

APPENDIX A

REFERENCES

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|---------------|---|
| ACP-168 | Allied Communications Publications Pyrotechnic Signals. |
| AR 95-Series | Aviation. |
| AR 320-5 | Dictionary of United States Army Terms. |
| AR 320-50 | Authorized Abbreviations and Brevity Codes. |
| AR 350-1 | Army Training. |
| AR 380-5 | Safeguarding Defense Information. |
| AR 385-10 | Army Safety Program. |
| AR 735-35 | Supply Procedures for TOE and TDA Units or Activities. |
| AR 750-5 | Organization, Policies, and Responsibilities for Maintenance Operators. |
| AR 750-8 | Command Maintenance Management Inspections. |
| ASubjScd 1-1 | Aerial Navigation. |
| ASubjScd 7-50 | Air Movement Training. |
| ATT 7-168 | Pathfinder Detachment. |
| DA Pam 108-1 | Index of Army Films, Transparencies, GTA Charts, and Recordings. |
| DA Pam 310-4 | Index of Technical Manuals, Technical Bulletins, Supply Manuals, Supply Bulletins, Lubrication Orders and Modification Work Orders. |
| DA Pam 310-7 | U.S. Army Equipment Index of Modification Work Orders. |
| DA TOE's | "G" Series. |
| JCS PUB 1 | Dictionary of U.S. Military Terms for Joint Usage (JC). |
| FM 1-5 | Aviation Company. |
| FM 1-10 | Army Aviation Organizational Aircraft Maintenance. |
| FM 1-15 | Divisional Aviation Battalion and Group. |
| FM 1-60 | Army Aviation Air Traffic Operations—Tactical. |
| FM 1-80 | Aerial Observer Training. |
| FM 1-100 | Army Aviation Utilization. |
| FM 1-105 | Army Aviation Techniques and Procedures. |
| FM 1-110 | Armed Helicopter Employment. |
| FM 3-10 | Employment of Chemical and Biological Agents. |
| FM 5-15 | Field Fortifications. |
| FM 5-25 | Explosives and Demolitions. |
| FM 6-20-2 | Field Artillery Techniques. |
| FM 6-135 | Adjustment of Artillery Fire by the Combat Soldier. |
| FM 7-11 | Rifle Company, Infantry, Airborne and Mechanized. |
| FM 7-15 | Rifle Platoon and Squads, Infantry, Airborne and Mechanized. |
| FM 7-20 | Infantry, Airborne Infantry and Mechanized Infantry Battalions. |
| FM 7-24 | Communications in Infantry and Airborne Divisions. |
| FM 7-30 | Infantry, Airborne and Mechanized Division Brigades. |
| FM 17-36 | Divisional Armored and Air Cavalry Units. |
| FM 21-5 | Military Training Management. |

APPENDIX B

OPERATION FORMATS

1. General

The formats described herein may be used to facilitate planning and accomplishment of pathfinder operations. These formats are intended as a *guide* and should be modified as required.

2. Operation Planning Format

a. Purpose. The pathfinder commander uses this format (fig. 14) in organizing his unit for an operation. It consolidates information pertinent to each individual or element, and the commander can use it as a reference during his planning and briefing for an operation.

b. Explanation of Headings.

(1) *Acft. no.* The chalk number or the last three digits of the tail number of the aircraft in which the individual will be transported.

(2) *Name.* The name of the pathfinder.

(3) *Load time.* The time the pathfinder must be loaded on the aircraft with all his equipment.

(4) *T/O time.* The takeoff time is when the aircraft will depart the staging area.

(5) *Duty and location.* The job assignment and location within the operational area for each pathfinder.

(6) *Call sign & freq.* The radio call sign and frequency for those individuals operating radios.

(7) *Equipment.* Equipment, other than individual equipment, that each pathfinder element will carry for the operation.

(8) *Remarks.* Any other pertinent information necessary.

3. Landing and/or Drop Zone Control Records

a. Purpose. This format (fig. 15) may be

used to maintain a record of aircraft arrivals, departures, and type loads. It serves as a source of information for both ground and aviation commanders, aids in accounting for personnel and equipment, and may be instrumental in initiating or assisting in search and rescue operations for overdue or downed aircraft. It is normally maintained by the pathfinder internal net radio operator at the CC.

b. Explanation of Headings.

(1) *Format heading.*

(a) *Pathfinder unit.* Coded or number designation.

(b) *Supported unit.* Principal ground unit or aviation unit designation.

(c) *Period.* Date and time operation commences until termination of operation or end of the day; 0001 until 2400 hours on succeeding days or until completion of operation.

(d) *Operation.* Name or number of operation.

(e) *LZ, Afld, DZ.* Cross out items not applicable, and add any special designation used.

(f) *Recorder.* Name of person who has recorded data on the form.

(2) *Column headings.*

(a) *Flight or aircraft number.* Radio call sign of the flight or aircraft.

(b) *Type aircraft.* Army or Air Force model designation.

(c) *Time communication established.* Time aircraft acknowledges contact (radio or visual, as applicable).

(d) *Time.*

1. *Arrival.* Time aircraft or first of flight lands.

2. *Departure.* Time aircraft or last of flight has wheels up.

(e) *Type load.*

(CLASSIFICATION)

PATHFINDER OPERATION PLANNING FORMAT

ACFT NO	NAME	LOAD TIME	T O TIME	DUTY AND LOCATION	CALL SIGN & FREQ	EQUIPMENT	REMARKS
N A	GILLEM	N A	N A	SECTION CO, STAGE FLD DEKKAR STRIP, GL 934730	BLACKHAT 6, 34.50	4-PRC 25 RADIOS 24-VS 17 PANELS 35-MX 290 LANTERNS 3 SETS OF BATONS 1-SE 11 LIGHT GUN 1-ML 433 ANEMOMETER 3 COLORED JACKETS EXTRA SMOKE	BE PREPARED FOR MIXED TRAFFIC AND NIGHT OPNS UNTIL RELIEVED.
N A	CARD	N A	N A	G A RTO, STAGE FLD	DEKKAR CONTROL, 34.50		
N A	SCHRADER	N A	N A	INT NET RTO, STAGE FLD	CC, 66.20		
N A	GREENE	N A	N A	SIGNALMAN, STAGE FLD	PARK, 66.20		
N A	CRANFIELD	N A	N A	SIGNALMAN, STAGE FLD	HOT SPOT, 66.20		
750	FULLERTON	0540	0545	SITE CO, LZ ALBANY GL 055713	BLACKHAT 1, 40.20	2-PRC/25 RADIOS 12-MX/290 LANTERNS 1-SE/11 LIGHT GUN 1 SET OF BATONS 6-VS/17 PANELS 1-ML/433 ANEMOMETER 8 SMOKE GRENADES	ACCOMPANY A 1-188TH ON SEARCH & DESTROY OPERATION UNTIL COMPLETED.
750	CLAREY	0540	0545	G A RTO, LZ ALBANY	ALBANY CONTROL, 40.20		
750	STRICKER	0540	0545	PFDR, LZ ALBANY	N/A		
777	ELLIS	0535	0540	SITE CO, LZ MACON GL 075720	BLACKHAT 2, 51.30	SAME AS FOR LZ ALBANY	ACCOMPANY B 1-188TH ON SEARCH & DESTROY OPERATION UNTIL COMPLETED.
777	MOORE	0535	0540	G A RTO, LZ MACON	MACON CONTROL, 51.30		
777	COGGINS	0535	0540	PFDR, LZ MACON	N/A		
N A	HOFFMAN	N A	N/A	SITE CO, STANDBY RE- SERVE VIC DEKKAR STRIP	BLACKHAT 3, 37.30	SAME AS FOR LZ ALBANY	REMAIN WITH C 1-188TH (RESERVE) AT DEKKAR STRIP; COMMITTED ON ORDER. *CALL SIGN WILL CORRESPOND WITH NAME OF LANDING SITE IF RESERVE IS COMMITTED.
N A	WELCH	N/A	N/A	G A RTO, STANDBY RESERVE	37.30*		
N A	MURRAY	N A	N A	PFDR, STANDBY RESERVE	N/A		
N A	BLIZZARD	N/A	N/A	R & R			

SIGNAL

1-188TH INF: RIGHT HALF, 47.00
A/21ST AVN BN: DEADLY SERPENT, 39.00
PATHFINDERS: DEKKAR CONTROL, 34.50
ALBANY CONTROL, 40.20
MACON CONTROL, 51.30
RESERVE, 37.30

SUPPORTED UNIT: 1-188TH INF.
LIFT UNIT: A 21ST AVN BN
ACL: 8 PAX
LZ TIME: 31 0600 MAR
DACO: S3 AIR, 1-188TH INF, DEKKAR STRIP

TYPE ACFT: UH-1D
ARTY PREP AT LZ MACON & ALBANY COMMENCES
H-20 MIN; LIFTED H-5 MIN
ARTY PREP FIRED FROM GL 035725
CCP: GL 956696
RP: GL 015692

(CLASSIFICATION)

Figure 14. Operation planning format.

