FM 1-80

DEPARTMENT OF THE ARMY FIELD MANUAL

AERIAL OBSERVER TECHNIQUES AND PROCEDURES

HEADQUARTERS, DEPARTMENT OF THE ARMY
DECEMBER 1968

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CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *18 November 1970*

AERIAL OBSERVER TECHNIQUES AND PROCEDURES

FM 1-80, 17 December 1968, is changed as follows:

Page 3. Paragraph 2*a*.1 is added after paragraph 2*a*.

2*a*.1. The entire content of this manual as it applies to techniques and procedures falls within the doctrinal concepts of the surveillance, target acquisition, and night observation (STANO) system (FM 31-2 Test).

Page 3, paragraph 2c. In line 11, "ATTN: AJRAC-D" is changed to read "ATTN: ATSAV-DL-L."

Page 5. Paragraph 6*g* is added after paragraph 6*f*.

g. Radio. Aerial observation operations rely heavily on radio, both in planning and executing missions. Indiscriminate use of radio without employing proper communications security procedures can lead to the compromise of aerial observation missions and thus reduce their effectiveness. The reliance on radio when making spot reports of critical information renders this communication means particularly susceptible to enemy electronic countermeasures (i.e., jamming and deception) unless aviator-observer teams are proficient in electronic counter-countermeasures. (See FM 32-5 for details on communication security. Electronic countermeasures and electronic counter-countermeasures are discussed in FM 24-18 and FM 32-20.)

Page 6, paragraph 10. Line 4, the following is added. All Army aircraft may be equipped with STANO items; however, the observation aircraft may be categorized as part of the STANO system.

Page 24, figure 13. Subparagraph 5*b*(2)(*c*) is added as follows:

(*c*) Instructions in the event of enemy ECM.

Page 25, paragraph 28c. Line 7 is changed to read "port. In the event of radio failure or denial of radio communications through enemy electronic countermeasures, alternate"

Page 29, paragraph 39a. In line 1, "AR 95-51" is changed to read "AR 95-1."

Page 30, paragraph 43. Subparagraphs *h* and *i* are added as follows:

h. Employ communications security measures consistent with the successful completion of the mission.

i. Be able to communicate effectively in spite of enemy electronic countermeasures.

Page 31, paragraph 45d(4). In line 9, "AR 95-51" is changed to read "AR 95-1."

Page 32, paragraph 1, appendix A.

(1) The following Army regulations are deleted.

95-51	Aerial Observer Training.
320-5	Dictionary of United States Army Terms.
320-50	Authorized Abbreviations and Brevity Codes.

(2) The following Army regulations are added.

95-1	Army Aviation General Provisions.
310-25	Dictionary of United States Army Terms (Short Title: AD).
310-50	Authorized Abbreviations and Brevity Codes.

Page 32, paragraph 2, appendix A.

(1) In numerical sequence, the following field manuals are added.

1-40	Attack Helicopter Gunnery.
24-18	Field Radio Techniques.
31-2(Test)	Surveillance, Target Acquisition, and Night Observation (STANO) Doctrine.
(C)32-5	Signal Security (SIGSEC) (U).
(C)32-20	Electronic Warfare (Ground Based) (U).

(2) The following field manuals are deleted.

1-110	Attack Helicopter Employment.
57-100	The Airborne Division.

Page 32, paragraph 5, appendix A. In line 1, DA Pam 108-1 title is changed to read "Index of Army Motion Pictures and Related Audio-Visual Aids."

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:
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CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *18 November 1969*

AERIAL OBSERVER TECHNIQUES AND PROCEDURES

FM 1-80, 17 December 1968, is changed as follows:

Page 3. Paragraph 2*c* is superseded as follows:

c. Users of this manual are encouraged to submit recommended changes and comments to improve the manual. 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 forwarded direct to the Commandant, United States Army Aviation School, ATTN: AJRAC-D, Fort Rucker, Alabama 36360.

Page 5. Paragraph 8*c*(4) is superseded as follows:

(4) Camouflage inspection is the aerial observation of friendly units to determine the condition and effectiveness of camouflage.

Page 6. Paragraph 8*c*(5) is superseded as follows:

(5) Other observation missions as directed by the commander or the tactical situation; e.g., reconnaissance of a landing zone, topographic survey, radiological survey, and reconnaissance for the escort of airmobile forces.

Page 6, paragraph 11b. In lines 22 and 23, "systems to perform the mission of aerial suppressive fire" is changed to read "subsystems for neutralization fire."

Page 13, paragraph 15b(1)(a). In line 8, "19 miles" is changed to read "30 kilometers"; in line 10, "29 miles" is changed to read "47 kilometers."

Page 15, paragraph 15b(3)(d). In line 6, "This" is changed to read "These."

Page 23. Paragraph 22 is superseded as follows:

22. Mission Request Procedures

All aerial observation mission requests are processed through intelligence channels.

a. Preplanned aerial observation. Any intelligence communications method (i.e., radio, wire, courier, etc.) may be used for requesting preplanned missions so long as the request arrives at the action headquarters prior to the cutoff time established by SOP. All intermediate headquarters will take the necessary action to approve, disapprove, or modify requested preplanned missions.

b. Immediate aerial observation. Immediate mission requests from subordinate elements that have a tactical air control party (TACP) attached are transmitted over the Air Force immediate air request net directly from the requesting unit's TACP, bypassing any intermediate headquarters, to the direct air support center (DASC). The corps G2 Air, who is located at the tactical air support element (TASE) of the corps tactical operations center (CTOC), receives a copy of the request from the DASC. Units that do not have a TACP will forward requests by the most expeditious means to the next higher headquarters, until they arrive at a headquarters with a TACP where the requests are inserted into the Air Force immediate air request net. The battalion, brigade, and division TACP's all monitor the Air Force immediate air request net. When a request is submitted over the net, intermediate headquarters will—

(1) Monitor and acknowledge receipt of the transmission.

(2) Remain silent after acknowledging receipt of the transmission, thereby signifying approval of the request.

(3) Enter the net to disapprove the requested mission.

(4) Enter the net to modify the requested mission.

Page 23, paragraph 23. In lines 15 through 19, "Preplanned missions will be assigned to units in the aerial surveillance and reconnaissance plan. For discussion of indirect aerial surveillance and reconnaissance, see FM 30-20" is changed to read "For discussion of indirect aerial surveillance and reconnaissance, see paragraphs 5-11 and 5-12, FM 30-20. Preplanned missions will be assigned to units in the aerial surveillance and reconnaissance plan."

Page 29, paragraph 37b. In line 1, "or" is changed to read "for."

Page 32, paragraph 2, appendix A. In the proper numerical order, add the following in paragraph 2, Field Manuals:

1–110	Attack Helicopter Employment.
31–36 (TEST)	Night Operations.

Page 35, paragraph 3g. In line 8, ".30 caliber" is changed to read "7.62mm."

Page 37, paragraph 4c. In line 2, "figure 13" is changed to read "figure 15"; in line 8, "(fig. 14)" is changed to read "(fig. 16)."

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:
To be distributed in accordance with DA Form 12–11 requirements for Aerial Observer Training.

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FIELD MANUAL
No. 1–80

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *17 December 1968*

AERIAL OBSERVER TECHNIQUES AND PROCEDURES

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***This manual supersedes FM 1–80, 30 April 1965 and Change 1, 21 December 1966.**

CHAPTER 1
INTRODUCTION

1. Purpose

This manual provides guidance to commanders, staffs, aviators, and observers concerned with the planning and conduct of direct aerial observation missions. It also provides information from which basic aerial observer skills may be developed.

2. Scope

a. This manual describes the planning and conduct of aerial observation missions and the aerial observer techniques and training procedures necessary to qualify selected personnel to observe from Army aircraft. See ASubjScd 1-8 for detailed guidance to qualify selected individuals for duty as aerial observers. The discussion herein is focused on direct observation methods. FM 30-20 provides information relative to indirect aerial surveillance and reconnaissance.

b. The information contained herein is applicable to nuclear and nonnuclear war.

2a.1 added see C2

c. ~~Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to a specific page, paragraph, and line of the text in which a change is recommended. Reason should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded to the Commandant, United States Army Aviation School, ATTN: AASPI, Fort Rucker, Alabama 36360.~~

Superseded C1

3. Objective and Missions of Aerial Observation

a. The objective of aerial observation is to provide timely information to the supported commander through missions performed by Army aviation employing aerial observers.

b. Aerial observation is employed in—

(1) Aerial surveillance.

(2) Aerial reconnaissance.

(3) Special missions.

CHAPTER 2
BASIC PRINCIPLES

Section I. GENERAL

4. Tactical Application of Aerial Observation

a. Army aviation is employed by the commander to supplement his ground observation means and to improve the observation capabilities over his area of influence and interest. Observation coordinating both aerial and ground means provides the commander a more complete coverage of his area of influence and interest.

b. Aerial observation is an inherent part of all Army aviation missions. Commanders utilizing Army aviation should consider this potential in their intelligence collection efforts.

5. Capabilities

Aerial observation is a primary capability of Army aviation. Properly employed, it increases the combat effectiveness of the supported ground unit by—

a. Providing greater observation coverage and, therefore, greater security within the commander's area of influence and interest.

b. Avoiding the obstacles and other restrictions normally countered in ground observation and reconnaissance.

c. Accelerating the accumulation, reporting, and dissemination of information by extending its ground reconnaissance capability.

6. Limitations

Factors that limit and affect the accuracy and completeness of the information obtained by aviator-observer teams are—

a. Weather. Weather conditions which produce poor visibility may affect accuracy and completeness of information or prevent its collection by direct observation methods. Use of indirect observation methods, such as side looking airborne radar and infrared devices, can lessen the effect of this limitation, provided the aircraft can be operated along the desired flightpath.

b. Air Defenses. Enemy air defense systems may deny access to certain areas. Flak suppression programs and local air superiority may reduce the effectiveness of enemy air defenses and facilitate the accomplishment of essential observation missions.

c. Loss of Secrecy. Increased aerial activity over a specific area may indicate to the enemy the intentions of the ground commander. Proper employment of counterintelligence measures and careful cover and deception planning of observation missions will lessen the effect of this limitation.

d. Terrain. The primary terrain limitation involves those areas having dense vegetation such as jungles, and areas having terrain obstacles such as high hills or mountains which mask or restrict direct observation. Natural restrictions may have similar effects on the various indirect observation methods.

e. Night and Reduced Visibility. The hours of darkness and periods of reduced visibility caused by smoke, haze, fog, dust, etc., may reduce the effectiveness of visual observation. Since indirect observation methods are affected less by these limitations, they may be used more extensively than direct methods during these periods of reduced visibility and at night.

Illuminating flares and/or searchlights may be used for night observation missions.

f. Quality and Proficiency of Aerial Observers. Complete and accurate information by direct observation methods is at best difficult to obtain. Aerial observer training must be complete and continuous in order to assure acceptable mission results.

f. Added see C

Section II. OBSERVATION METHODS AND CATEGORIES

7. Methods

The two methods used to conduct aerial observation are—

a. Direct observation, which is visual observation, sometimes aided by the use of binoculars, telescopes, mechanical ranging devices, and light amplifying devices.

b. Indirect observation, which is observation employing radar, infrared, photographic, and other electronic means.

8. Categories

Aerial observation includes aerial surveillance, aerial reconnaissance, and special missions employing both direct and indirect methods to conduct these missions.

a. Aerial Surveillance. Aerial surveillance is the systematic observation of air or surface areas to obtain information to be processed into intelligence. Aerial surveillance missions provide the supported commander with current information by keeping a systematic and repeated watch over a well defined area for the purpose of detecting, identifying, locating, and reporting any information of military value. These missions normally are flown on a regular schedule.

b. Aerial Reconnaissance. Aerial reconnaissance is a mission to obtain information about the activities and resources of an enemy or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. These missions normally are flown to obtain specific information of military value without the requirement for continuous coverage and are not flown on a regular schedule.

(1) *Route reconnaissance.* Route reconnaissance is the careful survey of an air or surface route for military purposes. A route may be a road, railroad, waterway, airspace, or other lines of communication. It is performed on a point-to-point or town-to-town basis over a selected route which may pass over several search areas. For details see FM 5–36.

(2) *Area search.* An area search is a mission conducted to obtain specific information about a general area, monitoring any movement within an area or detecting military activities. The limits of the area to be searched will be designated and will vary in size dependent upon thé tactical type terrain and information sought.

(3) *Specific search.* A specific search is the observation of a point or a limited number of points to secure specific information about military, paramilitary, or significant civilian activity.

c. Special Missions. Special reconnaissance missions are other observation missions that may assist the commander in the accomplishment of his overall missions. These missions include such tasks and techniques as reconnaissance by fire, contact reconnaissance, aerial column control, and camouflage inspection.

(1) Reconnaissance by fire is accomplished by firing on likely or suspected enemy positions in an attempt to cause the enemy to disclose his presence by movement or firing.

(2) Contact reconnaissance is a mission undertaken to locate friendly units that are isolated or cut off from the main force; e.g., a long range patrol out of contact with higher headquarters.

(3) Aerial column control is the airborne control of surface or airmobile columns by visual or radio contact to enhance rapid movement over unfamiliar terrain, detect obstacles, and to minimize the danger of surprise by the enemy.

(4) Camouflage inspection is the aerial observation of friendly units to determine the condition and effectiveness of camouflage. survey, radiological survey, and reconnaissance for the escort of airmobile forces.

See C1

(5) Other observation missions as directed by the commander or the tactical situation; e.g., reconnaissance of a landing zone, topographic

9. Artillery Adjustment

The adjustment of artillery, mortar, and naval gunfire and target acquisition are inherent in all aerial observation missions except indirect observations. For a detailed explanation, see FM 6–40.

Section III. ARMY AIRCRAFT USED FOR AERIAL OBSERVATION

10. General

Although all Army aircraft may perform aerial observation missions, those best suited for such missions are illustrated and discussed in this section.

11. Helicopters

a. Observation. The observation helicopter is one of the Army's primary observation aircraft. Presently, the OH–6A (fig. 1) is the standard observation helicopter in the Army inventory. It has only a visual or direct observation capability. The OH–6A is a multipurpose helicopter designed for observation, command and control, radiological survey, topographical survey, and light resupply missions. It can carry a pilot and three passengers or 930 pounds of cargo and has a speed up to 115 nautical miles per hour. It is powered by a single gas turbine, 250-horsepower engine. The OH–58 (fig. 2) is now being added to the Army inventory and is also a multipurpose observation helicopter. It will be powered by an Allison T63A–5A gas turbine engine, which will enable it to carry a pilot and four passengers or 900 pounds of cargo, at speeds up to 120 nautical miles per hour.

b. Utility. The utility helicopter has a multipurpose capability. The UH–1A, B, C, D, or H, manufactured by Bell Helicopter Company, is a compact design helicopter which features a low silhouette. This helicopter is powered by a single gas turbine Lycoming engine. The UH–1A can carry one crewman and six passengers; one crewman, two litters, and a medical attendant; or one crewman and a payload of 2,175 pounds. The UH–1B/C can carry one crewman and eight passengers; one crewman, three litters, and a medical attendant; or one crewman and a payload of 2,704 pounds. The UH–1D/H (fig. 3) can carry one crewman and 11 passengers; one crewman, six litters, and a medical attendant; or one crewman, and a payload of 3,116 pounds. These helicopters are capable of operating from unprepared landing areas. Cargo and equipment not feasible to load inside can be transported externally. The UH–1 can be equipped with various armament systems to perform the mission of aerial suppressive fire. Illuminating devices including flares and searchlights can be mounted on the UH–1 to enhance its direct observation capability.

12. Airplanes

a. Light Observation. The light observation airplane has a visual (direct) and photographic observation capability. The O–1 (fig. 4), manufactured by Cessna Aircraft Company, is a two place, all metal, high-wing airplane designed to operate from short unimproved, or slightly improved, airfields in the combat zone. It is capable of carrying an external load of 250 pounds of cargo under each wing, plus 200 pounds of cargo or one observer internally. It has a cruising speed of approximately 87 knots. The O–1 is powered by a 213 horsepower Continental six-cylinder, horizontally opposed, air-cooled engine. It is a multipurpose airplane used primarily for observation, primary and advanced training, and target marking. Some secondary capabilities of the O–1 include battlefield illumination, wire laying, radiological survey, message drop and pickup, and radio relay.

b. Medium Observation. The medium observation airplane has near all-weather visual, photographic radar (B model only), and infrared (C model only) observation capability. The OV–1 (fig. 5), manufactured by Gruman Aircraft Engineering Corporation, is a two-place, twin-engine, turboprop airplane. The OV–1 is powered by two Lycoming T–53–L–3 (960 shp) or two T–53–L–7 (1100 shp) turboprop engines, which turn three-bladed Hamilton

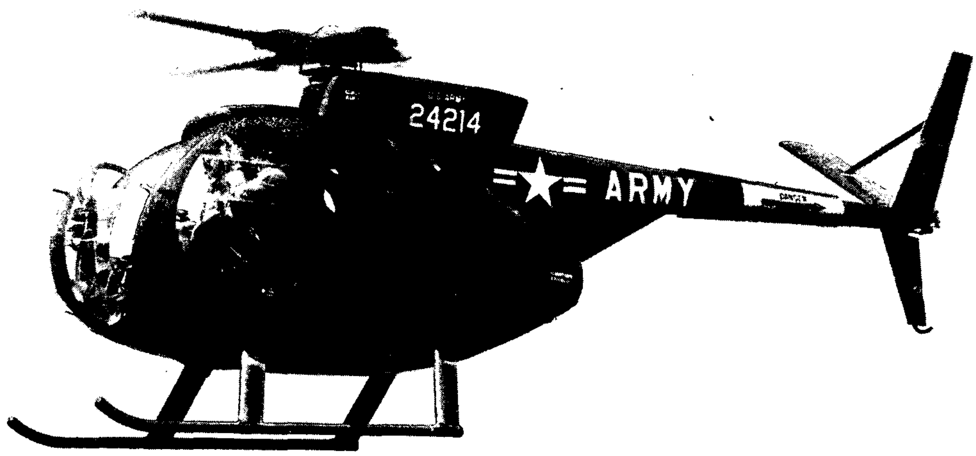


Figure 1. OH–6A (observation).

standard hydromatic propellers. This airplane is a tricycle-geared, mid-winged, tri-tail type with engine nacelles mounted on top of the wings. This twin-turbine airplane gives the Army the capability of carrying a variety of cameras and electronic sensors. It can be used for visual observation, day and night photography, and electronic surveillance. Its use provides the field commander with accurate and timely intelligence information, aerial fire direction, and prestrike and poststrike damage analysis.

