FM 31-24 July 1982 S/S TC 31-24, Sep 1988

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SPECIAL FORCES Air Operations

JULY 1982

HEADQUARTERS, DEPARTMENT OF THE ARMY

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Headquarters,
Department of the Army
Washington, DC 30 September 1986

Immediate Action INTERIM CHANGE

FM 31-24
Interim Change
No. I01
Expires 30 September 1988

Special Forces Air Operations

Justification. This interim change incorporates new US Air Force safety standards and air procedures in support of Special Forces airborne operations. These changes are mandated to ensure the safety of all personnel, equipment, or property and to avoid possible unfavorable litigation against the Army.

Expiration. This interim change expires 2 years from date of publication and will be destroyed at that time unless sooner rescinded or superseded by a permanent change.

1. FM 31-24, dated 6 July 1982, is changed as follows:

Page iv. Add "APPENDIX E. JOINT MISSION BRIEFING FORMAT" and "APPENDIX F. SPECIAL FORCES/SPECIAL MISSION TEAM DROP ZONE SIZE CRITERIA" to Table of Contents.

Page 13. Left column, ***Jump Procedures,*** second paragraph, change second and third sentences to read, "When conditions are considered safe for the drop to take place and the aircraft is over the designated release point (abeam of the base and flank panels), the pilot will turn on the green light to tell the jumpmaster the aircraft is over the release point, on track, and at the proper altitude and that all conditions are safe to jump. The jumpmaster *may* then give the go signal."

Page 13. Right column, ***Safety,*** fifth bullet (Drop Altitude), change "305 meters (1,000 feet)" to "243 meters (800 feet)..."

Pages 13-14. Right column, ***Pilot-Jumpmaster Briefing/Briefback,*** is superseded as follows:

> "***Pilot-Jumpmaster Joint Mission Planning.*** A joint mission briefing will take place prior to the briefback. Aspects to be addressed are found in Appendix E, Joint Mission Briefing Format. Aircrew presence at the briefing is highly desired and should include as a minimum the aircraft commander, senior navigator, and the loadmaster. The pilot/jumpmaster briefing will normally take place at plane side, and any changes or updates can be made at that time."

Page 18. CARGO SLINGS, AIRDROP CONTAINERS, AND PONCHO EXPEDIENT PARACHUTE, right column, ***A-7A Cargo Sling,*** second paragraph, third sentence, change "150 pounds" to "200 pounds."

Page 20. Left column, ***A-21 Cargo Bag,*** second paragraph, third sentence, change "150 pounds" to "200 pounds."

Page 25. Left column, ***Terrain,*** first bullet (Night Operations), first sentence, change "305 meters (1,000 feet)" to "153 meters (500 feet)..." and "4 kilometers (2 nautical miles)" to "6 kilometers (3 nautical miles)..."

Page 30. Left column, ***Forward Throw,*** the first three paragraphs are superseded as follows:

> "Last, the compensation for forward throw must be considered. Forward throw is the distance a jumper travels from the time he exits the aircraft until his parachute deploys."
>
> "Forward throw is compensated for by using a constant of 220 meters (240 yards) for high performance aircraft (C-130, C-141, etc.). Forward throw for STOL/rotary-wing aircraft is determined by multiplying the aircraft speed in knots by 1.6. For example, an aircraft with a forward speed of 90 knots (multiplied by a factor of 1.6) would produce a forward throw of 144 meters."
>
> "DZ markers are positioned 100 meters (328 feet) to the right of this point when facing the direction of aircraft approach."

Page 30. MARKING, left column, third paragraph, change "45.5 meters (50 yards)" to "50 meters (55 yards)." Paragraph 4 is superseded as follows: "The DZ markings will normally form an "L," "T," or "H" (see Figure 6-6)." Paragraph 5, change "50 meters (164 feet)" to "100 meters (328 feet)..." Paragraph 6 is rescinded.

Page 31. Figure 6-6 (Standard four-marker pattern) is superseded as follows:

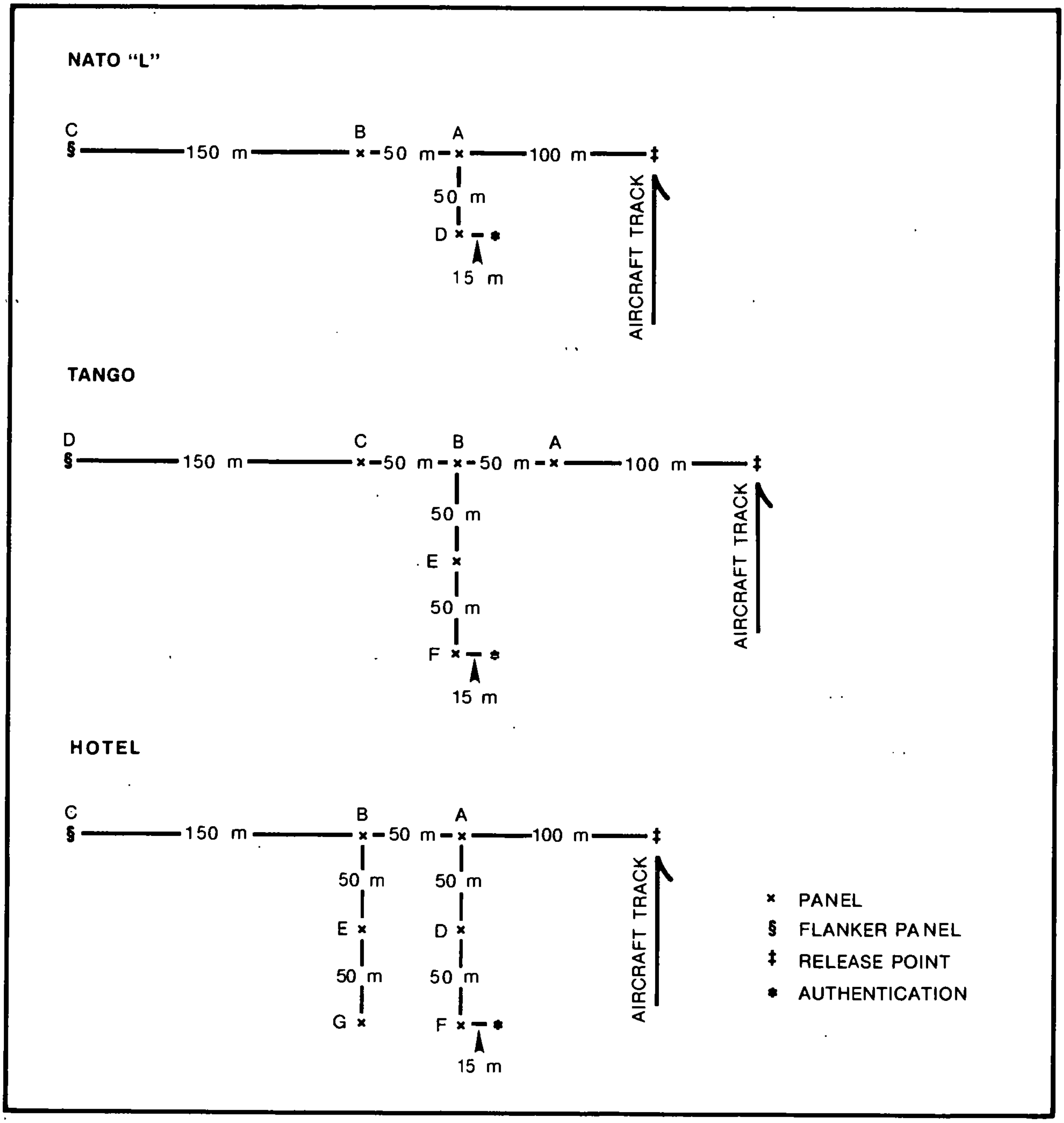

Figure 6-6. Standard marking patterns.

Page 33. Figure 6-8 (Standard inverted "L" marking) is rescinded.

Pages 33-34. STATIC LINE DZ MARKING PATTERNS is superseded as follows:

STATIC LINE DZ MARKING PATTERNS

Primary and alternate marking patterns are used to identify the RP for both day and night drops.

Primary Marking. The NATO "L" that uses:

- Four markers (A, B, C, and D) in the shape of an inverted "L." The distance between markers A and B and A and D is 50 meters. The distance between markers B and C is 150 meters.
- An authentication marker is positioned 15 meters to the right of marker D when viewed from the approaching aircraft. (See Figure 6-6.)

Alternate Marking. A daily pattern specified by the CEOI that uses:

- The required number of markers positioned to form the prescribed pattern. The distance between markers will be 50 meters (164 feet). The flanker panel will always be placed 150 meters to the left of the upper left panel of the pattern. (Note: The flanker panel will be used regardless of drop altitude.)
- An authentication marker is positioned 15 meters to the right of the lower right marker of the pattern (day and night) when viewed from the approaching aircraft.

Display. The static line DZ marking pattern will be displayed for 4 minutes—beginning 2 minutes before until 2 minutes past scheduled drop time or until the first parachute is observed.

Page 34. MILITARY FREE-FALL DZ MARKING PATTERN, third paragraph, the second and third sentences are superseded as follows: "Panels may also be used in a standard arrow configuration. When this pattern is used, the arrow is pointing into the wind. (See Figure 6-9.)"

Page 35. Figure 6-9 (MFF DZ markings) is superseded as follows:

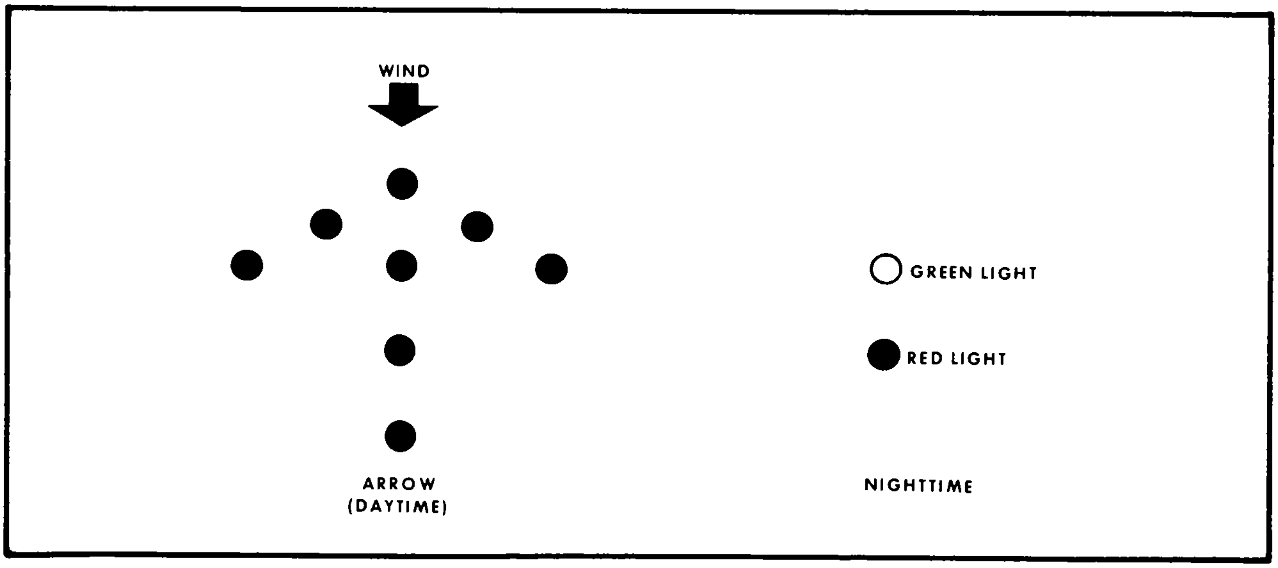

Figure 6-9. MFF DZ markings.

Page 40. Figure 7-2 (Land LZ STOL aircraft) is superseded as follows:

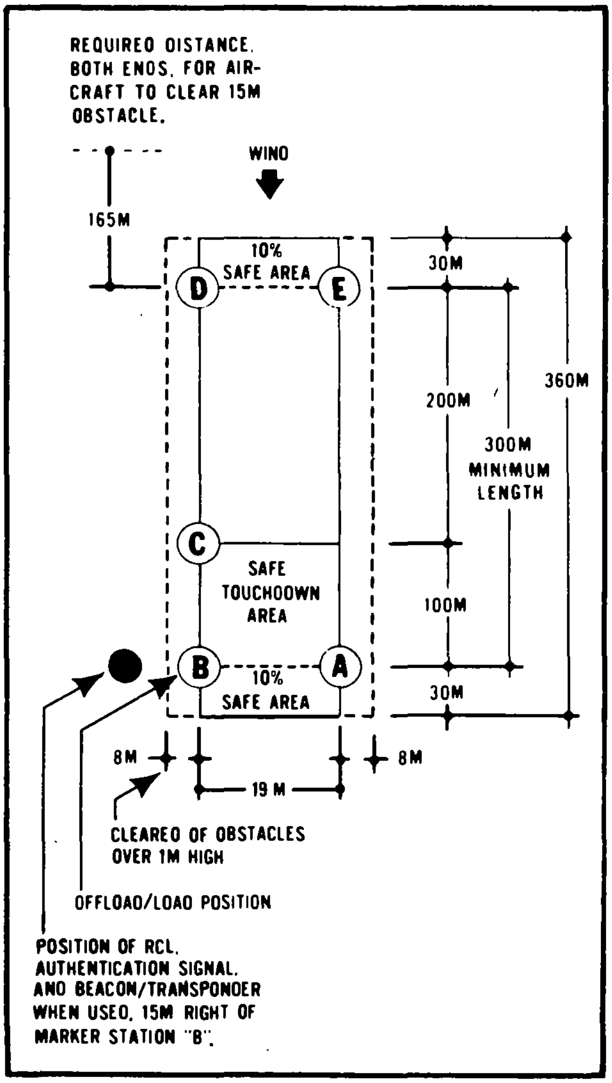

Figure 7-2. Land LZ STOL aircraft.

Page 40. Figure 7-3 (Land LZ medium aircraft) is superseded as follows:

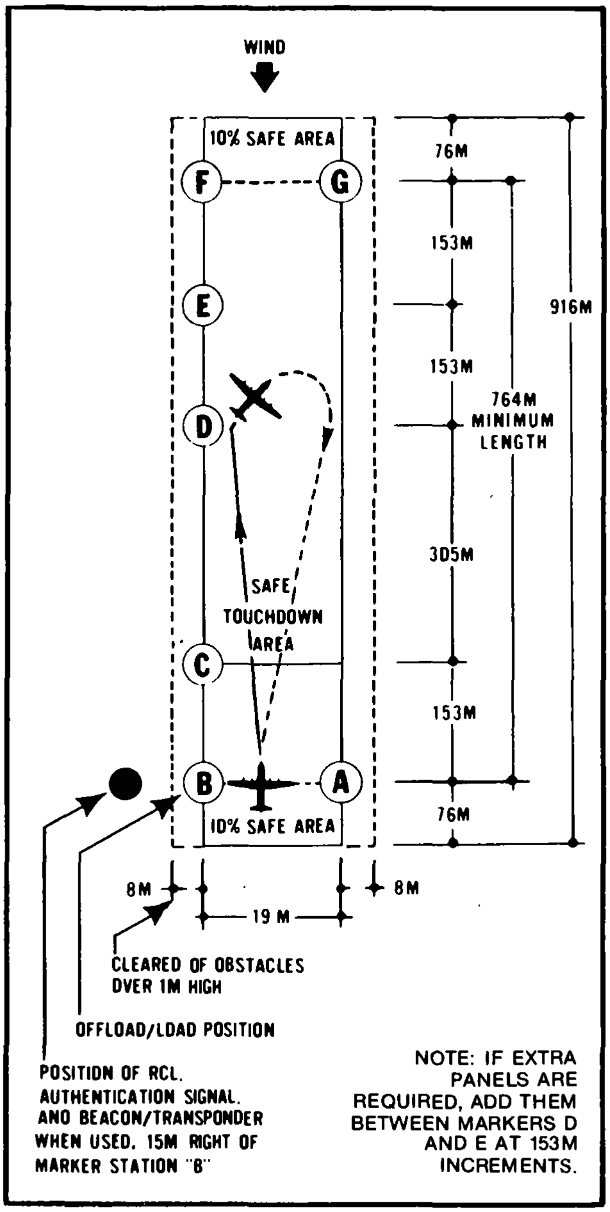

Figure 7-3. Land LZ medium aircraft.

Pages 68-79. Appendix B (Reports and Requests) is superseded as follows:

APPENDIX B

REPORTS AND REQUESTS

VOICE MESSAGE INSTRUCTIONS

MESSAGE NUMBER: D630

TITLE: Airlift Request [AIRLIFTREQ] (GRAZE & JAVIS)

PURPOSE

This message is used to request preplanned or immediate fixed-wing tactical airlift support.

GENERAL INSTRUCTIONS

This message is transmitted by voice when means for record transmission of the information are not available or when a transmission by voice is required to provide a timely dissemination of information. The AIRLIFTREQ voice message template will be used by the originator and addressee(s) to transmit and receive this message in accordance with provisions of JINTACCS TIDP Appendix I, Voice Message Formatting and Transmission Rules.

This voice message template is for use as a back-up means for the record message text format. While this template includes a space for information that one or more Services consider essential for some application, originators of this voice message should complete only those lines required to pass the essential information in each voice message. The second and/or third lines provided for call-up may be omitted whenever the net procedures permit an abbreviated call-up.

SPECIAL INSTRUCTIONS

Special instructions for completing the voice message template are as follows:

The Call. The call may be abbreviated whenever two or more messages are transmitted in sequence or whenever all parties clearly understand the abbreviated call.

Line 1. Enter the request number followed by "preplanned" or "immediate."

Line 2. Enter the priority number or number and alphabetic character.

Line 3. Enter the mission type, e.g., airland, airdrop, air evacuation, flare, special, etc.

Line 4. Enter the aircraft number and type only if specifically required.

Line 5. Enter the delivery method, e.g., airdrop or airland.

Line 6. Enter the on-load location, using either LAT/LONG, UTM Abbreviated 10-Meter, UTM Abbreviated 100-Meter, On-load Point Name, or On-load Base ICAO.

Line 7. Enter the day, hour, minute, and time zone or the relative or non-discrete time that the passengers and/or cargo are to be onloaded.

continued

VOICE MESSAGE INSTRUCTIONS

MESSAGE NUMBER: D630

TITLE: Aircraft Request [AIRLIFTREQ]

SPECIAL INSTRUCTIONS (continued)

Line 8. Enter the number of passengers, vehicles, and cargo items to be onloaded.

Line 9. Enter the load type, i.e., passenger category, vehicle type, cargo type. Palletized or contained cargo should be listed as pallets, boxes, etc., and no./wt. of items refers to these pallets or containers. Contents may be noted here or in line 25, narrative.

Line 10. Enter the off-load location, using either LAT/LONG, UTM Abbreviated 10-Meter, UTM Abbreviated 100-Meter, Off-load Point Name, or Off-load Base ICAO.

Line 11. Enter the day, hour, minute, and time zone or the relative or non-discrete time that the passengers and/or cargo are to be off-loaded.

Line 12. Enter the weight of each cargo item to be airlifted, or total weight if bulk items.

Line 13. Enter the cubic size of each cargo item.

Line 14. Enter the length of each cargo item.

Line 15. Enter the width of each cargo item.

Line 16. Enter the height of each cargo item.

Line 17. If applicable, enter the paragraph number on packaging instructions for hazardous cargo from the joint services document AFR 71-4/TM 38-250/NAVSPPUB 505 (REV)/MCO P4030.190/DLAM 4145.3 that indicates the type of hazard involved and acknowledges that appropriate precautions have been taken.

Line 18. Enter yes or no to indicate if a single dagger requirement is needed.

Line 19. Enter the total net explosive weight of the hazardous cargo.

Line 20. Enter the cargo classification, e.g., Unclassified.

Line 21. Enter the call sign of the landing site contact or the name of the person to be contacted.

Line 22. Enter the primary frequency used to contact the landing site, or the primary frequency designator of the landing site, or the primary phone number of the contact at the landing site.

Line 23. Enter the secondary frequency, the secondary frequency designator, or the secondary phone number of the contact.

Line 24. Enter the data code designating the status of enemy action in the vicinity of the landing site, if applicable.

Line 25. Enter any additional information about the airlift request.

Line 26. Enter the hour, minute, and time zone designation for the message time of origin.

Line 27. Enter the appropriate authentication code(s) for this message if authentication is required. Authentication will be in accordance with joint task force procedures.

VOICE MESSAGE TEMPLATE

MESSAGE NUMBER: D630

TITLE: Airlift Request [AIRLIFTREQ]

______ THIS IS ______ AIRLIFT REQUEST OVER
addressee originator

______ THIS IS ______ SEND AIRLIFT REQUEST OVER
originator addressee

______ THIS IS ______
addressee originator

FLASH IMMEDIATE PRIORITY ROUTINE (Underline and transmit the precedence of this message.)

TOP SECRET SECRET CONFIDENTIAL UNCLASSIFIED (Underline and transmit the security classification of this message.)

AIRLIFT REQUEST

1	REQUEST ______	(Request Number Followed by PREPLANNED or IMMEDIATE)
2	PRIORITY ______	(Priority Number or Number and Alphabetic Character)
3	TYPE ______	(Mission Type: AIRLAND, AIRDROP, AIR EVACUATION, FLARE, SPECIAL, ---)
4	NOTYPE ______	(Number and Type of Aircraft Only if Specifically Required; Explain in Narrative)
5	DELIVERY ______	(Method of Delivery: AIRDROP, AIRLAND, ---)
6	ON-LOAD LOCATION ______	(On-Load Base ICAO Identifier, Name or Location in GEOREF, LAT/LONG or UTM)
7	EARLIEST ON TIME ______	(On-Load Day-Time Zone)
8	QUANTITY ______	(Number of Passengers, Vehicles, and Cargo Items to be On-Loaded)
9	LOAD ______	(Load Type: Passenger Category; Vehicle Type; Cargo Type, e.g., Pallets of Bombs)
10	OFF-LOAD LOCATION ______	(Off-Load Base: ICAO Identifier, Name or Location in GEOREF, LAT/LONG or UTM)

continued

VOICE MESSAGE TEMPLATE

MESSAGE NUMBER: D630

TITLE: Airlift Request [AIRLIFTREQ]

11	LATEST OFF TIME ______	(Off-Load Day-Time Zone)
12	WEIGHT ______	(Cargo Weight)
13	SIZE ______	(Cargo Size)
14	LENGTH ______	(Cargo Length)
15	WIDTH ______	(Cargo Width)
16	HEIGHT ______	(Cargo Height)
17	HAZARD ______	(Hazardous Cargo Designator)
18	DAGGER ______	(Single Dagger Required: YES or NO)
19	NEW ______	(Net Explosive Weight)
20	CLASS ______	(Cargo Classification)
21	CALL SIGN ______	(Call Sign or Name of Contact at On-Load Base)
22	PRIMARY ______	(Primary Frequency, Frequency Designator, or Phone Number of Contact)
23	SECONDARY ______	(Secondary Frequency, Frequency Designator, or Phone Number of Contact)
24	STATUS ______	(On-Load Base Action Status)
25	NARRATIVE ______	
26	TIME ______	(Hour-Minute-Zone) See NOTE.
27	AUTHENTICATION IS ______	(Message Authentication) See NOTE.
	OVER	

NOTE: The message time group is used when required to identify message time of origin. Authentication will be in accordance with joint task force procedures.

EXAMPLE OF COMPLETED VOICE MESSAGE TEMPLATE

Page 1 of 2

MESSAGE NUMBER: D630

TITLE: Airlift Request [AIRLIFTREQ]

HILDA	THIS IS	PANAMA	AIRLIFT REQUEST OVER
addressee		originator	
	THIS IS	HILDA	SEND AIRLIFT REQUEST OVER
originator		addressee	
HILDA	THIS IS	PANAMA	
addressee		originator	

FLASH IMMEDIATE PRIORITY ROUTINE (Underline and transmit the precedence of this message.)

TOP SECRET SECRET CONFIDENTIAL UNCLASSIFIED (Underline and transmit the security classification of this message.)

AIRLIFT REQUEST

1	REQUEST 3AR ∅∅1 PREPLANNED	(Request Number Followed by PREPLANNED or IMMEDIATE)
2	PRIORITY 2	(Priority Number or Number and Alphabetic Character)
3	TYPE AIRLAND	(Mission Type: AIRLAND, AIRDROP, AIR EVACUATION, FLARE, SPECIAL, ---)
4	NOTYPE	(Number and Type of Aircraft Only if Specifically Required; Explain in Narrative)
5	DELIVERY	(Method of Delivery: AIRDROP, AIRLAND, ---)
6	ON-LOAD LOCATION KPAJ	(On-Load Base ICAO Identifier, Name or Location in GEOREF, LAT/LONG or UTM)
7	EARLIEST ON TIME 15∅5∅∅Z	(On-Load Day-Time Zone)
8	QUANTITY 2	(Number of Passengers, Vehicles, and Cargo Items to be On-Loaded)
9	LOAD FUEL BLADDERS	(Load Type: Passenger Category; Vehicle Type; Cargo Type, e.g., Pallets of Bombs)
10	OFF-LOAD LOCATION	(Off-Load Base: ICAO Identifier, Name or Location in GEOREF, LAT/LONG or UTM)

continued

EXAMPLE OF COMPLETED VOICE MESSAGE TEMPLATE

MESSAGE NUMBER: D630

TITLE: Airlift Request [AIRLIFTREQ]

11	LATEST OFF TIME 15 Ø7ØØZ	(Off-Load Day-Time Zone)
12	WEIGHT 1000 POUNDS	(Cargo Weight)
13	SIZE 48 CUBIC FEET	(Cargo Size)
14	LENGTH 6 FEET	(Cargo Length)
15	WIDTH 4 FEET	(Cargo Width)
16	HEIGHT 2 FEET	(Cargo Height)
17	HAZARD	(Hazardous Cargo Designator)
18	DAGGER	(Single Dagger Required: YES or NO)
19	NEW	(Net Explosive Weight)
20	CLASS UNCLASSIFIED	(Cargo Classification)
21	CALL SIGN MAJOR REYNOLDS	(Call Sign or Name of Contact at On-Load Base)
22	PRIMARY	(Primary Frequency, Frequency Designator, or Phone Number of Contact)
23	SECONDARY	(Secondary Frequency, Frequency Designator, or Phone Number of Contact)
24	STATUS	(On-Load Base Action Status)
25	NARRATIVE	
26	TIME	(Hour-Minute-Zone) See NOTE.
27	AUTHENTICATION IS	(Message Authentication) See NOTE.
	OVER	

NOTE: The message time group is used when required to identify message time of origin. Authentication will be in accordance with joint task force procedures.

EXAMPLE OF VOICE MESSAGE TRANSMISSION

MESSAGE NUMBER: D630

TITLE: Airlift Request [AIRLIFTREQ]

HILDA THIS IS PANAMA AIRLIFT REQUEST OVER

THIS IS HILDA SEND AIRLIFT REQUEST OVER

HILDA THIS IS PANAMA

PRIORITY

UNCLASSIFIED

AIRLIFT REQUEST

REQUEST THREE ALFA ROMEO ZERO ZERO ONE PREPLANNED

PRIORITY TWO

TYPE AIRLAND

LINE SIX KILO PAPA ALFA JULIETT

EARLIEST ON TIME ONE FIVE ZERO FIVE ZERO ZERO ZULU

QUANTITY TWO

LOAD FUEL BLADDERS

OFF-LOAD LOCATION KILO JULIETT OSCAR HOTEL

LATEST OFF TIME ONE FIVE ZERO SEVEN ZERO ZERO ZULU

WEIGHT ONE THOUSAND POUNDS

SIZE FOUR EIGHT CUBIC FEET

LENGTH SIX FEET

WIDTH FOUR FEET

HEIGHT TWO FEET

LINE TWO ZERO UNCLASSIFIED

LINE TWO ONE MAJOR REYNOLDS

OVER

VOICE MESSAGE INSTRUCTIONS

MESSAGE NUMBER: F657

TITLE: Request Confirmation [REQCONF] (RINGO)

PURPOSE

This message is used to inform the requesting command, the tasking authority, and the tasked units of the action being taken, and/or to provide additional information about the mission(s). It is used in both the preplanned and immediate air tasking cycles.

GENERAL INSTRUCTIONS

This message is transmitted by voice when means for record transmission of the information are not available or when a transmission by voice is required to provide a timely dissemination of information. The REQCONF voice message template will be used by the originator and addressee(s) to transmit and receive this message in accordance with provisions of JINTACCS TIDP Appendix I, Voice Message Formatting and Transmission Rules.

This voice message template is for use as a back-up means for the record message text format. While this template includes a space for information that one or more Services consider essential for some application, originators of this voice message should complete only those lines required to pass the essential information in each voice message. The second and/or third lines provided for call-up may be omitted whenever the net procedures permit an abbreviated call-up.

SPECIAL INSTRUCTIONS

Special instructions for completing the voice message template are as follows:

The Call. The call may be abbreviated whenever two or more messages are transmitted in sequence or whenever all parties clearly understand the abbreviated call.

Line 1. Enter the request number from the mission support request message.

Line 2. Enter the status of the request number entered in line 1. If request is disapproved, skip to line 13.

Line 3. Enter the mission number for a specific mission.

Line 4. Enter the priority number or number and alphabetic character.

continued

VOICE MESSAGE INSTRUCTIONS

MESSAGE NUMBER: F657

TITLE: Request Confirmation [REQCONF]

SPECIAL INSTRUCTIONS (continued)

Line 5. Enter the unit tasked to provide sorties.

Line 6. Enter the mission type. If the mission is an airborne or ground alert, the beginning of the alert period is entered in line 7 below.

Line 7. Enter the day, hour, minute, and time zone or enter the relative time aircraft are to arrive on mission location or start alert.

Line 8. Enter the day, hour, minute, and time zone or enter the relative time aircraft are to depart from mission location or stop alert.

Line 9. Enter the call sign of the aircraft provided.

Line 10. Enter the number and type of aircraft provided.

Line 11. Enter the type weapons or ordnance to be used.

Line 12. Enter any additional information about the request confirmation.

Line 13. TIME. Enter the hour, minute, and time zone designation for the message time of origin.

Line 14. AUTHENTICATION IS. Enter the appropriate authentication code(s) for this message if authentication is required. Authentication will be in accordance with joint task force procedures.

VOICE MESSAGE TEMPLATE

MESSAGE NUMBER: F657

TITLE: Request Confirmation [REQCONF]

______ THIS IS ______ REQUEST CONFIRMATION OVER
addressee originator

______ THIS IS ______ SEND REQUEST CONFIRMATION OVER
originator addressee

______ THIS IS ______
addressee originator

FLASH IMMEDIATE PRIORITY ROUTINE (Underline and transmit the precedence of this message.)

TOP SECRET SECRET CONFIDENTIAL UNCLASSIFIED (Underline and transmit the security classification of this message.)

REQUEST CONFIRMATION

1	REQUEST ______	(Request Number)
2	STATUS ______ If Disapproved, Skip to Line 13	(Approved or Disapproved)
3	MISSION ______	(Mission Number)
4	PRIORITY ______	(Priority Assigned)
5	TASKED ______	(Unit Providing Sorties)
6	TYPE ______	(Mission Type)
7	START ______	(Day-Time-Zone or Relative Time Aircraft are to Arrive at Mission Location or Start Alert)
8	STOP ______	(Day-Time-Zone or Relative Time Aircraft are to Depart From Mission Location or Stop Alert)
9	CALL SIGN ______	(Call Sign of the Aircraft Provided)
10	NOTYPE ______	(Number and Type Aircraft Provided)
11	WEAPON ______	(Weapon Type)

continued

VOICE MESSAGE TEMPLATE

MESSAGE NUMBER: F657

TITLE: Request Confirmation [REQCONF]

12	NARRATIVE ______	(Provide Amplification as Required to Include All Mission Data Not Conforming to That Requested)
13	TIME ______	(Hour-Minute-Zone) See NOTE.
14	AUTHENTICATION IS ______	(Message Authentication) See NOTE.
	OVER	

NOTE: The message time group is used when required to identify message time of origin. Authentication will be in accordance with joint task force procedures.

EXAMPLE OF COMPLETED VOICE MESSAGE TEMPLATE

MESSAGE NUMBER: F657

TITLE: Request Confirmation [REQCONF]

MOONBEAM THIS IS BLUEJAY REQUEST CONFIRMATION OVER
addressee originator

BLUEJAY THIS IS MOONBEAM SEND REQUEST CONFIRMATION OVER
originator addressee

MOONBEAM THIS IS BLUEJAY
addressee originator

FLASH IMMEDIATE PRIORITY ROUTINE (Underline and transmit the precedence of this message.)

TOP SECRET SECRET CONFIDENTIAL UNCLASSIFIED (Underline and transmit the security classification of this message.)

REQUEST CONFIRMATION

1	REQUEST RAF 345	(Request Number)
2	STATUS APPROVED If Disapproved, Skip to Line 13	(Approved or Disapproved)
3	MISSION WSA 1ØØ	(Mission Number)
4	PRIORITY 2A	(Priority Assigned)
5	TASKED NAVY	(Unit Providing Sorties)
6	TYPE REC	(Mission Type)
7	START 221ØØØZ	(Day-Time-Zone or Relative Time Aircraft are to Arrive at Mission Location or Start Alert)
8	STOP	(Day-Time-Zone or Relative Time Aircraft are to Depart From Mission Location or Stop Alert)
9	CALL SIGN JOKER	(Call Sign of the Aircraft Provided)
10	NOTYPE 1 RF4C	(Number and Type Aircraft Provided)
11	WEAPON	(Weapon Type)

continued

EXAMPLE OF COMPLETED VOICE MESSAGE TEMPLATE

Page 1 of 2

MESSAGE NUMBER: F657

TITLE: Request Confirmation [REQCONF]

12	NARRATIVE	(Provide Amplification as Required to Include All Mission Data Not Conforming tó That Requested)
13	TIME	(Hour-Minute-Zone) See NOTE.
14	AUTHENTICATION IS	(Message Authentication) See NOTE.
	OVER	

NOTE: The message time group is used when required to identify message time of origin. Authentication will be in accordance with joint task force procedures.

EXAMPLE OF VOICE MESSAGE TRANSMISSION

Page 1 of 1

MESSAGE NUMBER: F657

TITLE: Request Confirmation [REQCONF]

MOONBEAM THIS IS BLUE JAY REQUEST CONFIRMATION OVER

BLUE JAY THIS IS MOONBEAM SEND REQUEST CONFIRMATION OVER

MOONBEAM THIS IS BLUE JAY

PRIORITY

UNCLASSIFIED

REQUEST CONFIRMATION

REQUEST ROMEO ALFA FOXTROT THREE FOUR FIVE

STATUS APPROVED

MISSION WHISKEY SIERRA ALFA ONE ZERO ZERO

PRIORITY TWO ALFA

TASKED NAVY

TYPE ROMEO ECHO CHARLIE

START TWO TWO ONE ZERO ZERO ZERO ZULU

CALL SIGN JOKER

NOTYPE ONE ROMEO FOXTROT FOUR CHARLIE

OVER

Appendices E and F. Add Appendix E, Joint Mission Briefing Format and Appendix F, Special Forces/Special Mission Team Drop Zone Size Criteria as follows:

APPENDIX E

JOINT MISSION BRIEFING FORMAT

Conduct this briefing with the user prior to mission execution. This is normally done during the time the crew and team are in isolation.