PATHFINDER UNIT:
 SUPPORTED UNIT:
 PERIOD:
 OPERATION: (AFLD, LZ, DZ)

21ST AVN BN PFDR SECT
 1-188TH INF
 210001-212400 MARCH
 MASHER
 (NAME OR LOCATION OF SITE)
 PFC ROY S. COBB

RECORDER:

FLT OR ACFT NO	TYPE ACFT	TIME COMM ESTAB	TIME		TYPE LOAD		REMARKS
			ARR	DPRT	DELIVERED	EVAC	
(EXAMPLE FOR AIRFIELD OPERATION)							
MUDDY 750	U-1A	0600	0610	0625	RATIONS	2WIA	
MUDDY 882	U-1A	0605	0615		AMMUNITION		DAMAGED PROPELLER; TO DISPERSAL AREA.
DIXIE 21	C-123	0610	0620	0635	AMMUNITION	4WIA	
(EXAMPLE FOR DROP ZONE OPERATION)							
YANKEE III	C-7A	1705	1710		3 BUNDLES-AMMO		
MUDDY 334	U-6A	1715	N A				ABORTED TWO MILES OUT.
MUDDY 678	U-6A	1720	1725		3 BUNDLES-RATIONS		
(EXAMPLE FOR HELICOPTER LANDING SITE OPERATION)							
YELLOW 1	UH-1D	1230	1235	1236	PERSONNEL		CONTACTED CC WITH A FLIGHT OF FOUR
YELLOW 2	UH-1D	1230	1235	1236	PERSONNEL		
YELLOW 3	UH-1D	1230	1235	1236	PERSONNEL	4WIA	
YELLOW 4	UH-1D	1230	1235	1236	MORTAR AMMO		
PANTHER 167	CH-47	1245	1250	1252	AMMUNITION		
APACHE 921	CH-54	1300	1305	1307	N A	1 UH-1D	

Figure 15. Landing and/or drop zone control record (sample extract).

1. *Delivered.* Supplies, equipment, or personnel delivered.

2. *Evacuated.* Supplies, equipment, or personnel evacuated.

APPENDIX C

CHECKLIST FOR PATHFINDER OPERATIONS

Upon receipt of an order to conduct a pathfinder operation, the pathfinder commander follows, to the extent possible, the troop leading procedures listed below:

- a. Issue section warning order to include—
 - (1) A brief statement of the enemy and friendly situation.
 - (2) Mission of the section.
 - (3) Uniform and individual equipment; team and special equipment.
 - (4) Work priority for preparation of team equipment (normally SOP).
 - (5) Issue of rations, ammunition, and special equipment.
 - (6) Breakdown of section personnel.
 - (7) Time and place for the section to receive the operation order.
- b. Make tentative plan of operation to include the following:
 - (1) Study map.
 - (2) Check weather.
 - (3) Study unit *SOI*.
 - (4) Make a quick estimate of the situation.
 - (a) Requirement for additional personnel from supported unit.
 - (b) Requirement for additional equipment or material.
 - (c) Communications requirements.
 - (5) Begin planning.

- c. Arrange for—
 - (1) Movement of unit (informs second in command).
 - (2) Coordination (with ground and aviation units).
 - (a) Ground tactical plan.
 - (b) Landing and unloading plan.
 - (c) Air movement plan.
 - (d) Loading plan.
 - (3) Additional personnel or equipment, if any, from supported units.
- d. From the above, prepare tentative operational plan for the pathfinder section.
- e. Make reconnaissance when time permits. Continue estimate and receive recommendations.
- f. Complete plan (work out details, formulate orders).
 - (1) Present tentative plan to supported unit commander or his staff.
 - (2) Prepare final plan based on desires of supported unit commander and his final order.
- g. Issue section order (normally an oral order).
- h. Join supported units.
- i. Rehearse (if time and terrain permit).

APPENDIX D

AERIAL NAVIGATION STRIP MAPS

1. General

Aerial navigation strip maps can be used as map substitutes and as a systematic method for planning and study of flight routes. A sample strip map is shown in figure 16.

2. Elements of Aerial Navigation Strip Maps

All aerial navigation strip maps should contain the following eight elements:

a. Checkpoint Number. The numbering or lettering in sequence of checkpoints.

b. Identification of Checkpoint. A simple word description of the checkpoint.

c. Sketch. A simple sketch of what the checkpoint will look like as the aircraft flies over it.

d. Distance. The distance between checkpoints in nautical miles measured on a map to the nearest half mile.

e. Magnetic Heading. The magnetic heading in degrees from one checkpoint to the next.

f. Flight Speed. The speed in knots that the aircraft is to fly from one checkpoint to the next. This is usually the cruising speed of the aircraft.

g. Altitude (indicated). The altitude as indicated on the aircraft's altimeter. Indicated altitude includes ground elevation.

h. Time. The time rounded off to the nearest minute between checkpoints. The time is computed by using the formula in paragraph 4 below.

3. Preparation

In preparing aerial navigation strip maps, con-

sideration must be given to the following factors:

a. Checkpoints must be easily recognizable from the air.

b. Time between checkpoints should be relatively uniform. As the aircraft gets closer to the landing and/or drop zone, the checkpoints should be closer together to insure accuracy of navigation.

4. Formulas

The formulas used in computing time and distance are as follows:

$$a. \text{ Time: } T = \frac{D \times 60}{R}$$

T = Time

D = Distance

60 = Constant

R = Rate (speed) of aircraft in knots.

Example: Distance: 10 nautical miles

Rate: 90 knots

$$\frac{10 \times 60}{90} = \frac{600}{90} = 6.6 = 7 \text{ minutes}$$

Note: Round time off to nearest whole minute.

$$b. \text{ Distance: } D = \frac{R \times T}{60}$$

Rate: 90 knots

Time: 10 minutes

$$\frac{90 \times 10}{60} = \frac{900}{60} = 15 \text{ nautical miles}$$

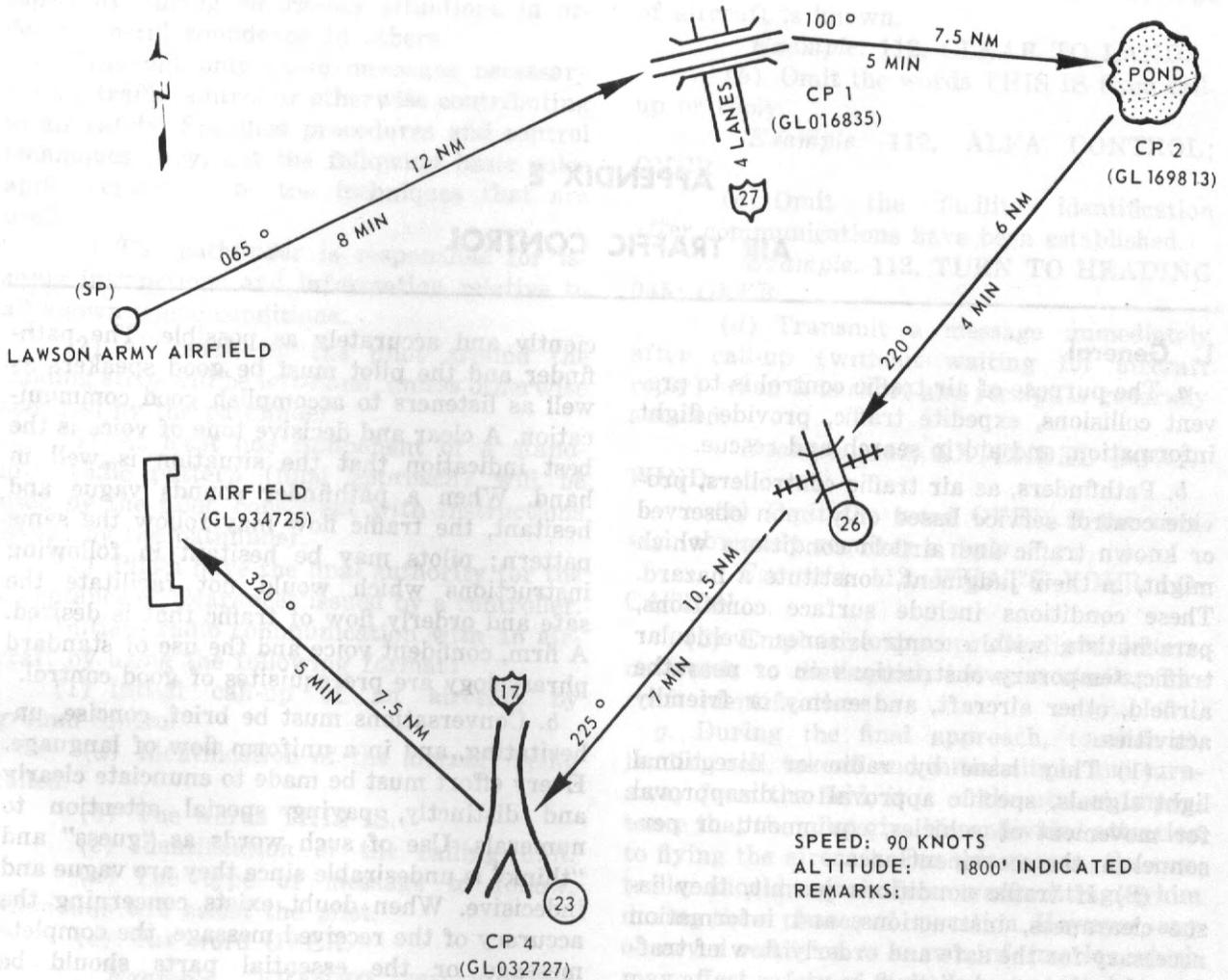


Figure 16. Sample aerial navigation strip map.