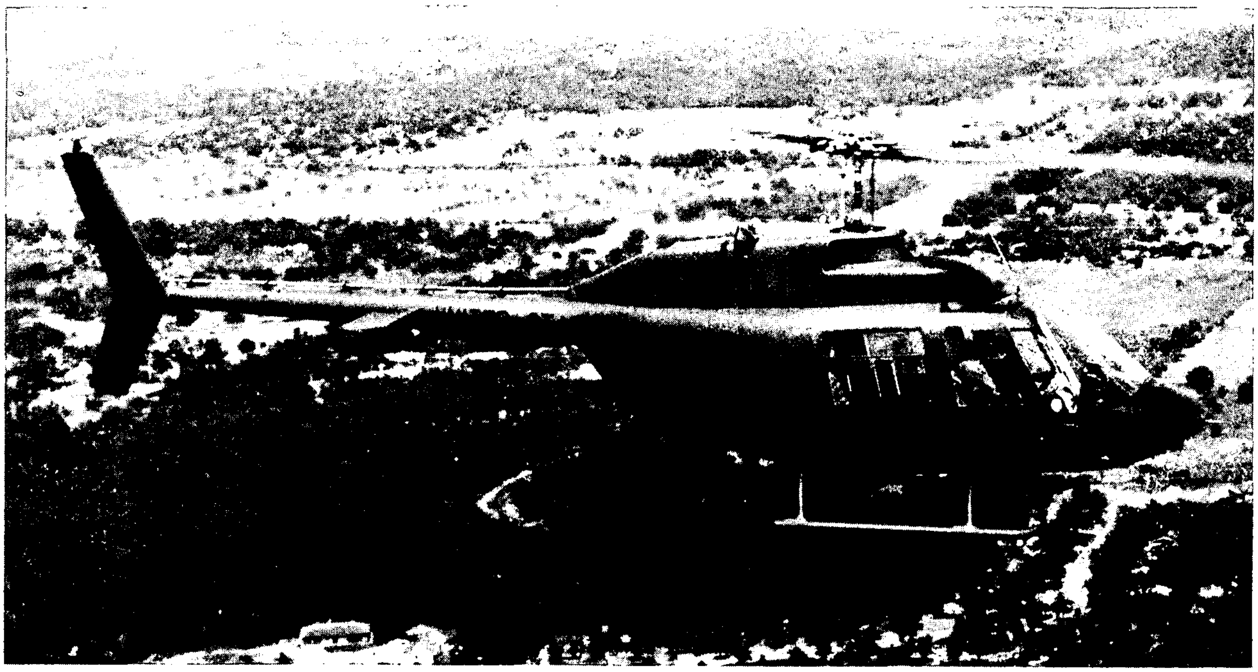


Figure 2. OH–58 (observation).

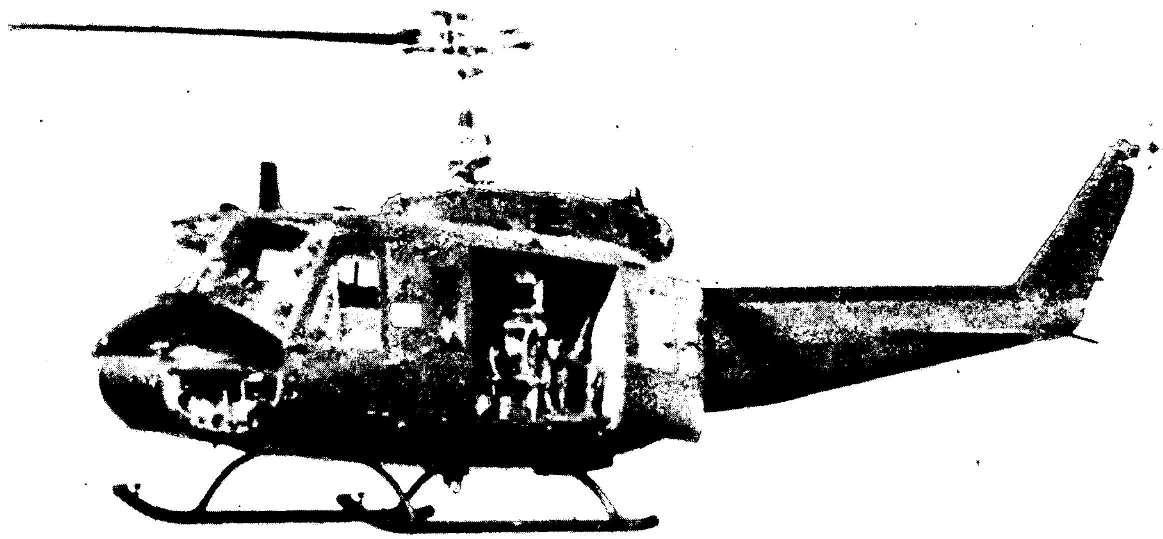


Figure 3. UH–1D (utility).

Figure 4. O–1 (light observation).

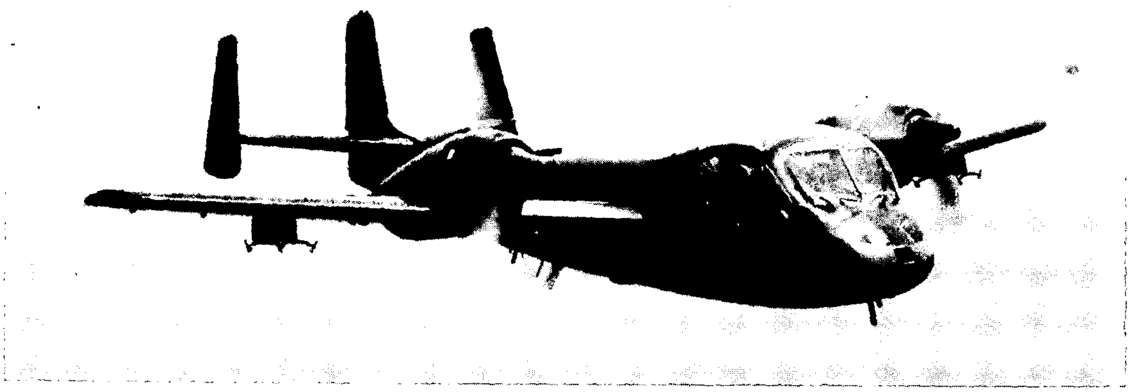


Figure 5. OV–1 (medium observation).

CHAPTER 3

AERIAL OBSERVER TECHNIQUES

13. General

During missions involving direct observation, the observer is primarily concerned with detection, identification, location, and reporting. Since the observer may be hampered by maneuvers used to reduce aircraft vulnerability (evasive maneuvers), he must devote maximum ability and effort to visually observe the terrain in the time available. Observation techniques will vary with the mission and the physical environment.

a. Detection. Detection requires determination that an object or activity exists. Factors influencing the detection capability are terrain, cover, light, altitude, target movement, airspeed (length of time the target is viewed), and visibility, as well as the deception practiced by the enemy.

b. Identification. Major factors in identifying a target are description, strength, and disposition. It is desirable that the observer be able to classify targets as either friendly or enemy and to discriminate among the types of targets observed. However, observers will not always be able to classify an activity as friendly or enemy. In such cases, the observer must be able to describe the activity in detail, then the requester can add this information to his knowledge of the area and information from other sources. This collective data provides means by which the identification or meaning of the target can be determined.

c. Location. The exact location of detected and identified targets is the ultimate objective of aerial observer missions. Depending upon the nature of the target, the observer may locate the center of mass and/or the boundaries of the entire area encompassed.

d. Reporting. For reporting procedures, see paragraph 32.

14. Direct Observation Techniques

There are four areas in which observation techniques may be directly applied: *visual search, target recognition, geographical orientation,* and *target location.*

15. Visual Search

a. General. Visual search is the systematic visual coverage of a given area. This method of search is directly applicable to all Army observation aircraft. It takes advantage of the inherent capability of human vision to detect fine detail. A relatively small portion of the human eye is capable of resolving a fine detail. From an aircraft in flight, this portion will cover a pattern on the ground varying in size in relation to the distance the ground area is from the human eye. Figure 6 shows that, from an altitude of 200 feet, an area on the ground located 30 meters from the ground track of the aircraft appears to be elliptical in shape, with a long axis of 6 meters; whereas, 500 meters from the aircraft, this ellipse has a long axis of 252 meters.

(1) From the standpoint of effective aerial observation, visual search is the hardest part of the observer's task. First, the observer may go through the motions of searching for a target without knowing that he is not completely or systematically covering the ground; and second, the observer is placed in a situation which taxes the limits of human observation.

(2) The purpose of visual search is to detect targets. The targets of interest are often the fleeting and transient types, ranging in size from a foot soldier with a hand-held weapon to the largest tactical missile and launcher. Within the limits of tactical deploy-

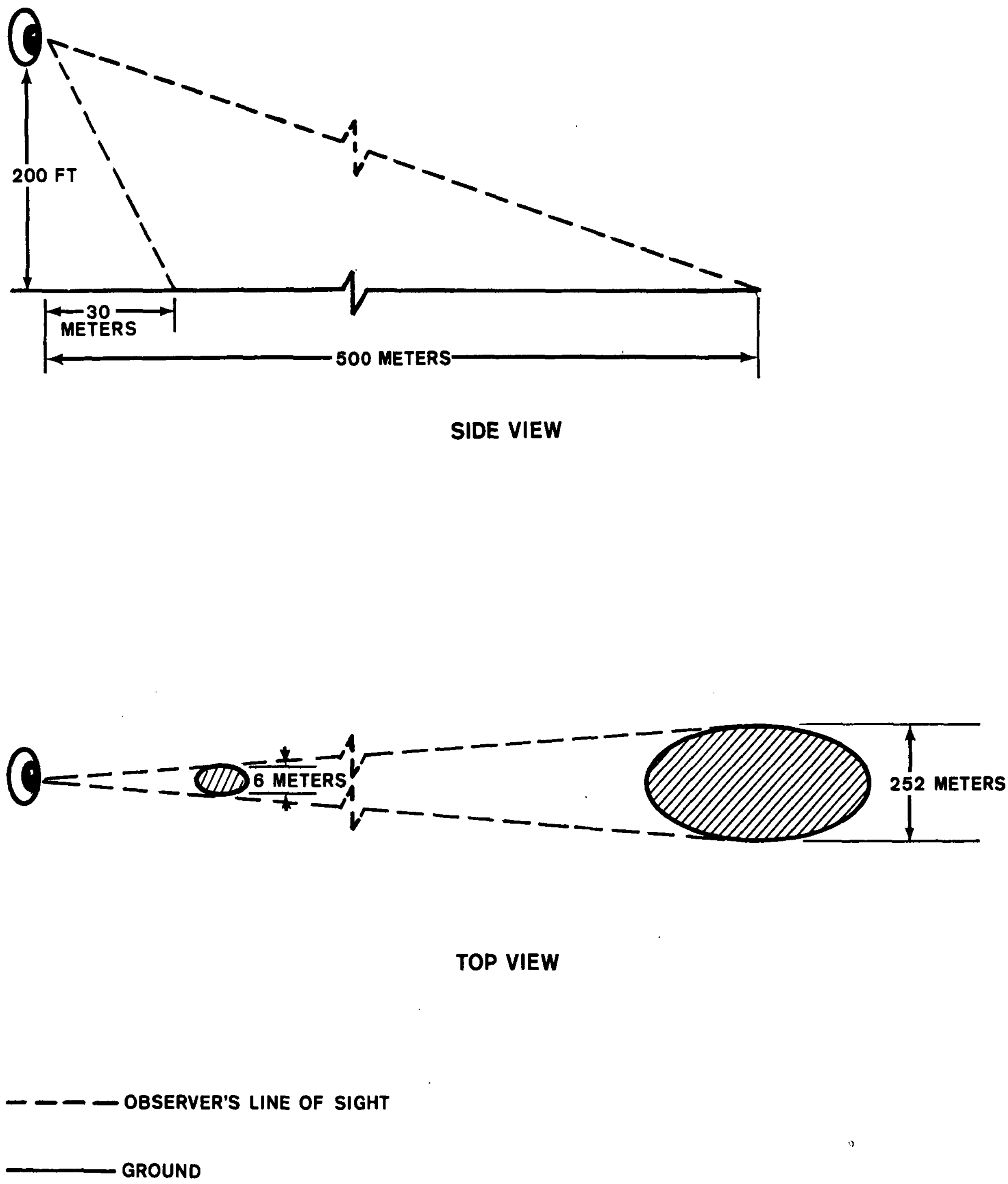


Figure 6. Visual search ground patterns.

ment, these targets may be located anywhere in the search area.

b. Capabilities and Limitations of Visual Observation. In area coverage the question of particular concern to the aerial observer is: *How much of a designated area am I expected to search in order to provide adequate visual coverage?* The answer depends upon several factors, the most important of which are—

(1) *Observation altitude.*

(*a*) The higher the altitude at which the aircraft operates, the greater the amount of terrain available to the observer for inspection. The distance that can be seen from an aircraft increases as altitude increases. For example, at an altitude of 250 feet, the horizon line for an observer is found to be at a distance of about ~~19 miles~~. At 500 feet, or double the altitude, the horizon line is extended to a distance of about 29 miles. The observer is not expected to sight even the largest targets of interest at these extreme distances.

(*b*) Search distance may refer to either slant range or ground distance. In figure 7, "A" is a point on the ground track of the aircraft; "B" is the position of the aircraft at that moment, or the air point; "C" indicates the target. Then "BC" is slant range or search distance to the target, and "AC" is ground distance or search distance to the target from the aircraft ground track. Slant range varies with altitude because it is the observer's line of sight; ground distance does not. It is the ground distance which is used to locate a target on the map. When considering the detectability of targets, it is the slant range which determines whether the target is capable of being seen, not the ground distance to the target. At altitudes above 2,000 feet, and for targets located near the ground track, altitude and slant range tend to become equivalent. At low altitudes, below 200 feet, and for targets located approximately 500 meters from the ground track, slant range and ground distance tend to become equivalent. While more terrain can be seen at high altitudes, a better visual coverage of the area adjacent to the ground track of the aircraft is possible at low altitudes. As a rule of thumb, the ground distance covered at low altitude in visual search is approximately one grid square. However, this figure is dependent upon the condition of the terrain over which the search is made.

(2) *Speed of the observation aircraft.*

(*a*) The speed of visual observation aircraft is expected to range from 0 to approximately 300 knots per hour. The upper limits of this range will not be useful in human aerial observation, but will be used instead to reduce the vulnerability of the observation aircraft. For example, at an altitude of 200 feet or below, and flying at 100 knots per hour, the aircraft is traveling over approximately 50 meters of terrain every second. This means that the observer has available for inspection, every second, a strip of terrain 50 meters by 1,000 meters.

(*b*) Aircraft speed, so far as it concerns the observer, is the rate at which the terrain passes by the aircraft. If aircraft speed is held constant and the altitude is increased, the apparent rate of movement of the ground object is decreased. Conversely as the altitude of the aircraft is decreased, the apparent movement of the ground object increases.

(*c*) Figure 8 illustrates schematically the apparent rate of ground movement at an optimal observation altitude. The direction of the aircraft is from right to left and, therefore, ground objects would appear to move toward the right, as shown by the arrows. The arrows, by their varying length, indicate the apparent rate of movement for objects located at different distances from the aircraft ground track. Objects near the flightpath move at a faster rate than objects out toward the horizon. As the line of sight falls on either side of a line drawn perpendicular to the flightpath, the observation distance, or slant range, increases and apparent movement decreases, as indicated by the arrow length. The length of these arrows when expressed numerically is called *angular velocity,* which is the number of degrees of arc through which a ground object moves per unit of time. It combines into a single expression the relationship between slant range and aircraft speed.

(3) *Terrain conditions.*

(*a*) The amount of terrain that can be covered effectively in visual search is largely

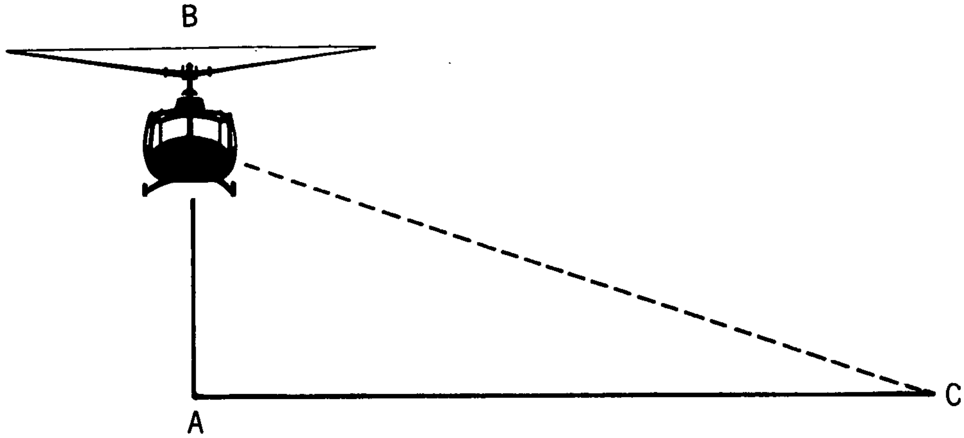


Figure 7. Diagram of search distance.

