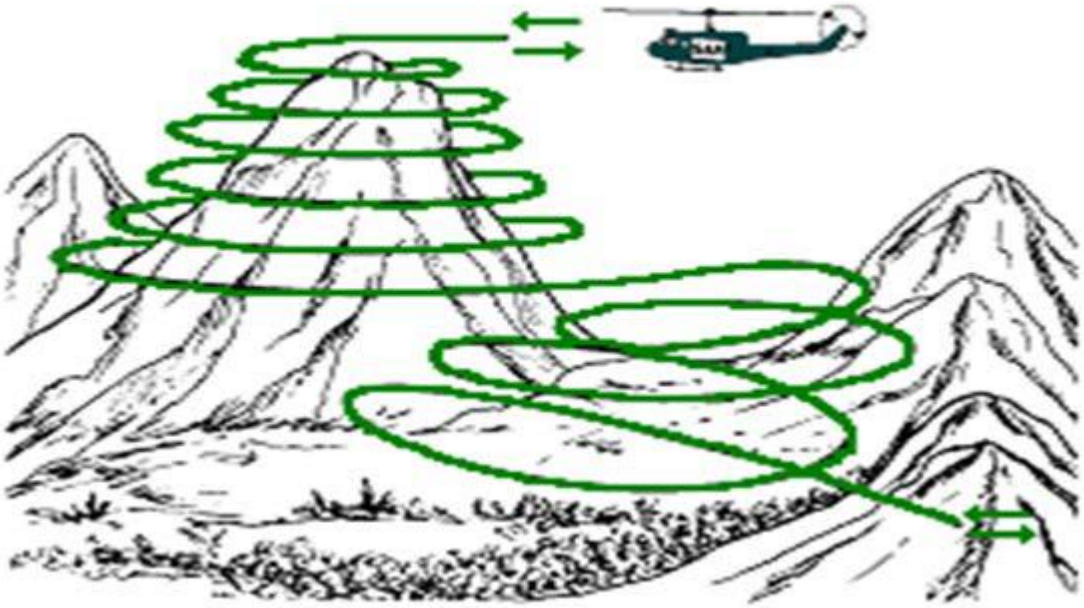


Figure 2.7.5: Contour Search Pattern

(5) **Central Area Known.** In this circumstance, while the general operating area of the aircraft is known, the actual position or the intended track of the aircraft is unknown. Using the aircraft's departure point, a search area is established based upon the aircraft's cruise speed from the time of departure to the end of its fuel endurance.

(6) **Extended Search.** When the target is found, but no isolated personnel are located at the scene of the incident, the Evasion Plan of Action (EPA) will be consulted.

2.8 Located Incident Site.

Once the site of the incident is located, the search aircraft will determine if a suitable extraction site is available based on the tactical situation. If immediate extraction is not possible or the downed aircraft is not reachable, the aviation unit staff will provide immediate aid to the isolated personnel. Ref APR- 3.3.7.7. PR TTPs

2.9 Downed Aircrew Recovery.

Following an emergency landing, the aircrew must immediately determine the security of the area. If the area is secure and the aircraft can be safely recovered, the crew will remain with the aircraft, establish communications using the aircraft radios or survival radios and assist in coordinating aircraft / personnel recovery efforts. If the area is not secure, the aircrew will be prepared to escape and evade the crash site and find a suitable hide location if rescue assets are not immediately available. Based upon the threat in the local area, the following immediate evasive action steps and responsibilities must be executed prior to departing the area in order to execute the briefed escape and evasion plan.

- Pilot / Co-Pilot / Flight Engineer:
  Zeroise Aircraft Survivability Equipment (ASE) / Radios if equipped;
  Secure Sensitive Items (NVGs, Weapons, Survival radios).

- As Briefed:
  Coordinate security and sterilisation of aircraft ASE equipment;
  Utilise survival radios to request immediate extraction.