APPENDIX E

AIR TRAFFIC CONTROL

1. General

a. The purpose of air traffic control is to prevent collisions, expedite traffic, provide flight information, and aid in search and rescue.

b. Pathfinders, as air traffic controllers, provide control service based only upon observed or known traffic and airfield conditions which might, in their judgment, constitute a hazard. These conditions include surface conditions, parachutists within control zones, vehicular traffic, temporary obstructions on or near the airfield, other aircraft, and enemy or friendly activities.

(1) They issue by radio or directional light signals, specific approval or disapproval for movement of vehicles, equipment, or personnel on the movement area.

(2) If traffic conditions permit, they issue clearances, instructions, and information necessary for the safe and orderly flow of traffic under their jurisdiction.

c. Pathfinders are charged with the responsibility for maintaining a continuous surveillance of all visible air traffic operating within the control zone of the landing drop zone or airfield. They are also responsible for all aircraft, vehicles, and personnel in the movement area of the landing and/or drop zone or airfield.

d. Since it is impossible to list procedures to cover all traffic situations, it is essential that the air traffic controller develop knowledge, speed, and accuracy, which are the results of application, study, experience, and good judgment. In air traffic control, there can be no substitute for these three elements.

e. Definitions of terms peculiar to air traffic control are included in the glossary.

2. Communications

a. Because communication is the basic tool of air traffic control, words must be used as effi-

ciently and accurately as possible. The pathfinder and the pilot must be good speakers as well as listeners to accomplish good communication. A clear and decisive tone of voice is the best indication that the situation is well in hand. When a pathfinder sounds vague and hesitant, the traffic flow may follow the same pattern; pilots may be hesitant in following instructions which would not facilitate the safe and orderly flow of traffic that is desired. A firm, confident voice and the use of standard phraseology are prerequisites of good control.

b. Conversations must be brief, concise, unhesitating, and in a uniform flow of language. Every effort must be made to enunciate clearly and distinctly, paying special attention to numerals. Use of such words as "guess" and "think" is undesirable since they are vague and indecisive. When doubt exists concerning the accuracy of the received message, the complete message or the essential parts should be repeated.

c. The phonetic alphabet is used to indicate single letters, initials, or for spelling words whenever similar sounds or difficulties in communication make such use necessary.

d. Transmissions should be concise and in normal conversational tone. Rate of speech may be rapid when the situation demands it, providing the enunciation is distinct. However, the speed must never result in the need for repeated transmissions. The following may be used as a guide to good operating techniques for radiotelephone communications:

- (1) Speak directly into the microphone.
- (2) Speak in normal conversational tone.
- (3) Avoid monotonous pitch.
- (4) Avoid a too slow or too fast rate of speech.
- (5) Avoid any display of emotion, nervousness, indecision, or excitement.

(6) Above all, *speaks with confidence*, especially during emergency situations in order to instill confidence in others.

e. Transmit only those messages necessary for air traffic control or otherwise contributing to air safety. Specified procedures and control techniques vary, but the following basic rules apply regardless of the techniques that are used:

(1) The pathfinder is responsible for issuing instructions and information relative to all known traffic conditions.

(2) All turns by the pilot around the landing strip will be left-hand, unless otherwise specified by the pathfinder.

(3) At least one component of a standard traffic pattern (final approach) will be used by the pilot, consistent with instructions issued by the pathfinder.

(4) Pilots have the final authority for the acceptance of clearances issued by a controller.

f. Initiate radio communication with an aircraft by using the following format:

(1) Initial call-up of an aircraft by ground control.

(a) Identification of the aircraft being called.

(b) The words THIS IS.

(c) Identification of the calling unit.

(d) The type of message to follow, when this will assist the pilot.

(e) The word OVER.

Example. FRESNO TILES 112, THIS IS ALFA CONTROL; OVER.

(2) Replying to initial call-up from aircraft.

(a) Identification of aircraft initiating the call-up.

(b) The words THIS IS.

(c) Identification of the replying unit.

(d) The word OVER.

Example. FRESNO TILES 112, THIS IS ALFA CONTROL; OVER.

(3) Always preface a clearance of instruction intended for a specific aircraft with the identification of that aircraft.

Example. FRESNO TILE 112, CLEAR TO TAXI.

(4) Shorten transmissions as follows when no confusion is likely:

(a) Use only the last three digits or letters of aircraft identification after commu-

nications have been established and the type of aircraft is known.

Example. 112, CLEAR TO LAND.

(b) Omit the words THIS IS from call-up or reply.

Example. 112, ALFA CONTROL; OVER.

(c) Omit the facility identification after communications have been established.

Example. 112, TURN TO HEADING 045; OVER.

(d) Transmit a message immediately after call-up (without waiting for aircraft reply) when it is short and receipt is generally assured.

Example. 112, EXTENDED DOWNWIND.

(e) Omit the word OVER if the message obviously requires a reply.

Example. 112, WHAT'S YOUR LOCATION.

(5) Emphasize appropriate digits, letters, or words to distinguish between similar aircraft identifications.

g. During the final approach, touchdown, landing roll, takeoff and initial climb, and turn-away from the field, it is of the utmost importance that the pilot give his undivided attention to flying the aircraft. For this reason, the controller should *refrain* from transmitting to him during these phases of operation. However, any observed condition or known information which may affect safety of flight is transmitted at any time. *Under no* circumstance is information pertaining to hazardous runway, field, weather, or traffic conditions withheld from the pilot of an approaching aircraft.

3. Use of Numbers in Air Traffic Control Operations

a. Figures indicating hundreds and thousands in round numbers, as for ceiling heights and flight altitudes, will be spoken in accordance with the following examples:

Examples.

500—Five hundred (or five zero zero, for additional emphasis).

1,300—One thousand three hundred.

11,495—One one four niner five.

b. State the word TIME, followed by the digits specified:

Examples.

<u>Time (12 hr)</u>	<u>Time (24 hr)</u>	<u>Statement</u>
1:15 A.M.	0115	TIME, ZERO ONE ONE FIVE
1:15 P.M.	1315	TIME, ONE THREE ONE FIVE

c. State field elevations in feet in accordance with the following:

Examples.

<u>Elevation</u>	<u>Statement</u>
17 feet	FIELD ELEVATION ONE SEVEN
583 feet	FIELD ELEVATION FIVE EIGHT THREE

d. The number "0", except where it appears in group form, state the word ZERO.

e. State the word WIND, followed by the indicated wind direction; the words DEGREES AT, and the indicated velocity in knots.

Example. WIND 270° AT 5.

f. State the word HEADING, followed by the three digits of the number of degrees and omit the word DEGREES. Use HEADING 360 to indicate a north heading.

Example. HEADING 120
HEADING 005

4. Phraseology

Phraseology is a manner of expressing air traffic control terminology. Familiarity with the following phrases is essential in order to adequately talk to and control aircraft:

a. To issue takeoff clearance when a delay is not desired.

Example. CLEARED FOR IMMEDIATE TAKEOFF.

b. To issue takeoff clearance when aircraft is delaying on the runway.

Example. TAKEOFF IMMEDIATELY OR TAXI OFF THE RUNWAY.

c. Pilot requesting straight-in approach (after landing instructions have been issued).

Example. ALFA CONTROL THIS IS MUDDY 750, REQUEST STRAIGHT-IN APPROACH TO RUNWAY 18.

d. Pathfinder authorizing straight-in approach.

Example. MUDDY 750, STRAIGHT-IN APPROACH TO RUNWAY 18 APPROVED.

e. Pathfinder authorizing right-hand traffic pattern.

Example. MUDDY 750, RIGHT TRAFFIC APPROVED.

f. Pathfinder issuing a landing sequence.

Example. MUDDY 750, YOU'RE NUMBER THREE TO LAND; FOLLOW U-6 385 ON DOWNWIND.

g. Pathfinder instructing an aircraft to extend downwind leg in order to obtain necessary aircraft separation:

Example. MUDDY 750, EXTEND DOWNWIND.

h. Pathfinder advising an aircraft of pertinent information not included in landing instructions.

Example. MUDDY 750, BE ADVISED WE ARE RECEIVING AUTOMATIC FIRE FROM THE EAST.

i. Pathfinder trying to ascertain the identification of an aircraft in his area.

Example. UH-1 ONE MILE WEST OF DEKKAR STRIP, SAY ID.

j. Pathfinder instructing an aircraft to circle the field.