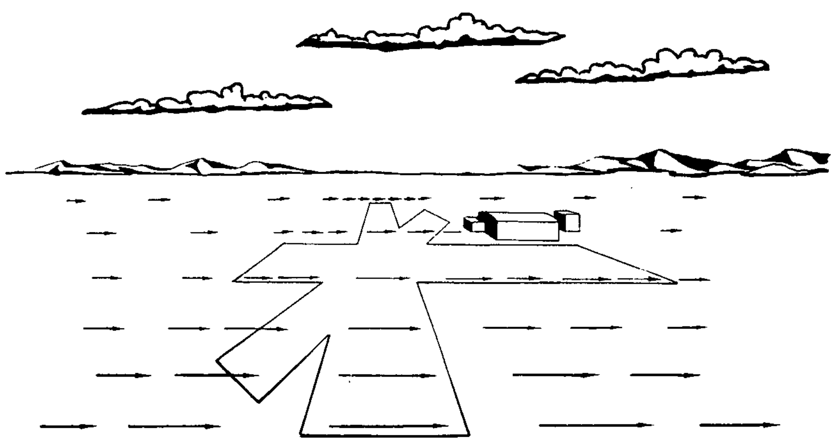


Figure 8. Motion perspective in the visual field looking to the right.

dependent on the type of terrain. For example, searching over dense jungle growth does not permit the degree of visual contact with the terrain that is afforded over barren wastes such as the artic or desert regions. Consequently, the amount of search area covered would be greatly reduced.

(*b*) The types of terrain which permit targets to be sighted more easily are roads; open, sandy areas; or fields. Because they are easier to cover visually, aerial observers often concentrate their attention upon open areas. However, it is possible to sight down through tree stands and through the adjacent low-lying shrubs and bushes. From the air, targets are rarely seen silhouetted against the sky; they normally do not stand out from their background. Military targets with their OD paint provide poor contrast for visibility.

(*c*) Terrain conditions often mask the target in such a way that it is exposed to aerial view for only a very brief period. This is particularly true in hilly or mountainous regions. Basically, when the terrain is mountainous or hilly or covered with moderate to sparse vegetation, the aerial observer can effectively cover an area of about one-half grid square from the ground track of the aircraft. In open terrain, his search depth can be extended to one grid-square.

(*d*) Natural cover and concealment often make target detection a difficult task.

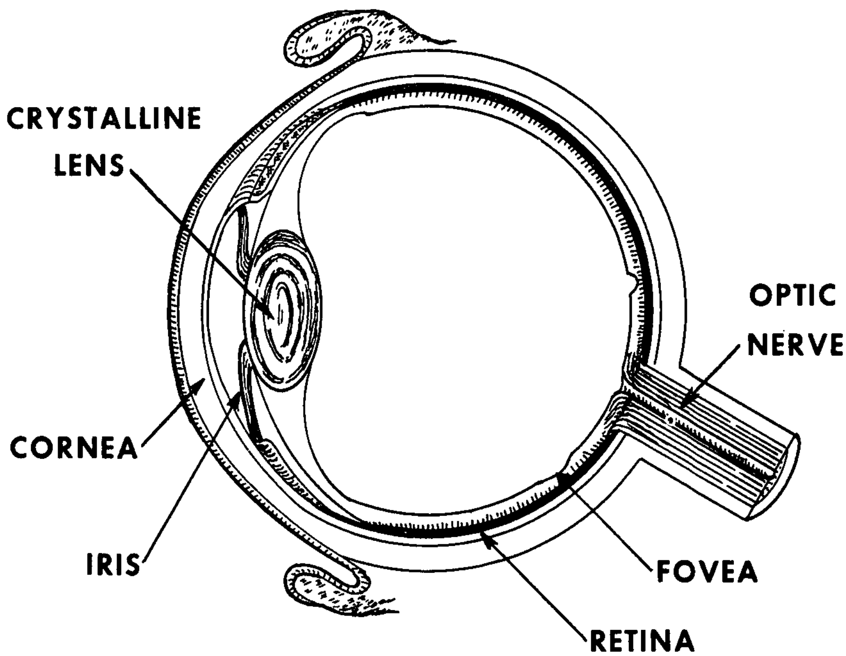


Figure 9. The human eye, showing the small area of foveal vision.

Visual target detection in areas such as triple canopy jungles or inundated areas covered with shrubs and bushes is possible only by association of enemy activity indicators. ~~This~~ These indicators include smoke, battlefield noises, trails leading into the area, etc. Continued surveillance of an area will assist the observer detecting the clues indicative of enemy activity.

(4) *Limitations of the human eye.*

(*a*) As a sensing mechanism, the human eye (fig. 9) has certain limitations. When light from a distant object enters the cornea, it passes through the pupil, the opening iris, and is focused on a light sensitive surface, the retina. Embedded in the retina are light-receiving cells, described as rods and cones, which are activated by the light rays to send impulses along their nerve attachments through the optic nerve to the visual centers in the brain.

(*b*) The rods and cones differ in their functions. The rods are sensitive to very faint light, and are most effective during the hours of darkness for the detection of small light sources. But the rods are exclusively a light-dark sense as they do not respond to the different wave lengths of light by which we distinguish differences of color, nor do they contribute much to the accurate identification of form. These facts would not be important to visual search if it were not for the manner in which the rods and cones are distributed throughout the retina. Only cones are present in the foveal area, and the number of cones per unit of area decreases rapidly from the fovea toward the periphery of the retina. Each cone in the fovea transmits its impulse along a single nerve fiber. In the peripheral region, several may transmit along a single fiber. This accounts for the fact that the foveal area is that portion of the retina used in resolving fine detail in an image. The foveal region covers a circular area of about 1½ millimeters in diameter. A 1-cent piece held 8½ inches from the eye would just about cover the foveal area. The foveal area is that portion of the retina by which the observer senses small differences in terrain configuration that signify the target.

(*c*) Figure 10 illustrates the amount of coverage by foveal vision at different ground distances from the flightpath when the aircraft is at an altitude of 200 feet. At a ground distance of 30 meters from the aircraft ground tract, the area covered is slightly elliptical with a long axis of 6 meters. That is, if the aircraft were stationary, all objects within this 6-meter length would be seen in clearest detail. Objects located outside of this area would appear

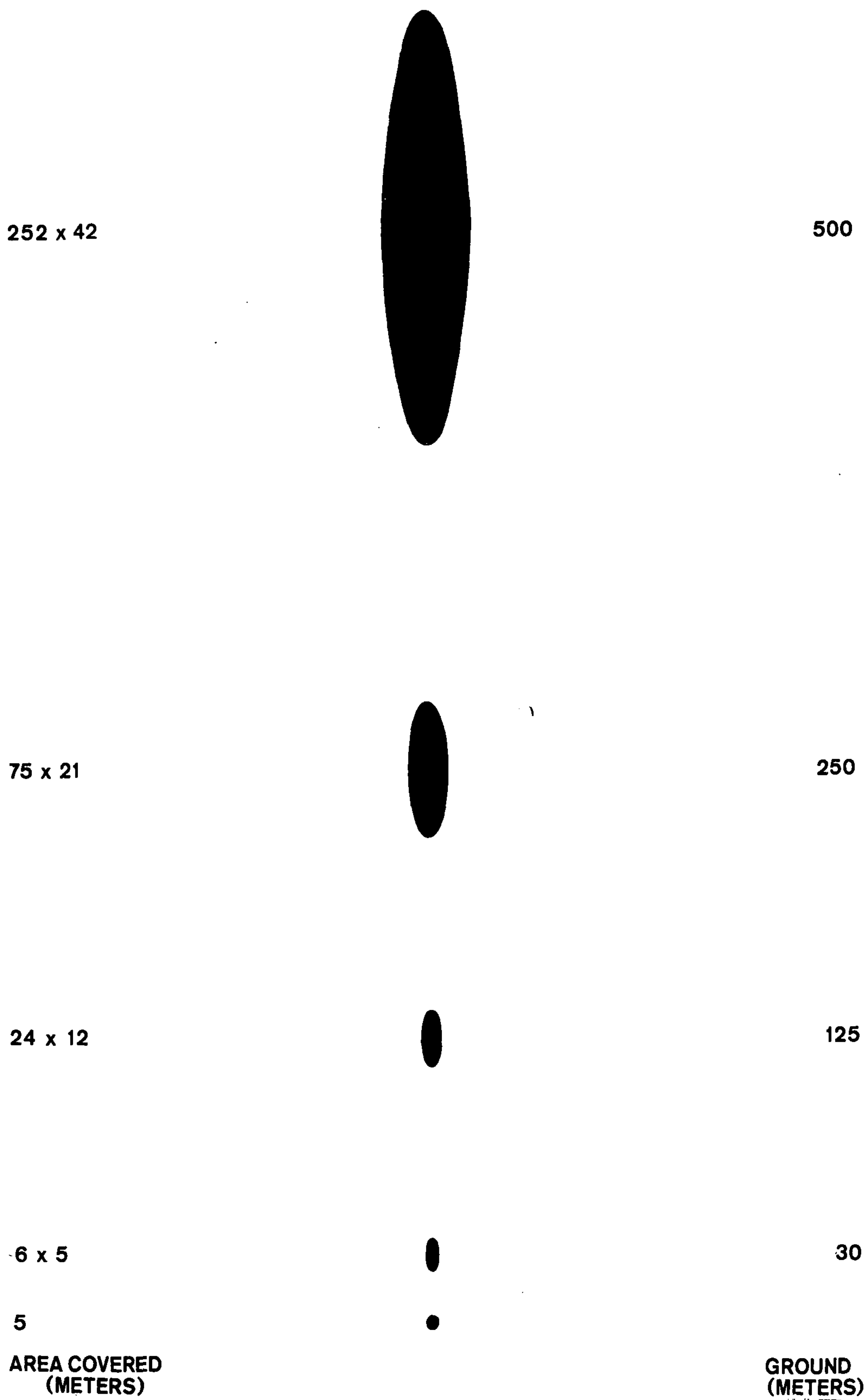


Figure 10. Ground area covered by foveal vision.

slightly blurred; the farther out from this area an object is located, the more blurred it would appear.

c. Visual Search Techniques and Procedures.

(1) *Sectors.* Visual search is conducted from only one side of the aircraft at a time, with the aerial observer confining his search activity to a limited portion of his entire field of observation. This limited area is called the observation work sector and includes the orientation and search sectors. Figure 11 depicts the observation work sector from an O-1 aircraft. The nonobservational areas result from the general configuration of the O-1 and will vary with the model of the aircraft. The observation work sector is 90° forward of the line placed perpendicular to the line of flight. Forty-five degrees forward of the perpendicular line is the *search sector.* The remaining 45° of the arc is the *orientation sector.*

(*a*) *Orientation sector.* The orientation sector is the forward portion of the observation work sector and is primarily used by the observer to locate terrain features for in-flight orientation. By preplanning the use of prominent terrain features in preflight planning for the mission, the observer will spend a minimum amount of time in the orientation sector.

(*b*) *Search sector.* The search sector is the rearward portion of the observation work sector in which the aerial observer systematically scans the terrain. It is on this sector that his attention centers during visual search.

(2) *Procedures.*

(*a*) Below an altitude of 500 feet, the observer's line of sight is directed toward the horizon; above 500 feet, the line of sight is directed downward. Over most terrain, the aerial observer systematically (fig. 12)—

1. Looks out toward the horizon approximately 1,000 meters and searches in toward the aircraft (Step A).

2. Looks out to 1/2 the distance (500 meters) toward the horizon and searches in toward the aircraft (Step B).

3. Looks out to 1/4 the distance (250 meters) toward the horizon and searches in toward the aircraft (Step C).

4. Repeats the above process.

Note. The rapidity with which the above steps are repeated is dependent upon the speed of the aircraft.

(*b*) During this procedure the observer must use head movement to avoid fixating a sighted target. When a target is located in the search sector, the observer should record the information as quickly as possible by using his map and recording device, if available, and then continue his systematic search.

d. Instructors' Aids (app B). Appendix B contains practical guides for the presentation of visual search instruction and the preparation of training aids.

16. Target Recognition

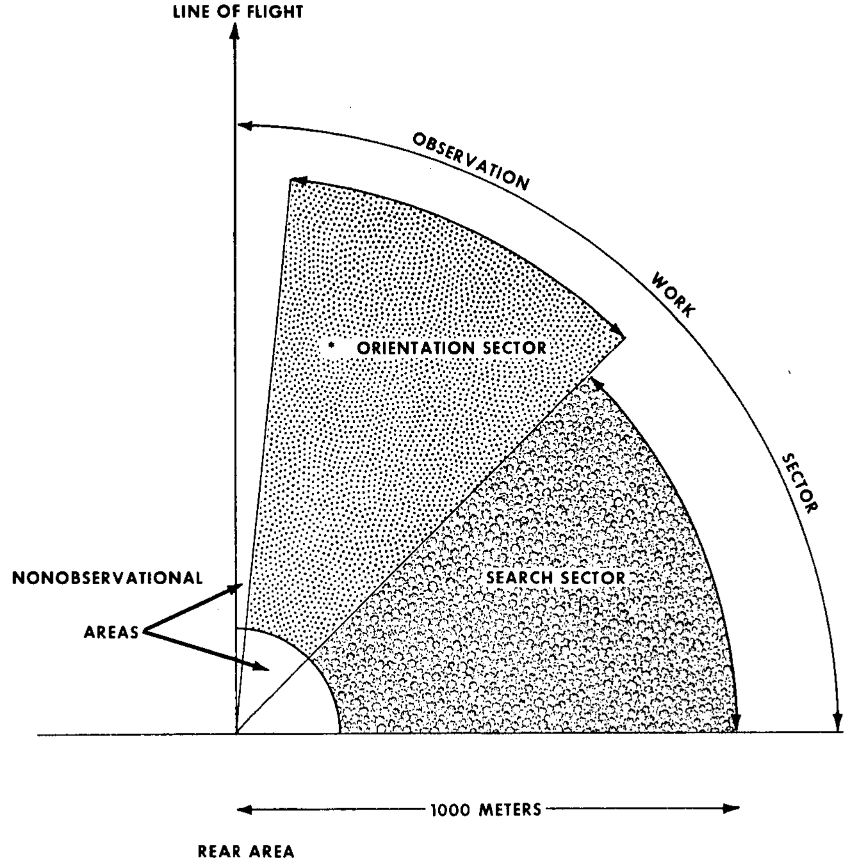
a. Accurate and complete reports are essential to the successful completion of an aerial observation mission. In order to develop the skills of target recognition, certain points should be understood.

(1) *Prior experience.* Aerial observer trainees have had varying amounts of experience; therefore, it cannot be assumed that any (all) student knows what a particular piece of equipment looks like.

(2) *Effects of distance.* As eye-to-target distance increases, certain characteristics of equipment change. Observers may recognize a piece of equipment by different characteristics, and these characteristics change as the range changes. Training must include slides of equipment from near the far limits of the search sector or the limits of vision if closer. Table 1 shows approximate maximum detection distances.

(3) *Vegetation.* Vegetation is referred to as *clutter.* Any target environment (background and near foreground) which varies in color or texture (trees, bushes, grass) or partly masks some of the target characteristics will affect the observer's ability to recognize a target. Acclimation to the local environment will enhance the observer's capability.

(4) *Uniqueness of equipment.* All military targets are unique by type; therefore, if an accurate description of a piece of equipment is required, the aerial observer must be *trained to recognize* that piece of equipment. The unit which has the largest color slide coverage of items of equipment will be the most capable of adequately training aerial observers for the intelligence system requirement. Supplemental training on foreign equipment would prepare the observer for a mobilization situation.



* TO ASSIST IN ORIENTATION, THE OBSERVER MAY USE ANY TERRAIN FEATURE REGARDLESS OF ITS DISTANCE FROM THE GROUND TRACK OF THE AIRCRAFT.

Figure 11. Observation work sector.

(5) *Speed of recognition.* Because of the short available viewing time in low-level flight, the aerial observer must be trained to instantaneously respond upon sighting a target. He should have abbreviated identifying terms for all types of targets available at his command (table 2 includes a partial list of military items and their abbreviations). These abbreviated terms are quickly recorded and will aid in rapid identification. To prevent the observer from locking on sighted targets or looking to the rear of the search sector, he must rapidly and positively identify targets. Upon sighting targets involving numbers of items, the observer will report by actual count, when possible, or by estimate when numbers are large.