1. Mission Overview
   a. Team/platoon number
   b. Mission number/aircraft call sign
   c. Mission purpose
   d. Time over target (TOT)
2. On-load Information
   a. Number of troops and type of equipment
   b. Load plan and rigging requirements
   c. Special requirements (e.g., security, etc.)
   d. Aircraft location
   e. Load time
3. En Route
   a. Flight time
   b. Threat assessment
   c. Route of flight, terrain, go/no-go point, copy of the flight route
   d. Weather forecast
4. Objective Area
   a. Primary/alternate DZ/LZ
   b. Hazards/threats
   c. Ground plan (off-load/on-load point, etc.)
5. Escape and Evasion
   a. USAF-selected areas for evasion
   b. Point of no return
   c. Aircrew/Army escape and evasion versus ground mission execution
   d. Destruction of classified material/equipment

APPENDIX F

SPECIAL FORCES/SPECIAL MISSION TEAM DROP ZONE SIZE CRITERIA

MARKED DROP ZONES

TYPE		MC-130	AWADS	C-130	C-141
PERSONNEL	CARP	300 yd x 300 yd (275 m x 275 m)	600 yd x 600 yd (550 m x 550 m)	600 yd x 600 yd (550 m x 550 m)	600 yd x 600 yd (550 m x 550 m)
	GMRS	300 yd x 300 yd (275 m x 275 m)	300 yd x 300 yd (275 m x 275 m)	300 yd x 300 yd (275 m x 275 m)	300 yd x 300 yd (275 m x 275 m)
		FOR EACH ADDITIONAL JUMPER, ADD 75 yd (70 m) TO THE DZ LENGTH (ALL AIRCRAFT)			
CDS/CRS		400 yd x 400 yd (365 m x 365 m)	400 yd x 400 yd (365 m x 365 m)	400 yd x 400 yd (365 m x 365 m)	450 yd x 590 yd (410 m x 540 m)
		FOR MC-130, AWADS, AND C-130, ADD 50 yd (45 m) TO DZ LENGTH FOR EACH ADDITIONAL CONTAINER			
		FOR C-141, INCREASE DZ LENGTH IN ACCORDANCE WITH PARA 18-2c(2) OF 1ST SOCOM REG 350-2			
HSLLADS/HSK		300 yd x 600 yd (275 m x 550 m)	NA	NA	NA
RECOVERY KIT		200 yd x 200 yd (180 m x 180 m)	400 yd x 400 yd (365 m x 365 m)	400 yd x 400 yd (365 m x 365 m)	NA
HEAVY EQUIPMENT		600 yd x 1,000 yd (550 m x 915 m)	600 yd x 1,000 yd (550 m x 915 m)	600 yd x 1,000 yd (550 m x 915 m)	600 yd x 1,000 yd (550 m x 915 m)
		FOR MC-130, AWADS, AND C-130, ADD 400 yd (365 m) TO DZ LENGTH FOR EACH ADDITIONAL PLATFORM			
		FOR C-141, ADD 500 yd (460 m) TO DZ LENGTH FOR EACH ADDITIONAL PLATFORM			

BLIND DROP ZONES*

TYPE	MC-130	AWADS	C-130	C-141
PERSONNEL	600 yd x 600 yd (550 m x 550 m)	600 yd x 600 yd (550 m x 550 m)	NA	NA
	FOR EACH ADDITIONAL JUMPER, ADD 75 yd (70 m) TO THE DZ LENGTH			
CDS/CRS	400 yd x 400 yd (365 m x 365 m)	400 yd x 400 yd (365 m x 365 m)	NA	NA
	FOR EACH ADDITIONAL CONTAINER, ADD 50 yd (45 m) to the DZ LENGTH			
HSLLADS/HSK	400 yd x 600 yd (365 m x 550 m)	NA	NA	NA
RECOVERY KIT	400 yd x 400 yd (365 m x 365 m)	400 yd x 400 yd (365 m x 365 m)	NA	NA
HEAVY EQUIPMENT	600 yd x 1,000 yd (550 m x 915 m)	600 yd x 1,000 yd (550 m x 915 m)	NA	NA
	FOR EACH ADDITIONAL PLATFORM, ADD 400 yd (365 m) TO THE DZ LENGTH			

* NATURAL RADAR TARGETS ONLY. NO RADAR BEACON OR ZONE MARKER ON THE DROP ZONE.

2. Post these changes per DA Pam 310-13.

3. File this interim change in front of the publication.

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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

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DEPARTMENT OF THE ARMY
Washington, DC, 6 July 1982

SPECIAL FORCES AIR OPERATIONS

Users of this publication are encouraged to recommend changes and submit comments for its improvement. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons will be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to:

Commandant
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ATTN: ATSU-TD-TL
Fort Bragg, North Carolina 28307

*This publication supersedes TC 31-20-3, 16 June 1978.

FOREWORD

Joint unconventional warfare (UW) operations, by their very nature, are characterized by hazardous environments and conditions. The ability to conduct successful air entry into an unconventional warfare operational area (UWOA), and subsequently to resupply, conduct recovery operations, and exfiltrate, depends on thorough mission planning, training, rehearsals, timely and accurate intelligence, operational security (OPSEC), coordinated air support, and precise timing and execution.

Commanders and trainers at all echelons should use this manual in conjunction with Army Training and Evaluation Program (ARTEP) 31-101, Airborne Special Forces Group.

SPECIAL FORCES AIR OPERATIONS

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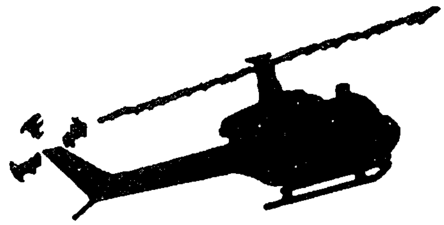


INTRODUCTION

PURPOSE

This manual is a guide for Special Forces (SF) commanders, staffs, and operational detachment personnel in planning and conducting air operations. It provides techniques and procedures for air operations in support of unconventional warfare (UW). These techniques and procedures may also be applied to the other SF missions of special operations (SO) and foreign internal defense (FID). They provide a base from which unit procedures may be developed to cope with a specific mission or area requirement.

Additionally, this document establishes a coordinated and common planning base for units participating in joint operations.

SCOPE

This manual covers planning considerations and operational guidelines for conducting air operations. You will find information on—

Pre-mission preparation, including rehearsals and briefbacks.

Significant actions, considerations, and decisions that can determine the success of a mission.

Use of indigenous assets.

Types of airborne missions to support UW operations, including types of air drops.

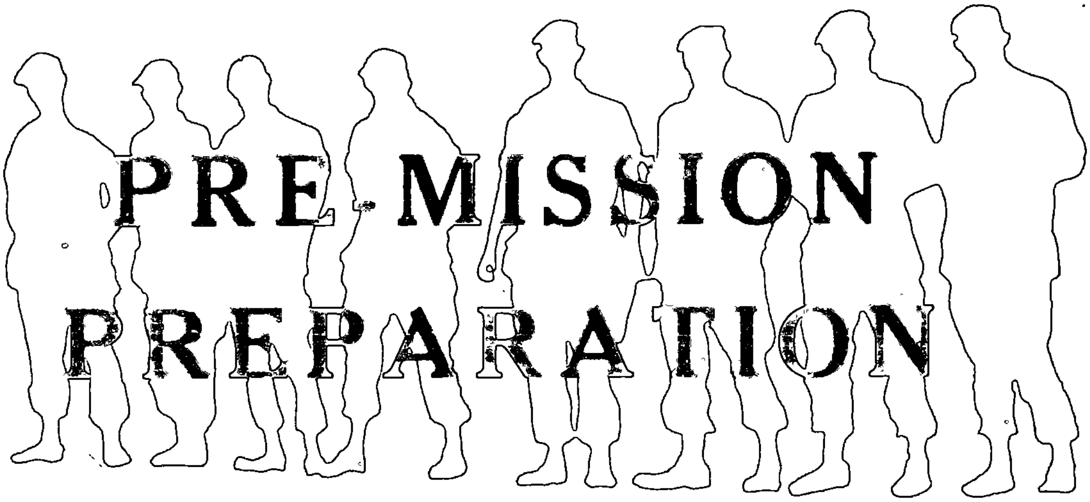
Drop zones and markings.

Landing zones.

Equipment used in the various air operations.

Training requirements.

2



PRE-MISSION PREPARATION

GENERAL

Detailed mission planning is vital to insure the mission is carried out with success. It is also very important to the survival of the operational element. This planning is conducted by the tasked operational element that receives help from an area specialist team (AST). The supporting air/naval commander, navigator, and/or electronic warfare officer may aid the element during the planning phase.

Upon receipt of the mission tasking, the element selected to carry out the mission is moved into isolation at the Special Forces Operational Base (SFOB)/forward operational base (FOB). There the element receives its initial mission briefing. The items covered in this briefing will allow the operational element to complete the detailed planning. It will be presented to the SFOB/FOB commander. Staff specialists, such as intelligence, weather, communications, provide help as required.

PLANNING CONSIDERATIONS

Operations Security. OPSEC is a command responsibility. Commanders must insure OPSEC is considered in all staff efforts, including intelligence, communication-electronics, logistics, administration, and maintenance, in order to provide maximum protection for an operation. OPSEC must be integrated throughout every Special Forces mission—from initial planning through postexecution stages—to keep the enemy from learning:

THE PLAN—how, when, where, and why we will do something.

THE EXECUTION—how, when, where, and why we are doing it.

THE AFTER-ACTION—how, when, where, and why we did it.

OPSEC consists of four main categories of security measures—

Signal security (SIGSEC), which includes communications security (COMSEC) and electronics security (ELSEC).

Physical security.

Information security.

Deception.

All are interrelated and must be considered simultaneously for each operation. See ARs 530-1 through 530-4 for operations security.

Mission. The mission may require rapid deployment into the operational area thereby dictating the most expeditious method for infiltration. In other cases, however, mission success may depend on maintaining secrecy and rapid execution is of secondary importance.

Transportation. The transportation means selected for the delivery/recovery depend on the specific needs of the mission. This selection is also based on the capabilities/limitations and availability of the mission support platform.

Distance. The distance to and from the objective area must be considered. For infiltrations, it is the distance from the departure area to the objective area. For exfiltrations, it is the distance from the objective area to the recovery area.

Intelligence.

- Enemy Situation. The enemy threat—his capabilities, disposition, security measures, and air detection/defense systems—affects the means selected for delivery/recovery.
- Terrain. Land formations must be considered in selecting the method of infiltration/exfiltration. Terrain affects the selection of altitudes, approach and exit routes, landing areas for mission aircraft, drop zones, and beach landing sites. Air infiltration routes that provide terrain masking are desirable in static line parachute operations.
- Weather. Seasonal weather conditions affect infiltrations/exfiltrations. Factors to be considered are temperature, precipitation, visibility, clouds, and wind. If para-SCUBA techniques are used, high surface winds and their effect upon surf conditions or periods of reduced visibility may prohibit the use of parachutes, inflatable boats, or surface/subsurface swimming as entry/recovery techniques. These same conditions generally favor land infiltration/exfiltration. The adverse weather aerial delivery system (AWADS) reduces the impact of weather as a limiting factor for air infiltrations.
- Astronomical Conditions. Periods of sunrise and sunset, moon phase, moonrise and moonset, and periods of twilight must be selected to favor air operations.

BLIND INFILTRATIONS

This technique is used in parachute operations onto unmarked drop zones without assistance from a reception committee. Blind infiltrations are normally limited to and depend on favorable astronomical and weather conditions in the objective area. The navigator of the supporting aircraft will compute the release point (RP) for the drop. This technique would also be employed when:

Special Forces elements are operating in a unilateral role, e.g., operations against selected targets without the support of a resistance force.

The enemy situation prevents normal marking and recognition signals.

A resistance force of sufficient potential requiring support is known to be in the area, but no prior contact has been established.

SELECTION OF EQUIPMENT

The selection of accompanying equipment/supplies to be carried on the initial infiltration should be based on:

The need for security.

The enemy threat.

The size of the resistance force and situation in the UWOA.

The means of transportation selected and method of insertion.

The distance, terrain, and signal propagation conditions.

The weight and bulk of equipment to be carried by the operational element.

Communication equipment compatibility.

Equipment availability.

Potential for external resupply.

PREPARATION OF EQUIPMENT

The reliability of equipment in the field depends primarily upon the care the unit takes in preparing the equipment for transportation and its use.

PACKING AND RIGGING

The nature of aerial delivery requires that equipment be packaged to withstand the landing shock. Equipment and supplies are packed and rigged in appropriate air delivery containers that have a cargo capacity of 500 pounds or less. Four bundles, each weighing up to 600 pounds, can be dropped at speeds up to 250 knots indicated air speed (KIAS) from the Combat Talon aircraft. To allow rapid clearance of the drop zone, the contents of each container are further packaged in man-portable units of approximately 50 pounds each. See TM 57-220 for instructions relative to padding and packaging equipment.

CONTROL PROCEDURES

Recognition signals are formulated for emergency abort, ground assembly, and contact procedures. Rehearsals are conducted to insure a complete understanding of recognition signals and their use. Electronic equipment used in assembly and recognition procedures should be carefully checked before departure to insure proper functioning and adequate power sources.

GROUND ASSEMBLY PROCEDURES

Each member of the operational element is thoroughly briefed on assembly points and on actions each member is to take.

The primary assembly point is referenced to an easily recognized terrain feature located 200 to 300 meters (656 to 894 feet) from the reception site. The primary assembly point must provide enough concealment to allow personnel to remain undetected until such time as they can be recovered.

An alternate assembly point must fill the same criteria as the primary but should be located 5 to 8 kilometers (2.7 to 4.3 nautical miles) from the drop zone (DZ).

MISSION ABORTS

The decision to proceed with or to abort the mission due to the lack or improper display of identification markings/authentication signals is the joint responsibility of commanders concerned and will be stated in the operation order. There are two courses of action available:

Abort the entire mission and return to the SFOB/FOB.

Abort the primary reception site and proceed to a preselected alternate drop zone and conduct a blind infiltration.

EN ROUTE EVASION AND ESCAPE PLAN

A vital part of pre-mission planning is the development of a viable en route evasion and escape (E&E) plan. Such a plan enhances survivability of the aircrew and the Special Forces element in case of emergency evacuation of the plane over or in hostile areas.

The mission commanders concerned are jointly responsible for:

Checking all factors bearing on survivability.

Devising an E&E plan that provides the best chance of survival in view of the hazards involved and the mission objectives.

Thoroughly briefing all mission members prior to departure.

Each mission will present unique, peculiar problems, but the following are basic considerations:

Joint E&E planning should focus on that portion of the mission from the initial penetration of enemy-controlled territory to the objective.

Joint E&E plans should be based on two phases:

Phase one—that portion of flight following entry into the hostile zone where personnel survival is the only consideration. The senior ranking survivor takes charge. He must consider prior E&E planning and any experience or expertise gained from survivor personnel in order to survive, evade, and escape in the hostile environment.

Phase two—that portion of the flight that is close to the objective and will permit the Special Forces element to pursue its mission with a reasonable chance of success. The senior Special Forces survivor will proceed with the assigned mission if enough of his team members have survived and are able. The senior aircrew survivor must then choose a course of action for aircrew survivors that will not interfere with the assigned mission.

The aircraft crash site and the aircraft flight path prior to ground contact must be avoided to preclude discovery by hostile forces responding to the crash or detection reports.

TRAINING

Special Forces training is usually sufficient to conduct any means of infiltration/exfiltration. However, it is not anticipated that all members of a selected operational element will be equally proficient in a given skill or technique at any given time. Should areas be discovered in which weaknesses exist, added emphasis is placed on such areas. A properly balanced training program will produce a proficient team member. Special training programs are required to attain and maintain proficiency for:

Military free-fall (MFF) parachuting. (FM 31-19)

Insertion/extraction techniques.

Survival, evasion, resistance, and escape. (FM 21-76)

REHEARSALS

Rehearsals are the best means for determining flaws in procedures or errors in planning. Thorough coordination of all procedures to be used is essential. The exact type aircraft that will be used for infiltration should be used for training when possible. Rehearsals should be conducted under terrain, astronomical, hydrographical, and meteorological conditions close to those to be met on the operation. The more complex the procedures, the greater the need for rehearsals.

BRIEFBACKS

When mission planning is complete, the operational element gives a briefback of the entire mission to the initial briefing staff. This lets the staff determine if the operational element has considered and has properly used the information given during the initial mission briefing. The briefback fulfills two major goals:

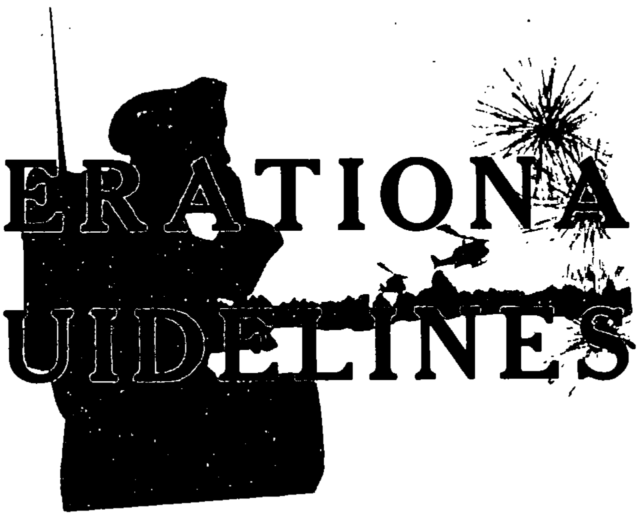
It lets the commander and his staff judge if the operational element is ready for the mission.

It lets the commander and his staff suggest changes in the mission, as required.

(See appendix B, FM 31-22 for briefback format.)

3

OPERATIONAL GUIDELINES



GENERAL

The operational guidelines discussed below are required to insure complete accord and agreement between the SFOB/FOB and operational elements. Although these guidelines are not all encompassing, they do address those actions/decisions that are significant to operations.

INITIAL ENTRY REPORT

Infiltration into the UWOA is not complete until the initial entry report is received at the SFOB/FOB. This report is sent as soon as possible after infiltration, regardless of whether contact has or has not been made with the resistance.

MISSION REQUESTS

Deployed operational elements must understand that the SFOB/FOB requires reaction time to process mission requests. The supporting air unit must acknowledge confirmation/denial through the SFOB/FOB before mission launch can be effected. The SFOB/FOB then sends the mission confirmation message. Therefore, the deployed detachments must submit mission requests as far in advance of the requested mission time as possible.

MISSION CONFIRMATION MESSAGE

As soon as possible after the mission request has been confirmed, the SFOB/FOB will send the mission confirmation message, usually by blind transmission broadcast (BTB), to the deployed operational element. The operational element will acknowledge receipt as soon as practicable. If the operational element does not positively acknowledge receipt, the SFOB/FOB will decide if the mission is to be executed or canceled. If a decision cannot be reached, the matter will be referred to the Commander, Joint Unconventional Warfare Task Force (COMJUWTF), for final resolution.

GROUND DELAYS

Planned mission route will determine the length of delay which can be incurred and still meet the established time-on-target (TOT). In the event departure is delayed and the route can be safely altered to arrive on time, the mission should be executed.

WEATHER DECISION

The commanders of the SFOB/FOB and the supporting air unit will jointly make the final decision on operational delays or weather cancellations based on existing weather minimums.

ABORTS/CANCELLATIONS

When a mission is aborted/canceled while en route, the supporting aircraft will return to the launch base or a designated alternate. The Special Forces commander will attempt immediate contact with the SFOB/FOB for further orders. Following emergency recovery, the commander of the supporting aircraft will be responsible for the safety of all personnel.

EARLY/LATE ARRIVAL AT OBJECTIVE

Missions not accomplished due to early or late arrival at/over the primary objective area will proceed to the alternate site, as specified in the mission confirmation message.

RESCHEDULED AIR MISSIONS

Missions not accomplished for any reason will be rescheduled under the delay provisions. If delay provisions are not prescribed, a new mission request must be submitted.

DEBRIEFING

Debriefing is the means of getting information from team members by interrogation. Teams are debriefed as soon as possible after recovery.

Ideally, debriefing should be conducted by personnel from the headquarters originating the mission.

Team members give specific information obtained as a result of the mission. At the same time, personnel doing the questioning get information on sightings or observations that appear unimportant to team members.

Formal reports are prepared by the interrogators based on the information obtained.

4

RECEPTION COMMITTEES

GENERAL

Once established in the UWOA, Special Forces will organize, train, and supervise indigenous reception committees to conduct future air reception operations. Indigenous assets may also be trained to assist in recovery operations.

FUNCTIONS

The reception committee—

Provides operational security.

Emplaces/operates the marking system.

Maintains surveillance of the reception site before and after each operation.

Recovers incoming personnel/supplies.

Moves supplies to designated distribution points or cache sites.

Sterilizes the reception site to maintain secrecy, to preclude compromise of the mission, and to insure the success of future operations.

ORGANIZATION

The reception committee is normally organized into five parties for air reception operations. Small reception committees may combine the functions of two or more parties; e.g., the command and marking parties may be combined.

Command Party—Includes the reception committee leader (RCL), the Special Forces advisor, radio operators, and messengers.

- Controls and coordinates all committee actions.
- Provides medical support when necessary.

Marking Party—Size is governed by the type marking system to be used.

- Emplaces/operates the marking system.
- Assists in recovering personnel/supplies.
- Assists in sterilizing the site.

Security Party.

- Prevents or delays enemy interference.
- Normally includes an inner and outer security element. The inner element is placed around the perimeter of the reception site to conduct delaying/holding actions. The outer element sets up outposts, roadblocks, and ambush sites along approach routes to stop/delay enemy movement.
- May be increased by members of the auxiliary to provide surveillance and give information on enemy activities/movements and to conduct limited diversionary attacks/ambushes.
- Provides security during transfer of personnel/supplies from the reception sites.

Recovery Party—Size is governed by the scheduled number of incoming personnel and/or supply bundles. As a minimum, two persons should be assigned for each parachutist/bundle.

- Recovers, guides, and delivers incoming personnel/bundles to the collection point.
- Is placed from the desired impact point along the length of the dispersion pattern. Specific members/groups are assigned to track the descent of each parachutist/supply bundle to insure immediate recovery and preclude loss during darkness.
- Positions a separate recovery detail at the exit end of the DZ to track and locate parachutist/supply bundles. This detail also serves to determine the aircraft's exact line of flight and to facilitate a sweep of the DZ should the delivery be disrupted or lost.
- Employs a signal system that precludes undue noise or movement.
- Is responsible for sterilizing the reception site.

Transport Party.

- Includes part of, or all members of, the command, marking, and recovery parties.
- Moves supplies received to designated distribution points or cache sites.

5

AIRBORNE OPERATIONS

GENERAL

UW air operations are characterized by penetration flights into hostile or politically sensitive areas to infiltrate, resupply, and exfiltrate Special Forces operational elements. Missions are normally flown during the hours of darkness during a proper moon phase (see appendix D) or period of limited visibility. Air support may be provided from US or Allied resources, depending on aircraft/aircrew availability and capability.

MISSIONS

Appropriate air missions to support UW operations are:

Infiltration, resupply, and exfiltration.

Recovery and/or search and rescue (SAR).

Message pickup and delivery.

Surveillance and reconnaissance (visual, photographic, and electronic).

Airborne radio retransmission.

Close air support or interdiction within assigned capabilities.

Diversionary tactics.

Psychological operations (PSYOP) loudspeaker/leaflet sorties.

UW aircraft missions are further characterized by:

Unescorted single aircraft missions flying at minimum clearance altitude (MCA) (below 152 meters (500 feet)) and at night, depending on the moon phase. (For the C-130 Combat Talon, moon phase is not a limiting factor.)

Frequent course changes (doglegs) en route to and departing from the drop zone.

Flight on a predetermined track from the initial point (IP) to the drop zone.

Arrival at the drop zone within a designated time limit, track, and drop altitude.

Delivery conducted at drop altitudes between 15 and 380 meters (50 and 1,250 feet), as determined by the capability of the delivery system, technique used, parachute performance characteristics, and terrain limitations. MFF missions will normally range from 762 to 7,620 meters (2,500 feet to 25,000 feet).

Making drops on an RP that has been computed and marked by a reception committee or on an RP that has been determined by the navigator for drops on unmarked DZs. The drop is normally executed during a single pass over the DZ.

Maintaining track, altitude, and air speed (power settings) for a designated distance and time to avoid compromising the DZ after the drop has been made.

Sorties that are planned to overfly both the primary and alternate DZs. When conditions prevent the aircraft from using the primary DZ, it will proceed to the alternate in an attempt to accomplish the infiltration.

Air-landed delivery missions when UWOAs expand and come under some degree of friendly control. Landings are normally made on a straight-in approach to the landing zone (LZ) from the IP.

Fixed-wing gunship close air support or interdiction operations.

The following paragraphs emphasize those aspects of air operations that are unique to the Special Forces mission:

Planning considerations.

Infiltration and resupply.

Types and methods of aerial resupply.

Airdrop containers.

How to select, mark, and operate drop zones, landing zones, message pickup zones (PZ), and recovery zones (RZ).

Fixed-wing gunship operations.

PLANNING CONSIDERATIONS

Successful air operations depend on thorough air mission planning, preparation, and coordination. Pre-mission planning must include joint preparation and briefing between the aircrew and the deploying operational element. Each group must know the sequence of events and what it is to do under both normal and emergency conditions. This will assure efficient and harmonious mission completion and survival. Planning, preparation, and coordination must consider:

Personnel. The number of personnel to be infiltrated, their training, and the amount of equipment to be carried may be limiting factors that impact on how the operational element will infiltrate. A need for special skills may call for use of nonorganic assets whose physical stamina and capabilities may also be limiting factors. Availability of supporting forces and special equipment items must also be considered.

Aircraft. The type aircraft selected for a mission is based on its capabilities/limitations and its availability to fulfill specific mission requirements.

Delivery Systems. The type and method of air-to-ground delivery depend on the specific needs of the mission. Planning and coordination must be thorough and normally require much lead time. Planners should keep the following in mind:

High altitude drops need special equipment and may limit cargo loads.

DZ intelligence must be acquired for the supporting air unit to accurately figure offset aiming points when using AWADS aircraft.

Programing and navigational planning for an instrument meteorological conditions (IMC) mission are more time consuming and demanding than for a visual drop.

Security. Security is of prime importance because of the visibility of reception operations and the vulnerability of Special Forces/indigenous assets engaged in these operations. Observable operational patterns and unclassified activities may give reception site information to the enemy. These actions must be avoided. Also use proper counterintelligence measures. Using area DZs and beacons/transponders will greatly enhance the safety of reception operations.

Enemy Air Defenses. If at all possible, do not choose reception sites where the aircraft will have to fly directly over or near enemy air defense or detection systems. Identification of such systems requires close coordination with intelligence personnel.

Weather and Astronomical Conditions. Seasonal weather conditions in the operational area, such as ground fog, mist, haze, smoke, and low-hanging cloud clutter, may hinder pilot sighting of the visual ground marking pattern and authentication signals. High surface winds cause excessive wind drift of jumpers/cargo containers. Parachute drops may therefore not take place. Weather minimums are set by the COMJUWTF.

Appropriate periods of sunrise and sunset, moon phase, moonrise and moonset, and periods of twilight must be selected that will favor the mission.

Airdrop Containers. Equipment/supplies may be packed and rigged in appropriate airdrop containers to be dropped as door bundles or by other approved types/methods of airdrop. This permits the parachutist to jump unencumbered by excess equipment but may result in the loss of equipment if the containers are not recovered.

Airdrop containers should be used only when an adequate reception committee is assured or in low-level drops (152-213 meters (500-700 feet)) where dispersion is not a problem.

The operational element commander decides whether to use or not to use door bundles for infiltration.

High altitude (up to 7,620 meters (25,000 feet)) resupply methods are now under development and include the A-7A, A-21, A-22, and A-23 systems. These systems are 1 year to 3 years from completion.

Reception Committees. The presence of a reception committee influences the amount of accompanying equipment as well as follow-up automatic, emergency, or on-call resupply. Sterilization of the reception site and disposal of air items are less of a problem than when conducting a blind drop.

Jump Procedures. The supporting mission aircraft commander/navigator will determine and compute the RP for blind infiltrations. The drop will be made on a computed air release point (CARP) or on a visible preselected release point.

When a visual ground release point marking system is used, the pilot will align his aircraft on the proper track in order to pass over the RP. When conditions are considered safe for the drop to take place, the pilot will turn on the green light to tell the jumpmaster that the aircraft is nearing the designated DZ on track and at proper altitude, and that all conditions are safe to jump. The jumpmaster will give the go signal when the aircraft is aligned with the release point marker.

Safety.

- Personnel and Cargo Containers.

Personnel and cargo containers can be dropped on the same pass over the DZ. Exit signals and timing must be rehearsed until all operators are thoroughly cognizant of the dangers involved due to entanglement. On tactical infiltrations, the container load is dropped first, followed immediately by the personnel.

- Electrical High Tension Lines.

Electrical high tension lines will be no closer than 1 kilometer (1/2 nautical mile) on either side of and from the aircraft approach end of the DZ, and 2 kilometers (1 nautical mile) from the aircraft exit end.

High tension lines constitute no major hazard or obstacle if electrical power can be shut off during the drop.

The DZ safety officer or the RCL is responsible for the safety of the drop if power lines other than high tension lines are present.

- Wind Limitations. (See figure 5-1.)
- Over Water Flights.

A flotation device (LPU B7) will be worn by all parachutists as part of their normal jump equipment whenever the aircraft flight path is over water or whenever a body of water is sufficiently close to the drop zone to warrant its use. All personnel should be briefed on ditching procedures and techniques of parachute water landings prior to such flights.

- Drop Altitude.

Static line training jumps should not be executed at altitudes lower than 305 meters (1,000 feet) above ground level (AGL) from aircraft flying at speeds greater than 90 knots indicated air speed (KIAS) and 213 meters (1,250 feet) AGL from aircraft flying less than 90 KIAS. The COMJUWTF may designate that combat static line insertions be made at lower altitudes, usually from 152 to 243 meters (500 to 800 feet) AGL.

Pilot-Jumpmaster Briefing/Briefback. A pilot-jumpmaster briefing should take place prior to the briefback. The briefing

PEACETIME OPERATIONS

PERSONNEL DROPS - LAND	
SURFACE WIND	13 knots (24 km or 15 mph)
DROP ALTITUDE WIND	30 knots (56 km or 35 mph)
PERSONNEL DROPS - WATER	
SURFACE WIND	15 knots (28 km or 17 mph)
DROP ALTITUDE WIND	30 knots (56 km or 35 mph)
SEA STATE	3-foot high chop and 4-foot high swell
CARGO DROPS	
SURFACE WIND	17 knots (32 km or 20 mph)
DROP ALTITUDE WIND	40 knots (74 km or 46 mph)

NOTE: Drop altitude wind restrictions do not apply during MFF, free drop, and recovery kit drop operations.

WARTIME OPERATIONS

LIMITS WILL BE SET BY THE COMMANDER, JOINT UNCONVENTIONAL WARFARE TASK FORCE.

Figure 5-1. Wind limitations during peacetime and wartime operations.

should include all aspects of mutual interest to include the pilot briefing and en route phases of the mission. Aircrew presence at the mission briefback is highly desired and should include, as a minimum, the aircraft commander, the senior navigator, and the loadmaster.

INFILTRATION AND RESUPPLY

Standard and nonstandard static line and MFF parachutes may be used to infiltrate personnel and supplies into an operational area.

Infiltration.

- Static Line. Techniques and procedures for static line parachute operations are prescribed in TM 57-220, Technical Training of Parachutists, with all changes, and TC 57-1, The Jumpmaster.
- Military Free-Fall.

MFF parachute infiltrations may be used when enemy air defense and detection systems prevent a low altitude penetration or when mission needs demand a clandestine insertion. MFF parachute operations are characterized by:

Flights at altitudes above normal sight and sound.

High drop altitudes—above 3,048 meters (10,000 feet).

Low openings—between 547 to 762 meters (1,800 to 2,500 feet).

MFF parachute drops may be made on a visually marked RP, on an unmarked DZ using the high altitude release point (HARP), or on a visible preselected RP to reach the desired ground impact point. The technical and procedural guidance for military free-fall parachute operations are prescribed in FM 31-19, Special Forces Military Free-Fall Parachuting.

- Adverse Weather Aerial Delivery System.

AWADS is a multipurpose, self-contained tactical navigation system that greatly improves mission aircraft capability to infiltrate and resupply personnel and equipment into minimum size DZs in adverse weather or darkness. AWADS operations can be conducted safely and effectively in IMC with a minimum 91-meter (300-foot) ceiling AGL and a minimum visibility of 0.92 kilometer (0.424 nautical mile). The following procedures apply when using AWADS aircraft for infiltration:

Standard DZ RP markings are used if ceiling and visibility permit visual sighting.

The navigator will confirm the aircraft's location with respect to the in-flight CARP when visibility prevents visual sighting.

Jumpers must be briefed on the psychological effect of exiting the aircraft in or just above the clouds because the jumper perceives a false sense of excessive aircraft speed that may cause him to hesitate in the door.

The jumper has limited time for DZ orientation after he breaks out of the clouds. This may cause further problems in ground assembly.

The minimum drop altitude during instrument flight rules (IFR) will be 152.5 meters (500 feet) above the highest obstruction, 5.55 kilometers (3 nautical miles) either side of the DZ centerline from the DZ entry point to the DZ exit point. The DZ entry/exit points are defined as follows:

DZ Entry Point: A geographical point on the DZ run-in course where drop altitude, drop airspeed, and stable flight conditions must be established. This point normally will be at least 11.1 kilometers (6 nautical miles) prior to point of impact.

DZ Exit Point: A geographical point on the DZ departure course (extended DZ centerline) at or prior to which the departure maneuver will be performed. This point normally will be no closer than 3.7 kilometers (2 nautical miles) past the trailing edge of the DZ. Selection of the DZ exit point and departure profile will insure at least a 305-meter (1,000-foot) altitude separation from all obstructions within 9.25 kilometers (5 nautical miles) of the DZ departure flight path.

Minimum ceiling or visibility restrictions do not apply to the Combat Talon aircraft for actual contingency operations. Minimum IMC drop altitude is 76 meters (250 feet) AGL.

Sequence Of Resupply. A typical air resupply mission involves a particular sequence of actions (figure 5-2).

- Operational Element.

Identifies and reports DZ/LZ sites.

Transmits DZ/LZ data and resupply requests to the SFOB.

- SFOB.

Processes DZ/LZ data and resupply requests.

Coordinates mission with the air support unit.

Transmits mission confirmation message to the operational element.

Prepares and delivers supplies/personnel to the departure site. (See page 4.)

- Air Support Unit.

Prepares mission confirmation data for the SFOB.

Receives and loads supplies/personnel.

Executes the air delivery mission.

- Operational Element.

Organizes the reception committee.

Establishes the DZ/LZ.

Receives personnel/supplies.

Removes and distributes incoming supplies.

Types of Resupply. The SFOB or FOB plans and schedules the aerial delivery of automatic, emergency, or on-call resupply

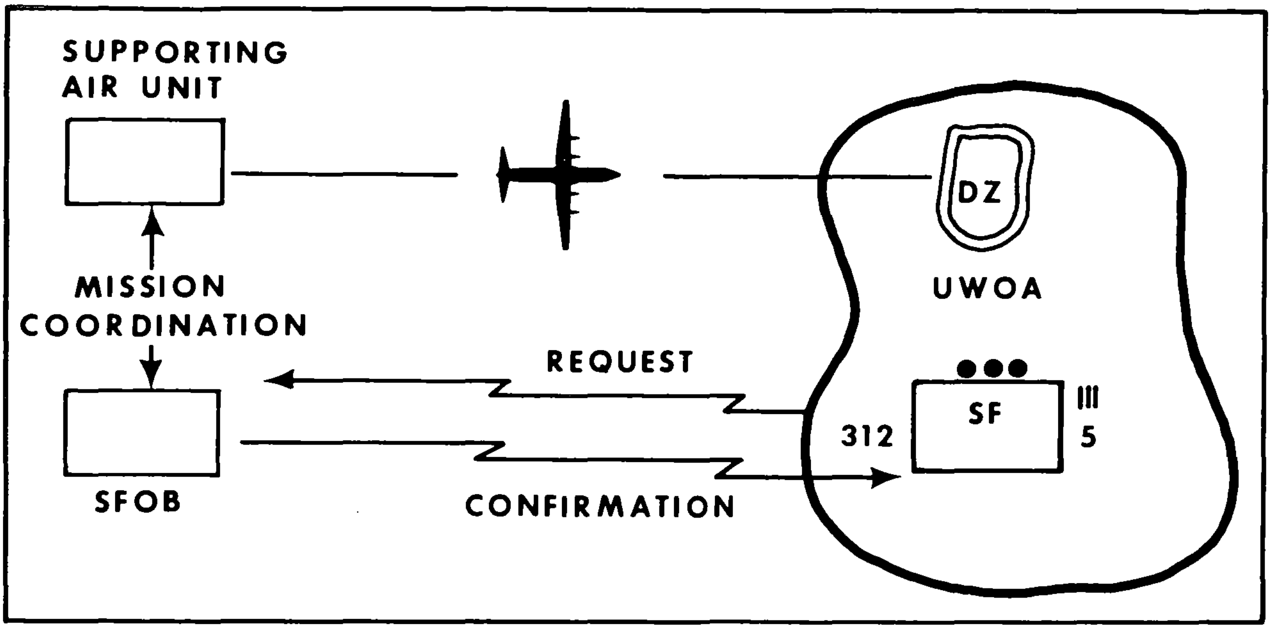


Figure 5-2.Sample UW air resupply mission.

missions to deployed operational elements. Preplanned automatic and emergency resupply provide operational elements with immediate equipment/supplies until routine on-call supply procedures can be established.

