WAR DEPARTMENT

ARMY AIR FORCES FIELD MANUAL

EMPLOYMENT OF AVIATION OF THE ARMY

January 18, 1943

FM 1–5

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UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1943

[redacted] WAR DEPARTMENT,
WASHINGTON, January 18, 1943.

FM 1–5, Army Air Forces Field Manual, Employment of Aviation of the Army, is published for the information and guidance of all concerned.

[A. G. 062.11 (12–22–42).]

BY ORDER OF THE SECRETARY OF WAR:

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DISTRIBUTION:

R and H 1–7, 17, 18 (6); Bn 1 (8), 17, 18 (5); IBn 7, 19 (5); IC 7, 19 (5), 11 (2).

(For explanation of symbols see FM 21–6.)

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ARMY AIR FORCES FIELD MANUAL

EMPLOYMENT OF AVIATION OF THE ARMY

(This manual supersedes FM 1–5, April 15, 1940; and TC No. 70, War Department, December 16, 1941.)

CHAPTER 1

GENERAL

SECTION I

MILITARY AVIATION

■ 1. MISSION OF THE ARMY AIR FORCES.—The mission of the Army Air Forces is to procure and maintain equipment peculiar to the Army Air Forces and to provide air force units properly organized, trained, and equipped for combat operations.

■ 2. GENERAL CATEGORIES.—Aviation of the United States Army, referred to herein as military aviation, falls into two general categories as follows:

a. Aviation directly under command and control of the Commanding General, Army Air Forces.—Included in this category are—

(1) All nontactical units of the Army Air Forces used for training, research, development, and transport.

(2) All tactical units of the Army Air Forces not assigned to a task force or other commander.

b. Aviation directly under command and control of other commanders.—(The Commanding General, Army Air Forces, has such technical command of this aviation as is necessary for the control and supervision of training and the supply and maintenance of equipment peculiar to the Army Air Forces.) This category consists of air forces assigned to task force or other commanders.

NOTE.—For purposes of simplification, the term "task force(s)" as used throughout this manual denotes the component units of the military forces under the command control of a single com-

mander and assigned to theaters of operation, oversea garrisons and departments, base and defense commands, or similar organizations.

From the aviation assigned to air forces there are formed—

(1) *Striking forces.*—To operate as strong offensive air units for the application of air power. These forces will be required to extend the destructive effect of air operations over both land and sea to great distances beyond their operating bases. Tactically they conduct counter air force operations to gain and to maintain control of the air. The strategic functions of these forces are set forth in paragraph 11.

(2) *Defense forces.*—To provide a close-in air defense of vulnerable and important areas to include, where necessary, reasonable protection against offshore carrier attacks.

(3) *Support forces.*—To provide the necessary air power in support of the operations of ground, naval, or composite forces. While all tactical aviation is trained within its means to provide effective air support to these forces, observation, light and dive bombardment, troop carrier, and photographic aviation are specifically trained to furnish air support. In addition to these types of aviation, support forces may include heavy and medium bombardment and fighter aviation.

■ 3. PURPOSE.—In accordance with the purpose for which various types of aircraft are ordinarily employed, military aviation is divided into combat, special purpose, training, and experimental aviation.

a. Combat aviation is organized, trained, and equipped to engage in offensive and defensive air operations by air attack and air fighting. Corresponding to the means with which equipped, combat aviation is divided into bombardment, fighter, and observation aviation.

(1) *Bombardment aviation* is the term applied to all aircraft designed for the air attack of surface objectives, and the organizations equipped with such aircraft.

(2) *Fighter aviation* is the term applied to all aircraft designed for offensive air fighting, and the organizations equipped with such aircraft.