Table 1. Approximate Detection Range

Target	Slant Range (meters)
Gun, machine, 7.62mm	100
Launcher, rocket, 3.5-inch	175
Mortar, 81mm	200
Gun, machine, cal .50	225
Personnel	300
Mortar, 4.2-inch	300
Rifle, recoilless, 106mm	300
Howitzer, 105mm, towed	600
Truck, utility, ¼-ton, 4 x 4	600
Howitzer, 155mm, towed	900
Truck, cargo, ¾-ton, 4 x 4	900
Howitzer, self-propelled, full-track, 155m	925
Truck, cargo, 2½-ton, 6 x 6	925
Tank, combat, full-track, 90mm gun, M–48	925

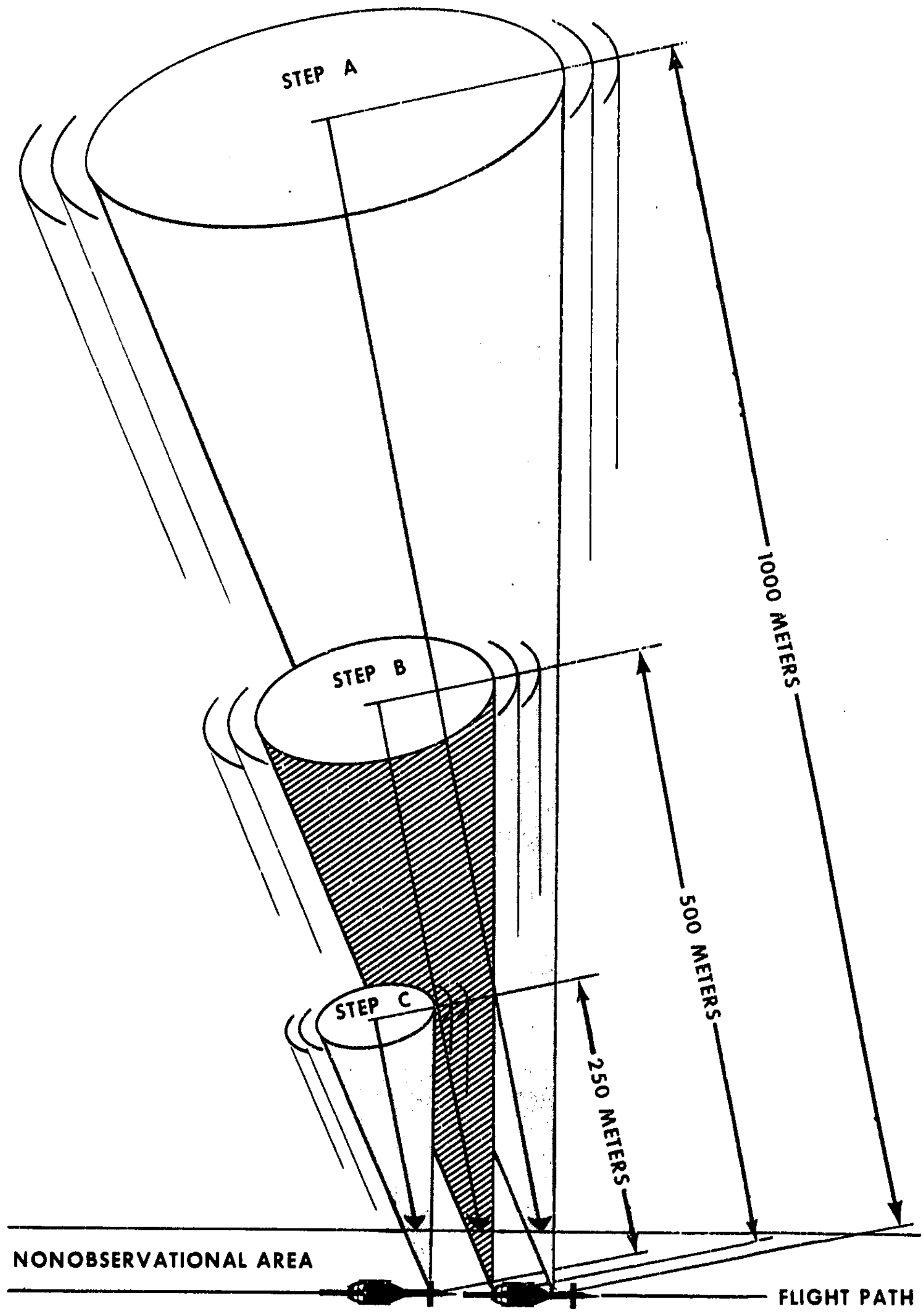


Figure 12. Search techniques (OH).

Table 2. Military Items

Nomenclature	Abbreviated Name
Personnel	Troops
Truck, utility, ¼-ton, 4 x 4	¼
Truck, cargo, ¾-ton, 4 x 4	¾
Truck, cargo, 2½-ton, 6 x 6	2½
Truck, cargo, 5-ton, 6 x 6	5
Truck, commercial, 1½-ton, 4 x 2	1½
Carrier, light weapon, infantry, ½-ton, 4 x 4, M–274	Mule
Trailer, ¼-ton, 2-wheel	¼ T
Trailer, ¾-ton, 2-wheel	¾ T
Gun, machine, 7.62mm	7.62
Gun, machine, cal .50, Browning	50
Gun, self-propelled, full-track, 175mm	175 SP
Mortar, 4.2-inch	4.2
Mortar, 81mm	81
Launcher, rocket, 3.5-inch	3.5
Howitzer, 105mm	105
Howitzer, 155mm	155
Howitzer, self-propelled, full-track 105mm	105 SP
Howitzer, self-propelled, full-track, 155mm	155 SP
Launcher, rocket, multiple, 4.5-inch	4.5
Rifle, recoilless, 106mm	106
Carrier, personnel, full-track, armored, M–113	M–113
Truck tractor, semitrailer, M–15	M–15
Tank, combat, full-track, 90mm gun, MBT–M–48	M–48
Tank, combat, full-track, MBT–M–70	M–70
Tent, 2-man	Pup tent

b. The accurate identification of sighted targets assists intelligence agencies in the association of items of equipment with specific types of enemy units. For example, if an indirect fire weapon is reported by an aerial observer as a mortar, the fact that this mortar was not reported by caliber restricts the use of this information for intelligence purposes. Had the weapon been identified as a 4.2, then intelligence personnel could have associated the information with the presence of a heavy mortar unit.

c. Appendix B contains practical guides for the presentation of target recognition instruction and the preparation of training aids.

17. Geographical Orientation

a. Geographical orientation, which takes place in the orientation sector (fig. 11), is the ability of the observer to know his position relative to any geographic reference, to include maps, charts, aerial photos, or preselected terrain features. The aerial observer must be able to orient the terrain view to his map. To facilitate this, the observer orients his map, so that north is at the top of the map. This procedure avoids excessive "head in cockpit" time and permits better use of search time.

b. Geographical orientation training is valuable in correcting the two major orientation problems: *unorientation,* which occurs when the aerial observer has no geographical reference by which to determine his relative position and direction; and *disorientation,* which occurs when the aerial observer is confused as to geographical reference with respect to his relative position or direction. In this training, the observer must learn to recognize a terrain feature, orient himself in relation to that terrain feature, and locate the target with reference to the surrounding terrain. As training progresses, he should be able to shift from a geographical reference point(s) directly to the target.

c. Appendix B contains practical guides for the presentation of geographical orientation instruction and the preparation of training aids.

18. Target Location

a. Target location is the transposition of a sighted target on the ground to a geographical representation of the terrain, such as a map or chart. The observer must be able to record the boundary limits of the sighted target as rapidly as possible. Procedures which may be used by the aerial observer to report and record information include—

(1) Assigning reference numbers to targets as sighted, and reporting information by verbal means such as radio or recording devices.

(2) Reporting desired information on sighted targets, such as—

(*a*) Relative speed and direction of movement.

(*b*) Degree of cover or concealment.

(*c*) Relative position with respect to the target and surrounding terrain.

b. Target location training combines all previous training, in addition to training in target location. The observer must now—

(1) See and recognize a target (Search and Recognition Training).

(2) Orient the sighted target with the surrounding terrain (Geographical Orientation).

(3) Locate that target on a map or chart carried by the observer (Target Location Training).

c. Appendix B contains practical guides for the presentation of target location instruction and the preparation of training aids.

CHAPTER 4

AERIAL OBSERVATION PLANNING AND OPERATIONS

Section I. GENERAL

19. Concept of Employment

Aerial observation missions will be flown mainly in support of infantry, armored, or artillery units. The specific mission to be flown (surveillance, reconnaissance, or special) will vary with the intelligence requirements. During a single mission or flight, the aviator-observer team may be called upon to change from one mission to another or to perform more than one type of mission. For example, an aviator-observer team on a surveillance mission may be diverted to confirm a suspected target, thus changing the mission to one of reconnaissance; or the aviator-observer team on a reconnaissance mission may be told to perform a camouflage inspection, which changes the mission to *special.*

20. Command and Staff Responsibilities for Aerial Observation

a. Intelligence Officer, G2 (S2). The G2 (S2) performs the staff functions and responsibilities prescribed in FM 101–5.

b. G2 (S2) Air. The G2 (S2) Air is responsible for the overall planning and coordination of the aerial observation effort within his command.

c. Commanding Officers, Supported Ground Forces. Commanders of supported ground forces are responsible for furnishing qualified personnel for aerial observers. Through coordination with supporting aviation units, the ground force commander may arrange for the training of personnel as aerial observers.

d. Army Aviation Staff Officer. The Army aviation staff officer performs the staff responsibilities prescribed in FM 101–5. In units not authorized an aviation staff officer, the senior officer of supporting aviation elements performs limited aviation staff duties.

e. Commanding Officer, Army Aviation Unit. The commanding officer of an aviation unit is responsible for the employment of available organic means in the execution of aviation missions assigned to his command and for the training of aerial observers. The senior officer of a supporting aviation element has the responsibility of providing limited aviation staff support to the supported unit. This is usually accomplished through a liaison officer to the supported unit.

f. Operations Officer, Army Aviation Unit. The operations officer of the aviation unit is responsible to the unit commander for supervising the aviation unit operations section and the processing, assigning, and planning of specific flight missions.

g. Aviator-Observer Teams. Aviator-observer teams performing aerial observation must be capable of providing timely response to the requirements of the combat intelligence system and complete and accurate information in the degree of detail requested. Aviator-observer teams must—

(1) Have a thorough understanding of the mission.

(2) Plan the mission.

(3) Supervise preparation of the equipment.

(4) Prepare and file the flight plan for the mission.

(5) Execute the mission.

(6) Prepare mission data for debriefing.

Section II. AERIAL OBSERVATION MISSION REQUEST AND ASSIGNMENT PROCEDURES

21. General

Aerial observation mission requirements may originate at any level of command. According to the time available, they are classified as either *preplanned* or *immediate* mission requirements.

a. Preplanned. Preplanned mission requirements are anticipated observation requirements. Unit standing operation procedures (SOP) will establish the cutoff time for the submission of preplanned mission requirements.

b. Immediate. Immediate mission requirements are unforeseen observation requirements. Normally, a portion of the observation air effort is allocated to meet immediate observation requirements as they arise. In the event additional assets are not available, preplanned missions will be adjusted to accomplish the higher priority mission.

22. Mission Request Procedures

All aerial observation mission requests are processed through intelligence channels. Any intelligence communications method (i.e., radio wire, courier, etc.) may be used for requesting preplanned missions so long as the request arrives at the action headquarters prior to the cutoff time established by SOP. All intermediate headquarters will take the necessary action to approve, disapprove, or modify requested preplanned missions. Immediate mission requests are transmitted over the immediate air request net from subordinate elements to the corps G2 Air at the corps tactical operations center (CTOC). These requests go directly to the CTOC, bypassing the brigade and the division. The brigade and division will monitor the air request net and may—

a. Remain silent, thereby approving the requested mission.

b. Enter the net to disapprove the requested mission.

c. Enter the net to modify the requested mission.

23. Mission Assignment Procedures

The G2(S2) Air has overall staff responsibility for planning and coordinating the aerial observation effort of the command. Upon receiving an aerial observation request, the G2(S2) Air will, in the name of the commander, approve, disapprove, modify if necessary, and/or assign the mission to an aviation element for execution. For approved missions, the G2(S2) Air will determine the type of mission (reconnaissance, surveillance, or special) to be flown and the method of observation, direct or indirect, to be used to conduct the mission. For indirect observation missions, the G2(S2) Air may specify the type sensor to be used (photographic, radar, infrared, etc.). Preplanned missions will be assigned to units in the aerial surveillance and reconnaissance plan. For discussion of indirect aerial surveillance and reconnaissance, see FM 30–20. Immediate missions will be assigned to units through normal command channels using any rapid means of communications available.

24. Briefing

To insure a thorough understanding of assigned missions, the aviator-observer team will receive general and preflight briefings.

a. A general briefing is given daily to all aviator-observer teams. Pertinent information relative to tactical operations for the next 24 hours is presented. This briefing aids in reducing the amount of information that must be presented at the preflight briefing.

b. The preflight briefing, which is conducted in conjunction with the assignment of the mission, includes all information relative to the conduct of the mission. The G2(S2) Air (or his representative) or an intelligence representative of the supported unit conducts the intelligence portion of the briefing. The flight operations officer conducts that portion of the briefing pertaining to aviation matters.

c. The general and preflight briefings may be conducted using the format of a 5-paragraph operations order. A sample "Guide for Aviation Briefing" is shown in figure 13.

A GUIDE TO AVIATION BRIEFING

1. SITUATION

a. Enemy forces: Terrain, identification, location, activity, strength.

b. Friendly forces: Requirements of next higher unit; location and planned actions of adjacent units; location and planned actions of supported unit; fire support available; missions and routes of other aircraft; attachments and detachments.

c. Weather forecast.

2. MISSION

3. EXECUTION

a. Plan of operation.

b. Specific duties of subordinate elements.

(1) Flight plan: Routes, formation, checkpoints, zones.

(2) Loading plan.

(3) Landing plan.

c. Location of friendly airfields and alternate fields.

d. Coordinating instructions.

(1) Air traffic control.

(2) Artillery support: Reference lines, preplanned fire, registrations, concentrations, and barrages.

(3) Ground units at objective (methods of contact, recognition).

(4) Other (specific coordination for specific mission).

e. Pickup point for downed crews and passengers.

f. Reporting.

4. ADMINISTRATIVE AND LOGISTICS

a. POL requirements.

b. Maintenance.

c. Special equipment.

d. Evacuation.

e. Rations.

f. Relief.

5. COMMAND AND SIGNAL

a. Command.

(1) Chain of command.

(2) Location of the commander.

b. Signal.

(1) Air-ground signals.

(2) SOI.

(*a*) Frequencies and call signs.

(*b*) Codes—authentication, map, and operational.

Figure 13. Guide for aviation briefing.

Section III. MISSION PLANNING AND DUTIES OF THE AVIATOR-OBSERVER TEAM

25. General

After receiving an aerial observation mission assignment and the general and preflight briefings, the aviator-observer team plans the mission. This is the preflight planning phase, and consists of four steps.

a. Map and aerial photograph selection.

b. Terrain evaluation.

c. Flight planning.

d. Crew coordination.

26. Map and Aerial Photograph Selection

Only those maps and photographs necessary for the conduct of the mission should be selected and carried by the aviator-observer team. These should be the most current available and of a scale that will facilitate navigation by the aviator and accurate locating and recording of information by the observer. For navigation, medium scale maps (1:100,000) will assist the aviator in flying from the tactical landing area to the mission area. For observation, tactical scale maps (1:50,000) will aid the observer in accurately identifying and locating prominent terrain features by coordinates. The scale of an aerial photograph should not be smaller than 1:20,000 and, depending upon the detail desired, may be as large as 1:5,000.

27. Terrain Evaluation

Preliminary analysis of the terrain to be covered is made from—(1) maps and photos, (2) past experience of the aviator and observer and their knowledge of the situation and the enemy, (3) viewpoints of other personnel with experience in the area, and (4) recorded information from previous missions. Areas known to contain enemy positions or activities are marked on the map or photo. Key terrain features, woods, and defilade areas are marked for close observation as possible locations for enemy strongpoints, artillery positions, assembly areas, command posts, supply dumps, etc. Guiding factors in determining probable locations of enemy positions or activities in the areas of influence and interest include the following:

a. Strongpoints and observation posts can be expected in any area where the terrain offers a decisive advantage to the holder.

b. Artillery positions normally are located in defilade.

c. Assembly areas usually are in wooded areas or other areas offering cover and concealment.

d. Supply installations have accessible road nets and, when possible, are out of range of friendly artillery.

e. Roadblocks can be expected at narrow points along the routes of advance where bypass is difficult or impossible.

f. Command posts normally are located near good road nets, in defilade, and in areas containing good natural cover and concealment. Presence of vehicles, troop shelters, and a concentration of communication antennas usually indicates the location of a command installation.

28. Flight Planning

In flight planning, the aviator-observer team conducts a detailed map and aerial photograph study (para 26); selects primary and alternate flight routes, altitudes, and checkpoints; memorizes prominent terrain features; and prepares notes or a checklist as necessary to assist in accurate orientation and location. In addition, the following factors must be considered:

a. Type Mission. The flightpath must coincide with the assigned task; i.e., if the mission is an area search reconnaissance, the flightplan must permit the observer to view and search the entire designated area at frequent intervals to insure immediate detection and location of enemy activities and complete coverage of the assigned mission area.

b. Time Allocated. The briefing officer specifies the time allocated for each mission or the time that the mission information is required. This time element may be necessary to insure maximum aircraft utilization and aviation support and/or to insure that collected intelligence information is disseminated while still valid. The time element may require that the aviator fly the shortest flightpath, giving the observer only a one-pass opportunity to observe preselected areas.

c. Methods of Reporting. Radio is the primary means of reporting information as it is obtained. Frequencies, call signs, codes, reporting times, and authentication procedures must be verified prior to flight. Appendix C lists the standard form of message for an inflight report. In the event of radio failure, alternate means may be used such as message drops or landing to contact personnel of friendly units. A debriefing (para 33) will be conducted upon completion of all missions.

d. Flight Routes. The flight route is the flightpath from the tactical landong area to, through, and over the forward friendly positions. Coordination must be established between the aviator-observer teams and aviation operations sections, flight coordination centers (FCC), or flight operations centers (FOC) to avoid the hazards of friendly mortar and artillery fires, nuclear weapons, and air defenses. The flight routes must be planned to insure complete coverage of the mission area with minimum exposure of the aviator-observer team to flight hazards and enemy countermeasures.

e. Altitude. The mission requirements will dictate the mission altitude. Enemy air defense capabilities also influence both the mission altitude and the altitude flown to and from the target area. Friendly artillery fires must be considered when planning flight altitudes. See FM 30–20 for additional altitude considerations when employing indirect observation methods.

(1) Mid and high intensity warfare. The encounter of a sophisticated enemy air defense system can be anticipated. Circumstances will likely dictate nap-of-the-earth flights en route to and from the target area combined with rapid ascents and descents as required near the target area to complete the mission.

(2) *Internal defense or stability operations.* Enemy small arms fire and small caliber automatic weapons will present the largest threat to aircraft in either internal defense or stability operations. Based on these considerations, observation missions normally will be flown at altitudes which afford protection from hostile small arms fire. Here again, the mission requirements will dictate the mission altitude while in the target area.

f. Direction of Observation. The aviator-observer team must consider the approach for an observational pass to insure that the enemy, sun, shadows, terrain features, etc., do not hinder, but rather enhance, the observer's opportunity to detect the enemy.