- Automatic Resupply.

Planned before infiltration as to delivery time, location, contents, and the DZ marking and authentication to be used.

Delivered automatically after successful infiltration and radio contact is established unless canceled, modified, or rescheduled by the deployed operational element.

Replaces lost or damaged equipment items and augments equipment that could not be carried in on the initial infiltration.

Also serves to reinforce US support of the resistance movement.

- Emergency Resupply.

Planned before infiltration. It includes specified delivery time, provisional location (to be confirmed), contents, and the DZ marking and authentication to be used.

Started when radio contact has not been made between the operational element and the SFOB/FOB within a specified period of time after infiltration.

— OR —

Started on the loss of communications between a deployed Special Forces element and the SFOB/FOB for a certain, consecutive number of scheduled radio contacts. When the Special Forces element is forced into continuous movement, emergency DZs must be selected and reported at the first opportunity. If, during this time, a certain number of radio contacts are missed, the resupply is delivered on the last reported DZ.

Contains mission-essential equipment/supplies to restore the operational capability and survivability of the Special Forces element and indigenous assets. As a minimum, it should contain:

Communications equipment.

Homing beacons/devices.

Survival and medical supplies.

Selected weapons, ammunition, and demolition items.

- On-Call Resupply.

On-call resupply missions are requested based on operational needs when communications have been established between the SFOB/FOB and the Special Forces element.

These supplies consist of major equipment items that are not consumed at a predictable rate. These supplies are held in readiness at theater army area command (TAACOM) depots or at the SFOB/FOB for immediate delivery following specific mission requests.

When determining the quantities to be requested, the following factors must be considered:

The rate of expansion of the resistance force.

Anticipated tempo of operations.

The capability to receive, transport, store, and secure the incoming supplies.

Special Forces use a brevity code system, known as the catalog supply system (CSS), to expedite on-call resupply requests, to insure accurate identification of equipment/supply items, and to minimize radio transmission time. CSS permits maximum user flexibility and identifies single major equipment items or several associated items by code words. It is cataloged by class of supplies and grouped in individually packaged items or several associated unit items packed together. For example, an individual bundle might be made up of one mortar with base plate, mount, and sight; a unit bundle might be made up of a recoilless rifle, complete with sight, spare parts, and eight rounds of HEAT ammunition.

TYPES AND METHODS OF AERIAL RESUPPLY

An airdrop involves all types and methods of air-to-ground delivery of equipment and supplies from an aircraft in flight. The airdrop is thought by many to be one of the best and fastest means of resupply. In some cases it may be the only means of resupply available to the commander. See FM 29-51, Division Supply and Field Service Operations.

Types of Airdrop. The five types of airdrop are:

- Free Drop. A free drop is the delivery of certain nonfragile items of equipment/supply from a slow-flying aircraft at low altitude without the use of parachutes or other retarding devices. Normally, the special packaging required for fragile items greatly limits this technique. Free drops are most effective when the drop can be made into a river, stream, or other body of water, and immediate action is taken to recover the supplies.
- Low-Velocity Drop. A low-velocity drop is the delivery of supplies from an aircraft using cargo parachutes. Such loads are specially prepared for airdrop either by packing the items in air-droppable containers or by lashing them to air-droppable platforms. Cargo parachutes are then attached to the load or the platform to slow the descent of the load and to insure minimum landing shock.
- High-Velocity Drop. A high-velocity drop is the delivery of certain items of supply that are specially packed and rigged in containers having layers of energy-dissipating material attached to the underside and a stabilizing device. The stabilizing device, such as a ring-slot parachute, is designed to minimize oscillation of the load and to create just enough drag to keep the load upright during descent so that it will land on the energy dissipator.
- Low Altitude Parachute Extraction System (LAPES). This system extracts cargo loads up to 36,700 pounds depending on the type aircraft used. While the aircraft is flying at about 1.5 to 3 meters (5 to 10 feet) above the ground delivery point, a drogue parachute extracts the metric platform load from the rear of the aircraft. This parachute provides deceleration which, combined with ground friction, quickly stops the forward momentum of the load. Recovery parachutes are not used with LAPES. Advantages are precise accuracy, no need for DZ marking equipment, and rapid clearance of the DZ.
- High-Speed, Low-Level Aerial Delivery

System (HSLLADS). HSLLADS was developed for airdrop resupply from the Combat Talon flying at 250 KIAS and as low as 76 meters (250 feet) AGL. This system employs a modified container utilizing A-21 covers and a modified 22-foot or 28-foot extraction parachute. This system can deliver up to 4 cargo containers weighing a minimum of 250 pounds each but not exceeding a total of 2,200 pounds at delivery altitudes ranging from 76 to 229 meters (250 to 750 feet) AGL. A "slingshot" ejection system ejects the cargo load over the RP.

Methods Of Airdrop. The five methods of airdrop currently employed are:

- Door Loads. The load is pushed or skidded out of the aircraft door or tail ramp opening. This method is suitable for free, low-velocity, and high-velocity drops. The load is limited in size and weight by the opening in the aircraft and by the personnel capability to eject the load.
- Wing Loads. Loads are rigged in containers attached to shackles on the underside of the aircraft's wings. The size and weight of the load are limited by the load-carrying capacity of the aircraft and by the type container and its asymetric flight characteristics.
- Gravity. Load-restraining ties are released to allow the load to slide out of the cargo compartment of the aircraft flying in drop attitude (with the nose slightly elevated).
- Extraction. A drogue parachute is used to extract platform loads from the aircraft cargo compartment.
- External Transport. Loads are hung from a hook clevis on a helicopter, flown to the delivery site, and dropped using the free, low-velocity, or high-velocity method.

Delayed Opening Airdrop. When the enemy air defense threat stops aerial resupply drops below 3,048 meters (10,000 feet), cargo loads can be equipped with time-delay devices such as power-actuated reefing line cutters, barometric opening devices, or timers. These devices are set to delay the opening of the cargo parachute at lower altitudes permitting a good ground dispersion pattern. The aircrew employs high altitude bombing techniques combined with HARP computations when using this airdrop system.

CARGO SLINGS, AIRDROP CONTAINERS, AND PONCHO EXPEDIENT PARACHUTE

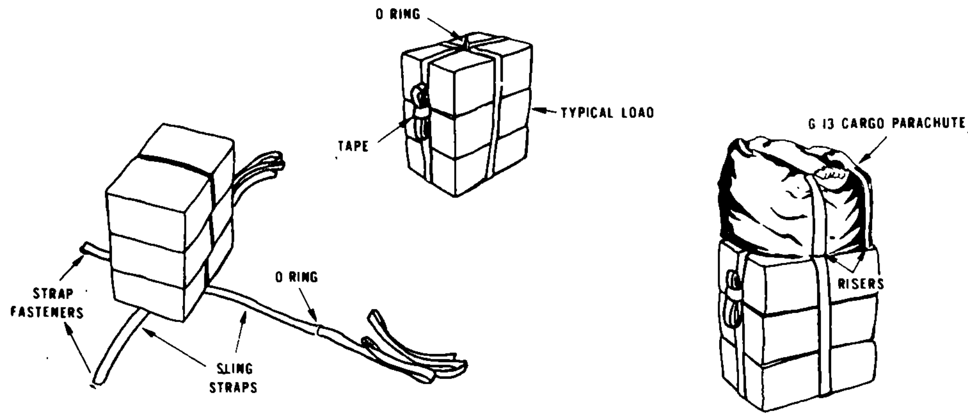
This section contains information on the use of cargo slings (A-7A), airdrop containers (A-21 and A-22 cargo bags; CTU-2/A high-speed aerial delivery container), the poncho expedient parachute, steel strapping, and rigging knots. The containers may be packed with supplies, disassembled equipment, or small items of ready-to-use equipment prepared for airdrop. The container load may require cushioning material such as honeycomb, felt, or cellulose wadding, depending on the load requirements and the method of airdrop. The number and types of parachutes required to stabilize and retard the descent of the load will depend on the type of container used, the weight of the load, and the method of airdrop. (For rigging procedures, use FM 10-501, Airdrop of Supplies and Equipment, Rigging Containers.)

A-7A Cargo Sling. The A-7A cargo sling consists of four identical sling straps, each 188 inches long. Each sling strap is fitted with a stationary parachute quick-fit adapter (commonly called a friction adapter) and a floating D-ring. Each A-7A cargo sling assembly weighs 1-1/2 pounds.

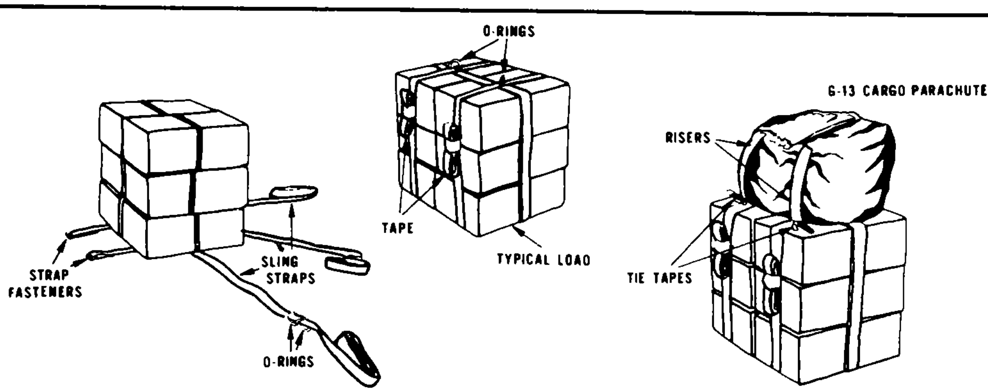
A combination of two, three, or four sling straps may be used for rigging a load depending upon the size, weight, and/or shape of the load. The A-7A cargo sling is used to drop nonfragile supplies. The maximum load capacity is 500 pounds; the minimum is 150 pounds.

Two A-7A sling straps have a maximum weight limit of 300 pounds; three straps, 400 pounds; and four straps, 500 pounds. (See figure 5-3.)

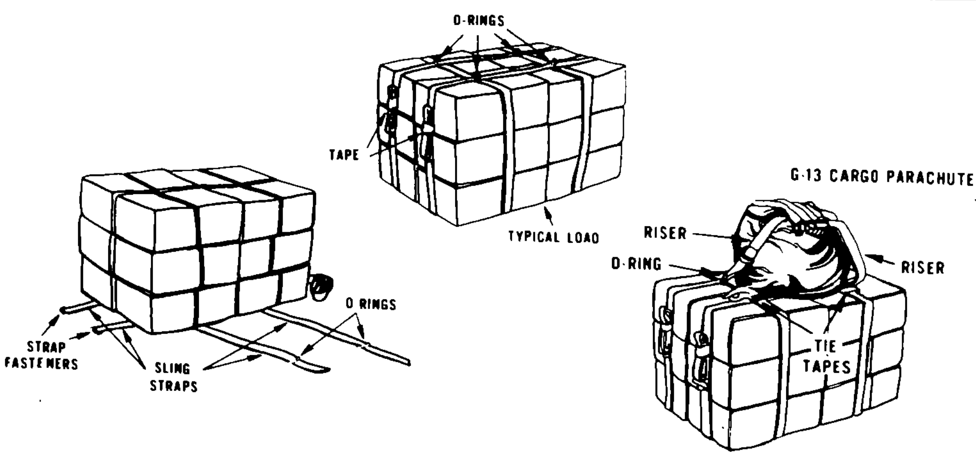
A-7A CARGO SLINGS



LOAD USING TWO A-7A SLING STRAPS (300-POUND LIMIT)

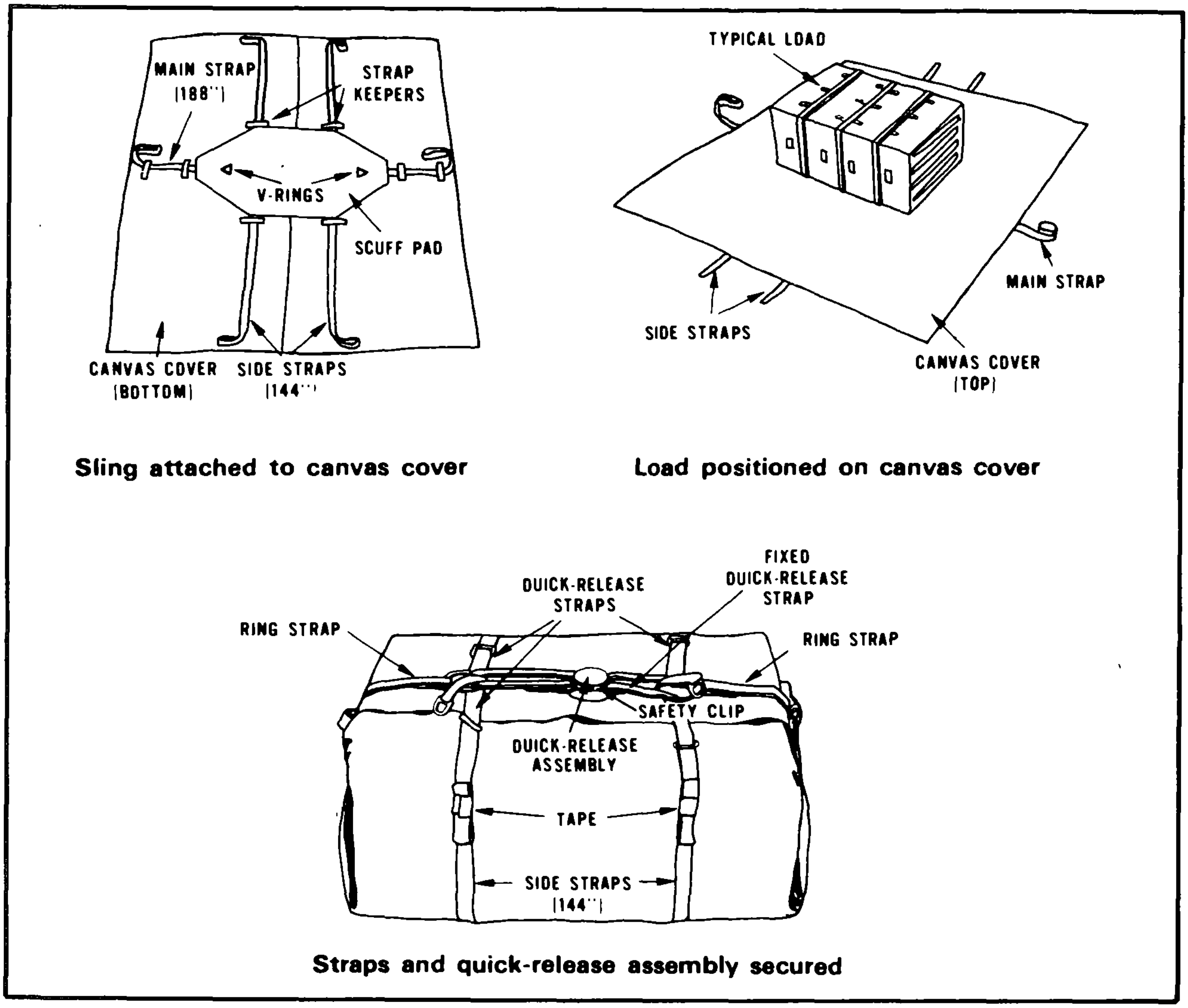


LOAD USING THREE A-7A SLINGS (400-POUND LIMIT)



LOAD USING FOUR A-7A SLINGS (500-POUND LIMIT)

Figure 5-3. Loads using A-7A cargo slings.



Sling attached to canvas cover

Load positioned on canvas cover

Straps and quick-release assembly secured

Figure 5-4. A-21 cargo bag.

A-21 Cargo Bag. The A-21 cargo bag is an adjustable container consisting of a sling assembly with scuff pad, a quick-release assembly (personnel parachute harness), two ring straps, and a 97- by 115-inch canvas cover. The A-21 cargo bag weighs approximately 31 pounds.

The A-21 cargo bag is used to drop both fragile and nonfragile supplies. The maximum load capacity is 500 pounds. The minimum load capacity is 150 pounds.

The maximum allowable dimensions of a rigged A-21 cargo bag are 32 inches wide, 60 inches long, and 32 inches high. (See figure 5-4.)

A-22 Cargo Bag. The A-22 cargo bag is an adjustable, cotton duck cloth and webbing container consisting of a cotton or nylon webbing sling assembly, a cover, and four cotton or nylon suspension webs. (See figure 5-5.)

The A-22 cargo bag has a maximum load capacity of 2,200 pounds.

The maximum allowable dimensions for a rigged load are 48 inches wide, 53-1/2 inches long, and 60 inches high.

For low-velocity airdrop, a standard cargo bag skid (48 by 53-1/2 inches) serves as a base for the container load. For high-velocity airdrop, the standard cargo bag skid

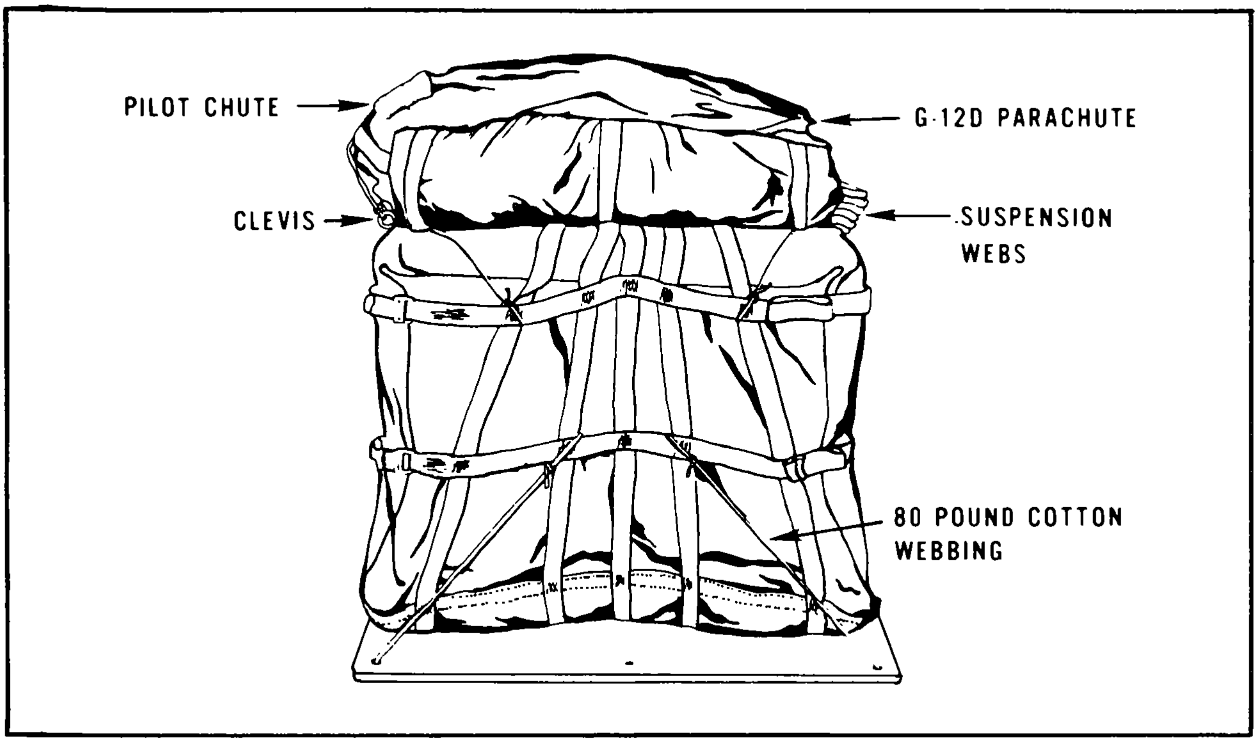


Figure 5-5. A-22 cargo bag.

or an appropriate size piece of plywood may be used for the base of the container load. The weight of the A-22 cargo bag and skid is approximately 58 pounds.

NOTE: Low-velocity Container Delivery System (CDS) with A-22 container is not organic to Special Forces.

High-Speed Aerial Delivery Container, CTU-2/A. (See figure 5-6.)

The CTU-2/A container (FM 10-547) is designed to be dropped by high speed aircraft flying at 425 KIAS and at minimum altitude of 91 meters (300 feet) AGL. It is a fin-stabilized, parachute-retarded, reusable pod capable of carrying up to 500 pounds of cargo.

The container measures 21 inches in diameter by 106 inches long, weighs 213 pounds empty (with parachute), and is made of glass-wound resin acrylic that allows easy destruction by burning.

The CTU-2/A container can be used to deliver:

Critical supplies such as food, water, ammunition, and medicine.

CAUTION: Only ammunition listed in FM 10-553/TO13C7-18-41 may be **air-dropped.**

Surface-to-air recovery (STAR) kits.

DZ marking equipment or beacons for airdrop/airstrike direction.

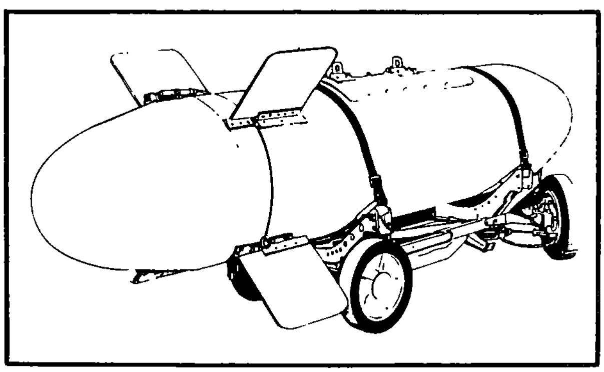


Figure 5-6. CTU-2/A high-speed aerial delivery container.

Poncho Expedient Parachute. The poncho expedient parachute can be used to drop up to 65 pounds of equipment and lessens the need for expensive parachutes. Rigging the poncho is illustrated and described in detail below:

- First, pull the hood drawstring loop to close the hood opening, then wrap the excess drawstring tightly around the base of the hood and tie it off so no air will escape.
- Fold the poncho in half (bottoms together) with the snaps down.
- Cut eight suspension lines 6 feet in length.
- Tie one suspension line to each of the grommets on the poncho with a bowline knot.
- Insure that the suspension lines are not tangled and are the same length.
- Tie all the free ends of the suspension lines to a snap link with one large overhand knot that is further secured by one or two half-hitch knots.

- Fold the poncho as follows:

  Lay the half-folded poncho flat.

  On both long sides of the poncho, make S folds 6 to 8 inches wide to meet in the center (there should be the same number of folds on both sides).

  Next, fold the narrow-folded poncho into an M fold.
- Tie the loop end of the static line to the drawstring (which is wrapped around the hole of the poncho) with one loop of 25-pound test cord (or with a lightweight string that will break when the bundle is deployed from the aircraft) and tie with a square knot.
- Attach the load to the snap link that is attached to the suspension lines.
- Fold the suspension lines on top of the load.
- Then place the M-folded poncho parachute on top of the folded suspension lines.
- Affix the poncho parachute to the top of the load with one wrap of 25-pound test cord in the same manner as tying a package, insuring the cord goes through the loop in the static line. Tie with a square knot. This will deploy the suspension lines prior to breaking lose from the aircraft (see figure 5-7).

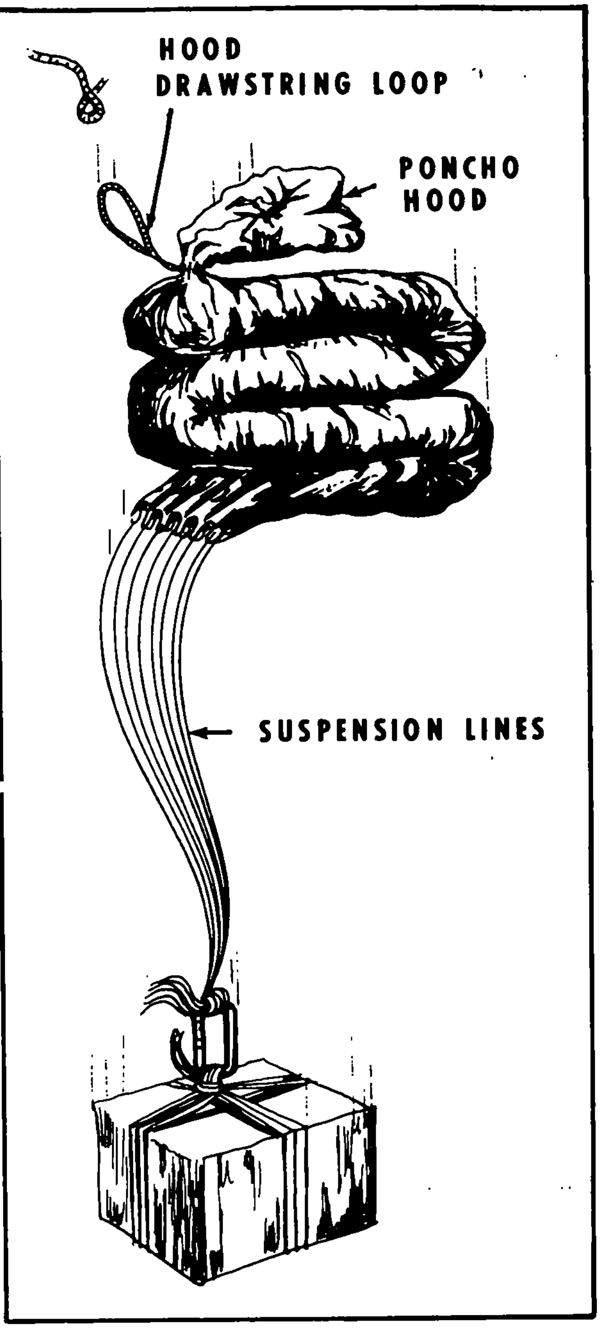
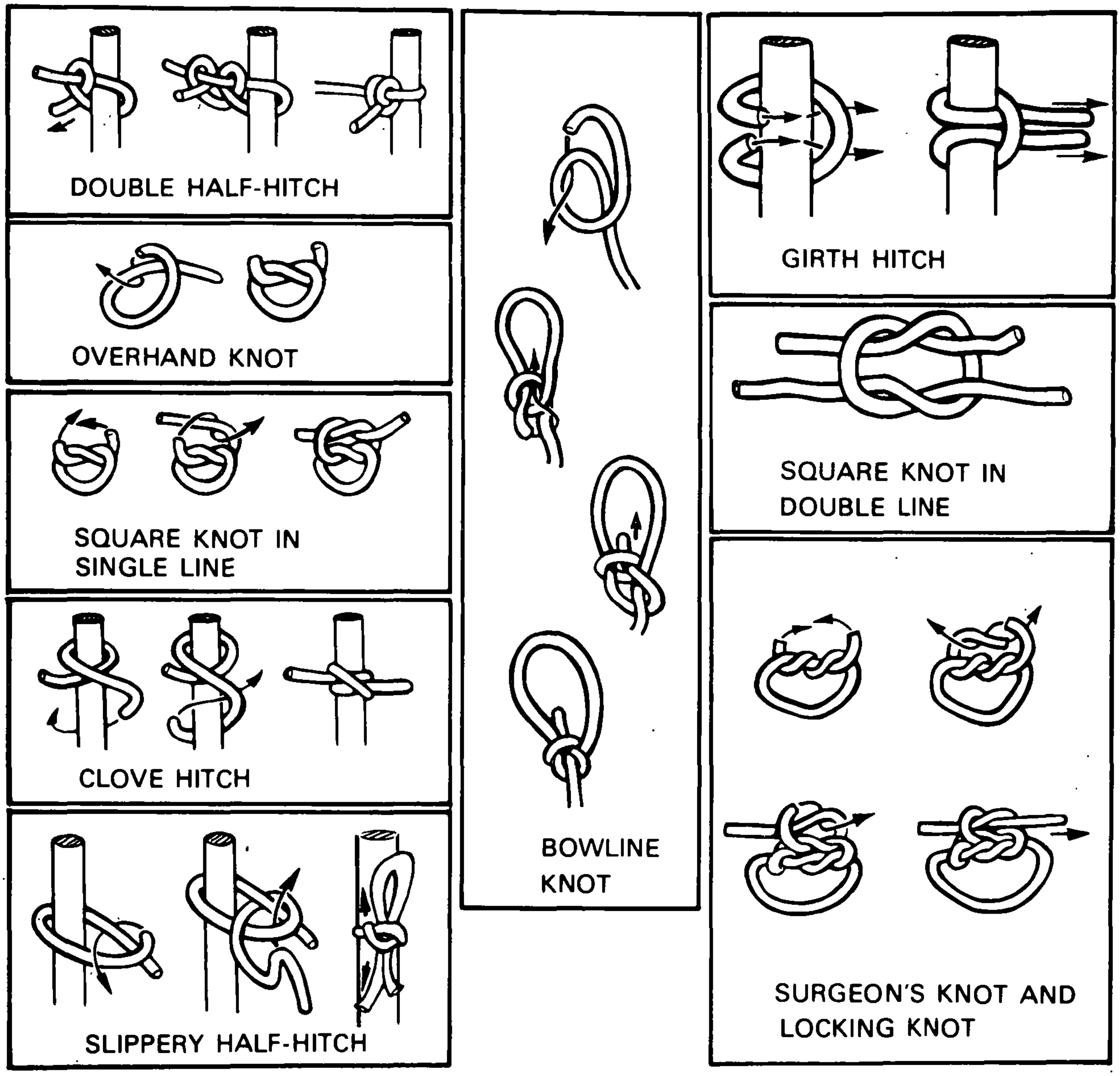


Figure 5-7. Poncho expedient parachute.

Steel Strapping. The steel strapping commonly used for rigging airdrop loads is made of flat steel, 0.020 inch thick by 5/8 inch wide, with a breaking strength of 1,000 pounds. The steel strapping may be used as a container, used in combination with webbing straps, or used to bind equipment items together for packing in container loads. When steel strapping is used as the container, it must be used in double thickness. The load limit is 250 pounds.

Knots for Rigging. A good knot must be easy to tie/untie and must hold without slipping. The proper use of knots during the rigging of loads for airdrop cannot be overemphasized. The most frequently used knots are illustrated below.



RIGGING KNOTS

6

DROP ZONES

GENERAL

Special Forces personnel are responsible for selecting, reporting, and marking DZs used for UW reception operations.

During the planning phase of any Special Forces air operation four basic factors must be considered:

DZ selection.
Type of DZ.
Computing the DZ release point.
DZ marking.

Infiltration DZs are selected using all available intelligence resources and maps. Final approval of the DZ selected is made jointly by the commanders of the SFOB/FOB and the supporting air unit.

After the Special Forces operational element infiltrates into a UWOA, it must confirm and report additional DZ data for use by the SFOB/FOB and the supporting air unit. The operational element will select DZs to be used for future reception operations that are generated by its mission and where timing is extremely important.

SELECTION

The selection of a DZ must satisfy the requirements of both the reception committee and the supporting air unit. The DZ must be accessible and secure, and must permit a safe static line or military free-fall parachute delivery of personnel/cargo containers. The pilot/navigator must be able to locate, identify, and authenticate the DZ. The following factors are considered when selecting a DZ:

Safety. A DZ that does not meet all criteria for the safety of infiltrating personnel but meets all air safety criteria may be used for cargo drops only.

Weather And Astronomical Conditions. Seasonal weather and astronomical conditions in the area must be considered.

Security. The DZ must provide maximum security from the enemy ground threat; the approach and exit routes must be concealed from observation or secured against interdiction. Additionally, the DZ should be near areas suitable for caching supplies and disposing of air delivery equipment.

Shape. Square- or circular-shaped DZs are preferable since they permit a wider choice in selecting the aircraft approach track.

Size

- Width. The DZ width should allow for minor computation errors in wind drift. Generally, the minimum width is 305 meters (1,000 feet) for personnel drops.
- Length. The absolute minimum DZ length depends on the ground dispersion pattern formed by the number of jumpers/ cargo containers to be dropped. This pattern generally parallels the aircraft's line of flight along the long axis of the DZ.

Ground Surface. Ground surfaces should be reasonably level and relatively free of obstructions, such as rocks, trees, fences, and power lines. Swamps, paddies, and marshy ground may be used, but they can hinder recovery operations.

Special attention must be given to the surface of DZs located at elevations in excess of 1,830 meters (5,905 feet) above sea level. The increased rate of parachute descent due to decreased air density at these altitudes causes hard landing impacts.

Terrain. Flat or rolling terrain is desirable. Sites selected in mountainous or hilly country containing large valleys or level plateaus may be used for mission security. If a DZ must be located on a relatively steep slope, plan to have the aircraft fly parallel to the ridge line to make the drop.

The use of cultivated fields should be avoided.

Small valleys or pockets completely surrounded by hills are difficult to locate from the air and should not be selected except in unusual circumstances.

The surrounding area must be relatively free of obstacles that could interfere with safe flight.

- Night Operations. Rising ground or hills more than 305 meters (1,000 feet) higher than the surface of the site should be no closer than 4 kilometers (2 nautical miles) and must be reported. Regardless of good moon illumination, high terrain still constitutes a hazard to aircraft since perception of height is greatly reduced during hours of darkness. Navigational obstacles in excess of 30 meters (98 feet) must be reported for operational drops at altitudes less than 122 meters (400 feet) AGL.
- Approach Quadrants. It is important that the site should have one or more open approach quadrants free of terrain/vegetation masks that could block the aircrew's vision of the DZ marking during the aircraft's final approach. There should be an open approach quadrant of at least 45 degrees that will allow the air support unit a choice when determining its approach track from the IP. (See figure 6-1.)

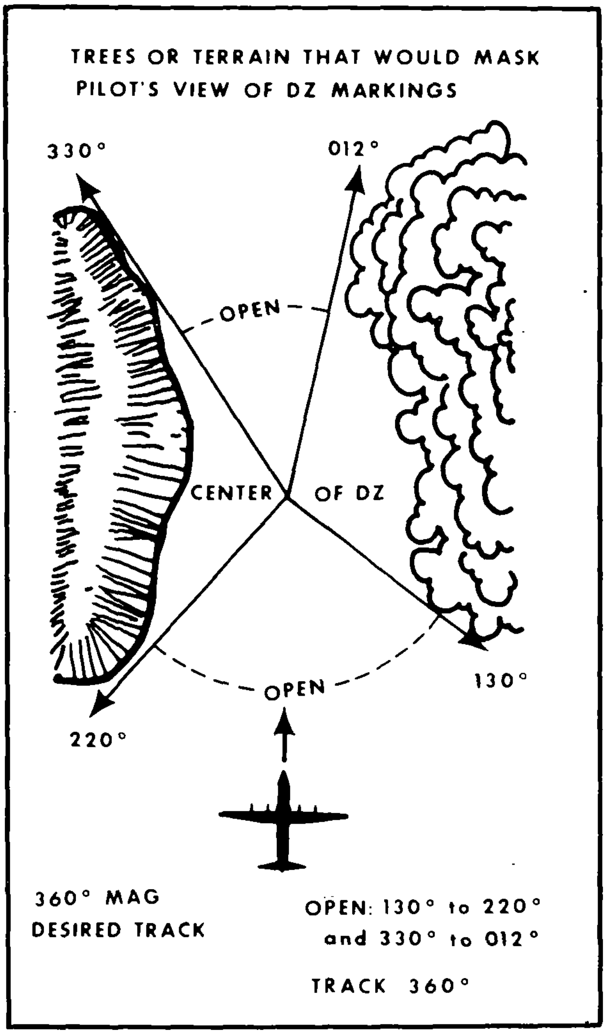


Figure 6-1. Computation of open quadrant and aircraft track (desired heading).