(3) *Observation aviation* is the term applied to aircraft designed for the performance of a service of information

for military commands. It is equipped with light bombardment, fighter, and liaison aircraft. The primary function of observation aviation is to secure information by visual and photographic means and to return this information for exploitation. The secondary function of observation aviation is the application of its available armament in air fighting and air attack. This function will not be undertaken on an observation mission, and will be undertaken only when dispatched on attack missions. Observation airplanes equipped for combat form a potential battle weapon but must not be diverted from the primary function of observation except when observation is not required or in the final phase of an action when observation can be sacrificed in favor of added fire power. Observation aviation will be committed to its secondary function only on authority of the commander charged with complete responsibility.

b. Special purpose aviation is organized, trained, and equipped to perform special tactical missions essential to military operations. It consists of troop carrier (including glider) and photographic aviation.

(1) *Troop carrier* (including gliders) is the term applied to aircraft designed to carry parachute troops, airborne troops, their equipment and cargo; also the organizations equipped with such aircraft.

(2) *Photographic aviation* is the term applied to aircraft designed to perform photographic reconnaissance missions beyond the responsibilities of observation aviation and special photogrammetric mapping missions for engineer topographic troops. Photographic aviation also denotes the organizations equipped with such aircraft.

c. Training aviation is organized, trained, and equipped especially for the training of personnel in pilot functions and specialist nonpilot functions of combat and ground crews. Training aviation has no tactical or strategical functions.

d. Experimental aviation is organized, trained, and equipped for the development and test of aircraft and aeronautical equipment. It has no tactical or strategical function.

■ 4. CHARACTERISTICS.—*a.* Military aviation constitutes a powerful weapon for the conduct of strategic air operations and for the support of operations of naval and other military

forces. It is characterized by an extremely high degree of tactical mobility, the ability to move in three dimensions, and extreme range of fire power. The strategic mobility of military aviation is dependent upon the availability and adequacy of air bases from which to conduct air operations.

b. The mobility of airplanes enables them to cover great distances in a short period of time. It makes possible their rapid employment at critical points and times in a theater of operations and rapid movement between widely separated theaters.

c. The power of aircraft to move in three dimensions enables them to maneuver at altitudes beyond the effective range of ground weapons, to approach and attack ground objectives from such altitudes, and to make deep incursions into enemy territory.

■ 5. TACTICAL FUNCTIONS.—*a.* In general, tactical air operations involve four fundamental functions:

(1) Air attack, which is the attack of objectives on the earth's surface by aircraft.

(2) Air fighting, which is the act of fighting between aircraft in flight.

(3) Air reconnaissance and observation, which is the gaining of information through visual and photographic means carried in aircraft, including special mapping photography required for engineer topographic troops.

(4) Air transportation, which is the tactical movement of troops and supplies by troop carrier and glider aviation.

b. The tactics and technique of performing the tactical functions of air attack, air fighting, and air reconnaissance and observation are set forth in FM 1–10, 1–15, and 1–20. FM 31–35 sets forth the tactics and technique in employment of military aviation in support of ground forces and includes the employment of troop carrier and glider aviation.

SECTION II

ORGANIZATION, COMMAND AND STAFF

■ 6. ASSIGNMENT OF MILITARY AVIATION.—Military aviation is initially assigned to air forces and to the zone of the interior.

a. Aviation assigned to air forces consists of combat and special purpose types with which striking forces, defense forces, and support forces are organized. No fixed organization or composition may be given for an air force, since these factors depend upon the specific missions to be accomplished by the air force. Until assigned as the air component of task forces or to other commanders, air forces are under the direct command and control of the Commanding General, Army Air Forces.

b. Certain types of aviation initially support units of the Army Ground Forces. This aviation generally consists of such light and dive bombardment, observation, and special purpose aviation as may be designated. The air support commander is charged with the responsibility for the maximum support of the plan of the supported ground commander. In order to accomplish this efficiently, he must have sufficient control to dispose his units in conformity with the requirements established by the ground commander. He and his group commanders lay general plans for the complete coverage at all areas affected to eliminate overlapping and unnecessary missions in lower echelons. Actual operations will be decentralized to permit ground unit commanders to make direct requests upon supporting observation units for missions and receive the resulting intelligence information direct.

c. Aviation assigned to the zone of the interior comprises training and experimental aviation and such other air force units as are required for effective mobilization, training, and transport within the zone of the interior, and for replacement and maintenance of aviation in the theaters of operation. In addition to this aviation, air forces may be assigned for air defense in the zone of the interior.