Example. MUDDY 750, CIRCLE THE FIELD.

k. Pathfinder issuing clearance to land.

Example. MUDDY 750, CLEAR TO LAND.

l. Pathfinder instructing an aircraft on final landing that clearance has been cancelled.

Example. MUDDY 750, GO AROUND.

m. Pathfinder informing an aircraft that it should continue its approach to the landing area.

Example. MUDDY 750, CONTINUE APPROACH.

n. To inform an aircraft of an observed aircraft condition when requested or when you deem necessary.

Example. MUDDY 750, LANDING GEAR APPEARS DOWN AND IN PLACE.

o. To describe vehicles, equipment, or personnel on the movement area in a manner which will assist pilots in recognizing them.

Example. MUDDY 750, AIRCRAFT TO LEFT OF RUNWAY.

MUDDY 750, VEHICLES ON TAXIWAY.

p. Describe military traffic by either of the following as appropriate:

(1) Service and type.

Example: ARMY HELICOPTER ON DEPARTURE END.

(2) To pilots familiar with military designations as a group figure rather than individual fires.

Example. MUDDY 750, BE ADVISED CH-47 ON RIGHT SIDE OF RUNWAY.

g. Describe the relative positions of traffic in an easy-to-understand manner, such as TO YOUR RIGHT or AHEAD OF YOU, instead of local terminology or compass directions.

Example: MUDDY 750, U-6 ON DOWNWIND TO YOUR LEFT.

5. Air Traffic Communication Words and Phrases

The following is a list of air traffic words and phrases and their meanings.

Abort—A failure to complete a landing or takeoff for any reason.

Acknowledge—Let me know that you have received and understand the message.

Affirmative—Yes.

Approved—When a pilot's request for a certain clearance can be met.

Be Advised—I am informing you of an unusual condition or hazard to flight.

Break—(1) To indicate the separation between back-to-back transmissions to two separate aircraft.

(2) To indicate the separation of the text from other portions of the message.

Correction—An error has been made in this transmission; the correct version is —.

Do Not Land—Self-explanatory.

Execute—Commence dropping personnel or equipment.

Go Ahead—Proceed with your message. Normally used when answering a call-up.

Go Around—Do not land; terminate your approach for landing; circle the landing area and begin another approach.

How Do You Hear Me?—Self-explanatory.

I Say Again—Self-explanatory.

Mayday—An emergency is in effect, clear the airways.

Negative—That is not correct.

No Drop—Cease dropping or do not drop personnel or equipment.

Out—This transmission is ended and no response is expected.

Over—My transmission is ended and I expect response from you.

Read Back—Repeat all this message back to me.

Report—Instruction to an aircraft to contact the control facility when reading a designated location, such as, REPORT ONE MILE FINAL.

Roger—I have received and understood all of your last transmission.

Say Again—Self-explanatory.

Say I.D.—Identify yourself.

Speak Louder—Self-explanatory.

Standby—(1) Must pause for a few seconds.

(2) Prepare to drop personnel or equipment.

That Is Correct—Self-explanatory.

Unable To Approve—When a pilot's request for a certain clearance cannot be met.

Unknown Station—The identity of the station with whom I am attempting to establish communication is unknown.

Use Caution—Self-explanatory.

Verify—Check with the originator.

Words Twice—Communication is difficult; transmit each phrase twice. This proword may be used as an order, request, or as information.

What Are Your Intentions?—Self-explanatory.

What Is Your Location?—Self-explanatory (normally requested by an air traffic controller to determine exact aircraft location).

Wilco—Will comply.

You Are Unreadable (Broken, Garbled)—Your radio transmission cannot be understood.

6. Traffic Pattern

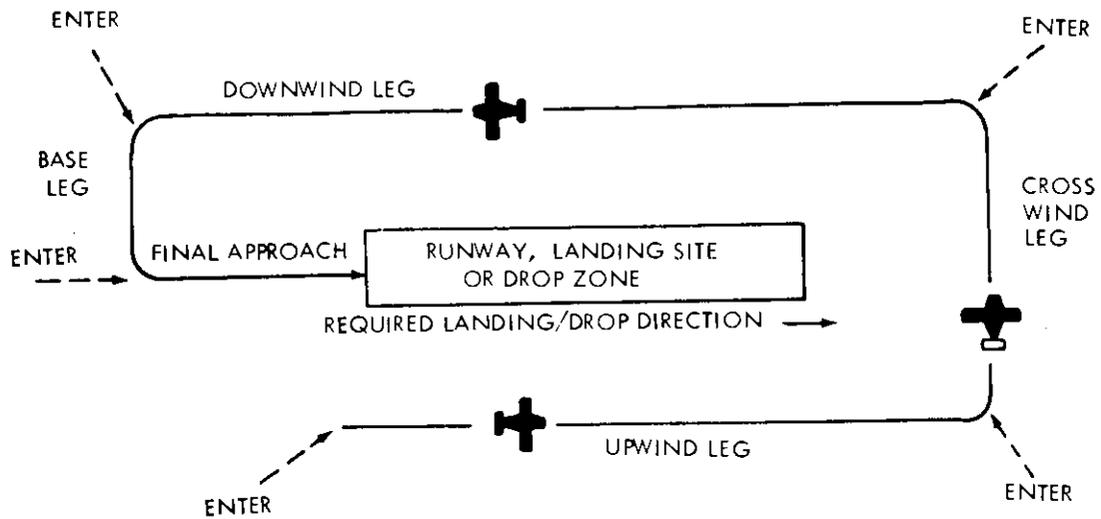
a. A traffic pattern (fig. 17) is used to maintain control in and around a landing site, airfield, or drop zone.

(1) *Left-hand traffic pattern.* The aircraft makes all left turns, keeping airfield, landing site, or drop zone to the pilot's left. This is the normal traffic pattern.

(2) *Right-hand traffic pattern.* The aircraft makes all right turns, keeping airfield, landing site, or drop zone to the pilot's right.

b. An aircraft may enter the traffic pattern from any point and from any direction within the area surrounding the landing strip and/or site, consistent with safety requirements.

LEFT-HAND TRAFFIC PATTERN (STANDARD)



- NOTES: a) TRAFFIC PATTERN ALTITUDE IS NORMALLY 1000-1200 FT ACTUAL
 b) TRAFFIC PATTERN MAY EXTEND OUT TO ONE MILE IN ALL DIRECTIONS FROM THE RUNWAY, LANDING SITE, OR DROP ZONE.

RIGHT-HAND TRAFFIC PATTERN

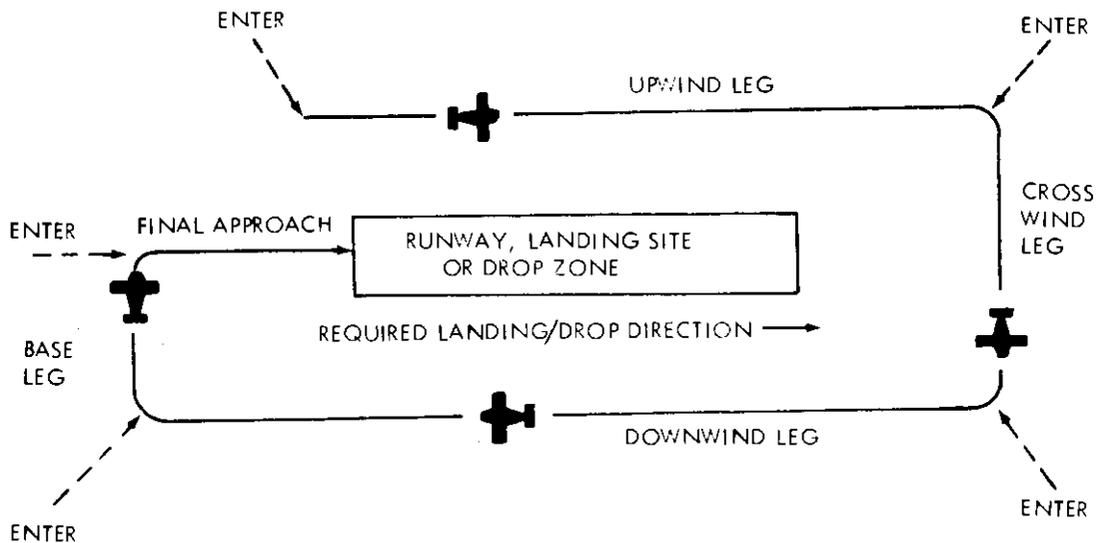


Figure 17. Air traffic patterns.

c. A straight-in approach is on a line within 20° of the center line of the landing strip.

d. A traffic pattern normally extends out to 1 mile from the center line of the landing area

in all directions, depending on the type of aircraft or size of the facility.

e. The altitude flown while in the traffic pattern is normally between 1000 and 1200 feet.

f. There are five legs to a traffic pattern:

(1) *Upwind leg.* A flight course parallel to the landing runway in the direction of landing.

(2) *Crosswind leg.* A flight course at right angles to the landing runway off its upwind leg.

(3) *Downwind leg.* A flight course parallel to the landing runway in the direction opposite to landing.