• Approach Path. A single clear line of approach is acceptable provided there is a clear level turning radius of at least 4 kilometers (2 nautical miles) on each side of the DZ for medium aircraft or as prescribed by current regulations of the supporting air unit for the type aircraft to be used. For short take off and landing/light (STOL) aircraft the distance must be 2 kilometers (1 nautical mile). (See figures 6-2 and 6-3.)

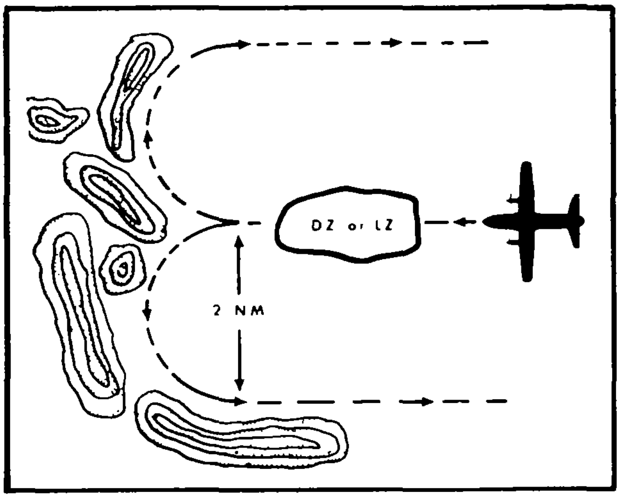


Figure 6-2. Level turning radius required for one-approach DZs and LZs (medium aircraft).

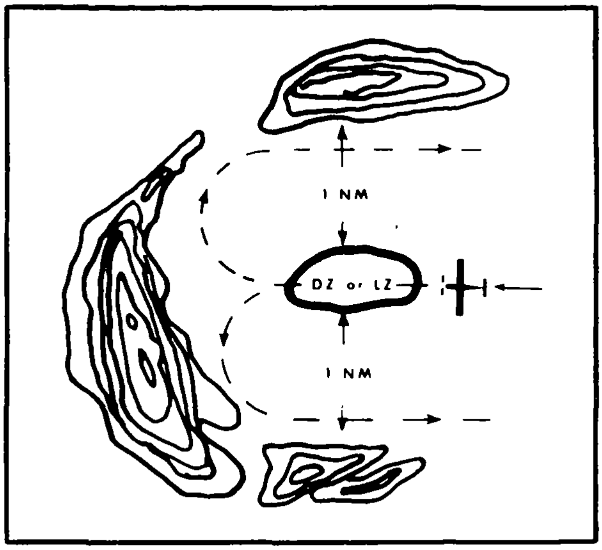


Figure 6-3. Level turning radius for STOL/light aircraft.

Suitable bodies of water may be used, but rapid recovery procedures must be employed. The water must be at least 2 meters (6.56 feet) deep and clear of underwater obstructions to that depth. The surface must be clear of all floating debris, moored craft, and protruding obstacles. For personnel drops, current speed should not exceed 1 meter (3.28 feet) per second, and the minimum safe water temperature is 50 degrees F (10 degrees C).

TYPES OF DROP ZONES

Primary Drop Zones. The primary drop zone must satisfy the requirements of both the aircrew and the reception committee. The site is one that is accessible, reasonably secure, and safe for delivery of incoming personnel/supplies. Additionally, the aircrew must be able to identify the DZ. The information contained in the paragraph above will aid in selecting the appropriate drop site.

Alternate Drop Zones. An alternate DZ is selected and designated for every mission. It is used for personnel, automatic, emergency, or on-call resupply drops when unfavorable conditions prevent using the primary DZ. The date-time group of the drop is determined by the commanders of the SFOB/FOB and the supporting air unit. This information is then transmitted to the operational element in the mission confirmation message. Combat Talons normally plan to overfly alternate DZs as a matter of course. Alternate DZs—

Should be located as close as possible to the aircraft's primary track to preclude excessive aircraft maneuver and minimize the possibility of enemy detection.

Should be manned by a skeleton reception committee.

Unmarked Drop Zones. Unmarked DZs are used for preplanned blind drop parachute delivery of personnel/emergency resupply during specified time periods. Observers are assigned to keep the DZ under constant surveillance before and during the scheduled drop time. When the drop has been made, the observers alert the operational element. The DZ is then rapidly cleared and sterilized. Unmarked DZs—

Are normally limited by visibility to specific astronomical conditions.

Should be of odd shape and size and have identifiable terrain features.

Should be located in isolated or remote areas away from the enemy threat.

Should be reasonably close to planned evacuation routes.

The pilot/navigator computes the RP after visual or radar sighting of the DZ. If bad weather or limited visibility in the DZ area prevents the drop, but the terrain allows a safe drop close to the objective, the drop may be conducted on the nearest field along the aircraft's line of flight; however, the field cannot be more than 3 kilometers (1.62 nautical miles) from the original DZ. Personnel to be dropped will be so advised by the pilot.

Area Drop Zones.

The area DZ system is well adapted for use in conjunction with preplanned automatic resupply drops where DZs are frequently selected by map reconnaissance.

It consists of a prearranged flight track over a series of acceptable drop sites located not more than 1 kilometer (1/2 nautical mile) on either side of the track.

A line-of-flight path is established between two selected points, A and B. The distance between these two points will not exceed 28 kilometers (15 nautical miles) and will have no major changes in ground elevation over 90 meters (295 feet). Points A and B must be identified by coordinates in the mission request.

The reception committee is free to receive the drop at any location along the line of flight between points A and B. (See figure 6-4.)

The aircraft arrives at point A at the scheduled time and proceeds toward point B at drop airspeed and altitude. Once the DZ markings have been located and identified, the drop is made.

DZ markings will be displayed no longer than 10 minutes—beginning 2 minutes before the aircraft's scheduled arrival

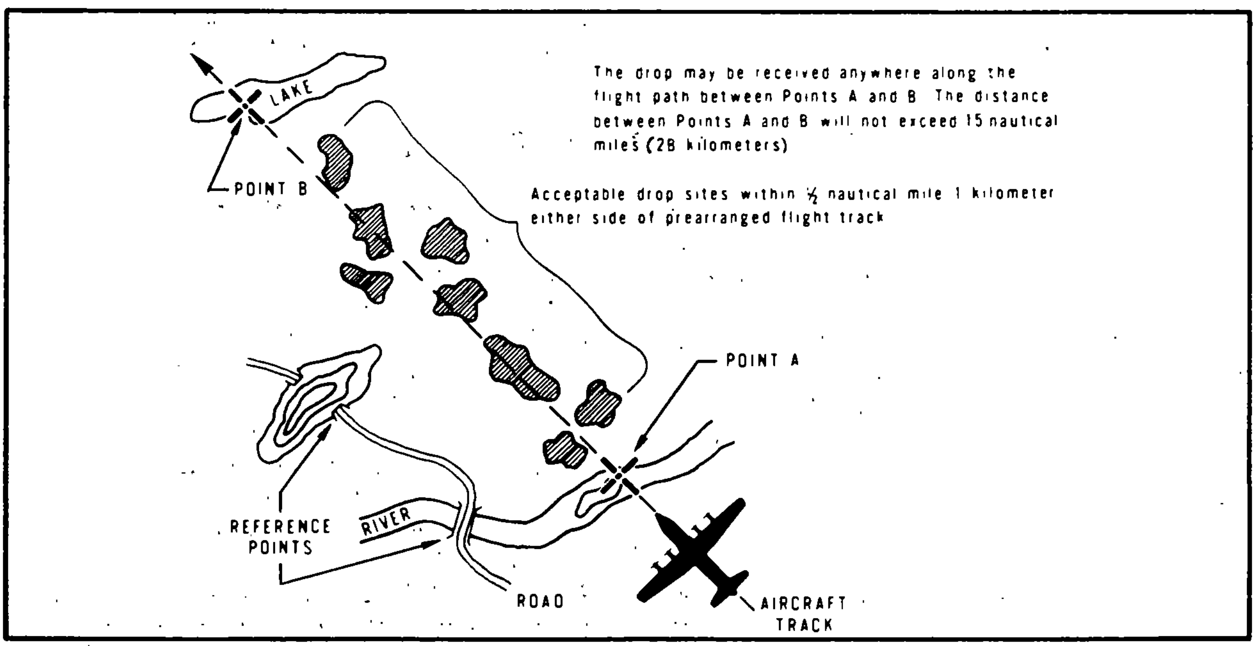


Figure 6-4. Area drop zones.

time over point A until 8 minutes past or until all jumpers/cargo have landed.

If a beacon/transponder is to be used for area DZ identification, it will be positioned to mark point A and turned on prior to the aircraft's TOT, as jointly agreed upon by the commanders concerned, and it will be left on for 15 minutes or until the first deployed parachute is observed. A beacon may also be used on an area DZ to mark the desired point of impact.

Area DZs are reported by using the normal DZ report format except—

Locations of points A and B, including reference points, are given.

The open quadrant is not reported.

Obstacles not shown on the issued map are reported in reference to either points A or B when they are over 90 meters (295 feet) above the level of the terrain and within 3.7 kilometers (2 nautical miles) on either side of the line of flight. (See figure 6-5.)

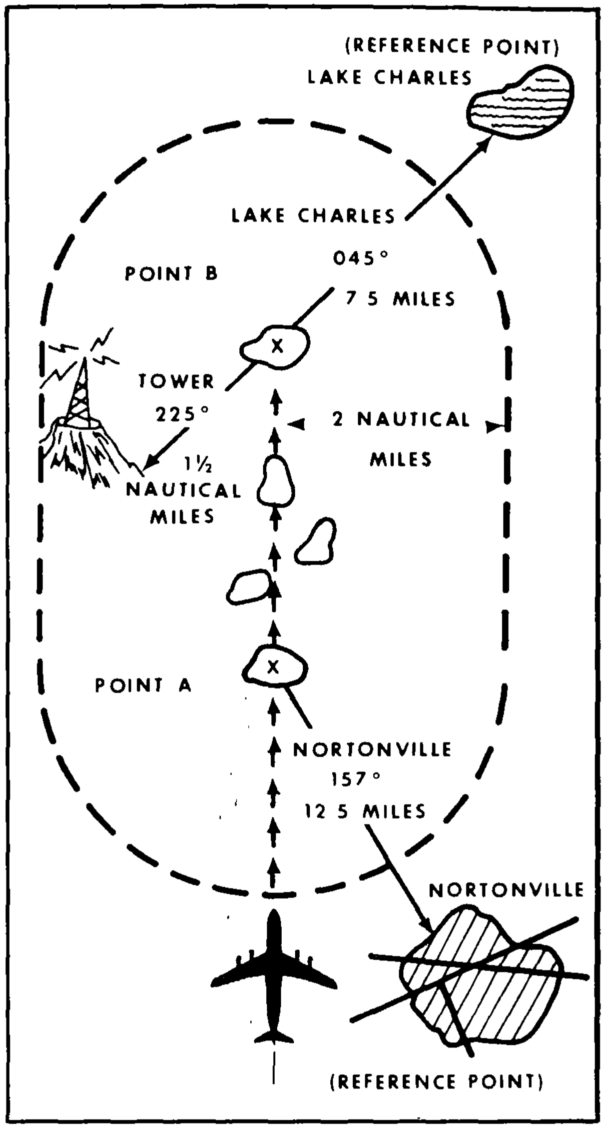


Figure 6-5. Obstacles and reference points (area DZ).

MFF Drop Zones. DZs for MFF parachute operations are easier to select than DZs for static line parachute operations because the MFF parachute is easily maneuvered. Some factors to consider are:

A DZ that does not meet the air safety criteria may still be suitable for MFF personnel drops as dispersion is not a prime factor.

There is no preferred shape. Any reasonably level area more than 100 meters (328 feet) in width and relatively free of obstacles may be used.

Any ground surface suitable for static line DZs is satisfactory.

Small valleys or pockets completely surrounded by hills can be used.

Normally, open approach quadrants, obstacles, and weather conditions are not a selection factor. Jumpers can maneuver around obstacles at lower altitudes. Weather conditions, such as ground fog, mist, haze, or cloud formations that obscure ground vision, may serve as convenient cover.

COMPUTING THE RELEASE POINT (STATIC LINE OPERATIONS)

In planning a DZ operation, computing the RP is extremely important. The RP is the exact point on the DZ over which exit from the aircraft is to be made. The RP marker is located in relation to the desired impact point using a backward planning sequence. RP computation relies on three factors:

Dispersion is the length of the pattern formed by the impact of the parachutists/ containers. The desired point of impact for the first parachutist/container depends on how the calculated dispersal pattern is fitted into the available DZ space.

Wind drift is the horizontal distance traveled from the point of parachute deployment to the point of impact as a result of wind conditions. The RP is located a calculated distance upwind from the desired impact point.

Forward throw is the horizontal distance traveled by the parachutist or cargo container between the point of exit and the opening of the parachute. Adjustment for this factor is made by moving the release point in the direction of the aircraft approach.

Dispersion. First, the ground dispersion pattern is computed to determine the absolute minimum length of the DZ. It is the computed horizontal distance depending on and formed by the desired impact point of the first jumper/container to the impact point of the last jumper/container as determined by the known number of incoming jumpers/containers. It generally parallels the aircraft's line of flight. This computation provides the reception committee with accurate data that will insure the aerial delivery lands within the usable limits of the DZ.

Use this formula to compute ground dispersion pattern: D = RT.

D = unknown dispersion pattern in meters.

R = 0.51 times speed of aircraft in knots.

T = exit time in seconds. It is calculated by multiplying the number of jumpers/ containers to be dropped by the specified interval (second(s)) as determined by unit standing operating procedure and subtracting 1 second. If two aircraft doors are used simultaneously, use the figure of the most used door and subtract 1 second.

Example:

R = aircraft flying at 110 knots times 0.51.

T = 12 jumpers and 2 cargo containers are to be dropped at 1-second interval using two aircraft doors: 12 + 2 × 1 second = 14 divided by 2 minus 1 second = 6 seconds.

D = 56.1 × 6 = 336.6 or 337 (round out numbers) (1,106 feet).

For personnel drops, a 100-meter (328-foot) safety factor is added to each end of the computed ground dispersion pattern. Therefore, using the above figures, D = 337 + 200 = 537 meters (1,752 feet).

Wind Drift. Next, the wind drift distance is computed. It is the horizontal distance a jumper/container will travel with the wind from the point of parachute opening through descent to the desired impact point on the DZ.

It is based on three factors: the wind velocity, the aircraft drop altitude, and the constant factor for the type parachute used.

An anemometer is used to measure wind velocity. Readings may be in knots or miles per hour depending on the type used. Multiply miles per hour by 0.86 to convert to knots. When wind velocities are below 10 knots, the direct substitution of miles per hour in the wind drift formula gives sufficient and accurate results.

Use this formula to compute wind drift: D = KAV.

D = unknown wind drift distance in meters.

K = constant factor for a parachute. It represents the lateral wind drift in meters for each 100 feet of altitude loss in a 1-knot wind.

A = aircraft drop altitude in hundreds of feet.

V = wind velocity in knots.

K FACTORS:

- 2.6 for cargo parachutes (G-13).
- 4.1 for static line deployed maneuverable

parachutes (MC1/MC1-1).

- 4.1 for 35-foot canopies (T-10).

When receiving jumpers/containers in the same drop, use the K factor for personnel parachutes.

> Example:
>
> K = 4.1
> A = 800 feet.
> V = 10 knots.
> D = 4.1 x 8 x 10 = 320 meters (1,050 feet).

The computed wind drift distance is measured from the desired impact point into the wind direction (back azimuth). This point is the beginning of wind drift or the end of forward throw.

Forward Throw. Last, the compensation for forward throw must be considered. It is the horizontal distance a jumper/container will free fall between the point of exit from the aircraft and the parachute opening.

Forward throw is computed by taking one half the speed of the aircraft (expressed in knots) and substituting meters for knots. For example, a C-130 normally flies at a speed of 130 knots while dropping personnel or equipment. The forward throw would be computed as follows:

$$\frac{130 \text{ knots (speed)}}{2} = 65 \text{ knots}$$

Therefore, the forward throw would be 65 meters.

DZ markers are positioned 50 meters (164 feet) to the right of this point when facing the direction of aircraft approach.

When high velocity and free drops are used for aerial resupply, the method for determining the RP is different:

The ground dispersion pattern is computed in the same manner as above.

Wind drift is disregarded as wind conditions do not affect these type drops.

Without the restraint of a parachute, forward throw is compensated for by moving the RP location a distance in meters (feet) equal to the aircraft's drop altitude into the direction of aircraft approach. For example, if drop altitude is 600 feet, measure off 183 meters.

MARKING

Visual ground markings are used to identify both the DZ and the RP for the airdrop. The last steps in DZ planning are selecting an appropriate marking system and positioning the markers on the DZ. Primarily, marking employs lights or panels in a distinctive configuration according to the unit's Communications-Electronics Operation Instructions (CEOI).

The number of markers used seldom exceeds six.

The distance between markers is usually 45.5 meters (50 yards).

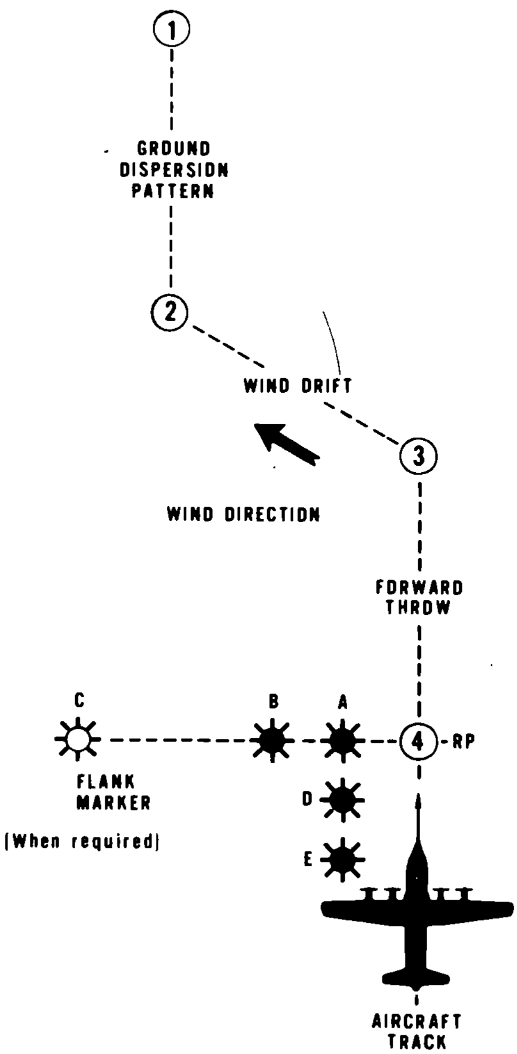
The DZ markings will normally form a distinctive shape (square, rectangle, or triangle) or letter ("T," "L," or "X").

The aircraft is aligned as accurately as possible 50 meters (164 feet) to the right of the right hand row of markers during static line drops. The drop is made when the aircraft is adjacent to the last marker in the right hand row.

The standard marking method employs a standard four-marker pattern (figure 6-6) in the form of an inverted "L."

MARKERS

Nighttime. Visible light sources are used as markers during darkness or periods of limited visibility. Atmospheric and terrain conditions and security in the area must be considered when selecting a light source. Strong light emissions may be necessary to penetrate haze or ground fog. Whatever light source is selected, all lights must be of the



LEGEND

(1) Impact point of last jumper/container

Distance 1 to 2 Computed ground dispersion pattern

(2) Desired impact point of first jumper/container.

Distance 2 to 3. Computed wind drift.

Distance 3 to 4 Compensation for forward throw

(4) Location of release point (RP)

TO MARK THE RELEASE POINT

1 After selecting the desired impact point (Point 2), compute the ground dispersion pattern. Starting at Point 1, face into the direction of aircraft approach and pace off the computed distance, Point 1 to 2

2. At Point 2, face into the wind direction and pace off the computed wind drift distance, Point 2 to 3

3 At Point 3, face into the direction of aircraft approach and pace off the constant forward throw distance, Point 3 to 4.

4 **You are now standing at or under the release point,** Point 4

5. TO POSITION DZ MARKERS At Point 4, **face into the direction of aircraft approach,** position marker A 50 meters to your right, and marker B 50 meters to the right of marker A. Position markers D and E at 50-meter intervals forward of marker A into the direction of aircraft approach.

NOTE: PLACEMENT OF MARKERS ARE VIEWED FACING AIRCRAFT APPROACH TRACK.

Figure 6-6. Standard four-marker pattern.

same type and have equal light emission to form a distinctive pattern. Homing beacons may be used in conjunction with the marking pattern.

Daytime. Standard or improvised panels are used during daylight. The color selected must contrast sharply with the ground/vegetation background colors in the area. Whenever security permits, smoke grenades or smoke-pots may be used to augment or replace panels. If smoke alone is used for a resupply drop, it should be placed at the release point.

Homing beacons may also be employed.

Positioning of Markers. Markers must be placed so they are visible only from the direction of the aircraft approach. Selected light sources should be appropriately hooded, screened on three sides or placed in pits to reduce side glow, and aimed at the aircraft flight path. Panels should be positioned at an angle of approximately 45 degrees from the horizontal to present maximum surface toward the approaching aircraft.

Markers must also be placed where obstacles will not mask the pilot's line of sight. As a guide, a mask-clearance ratio of 1 to 15 is used, i.e., 1 unit of vertical clearance to 15 units of horizontal clearance. For example, if a DZ marker has to be positioned near a terrain mask such as the edge of a forest that is on the DZ approach track and the trees are 10 meters (33 feet) high, the marker would require 150 meters (492 feet) of horizontal clearance from the trees. (See figure 6-7.) This applies to static line jumps only.

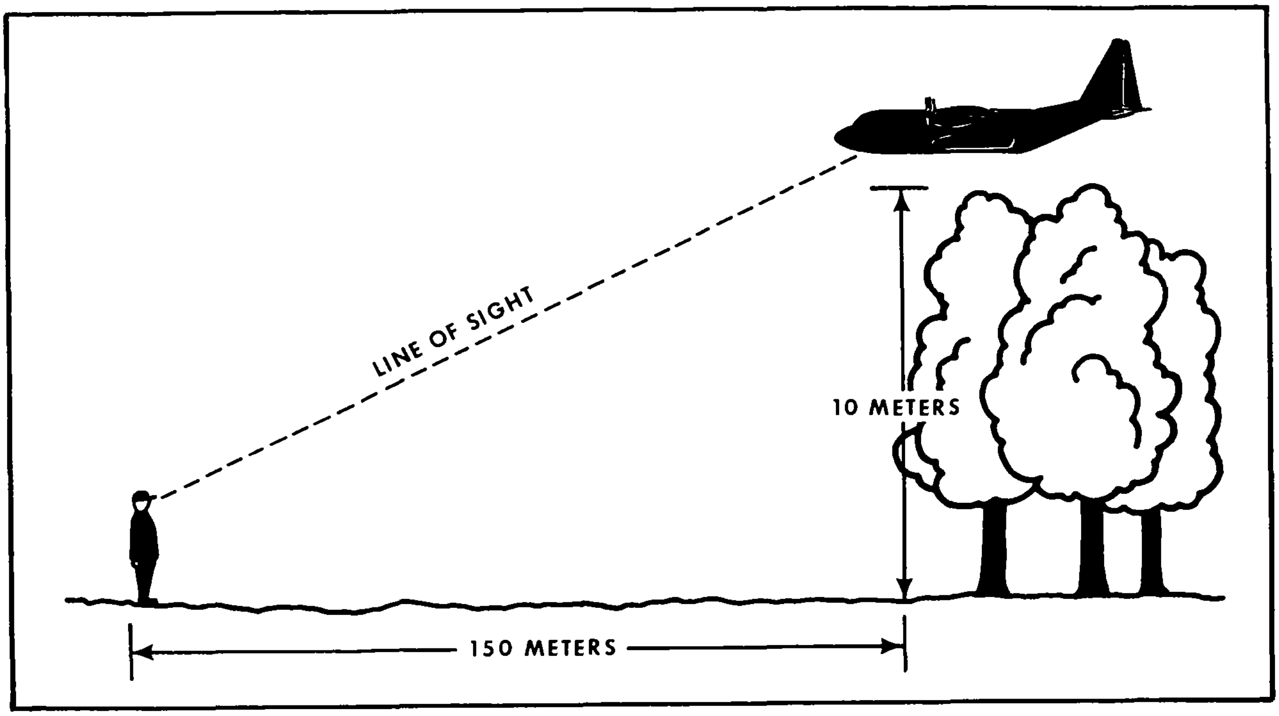


Figure 6-7. Mask clearance ratio 1:15.

IDENTIFICATION

Air-to-Ground. The aircraft is identified to the reception committee by—

Arriving in the objective area within the specified time limit, usually 2 minutes before to 2 minutes after scheduled drop time.

Approaching at designated drop altitude and track.

Ground-to-Air. The reception committee is identified to the aircraft by—

Displaying the correct marking pattern within the specified time limit.

Using the proper authentication code signal.

AUTHENTICATION

There is no standard authentication system for UW reception operations. The authentication system to be used is agreed upon by the commanders concerned during mission planning. Authentication procedures will be prescribed in the CEOI and changed on a predetermined schedule for security purposes.

Authentication between the aircraft pilot/navigator and the RCL may be accomplished by using a coded light source, panel signal, radio contact, homing beacon, or combinations thereof. These may be employed individually or in conjunction with the marking pattern.

When coded light signals are used, code letters identified by all DOTS or DASHES—I, E, M, O, S, T, and H—will not be used. The following time intervals will be used to assist pilot/navigator recognition:

2 seconds for DOTS.
4 seconds for DASHES.
2 seconds for intervals between DOTS and DASHES.
5 seconds for intervals between repetitions.

When a beacon/transponder is to be used for authentication, the commanders concerned will jointly agree upon positioning and turn on/off times during mission planning.

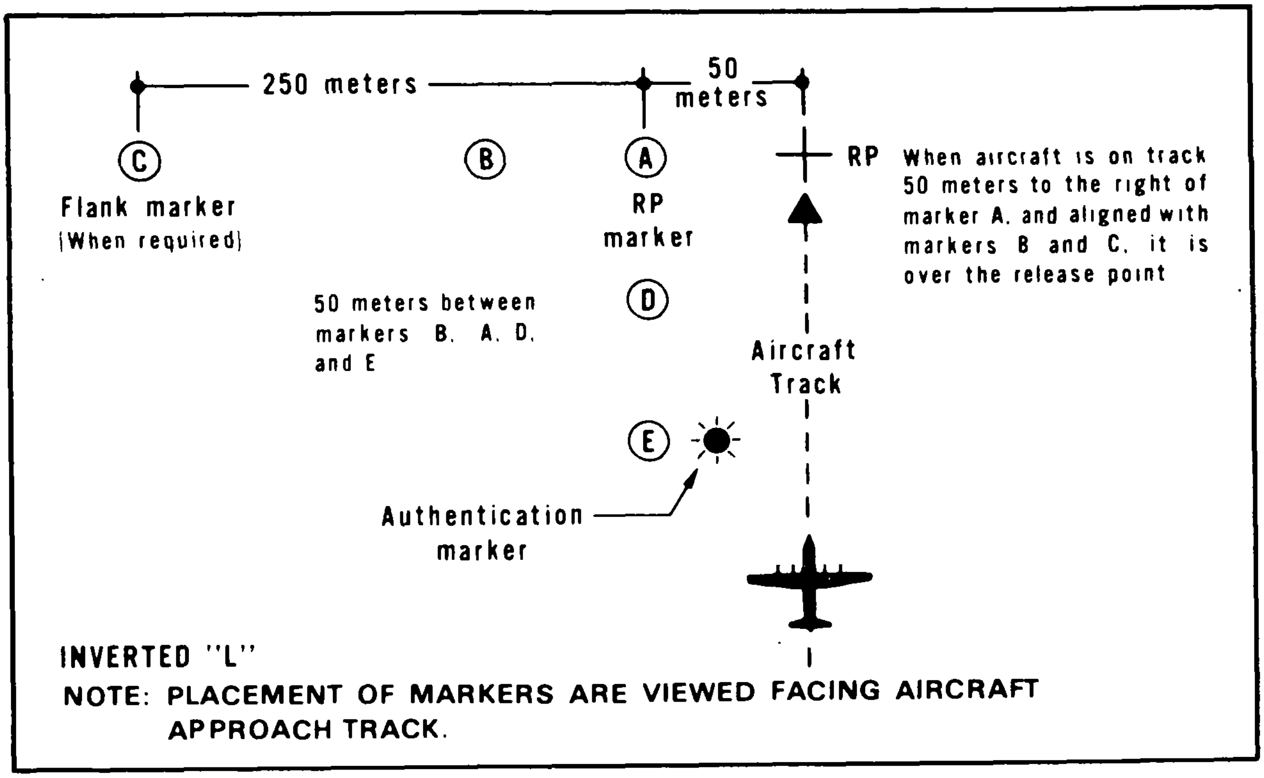


FIGURE 6-8. Standard inverted "L" marking.

STATIC LINE DZ MARKING PATTERNS

Primary and alternate marking patterns are used to identify the RP for both night and day drops.

Primary Marking The standard inverted "L" (figure 6-8) that uses:

- Four markers (A, B, D, and E) positioned in the shape of an inverted "L". The distance between markers is 50 meters (164 feet).

- An authentication marker positioned 5 meters (16 feet) to the left of marker E at night. During daylight, it will be positioned 15 meters (49 feet) to the left. For nonstandard positioning, the mission request will indicate its location in relation to markers A, B, D, or E.
- An additional flank marker (marker C) when absolute drop altitude is 600 feet or above. This is necessary because of restricted cockpit visibility in current airlift aircraft at that altitude. Marker C is positioned 250 meters (820 feet) to the right of marker A. Below 600 feet altitude, this marker is not required.

Alternate Marking. A daily pattern specified by the CEOI that uses:

- The required number of markers positioned to form the prescribed pattern. The distance between markers will be 50 meters (164 feet).
- An authentication marker positioned 5 meters (16 feet) to the left of the E panel as you face the approaching aircraft at night, and 15 meters (49 feet) to the left during daylight. Nonstandard positioning will be indicated in the mission request.
- An additional flank marker when drop altitude is 600 feet (183 meters) and above. It will be positioned 250 meters to the right of the RP marker. It is not required for drops below 600 feet (183 meters).

Display. The static line DZ marking pattern will be displayed for 4 minutes—beginning 2 minutes before until 2 minutes past scheduled drop time or until the first deployed parachute is observed.

MILITARY FREE-FALL DZ MARKING PATTERN

The high altitudes involved in MFF operations make the use of visual markings for identification extremely difficult if not impossible. Identification must normally be made from terrain features. MFF parachutists assemble on the lowest canopy and the impact point of the first jumper is the desired impact point (DIP) for all other jumpers.

DZ markings are sometimes used because it is desirable to indicate wind direction to the descending parachutists.

Smoke may be used during daylight jumps and when the tactical situation permits. Panels may also be used in a standard inverted "L" or an arrow configuration. When these patterns, are used the long axis of the inverted "L" is aligned to the wind direction with the wind blowing toward the short axis of the "L" or the arrow is pointing into the wind. (See figure 6-9.)

Two lights (one red and one green) may be used to mark the DZ and to indicate wind direction during night jumps. They will be set up with the green light upwind of the red light. (See figure 6-9.) An additional light may be used to mark the release point if it is known. This light must be of sufficient intensity so as to be easily identified at jump altitude.

Release point computations for MFF operations are complex and depend on the availability of upper wind data. See FM 31-19 for the method of computation.

DROP ZONE REPORTS

Each Special Forces operational element will reconnoiter its operational area as soon as possible after infiltration. This reconnaissance is to select sites for DZs and to confirm, reassess, or refute the sites selected during pre-mission planning.

The importance of DZ reporting by the operational element is to identify and send data to the SFOB on DZ locations for current or future use. DZ data can be sent separately or as a part of a specific mission request where the drop site is or can be identified.

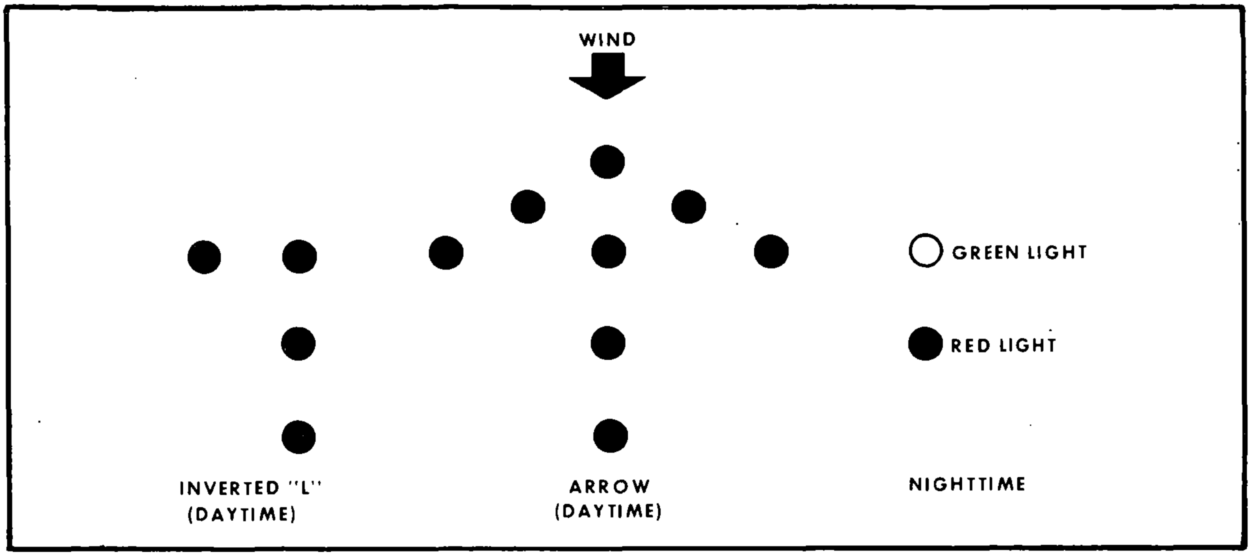


Figure 6-9. MFF DZ markings.

The messages from the operational elements to the SFOB are concise and use precise message formats. Each Special Forces operational element, using its CEOI, reports data on each DZ site in a mission request or in an information report. DZ data includes code name (from CEOI, or as appropriate), location (grid designation and coordinates of the center of the DZ), track of recommended aircraft approach, obstacles, and reference point(s). Other data, such as the time of drop, services/items desired, and alternate DZ(s), can be included in a mission request. Prevailing requirements, as stated in the CEOI, determine message format and content.

DZ/LZ STERILIZATION

To insure sterilization, the reception committee (when one is used) must:

Police or obliterate cigarette butts, candy and gum wrappers, equipment, and other signs of occupancy (crushed undergrowth, heel scuffs, trails, human waste).

Recover all rigging straps and other air delivery equipment.

Assign an individual at the recovery collection point to be responsible for accounting for air items and packages as recovery teams bring them off the DZ/LZ.

Provide a two- or three-man surveillance team, preferably from the supporting auxiliary element, to maintain a close watch on the DZ/LZ area for enemy activity during the 48 hours following the drop.

To assist in sterilization, the individual parachutist must:

Recover all parachute items, straps, bundles, and equipment worn on the drop.

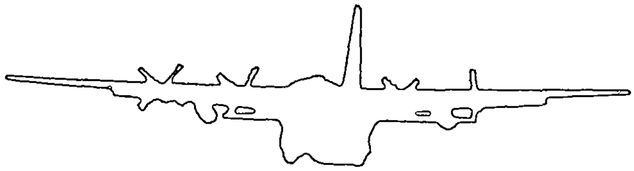
Bury unwanted air items separately, preferably at the base of thick bushes.

Erase drag marks, footprints, and impact marks. Disguise freshly cut tree branch stubs with mud if possible.

Avoid trampling or crushing vegetation; bypass plowed areas and grass fields when moving off the DZ/LZ.

Prevent accidental compromise of the operation by avoiding paths and roads and by moving cross-country to the assembly point.