■ 7. AIR FORCE.—*a.* A tactical air force is a grouping of air, base, and service units formed to conduct the air missions required by a plan of operations. Air forces are trained, equipped, and organized by the Commanding General, Army Air Forces, and are then available to the Chief of Staff of the Army for assignment. These forces are assigned as the component air unit of a task force commander. On occasions, they may be placed under the direct control of an

air force commander and operate as an air task force apart from and beyond the sphere of action of ground forces.

b. A typical force consists of four elements:

(1) Fighter aviation.
(2) Bombardment aviation.
(3) Support aviation.
(4) Base services.

c. As previously indicated, the composition and size of each air force will be determined by the mission to be accomplished. On occasions all of the elements given above will not be necessary. For example, if an air force is operating independently of and beyond the sphere of action of the ground forces, there will be no necessity for a support element. Normally, however, an air force will consist of a fighter, bomber, air support, and air service command.

■ 8. ORGANIZATION OF AVIATION UNITS.—*a.* The tactical air units of the Army Air Forces from the smallest to the largest are designated flight, squadron, group, wing, command, and air force. The method of assignment and employment of the air forces necessitates a highly flexible organization within tactical units. All units above the group may vary both as to number and type of lower units contained.

b. The basic element of organization in military aviation is the individual airplane and its combat crew. All other organization in the Army Air Forces is for the purpose of efficient employment and maintenance of this basic element.

c. The *flight* is the basic tactical grouping or unit of the Army Air Forces and consists of two or more airplanes. The basic administrative and tactical unit is the *squadron* which consists of three or four flights, depending upon the type of aviation. The *group,* composed of three or more squadrons, is both tactical and administrative; it contains all the elements essential for its air operations. Bombardment groups, however, are essentially tactical units and perform a minimum of administrative functions. The *wing* is the next higher unit of the Army Air Forces and consists of one or more groups. The functions of a wing—like those of a bombardment group—are primarily tactical. Wings and groups usually contain only one type of aviation, although composite wings and groups may be formed where the situation demands. The *command,* which may include wings and groups or a number of groups alone, is both tactical and administrative. It is designated according to its primary function as a fighter, bomber, air support, troop carrier, transport, or air service command. The *air force* is the largest tactical unit of the Army Air Forces. It normally contains a fighter, bomber, air support, and air service command.

d. Ordinarily the group is the largest unit of the Army Air Forces that will operate in the air as a tactical entity under the command of one individual. Many air operations are conducted by smaller units. Reconnaissance and observation missions, and less frequently bombardment missions, may be carried out by single airplanes.

e. In addition to flying units, units are organized for the purpose of maintenance and supply and for facilitating air operations. These units comprise personnel of the Army Air Forces and Services of Supply who are trained for rendering service for the Army Air Forces. The maintenance and service units serving an air force are collectively designated the air service command.

f. An air base is a command which is equipped and organized for sustaining the operations of one or more tactical air units. The base comprises the personnel, supplies, equipment, and all other facilities necessary to support the operations of tactical air units currently using its facilities.

■ 9. COMMAND AND STAFF.—*a.* Commanders of Army Air Forces squadrons and higher units have staffs to assist them in the exercise of their commands. The staff, in assisting the commander of an air unit in carrying out his command functions—

(1) Constantly provides for the needs of the personnel of the command.
(2) Secures information for the commander.
(3) Works out the details of his plan.
(4) Translates his decisions and plans into orders.
(5) Causes such orders to be transmitted to the command.
(6) Observes the execution of such orders.
(7) Anticipates and initiates action, within the scope of its authority, to complete the carrying out of the commander's

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intentions. Under no conditions is the commander relieved of his responsibility by the assistance of his staff.

b. In general, all air staffs are organized into sections corresponding to the usual staff functions of personnel, intelligence, operations and training, and supply. In all air units there must be a sufficient variety and number of special staff officers to relieve the commander of the technical and administrative details with which a highly specialized unit burdens its commander.