Chapter 3 DAR OPERATIONS

Aircraft recovery operations include the assessment, repair, and, if possible, the retrieval of aircraft forced down due to component malfunction, an accident or combat-related damage that prevents the continued safe flight or operation of an aircraft.

3.1 Downed Aircraft Recovery.

An aircraft recovery mission extracts an aircraft from a downed location and transports it to a safe area using recovery kits, a trained recovery team, and a recovery aircraft or tactical vehicles. BDAR-trained repair personnel can augment a Downed Aircraft Recovery Team using BDAR procedures to expedite self-recovery and to safely return an aircraft and if needed, personnel. Furthermore, recovery operations prevent enemy retrieval of an aircraft, retaining control for future use and eventual reintegration into the battle. DART should recover the aircraft if the tactical situation allows for the safe extraction of the airframe and if the aircraft is worth recovering.

3.2 Recovery Operations.

There are two categories of aircraft recovery operations: **immediate** or **delayed**. Commanders must be able to recognise and prepare for both types of recoveries. Commanders should use METT-TC to determine whether the recovery is either an immediate or a delayed operation. Once the downed aircraft is located,
also consider to the following factors:

- The actions to be taken by the search party at the scene;
- The location of survivors, i.e. land or water, type of terrain, distance from operating bases;
- The condition of survivors and whether urgent medical attention is required;
- The accountability of all distressed persons;
- Reports provided by the On Scene Commander (OSC);
- Available recovery facilities;
- Weather conditions and the time of day.

3.2.1 Immediate Recovery.

Immediate recovery is any recovery that can be rapidly executed by an aircraft in the flight under the control of the Air Mission Commander (AMC). 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 flight 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.

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:

- Operational mission. Immediate recovery may divert 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.

- Pickup aircraft. A commander may designate specific aircraft, crewed with maintenance personnel, to conduct an 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 an immediate recovery during the planning process. The selected crew must receive specific and detailed instructions for the execution of aircraft recovery operations.

- Recovery aircraft location. The aircraft designated for immediate aircraft recovery should be part of the mission and formation. The recovery aircraft should be positioned where it can provide the best support for the operation.

- Airspace command and control. Separate airspace control measures may be necessary to deconflict aircraft performing immediate recovery operations from the aircraft involved in the ongoing mission.

3.2.2 Delayed Recovery

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 operations are planned as a separate mission and may involve JPRC assets. Delayed recovery is necessary when:

- Utility or cargo aircraft are not available or in the flight;

- Enemy activity in the vicinity of the downed aircraft makes an immediate recovery too risky;

- An immediate recovery cannot be executed without adversely affecting the operational mission;

- Location of the downed aircraft is not precisely known;

- Damage to the aircraft is extensive rendering it non-flyable;

- Location of the aircraft does not facilitate an aerial insertion/recovery.

3.3 Downed Aircraft Recovery Team (DART)

Once the downed aircraft has been located and is considered secured, the (aviation unit) commander will direct the recovery aircraft to execute recovery operations. The aircrew of the downed aircraft will be recovered either before or concurrently with the recovery of the aircraft. Protection Forces will establish security around the downed aircraft. Ideally, the downed aircrew will have completed the following actions.

- Dumped classified data in all avionics and navigational equipment;

- Secured sensitive items such as documents or equipment from the aircraft;

- Prepared the aircraft for destruction if recovery will not be feasible.

3.3.1 DART Composition, Responsibilities and Tasks

A typical DART includes a trained inspector for damage assessment, two or three repairers and a maintenance test pilot. The actual composition of a DART will depend on the type and extent of anticipated maintenance and battle damage repairs. The commander authorises dispatch (normally by air) of a DART to the site with tools, manuals, recovery kit, repair kits, hazardous materials protection kits, materials, and parts based upon mission requirements. The team's initial on-site inspection assesses the condition of the aircraft and the subsequent appropriate course of action and/or disposition of the airframe.