(4) *Base leg.* A flight course at right angles to the landing runway off its approach and extending from the downwind leg to the intersection of the runway center line extended.

(5) *Final approach.* A flight course in the direction of landing along the runway center line, extending from the base leg down to the runway.

7. Field Condition Information

As a pathfinder air traffic controlled, you must issue pertinent field condition information necessary for an aircraft's safe operation in time for it to be useful to the pilot. Include the following information, as appropriate:

a. Construction work on or immediately adjacent to the movement area.

b. Rough portions of the movement area.

c. Braking conditions caused by ice, snow, mud, slush, or water on the runway.

d. Parked aircraft on the movement area.

e. Any other pertinent field operations, situations, or conditions.

8. Advisory Service

Locations and configurations of airfields and landing sites vary greatly. It is safe to say that no two areas and situations encountered will be identical. A different location presents problems of its own with respect to environmental conditions, peculiar weather characteristics, a preferential landing direction, and other considerations. The following are some typical examples:

a. The final approach to a particular runway may require a glide slope angle that is higher than normal.

b. Unusual terrain features near the airfield may, under certain wind conditions, create turbulence that can be hazardous to aircraft operating nearby. Additionally, helicopters operating on or adjacent to the airfield can

create turbulence which may be hazardous to light aircraft.

c. Turns immediately after takeoff from some runways may be required due to prohibited areas, mountains, or other obstacles directly in line with the end of the runway.

d. Known friendly artillery or mortar fire within the control zone will require that the pathfinder give the aviator information pertaining to the origin, range, direction, and maximum ordinate of the firing. Air strikes within the control zone, especially those involving high performance aircraft, must be included.

e. Information pertaining to enemy situation must be given to the aircraft.

9. Taxiing Aircraft

a. When issuing taxi information, include the route for the aircraft to follow on the movement area, plus instructions to hold at a specific point, if necessary. However, movement of aircraft within loading, maintenance, dispersal, or parking areas is the responsibility of the pilot, although he might be assisted by signalmen. Issue concise and easy to understand taxi information.

Example. MUDDY 750, TURN RIGHT AT SIGNALMAN.
SERPENT 412, TURN LEFT AT END OF RUNWAY.

b. Hold a taxiing aircraft short of an active runway at least two airplane lengths, to insure that landing aircraft have sufficient clearance.

10. Visual Signal Procedures and Techniques

a. A rapid and efficient means of communications between aircraft and ground stations is a necessity in air traffic control. Two-way radio is the most advantageous system since information can be exchanged quickly and there is little doubt as to the intent of the messages. Since all aircraft may not be equipped with operative radios, however, a system of visual signals has been established. Colored smoke signals may also be used, but prior coordination must be made between the pathfinder and the aviation unit. The visual system also serves as a standby or back-up means of communications in case of radio failure in the aircraft or control center, or if an aircraft desires to land and does not have the control frequency.

b. Standard light signals are as follows:

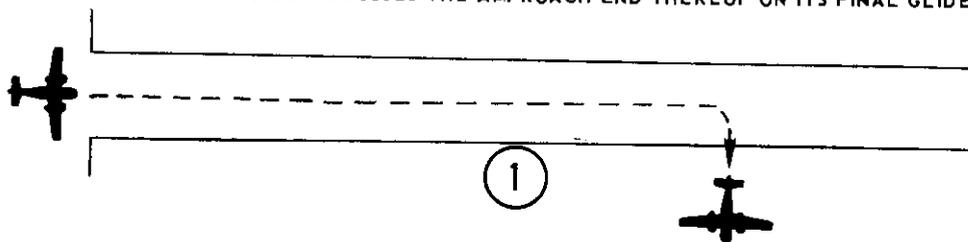
<i>Color & Type of Signal</i>	<i>Meaning on the Ground</i>	<i>Meaning in Flight</i>
Steady green	Cleared for takeoff	Clear to land.
Flashing green	Clear to taxi	Return for landing (to be followed by steady green at the proper time).
Steady red	Stop	Give way to other aircraft and continue to circle.
Flashing red	Taxi clear of landing area and/or runway in use.	Airfield unsafe—Do not land.
Flashing white	Return to starting point on the airfield.	
Alternating red and green	GENERAL WARNING SYSTEM—EXERCISE EXTREME CAUTION.	

11. Minimum Separation Requirements

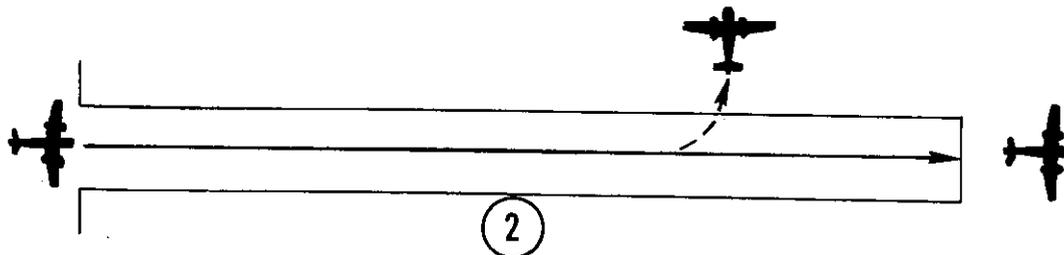
The minimum separation criteria illustrated in figure 18 should be followed during normal

operations. Combat situations, however, may often dictate less separation.

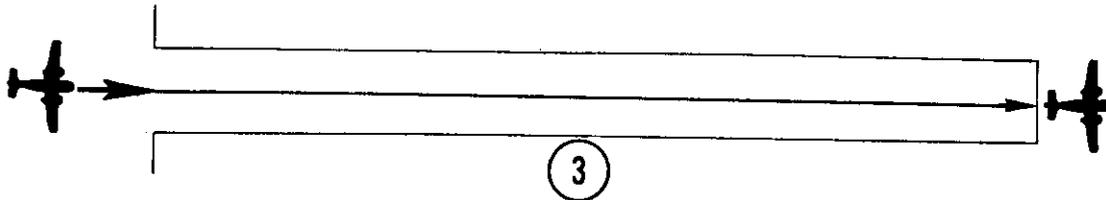
ARRIVING AIRCRAFT. THE PRECEDING AIRCRAFT HAS TAXIED OFF THE LANDING STRIP BEFORE THE SUCCEEDING AIRCRAFT CROSSES THE APPROACH END THEREOF ON ITS FINAL GLIDE:



DEPARTING AIRCRAFT. THE PRECEDING AIRCRAFT HAS EITHER CROSSED THE OPPOSITE END OF THE RUNWAY OR TURNED AWAY FROM THE PROJECTED PATH OF THE SUCCEEDING AIRCRAFT BEFORE THE LATTER BEGINS ITS TAKE-OFF RUN.



ARRIVING AIRCRAFT AND A PRECEDING DEPARTING AIRCRAFT. THE PRECEDING DEPARTING AIRCRAFT HAS CROSSED THE OPPOSITE END OF THE RUNWAY BEFORE THE ARRIVING AIRCRAFT CROSSES THE APPROACH END THEREOF ON ITS FINAL GLIDE.



DEPARTING AIRCRAFT AND A PRECEDING ARRIVING AIRCRAFT. THE PRECEDING ARRIVING AIRCRAFT HAS TAXIED OFF THE RUNWAY BEFORE THE DEPARTING AIRCRAFT BEGINS TAKE-OFF RUN.

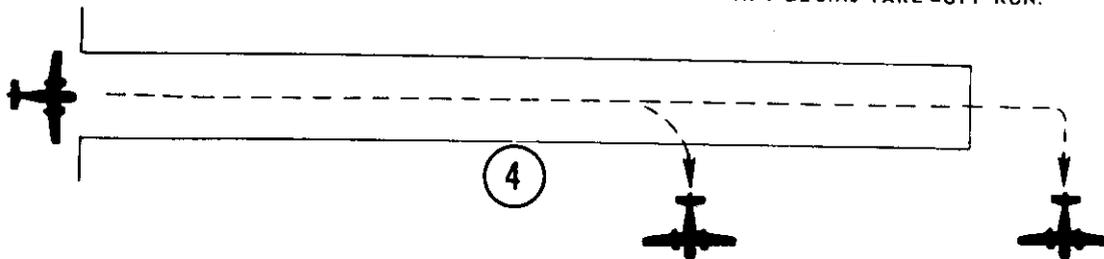


Figure 18. Minimum separation requirements.

APPENDIX F

STANDARD HAND-AND-ARM SIGNALS

1. General

The standard hand-and-arm signals contained in this appendix may be used effectively to assist in landing, hovering or taxiing, and parking of aircraft (figs. 19-37).

2. Conduct of Signaling

a. Signal must be given in a clear, distinct manner so as not to be confused with other similar signals. Signals should be given only when needed.

b. Signals at night are given using lighted batons or flashlights in each hand. Signals given at night are identical to the day signals. When using flashlights, as an expedient, care must be taken to preclude blinding the pilot. Batons and flashlights should remain lighted at *ALL TIMES* when signaling.

c. Speed of arm movement indicates desired speed of aircraft compliance with signal.