29. Crew Coordination

Crew coordination consists of an intercrew briefing, preparation of checklists, and a thorough equipment check. This equipment check includes the aircraft preflight inspection and check, and inspection of any other equipment that may be necessary for the mission; i.e., maps, cameras, sensory devices, binoculars, flares, etc.

30. Duties of the Aviator-Observer Team

In addition to the preflight planning, the aviator-observer team must fly the mission and detect, identify, estimate the size, and determine the location, disposition, and activities of targets. As required by the mission, the team must rapidly record or report all significant observations while the aircraft is operating at varying attitudes, groundspeeds, and altitudes. Emphasis is placed on speed, accuracy, and completeness of information.

a. Detection. Targets must be detected under conditions of excellent concealment and great dispersion, to include temporary or highly mobile targets.

b. Identification. Targets must be accurately identified and promptly reported to permit valid assessment of the situation and sppli-cation of appropriate countermeasures.

c. Strength Estimation. Accurate reports of strength or size provide additional information about the capabilities and composition of enemy forces. Targets should be reported by actual count or estimated number. Dispersion on the battlefield will result in an increased number of target groups; however, the elevated position of the aerial observer will enhance his capability to estimate the strength of these target groups.

d. Target Location. Exact locations of targets are essential, particularly if the target is to be engaged by unobserved fire.

e. Disposition and Activity. Accurate and complete reports on target disposition and activity provide guidance in determining enemy composition and capabilities and locations of highly mobile targets.

31. Recording

To provide commanders with accurate information, a systematic method of recording information observed during the flight must be used. When recording on a map or photograph, an abbreviated term may be used to identify the observed target (table 2). The notation may be made directly on the map or photograph at the location where the target or activity was observed. Portable recording instruments, such as tape recorders, may be used by the observer to record observed information.

32. Reporting

To provide commanders and staffs with critical information during the conduct of the mission, the aviator-observer team must be able to make spot reports to the requesting unit by means of radio (the primary means), message drop, or prearranged signals. When circumstances permit, the aviator will land at or near the requesting unit to report pertinent information. If a spot report is not required while the

MISSION NO. 3 DATE/TIME 210600 June 64 MAP/PHOTO Daleville Ala. 1:25000
OBSERVER Greene ORGANIZATION B Co. 20th Arm Bn
TYPE MISSION Reconnaissance TYPE AIRCRAFT OH

ITEM NO.	TARGET IDENTIFICATION	MAP/PHOTO LOCATION	TARGET DESCRIPTION	TIME OF OBSERVATION	REMARKS
1.	APC	318670	Three APC's moving north of hill 308.	0932	Directed artillery fire.
2.	Hv Mortar (4.2) troops	320690	One mortar dug in; four individuals digging in.	0937	

Figure 14. Sample debriefing format.

aircraft is in the air, the debriefing officer forwards a mission report through intelligence channels to units concerned. Although a spot report may not be required, the aviator-observer team must constantly evaluate observed information, and report any information that may be of immediate value.

33. Debriefing

For maximum information, the same individual should conduct both the preflight briefing and the debriefing of the aviator-observer team. Information is consolidated into two categories—mission and general information.

a. Mission. On debriefing, the aviator-observer team is asked questions covering all aspects of the mission assigned in the preflight briefing.

b. General. Any additional information obtained which was not an assigned mission task, but is of value (such as areas of enemy small arms fire) or any changes in tactical maps and weather data is general information.

34. Debriefing Form

Figure 14 shows a sample debriefing format to aid the aviator-observer team in compiling mission data and to shorten the time spent in debriefing. This format may be modified as the situation requires.

CHAPTER 5

AERIAL OBSERVER TRAINING GUIDE

Section I. GENERAL

35. Purpose

This chapter is a guide for commanders in establishing and conducting a visual aerial observer training course.

36. Responsibility

Commanding officers of Army aviation units are directly responsible for the conduct, efficiency, and results of aerial observer training within their parent organizations, which includes the training of observers from brigades, combat commands, battalions, and squadrons.

37. Authority

a. AR 40–501 prescribes the physical requirements for observer training.

b. AR 600–106 authorizes flight status ~~or~~ for observers.

38. Training Objective

The objective of observer training is to qualify selected personnel from the supported ground units as aerial observers.

39. Scope

Aerial observer training will be designed to meet the needs of each branch of service concerned and will be of adequate length to fulfill the observation requirements~~.~~ 95-1 See c

a. AR ~~95–51~~ outlines the scope and minimum number of hours required for the observer training course.

b. Appendix B provides a practical guide for the presentation of basic skills instruction and the preparation of training aids.

Section II. SELECTION CRITERIA

40. Trainees

When selecting personnel to be trained as observers, the following should be considered:

a. Physical profile.

b. Diversified experience in basic branch.

c. Desire to fly.

d. Previous flying experience.

41. Instructors

Qualifications to be considered in selecting instructors to conduct observer training are that the individual—

a. Is airplane and helicopter qualified.

b. Is qualified in one of the branches closely related to aerial observation (armor, infantry, or artillery).

c. Has other related specialized training, such as that required for combat intelligence, aerial photography, communications, or air-ground operations.

42. General

In planning an observer training course, Army aviation unit commanders, operations officers, and instructors must consider the—

a. Specific training objectives.
b. Training variables.
c. Methods of instruction.
d. Program of instruction.
e. Equipment availability.

43. Specific Training Objectives

The training course must prepare the individual to—

a. Detect, identify, locate, and report friendly and enemy personnel and equipment, and combat area activity.

b. Use special equipment (photographic, electronic, and CBR).

c. Adjust the fire of indirect fire weapons from the air.

d. Plan surveillance, reconnaissance, and special observation missions (using maps and aerial photos), to include the flightpaths, altitudes, checkpoints, etc.

e. Analyze terrain conditions and report changes in terrain which do not appear on maps.

f. Report information to appropriate agencies clearly, concisely, and accurately.

g. Understand the pilot techniques of level flight and of landing the aircraft.

H. Added i Added Sw

44. Training Variables

In any training situation, a number of variables affects the methods of training used, time allotted for training, and the program of instruction. These variables include the—

a. Training mission.
b. Training status of the individual and the unit.
c. Personnel situation.
d. Time available for training.
e. Training areas and facilities.
f. Weather and climatic conditions.
g. Status of equipment.
h. Special subjects to be stressed.

45. Methods of Instruction

To insure maximum effectiveness and uniformity of instruction, the commander must determine the best methods for utilizing instructors, presenting subject material, and conducting the training course. Specific training methods are given in FM 21–5.

a. It is desirable to use the same instructors throughout the course (during the individual and team phases of training).

b. Subject material should be presented in conferences, demonstrations, or practical exercises. Lectures should be avoided. The maximum number of field exercises should be included to give the student practical application of his classroom training.

c. The training course is divided into two phases—individual and team.

(1) *Individual.* Individual training encompasses the necessary hours of ground and flight subjects to prepare the individual to work as a member of the aviator-observer team.

(2) *Team.* Team training establishes the aviator-observer team and qualifies the individual as an observer.

d. Classroom training should be designed to teach effective aerial observation techniques and procedures for actual flight, with emphasis on speed, accuracy, and completeness.

(1) Flight training is scheduled immediately after visual search, recognition, geographical orientation, and target location training to better associate classroom instruction with practical application.

(2) Flight training should begin with a brief orientation for the students, as a group, stressing the capabilities of the aircraft to withstand normal, marginal, and emergency operational or technical situations. This should be followed immediately with a demonstration at the airfield depicting normal landings and takeoffs, simulated short field landings and maximum performance takeoffs, simulated takeoffs over barriers, power-off landings simulating marginal and emergency situations, and low altitude 360° and 720° steep turns demonstrating the stability and controllability of the aircraft. The students should be encouraged to ask questions while observing the demonstration.

(3) After the orientation and demonstration, the student aerial observers should be

given an orientation ride not to exceed 30 minutes. The aircraft used should be of the same type as those to be used later on in the training program. The aviators conducting these rides should be the instructors for the course and must insure that this ride does not include any violent maneuvers. The best flight altitude is 1,000 feet, and over an area readily recognizable by the student. The student should be encouraged to discuss his impressions of various sightings.

(4) Upon completion of the introductory ground training, an average student requires a minimum of 15 training flights before he may be considered to have marginal training as an aerial observer. Normally, 25 training flights are required to qualify a student as an effective aerial observer. Therefore, the 20 flying hours included in the aerial observer program of instruction given in AR 95–51 can best be utilized as follows: (1) one 30-minute orientation ride; (2) five 30-minute training flights (at the beginning of the flying portion of the course); (3) seven 1-hour training flights; and (4) the remaining 10 hours used for training flights of varied duration but not to exceed 2 hours at any one time.

APPENDIX A

REFERENCES

1. Army Regulations

40–501 95	Standards of Medical Fitness.
~~95–61~~	Aerial Observer Training.
~~320–5~~	Dictionary of United States Army Terms.
~~320–50~~	Authorized Abbreviations and Brevity Codes.
350–1	Army Training.
600–106	Aeronautical Designations and Flying Status for Army Personnel.

2. Field Manuals

1–5 1–110	Aviation Company.
1–100 95–1	Army Aviation Utilization.
1–105	Army Aviation Techniques and Procedures.
3–12 310–25	Operational Aspects of Radiological Defense.
5–20	Camouflage.
5–34 310–50	Engineer Field Data.
5–36	Route Reconnaissance and Classification.
6–40	Field Artillery Cannon Gunnery.
6–135	Adjustment of Artillery Fire by the Combat Soldier.
7–20	Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
11–40	Signal Corps Pictorial Operations.
17–1	Armor Operations.
17–95	The Armored Cavalry Regiment.
21–5	Military Training Management.
21–6	Techniques of Military Instruction.
21–26	Map Reading.
21–30	Military Symbols.
30–5	Combat Intelligence.
30–20 31–36	Aerial Surveillance—Reconnaissance, Field Army.
57–35	Airmobile Operations.
57–100	The Airborne Division.
61–100	The Division.
100–5	Operations of Army Forces in the Field.
101–5	Staff Officers' Field Manual; Staff Organization and Procedure.

3. Technical Manuals

1–250	Fixed Wing Flight.
1–260	Rotary Wing Flight.
1–380-series	Aerial Observer Programmed Text.

4. Army Subject Schedules

ASubjScd 1–8	Aerial Observer Training.

5. Department of the Army Pamphlets

108–1	Index of Army Films, Transparencies, GTA Charts, Recordings.
310-series	Military Publications Indexes.

APPENDIX B

INSTRUCTORS' AIDS

Section I. INTRODUCTION

1. General

The information contained in this appendix is intended primarily for use by aerial observer course instructors. It covers the practical aspects of presentation of instruction and the preparation of instruction and of training aids pertaining to visual search training, recognition training, geographical orientation, and target location.

2. Training Aids

The training aids included in this appendix are examples of training aids which will add to the effectiveness of the aerial observer course presentation. Local requirements and production capability will govern the type and number of training aids available for use.

Section II. VISUAL SEARCH TRAINING

3. Guide for Presentation of Visual Search Training

a. General. Classroom instruction should be closely integrated with practical exercises. The aircraft should be of that type predominantly used by the unit in aerial observer missions. Prior to the student's arrival, the aircraft is parked in a level flight attitude. (For the O–1 the brakes are locked, the aircraft chocked, and a sawhorse placed under the tail jack point.) Strips of engineer tape (approximately 25 meters) are nailed to the ground to delineate the search orientation sectors. If small-scale models of military equipment are available, these are placed in the search sector for realism. Upon arrival at the aircraft, the student occupies the observer's seat and all safety items (parachute, helmet, restraining harness, etc.) are fitted and secured. The instructor takes a position near the observer to one side of the observational work sector. The observer practices head and eye movement, searching in the prescribed manner. The instructor should insure that the student actually moves his head while practicing. When satisfied that the student has utilized the proper head movement and has noted the location of the work sectors in relation to the aircraft, the instructor may release him. He then repeats this procedure for each student in the class. See TM 1–380-series for individual training when field units lack qualified instructors or aids to conduct training.

b. In-Flight Instruction Requirements. Requirements for in-flight instruction include—

(1) Aviator training.

(2) Controlled terrain.

(3) Observation aircraft.

(4) Recording materials (air-to-ground radio or notebook).

(5) Ground targets.

c. Aviator Training.

(1) The primary role of the aviator is that of an assistant instructor; merely flying the observer over a training course is not sufficient. All aviators must be standardized on the—

(*a*) Exact flightpath.

(*b*) Instructional methods and procedures.

(*c*) Method of critique.

(2) It is the responsibility of the instructor to insure that the aviators are all flying the same flightpath and that airspeed and altitude are similar. Pretesting the aviators is required to insure accuracy of flight.

d. Controlled Terrain. Controlled terrain is ground area over which the aerial observer school has control with only those target objects required for training placed therein. It is necessary for the instructor to be able to determine whether or not the student sighted a particular target. If the terrain is uncontrolled, the critique following flight is unsatisfactory in that it is difficult to determine whether or not the student was correct in his sightings and whether or not he performed visual search properly.

e. Observation Aircraft. Current types of observation aircraft used by the aerial observer in actual operation should be employed.

f. Recording Material. Any activity which requires the aerial observer to move his eyes away from the terrain will reduce his performance level. The best method is to use an in-flight recorder; however, these may not be readily available. An air-to-ground radio may be used with assistant instructor transcribing the observer's response. The least desirable method, because the eye loses contact with the terrain, is notetaking by the observer while in flight.

g. Ground Targets. The primary purpose of ~~the~~ observer's visual search mission is to allow him to practice what he has learned in classroom instruction. Large targets such as 5-ton trucks, 2 1/2-ton trucks, or other military equipment of this category are most desirable. Placing small items such as 4.2-inch mortars or ~~.30-caliber~~ 7.62-mm machineguns will not enhance training at this time. The positioning of these items is contingent upon the terrain being used. (See diagrams of visual search area, figs. 15 and 16.)

h. In-Flight Training: Four steps to be considered in in-flight training are preparation, demonstration, in-flight practice, and critique.

(1) *Preparation.* All previous visual search training material plus the actual preparation of the aerial observer for the mission is included in the preparation phase. The student must be secured in the aircraft, instructed as to the direction in which to search, and briefed on any instructions that the aviator may give him while in flight.

(2) *Demonstration.* Mainly this demonstration should include extremely low-level flying (50 feet and below). While en route to the training area, the aviator demonstrates the change in the apparent movement of ground objects whenever the aircraft's speed/altitude varies.

(3) *In-flight practice.* Prior to entry on the training course, the aviator alerts the ob-

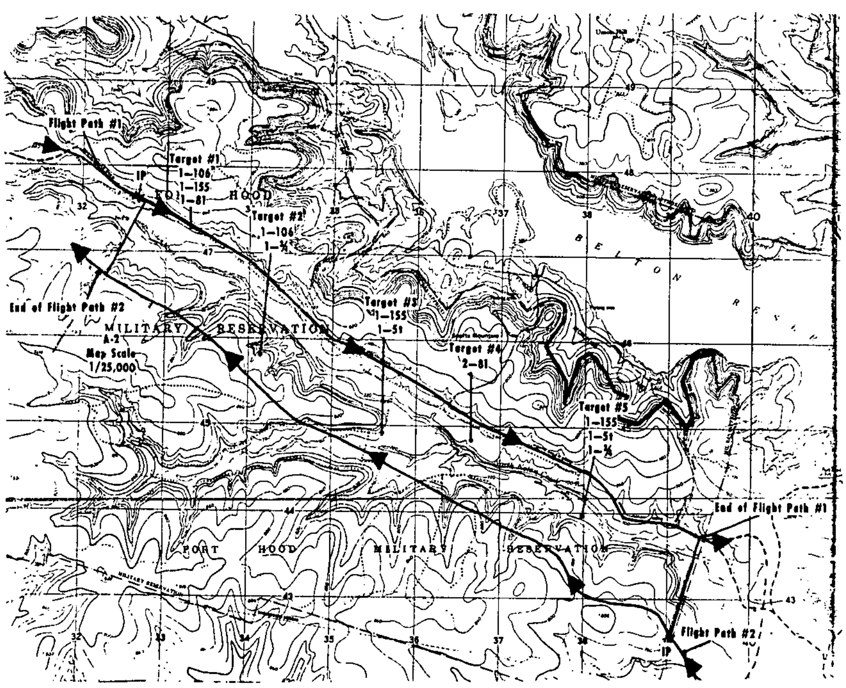


Figure 15. Type target course for visual search training.

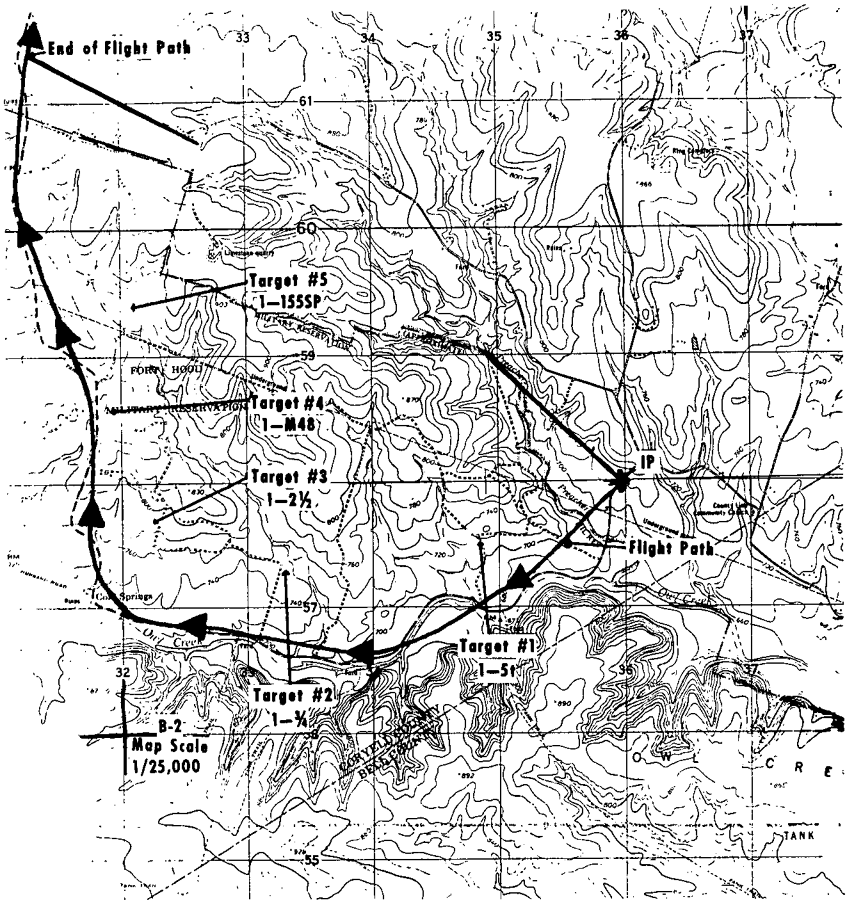


Figure 16. Type target course for visual search training.

server that in (x) seconds he will be in the training area; he again tells him the direction in which to look. The aviator then stabilizes his observation altitude at 50 feet or below (depending on terrain) and tells the observer when he is over the starting point of the course. After flying the course, he tells the observer that the flight course has ended. The aircraft is then flown back to the starting point and the aviator tells the observer that he will refly the course and point out the targets to him.