7



LANDING ZONES

INTRODUCTION

Landing zone operations are normally conducted at night on a preselected, unprepared LZ to insert or recover personnel/equipment into or from a UWOA. A reception committee on the LZ assists during these operations.

LZ procedures and techniques described in this section apply primarily to two categories of fixed-wing aircraft (STOL and medium) and to helicopters. They also apply to light and medium aircraft no longer in the active Army/Air Force inventory. Whereas STOL infers the AU-23A Peacemaker/Porter, the U-10, and the UV-18A Twin Otter aircraft, the LZ criteria also apply to other light aircraft. The medium category of aircraft addressed is the Combat Talon, but the LZ criteria also apply, without adjustment, to the C-47, C-123, etc. Helicopter LZ criteria apply to past, present, and future models, such as the utility tactical transport aircraft system (UTTAS). Where differences exist, specific aircraft operations manuals will take precedence.

GENERAL CRITERIA

As a general rule, the same criteria used in selecting DZs apply when selecting LZ sites; however, LZ size and approach features are more important. The basic factors to consider in selecting an LZ are:

Aircraft Limitations. The aircraft limitations are the primary factors in site selection. Landing rules cannot be set arbitrarily, but certain specified minimums must be met. The RCL must have a thorough knowledge of all requirements that are necessary to provide aircrew/aircraft safety when landing on unprepared land or water LZs. Sound judgment cannot be overemphasized.

The Mission and Security. The planning and coordination required to implement an air-landed operation closely parallel DZ planning procedures. The LZ should not be near a heavily defended area since low-flying aircraft are extremely vulnerable to ground fire. There is also the danger that nearby enemy forces could observe the aircraft while it is landing and raid the LZ, capture the aircraft and personnel, and neutralize the entire operation. An alternate LZ should be designated and prearranged signals set up in order to divert the aircraft to the alternate LZ and enhance the chance of mission success.

Aircraft security is enhanced by leaving one or more engines running; therefore, extra safety precautions must be taken by all ground personnel. The RCL must make ample plans to disperse or withdraw personnel/cargo in case of enemy interference. These plans must be carefully coordinated with all elements involved in the mission, and practice withdrawals or dispersions should be conducted if considered necessary.

Identification. A site easily identifiable from the air must be selected. Flat or rolling terrain is best. Ridges or plateaus may be used in mountainous areas. The site must be relatively free of vegetation and natural or man-made obstacles.

Size and Features. The physical requirements, such as site size, ground/water surface conditions, and approach/takeoff features, are important. The size required will depend on the type of aircraft used, such as STOL, light, medium fixed-wing, or helicopters. There must be strict adherence to minimum dimensions to insure safe operations.

Weather and Astronomical Conditions. Prevailing wind direction and velocity and visibility restrictions, such as ground fog, haze, ambient light, or low cloud formations in the landing area, must be determined. Both prevailing weather and astronomical conditions should favor the operation.

The remainder of this chapter will explain how to select, lay out, mark, and operate LZs used by STOL and medium fixed-wing aircraft on land, water and snow, and by helicopters. Message and recovery zones will also be covered.

LANDING ZONES (STOL AND MEDIUM AIRCRAFT)

Terrain Features.

The site should be located on flat or rolling terrain or on ridges or plateaus in mountainous areas.

A valley or plateau of sufficient size can be used as LZs in mountainous or hilly country; however, landings at higher elevations require increased LZ dimensions because of decreased air density.

If the site is above 1,220 meters (4,000 feet) altitude or in an area with a high temperature range, the minimum length must be increased as follows:

Add 10 percent for each 305 meters (1,000 feet) of altitude above 1,220 meters (4,000 feet).

Add 10 percent when temperatures are between 90 and 100 degrees F (30 and 38 degrees C).

Add 20 percent when temperatures exceed 100 degrees F (38 degrees C).

A pocket or small valley completely surrounded by hills is usually undesirable for fixed-wing landing operations.

A site with a single approach, although undesirable, can be used. When using such a site, you must insure that—

Sufficient clearance is available at both ends of the strip to permit a 180 degree turn to either side within a radius of 2 kilometers (1 nautical mile) for STOL aircraft and 4 kilometers (2 nautical miles) for medium aircraft, or as prescribed in appropriate aircraft operation manuals.

All landings and takeoffs are made into the wind.

Ground Surface.

The surface must be level and free of obstructions, such as ditches, deep ruts, logs, fences, hedges, rocks larger than the fist, or grass over 30 centimeters (12 inches) high.

The subsoil must be firm to a depth of 61 centimeters (24 inches).

A surface containing gravel, small stones, or thin layers of loose sand over a firm layer of subsoil is acceptable.

Plowed or planted fields should not be used.

A surface unsuitable in summer may be ideal in winter. Ice 48 centimeters (19 inches) thick will support STOL aircraft. Ice 91 centimeters (36 inches) thick will support medium aircraft. Unless the aircraft is equipped for snow landing, snow in excess of 10 centimeters (4 inches) must be packed firmly or removed.

The surface gradient, both length and width, should not exceed 2 percent.

Crosswinds. Ground crosswind velocities are difficult to predict. Accurate reconnaissance will prevent selecting LZs that are disoriented with prevailing winds.

The pilot of each mission aircraft will be the final authority on both his aircraft and his own crosswind limits.

Approach and Takeoff Clearance. Approach and takeoff clearances are based on the descent/ascent characteristics of the aircraft and on obstacle height and proximity to the LZ.

Descent/Ascent Ratio.

The descent and ascent ratio or the so-called glide/climb ratio is the ratio of aircraft gain or loss of altitude to distance traveled. For example, a 1 to 11 ratio is a 1-meter (3-foot) gain or loss of altitude for every 11 meters (36 feet) of distance traveled. The ratio for:

- STOL aircraft is 1 to 11 (U-10, AU-23A/Porter, and UV-18A).
- Medium aircraft is 1 to 40.

These ratios are applied as 1 unit of vertical clearance to 11 (or 40) units of horizontal clearance to determine the horizontal clearance required:

- Between obstacle(s) and the approach/takeoff ends of an LZ.
- Between LZ markers and terrain/obstacle masks.

FOR EXAMPLE: The approach end of a STOL LZ would have to be located 165 meters (541 feet) from a 15-meter (49-foot) high obstacle in the approach path.

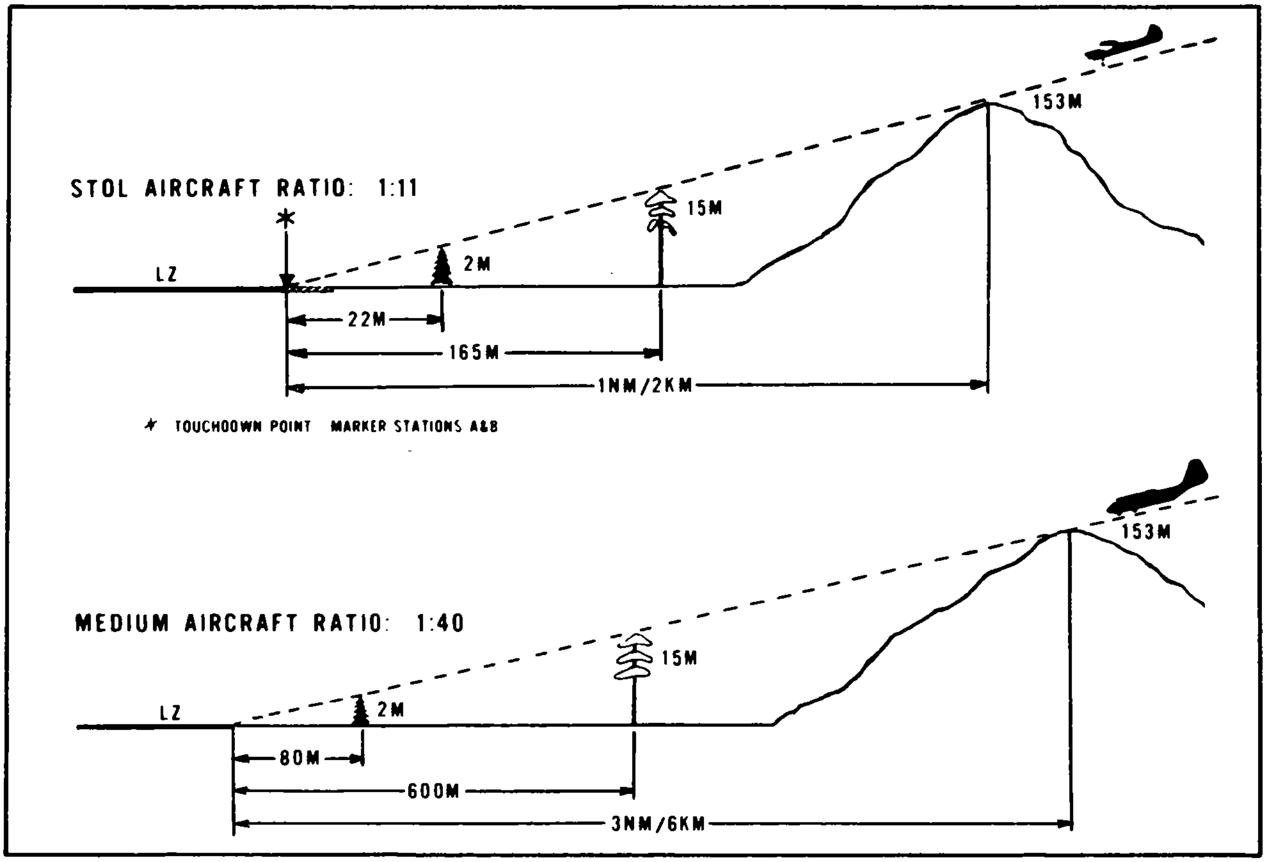


Figure 7-1. Obstacle clearance.

Obstacles. Natural or man-made obstacle height is measured from ground level at the center of the LZ. Where land falls away from the site, obstacles that do not cut the line of aircraft descent or ascent may be disregarded. This condition is most likely to exist in mountainous areas where plateaus are selected for a landing site.

A 2-meter (6 1/2-foot) obstacle in the approach/takeoff path must not be closer than:

22 meters (72 feet) for STOL aircraft.

80 meters (262 feet) for medium aircraft.

A 15-meter (49-foot) obstacle in the approach/takeoff path must not be closer than:

165 meters (541 feet) for STOL aircraft.

620 meters (4,034 feet) for medium aircraft.

A 153-meter (502-foot) obstacle in the approach/takeoff path must not be closer than:

2 kilometers (1 nautical mile) for STOL aircraft.

6 kilometers (3 nautical miles) for medium aircraft.

Marking. Visual markers are used to outline the limits of the landing strip, to indicate landing direction, and to identify the RCL station. Visible light sources are used during darkness or periods of limited visibility. Standard or improvised panels are used during daylight. LZ markings are the same as used for DZs. Markers must be positioned so they can be seen from the approaching aircraft. Flashlights, when used, must be hand held to insure directional control. The landing direction is always indicated by the row of marker stations aligned along the left edge of the strip and by the RCL signal station that is always on the approach or downwind end.

Display. LZ markings will be displayed for 4 minutes—beginning 2 minutes before until 2 minutes past the scheduled aircraft arrival time or until the aircraft completes touchdown and landing roll.

Authentication. At night, the RCL will display the proper authentication code signal by flashing a green light (or other designated signal) aimed in the direction of the approaching aircraft. The RCL will aim a continuous green light at the landing gear when the aircraft is on final approach.

In daylight, a distinctive panel or smoke signal will be displayed, as prescribed in the CEOI.

Identification.

- Air-to-Ground. The aircraft is identified to the RCL by—

  Arriving within the specified time limit.

  Approaching the LZ at designated altitude and track.

- Ground-to-Air. The LZ is identified to the pilot by displaying the correct marking pattern within the specified time limit.

Dimensions and Layout. Figures 7-2 and 7-3 show how the two standard land LZs used for STOL and medium fixed-wing aircraft are laid out and marked.

A safe area (cleared surface) must be added to each end of the LZ, a distance equal to 10 percent of the minimum length. These areas will never be less than 30 meters (98 feet) in length and must support the weight of the aircraft. It is important to remember that the 10 percent safe area is added to each end of the runway **after** the altitude and temperature increases have been added.

An area 8 meters (26 feet) wide must be added along both sides of the LZ and cleared of all obstacles over 1 meter (3 feet) high.

The marking pattern outlining the limits of the LZ consists of:

Five marker stations for STOL aircraft.

Seven or more marker stations for medium aircraft. For LZs longer than the depicted minimum length, the number of left-hand markers beyond station C will be increased to retain a marker spacing of 153 meters (502 feet).

Stations A and B always mark the downwind end and provide the entrance "gate" for aircraft approach. These stations represent the first point at which the aircraft should touch the ground.

Station B is the aircraft offload/onload position. The RCL station is located, as

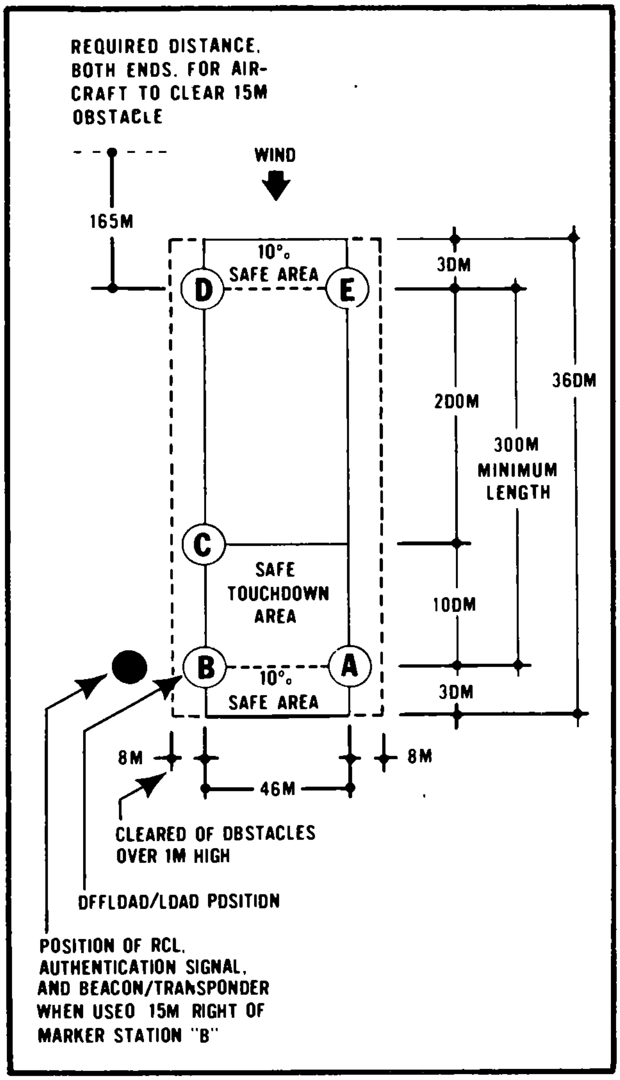


Figure 7-2. Land LZ STOL aircraft.

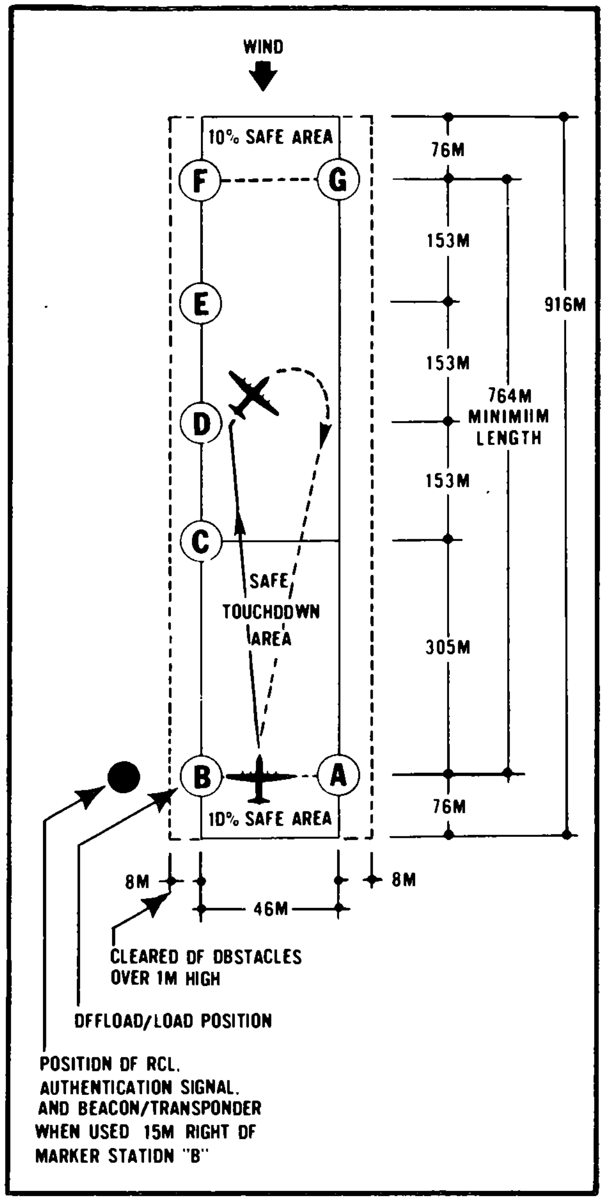


Figure 7-3. Land LZ medium aircraft.

depicted, 15 meters (49 feet) to the right of marker station B.

Station C marks the very last point at which the aircraft can touch down and still complete a safe landing.

Stations D and E or F and G mark the upwind extreme of the landing area.

Concept of Operations. The RCL directs all marker stations to be displayed 2 minutes before scheduled arrival time. The RCL flashes the authentication code signal toward the direction of expected aircraft approach.

When the RCL determines the aircraft is on its final approach (within 15 degrees to either side of the approach track and below 1,000 feet) he ceases flashing the code signal and aims a continuous signal in the direction of the landing aircraft.

The pilot attempts to make a straight-in landing on the initial approach. When he cannot do so because of a sudden change in wind direction/conditions, he flies a modified landing pattern at minimum altitude for security purposes.

All lights follow the aircraft if a "go-around" is required.

All lights continue to follow the aircraft during touchdown and landing roll and are extinguished as the aircraft passes each successive marker station.

The pilot turns the aircraft right after touchdown and landing roll, and he taxis it back to the offload/onload position guided by the RCL's continuous light source at station B. The pilot keeps one or more engines running during the entire operation.

Incoming personnel/materiel are offloaded first in order to eliminate confusion and insure rapid handling. To insure safety, all offloading/onloading is accomplished behind the running engine(s).

The pilot prepares the aircraft for immediate takeoff after the offloading/onloading is completed. The RCL moves to a vantage point clear of the aircraft, directs the LZ be illuminated, and signals the pilot to take off by flashing his light toward ground level in front of the aircraft.

The LZ illumination is extinguished as soon as the aircraft is airborne.

The aircraft pilot will not land when—

There is a lack of or improper identification/authentication received from the LZ.

An abort signal is given by the RCL, e.g., extinguishing the LZ markings.

WATER LANDING ZONES (STOL AND MEDIUM AIRCRAFT)

The selection of a suitable water LZ is based on the characteristics and limitations of STOL floatplanes and medium amphibious aircraft. Following is guidance on how to select, lay out, mark, and operate water LZs when working with STOL and medium fixed-wing amphibious aircraft.

Water Surface and Depth. The water surface must be free of obstructions such as boulders, rock ledges, shoals, sunken pilings, logs, moored craft, floating debris, or seaweed.

The minimum safe water depth for STOL floatplanes is 1 meter (3 feet).

The minimum safe water depth for medium fixed-wing amphibious aircraft is 3 meters (10 feet).

Weather Conditions. Surface wind conditions are critical for water landings; crosswinds are difficult to predict, but accurate reconnaissance can preclude choosing a landing site that is disoriented with prevailing winds.

The pilot of each mission aircraft will be the final authority on both his aircraft and his own crosswind limits.

Any direction may be used for landing/takeoff in winds less than 8 knots (14 kilometers or 9 miles per hour).

The landing may vary up to 15 degrees from the wind direction when surface winds do not exceed 8 knots and it is impossible to land directly into the wind.

The landing must be made into the wind when surface winds exceed 8 knots on open water.

Landings will not be made in winds exceeding 20 knots (37 kilometers or 23 miles per hour).

If a downwind landing/takeoff is absolutely required, it will be made directly downwind.

Wave Height. The maximum wave height is 0.3 meter (1 foot) for STOL floatplanes.

Surface Swells and Wind Waves. The height of surface swells must not exceed 0.3 meter (1 foot) and the wind wave must not be more than 1 meter (3 feet) for medium fixed-wing amphibious aircraft when all swells and wind waves are in phase.

Tide. The state of the tide should have no bearing on the suitability of the landing area, but the low-tide depth must exceed the minimum safe water depth required for the mission aircraft.

State of Sea. The state of the sea is the state of agitation of the sea resulting from various factors such as wind, swell, currents, angle between swell and wind, etc. The following State of Sea (Code Table 3700) was taken from the 1974 edition of the World Meteorological Organization Manual on Codes, Number 306, Volume 1, International Codes.

CODE FIGURE	DESCRIPTIVE TERMS	HEIGHT* IN METERS
0	Calm (glassy)	0
1	Calm (rippled)	0-0.1
2	Smooth (wavelets)	0.1- 0.5
3	Slight	0.5- 1.25
4	Moderate	1.25- 2.5
5	Rough	2.5- 4
6	Very rough	4-6
7	High	6-9
8	Very high	9-14
9	Phenomenal	Over 14

NOTES:

*These values refer to well-developed wind waves of the open sea. While priority shall be given to the descriptive terms, these height values may be used for guidance by the observer when reporting the total state of agitation of the sea resulting from various factors such as wind, swell, currents, angle between swell and wind, etc.

The exact bounding height shall be assigned for the lower code figure, e.g., a height of 4 meters is coded as 5.

Water and Air Temperature. Due to the danger of icing, water and air temperatures must conform to these minimums:

TYPE WATER	WATER TEMPERATURE	AIR TEMPERATURE
Salt	+18°F (-8°C)	+26°F (-3°C)
Fresh	+35°F (+2°C)	+35°F (+2°C)
Brackish	+30°F (-1°C)	+35°F (+2°C)

Altitude and Air Temperatures. Additions to the length of a water LZ due to high altitudes and extreme temperatures are also required and applied in the same manner as described for LZs on page 37.

Approach and Takeoff Clearance. Water LZs require approach and takeoff clearances identical to those of land LZs and are based on the descent/ascent ratios of STOL and medium fixed-wing amphibious aircraft.

Marking. Visible light sources during darkness or panels in daylight are used to mark the limits of the landing area.

Markers may be positioned in boats or secured to flotation devices. If the markers are positioned in boats, they must be hand held, and the boats must maintain station position. Two persons are usually required in each boat: one to maintain station position and the other to signal. Station position may be maintained by alignment with shore lights or by azimuth directions to terrain features. If markers are attached to flotation devices, the flotation device must be anchored to prevent drifting. In deep or rough water, improvised sea anchors may be used.

Light sources will be at least 0.3 meter (1 foot) above the surface of the water to prevent waves from causing a blackout.

Display. LZ markings will be displayed for 4 minutes—beginning 2 minutes before until 2 minutes past the scheduled aircraft arrival time or until the aircraft completes touchdown and landing run.

Authentication and Identification. Authentication and identification procedures are the same as those described for land LZs on page 37.

Dimensions and Layout. Figures 7-4 and 7-5 explain how to lay out and mark the two standard water LZs used for STOL floatplanes and medium amphibious fixed-wing aircraft.

A safe area (cleared surface) must be added to each end of the LZ, a distance equal to 10 percent of the minimum length. These areas will never be less than 30 meters (98 feet) in length.

A safe taxi area free of all surface obstructions is required along the left-hand side of the landing area.

The marking pattern outlining the limits of the LZ consists of five marker stations for both STOL and medium aircraft.

Stations A and E always mark the downwind end and provide the entrance "gate" for aircraft approach. These stations also represent the desired touchdown point.

Station B is the RCL marker/boat; it also is the offload/load point and represents the very last point at which the aircraft can touchdown and still complete a safe landing.

Stations C and D mark the upwind extreme of the landing area.

Concept of Operations. The LZ marking display is extinguished as soon as the aircraft has landed.

The aircraft turns to the left following the landing run and taxis back to the vicinity of the RCL boat at station B to pick up/offload personnel/cargo.

The RCL guides the aircraft to his position by shining a continuous light beam in the direction of the taxiing aircraft. Care must be taken not to blind the pilot with this light. The RCL marks his position with a continuous light beam aimed at the waterline of the aircraft during the entire operation.

The aircrew is given any information that will aid in the takeoff after the offloading/loading is completed. The RCL boat then moves to a safe vantage point. The RCL directs the LZ be illuminated and signals the pilot all clear for takeoff by flashing his light toward the waterline in front of the aircraft.

The LZ display is extinguished as soon as the aircraft is airborne.

The aircraft pilot will not land when—

There is a lack of or improper identification/authentication received from the LZ.

An abort signal is given by the RCL, e.g., extinguishing the LZ markings.

Pickup Procedures (STOL Aircraft). The rendezvous may be made faster if the RCL uses a powerboat. The pilot will hold the aircraft into the wind at minimum speed and let the RCL boat maneuver into position, or—

The RCL boat will remain stationary at marker station B. The pilot will taxi the aircraft 15 to 30 meters (50 to 100 feet) from the boat using the circle approach. A buoyant dragline will then be released from the left door.

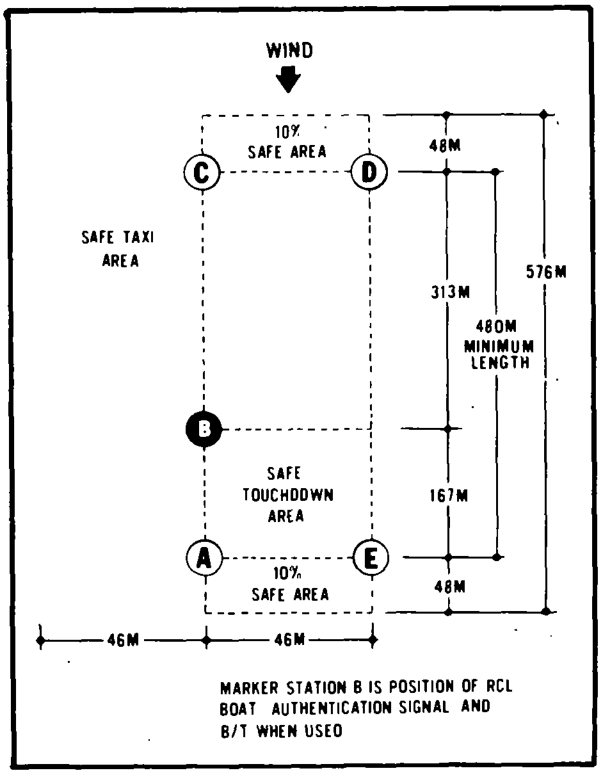


Figure 7-4. Water LZ (STOL aircraft).

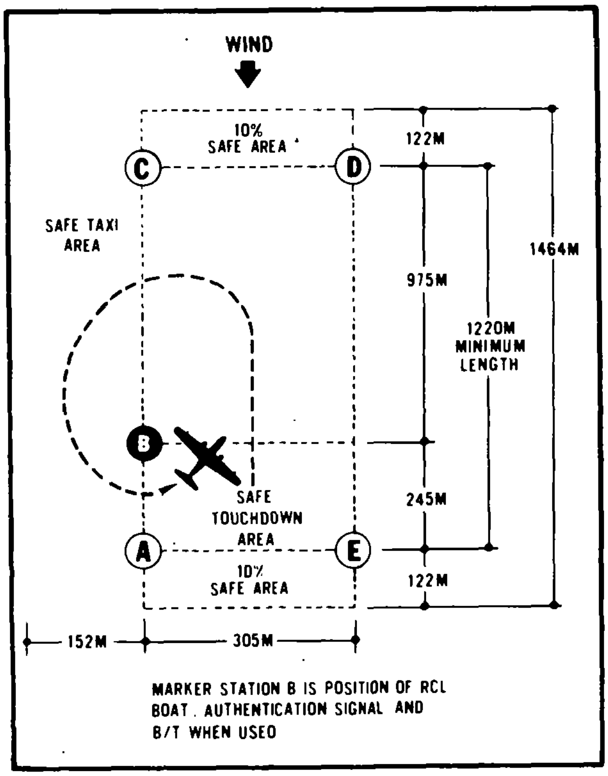


Figure 7-5. Water LZ (medium aircraft).

The dragline is approximately 19 meters (60 feet) long and has a flotation device attached to its end. The flotation device is equipped with a small marker light for night operations.

The aircraft is taxied to the left around the RCL boat to position the dragline close enough to be secured.

The RCL will shine his light toward the aircraft at all times to permit the pilot to position the dragline and to keep a safe distance between the RCL boat and the propeller. If the pilot loses sight of the RCL light, he may turn on a landing light immediately and keep it directed downward toward the water.

The pilot will continue a left turn when the dragline has been secured to the RCL boat. Personnel will pull and secure the boat alongside the left float. Personnel and cargo will be offloaded/loaded.

The boat must not be allowed to drift forward of the aircraft door where it could be struck by the propeller. The boat will be backed off and moved away from the aircraft once loading/offloading is completed.

Pickup Procedures (Medium Aircraft). The RCL boat will remain stationary during the operation. The pilot will taxi the aircraft 15 to 30 meters (50 to 100 feet) from the boat. A buoyant dragline will then be released from the left door.

The dragline is approximately 45 meters (150 feet) long and has three flotation devices attached as follows: one about 15 meters (50 feet) from the aircraft, a second at midpoint, and a third on the extreme end of the line. The flotation devices are equipped with small marker lights for night operations.

The aircraft is taxied to the left around the RCL boat to position the dragline close enough to be secured. Once the line is secured to the boat, personnel in the boat will not attempt to pull on the line because of the danger of swamping the boat. The aircrew will then pull the boat to the door of the aircraft.

Should the boat drift past the aircraft door toward the running engine, all personnel must immediately abandon the boat when it passes under the trailing edge of the wing.

Outgoing personnel/cargo will be loaded first. The RCL boat will be backed off and moved away from the aircraft when the operation is completed.

SNOW LANDING ZONES

The procedures for ski-plane operations described below apply only to STOL-type aircraft equipped with wheel or spring skis.

Almost any snow-covered field or frozen lake of the proper size will make acceptable ski LZs.

The minimum ice thickness for a ski landing is 48 centimeters (19 inches).

The minimum snow depth on ice is 3 centimeters (1 inch) and 10 centimeters (4 inches) on a hard surface.

The RCL is responsible for determining that these minimums exist. If these minimums do not exist, the RCL will abort the operation.

The ski-plane approach and takeoff clearances are identical to those of land LZs and are based on the same descent/ascent ratios.

Depth perception is usually very poor during landings on a large snow-covered surface. Small bushes may be used to augment the marking pattern to assist pilot depth perception.

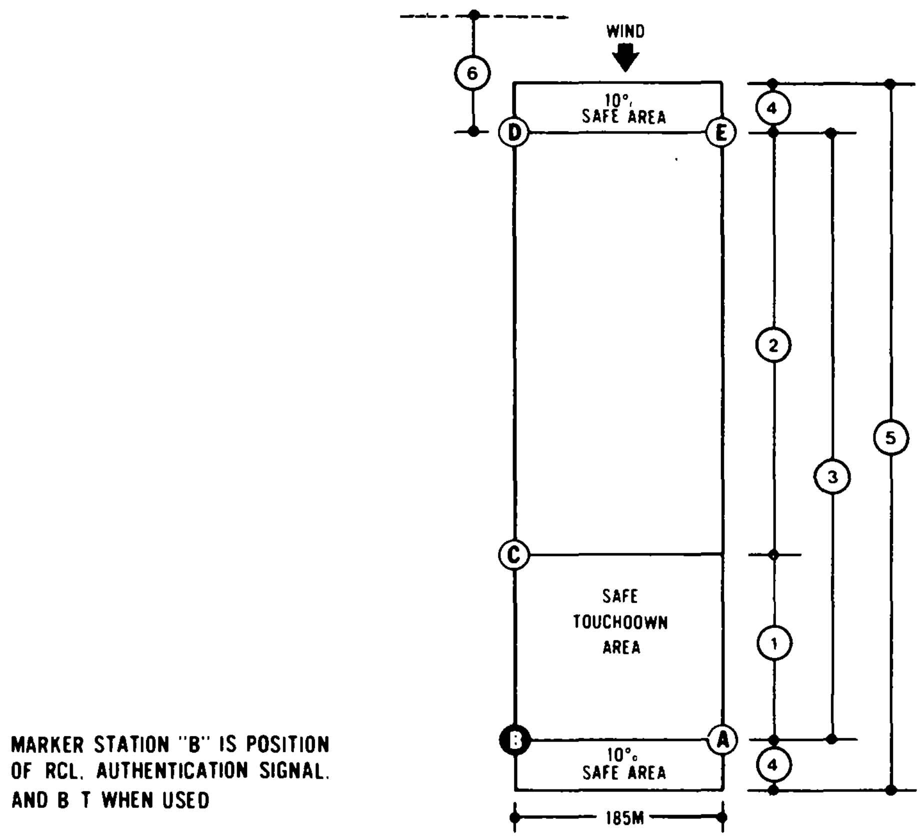
The maximum crosswind velocity for a landing/takeoff on skis is 10 knots (18.5 kilometers or 11.5 miles per hour).

More power is required to start the aircraft moving while on skis. This power may be the maximum available if the skis are slightly frozen to the snow.

Standard marking, display, and authentication procedures used are the same as those described for land LZs (STOL and medium aircraft).

It should be noted that the takeoff and landing distances for the wheel/ski-plane operating on snow will vary according to snow conditions, which are difficult to define. Figure 7-6 shows the minimum dimensions required for a typical snow LZ. These minimum dimensions depend on:

Snow and surface conditions.
Weather.
Weight of aircraft.



ALTITUDE	SNOW CONDITION	DISTANCE (meters)					
		1	2	3	4	5	6
SEA LEVEL	SLIPPERY	535	1.070	1.605	160	1.925	165
	DRY	307	613	920	92	1.104	165
4.500 FT ASL	SLIPPERY	550	1.100	1.650	165	1.980	165
	DRY	320	640	960	96	1.152	165

Required distance, both ends, for aircraft to clear 15M obstacle

Figure 7-6. Snow LZ (STOL aircraft).

General. Helicopters may be used to support SF missions—UW, SO, or FID—by air-dropping, air-landing, or hovering to accomplish infiltration, exfiltration, and resupply. People can be deployed or recovered using such techniques as the STABO system, rappelling, the special patrol insertion/extraction (SPIE) system, or other similar techniques/devices. The new family of helicopters, the UTTAS especially, has the potential and capability to further enhance operations.

Alternate LZs may be needed because of enemy action, unfavorable terrain, changes in the mission, or supply problems. They are chosen to support the mission.

The following selection criteria and dimensions of helicopter LZs for night and day operations are in agreement with the unclassified NATO Standardization Agreement (STANAG) 3597, Helicopter Tactical or Non-permanent Landing Sites, with Annex A, Helicopter Landing Points. This STANAG gives the ideal criteria. Reduced criteria may sometimes be accepted. The ultimate decision will rest with the supporting helicopter unit. LZ dimensions may require alteration in the future as new helicopters are introduced.

Selection Criteria. The Special Forces commander must know how to select a helicopter LZ that best supports his mission. A helicopter requires a relatively level clearing at least 20 to 75 meters (65 to 246 feet) in diameter for landing. The LZ size depends on the type of helicopter used, the nature of the load, and the climatic conditions. The commander selects an LZ using maps, aerial photographs, or actual ground reconnaissance, and he will consider the following factors:

- Clearing. Generally, a helicopter will require more usable landing area at night than during the day. To insure a safe landing, solid obstacles and inflammable and loose materials that could cause damage to the rotor blades, turbine engines, or underside of the fuselage must be cleared. The term "cleared to ground level" is used to indicate this. It would not, for instance, be necessary to clear grass up to 0.3 meters (1 foot) high that might cover a level field unless a fire risk existed. If ground obstructions cannot be cleared, the helicopter may hover above the LZ.