Figure 19. Signalman's position (helicopter). The position for the signalman when directing a helicopter is to the right front of the aircraft, where he can best be seen by the pilot. When directing armed helicopters, the signalman should not position himself directly in front of the aircraft at any time.



Figure 20. Assume guidance. Arms above the head in vertical position with palms facing inward.



Figure 21. Proceed to next signalman. Right or left arm down, other arm moved across the body and extended to indicate direction to next signalman.



Figure 22. Hover. Arms extended horizontally sideways palms downward.

Note. When guiding a landing helicopter, this signal normally should not be given until the helicopter is approximately 5 feet off the ground and just short of the desired landing point, depending on its forward speed.



Figure 23. Move ahead. Arms a little aside, palms facing backwards and repeatedly moved upwards and backwards from shoulder height.



Figure 24. Move back. Arms by sides, palms facing forward, arms swept forward and upward repeatedly to shoulder height.

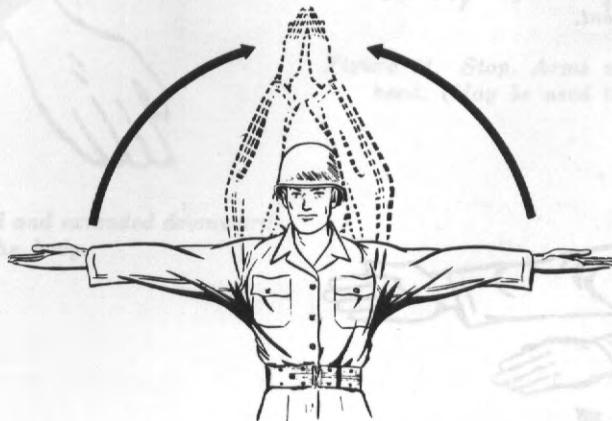


Figure 25. Move upwards. Arms extended horizontally sideways beckoning upwards, with palms turned up.



Figure 26. Move downwards. Arms extended horizontally sideways beckoning downward, with palms turned down.



Figure 27. Cut sling load. Left arm is extended sideways in direction of movement and other arm swung in front of body in same direction, in repeating movement.

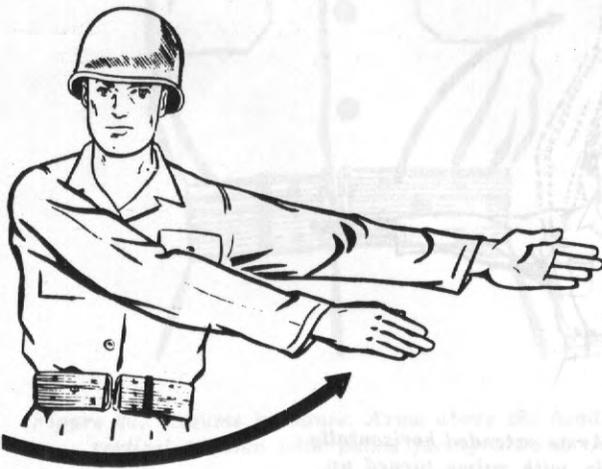


Figure 28. Move right. Left arm extended horizontally sideways in direction of movement and other arm swung in front of body in same direction, in repeating movement.



Figure 29. Spot turn. Left or right hand moving upward and backward, from a horizontal position, to indicate direction of tail movement. Other hand pointing to center of spot turn. Signalman must remain in full view of the pilot.



Figure 30. Land. Arms crossed and extended downward in front of the body.



Figure 31. Stop. Arms repeatedly crossed above the head. (May be used to indicate "go around.")

TAXIING

... of the signaller's position (telephone). The position for the signaller which directs airplanes is forward of the left wingtip in full view of the pilot.

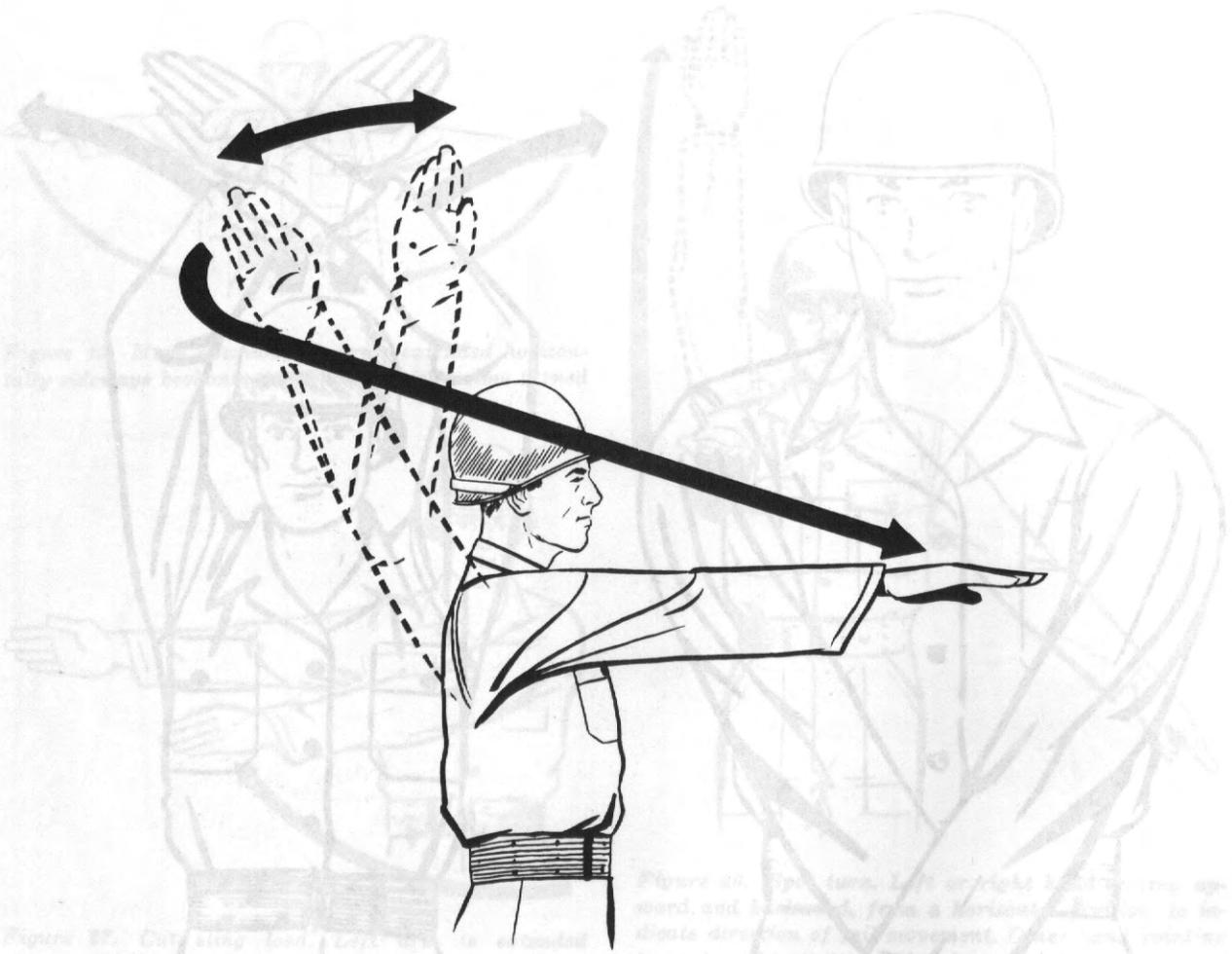


Figure 32. Takeoff. Make circular motion with right hand overhead, ending in a throwing motion in the direction of takeoff.