(4) *Critique.* While reflying the course, the aviator points out all targets to the observer. Four problems will be of primary interest:

(*a*) *Problem 1:* Observer did not report enough of the distant targets.

Possible cause: Observer is not scanning out far enough.

(*b*) *Problem 2:* Observer did not report enough of the near targets.

Possible cause: Observer is not scanning in close enough.

(*c*) *Problem 3:* Observer had few reports when compared to actual target display.

Possible cause: Observer did not scan rapidly enough.

(*d*) *Problem 4:* Observer reports only one target when two were in line, one near and one far.

Possible cause: Observer is "locking" his eyes on a single target too long. To aid in correcting this, a 5-inch mirror attached to a rubber suction cup may be placed inside the aircraft in a position which will allow the aviator to monitor the observer's head movement while in flight. If the aviator notes that head movement is not occurring during flight, he should remind the observer to move his head.

(5) *Debriefing.* Upon completion of the flight, the observer should be debriefed by the

classroom instructor to ascertain any visual search problems encountered while in flight and to give corrections.

4. Guide for Development of Training Material

Materials to be used include a terrain board, vugraph slides, and blackboard or charts.

a. Terrain Board (fig. 17). The board display should be drawn with the dimensions of depth to show the angle covered by foveal vision (5°). When this angle is used, the terrain area covered greatly increases as the range increases. Movable strings threaded through a hole in the drawn observer's eye (in cockpit of depicted aircraft) allows the instructor to move the strings from a near location to a far location, thereby indicating that foveal area coverage changes with distance.

b. Vugraph Slides and 35–mm Slides. All illustrations shown in the visual training portion of chapter 4 plus those shown in this section of the appendix may be made into vugraph slides or 35–mm slides and used to enhance the instruction of aerial observers.

c. Blackboard or Charts. In drawing the search sector, such as in figure ~~16~~ 13, metallic strips may be used to delineate the work areas, thereby allowing variations in the forward limits of the orientation sector to change, dependent on the type aircraft used. Search patterns may also be drawn showing visual search techniques ~~(fig. 14)~~. fig 16), see C1

Figure 17. Terrain board.

Section III. RECOGNITION TRAINING

5. Guide for Presentation of Recognition Training

a. Classroom Training.

(1) *Method of presentation.* A variety of slides will be shown the students in the classroom. The projectionist will show a slide for 5 seconds. Individuals in the classes are instructed to *verbally* respond first, then write their answers on their worksheets. A sample worksheet is shown in figure 18. Motivation

NAME ______________________ RANK ________ SERIAL NO. ________

ORGANIZATION ______________________________________

SESSION NO. R-______ DATE ________

SLIDE NO.	TARGET(S)	SLIDE NO.	TARGETS(S)
1		16	
2		17	
3		18	
4		19	
5		20	
6		21	
7		22	
8		23	
9		24	
10		25	
11		26	
12		27	
13		28	
14		29	
15		30	

Figure 18. Recognition training worksheet.

may be accomplished by calling on certain individuals to describe why they called it what they did. Testing procedures may be implemented by merely deleting the verbal response. A method of abbreviated reporting is listed in table 2.

(2) *Sequence of presentation.* The slides are presented in a systematic, progressive manner. The initial stage places the observer near a single target and without surrounding clutter; the sequence gradually progresses until maximum viewing distance and maximum

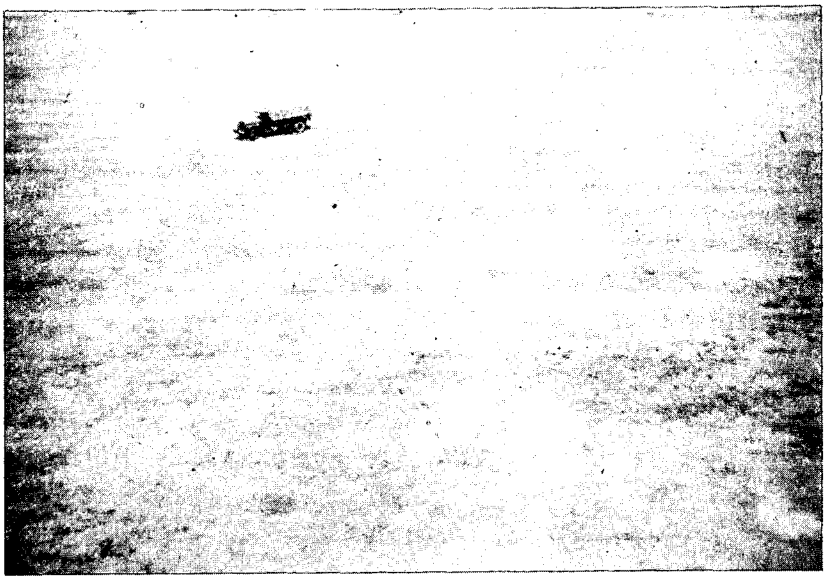


Figure 19. Recognition training slide: 5-ton cargo truck, condition SR_2C_1.

Figure 20. Recognition training slide: 5-ton cargo truck, condition SR_2C_2.

clutter are shown. Figures 19 through 25 illustrate the type slides to be used in this presentation.

b. In-Flight Practice.

(1) The following guidance used in visual search training is also applicable for in-flight target recognition practice.

(*a*) Aviator training.

(*b*) Controlled terrain (a type course is shown in fig. 26).

(*c*) Recording procedures.

(*d*) Aviator procedures.

(*e*) Critique.

Figure 21. Recognition training slide: 5-ton cargo truck, condition SR_3C_2.

Figure 22. Recognition training slide: 5-ton cargo truck, condition SR_2C_3.

(2) Additional requirements for in-flight practice are ground and target conditions. Where possible, the equipment placed on the target course should cover all conditions discussed in the classroom, to include distance to target, clutter, single and multiple target presentations, and types of targets. Prior selection of target placement areas is important in order to offer varying conditions to the aerial observer.

6. Guide for Development of Training Material

(See also TM 1–380-series.)

Materials and equipment used are an observation helicopter, 35–mm camera and color film, and military equipment (target objects such as M–48 tank, ¾-ton truck, etc.).

a. Training Material. The 35–mm color slides, when shown in the classroom, provide in-flight views of military items of equipment. The slides should show all items that the observer must be trained to recognize under varying conditions of distance and natural concealment. The observer must be able to recognize targets at all distances within the capability of the human eye (table 1), and to recognize targets when they are partially obscured by surrounding vegetation. A method for doing this is to establish at least three categories for both the distance to the target and the amount of surrounding vegetation. For this purpose the

Figure 23. Recognition training slide: 2M–59's, 1M–48, low difficulty level.

Figure 24. Recognition training slide: 2 M–48's, 1 M–59, medium difficulty level.

distance to the target will be defined as *slant range* (SR) and will vary from near distances (SR_1) through medium distances (SR_2) to far distances (SR_3). The surrounding vegetation will be defined as *clutter*. Clutter will vary from parade ground vegetation (C_1) through light brush or trees (C_2) to heavier obscuring vegetation (C_3).

(1) *Slant range (SR)*. The slant range is the distance from the eye (camera) to a particular object being viewed (photographed). Slant range considered herein will be translated into the ratio of the major axis of a piece of equipment to the total lateral area of a 35–mm slide. (As altitude decreases toward zero, the slant range gradually becomes ground distance.)

(*a*) *Slant range 1* (*SR_1*). Slides illustrating SR_1 should be taken from a distance which results in the major axis of the target being not less than ¼ the width of the slide. In terms of details, all the major and most of

Figure 25. Recognition training slide: 2 M–48's, 2 M–59's, high difficulty level.

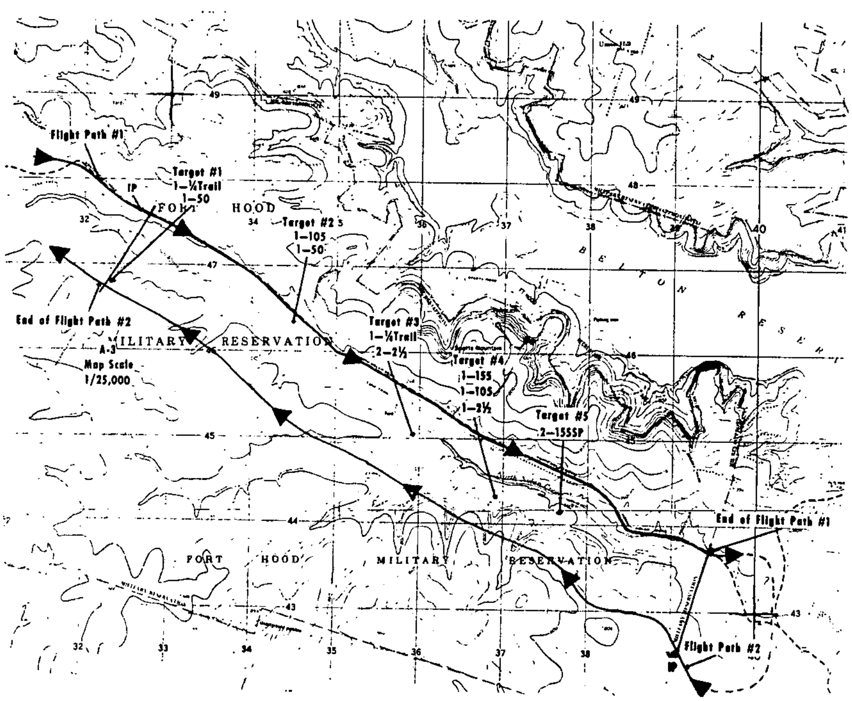


Figure 26. Type target course for carget recognition training.

the minor details which contribute to the uniqueness of the item are apparent.

(*b*) *Slant range 2* (SR_2). Slides illustrating SR_2 should be taken from a distance which results in the major axis of the target being approximately $^1/_{10}$ to $\frac{1}{4}$ the width of the slide. All of the major details which contribute to the uniqueness of the target are clear at these distances, but the minor details are not as obvious as at SR_1.

(*c*) *Slant range 3* (SR_3). Slides illustrating SR_3 should be taken from a distance which results in the major axis of the target being less than $^1/_{10}$ the width of the slide. At these distances, all of the minor and some of the major details of the items appear indistinct.

(2) *Clutter.* Clutter is defined as vegetation and the property of the terrain, to include color and texture of the area surrounding the target.

(*a*) *Clutter 1* (C_1). The items in slides illustrating C_1 should be photographed against a relatively homogeneous background, such as a parade ground, so that the item is in full view and dominates the slide.

(*b*) *Clutter 2* (C_2). These targets should be photographed near distinctive terrain features, vegetation, or shadows. In the case of small weapons, semitactical positions (i.e., machinegun emplacements) are employed. The items are placed in such a manner that they are either separated from or adjacent to the background features, but in no case is more than ⅓ of the item obscured by such features.

(*c*) *Clutter 3* (C_3). Items in slides illustrating C_3 should be photographed against backgrounds which contain more irregularities than those of the C_2 slides. The items are placed so that, in terms of color and configuration, advantage can be taken of natural camouflage. The actual amount of concealment offered by this camouflage results in not more than ⅔ of the item being covered; generally, ½ or less of the item is concealed. In no case, however, is the item separated from the background features.

b. Pictorial Method of Development. The slides used in recognition training should be taken from an altitude of 50 to 200 feet above the altitude of the target. The photographer, when looking through the viewfinder, should use the guidelines established in slant range, above. All slides are taken in color, and the orientation of the target to the camera (e.g., end view, side view, and variations thereof) is unsystematically varied. This permits a complete coverage of a target item from all views.

c. Total Requirement. Approximately 340 usable slides are required: 160 of single targets (SR_1C_1 through SR_3C_3) and 180 of multiple targets (2 to 6 items, low through high difficulty).

d. Film Cataloguing. After slides are selected, they should be catalogued and numbered in sequence in this manner:

Period 1	Slides 1–40	(SR_1C_1)	Single items
Period 2	Slides 41–100	(SR_2C_2)	Single items
Period 3	Slides 101–160	(low difficulty level)	Multiple items
Period 4	Slides 161–240	(SR_3C_3)	Single items
Period 5	Slides 241–300	(medium difficulty level)	Multiple items
Period 6	Slides 301–340	(high difficulty level)	Multiple items

Note. A slide key, listing slide number(s) and target(s), should be made a portion of the narrative for projectionist and instructor reference.

e. Multiple Target Combinations. It is necessary to modify the categories of slant range and clutter when developing multiple targets. The slant range and clutter values for a ¼-ton truck are not the same as for a 5-ton truck. When these two items are placed together in a multiple target situation, the instructor will have to categorize the slide based on his opinion as to whether its difficulty level is low, medium, or high.

Administrative Caution. **When developing a film library, caution should be taken to insure that the level of difficulty does not exceed the observer's ability. This may occur when a vehicle is shown in the woods, making the difficulty level of the picture exceed the observer's capability of discriminating the object. All targets should fall within the average maximum detection ranges given in table 1.**

Section IV. GEOGRAPHICAL LOCATION

7. Guide for Presentation of Geographical Orientation Training

(See also TM 1–380-series.)

a. Classroom Training.

(1) *Method of presentation.* The aerial observer receiving geographical orientation training is shown colored slides of various terrain features. The photographs are taken from three altitudes above the level of the terrain feature and from nine different directions (figs. 27–35). These varied views should give the observer a good idea of how the appear-

Figure 27. Geographical orientation slide for grid 3–D, map F; photographed from 180° at 2,000 feet.

ance of a terrain feature can change relative to the angle and height from which it is seen. To give the observer optimum practice in geographical orientation, presentation of slides should be varied at random by altitude and height.

(2) *Sequence of presentation.* Progressive levels of difficulty, contingent upon geographical terrain features available in the unit area, must be determined by the instructor (para 8*b*).

(3) *Maps.* The maps used in training (fig. 36) are folded and inserted in an acetate binder. In order to reuse the folders, the acetate is marked with UMT grid crosses in four corners. The top margin is labeled A, B, C, etc., and the left margin is marked 1, 2, 3, etc., downward, all of which are in grid square increments. The initial orientation is given the student by stating, "Look in grid square ___ (A3, B6, etc.) for the ______ (terrain feature)."

Figure 28. Geographical orientation slide for grid 3–D, map F; photographed from 180° at 1,100 feet.

Figure 29. Geographical orientation slide for grid 3–D, map F; photographed from 180° at 200 feet.

Figure 30. Geographical orientation slide for grid 3–D, map F; photographed from 360° at 2,000 feet.

b. In-Flight Training. Prior to flight, the aerial observer is given a map (fig. 37) and two grease pencils, and then is briefed on his job requirement, including the method to be used in marking his map. Upon arrival over the grid square designated, the aviator insures that altitude is stabilized at 50 to 100 feet (depending on terrain and airspeed) and alerts the observer that he is over a specified area. He then flies the prescribed flight course without giving any further assistance to the observer. Upon completing the first flight over the course, the aviator may replace the grease pencil with one of a different color to enable the observer to correct his inaccuracies. The remainder of the flight then becomes the critique.

Figure 31. Geographical orientation slide for grid 3–D, map F; photographed from 360° at 1,100 feet.

c. Critique.

(1) The observer is flown back over the course at an altitude of 200 to 500 feet and the terrain features (which are randomly numbered) are pointed out by stating, "Number ____ coming up on the left, number ____ coming up on the right," etc. With a different colored pencil, the observer may then re-mark his flight course.

(2) Upon returning to the airfield, the aerial observer should be critiqued on his flight course and a comparison made on the variance in colored arrows (which should trace the flight course) on his map and the master flight diagram.

Note. Figure 37 is a master flight diagram. The student's map will show terrain features without a flightpath.

8. Guide for Development of Training Manual

Materials used are an observation helicopter, 35–mm camera and color film, tactical maps scale 1:25,000 or 1:50,000, and compass rose (fig. 38).

Figure 32. Geographical orientation slide for grid 3–D, map F; photographed from 360° at 200 feet.

a. Description of Geographical Orientation Features. Geographical orientation features which should be used for training will vary from one area to another. The unit should use features which will best represent actual or anticipated operational area requirements.

b. Selection Factors. Terrain features selected for use in training should meet the following qualifications:

(1) *Uniqueness of identity.* This means that a feature, such as a road junction, is so laid out that it is not readily confused with a feature of the same sort in the near vicinity.

(2) *Permanent or semipermanent objects (natural or manmade).* A house on a road would be a poor selection because of the lack of permanency. A bridge over a river may be destroyed; however, the road approaches and bridge abutments would indicate that the bridge was once there. Use terrain features which will not markedly change by enemy action or time.