■ 10. CONTROL OF AIR OPERATIONS.—The directions issued by a task force or similar high commander to an air force for the conduct of air operations include—

a. Assignment of general missions.

b. Designation of periods during which missions are to be accomplished.

c. Instructions concerning the support that is to be furnished by other units.

d. Essential instructions for the coordination of operations.

CHAPTER 2

AIR OPERATIONS

SECTION I

GENERAL

■ 11. BASIC STRATEGICAL TASKS.—The combat operations in which air force units are engaged are directed toward the accomplishment of the following basic strategical tasks, given in order of their priority:

a. Deny the establishment and destroy existing hostile bases from which an enemy can conduct operations on land, sea, or in the air.

b. Oppose the operations of hostile air forces by fighting in the air.

c. Operate against hostile land or sea forces, the location and strength of which are such as to threaten the vital interests of the United States and its Allies.

d. Wage offensive air warfare against the sources of strength, military and economic, of the enemies of the United States and its Allies in the furtherance of approved war policies.

e. Operate as a part of the composite task forces in the conduct of land operations.

f. Operate in support of our naval forces when the fleet is so situated that it can and does operate effectively against enemy forces afloat in the threatened area.

g. Operate in lieu of or supported by the Navy forces when the fleet is so situated that it cannot operate effectively against enemy forces afloat in the threatened area.

■ 12. BASIC DOCTRINE OF EMPLOYMENT.—*a.* Air operations almost invariably precede the contact of the surface forces.

The orderly mobilization and strategic concentration of the field forces and their ability to advance from their concentration areas in accordance with the strategical plan of operations depend in large measure on the success of these early air operations.

b. Air operations in joint Army and Navy operations are undertaken in furtherance of the strategical and tactical plan. They include the air operations for which the Army is responsible under special regulations governing joint action of the Army and the Navy. The success of such air operations can be assured only by adequate joint training and careful joint planning.

c. Complete control of the air can be gained and maintained only by total destruction of the enemy's aviation. Since this is seldom practicable, counter air force operations must be carried on progressively, and in most situations intensively, to gain local air superiority and provide security from hostile air operations.

d. The impracticability of gaining complete control of the air necessitates the constant maintenance of air defenses to limit the effectiveness of enemy air operations.

e. Strong air defenses of vital hostile installations must be given consideration in decision for an attack but will not constitute an absolute bar to making such attack. Determination, good leadership, and efficient execution often will accomplish the mission notwithstanding strong active air defense.

f. The operations of the constituent units of a large air force must be closely coordinated. Such coordination assumes special importance when the force is composed of more than one type of aviation and the situation requires the various component units to operate at different times and places in the accomplishment of a common mission.

■ 13. CHARACTERISTICS.—A knowledge of the powers and limitations of military aviation is a prerequisite to sound employment. Such powers and limitations are derived from the characteristics of its constituent types of aircraft. These characteristics are determined by advances in aeronautical science and aircraft development. Therefore, continuous

progress in the employment of military aviation may be expected.

■ 14. EMPLOYMENT.—*a.* The employment of military aviation is governed primarily by the requirements of the specific situation. When it is employed for the conduct of operations outside the sphere of action of the surface forces, the selection of objectives for air operations is governed by the strategical plan and may have only an indirect bearing upon the tactical operations of these forces.

b. The selection of objectives against which air operations are to be directed is of vital importance. When military aviation is employed for the immediate tactical support of surface forces, the requirements of the supported force will be of paramount importance in the selection of objectives for air operations.

c. Air operations must be pushed with energy and dispatch, using every opportunity to take full advantage of surprise. Since the replacement of flying personnel and equipment is both slow and expensive, economy of force is especially important. Combat aviation must be employed intensively against objectives of decisive importance and not dispersed or dissipated in other operations.

d. The frequency of engagement of combat aviation depends upon the urgency of the situation and the demands already made on the particular air unit. It is essential that aviation units be conserved in their employment in order that maximum possible air strength may be available during critical phases of operations.

e. Although the general mission of the field forces may be either offensive or defensive, the tactical operations of combat aviation are inherently offensive.