DART missions are either **deliberate** or **hasty**.

a. **Deliberate** DART:

- Personnel and assets remain on standby at a predetermined location prior to the mission and remain ready to launch until the mission is complete;
- Participates in the air mission brief;
- Assembles all organic and attached personnel at the standby location;
- Assembles and preloads all equipment and ground recovery assets;
- Prepositions all aerial recovery assets for rapid loading;
- Conducts rehearsals and ensures pre-combat checks are complete;
- DART OIC/NCOIC positioned at the controlling CP or appropriate supporting CP.

b. **Hasty** DART:

- DART personnel are on-call and readily available while continuing to perform their normal duties pending notification of a DART mission;
- Upon notification, the DART assembles all organic and attached personnel at a designated standby location in accordance with the predetermined recall timeline;
- Once notified, DART personnel will load all air or ground recovery equipment as required. Pre-combat checks and inspections will occur prior to the load out of the equipment;
- DART-commander remains in contact with the controlling CP to ensure a rapid incident response.

1. Once activated and on site, DARTs perform the following functions:

a. Aircraft Assessment and Disposition. The DART will determine the feasibility for on-site repair and if additional maintenance personnel or equipment is required. The disposition of the aircraft is determined by the degree of damage sustained. The assessment determines whether the aircraft is;

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

b. Reparable Aircraft. Depending upon the condition of the aircraft and the required repairs, the DART team will determine which of the following is applicable.

- Repairs can be deferred, and the aircraft is cleared for immediate return to operations;
- Temporary repairs can be applied, and the aircraft may be returned to service to meet immediate operational needs. Permanent repairs to higher standards are deferred to a later time;
- Permanent repairs can be applied in the field and the aircraft may be returned to a fully serviceable mission capable condition;

- The aircraft can be temporarily repaired or cleared for a one-time evacuation flight back to a more secure and better resourced maintenance facility.

c. Recoverable Aircraft. If on-site repairs are not feasible, the DART will recommend either aerial or surface recovery of the aircraft. Depending upon the means of recovery, the DART will rig the aircraft appropriately for recovery and serve as either the ground crew for an aerial extraction or the crew for securing the load on a vehicle.

d. If neither repair nor recovery are viable options, the DART will cannibalize critical components and abandon the airframe (potentially for recovery at later time) or destroy the aircraft. Prior to destroying an unrecoverable aircraft, the DART must obtain approval from the appropriate authority in the chain of command. If necessary, the DART will perform salvage recovery to sterilize the area and remove the aircraft in part or in total for investigation or disposal at another location. The decision whether to abandon or destroy an aircraft is based on the possibility of an abandoned aircraft falling into the control of an adversary.

e. Sanitisation. Sanitisation 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. Sanitisation must be completed prior to abandonment of an airframe. If onsite sanitisation is not possible, destruction of the aircraft by extended-range fire support systems should be considered as part of the abandonment process.

f. The DART - commander should address the following actions.

- Identify and mitigate hazards such as residual armament, squibs, fuel, hazardous materials, electrical and other sources of ignition;

- Safe weapons and external stores;

- Remove or disarm and safe all crew-served and/or gunner weapons;

- Remove or zeroise all aircraft survivability, communications and navigation equipment;

- Remove all maps, kneeboards, strip maps and documentation from the aircraft and surrounding areas.

3.4 Recovery Process.

As specified in the contingency plan, designated members of the DART are responsible for facilitating the following actions.

1. Security Team. Upon arrival at the incident site, the security team will immediately establish a perimeter by positioning themselves at least 50 meters out at the 10, 2, 4, and 8 o'clock positions relative to the nose of the downed aircraft.

2. DART - commander. Ensures all weapon systems on the airframe are placed in a "safe" mode by armament personnel.

3. Medic/Combat Lifesaver. If the aircrew has not been evacuated, the medic / combat lifesaver will check on the condition of the crew, provide medical assistance and assist in the extraction of crewmembers from the wreckage and reports the status to the DART- commander.