(3) *The twosome rule.* This rule states that a single feature is not sufficient for ready identification of that feature when compared to a map or chart. A river may be a terrain feature, but it is a poor selection unless it is associated with a bridge, a roadway curve, a railroad, or a community. The rule holds true for a road junction, which should be accompanied by a group of buildings (possibly indicated by foundations or rubble), a creek, or a railroad. For orientation training, always associate a second feature with the primary feature to be used.

c. Method of Development. Four steps are required for the development of film material. These are—

(1) *Detailed map study.* For selection of terrain features to use.

(2) *Aerial inspection.* To be performed on each location to verify map accuracy.

(3) *Preplanning.* Upon final selection of the terrain features, the aviator and photographer, along with the instructor, preselect the specific points over which the photographs will be taken and mark them on a map for in-flight use.

(4) *Photography.* The simplest method is to fly the highest altitude (2,000 feet actual) over the preselected points, then repeat at 1,000 feet and again at 100 to 200 feet (35–mm camera, normal focal length, color film). The photograph should be taken on the following headings from the target: 0° north, and each succeeding 45° increment around the compass. Each compass heading will be repeated (except where not feasible due to masking effects of terrain) at each altitude. Range will be varied to complete the required number of slides (*e* below).

d. Film Library. Selection for inclusion of

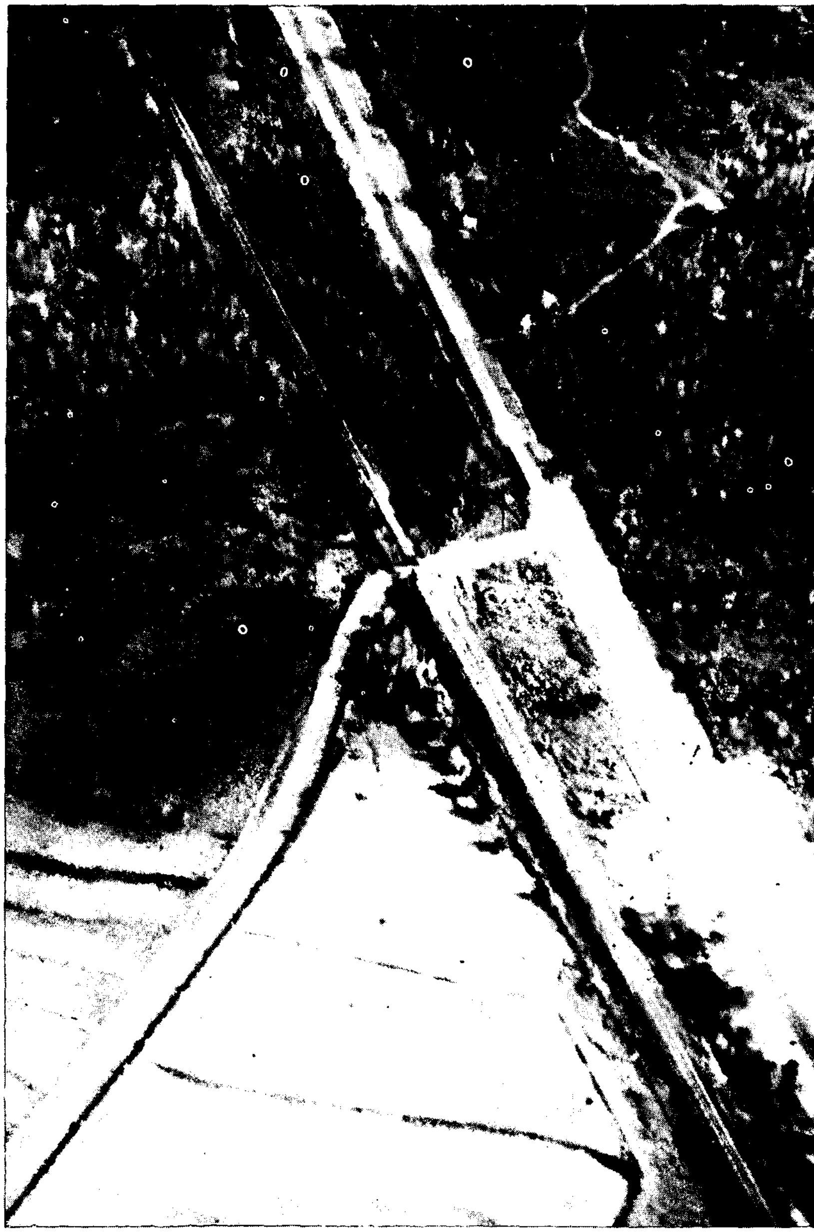


Figure 33. Geographical orientation slide for grid 3–D, map F; photographed from 315° at 2,000 feet.

the training slides should be based on—

(1) *Picture quality.* Poor quality photographs should be discarded.

(2) *Variations of altitude and compass headings.* When compiled into a training series, random selection of headings and altitudes should occur for all terrain locations. One example of random selection is as follows:

Slide No.	*Photographed from*	*Altitude*
1	180°	2,000 ft
2	225	200
3	000	1,000
4	270	200
etc.	etc.	etc.

(3) *The map used in flight* (*c*(1) above). This will be of value in retaking and supple-

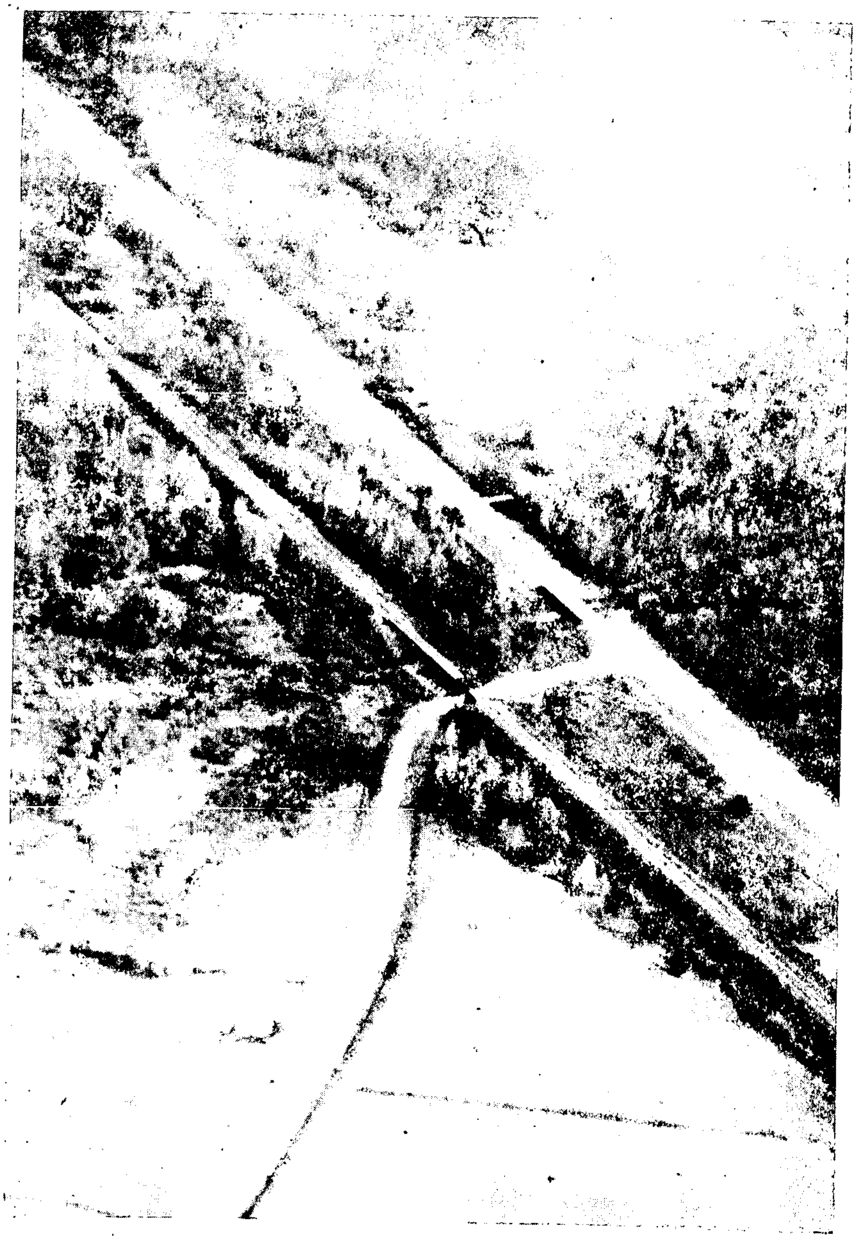


Figure 34. Geographical orientation slide for grid 3–D, map F; photographed from 315° at 1,100 feet.

menting photographs of a particular terrain feature.

e. Film Requirement. Approximately 20 slides per location are desirable. A total of 280 slides are required, any portion of which may be used as a test. The first training period will consist of two terrain features; the second through fourth periods will consist of four terrain features. Each feature will consist of 10 slides at 100 to 200 feet and 5 each from 1,000 to 2,000 feet, all of which should give varied compass coverage of the terrain feature. Examples of pictures are shown in figures 27 through 35.

f. Map Folders. The map folder (fig. 36) is constructed by placing a piece of acetate over a stiff backing and then taping on three sides. The grid numbering and lettering system is printed on the top and side. Four grid alignment crosses are superimposed on the acetate to enable quick alignment of the map inserted. Subsequent maps needed are prefolded to fit the folder and are numbered. The student, on

Figure 35. Geographical orientation slide from grid 3–D, map F; photographed from 315° at 200 feet.

request, will insert the map needed for subsequent training sessions.

g. Worksheet. A sample geographical orientation training worksheet is shown in figure 39.

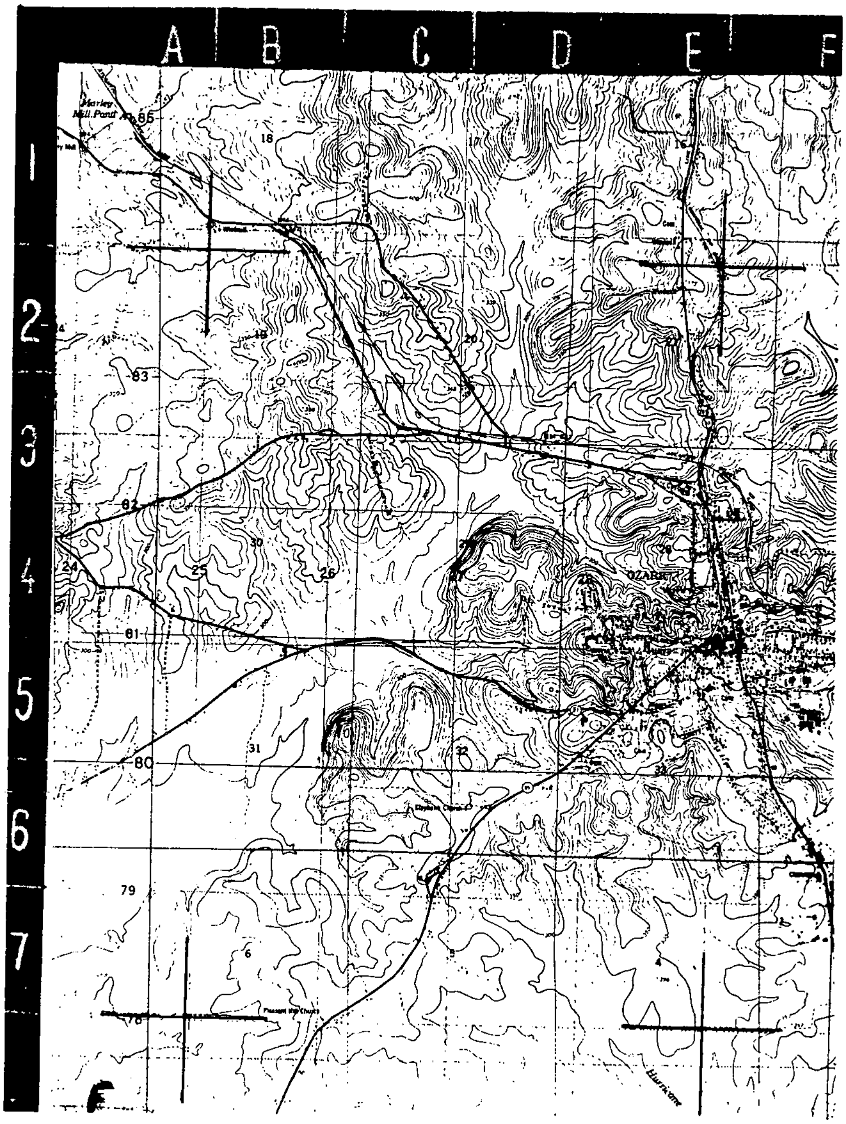


Figure 36. Map F, used in geographical orientation training.

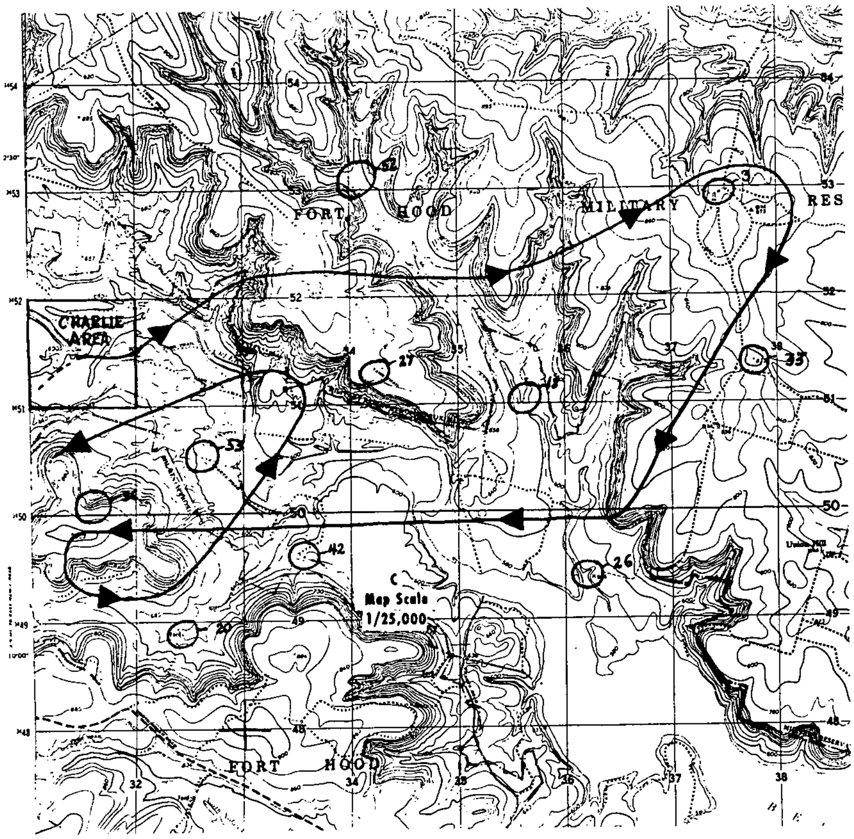


Figure 37. Type course for geographical orientation training, target area C.

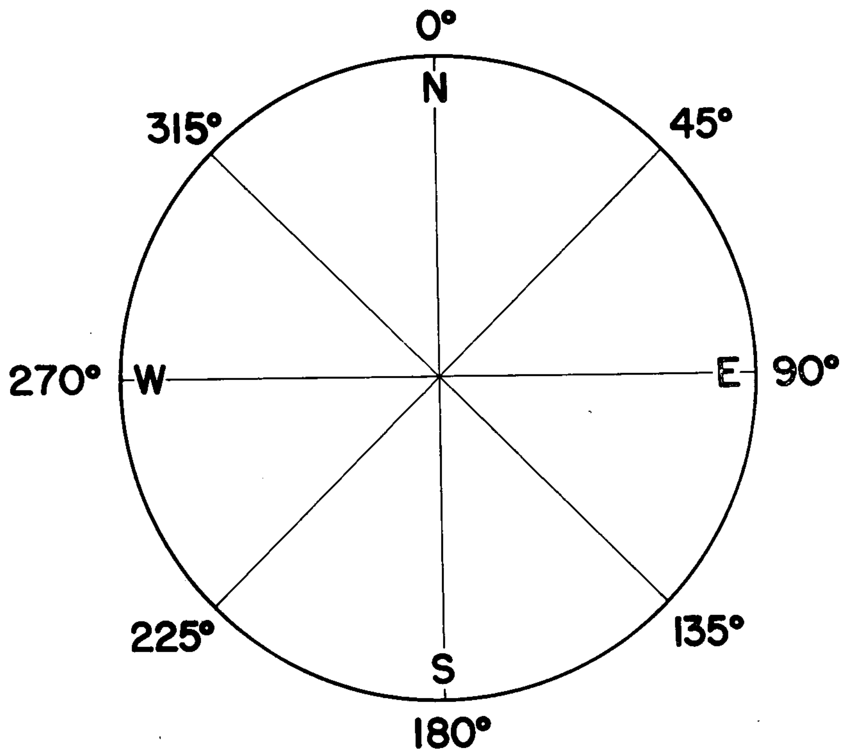


Figure 38. Compass rose.

NAME ______________________ RANK ______ SERIAL NO. ________

ORGANIZATION ______________________________

SESSION NO. 0-____ DATE ________

SLIDE NO.	DEGREES	SLIDE NO.	DEGREES	SLIDE NO.	DEGREES
1		15		29	
2		16		30	
3		17		31	
4		18		32	
5		19		33	
6		20		34	
7		21		35	
8		22		36	
9		23		37	
10		24		38	
11		25		39	
12		26		40	
13		27			
14		28			

Figure 39. Geographical orientation training worksheet.

Section V. TARGET LOCATION

9. Guide for Presentation of Target Location Training

(See also TM 1–380-series.)

a. Classroom Training.

(1) The aerial observers are shown two colored slides in sequence for each target location. The first slide is a geographical orientation feature which is of the same type shown in his preceding training except that altitude for target location is held constant at 100 to 200 feet. The second picture showing the target viewed is 90° to the right or left of the flightpath to the geographical orientation feature. Both slides are taken over the same

Figure 40. Initial orientation slide, map 4; grid 4–B, viewed from 090°.