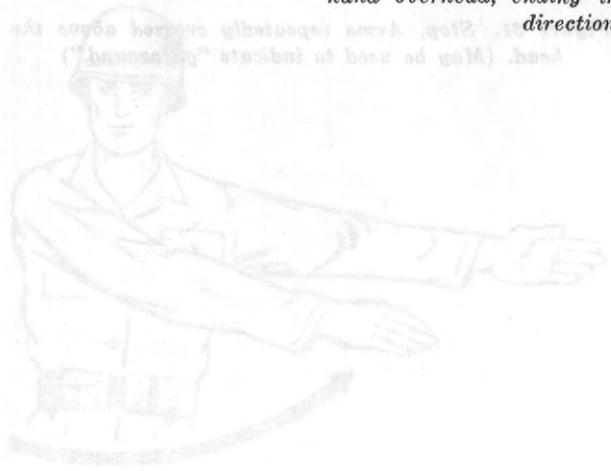
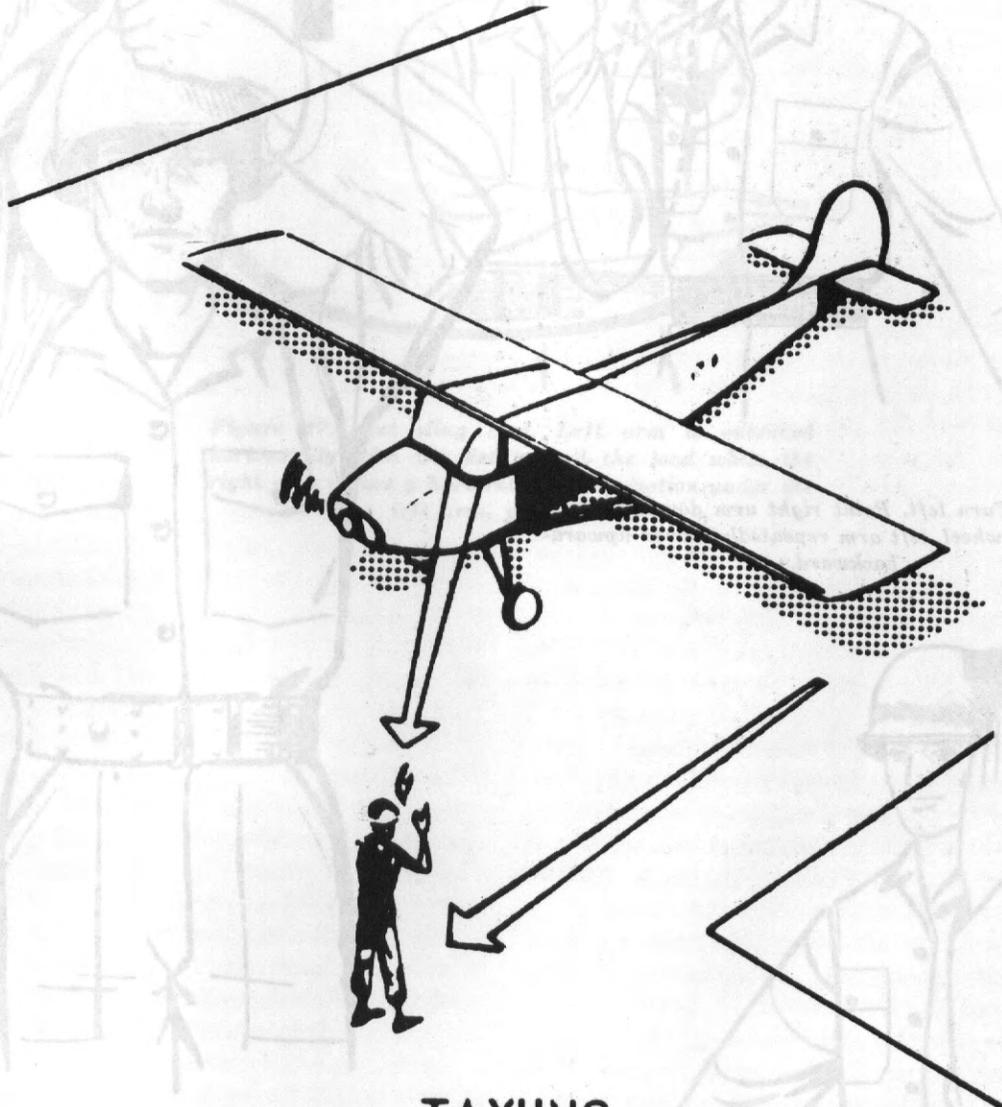


Figure 28. Move right. Left arm extended horizontally... in front of body...



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Figure 33. Signalman's position (airplanes). The position for the signalman when directing airplanes is forward of the left wingtip in full view of the pilot.



Figure 34. Turn left. Point right arm downward and point to left wheel, left arm repeatedly moved upward-backward.

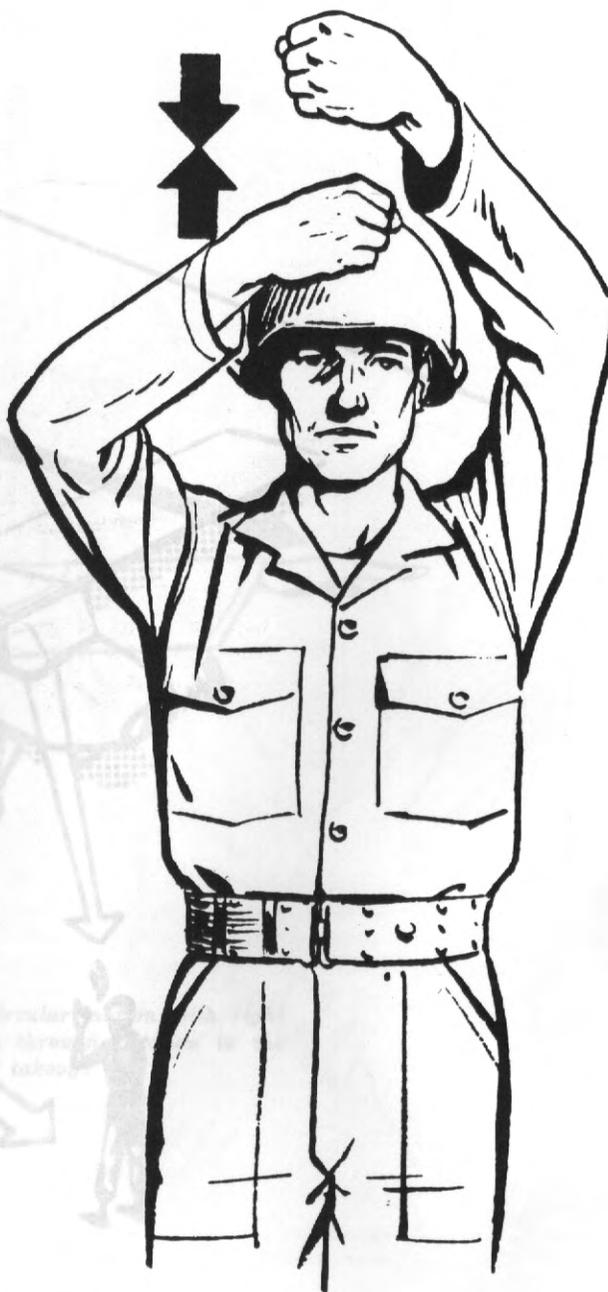


Figure 36. Hook up complete (slingload). Place right fist in front of head and left fist over right fist in a rope climbing position. Then bump fist together.



Figure 35. Turn right. Point left arm downward and point to right wheel, right arm repeatedly moved upward-backward.



Figure 37. Cut sling load. Left arm is extended horizontally with the fist toward the load while the right arm makes a horizontal slicing motion under the left arm, palm down.

GLOSSARY

- Advisory Service**—Advice and information provided by a facility to assist pilots in the safe conduct of flight and aircraft movement.
- Aerial Fire Support**—A capability of Army aviation to provide the ground force commander with offensive and defensive fires for the destruction or neutralization of enemy targets.
- Aerial Fire Request**—A request for any aerial fire support means to provide offensive or defensive fires for the destruction or neutralization of enemy targets.
- Aerial Rocket Artillery**—Army helicopters configured with an air-to-ground rocket delivery system, used for area fire, and organic to an artillery battalion.
- Aerial Surveillance**—The observation of specific air or surface areas by visual, electronic, photographic, or other means to provide timely intelligence information for supported tactical ground commanders.
- Aerial Control Point (ACP)**—An easily identifiable topographic feature of the terrain or an electronic navigational aid along a flight route to control an airborne formation to and from the objective area.
- Air Traffic**—Aircraft operation in the air or on an airport surface, exclusive of loading ramps and parking areas.
- Air Traffic Control (ATC)**—Air traffic control is an agency that provides services to promote the safe and expeditious flow of air traffic.
- Airmobile Combat Assault (CA)**—(combat assault helicopter assault force). Tactical organization combining helicopter and supported ground units, to conduct combat operations into an unsecure LZ.
- Airmobile Force (AMF)**—(airmobile units)
The aviation and ground combat elements combined to conduct airmobile operations.
- Airmobile operations**—Operations in which forces and their equipment move about the battlefield in air vehicles, under the control of the ground force commander to engage in ground combat.
- Air Movement Plan**—Used in detailed planning for an airlift, when the airlift of troops is involved. It is prepared jointly by the respective ground force and aviation unit commanders.
- Airport**—An area of land or water that is used or intended to be used for the landing and takeoff of aircraft, and includes its buildings and facilities, if any.
- Airport Traffic Area**—Unless otherwise specifically designated, that air space within a horizontal radius of 5 statute miles from the geographical center of any airport at which a control facility is operating, extending from the surface up to, but not including, 2,000 feet above the surface.
- Allowable Cargo Load (ACL)**—The number of troops, amount of cargo, or combination determined by weight, cubic displacement, and distance to be flown, which may be transported by one aircraft in one sortie.
- Alternate Landing Site**—A site selected to support a ground tactical plan and used if enemy action, unfavorable terrain, or change in situation require a change from primary landing site.
- Altimeter Setting**—A barometric pressure in inches (of mercury) for setting a pressure scale type of altimeter. For example, a barometric pressure of 29.92 inches of mercury would be stated as "altimeter two niner niner two."
- Assault Echelon**—The lead elements of an airmobile force scheduled for initial assault of the objective area.
- Assault Force**—Those units charged with the seizure of the objective area.
- Basic Planning Guide**—Report prepared by ground units, showing echelonment of personnel and equipment of the units to serve

as a basis for determining the aircraft needs for an operation.