- Surfaces. The LZ surface must be solid enough to bear the weight of the helicopter. The term "hard surface" is used to indicate this. Loose material that could be blown up by the rotors must be cleared. As rotor wash on dusty, sandy, or snow-covered surfaces may cause loss of visual ground contact, consideration must be given to stabilizing or covering these surfaces by an agreed method. Snow should be packed or removed to reveal hazardous objects and to reduce the proportion of blowing snow; a marker is essential to provide a visual reference for pilot depth perception and to reduce the effect of whiteout.

- Ground Slope. The ground should be relatively level and the slope should not exceed 7 degrees if the helicopter is to land safely; however, helicopters can terminate at a hover over ground slopes exceeding 15 degrees to load/offload personnel/supplies. Landings should be upslope when the ground slope is less than 7 degrees. In areas where the ground slope is from 7 to 15 degrees, helicopters must land and park sideslope.

- Altitude Density. The density is determined by altitude, temperature, and humidity. For planning purposes, as altitude density increases, the size of the LZ may have to be increased proportionately. High, hot, and dry conditions at a given LZ will decrease the lift capability of a helicopter using that site. Detailed information on the effects of air density and temperature at specific operating altitudes is contained in appropriate aircraft

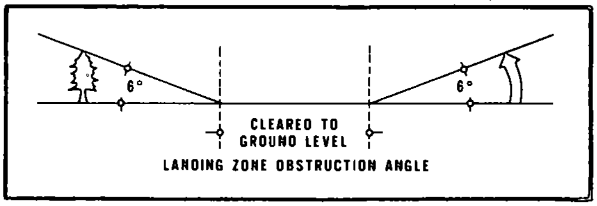


Figure 7-7. Landing zone obstruction angle.

technical manuals and should be referenced during pre-mission planning.

• Approaches. Ideally, there should be obstruction-free approach and exit paths into the prevailing wind; in conditions of light wind by day a single approach/exit is acceptable. However, if there is only one satisfactory approach path due to obstacles or the tactical situation, or if maximum use of available landing area is desired, most helicopters can land with a crosswind (10 knots or less) or a tailwind (5 knots or less). The same considerations apply to departure from the LZ. The approach path should be over the lowest obstacles and into the wind, especially at night. The normal maximum obstruction angle, measured from the outer edge of the area cleared to ground level, should be 6 degrees or a ratio of 1 to 10 (1 unit of vertical clearance to 10 units of horizontal clearance). For example, if the approach or departure path is directly over a tree 10 meters (33 feet) high, the LZ would require 100 meters (328 feet) of horizontal clearance from the tree. Greater obstruction angles may be acceptable, but this must be confirmed by the supporting helicopter unit.

• Prevailing Winds. When considering the approach/departure paths and prevailing wind, the more important factor is the best approach/departure path unless the crosswind velocity exceeds 10 knots. The ability to land crosswind or downwind will vary, depending on the type helicopter. Smaller aircraft can accept less crosswind or tailwind than larger, more powerful aircraft.

• Security. The LZ must facilitate helicopter operations and offer some degree of security from enemy observation and direct fire. Good LZs will allow safe helicopter operations without exposing personnel or the aircraft to unnecessary risks.

Security should normally be established around the entire perimeter of the LZ. Fire team sectors may be established or, if necessary, two-man positions may be established to provide all-round security. Elements must be shifted after the initial flight(s) to maintain security.

To assist in security, supporting fires should be planned and coordinated, and Claymore mines should be positioned. Automatic weapons must be carefully positioned to insure maximum effectiveness. Security elements must remain alert. Care must be taken to insure all personnel remain hidden so that the location of the LZ is not compromised.

Dimensions. The criteria depicted represent the minimum dimensions of helicopter LZs. Helicopter units will designate size 1, 2, 3, or 4 circular LZs or size 3 or 4 rectangular LZs to be used for specific operations. Numerous considerations, such as helicopter type, unit proficiency, nature of loads, climatic conditions, and day or night operations, may apply to the size of LZs used. (See figure 7-8.)

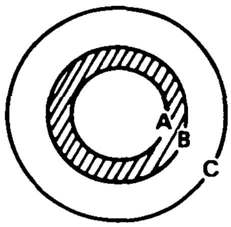
Marking. Visual ground marking for helicopter LZs provide the wind direction, identification, direction of approach, and the designated touchdown area. Visible light sources are used at night and panels in daylight, as prescribed in the CEOI.

In order not to disclose the LZ to the enemy, markings should be kept to a minimum and displayed only when required. They should be firmly secured or removed before the helicopter hovers so they will not blow into the rotors or engine intakes.

LZ markers should be adjusted for existing winds. When surface winds are a factor (10 knots or more for infiltration under load and 15 knots or more for exfiltration under load), the markers will be positioned to insure the landing is made into the wind, regardless of the approach track established in the mission request and confirmation message. The helicopter will make its initial approach to the LZ along the designated track and, if necessary, will adjust to the final approach track indicated by the LZ markings. The following diagram illustrates the helicopter LZ "Y" marking pattern used for night operations:

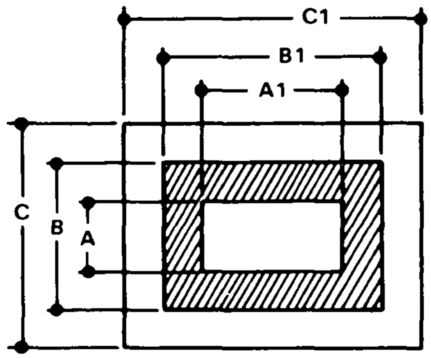
Display. LZ markings will be displayed for 4 minutes—beginning 2 minutes before until 2 minutes past the scheduled arrival time or

CIRCULAR LANDING ZONES



SIZE LZ	DISTANCE IN METERS		
	A	B	C
1	6	14	25
2	11	20	37
3	15	35	50
4	15	60	100

RECTANGULAR LANDING ZONES



SIZE LZ	DIAMETER IN METERS					
	A	A1	B	B1	C	C1
3	10	15	20	35	35	50
4	10	15	20	60	50	100

NOTE: Approach/exit will be made on the longitudinal axis of the clearing

LEGEND

- Hard surface
- Cleared to ground level
- Free of obstructions over 0 6 meters high.

Figure 7-8. Landing zone dimensions.

until offloading/onloading is completed and the helicopter departs.

Authentication. Authentication procedures/code signals will be prescribed in the CEOI; however—

Arrival at the LZ within the specified time block on or near the designated approach track will serve to authenticate the mission aircraft.

At night, the RCL displays the proper authentication code signal by flashing a green light (or other designated signal) aimed toward the approach track of the oncoming aircraft.

The RCL displays a continuous green light aimed at the underside of the fuselage to assist pilot ground orientation when the helicopter is on its final approach.

In daylight, a distinctive panel or smoke signal is displayed. When smoke is used, it should be positioned so that the prevailing wind will not cause the smoke to obscure the LZ.

Improvised Landing Platforms/Pads. Under ideal conditions and provided the necessary clearance for the rotors exists, a helicopter can land on ground slightly larger than the spread of its landing gear.

Landing platforms may be built in swampy or marshy areas using locally available materials (figure 7-10). Such LZs normally are used for daylight operations only. The size of the clearing and the approach and takeoff requirements for this type of LZ are discussed in Helicopter Landing Zones, page 46 , with the following additional requirements for the platform:

The platform should be large enough to accommodate the spread of the landing gear plus 3 meters (10 feet).

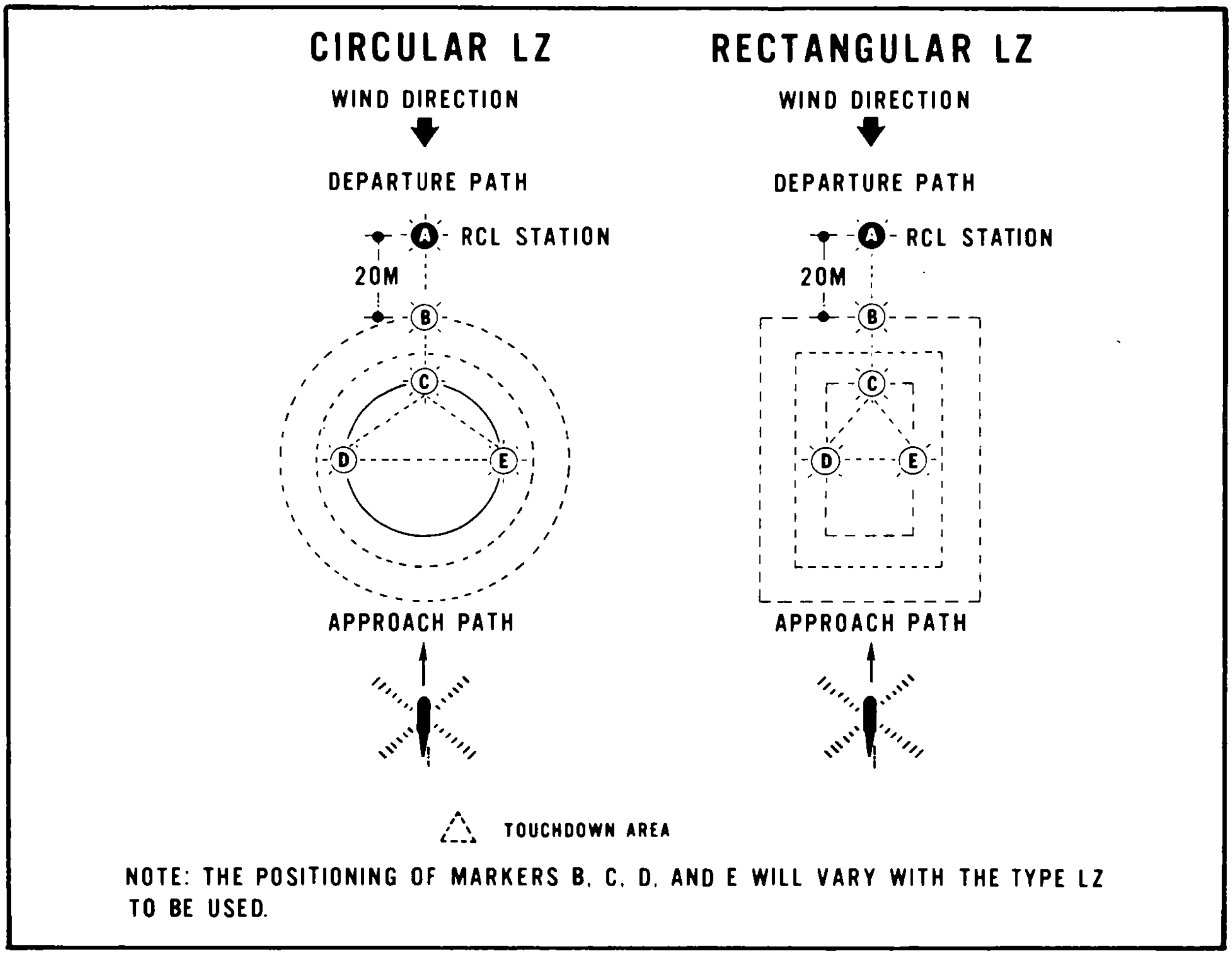


Figure 7-9. Landing zone "Y" marking patterns (night markings).

The platform should be capable of supporting the weight of the aircraft.

The platform should be of firm construction so that it will not move when the helicopter touches down and rolls slightly forward.

The platform should be level.

If logs or bamboo poles are used, they should be emplaced in such a manner that the top layer of poles is at right angles to the touchdown direction.

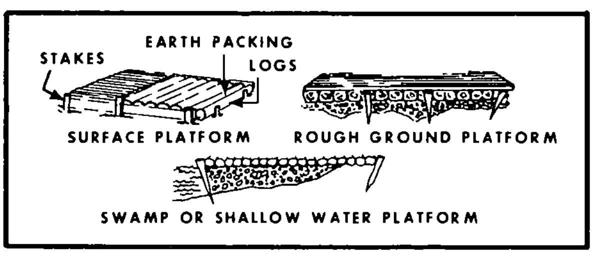


Figure 7-10. Examples of platform LZs for rotary-wing aircraft.

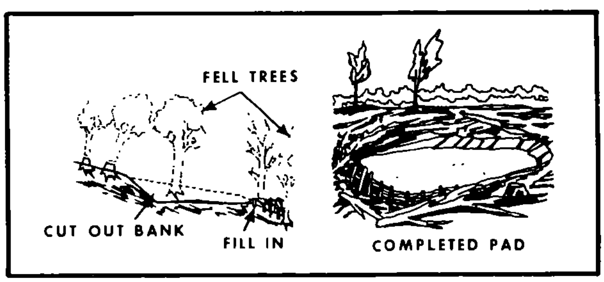


Figure 7-11. Preparing landing pads for rotary-wing aircraft in mountainous terrain.

Landing pads can also be prepared in mountainous terrain or on hillsides by cutting and filling (figure 7-11). Caution should be exercised to insure there is adequate clearance for the rotors.

Helicopters with a flotation capability present no problem in landing zone preparation. They are equipped to land in water of any depth. However, helicopters can land in water without the use of special flotation equipment provided—

The water depth does not exceed 30 centimeters (12 inches).

A firm bottom, such as gravel or sand, exists.

MESSAGE PICKUP ZONES

The STOL aircraft has been used successfully for message pickups. The procedures and techniques described below will apply for message pickup operations when using STOL aircraft.

Site Selection. The selection of a PZ must satisfy both ground and aircraft safety requirements. The PZ must be accessible and secure in order to insure a safe pickup. The pilot must be able to locate, identify, and authenticate the PZ. Ground and air selection considerations are identical to those used for DZs and LZs; however—

Flat or rolling terrain is best. In mountainous areas, use flat ridges or level plateaus. Stay away from small valleys or pockets completely surrounded by hills.

Straight sections of road are acceptable provided there are no obstacles and security permits their use.

The PZ surface must be reasonably level and vegetation should not exceed 0.3 meter (1 foot).

An area extending 24 meters (79 feet) from both edges of the PZ should be clear of obstacles that exceed 1 meter (3 feet) in height.

The surrounding area must be relatively free of obstacles to allow a safe flight during the approach and departure and to prevent entanglement of the aircraft pickup line/hook.

Night message pickup operations are conducted only during the full moon phase to allow the pilot sufficient light to distinguish terrain features.

Shape and Size. Rectangular- or circular-shaped PZs are preferred. The minimum PZ size is 23 meters (75 feet) wide by 91 meters (331 feet) long.

Approach and Departure Clearance. To insure adequate mask clearance, approach and departure clearances are identical to those used by STOL fixed-wing aircraft on land LZs.

Marking. Visual ground markings for PZs provide wind direction, location of the message container, and visual terminal guidance for the pilot. PZ markers are the same as those used for DZs.

The marking pattern uses five markers arranged in the shape of a "Y" (similar to the helicopter "Y" LZ marking pattern). The "Y" will be aligned with the stem pointing into the wind.

The stem is formed by three markers—A, B, and C. The distance between markers is 20 meters (65 feet).

The open end of the "Y" is formed by markers D and E that are positioned 26 meters (85 feet) apart and on a line perpendicular to the stem, 26 meters (85 feet) from marker C. This indicates the downwind or approach end.

Station C is the location of the message container. The message pickup apparatus is positioned approximately 2 to 3 meters (6 to 10 feet) forward (downwind) from this station.

Station B assists in directional alignment.

Station A marks the upwind extreme and is the location of the RCL. The authentication code signal is flashed from this station.

Display and Authentication. Display and authentication procedures are similar to

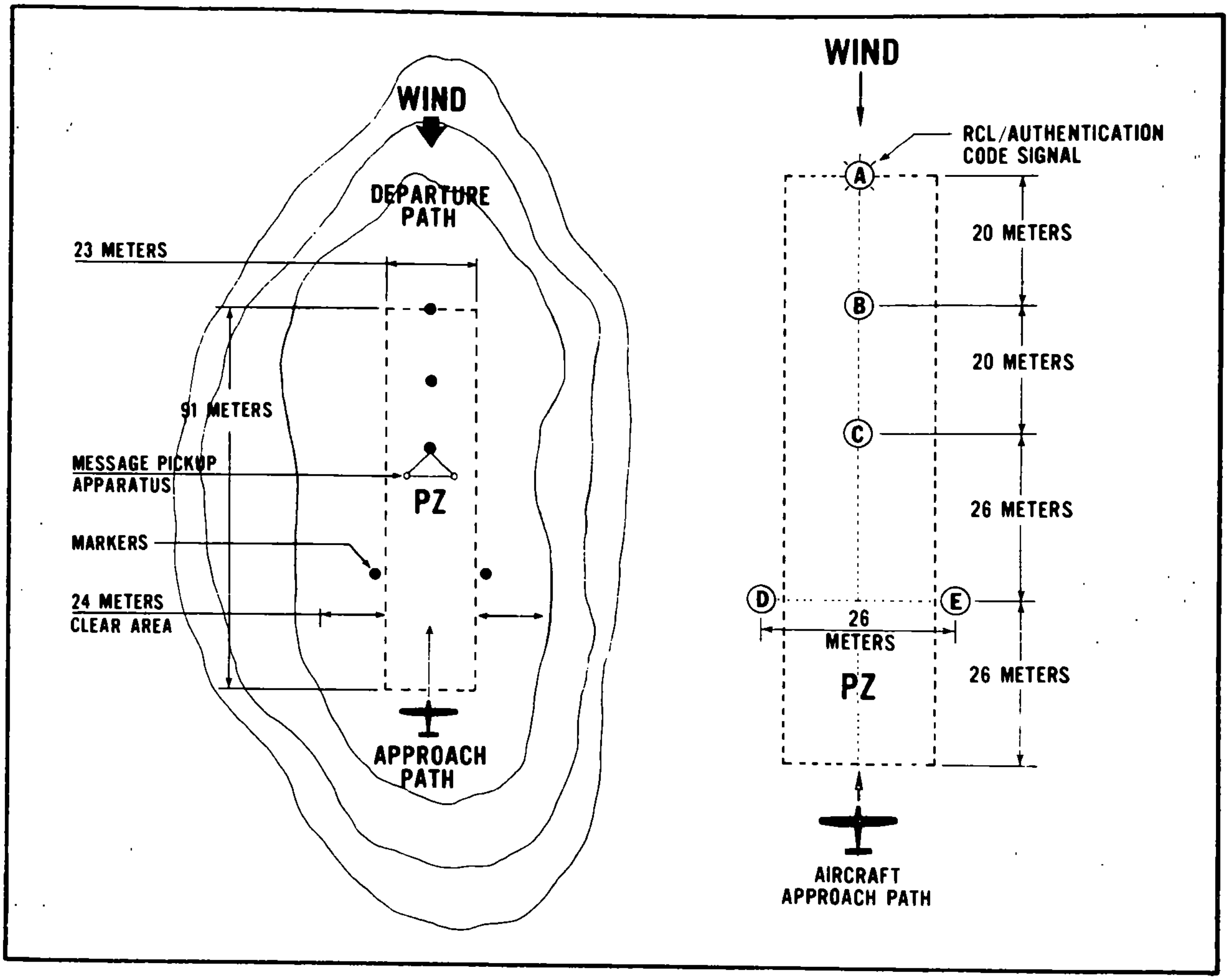


Figure 7-12. Rectangular PZs.

those used for LZs and will be prescribed in the CEOI.

Message Pickup Apparatus.

- The message pickup apparatus consists of:
  - Two poles 5 meters (16 feet) long.
  - Visual markers.
  - Message container.
  - Message pickup line.
- The aircraft pickup line consists of:
  - Pickup line.
  - Grapnel hook.
  - A 5-pound weight.
  - Visual markers.
- To set up the message pickup apparatus—

Select two poles 5 meters (16 feet) long that are flexible enough to allow collapsing in case of aircraft near-misses, but strong enough to support the message pickup line and visual markers. (Deviations in length must be reported to the SFOB/FOB.)

Choose visual markers to be used. At night, this is a visible light source. In daylight, this is a bright-colored tape, cloth, or paper of sharp contrast to the background colors.

Position the message container; it will not weigh more than 5 pounds. At night, place the container approximately 2 to 3 meters (6 to 10 feet) forward (downwind) from the light source. In daylight, place it on marker station C panel.

Take the message pickup line (#550 cotton cord or nylon equivalent, e.g.,

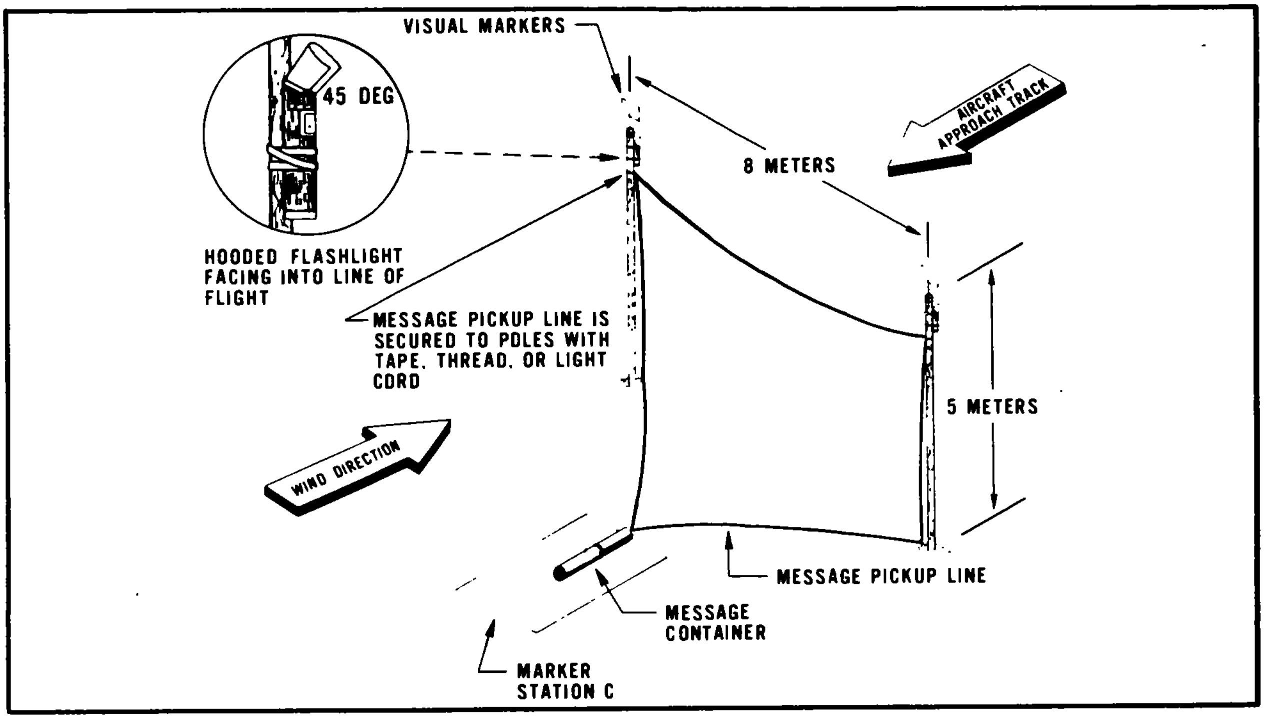


Figure 7-13. Message pickup apparatus.

parachute suspension line) that measures approximately 25 meters (82 feet) and tie both ends to the message container.

Place the two poles 8 meters (26 feet) apart and equidistant on each side of the positioned message container. The base of the poles should be about 3 meters (10 feet) downwind from the message container.

Attach visual markers as close as possible to the top of the poles.

Play out and route the message pickup line to the base of each pole and along the inside of the pole to about 0.3 meter (1 foot) from the top.

Use thread, tape, light cord, or nails/ projections to lightly fasten message pickup line near top and bottom of each pole. This action is to prevent the message pickup line from being blown off or shaken off but to allow quick breakaway upon pickup.

Raise the poles and implace in ground or hand hold for pickup. Insure message container is placed as indicated on page 51, and the poles are perpendicular (broadside) to the wind. The aircraft will fly into the wind above and between the poles.

- To assemble the aircraft pickup line—

Select a pickup line slightly smaller than a rappeling rope that is about 21 meters (69 feet) long.

Secure a 5-pound weight to one end of the line. This prevents the line/hook from getting into the slipstream and hitting the aircraft's fuselage.

Secure a grapnel hook 30 to 45 centimeters (12 to 18 inches) from the end of the line.

Mark the aircraft pickup line midway between the weight and the hook for identification by the ground party. Use a visible light source for night operations or bright-colored tape for daylight operations.

Mark or tape the line 8 meters (26 feet) from the hook. This mark aids the operator in judging hook location.

Concept of Operations. Prior to departure, all equipment, including a complete spare pickup line assembly, is stored safely aboard the aircraft, and the rear door is removed.

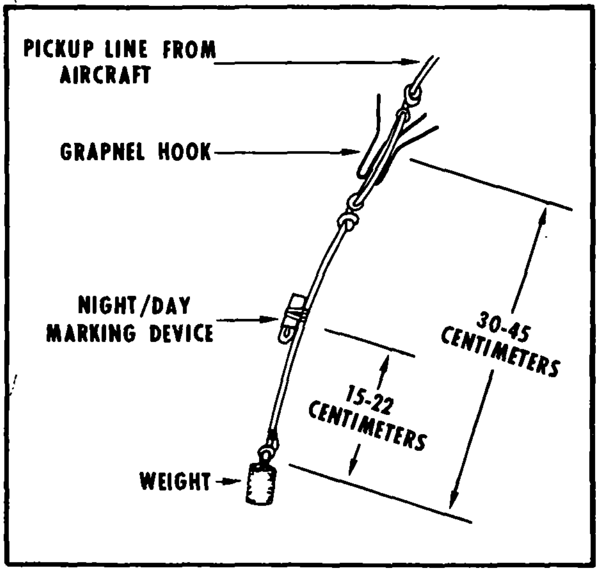


Figure 7-14. Aircraft pickup line assembly.

The hook operator must wear a safety belt and gloves. The pickup line is not attached to the aircraft but is hand held by the operator. A bight is formed in the pickup line to allow the line to be pulled out of the operator's hand should the hook engage an obstacle.

The pilot will fly low into the open end of the "Y" pattern (into the wind).

The hook operator feeds the pickup line out of the aircraft until the 8-meter (26-foot) mark is reached, and manipulates the line to clear obstacles, maintaining a 1- to 2-meter (3- to 6-foot) terrain clearance.

The fastening tape/thread breaks away and the message container is borne aloft when the hook engages the message pickup line suspended between two poles. The operator then reels in the container by hand.

The pilot then makes his climbout.

If the pickup is not successful on the first pass, pickup attempts will be repeated unless the RCL signals an abort by removing the marking pattern.

These same procedures and techniques can be applied for message pickup from a water PZ; however, the message container must be floatable and watertight.

RECOVERY ZONES

General. The presence of Special Forces elements operating within UWOAs enhances the capability for search and rescue (SAR) and recovery efforts. However, uncoordinated SAR efforts within UWOAs could compromise the Special Forces mission; therefore, SAR operations must be coordinated between the JUWTF and the Air Force Rescue Coordination Center (RCC).

Special Forces operational missions may include recovery and extraction of—

Seriously ill or injured US personnel.

Guides or assets who can brief operational elements and reinfiltrate with them.

Priority and valuable cargo/equipment that might normally require days or weeks of hazardous travel to bring out from remote areas.

Downed aircrews.

Bodies subject to possible desecration, such as heroes and martyrs.

Personnel engaged in underwater operations against selected targets following mission accomplishment.

Prisoners who possess useful information.

Various recovery techniques are discussed below.

Fulton Surface-to-Air Recovery (STAR) System.

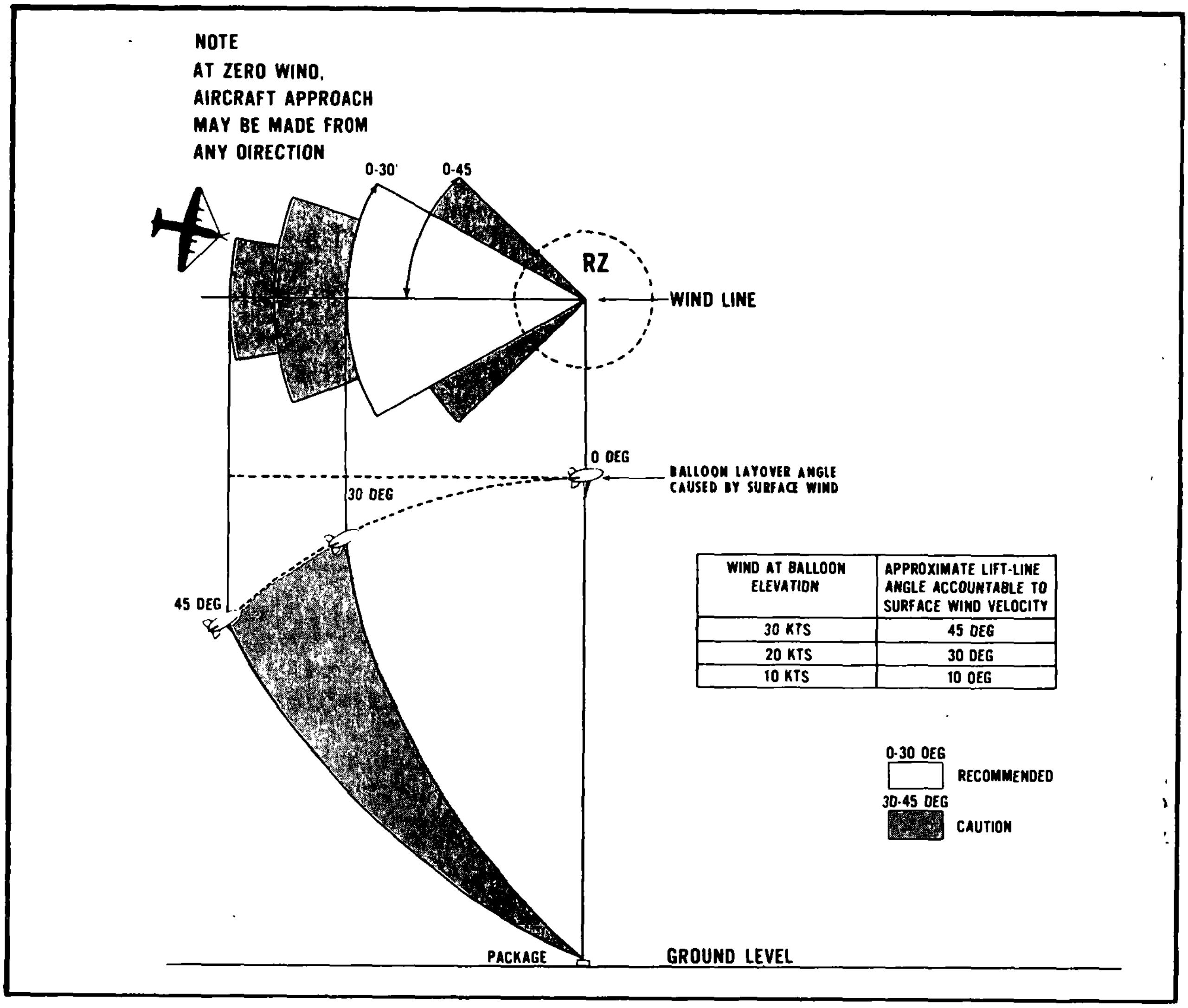
- General.

The Fulton STAR system uses special equipment in conjunction with specially equipped Combat Talon to conduct day/night recoveries from land or water surfaces. The system is capable of two-man pickups and recovery of sensitive equipment items.

A recovery request for personnel/equipment will be transmitted by the operational element to the SFOB/FOB who, in turn, will pass it on to COMJUWTF for approval. COMJUWTF will determine the method to be used.

If the STAR system is to be used, the recovery will be performed as described below, and as amplified by applicable service operational directives.

- Recovery Zone.



WIND AT BALLOON ELEVATION	APPROXIMATE LIFT-LINE ANGLE ACCOUNTABLE TO SURFACE WIND VELOCITY
30 KTS	45 DEG
20 KTS	30 DEG
10 KTS	10 DEG

Figure 7-15. Recovery zone and wind limitations.

The RZ should be no less than 30 meters (98 feet) in diameter and contain no obstacles exceeding 2 meters (6 feet) in height. Obstacle height outside the perimeter of this circle must not be greater than 15 meters (49 feet). Smaller areas can be used in emergency situations.

The RZ is marked by the balloon that is contained in the recovery kit.

Display and authentication procedures are prescribed in the CEOI.

Surface-to-air recovery can be made under varying conditions; however, the system's capabilities and limitations must be understood.

Recovery may only be made when the balloon layover angle caused by surface wind is 30 degrees or less in relation to the vertical plane (figure 7-15).

Recovery should normally be accomplished when the wind velocity is no more than 20 knots (37 kilometers or 23 miles per hour) at balloon altitude. Under emergency conditions and with extreme caution, recovery may be attempted with a maximum wind velocity of 30 knots (56 kilometers or 35 miles per hour). Under these conditions, the balloon layover angle is approximately 45 degrees relative to the vertical plane and therefore reduces the chances for success.

The balloon is limited to use at temperatures between -65 to +120 degrees F (-54 to +49 degrees C).

The maximum extraction weight is 250 pounds for a one-man line from sea level to 3,048 meters (10,000 feet) mean sea level (MSL) and 500 pounds for a two-man line from sea level to 1,829 meters (6,000 feet) MSL.

- Recovery Kit.

STAR recovery kits can be configured for airdrop from fighter-type aircraft using the CTU-2/A container. Also, an A-7 cargo sling can be included in the kit for recovering equipment/material. Kits can also be packaged and rigged in waterproof containers and equipped with a rubber raft for water drops.

The recovery kit consists of two air-droppable containers of heavy duck material and nylon webbing. Each container measures 0.2 meters (2 feet) square by 1.2 meters (4 feet) long and weighs 250 pounds. The kit includes:

Two fiberglass bottles filled with 650 cubic feet of helium.

One polyethylene, dirigible-shaped balloon 2.4 meters (8 feet) in diameter by 7 meters (23 feet) long, with a valve that seals automatically when inflation is completed. The balloon is attached to the lift line by breakaway extension cords.

One 500-foot tubular nylon lift line (4,000, 5,000, or 6,000-pound test depending on load to be picked up).

Four cerise-colored flags attached to the lift line. The first flag is 15 meters (50 feet) below the balloon and serves as the aircraft contact point. The remaining flags are spaced at 7.7-meter (25-foot) intervals. For night operations the lift line is equipped with stroboscopic lights that are positioned as the flags.

An all-weather, nylon coverall suit with zippered front, one chest strap with integral self-adjusting harness to fit any size, and a sheepskin protective hood.

A remote control unit for use by the exfiltrator to activate the stroboscopic lights at night. (The aircraft is also equipped with a remote control unit on the instrument panel that permits the pilot to activate the lights until intercept is made with the liftline.)

CAUTION: This item seldom, if ever, works properly.

An animated cartoon instruction board for assembly.

- Recovery Kit Airdrop Procedures. If a recovery kit has not been pre-positioned, one will have to be air-dropped following these procedures:

For land drops, the recovery kit is normally delivered from an altitude of 76 meters (250 feet) AGL using a mechanical sighting device. Normally, the approach will not be flown into the wind.

For water drops, the kit must not be dropped above 76 meters (250 feet) and the approach must be flown crosswind.

As an alternate method, land drops may be made using the CARP drop procedure; an operational element can also be inserted along with the kit, if necessary, from the standard personnel drop altitude.

There are no wind limitations for recovery kit drops; however, wind restrictions that apply for surface-to-air recovery should be considered. If winds are too high to complete the recovery, the kit should not be dropped.

When a recovery kit is to be air-dropped onto an RZ or another DZ, standard DZ markings are used provided the area is large enough and sufficient assets are available to set it up. If the DZ is small or only one person is available, it can be marked by a single, flashing light source/panel located in the center of the DZ. A DZ used for this purpose must be 185 meters (607 feet) in diameter. A DZ completely encircled by trees/obstacles should be used only as a last resort. The rules for normal reception site open quadrants will apply, if possible.

The kit will be dropped on the first pass and at the time specified in the mission request. The person/package will be recovered 20 minutes after the kit has been dropped unless specified otherwise in the mission confirmation message.