■ 15. AIR BASES.—Air bases, suitably located, are essential for the sustained operation of military aviation.

a. Much of the equipment pertaining to aircraft is of a complex and highly technical nature; its operation requires highly trained air crews; its maintenance and repair require mechanics with specialized skill. All aircraft need regular and frequent care and maintenance. They are vulnerable

to air attack both in flight and on the ground. The fatigue of air crews and the repair and reservicing of equipment and material require all aviation units to operate from air bases where the necessary facilities are provided for security, rest, replacement, maintenance, and repair.

b. The essential requirements for base facilities are landing areas, facilities for tactical control and planning, administration, maintenance, repair and supply, and provisions for the security of personnel and equipment on the ground. Technical personnel are essential for the operation, maintenance, supply, and repair of aviation equipment in the field. In addition, adequate communications for the control and direction of air operations and for liaison are required.

SECTION II

BEYOND THE SPHERE OF ACTION OF SURFACE FORCES

■ 16. GENERAL.—*a.* Air operations beyond the sphere of action of the surface forces are undertaken in furtherance of the strategical plans prepared by the War Department General Staff under the direction of the Chief of Staff of the Army. Important objectives may be found in the vital centers in the enemy's lines of communication and important establishments in the economic system of the hostile country. Objectives are selected in accordance with the ultimate purpose of the strategic plan. Counter air force operations necessary to neutralize or limit the offensive power of the enemy's air forces are of continuing importance.

b. Air attacks against objectives beyond the sphere of action of the surface forces normally require such preparatory and supporting air reconnaissance of wide areas as may be necessary for the accomplishment of the assigned task. These missions are performed by medium and heavy bombardment airplanes which assist in obtaining information upon which the operative decisions and plans of the commander are based.

■ 17. NATURE OF OPERATIONS.—*a.* Air operations beyond the sphere of action of surface forces include, in general, strategic reconnaissance for information and security, and air

operations for the application of air power. Strategic air operations for the application of air power embrace the sustained offensive operations by striking forces, called the air offensive, and the operations of air force reconnaissance necessary for the effective conduct of the air offensive. Strategic reconnaissance includes research, search attack, air patrol operations in coastal frontier defense, and reconnaissance operations to gather information for strategic planning.

b. Operations beyond the sphere of action of surface forces include the following:

(1) Strategic reconnaissance.
(2) Striking force reconnaissance.
(3) The air offensive.

■ 18. STRATEGIC RECONNAISSANCE.—*a.* Strategic reconnaissance operations constitute a service of information and security. Such air operations have as a primary purpose the gathering of information of hostile movements, concentrations, and activity of sufficient magnitude or importance to be of interest to the commander of the task force, the theater, or coastal frontier. Strategic reconnaissance is of special importance in coastal frontier defense and in the strategic movement phase of ground operation.

b. Control of strategic air reconnaissance operations should be retained by the commander of the task force or the commander of a theater or frontier. Decentralization in the control of such operations is seldom justified.

■ 19. STRIKING FORCE RECONNAISSANCE.—*a.* The primary purpose of striking force reconnaissance operations is to gather information of objectives. These operations are performed by medium and heavy bombardment aircraft which are also employed in the striking force offensive. Combat intelligence of objectives is required by the commander of the striking forces to serve as a basis for planning the air offensive. Combat intelligence of objectives is also required by subordinate air unit commanders for use in connection with the execution of the air operations for which they are responsible. Special striking force reconnaissance operations in-

clude such missions as the surveillance of moving targets, targets of opportunity, and weather reconnaissance.

b. Control of striking force reconnaissance operations is exercised initially by the air force commander in order that a systematic and coordinated evaluation of air intelligence may be made to determine the priority of objectives. The retention of striking force reconnaissance under centralized control makes for greater flexibility of employment and permits the rapid adjustments to meet changes in the situation. Control is not vested in a subordinate air force commander until the requirements of the subordinate unit clearly indicate the necessity for decentralization.