CDS—Container delivery system (USAF).

Ceiling—For practical purposes, the lowest height above the surface at which the total cloudiness between that level and the surface (as seen by a ground observer) covers more than half the sky.

Center of Gravity (CG)—The point about which an object would balance if supported at that point, or the point at which the weight of an object or group of objects may be considered concentrated.

Chalk Number—A single aircraft or aircraft load within a flight element.

Clearance—An authorization by an air traffic controller, for the purpose of preventing collisions between known aircraft, for an aircraft to proceed under specified traffic conditions within controlled air space.

Closed Traffic—Air traffic that remains within the traffic pattern around a landing site.

Combat Loading (Cross Loading)—The loading of personnel to maintain tactical integrity consistent with type aircraft; and the storage of equipment and supplies to permit direct employment into the area of operations.

Command and Control Aircraft (C AND C A/C)—An aircraft, usually a UH-1D, equipped with additional FM and UHF radios and used by the airmobile force commander and his staff in controlling airmobile operations.

Communication Checkpoint (CCP)—An easily identifiable topographic feature on the terrain along a flight route over which aircraft inbound to a landing and/or drop zone initiate radio contact with a control facility at the landing and/or drop zone.

Contour Flying—Low altitude flight in which the flight pattern conforms generally to the contours of the ground. It is used to avoid observation or detection of an aircraft and/or the prints to and from which it is flying.

Control Center—A location from which appointed personnel control air traffic in and around a landing drop zone to promote safe, orderly, and expeditious air movement.

Control Zone—Control zones extend upward from the surface. A control zone may include one or more landing and/or drop zones

and is normally a circular area of 5 statute miles in radius with extensions where necessary to include instrument approach and departure paths.

Controlled Airspace—Airspace designated as continental control area, control zone, or transition area, within which some or all aircraft may be subject to air traffic control.

Course—The intended direction of horizontal flight.

Density Altitude (DA)—Density altitude is determined by altitude, temperature and humidity. Generally speaking, high, hot, and dry conditions (high density altitude) will decrease the lift capability of an aircraft.

Drop Altitude—Actual altitude in feet of an aircraft above the ground at the time of the initiation of an airdrop.

Drop Zone (DZ)—A specified area upon which airborne troops, equipment and supplies are dropped by parachute, or on which supplies and equipment may be delivered by free fall.

Eagle Flight—An airmobile force either on ground or air alert to perform rapid reaction mission.

Extraction—Voluntary or involuntary withdrawal by air of troops, equipment, or supplies from an area.

Final Approach (VFR)—A flight path of a landing aircraft in the direction of landing along the extended runway centerline from the base leg to the runway.

Flight—Two or more Army aircraft, with a common mission, under the control of a single flight leader.

Flight Leader—An aviator who commands a designated flight of aircraft on a common mission supporting one unit.

FM Home—A directional homing or beacon signal given by keying an FM radio.

Glide Slope—The vertical slope between an aircraft and the landing surface during an approach. The glide slope is normally expressed in degrees.

Glide Slope Indicator (GSI)—A device designed to emit a visual, three-color light beam which indicates to an aviator a safe glide path for an aircraft over approach obstacles into a landing site.

Ground Controlled Approach (GCA)—Landing, usually under IFR conditions, accom-

- plished with the assistance of a ground controller using radio and radar to direct an aircraft to, and maintain it on, the correct course and glide path to accomplish a successful landing.
- Ground-to-Air Radio**—A radio used to maintain communication with aircraft.
- Heliport**—An area prepared for the accommodation, landing and takeoff of helicopters only.
- H-HOUR**—Pertaining to airmobile and/or airborne operation, H-Hour is the time of touchdown of the lead ship of an assault echelon in the landing zone, or the initiation of the drop of the first load of parachutists.
- Homing Beacon**—A device transmitting an electronic signal used to assist in the guidance of aircraft.
- IFR Conditions**—Weather conditions below the minimums prescribed for flights under visual flight rules.
- Internal Net Radio**—A radio used to maintain communication with other elements of a pathfinder unit at the same or adjacent locations.
- Instrument Flight Rules (IFR)**—Rules prescribed by the Civil Air Regulations governing instrument flight.
- Knots**—A unit of speed equivalent to 1 nautical mile or 6,080.2 feet per hour. Sixty nautical miles equals 1° of a terrestrial great circle.
- Landing Aids**—Any system or device for aiding aircraft in an approach for landing.
- Landing Formation**—The formation in which aircraft will land. It is desirable to land aircraft in the same formation in which they are flying.
- Landing Point**—A designated or selected touchdown point where a single aircraft lands.
- Landing Site**—A subdivision of a landing zone that contains one or more landing points.
- Landing Strip**—An airfield which may include a runway, taxiways, parking points, and dispersal areas. The three classifications of airfields are pioneer, hasty, and deliberate, depending upon the degree of improvement.
- Landing Zone**—A landing area that encompasses one or more landing sites and/or strips, and normally has the required control facilities.
- Lapes**—Low altitude parachute extraction system (USAF).
- Lift**—A tactical grouping of one or more serials of aircraft operating on an assigned mission.
- Light Gun**—A long, range, highly directional, visual signaling device normally used in a ground-to-air role.
- Local Traffic**—Aircraft operating in the traffic pattern of the landing area concerned.
- Lolox**—Low level extraction (U.S. Army).
- Medical Evacuation (MEDEVAC)**—The primary mission of air ambulance units and a secondary mission of all Army aircraft.
- Minimum Safety Altitude**—The altitude below which it is hazardous to fly.
- Movement Area**—The part of the airfield reserved for taking off, landing, and taxiing of aircraft.
- Pathfinder (PFDR)**—Trained individuals who provide navigational assistance to and control of aircraft.
- Pickup Zone (PZ)**—The designation of a tactical extraction area secured by the extracted force with diminishing security after each lift.
- Pre-Strike**—Air Force, artillery, or armed helicopter fire placed on an LZ and/or objective area prior to the arrival of the airmobile task force.
- Release Point (RP)**—An established traffic control point and final navigational checkpoint along a flight route for aircraft approaching the landing and/or drop zone.
- Reporting Point**—A geographical location in relation to which the position of an aircraft is reported.
- Runway End**—The end of that portion of the runway usable for landing or takeoff.
- Search and Rescue Facility**—A facility responsible for maintaining and operating a search and rescue service for occupants of missing or downed aircraft.
- Separation**—Spacing of aircraft to achieve their safe and orderly movement in flight and while landing and taking off; a specified longitudinal, vertical, or lateral distance between two or more aircraft in flight provided by air traffic control to insure safety in the air.
- Serial**—A tactical grouping of two or more flights, under control of a single mission

commander separated from other tactical grouping of flights.

Sortie—One aircraft making one takeoff and one landing.

Staging Area—A geographic locality between the base camp and the objective of an air-mobile force through which the parts thereof pass for refueling, regrouping, inspection and redistribution of troops, to continue operations more efficiently. Encompasses as a rule, a forward logistical base, aviation fueling-arming facilities, and the AMF reserve.

Station Time—That time when all personnel and/or material must be loaded and prepared for takeoff.

Straight-In Approach (VFR)—Entry of the traffic pattern by interception of the extended runway centerline without executing any other portion of the traffic pattern.

Supporting Aircraft—Supporting aircraft consist of all aircraft designated to provide combat support, combat service support, or command and control service to a land force.

Suppressive Fires—Fires placed upon known or suspected locations of enemy troops, weapons, or likely enemy positions which, because of their proximity to the flight path, present an immediate or potential threat to aircraft movement. Suppressive fires are employed during helicopter assault of an enemy position in order to greatly reduce effective enemy small arms and automatic weapon fires directed against the assault landings. Fires are provided by Army air-

craft armed for the expressed mission of aerial fire support.

Takeoff Clearance—Authorization by an air traffic control tower for an aircraft to take-off.

Terminal Guidance Personnel—Selected personnel other than qualified pathfinders within a ground unit who are trained to provide minimum guidance, information, and control to aircraft in the absence of TOE pathfinder elements.

Traffic Pattern—The traffic flow that is prescribed for aircraft landing at, taxiing on, and taking off from an airport. The usual components of a traffic pattern are upwind leg, crosswind leg, downwind leg, base leg and final approach. A traffic pattern may also be used around a drop zone.

UHF Communications—Communications using the ultra-high radio frequencies. Frequency span is 300 megacycles to 3000 megacycles.

Vector—A heading issued to an aircraft to provide navigational guidance by radar.

Visual Flight Rules (VFR)—Rules prescribed by the Civil Air Regulations governing visual flight.

VFR Conditions—Weather conditions equal to or better than the minimums prescribed for flights under Visual Flight Rules.

VFR Flights—Flights governed by Visual Flight Rules.

VHF Communications—Communications using the very high radio frequencies. Frequency span is 30 megacycles to 300 megacycles.

By Order of the Secretary of the Army:

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