- Recovery Preparation.

After air-dropping the recovery kit, the aircraft will fly a 20-minute circular course. During this time—

> The person/package for recovery is readied, assisted by the Special Forces element/reception committee.
>
> The lift line is connected to the harness and a final equipment check is made.
>
> The balloon is plugged into the helium bottles, and the bottles are activated to inflate the balloon.
>
> The person sits down facing the approaching aircraft and releases the balloon. During night operations the strobe lights are activated.

In emergencies, you may be required to perform these operations alone. If so, select an area that is remote and inaccessible to ground interference. Remaining equipment may be cached for future pickup by the reception committee.

- Recovery.

On the return pass over the RZ/DZ, the pilot will attempt to make the intercept directly into the wind while approaching the balloon at an altitude of approximately 122 meters (400 feet).

STABO Extraction System, Personnel. Whenever environmental conditions and mission circumstances permit, the STABO extraction system is used for rapid pickup of one to three persons by helicopter. Personnel are extracted and moved, suspended on lines beneath the helicopter, to an area where the aircraft can land and safely pick them up.

The limitations and capabilities of the mission aircraft are the primary factors in

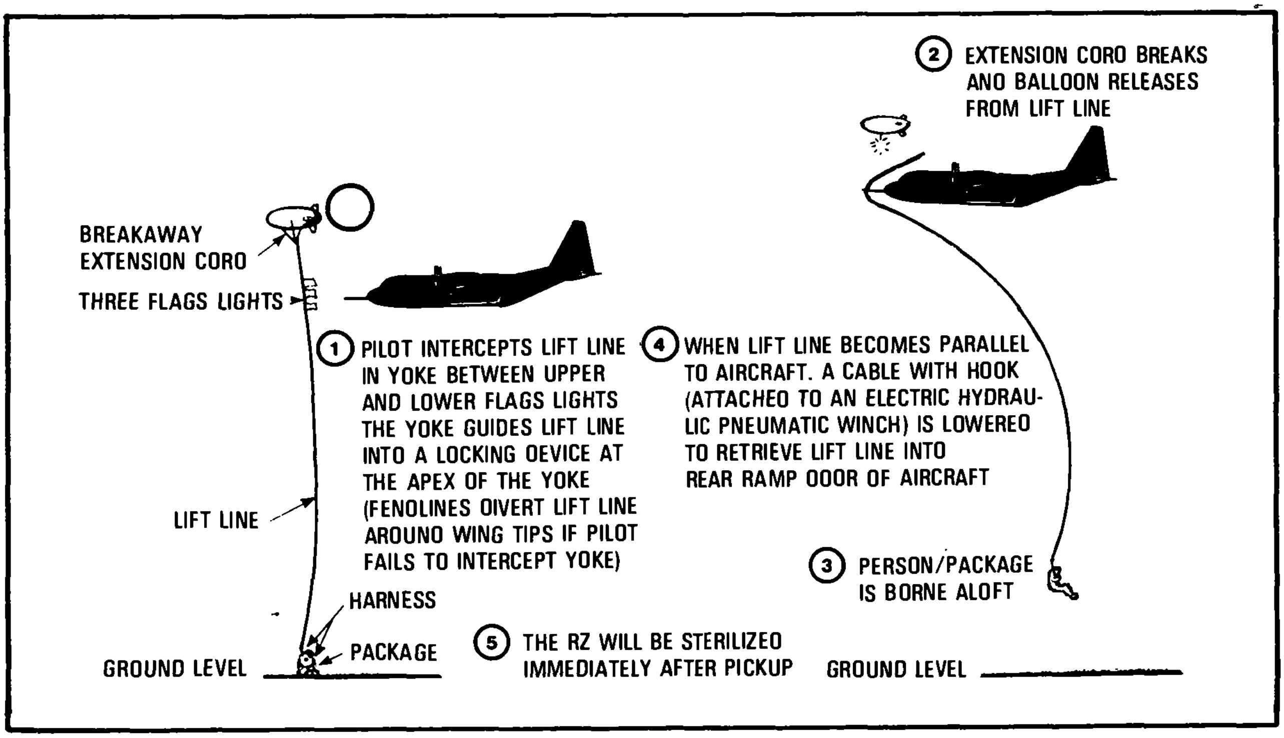


Figure 7-16. Recovery of person/package.

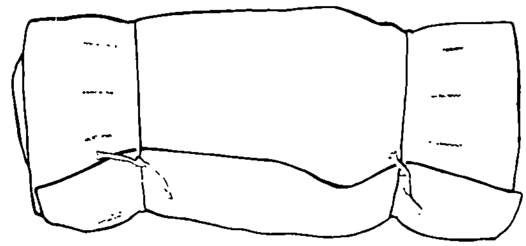
site selection. Site altitude and temperatures must be considered as they determine air density that affects the helicopter payload. There are no particular selection criteria for STABO extraction sites as any small clearing is ideal. Forested areas may be used but can be dangerous when extracting more than one person because the safety rope can become entangled in the foliage/branches.

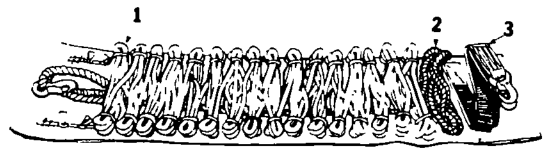
The extraction mission will be flown on the date-time group specified in the mission request unless specified otherwise in the mission confirmation message. Alternate pickup points/times should be designated.

The component parts of the STABO system are:

Deployment Bag. The deployment bag is made of cotton duck and is of the roll-type design. The bag, when packed, contains the suspension rope, bridle, and safety rope. The lower end of the bag contains a 10-pound weight that aids the deployment of the suspension rope from the helicopter.

Anchoring Device. The anchoring device, a multipart component, consists of the parts shown in figure 7-17b.


(Deployment bag closed and secured)



1. Suspension rope 2. Safety rope
3. Bridle

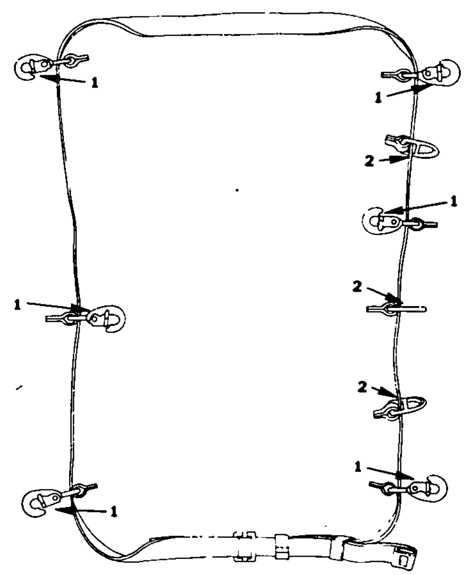
Figure 7-17a. Deployment bag.

The anchoring device web loop—a 4-meter (13-foot) long nylon web floor tiedown loop.

Six sliding connector snap hooks.

Appropriate number of sliding D-rings.

Three 87 3/4-inch nylon strap assemblies.

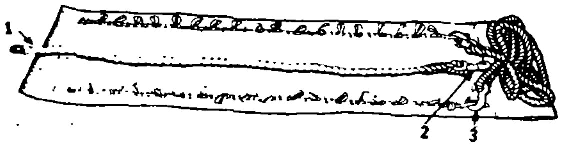


1. Snap hook 2. D-ring

Figure 7-17b. Anchoring device.

The sliding D-rings are placed on the web loop to provide an attachment point for the strap assemblies. The D-ring at the end of the strap assemblies provides an attachment point for the suspension ropes.

Suspension Rope. The suspension rope is 45 meters (147 feet) long and made of nylon. Each end of the rope is looped and spliced. A snaphook is attached to each rope end loop. The suspension rope is designed to connect onto the D-ring in the end of the strap assembly of the anchoring device while the opposite end is attached to the D-ring of the bridle.

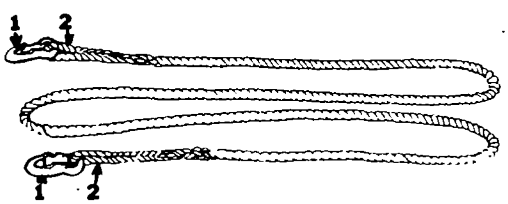


1. Suspension rope 2. Snap hook
3. Safety rope

Figure 7-17c. Suspension rope.

Safety Rope. The safety rope is 3.7 meters (12 feet) long and made of nylon. Each end of the rope is looped and spliced and a snaphook is attached to each loop. The safety rope is used when extracting two or three persons (see paragraph on multiple extraction, page 59, for its use).

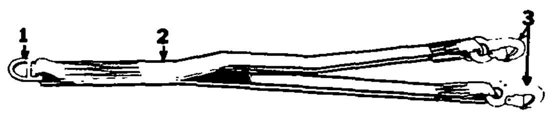
NOTE: Each deployment bag contains a safety rope; however, it is used only during multiple personnel extraction.



1. Snap hook 2. Spliced loop

Figure 7-17d. Safety rope.

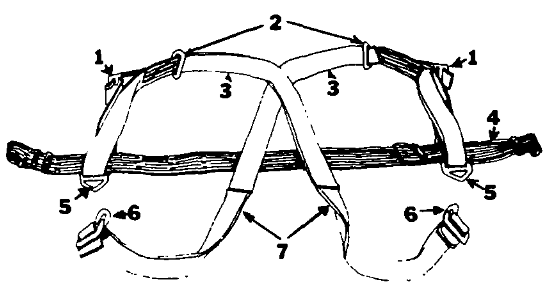
Bridle. The bridle is a V-shaped device made of nylon webbing with a D-ring on the single end and a snaphook in each of the running ends.



1. D-ring 2. Bridle body
3. Snap hook

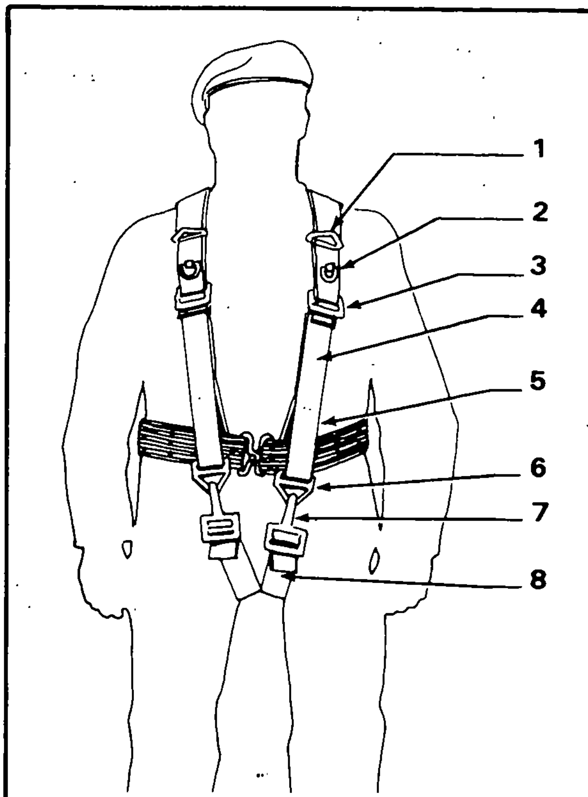
Figure 7-17e. Bridle.

Personnel Harness. The personnel harness is made of nylon webbing that is stitched to a standard medium- or large-sized pistol belt, and comes in small, medium, and large sizes.



1. Web adjuster
2. Lift V-ring
3. Harness shoulder strap
4. Web pistol belt
5. Legstrap connector V-ring
6. Adjustable snap hook
7. Legstrap

Figure 7-17f. Personnel harness.



1. Lift V-ring
2. Equipment attaching ring
3. Web adjuster
4. Harness strap
5. Harness strap loop
6. Connector V-ring
7. Adjuster snap hook
8. Legstrap

Figure 7-17g. Personnel harness on individual.

Multiple Extraction. Only one safety rope is used when a multiple extraction is conducted. The safety rope holds the individuals together and minimizes the effects of wind buffeting and oscillation during the extraction and subsequent flight.

For two persons: Pass the snaphook on each end of the safety rope through the harness strap loops of each individual, bring back over the outer loop, and snap securely to the rope.

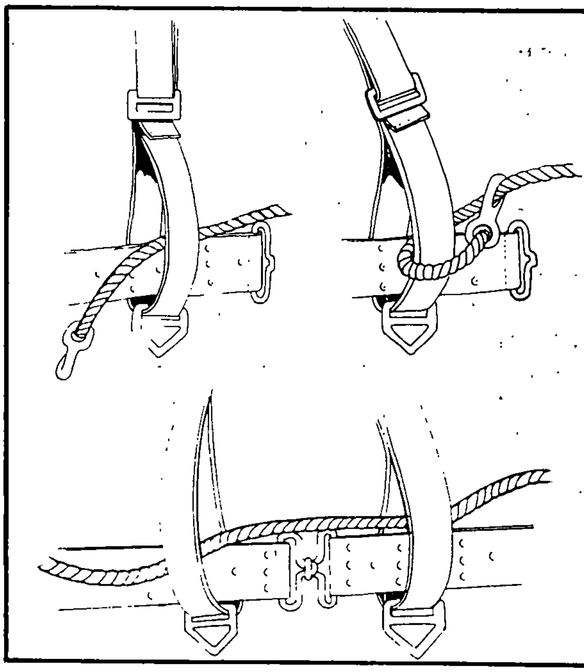


Figure 7-17h. Hookup for extraction.

For a third person: Pass one end of the safety rope through both harness strap loops of the person in the middle and then connect the safety rope to the other two persons as described above.

When the safety rope is properly rigged, it allows the middle person to move laterally between the two outboard persons. Each person is suspended by his own suspension rope from the aircraft, but they are connected together by the safety rope.

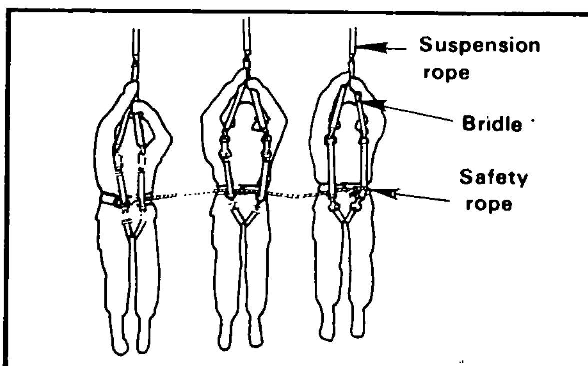


Figure 7-17i. Multiple extraction.

Concept of Operations.

As the helicopter approaches the extraction site, the aircrew opens the required number of deployment bags and attaches the snaphook of each suspension rope to the strap assembly of the anchoring device on the aircraft floor.

While hovering in position, the pilot orders the deployment bags to be dropped.

Personnel rigging must be completed prior to aircraft arrival. Check that the harness is worn and fastened properly and insure that the harness legstraps are drawn tight and placed correctly.

When the suspension rope is fully deployed, extract the bridle and connect each bridle snaphook to each of the harness lift V-rings. Then attach the suspension rope snaphook to the bridle D-ring.

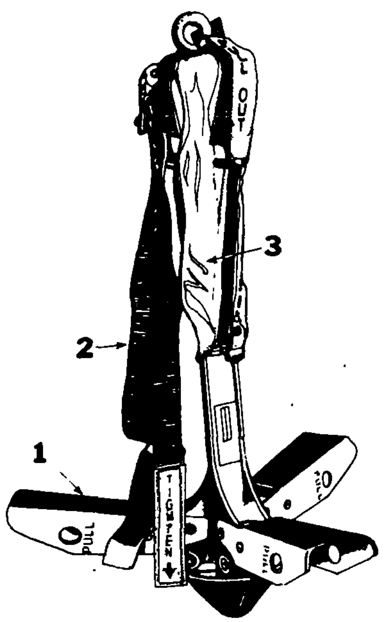
When extraction hookup is completed, signal the helicopter to lift off.

After liftoff, the helicopter flies to an area where a safe touchdown is possible. Suspended personnel are lowered to the ground, the helicopter sets down, and the personnel board the aircraft.

Normally, extended helicopter flights with suspended personnel are conducted at airspeeds that must not exceed 60 KIAS and with allowable banking turns of 40 degrees or less.

In emergencies, extended flights may be allowed at speeds that do not exceed 90 KIAS and with banking turns of 30 degrees or less.

Forest Penetrator (TM 55-4240-284-12/P) (figure 7-18). The forest penetrator is used by rescue and recovery units to retrieve personnel from areas in which helicopters cannot land. It attaches to the hook of the helicopter rescue hoist cable and can retrieve one to three persons at one time. It is basically a rescue seat assembly with folding blade seats and a weighted "nose" designed to pass freely through interlacing tree branches and



1. Seat Blades
2. Safety Straps
3. Safety Strap Cover

Capacity -	3 personnel
Maximum load -	600 pounds
Weight -	19.25 pounds
Length -	34 inches

Diameter with blades extended 26 inches

Figure 7-18. Forest penetrator.

dense forest growth. The seat blades are spring loaded to keep them flush against the sides of the rescue seat body when in the folded position. A safety strap is provided for each seat blade, and a fabric cover protects the stowed safety straps and maintains the ballistic profile of the rescue seat during its descent.

Selection of Site.

The capabilities and limitations of the mission aircraft are the primary factors in site selection. Site altitude and temperatures must also be considered as they determine air density that affects the helicopter payload. As extremely dense overhead foliage will prevent lowering the penetrator, select a spot that will allow safe retrieval.

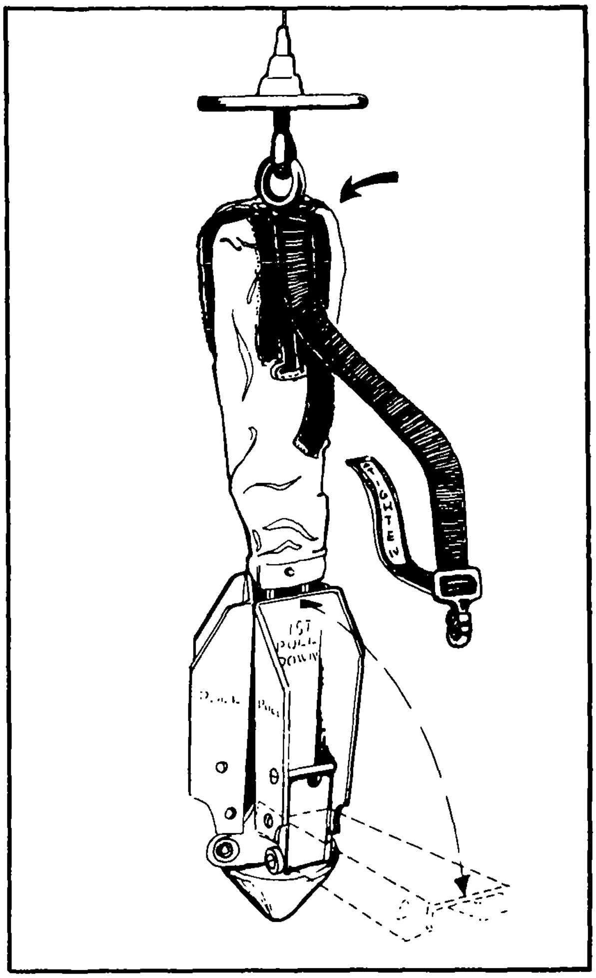


Figure 7-19. Preparing penetrator for one-man rescue.

How to Use the Forest Penetrator.

Allow the penetrator to touch the ground in order to discharge static electricity. Do not touch the hoist cable or rescue seat until after ground contact; static electricity may cause severe electrical shock.

- One-Man Rescue.

Assume a kneeling position for ease in holding and mounting the penetrator.

Hold the penetrator upright in front of you; pull the seat blade down until the retaining hook engages and locks the seat blade in the extended position; and then mount and straddle the seat while facing the shank.

Open the safety strap cover and remove the safety strap.

Position the safety strap around the body under the armpits and pull it tight. Attach snap fastener to the bar located at the top of the safety strap (see arrow).

Signal for retrieval.

WARNING: Make certain the hoist cable does not become entangled with the safety strap(s) or with any part of the body.

- Two-Man Rescue. Each man follows the same mounting and hookup procedures as for a one-man rescue except:

#1 man pulls the nearest seat blades into the extended position, straddles both, and secures nearest safety strap.

#2 man then locks and straddles the remaining seat placing his legs over the legs of #1 man.

- Three-Man Rescue. Each man follows the same mounting and hookup procedures as for a one-man rescue.
- For Wounded or Injured Personnel.

Place least injured individual (#1) on one seat and secure safety strap.

Place severest injured individual (#2) on the two remaining seats with his legs over #1 man's legs and secure safety strap.

Instruct the men to hold on to each other. Signal the helicopter for retrieval. Hoist operator will bring #2 man into aircraft first, followed by #1 man.

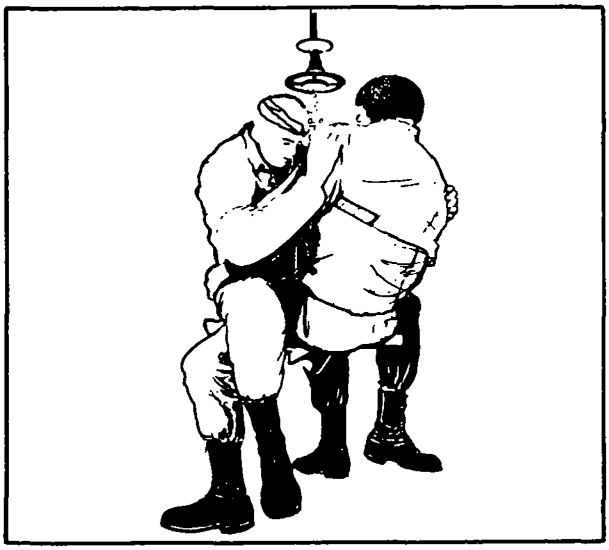


Figure 7-20. Using penetrator with wounded personnel.

NOTE: For rescue of wounded/injured personnel or rescue under emergency conditions, the rescuer always dons and tightens the safety strap. Personnel can be safely retrieved without being mounted on the seat.

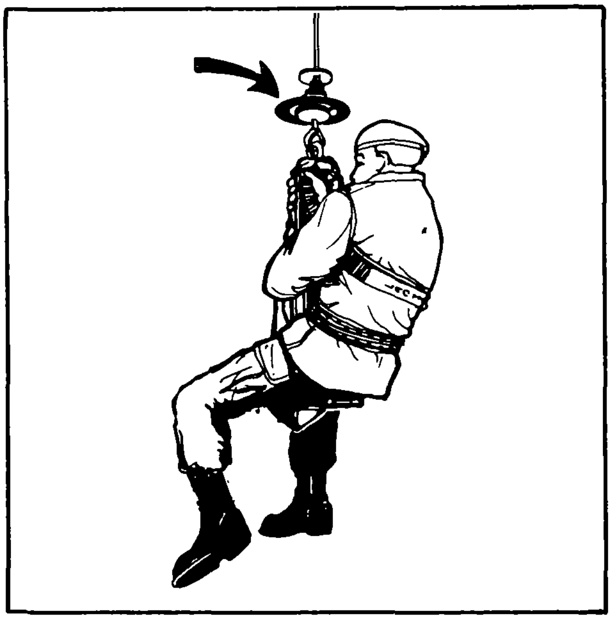


Figure 7-21. Retrieval.

Signal for Retrieval. When ready for retrieval, signal helicopter by one of the following means:

Give "thumbs up" signal.

Radio.

Vigorously shake hoist cable from side to side.

Retrieval. Hold on with both arms around the shank, keep the crotch close to the penetrator and the head and shoulders close to the cable.

The hoist hook swivel (note arrow) will spin rapidly as tension is placed on the cable. ***Do not hold the swivel.*** Upon reaching a position level with the helicopter door, you will be turned to face away from the door and pulled inside by the crewman. Do not attempt to help him nor to dismount the rescue seat until instructed to do so. The crewman will disconnect you from the penetrator when you are safely inside.

Maguire Rig. The Maguire rig is simple to make and can be used when other recovery systems are not available.

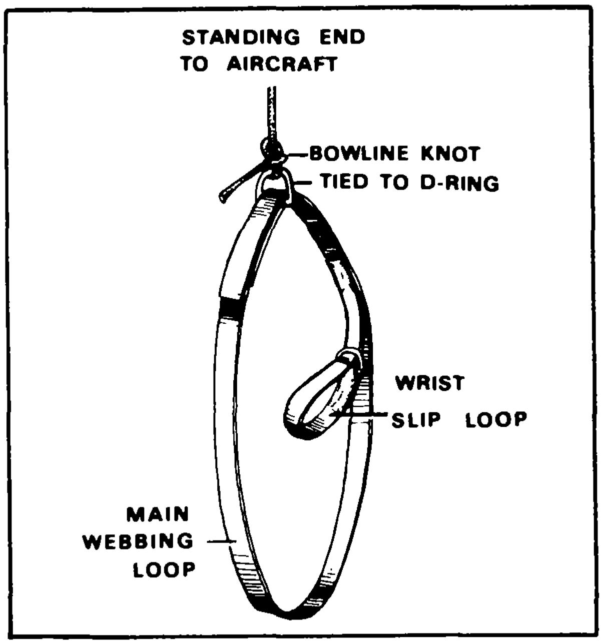


Figure 7-22. Maguire rig.

Overlap the ends of an 8-foot by 2-inch piece of nylon webbing approximately 12 inches. Insert a D-ring between the overlapped ends and sew the webbing together on each side of the D-ring. This forms the main webbing loop.

Use another 24-inch by 2-inch piece of nylon webbing and sew a D-ring to one end. Take the free end and form a loop by putting it through the D-ring. Sew the free end at least 12 inches from the D-ring on the main loop. This forms the wrist strap.

During extraction, the standing end of the aircraft recovery line is tied to the main loop D-ring using a bowline knot. The rider sits in the main loop, and places his wrist in the sliploop and tightens it. This insures he will not fall during extraction.

Palmer Rig. The Palmer rig is also a simple recovery expedient that is made from a 120-foot nylon rope and two 10-foot nylon sling ropes.

Tie a bowline knot at the running end of the 120-foot rope.

Tie one of the 10-foot sling ropes with a Prusik knot 3 feet above the bowline knot and tie the loose ends of the sling rope with a square knot to form a loop.

Use the remaining sling rope to form a rappel seat.

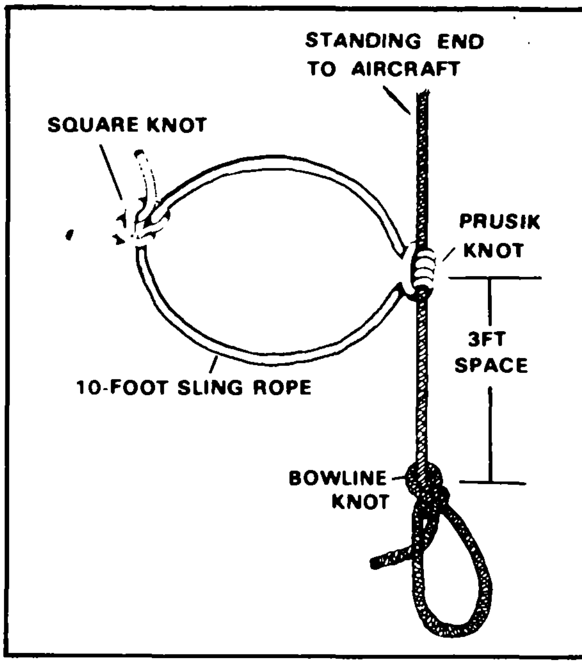


Figure 7-23. Palmer rig.

Fasten a snaplink to the rappel seat and the bowline knot.

The rider places his arms up and body through the upper loop and positions the loop under his armpits. Extraction is then completed.

This rig is relatively safe and useful to evacuate wounded personnel.

8

TRAINING

PLANNING

Although commanders strive to accomplish the ultimate training objectives set forth by higher headquarters, certain factors will cause local variations:

Personnel turnover.

Availability of aircraft support.

Availability and timing of formal school quotas.

Exercise and other training for administrative commitments imposed by higher headquarters.

Actual operational commitments.

Careful scheduling can overcome the above factors and can help to realize meaningful and effective training.

PERFORMANCE ORIENTED

Special Forces air infiltration/exfiltration training must be mission oriented. However, it is not anticipated that all members of a selected operational element will be equally proficient in a given skill or technique at any given time. Should areas be discovered in which weaknesses exist, added emphasis is placed on such areas. A properly balanced training program will produce a reasonably proficient team member.

REALISM

Training should be conducted under conditions that approximate those expected in combat. Because emphasis is placed on realism, there is a degree of hazard associated with parachuting and open water exercises. Safety is an essential factor in any training program. Although control and medical personnel are required on the drop zone during parachute exercises, this does not mean that their presence should interfere with or detract from a tactical parachute exercise unless unsafe conditions exist. To enhance realism, their presence and location need be known only to selected personnel. Realism is acquired by—

Emphasizing night training.

Training in unfamiliar and varied terrain.

Training in varied geographic, climatic, and hydrographic areas.

Introducing into exercises those conditions and problems which the teams could be expected to encounter in combat, such as—

Secrecy in planning and execution.

Thorough briefing of all participating troops.

Unmarked landing areas (blind drops/ infiltrations).

Tactical landing and recovery methods.

Use of alternate landing and recovery plans.

Limited resupply.

Use of tactical communication procedures including radio transmission at extreme ranges. Teams should be subjected to enemy jamming and direction finding efforts.

Planned operational emergencies and simulated casualties.

Intense enemy counterreconnaissance activities.

PARACHUTE TRAINING

Land, water, and para-SCUBA parachute training should be conducted at night, with full combat equipment, onto drop zones and under conditions similar to those that might be encountered during tactical operations. This training should include:

Assembly of team personnel.

Contact with indigenous forces.

Movement to safe area.

Familiarization with Army, Air Force, Navy, and Marine aircraft.

Familiarization with and use of airdrop containers.

Preparation and rigging of individual equipment rucksacks and cargo bundles for airdrop.

Day and night jumps with complete combat equipment using static line or MFF parachutes.

Qualification of selected individuals as jumpmasters.

Practice rucksack jumps from the 34-foot tower.

TRAINING WITH HELICOPTERS

Helicopter insertion/extraction operations using rappelling ropes or other insertion/ extraction systems affixed to and suspended below a hovering helicopter are extremely hazardous for both personnel and helicopter. Both may be exposed to enemy fire. Training should cover all aspects of helicopter-supported insertions and extractions:

Rappelling techniques.

Cast and recovery techniques.

Insertion/extraction systems: STABO, SPIE, Maguire and Palmer rigs, ladder, and hoist use techniques.

LZ selection, identification, and marking (day/night).

Directing helicopters into an LZ (day/ night).

Medical evacuation.

Control and direction of helicopters for fire suppression.

APPENDIX A

REFERENCES

JOINT CHIEFS OF STAFF PUBLICATIONS (JCS PUB)

1	Dictionary of Military and Associated Terms

READINESS COMMAND MANUALS*

(FOUO) 10-3	Joint UW SOP
(FOUO) 525-5	Joint Beacon Operations

*To obtain copies write HQS, Readiness Command, ATTN: RCJ3-U, McDill AFB, FL 33068

ARMY REGULATIONS (AR)

	310-25	Dictionary of US Army Terms
	310-50	Authorized Abbreviations and Brevity Codes (Microfiche)
	530-1	Operations Security (OPSEC)
(C)	530-2	Communications Security (U)
(C)	530-3	Electronic Security (U)
(S)	530-4	Control of Compromising Emanations (U)

FIELD MANUALS (FM)

	1-51	Rotary Wing Flight
	10-501	Airdrop of Supplies and Equipment, Rigging Containers
	10-547	Rigging the High Speed Aerial Delivery Container CTU 2/A
	20-150/AFM 64-2/NWP 37(B)	National Search and Rescue Manual
	21-26	Map Reading
	21-76	Survival, Evasion, and Escape
	29-51	Division Supply and Field Service Operations
	31-19	Special Forces Military Free-Fall Parachuting
(C)	31-20	Special Forces Operations (U)
	31-22	Command, Control and Support of Special Forces Operations
	57-38	Pathfinder Operations

TRAINING CIRCULARS (TC)

	30-11	Army Tactical Weather
(C)	31-20-3	Special Forces Air and Maritime Operations (U)
	57-1	The Jumpmaster

TECHNICAL MANUALS (TM)

10-1670-262-12	Operator's and Organization Maintenance Manual for Personnel STABO Extraction System and Cargo and Personnel Lowering Anchor Device
10-1670-264-13&P	Organizational and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for MC-3 Free-Fall Personnel Parachute System
55-4240-284-12&P	Operating and Maintenance Manual for Rescue Seat, Forest Penetrating Including Repair Parts and Special Tools List
57-220	Technical Training of Parachutists

NATO STANDARDIZATION AGREEMENTS (STANAG) *

2087	Medical Employment of Air Transport in the Forward Area
2355	Procedures for the Employment of Helicopters in the Anti-Armour Role in Support of Ground Forces
2861	Procedures for the Recovery of Downed Aircraft/Helicopters While Engaged in Airmobile Operations
3158	Day Marking of Airfield Runways and Taxiways
3552	Search and Rescue- ATP-10(B)-Navy/Army/Air
3570	Drop Zones and Extraction Zones- Criteria and Markings
3597	Helicopter Tactical or Non-permanent Landing Sites
3601	Criteria for Selection and Marking of Landing Zones for Fixed Wing Transport Aircraft
3619	Helipad Marking
3652	Helipad Lighting (VMC)
3685	Airfield Portable Marking
3737	Height Bands- Airdrop
3744	Minimum Requirements of Medical Equipment in Search and Rescue (SAR) Aircraft

NOTE:
*STANAGS available from Navy Publications and Forms Center, 5801 Tabor Ave, Philadelphia, PA 19120 (DD form 1425 Req Form)

APPENDIX B

REPORTS AND REQUESTS

This appendix contains general information and formats pertaining to the following reports and requests used in UW:

Initial Entry Report.
DZ, LZ, RZ, Message Pickup Zone (PZ) Reports.
Delivery/Recovery Mission Requests.
Delivery/Recovery Mission Confirmation Messages.

These formats are not the only ones needed but are some of the basic formats pertaining to air operations. For additional report and request formats, see current unit CEOI.

Prowords used in the sample formats are not necessarily the same as those contained in a unit's current CEOI and should be considered as examples only.

Report formats/contents and examples will be found on the following pages.

INITIAL ENTRY REPORT (ANGUS).

The Initial Entry Report (ANGUS) will be submitted as soon as possible after the infiltration. This report reflects to the SFOB the success of the infiltration and the initial situation.

Format/content	Example	
Proword	ANGUS	
Cite	CITE ( )	
Paragraph:		
A. Location (nearest 1,000 meters).	AAA	OSCAR HOTEL NINE SIX FOUR EIGHT
B. Casualties: Code name of personnel who are unable to continue the mission and their status using code words listed below: UNCLE—Killed in Action. FROST—Wounded in Action. SPARK—Captured or Missing in Action.	BBB	ROBIN BROKEN LEG QUACK SPARK
C. Was contact made with friendly elements?	CCC	YES
D. Strength of guerrilla force.	DDD	TWO HUNDRED FIFTY
E. Additional information.	EEE	(Use if needed; otherwise omit.)

DZ, LZ, RZ, MESSAGE PICKUP ZONE (PZ) REPORTS (GRAZE).

Proposed DZs, LZs, RZs and Message PZs will be surveyed and reported as soon as practicable after initial entry/infiltration.

Format/content	Example (DZ Report).	
Proword		GRAZE
Cite		CITE ( )
Paragraph:		
A. Code Name* and Type.	AAA	HELGA TIGER

LAND	WATER	
TIGER	SHARK	Personnel DZ
BRAVE	WHALE	Resupply DZ
RHINO	PERCH	Fixed Wing LZ
CAMEL	MORAY	Rotary Wing LZ
SNAKE	CORAL	STAR RZ
MOUSE	SNAIL	STABO RZ
HORSE	SWORD	Message PZ

* Select code names with five letters with no two letters alike.

Include the word RESUP after code name of DZ if DZ can only be used for resupply.