■ 20. AIR OFFENSIVE.—*a.* The selection of strategic objectives for the air offensive is a responsibility of the commander of the task force or air task force operating independently of surface forces. Ordinarily the task force commander will control these air operations by the assignment of a broad general mission, leaving the details of employment to the air force commander.

b. Generally, the objective of the air offensive is the maximum contribution of which the striking forces are capable toward the attainment of the defeat of the enemy nation. To this end, the air operations include those undertaken to—

(1) Decisively defeat important elements of the enemy armed forces, or contribute thereto.

(2) Deprive the enemy of the materials and ability to wage war.

c. On occasions, the object of the air offensive is the provision of security. To this end, air operations are conducted primarily against the hostile armed forces. Such operations include—

(1) Counter air force operations.

(2) Operations against enemy ground forces.

(3) Operations against enemy naval forces.

(4) Operations against enemy joint forces, generally in the form of oversea expeditions.

NOTE.—The employment of bombardment aviation against these objectives is covered in chapter 3.

d. The general mission of the air offensive may be translated into terms of a system of objectives whose destruction

would accomplish the desired aim. For example, in a specific situation the general mission of depriving the enemy of war matériel might be accomplished best by systematic cutting off (interdiction) of rail communication. In such a situation, bridges, tunnels, rail yards, and similar potential objectives collectively would constitute a system of objectives.

(1) The system of objectives against which the air offensive is to be directed is selected only as a result of a thorough estimate of the existing situation. Once selected, the system of objectives is adhered to in order to realize the cumulative effect derived by the destruction of individual components of the system.

(2) The diversion of forces for the attack of objectives of immediate importance but outside the selected system serves to dissipate the efforts of the aviation force and to decrease the effectiveness of the air offensive as a whole.

e. The rate of operations exerts an important influence on the results of an air offensive. The size and composition of the aviation force available and the adequacy and location of base facilities are factors of primary importance in sustaining air operations.

f. Maximum results from air operations are obtained only when the individual operations are coordinated as to purpose. Concurrent air operations by components of the whole force should be planned and executed in such relation to each other, both in time and in space, as to realize the full capabilities of the aviation forces available.

SECTION III

IN AIR DEFENSE

■ 21. GENERAL.—*a.* Air defense is the direct defense against hostile air operations as distinguished from the indirect defense afforded by counter air force operations. Air defense comprises all measures designed to prevent, to interfere with, or to reduce the effectiveness of hostile air action. Air defense measures are applied after the hostile aircraft take off from their own airdromes, carriers, or other bases.

b. The purpose of air defense is to limit the effectiveness of enemy air operations, as the complete denial of air opera-

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tions can be assured only by the total destruction of the enemy's aviation.

c. Air defense may be divided into active air defense and passive air defense.

(1) Active air defense comprises all measures aimed to destroy or to threaten destruction of hostile aircraft and their crews in the air. Active air defense takes place in the air space through which enemy aircraft move and is provided by aircraft, principally fighter; projectiles fired from the ground, principally by antiaircraft artillery; and obstacles, principally barrage balloons.

(2) Passive air defense takes place at the surface objective or area against which the enemy's air operations are directed and is provided by dispersion, camouflage, blackouts, and all measures other than those used in active air defense which are designed to minimize the harmful effects of hostile air attack, including organization for control and repair of damage to property; maintenance of domestic utilities and service; protection, evacuation, and hospitalization of personnel; control of lighting, place signs, radio, and other potential aids to hostile aircraft; and measures to educate the population in self-protection in order to maintain public order and morale in the face of air attacks. Passive defense, where applicable, is the most economical and continuously effective means of air defense. The maximum use of passive measures contributes to the efficacy of the defense as a whole by permitting effective disposition of the available active defense forces.