4. DART Maintenance Test Pilot (MTP), aircraft Technical Inspector (TI) and airframe specific crew chief will immediately evaluate the condition of the aircraft to determine its airworthiness.

3.5 Recovery Conditions

Given the threat environment, the following are operational planning considerations for conducting recovery operations.

1. Low / No Threat.

- Once it is determined that repairs will take longer than four-hours to return the aircraft to a flyable status, the DART- commander will notify its higher headquarters to coordinate for additional maintenance support.

- Repair of the aircraft for a one-time evacuation flight is acceptable and will only be authorized by the appropriate commander or designated representative.

- Safety shall not be compromised to return an aircraft to service.

2. High Threat.

- The first priority on the objective is to safely evacuate the aircrew, passengers and classified material.

- Ideally repair of the airframe and systems should be accomplished ASAP on station and the decision for any extension is based upon the operational environment.

- Repair of the aircraft for a one-time evacuation flight is acceptable and under HIGH THREAT conditions shall be pre-authorised by the

appropriate commander or the designated representative when the MTP and TI agree the airframe is stable enough for flight.

- Safety shall not be compromised to return the aircraft to service.

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ANNEX A DAR(T) OPERATIONAL PROCEDURES

DOWNED AIRCRAFT PLANNING CONSIDERATIONS AND OPERATIONAL PROCEDURES

The execution of downed aircraft operations requires a detailed, phased and rehearsed contingency plan. The intent of the plan is to facilitate the recovery of an aircraft as soon as possible following an incident. The potential rescue of personnel is covered through the JPRC/PRCC and based on extensively trained and described procedures. Phases of the Downed Aircraft Plan include incident notification, alert / launch, personnel recovery, and downed aircraft recovery.

A. Phase I – Notification.

The notification phase begins with the downed aircraft incident and ends with the notification of the aviation headquarters. Immediate PR by own aircrew and/or other aircraft in the package can occur during this phase. Notification of the incident generally comes from the wingman of the downed aircraft. It can also come from coalition ground forces, host-nation military, or police elements. At this time, the senior person on scene, in the best condition to command and control the situation, becomes the on-scene commander.

Upon notification of a downed aircraft and depending on METT-TC, commanders should dispatch a Quick Reaction Force (QRF) to the location of the incident to secure the area, assist downed aircrew / passengers, provide medical support, and conduct an initial evaluation of the aircraft's condition. The minimum personnel within the QRF should be the ground security element and at least one member of the DART. The intent of the QRF is to ensure protection of the crash / accident site and to determine the required follow-on actions by medical personnel, DART, maintenance, and / or ground forces.

B. Phase II – Alert / Launch.

The alert phase begins when the command post is notified of an incident involving a downed aircraft. It includes actions by the aviation headquarters and ends with the launch of assets to recover the aircraft. During this phase, planning for PR and DART operations may be conducted simultaneously. **The primary effort is PR**, as controlled by the JPRC/PRCC. Planning, launching and executing a DART mission may never interfere with or hamper any JPR mission. Upon notification of an aircraft incident, the staff operations officer assumes initial command and control responsibilities and delegates duties and responsibilities as necessary to the appropriate elements.

Tasks may consist of operations carried over from the notification phase, direct coordination with ground maneuver forces, on-site security team, DART and the personnel recovery team. This phase ends when aircrew recovery elements launch.

1. Aviation DART elements should include, but are not limited to, the following.

- An attack / security element;
- An airborne command and control element;
- An assault element;
- Appropriate medical personnel;
- An air-inserted, DART / assessment element, to conduct an assessment and to determine the condition of the aircraft.

2. Key tasks in this phase are as follows:

- Receive an initial report from the on-scene commander to validate and confirm required information;
- Complete a rapid mission analysis and notify the chain of command and all subordinate units involved in the recovery operation;
- Report the current status of the incident to the next higher headquarters;
- Launch aviation elements in support of recovery efforts.