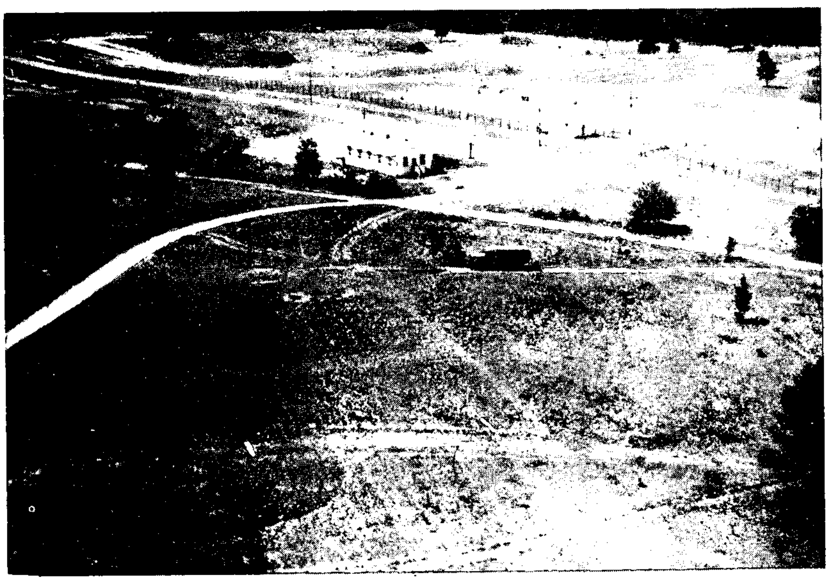


Figure 41. Target location slide looking left.

ground point and at the same altitude. In all cases a large vehicle, such as a 5-ton truck, should be used as the target to be located. Figures 40 through 51 illustrate the type slides to be used.

(2) Classroom procedures are a combination of those in geographical orientation and the additional procedures required for target location. The steps are as follows:

(*a*) Tell the students what grid square of the map (fig. 52) to look in.

(*b*) Project the geographical orientation slide on the screen and have the observers identify the direction from which it is viewed.

(*c*) Have an observer respond with direction.

(*d*) State that the terrain feature shown is directly ahead of the aircraft's position and the aircraft is flying toward it. This would be a view that the aviator of an O–1, or the aviator and observer in an observation helicopter might see.

Figure 42. Initial orientation slide, map 4, grid 4–B, viewed from 090°.

Figure 43. Target location slide, grid 4–B, looking left.

(*e*) Direct their attention right or left from the flightpath (whichever direction is correct for the location slide).

(*f*) Project the target location slide.

b. In-Flight Practice.

(1) The following guidance is applicable to target location in-flight practice:

(*a*) Aviator training.

(*b*) Controlled terrain.

(*c*) Recording procedures.

(*d*) Aviator procedures.

(*e*) Critique.

(2) Additional requirements for in-flight practice are ground and target conditions. Target conditions for target location training should be similar to target recognition training. To enable the instructor to evaluate the student's progress, all targets used in target location training must be engineer-surveyed into location. A survey error of 10 meters in

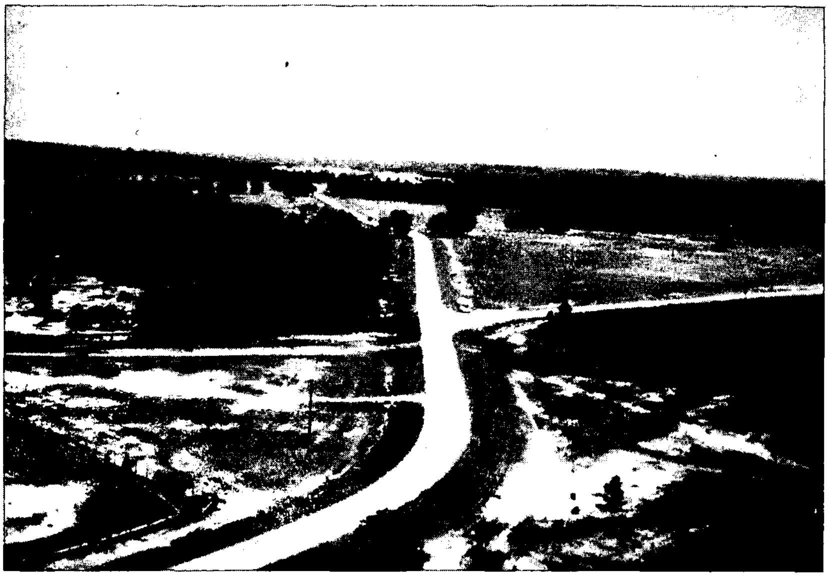


Figure 44. Initial orientation slide, map 4, grid 4–B, viewed from 135°.

Figure 45. Target location slide looking right.

actual ground location is allowed. Type target courses are shown in figures 53 and 54.

(3) Prior to flight, the observer is handed an acetate-covered map (or strip map) showing the flightpath and the initial point. He is then briefed by the instructor on his mission which is to "search for, identify, and locate all targets within the area prescribed." He is handed two grease pencils and told to circle the target locations on his map. In-flight procedures discussed for other phases of aerial observer training apply for target location training.

c. Critique. One method for in-flight critique is to request the observer to pass the grease pencils to the aviator after completing the target location flight. The observer is then handed an acetate overlay which shows the surveyed locations of the targets by a dot (center of target mass), a circle surrounding the dot,

Figure 46. Initial orientation slide, map 4, grid 4–B, viewed from 135°.

Figure 47. Target location slide looking right.

and the target number. The course is then reflown so that the observer can see where errors occurred.

10. Guide for Development of Training Material

Materials and equipment used are an observation helicopter, 35-mm camera and color film, 5-ton truck (or other large vehicle), and tactical map of local airfield.

a. Selection Factors. Terrain selection criteria established for geographical orientation (para 8*b*) apply to target location, except that geographical heading is not considered. After selecting a point over which to photograph the geographical orientation feature, verify its suitability by looking 90° right or left of the inbound flightpath to the geographical feature. In the areas right or left of the flightpath, there must be a suitably clear location in which

Figure 48. Initial orientation slide, map 4, grid 4–B, viewed from 090°.

Figure 49. Target location slide, grid 4–B, looking left.

to position the target (e.g., 5-ton truck). If a good target site does not exist, continue to shift the proposed photographic point until the geographical orientation feature and target location area are compatible. The target does not appear on the geographical orientation slide.

b. Method of Development of Film Material. Four steps are required for the development of the film material. These are—

(1) *Detailed map study.* For selection of terrain features to include sufficiently clear areas in which to position the target.

(2) *Aerial inspection.* Of each location, to ascertain the accuracy of the map and the suitability of the area.

(3) *Preplanning.* Upon final selection of the terrain features and positions, the aviator,

Figure 50. Initial orientation slide, map 4, grid 4–B, viewed from 090°.

Figure 51. Target location slide looking left.

the photographer, and the instructor preselect the specific points over which the photographs will be taken and mark them on a map for in-flight use.

(4) *Photography.* A method by which the photographs may be taken is as follows:

(*a*) Position the target in the target location area.

(*b*) Fly 45° to the geographical orientation feature so that your flightpath will take you directly over the photographic point. If weather conditions and safety warrant, the helicopter is brought to zero airspeed while the picture is taken of the geographical feature, and a pedal turn is made so the photographer may take the second picture 90° to the first. This procedure insures that both pictures are taken over the same ground point. If weather or safety does not permit zero airspeed at 100 to 200 feet, the helicopter may

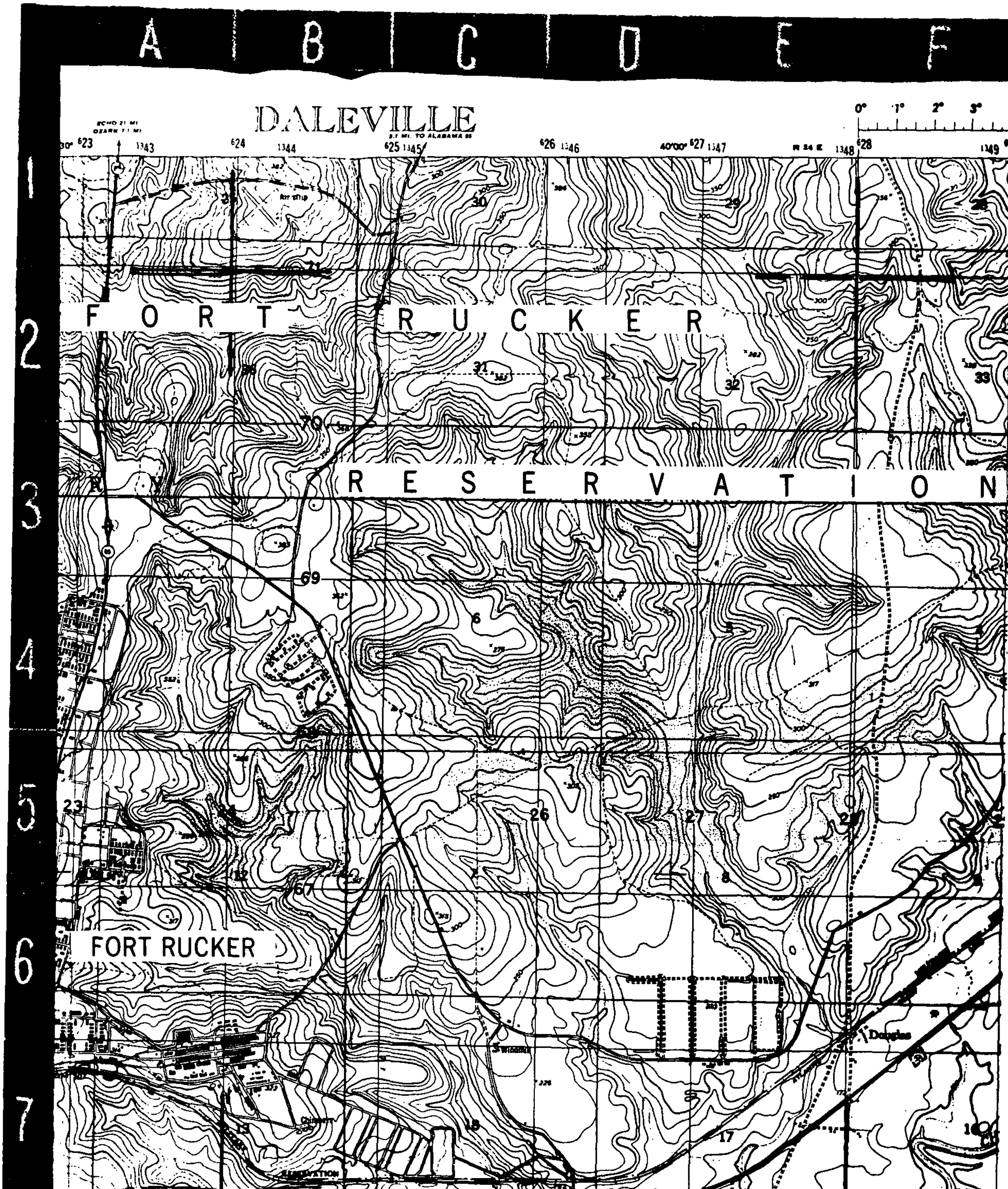


Figure 52. Map 4 for target location training.

be flown at a safe slow airspeed over the photographic point. The aircraft should then be reflown over the same precise point at the same altitude where the second picture is taken of the target. Range to the target may vary from 100 to 900 meters (table 1).

c. Film Library Selection. Selection of slides for training should be based on—

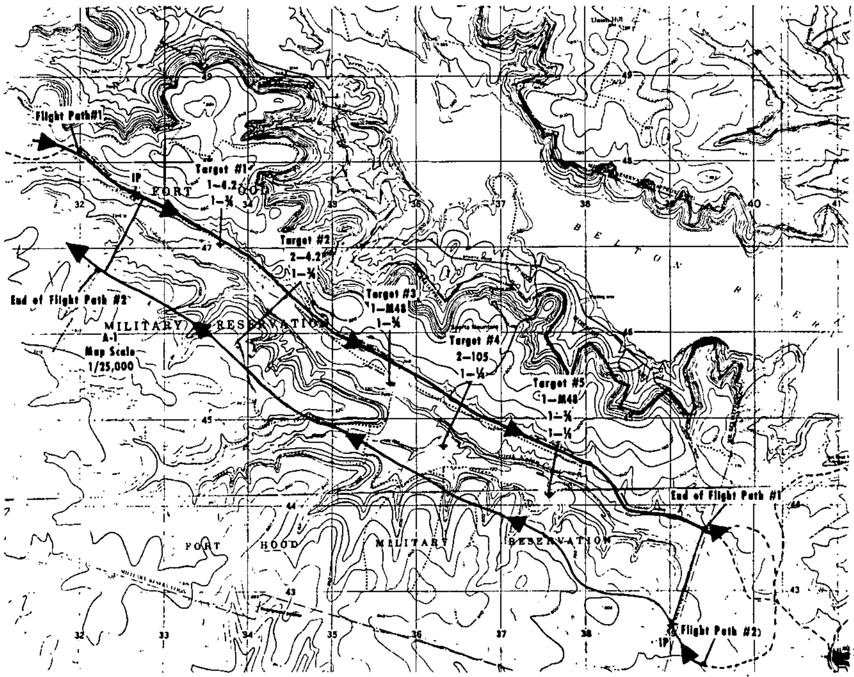


Figure 53. Type target course for target location training (engineering-surveyed locations), target area A–1.

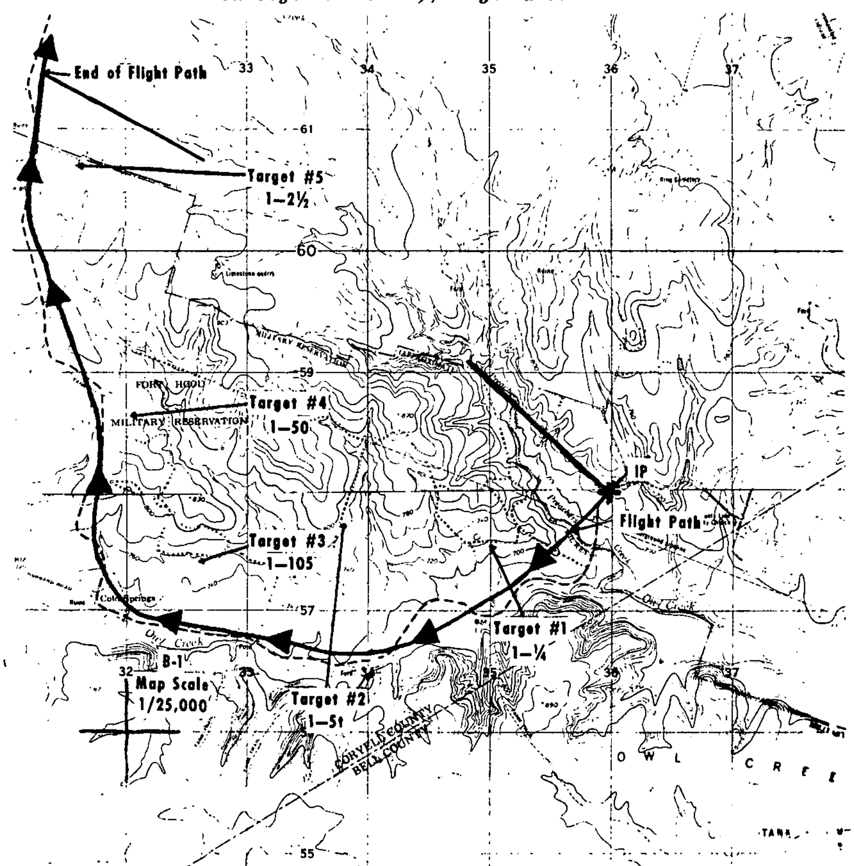


Figure 54. Type target course for target location training (engineer-surveyed locations), target area B–1.

(1) *Picture quality.* Poor quality photographs should be discarded.

(2) *Suitability of the photographs to fulfill the target location requirement.* More than one picture may be taken using the same geographical orientation feature and the same inbound flightpath, by shifting the target to another site away from the first. The map mentioned in *b*(3) above will be of assistance in retaking or supplementing any of the photographs of a particular target location.

d. Map Folder. The map folder used in target locations training is the same as that used in geographical orientation training.

APPENDIX C

IN–FLIGHT REPORT

ANNEX A TO
DETAILS OF AGREEMENT
OF STANAG 3377

1. PURPOSE

An IN-FLIGHT REPORT is the standard form of message whereby strike, attack, and reconnaissance pilots/crews report mission results while in flight. This report is also to be used for reporting any other tactical information sighted of such importance and urgency that the delay, if reported by normal debriefing, would negate the usefulness of the information.

2. FORMAT

USE STANDARD MESSAGE FORM HEADING (See Notes)	
FORMAT (Not to be transmitted)	EXAMPLE MESSAGE
IN-FLIGHT REPORT: Always at start of message.	IN-FLIGHT REPORT.
AIR TASK/MISSION NO.	3/A501.
A. LOCATION IDENTIFIER (only if necessary for clarification).	A. LC 7354.
B. TIME ON TARGET/TIME OF SIGHTING.	B. Target attacked 1610Z.
C. RESULTS. Results of mission, brief description of observation, recommendation for attack/reattack if necessary.	C. Two tanks destroyed, one damaged; 20 tanks and troops seen moving west out of HOF 1615Z.

3. NOTES.

a. Procedure.

(1) Submitted by. All units/wings in a strike/attack or reconnaissance role.

(2) Frequency. As ordered by the requesting authority and/or at the discretion of the mission leader.

(3) Time. As soon as possible after results are known, and aircraft is within radio range of a reporting post on the ground.

(4) Method of transmission. Voice broadcast to appropriate reporting post or as briefed.

b. Precedence. As required.

c. Security. Code words established by local SOP may be used if necessary.

By Order of the Secretary of the Army:

WILLIAM C. WESTMORELAND,
General, United States Army,
Chief of Staff.

OFFICIAL:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

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