B. Location of DZ.

Use complete military grid coordinates to nearest 100 meters of center for land DZ and latitude/longitude to nearest 100 yards of center for ocean DZ. For inland water DZs, grid coordinates will be used.

If an area DZ is to be used, report the coordinates of both limiting points (points A and B).

BBB EIGHT TWO HOTEL TANGO MIKE SIX SEVEN EIGHT FOUR FOUR TWO

C. Reference Points.

Use landmark clearly shown on issued map or chart.

Report reference points by magnetic azimuth, description, and distance in kilometers from the center of DZ. (Omit this item for area DZs.)

CCC THREE FIVE ONE DEG SANFORD TWO THREE KILOMETERS

D. Width, Length, and Long Axis of DZ.

Report width and length in meters and long axis by magnetic azimuth.

If an area DZ, omit this item.

For LZs: Indicate width and length (or diameter) in meters, the long axis by magnetic azimuth, type surface (sod, sand, dirt or

DDD FOUR FIVE ZERO BY SIX EIGHT FIVE METERS AXIS TWO TWO DEG gravel) and whether hard, medium or soft.

For RZs: Indicate diameter in meters.

For Message PZs: Indicate width and length in meters, the long axis by magnetic azimuth, and a brief description, such as ridge line, plateau, road, field, etc.

E. Open quadrant.

If open 360 degrees, report OPEN.

Measure open quadrant from center of zone and report as a series of magnetic azimuths. The open quadrant indicates acceptable aircraft approaches.

If an area DZ, omit this item.

EEE ZERO ONE THREE DASH ZERO NINE SEVEN CMM ONE NINE DASH TWO SIX EIGHT

F. Track.

The track is the recommended magnetic azimuth on which the aircraft is to fly when executing the drop.

Should circumstances dictate a required track, the symbol RQR will precede the azimuth (if not otherwise stated in follow-up message, the aircraft will fly the RQR track within 15° of either side of the track).

FFF SIERRA PAPA SIERRA ZERO FOUR FIVE

G. Obstacles.

Report by description, magnetic azimuth, and distance from the center of the DZ any artificial obstacles over 90 meters (300 feet) in height above the level of the DZ within a radius of 9.3 kilometers (5 nautical miles) that are not shown on the issued map.

If there are no obstacles, omit this item.

GGG ZERO THREE THREE DEG TOWER ZERO SEVEN ZERO METERS THREE KILOMETERS

H. Additional information.

HHH ENEMY PATROLLING ACTIVITY VICINITY SANFORD

Example (DZ Report)

GRAZE
CITE( )

AAA HELGA ZEBRA RESUP

BBB POINT ALPHA ISLAND FOUR SIX WHISKEY YANKEE PAPA TWO TWO SIX SEVEN SEVEN TWO DASH POINT BRAVO TIP OF LAKE FOUR TWO WHISKEY YANKEE PAPA TWO EIGHT FOUR FIVE NINE NINE

CCC	Omitted
DDD	Omitted
EEE	Omitted
FFF	Omitted
GGG	Omitted
HHH	TWO SIX SIX DEG BRIDGE THREE KILOMETERS FROM POINT ALPHA

Example (LZ REPORT)

GRAZE
CITE (   )

AAA	HEAVY RHINO
BBB	FOUR SIX MIKE NOVEMBER TANGO TWO FIVE TWO TWO SEVEN ZERO
CCC	ONE ONE ZERO DEG TABOR ZERO NINE KILOMETERS
DDD	FIVE SIX BY NINE FIVE FIVE METERS AXIS ONE THREE THREE DEG DASH DIRT HARD
EEE	OPEN
FFF	ONE THREE THREE
GGG	NONE
HHH	WINDS FROM ONE THREE THREE DEG

Example (Message PZ Report)

GRAZE
CITE (   )

AAA	HELGA HORSE
BBB	SEVEN ONE ROMEO TANGO PAPA TWO THREE FIVE SIX SEVEN SEVEN
CCC	TWO SIX ZERO DEG ROAD INTERSECTION ONE ZERO KILOMETERS
DDD	TWO FIVE BY NINE ZERO METERS AXIS ONE NINE FIVE DEG DASH HILL TOP

EEE	OPEN
FFF	ONE NINE FIVE DEG
GGG	Omitted
HHH	Omitted

Example (STAR RZ Report)

GRAZE
CITE

AAA	HELGA SNAKE
BBB	FOUR ONE NOVEMBER TANGO XRAY TWO SIX SIX EIGHT SEVEN NINE
CCC	ONE FOUR FIVE DEG TOWER SEVEN KILOMETERS
DDD	TWO FOUR SIX
EEE	OPEN
FFF	ZERO EIGHT FIVE
GGG	Omitted
HHH	Omitted

DELIVERY/RECOVERY MISSION REQUESTS (JAVIS).

The Delivery/Recovery Mission Request will include both primary and alternate DZ, LZ, PZ or RZ if available and within the support capabilities of the requester. If an alternate is designated in the request, it will be manned. If the DZ, LZ, PZ or RZ on which a mission is requested has not been reported previously, the requester must submit a GRAZE report in addition to the air mission request. The recovery mission request will be submitted by the requesting party as far in advance of requested TOT as possible. When a STAR kit is dropped, package/personnel will be recovered 20 minutes later unless otherwise specified in the mission confirmation message. If recovery time is not made good the aircrew will return to staging base and another recovery mission request must be submitted if still desired.

Format/content	Example (DZ Mission Request)
Proword	JAVIS
Cite	CITE ( )

Paragraph:

A. Code Name and Type (PRIMARY).		AAA	HELGA ZEBRA
LAND	WATER		
TIGER	SHARK	Personnel DZ	
BRAVE	WHALE	Resupply DZ	
RHINO	PERCH	Fixed Wing LZ	
CAMEL	MORAY	Rotary Wing LZ	
SNAKE	CORAL	STAR RZ	
MOUSE	SNAIL	STABO RZ	
HORSE	SWORD	Message PZ	

B. Mission Purpose. — BBB — RESUPPLY THREE EACH KILO ECHO

For DZs and LZs: Indicate Infil/Exfil/Resupply and number of persons and/or amount of supplies to be infiltrated.

For RZ only, indicate recovery kit requirements/type of package to be recovered/total weight in pounds. For STABO recovery, indicate number of harnesses required.

For message DZs: Indicate items to be picked up and total weight of containers in pounds.

C. Date/time/month requested (date-time group (DTG)). — CCC — ZERO ONE TWO TWO ZERO ZERO ZULU OCT

D. Authentication. — DDD — STANDARD

Authentication procedures will be in accordance with the CEOI (day letter code) and will be so indicated by inserting the word STANDARD in this paragraph. If an authentication light or any other deviation from this procedure is used, it will be so indicated in this paragraph.

E. Marking — EEE — STANDARD GAS

Insert STANDARD when marking pattern used on the Primary/Alternate are those in the CEOI. If a deviation from standard marking is used, this must be explained. This paragraph/item may be omitted when not applicable.

NOTE: Items F through J are reported only when a Beacon/Transponder is used for authentication and/or marking, either individually or as a part of the marking pattern.

F. Beacon/Transponder type and code. — (Omitted Items F to J)

G. Zone/Site Elevation (feet above sea level).

H. B/T Elevation (feet above ground).

I. B/T Position (nearest 10 meters-8 digit coordinates).

J. B/T Offset Azimuth and Range (magnetic azimuth to center of zone/site/RP/DIP and range in meters).

K. Code name and type (ALTERNATE). (If none, omit this item.)

KKK HELEN ZEBRA

L. DTG latest mission confirmation can be received.

LLL THREE ZERO TWO TWO ZERO ZERO ZULU SEPT

M. Remarks. (If none omit this item.)

MMM Omitted

Example (LZ Mission Request)

JAVIS
CITE (   )

AAA NOBLE RHINO

BBB EXFIL ONE TEAM MEMBER WITH BROKEN ARM

CCC TWO FOUR TWO THREE THREE ZERO ZULU MAY

DDD STANDARD

EEE STANDARD

(Items F-J Omitted)

Example (Message PZ Mission Request)

JAVIS
CITE (   )

AAA HELGA HORSE

BBB ENEMY MIKE FOX DATA DASH SEVEN POUNDS

CCC TWO FIVE TWO TWO ZERO ZERO ZULU MAR

DDD STANDARD

EEE STANDARD

(Items F-J omitted)

KKK Omitted

LLL TWO FOUR TWO TWO ZERO ZERO ZULU MAR

MMM SEVERE STORMS EXPECTED FORTY EIGHT HOURS

Example (STAR RZ Mission Request)

JAVIS
CITE (   )

AAA	HELGA SNAKE
BBB	ONE DASH TWO PAPA WHISKEY DASH TWO NINE FIVE POUNDS
CCC	TWO ONE TWO ONE ZERO ZERO ZULU MAY
DDD	STANDARD
EEE	STANDARD DASH LIFTLINE STROBE
	(Items F-J Omitted)
KKK	Omitted
LLL	TWO ZERO TWO ONE ZERO ZERO ZULU MAY
MMM	EXERCISE CAUTION CMM SECURITY GUARDS REQUIRED

Example (STABO RZ Mission Request)

JAVIS
CITE (   )

AAA	HELGA MOUSE
BBB	FOUR
CCC	ONE FIVE TWO ONE THREE ZERO ZULU JULY
DDD	STANDARD
EEE	STANDARD
	(Items F-J Omitted)
KKK	Omitted
LLL	ONE FOUR TWO ONE THREE ZERO ZULU JULY
MMM	ONE MAN LEG WOUND

DELIVERY/RECOVERY MISSION CONFIRMATION MESSAGES (RINGO).

The mission confirmation will be transmitted to the operational detachment as soon as possible after confirmation has been established.

The operational detachment will acknowledge receipt of mission confirmation on the next scheduled contact with SFOB/FOB. In the event the operational detachment does not positively acknowledge receipt of the mission confirmation, the component headquarters should determine whether the mission is to be executed or canceled. If a decision cannot be reached, the matter will be submitted to COMJUWTF for final resolution.

Even though a mission confirmation message has not been received by the originator of the request, the primary LZ, DZ, PZ, or RZ and the alternate, if requested, will be manned IAW the mission request.

Format/content	Example (DZ Mission Confirmation Message)	
Proword		RINGO
Cite		CITE ( )
A. Code name and type. (Use same code names and types as used for mission requests.)	AAA	HELGA ZEBRA
B. Mission DTG on primary.	BBB	ONE SEVEN TWO TWO THREE ZERO ZULU MAY
C. Track on primary.	CCC	ZERO THREE THREE
D. Code name and type (alternate). (If none, omit.)	DDD	HELEN ZEBRA
E. Mission DTG on alternate. (If none, omit.)	EEE	ONE SEVEN TWO THREE ZERO ZERO ZULU MAY
F. Track on alternate. (If none, omit.)	FFF	ZERO NINE FIVE
G. Data. For DZs: Indicate number of incoming personnel/bundles, drop altitude in feet, and type aircraft to be used. For LZs: Indicate number of incoming personnel/bundles and type aircraft used for infil/resupply. For exfil only indicate type of aircraft. For RZs: When a STAR recovery kit has been pre-positioned, confirm time that lift line strobe lights will be turned on. (If a recovery kit is requested, it will be dropped at time specified in B or E and recovery will take place 20 minutes later.) For STABO recovery, indicate type of aircraft to be used. For message PZs: Indicate type of aircraft to be used.	GGG	FOUR BUNDLES DASH FIVE ZERO ZERO DASH SEVEN ZERO ZERO FEET DASH CHARLIE ONE FOUR ONE
H. Aircraft call sign and frequency. (Omit if not applicable.)	HHH	SUPER CHIEF CMM SIX EIGHT POINT TWO TWO MEGAHERZ
I. Authentication.	III	STANDARD

Insert STANDARD when procedures to be used are those prescribed by the CEOI.

Direct any deviation from standard procedure if necessary or confirm those requested by inserting CONFIRMED.

If authentication is not desired by requester insert NONE.

J. Marking.

If marking is prescribed by CEOI, insert STANDARD.

Direct any deviation from standard procedure if necessary or confirm those requested by inserting CONFIRMED.

Omit this item if not applicable.

K. Beacon/Transponder.

Insert CONFIRMED if items F-J or the mission request are approved and indicate operating times.

Direct any deviation when necessary.

Omit this item if not applicable.

L. Remarks.

Indicate changes to original mission request or other information considered necessary. (If none, omit this item.)

JJJ	STANDARD
KKK	Omitted
LLL	Omitted

Example (LZ Mission Confirmation Message)

RINGO
CITE (   )

AAA	NOBLE RHINO
BBB	ONE SEVEN TWO TWO THREE ZERO ZULU JUNE
CCC	ZERO THREE FIVE
DDD	NOVEL RHINO
EEE	ONE SEVEN TWO THREE ZERO ZERO ZULU APRIL
FFF	TWO SEVEN SEVEN
GGG	INFIL TWO SIERRA FOXTROT MIKE DASH ONE BUNDLE DASH CHARLIE ONE THREE ZERO
HHH	NIGHT STAR CMM SIX ZERO POINT ONE FIVE MEGAHERZ
III	STANDARD

JJJ	STANDARD
KKK	Omitted
LLL	TWO EXFILS READY

Example (STAR RZ Mission Confirmation Message)

RINGO
CITE ( )

AAA	HELGA SNAKE
BBB	ONE SEVEN TWO THREE ZERO ZERO ZULU APRIL
CCC	ONE ONE ONE DASH ONE TWO FOUR
DDD	Omitted
EEE	Omitted
FFF	Omitted
GGG	THREE MINUTES BEFORE TANGO OSCAR TANGO FOR FOUR MINUTES
HHH	NIGHT HAWK CMM EIGHT SIX POINT TWO FIVE MEGAHERZ
III	STANDARD
JJJ	STANDARD
KKK	Omitted
LLL	Omitted

Example (STABO RZ Mission Confirmation Message)

RINGO
CITE ( )

AAA	HELGA MOUSE
BBB	ONE FIVE TWO ONE ZERO ZERO ZULU JULY
CCC	THREE SIX FIVE
DDD	Omitted
EEE	Omitted
FFF	Omitted
GGG	CHARLIE HOTEL FIVE THREE
HHH	OMITTED

III	STANDARD
JJJ	STANDARD
KKK	CONFIRMED DASH FOUR MINUTES BEFORE TANGO OSCAR TANGO FOR ONE FIVE MINUTES
LLL	MEDIC ON BOARD

Example (MESSAGE PZ Mission Confirmation Message)

RINGO
CITE (   )

AAA	HELGA HORSE
BBB	ONE SEVEN ONE NINE THREE ZERO ZULU NOVEMBER
CCC	ONE FOUR FIVE
DDD	Omitted
EEE	Omitted
FFF	Omitted
GGG	OSCAR VICTOR ONE ZERO
HHH	Omitted
III	CHARLIE ECHO OSCAR INDIA COMPRIMISED DASH USE CODE VICTOR FOR AUTHENTICATION
JJJ	STANDARD
KKK	Omitted
LLL	Omitted

APPENDIX C

CONVERSION TABLES

LENGTH

METRIC TO US UNITS	US TO METRIC UNITS
Millimeters x 0.03937 = inches	Inches x 25.40 = millimeters
Millimeters x 0.00328 = feet	Feet x 304.80 = millimeters
Millimeters x 0.00109 = yards	Yards x 914.40 = millimeters
Centimeters x 0.3937 = inches	Inches x 2.54 = centimeters
Centimeters x 0.0328 = feet	Feet x 30.48 = centimeters
Centimeters x 0.0109 = yards	Yards x 91.44 = centimeters
Meters x 39.37 = inches	Inches x 0.025 = meters
Meters x 3.281 = feet	Feet x 0.305 = meters
Meters x 1.094 = yards	Yards x 0.914 = meters
Meters x 0.00062 = miles	Miles x 1609.34 = meters
Kilometers x 3280.84 = feet	Feet x 0.00030 = kilometers
Kilometers x 1093.61 = yards	Yards x 0.00091 = kilometers
Kilometers x 0.621 = miles	Miles x 1.609 = kilometers

AREA

Square millimeters x 0.00155 = square inches	Square inches x 645.16 = square millimeters
Square centimeters x 0.155 = square inches	Square inches x 6.452 = square centimeters
Square meters x 1550.000 = square inches	Square inches x 0.00065 = square meters
Square meters x 10.764 = square feet	Square feet x 0.093 = square meters
Square meters x 1.196 = square yards	Square yards x 0.836 = square meters
Square kilometers x 0.386 = square miles	Square miles x 2.59 = square kilometers

VOLUME

Cubic centimeters x 0.061 = cubic inches	Cubic inches x 16.39 = cubic centimeters
Cubic meters x 35.31 = cubic feet	Cubic feet x 0.028 = cubic meters
Cubic meters x 1.308 = cubic yards	Cubic yards x 0.765 = cubic meters
Liters x 61.02 = cubic inches	Cubic inches x 0.016 = liters
Liters x 0.035 = cubic feet	Cubic feet x 28.32 = liters

CAPACITY

Milliliters x 0.271 = fluid drams
Milliliters x 0.034 = fluid ounces
Liters x 33.81 = fluid ounces
Liters x 2.113 = pints
Liters x 1.057 = quarts
Liters x 0.264 = gallons

Fluid drams x 3.697 = milliliters
Fluid ounces x 29.57 = milliliters
Fluid ounces x 0.030 = liters
Pints x 0.473 = liters
Quarts x 0.946 = liters
Gallons x 3.785 = liters

METERS-FEET

KILOMETERS TO

MTR	FT-MTR	FT	ST.M.	KM	N.M.
0.305	1	3.281	0.62	1	0.54
0.610	2	6.562	1.24	2	1.08
0.914	3	9.842	1.86	3	1.62
1.219	4	13.123	2.49	4	2.16
1.524	5	16.404	3.11	5	2.70
1.829	6	19.685	3.73	6	3.24
2.134	7	22.966	4.35	7	3.78
2.438	8	26.247	4.97	8	4.32
2.743	9	29.528	5.59	9	4.86
3.048	10	32.809	6.21	10	5.40
6.096	20	65.617	12.43	20	10.79
9.144	30	98.426	8.64	30	16.19
12.192	40	131.234	24.86	40	21.58
15.240	50	164.043	31.07	50	26.98
18.990	60	196.852	37.28	60	32.38
21.340	70	229.660	43.50	70	37.77
24.380	80	262.459	49.71	80	43.17
27.430	90	295.278	55.93	90	48.56
30.480	100	328.087	62.14	100	53.96
60.960	200	656.1	124.28	200	107.92
91.440	300	984.3	186.42	300	161.88
121.920	400	1312.3	248.56	400	215.84
152.400	500	1640.4	310.70	500	269.80
304.800	1000	3280.9	372.84	600	323.76
609.600	2000	6561.7	434.98	700	377.72
914.400	3000	9842.6	497.12	800	431.68
1219.200	4000	13123.5	559.26	900	485.64
1524.000	5000	16404.3	621.40	1000	539.6

STATUTE MILES TO			NAUTICAL MILES TO		
KM	ST.MI	N.M.	KM	ST.MI	N.M.
1.61	1	.869	1.85	1	1.15
3.22	2	1.74	3.70	2	2.30
4.83	3	2.61	5.55	3	3.45
6.44	4	3.48	7.40	4	4.60
8.05	5	4.35	9.25	5	5.75
9.66	6	5.21	11.10	6	6.90
11.27	7	6.08	12.95	7	8.05
12.88	8	6.95	14.80	8	9.20
14.49	9	7.82	16.65	9	10.35
16.10	10	8.69	18.50	10	11.50
32.20	20	17.38	37.00	20	23.00
48.30	30	26.07	55.50	30	34.50
64.40	40	34.76	74.00	40	46.00
80.50	50	43.45	92.50	50	57.50
96.60	60	52.14	111.00	60	69.00
112.70	70	60.83	129.50	70	80.50
128.80	80	69.52	148.00	80	92.00
144.90	90	78.21	166.50	90	103.50
161.00	100	86.90	185.00	100	115.0
322.00	200	173.80	370.00	200	230.0
483.00	300	260.70	555.00	300	345.0
644.00	400	347.60	740.00	400	460.0
805.00	500	434.50	925.00	500	575.0
966.00	600	521.40	1110.00	600	690.0
1127.00	700	608.30	1295.00	700	805.0
1288.00	800	695.20	1480.00	800	920.0
1449.00	900	782.10	1665.00	900	1033.0
1610.00	1000	869.	1850.00	1000	1150.0

YARDS TO METERS

100	91	1000	914	1900	1737
200	183	1100	1006	2000	1828
300	274	1200	1097	3000	2742
400	366	1300	1189	4000	3656
500	457	1400	1280	5000	4570
600	549	1500	1372	6000	5484
700	640	1600	1463	7000	6398
800	732	1700	1554	8000	7212
900	823	1800	1646	9000	8226

METERS TO YARDS

100	109
200	219
300	328
400	437
500	547
600	656
700	766
800	875
900	984
1000	1094
1100	1203
12000	1312
1300	1422
1400	1531
1500	1640
1600	1750
1700	1860
1800	1969
1900	2078
2000	2188
3000	3282
4000	4376
5000	5470
6000	6564
7000	7658
8000	8752
9000	9846

NAUTICAL MILES TO METERS

0.1	185
0.2	370
1/4	463
0.3	556
0.4	741
1/2	926
0.6	1111
0.7	1296
3/4	1389
0.8	1482
0.9	1667
1	1852
1 1/4	2315
1 1/2	2778
1 3/4	3241
2	3704
2 1/4	4167
2 1/2	4630
2 3/4	5093
3	5556
3 1/4	6019
3 1/2	6482
3 3/4	6945
4	7408
5	9260

APPENDIX D

MOON PHASES

In planning night air operations, a knowledge of the various moon phases and the light levels during each phase is necessary.

The moon revolves eastward about the earth; however, its rotational speed is slower than that of earth and it appears to move east to west. A complete revolution around the earth requires 29 days, 12 hours, 44 minutes, and 28 seconds. Because the time required for a revolution around the earth does not vary, the same side of the moon is always exposed to earth observers. Since the orbital plane of the moon is tilted 5 degrees 9 minutes toward the earth's orbital plane, its orbit is closer to the northern hemisphere during winter months. As a result, light is brighter in the winter than in the summer.

As the moon revolves on a vertical arc, the distance from a stationary point to the moon varies as the moon moves on its easterly orbit. This distance is referred to as the altitude of the moon and is one of the most important factors influencing night illumination. The light level, light produced by natural sources of skylight combined with moonlight, is determined by the phase angle and altitude of the moon.

The constant change in the moon's phase angle causes varying levels of light received from the moon. At low altitude, the vertical component of moonlight incident to a horizontal surface is small compared to that at high altitude. Also at low altitude, light is further reduced by the relatively long distance it travels through the earth's atmosphere. As the moon ascends in the sky, the distance light travels through the atmosphere decreases and the vertical component of moonlight increases, thus providing greater illumination. The greatest light level is achieved when the moon is directly overhead.

Because the rotation of the moon never changes and follows an exact time frame, time tables for each moon phase (new moon, first quarter, full moon, and last quarter) can be accurately computed for any year, and are normally provided by the Air Weather Service. Geographical location is not a consideration in computing moon phases.

The following illustration shows the phases of the moon as seen from the earth and explains each phase:

NEW MOON. The phase angle of a new moon begins at the 180-degree position and extends to the 90-degree position. It occurs when the moon rotates to a position between the sun and the earth. This phase always begins during the day and is not visible at night. Visual observation of the new moon at night is not apparent until the moon has reached the 173-degree position, and this takes approximately 2 days. The time required to complete this phase is approximately 8 days. During the first portion (5 days) of the phase, a low light level will exist. As the phase progresses, illumination increases and light conditions will reach mid light level. Moonrise will occur during the day and moonset before midnight. Approximately 40 to 50 percent of the moon will be illuminated at the end of the new moon phase. Night air operations conducted during this phase can anticipate that a low light level will prevail most of the time. Best light conditions will exist shortly after darkness when the moon is at its highest observable altitude during the night.

FIRST QUARTER. The phase angle of the moon at the first quarter begins at the 90-degree position. During this quarter more than one-half of the moon surface but not all the apparent disk is illuminated. Approximately 4 days are required to complete the first quarter phase. During the first days of the first quarter and the last days of the new moon (approximately 5 days), the light will be in the mid light range with increasing

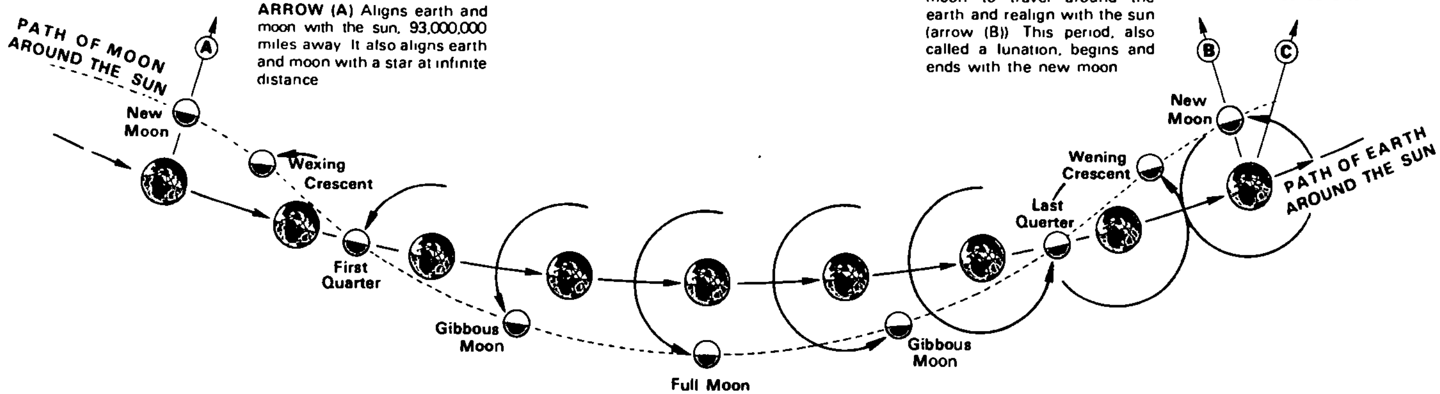
MOON PHASES

A SIDEREAL MONTH 27-1/3 days, is the time it takes the moon to travel around the earth and realign (arrow C)) with the same star aligned at arrow (A)

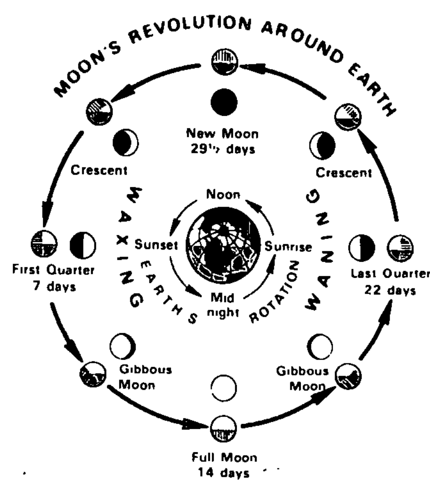
ARROW (A) Aligns earth and moon with the sun, 93,000,000 miles away It also aligns earth and moon with a star at infinite distance

A SYNODICAL MONTH, 29½ days, is the time it takes the moon to travel around the earth and realign with the sun (arrow (B)) This period, also called a lunation, begins and ends with the new moon

ORBITAL PATHS
The paths of earth and moon are traced through one lunar month as if viewed from a point north of the solar system's plane Moon's path is exaggerated for clarity Actually it is always concave to the sun



The moon's rotation on its axis and its revolution around the earth are both counterclockwise from the north Both motions take exactly the same time, because a tidal bulge on the moon's near side keeps that side always turned towards earth. During new moon the near side is dark while the far side is in sunlight



Earth and revolving moon are shown in north polar view Sun's rays coming from the top of this chart illuminate the halves shown in white, shadowed halves are in grey Moon's hidden side is shown with blue hatching Inside this ring are the phases, in equatorial view, as we see them from earth intensity to a high light level (approximately 3 days) toward the end. Moonrise occurs during daylight near the end of the day. Moonset changes from midnight to the early morning hours. The best time for conducting air operations will normally be about midnight when the moon is at its highest altitude. Light intensity is becoming brighter during this moon phase. When the moon is low on the horizon, flights toward the moon should be avoided.

FULL MOON. A full moon occurs when the sun, earth, and moon are aligned at the 0-degree position. At this time the moon is radiating its greatest illumination. The full moon phase includes approximately 3 days before and 3 days after the full moon. High light conditions begin during the last days of the first quarter and extend to the first days of the last quarter (approximately 12 days). During the early part of the phase, moonrise occurs just before nautical twilight and progressively increases into the hours of darkness. Moonset will occur during the early morning daylight hours. Air operations should be avoided when the moon's altitude is low because of its intense brightness. The optimum time for conducting flights will be the first few hours after midnight.

LAST QUARTER. This phase of the moon is very similar to the first quarter but in reverse sequence. It begins when a portion less than the entire disk is visible and ends when only one half of the moon is visible. The last quarter will normally last approximately 5 days. Light will decrease from a high light level (approximately 3 days) down to a mid light level that extends into the transition phase (approximately 5 days). Moonrise will occur after midnight. The most desirable time for conducting night air operations is just prior to beginning morning nautical twilight (BMNT). Moonset occurs during the daylight hours.

TRANSITION PHASE. Although there is no term that describes the period following the last quarter, there is a period of approximately 7 days after the end of the last quarter before the new moon phase begins. It is similar to the new moon phase but in reverse order. Illumination of the moon decreases from half to no visual form. Moonrise occurs a few hours before BMNT and moonset will always be during the daylight hours. Light will vary from a mid light level during the first few days (approximately 3 days) to a low light condition (approximately 4 days). To achieve any benefit from the moon illumination, air operations must be conducted 2 to 3 hours before BMNT. The longest period of time of low light conditions exists from the transition phase to the first quarter. During the period there are approximately 16 days when the moon is less than one half illuminated and is visible less than 50 percent of the hours of darkness.

TIDES

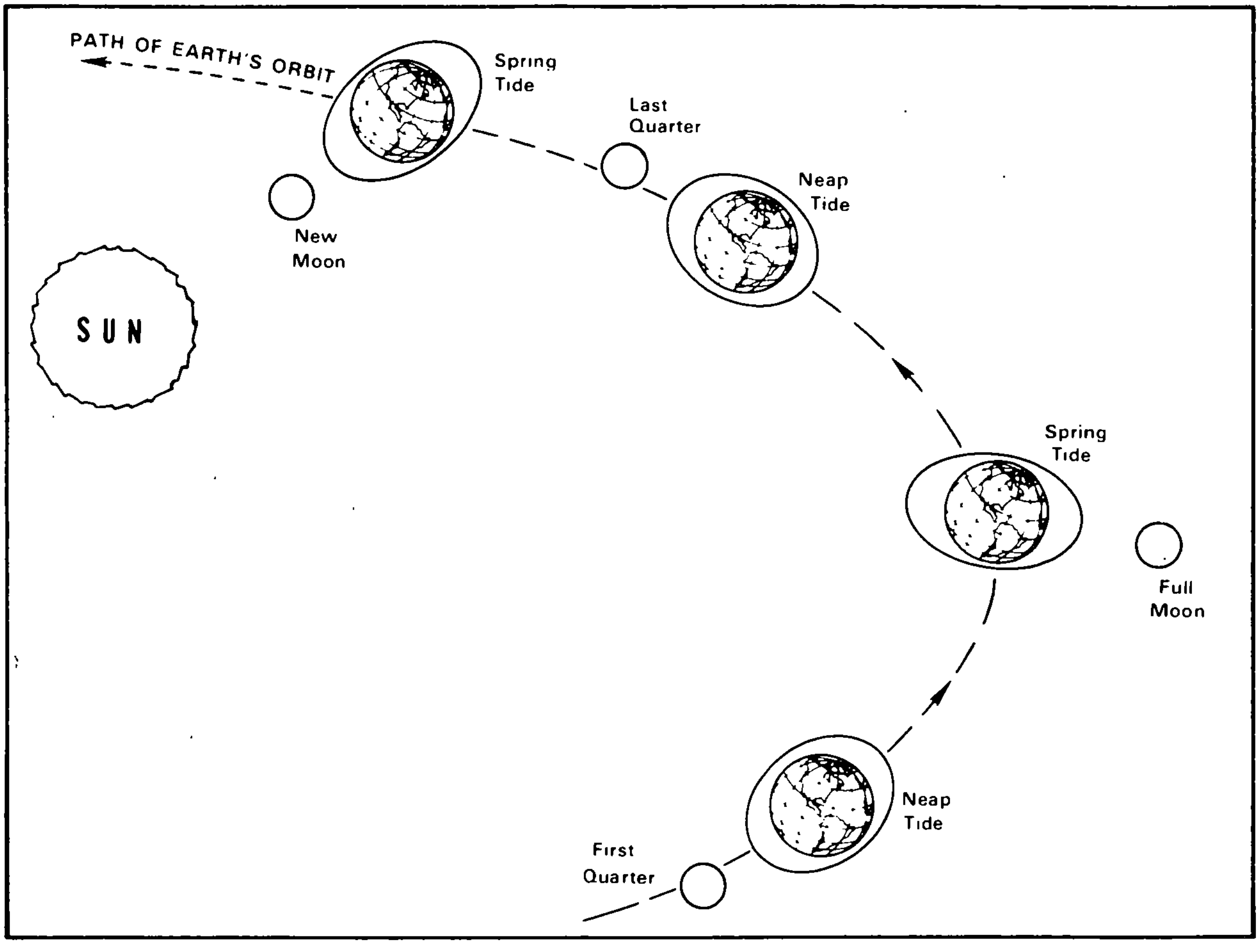
The rhythmic rise and fall of the earth's waters is caused mainly by the pull of the moon's gravity. The sun's gravity also influences tides, but because of its very great distance from the earth, it only modifies the moon's effect.

At times of new and full moon, the sun and moon align with the earth. Their combined forces produce the two high monthly tides called spring tides (not related to the season). During the first and the last quarter, the sun and moon are at right angles to the earth. This position creates the two low monthly tides, or neap tides.

While the moon pulls water to a bulge on its side of the earth, centrifugal force causes a bulge of water on the opposite side. The rotation of the earth beneath these bulges produces daily high and low tides.

CENTRIFUGAL FORCE

The earth rotates daily about an axis through its own center. The earth-moon system rotates monthly about its center of gravity, but its center of gravity is not in the center of the earth. Thus, the earth wobbles about this eccentric point, causing a centrifugal force in the opposite direction from the moon.



GLOSSARY

AGL	above ground level
ARTEP	Army Training and Evaluation Program
AST	area specialist team
AWADS	adverse weather aerial delivery system
BMNT	beginning morning nautical twilight
B/T	beacon/transponder
BTB	blind transmission broadcast
CARP	computed air release point
CDS	Container Delivery System
CEOI	Communications-Electronics Operation Instructions
COMJUWTF	Commander, Joint Unconventional Warfare Task Force
COMSEC	communications security
CSS	catalog supply system
DIP	desired impact point
DTG	date-time group
DZ	drop zone
E&E	evasion and escape
ELSEC	electronic security
FID	foreign internal defense
FOB	forward operational base
HARP	high altitude release point
HEAT	high explosive antitank
HSLLADS	high speed low level aerial delivery system
IFR	instrument flight rules
IMC	instrument meteorological conditions
IP	initial point
KIAS	knots indicated air speed
LAPES	low altitude parachute extraction system
LZ	landing zone
MCA	minimum clearance altitude
MFF	military free-fall
MSL	mean sea level
OPSEC	operations security
PSYOP	psychological operations
PZ	pickup zone
RCC	Rescue Coordination Center
RCL	reception committee leader
RP	release point
RZ	recovery zone
SAR	search and rescue
SF	Special Forces
SFOB	Special Forces Operational Base

SIGSEC	signal security
SO	special operations
SPIE	special patrol insertion/extraction
STANAG	Standardization Agreement
STAR	surface-to-air recovery
STOL	short takeoff and landing
TAACOM	theater army area command
TOT	time on target
UTTAS	utility tactical transport aircraft system
UW	unconventional warfare
UWOA	Unconventional Warfare Operational Area

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