3. The general sequence of events are as follows:

- The battle captain immediately notifies the maneuver unit owning the operational environment. The battle captain may also divert aviation assets already in the vicinity.
- Tactical operations request airborne close air support and / or close air support on ground alert.
- The battle captain ensures the medical evacuation (MEDEVAC) unit covering the AOO is notified of the incident and is prepared to evacuate casualties as necessary.

4. The battle captain coordinates planning efforts with the next higher HQ.

- The staff intelligence officer assesses the enemy situation in the area to develop the enemies “most likely” and “most dangerous” courses of action.
- Air defense and airspace management immediately requests appropriate airspace control measures to coordinate and de-conflict the airspace surrounding the site of the downed aircraft.

- The fire support cell requests no-fire area to facilitate the recovery.

- The subordinate units possessing the capability to contribute to a recovery effort receive notification, an intelligence assessment, mission, and launch time.

C. Phase III – Personnel Recovery

The personnel recovery phase begins with the launch and ends when the recovery mission is completed or terminated. If the PR operation is a result of a downed aircraft, this phase ends when the scene is secured and turned over to the DART element. NATO PR doctrine is detailed in STANAG 6511 / AJP-3.7 – Allied Joint Doctrine for Recovery of Personnel in a Hostile Environment. See STANAG 7233 / APJP-3.3.7.7 - Personnel Recovery Tactics, Techniques and Procedures (TTPs) for additional planning considerations and procedures.

D. Phase IV – Downed Aircraft Recovery

While preliminary DART activities have been ongoing, in this phase the main effort transitions to DART. At this point in the operation, the aircrew is recovered, and the operational environment is permissive enough to execute aircraft recovery. This phase ends when the downed aircraft is returned to a secure location or destroyed. 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;
- Physical recovery of aircraft.

1. Command and control of the DART is generally delegated by the higher-level aviation command to the controlling aviation task force commander. Assault or general support aviation units provide the transportation for the DART's personnel and equipment.

2. There are three options for aircraft recovery: self-recovery, dedicated recovery-air, and dedicated recovery-ground.

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

4. At a minimum, the DART consists of a security element, a recovery team, a means of transportation (Air or Ground), and a command-and-control element. The exact makeup of the DART effort and the method used to recover the aircraft is based on analysis of the following:

- 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.

5. If an air recovery is to take place, it's important to assure the availability of the needed recovery equipment. 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 ideally comes from the closest unit with the appropriate transportation assets. The special tools and personnel needed come from the aviation unit and generally move via air to the supporting ground transportation unit or aircraft scene as required.

ANNEX B. ABBREVIATIONS and ACRONYMS

AMC	Air Mission Commander
AOC	Air Operation Centre
AOO	Area of Operations
AOR	Area of Responsibility
ASE	Aircraft Survivability Equipment
ATD	Actual Time of Departure
BDAR	Battle Damage Assessment and Repair
DAR	Downed Aircraft Recovery
DART	Downed Aircraft Recovery Team
ELT	Emergency Locator Transmitter
EPA	Evasion Plan of Action
EPIRB	Emergency Position Indicating Radio Beacon
ETA	Estimated Time of Arrival
ISOPREP	Isolated Personnel Report
JFC	Joint Forces Commander
JPRC	Joint Personnel Recovery Centre
METT-TC	Mission, Enemy, Troops, Terrain and weather, Time available and Civilian considerations.
MTP	Maintenance Test Pilot
NVG	Night Vision Goggle
OSC	On Scene Commander
PR	Personnel Recovery
PRCC	Personnel Recovery Coordination Cell
PRIR	PR Incident Report
POB	Persons on Board
P4T3	problem, people, parts, plan, time, tools, technical assistance
QRF	Quick Reaction Force
RCC	Rescue Coordination Centre
RW	Rotary Wing
SAR	Search and Rescue
SOP	Standard Operating Procedures
TI	Technical Inspector
UAS	Unmanned Aircraft System

ATP-3.2.49.4.3(A)(1)