d. When the enemy sustains losses out of proportion to the results obtained, air operations against a defended objective will either be discontinued or undertaken under conditions less favorable to the active defense. The probability that enemy air operations will be entirely denied because of losses inflicted by active defenses is doubtful. The active defenses will rarely be strong enough at any one point to insure the complete security of that point.

e. In the absence of any active defense, the enemy suffers no losses and employs his forces in a manner that will insure the most effective results. Active defenses may reduce the effectiveness of enemy air operations by inflicting losses, by

adversely affecting morale, and by forcing the enemy to resort to any or all of the following:

(1) Carrying defense armament and gunners.
(2) Using defensive formations.
(3) Using excessively large forces.
(4) Operating at unfavorable altitudes.
(5) Employing protective forces.
(6) Consuming fuel rapidly to increase speed.
(7) Operating under unfavorable conditions of weather and visibility or by night.
(8) Changing course frequently, with consequent increase in fuel consumption and increase in difficulty of navigation; target location, and bomb aiming.
(9) Operating without benefit of radio and signal lights for coordination and control between aircraft.

■ 22. Disposition of Active Defense Forces.—*a.* The disposition of active defense forces must be such as will best meet the requirements of the immediate situation and will be determined largely by the enemy's capabilities and the nature and aim of the enemy air operations. Rigid adherence to any established scheme of employment might seriously decrease the effectiveness of the defense. Flexibility is essential.

b. The need of air defense for any installation is determined by the relative importance of that installation, its vulnerability, and the probability that air operations will be directed against it.

(1) The relative importance of the installations under consideration may be accurately determined by evaluating the immediate and ultimate effect if each separate installation or if certain combinations of installations are to be destroyed or neutralized by enemy air operations.

(2) The vulnerability to hostile air attack of the installations under consideration may be determined by estimating the ease or difficulty with which enemy air operations may be conducted against them. Where the importance of an installation warrants its defense, the strength required in active defense forces varies directly with the vulnerability to air attack of the installation under consideration.

(3) Every effort should be made to discover the enemy capabilities and determine the purpose and immediate aim of

his air operations. This determination will indicate the general categories of objectives against which the enemy is most likely to operate and forms one basis for disposition of the active defense forces.

c. The strength of active defense forces required for the protection of an objective is, within certain limits, dependent upon the area of the objective. The location of the potential objective is important in its relationship to a front, frontier, shore of a large body of water, edge of a desert, or any other barrier to the establishment of an aircraft warning service. Location is also important in determining the ability to establish defenses in depth and in estimating the rate at which enemy air operations may be conducted against them.

■ 23. ORGANIZATION OF AIR DEFENSES.—*a.* Air defenses are organized with relation to the area or specific objectives to be defended. The efficient conduct of the defense requires the placing of the responsibility for the coordinated employment of both active and passive defenses on a common authority so far as practicable. The active air defenses for any area may include fighter aviation, antiaircraft artillery, and aircraft warning service. Fighter aviation and its associated fixed and mobile aircraft warning service form an inseparable team. Without effective aircraft warning service and ground-to-air communication, the capabilities of fighters are restricted beyond reason. All active air defense forces in a given area are under one direction. In addition to the defense provided by the various air defense troops, all troop units must provide appropriate security measures for their own protection against hostile air action, including the employment of fire power available to them. Depending upon the nature of the defense and the end it is designed to achieve, an air defense is classified as local or general.

b. A local air defense is the integrated defense provided to minimize the effect of hostile air operations on a specific point or installation in a restricted locality. The elements of a local air defense normally consist of both active and passive means.

c. A general air defense is the defense provided by the coordinated use of all air defense measures throughout a

large area to minimize the effect of hostile air operations throughout the entire area. The active and passive elements of a general air defense are coordinated by a common authority, and active elements are disposed and rearranged to present the maximum threat to hostile aircraft penetrating any part of the defended area.

■ 24. IN LOCAL DEFENSE.—*a.* The establishment of a local air defense provides a higher order of security for any particular installation than does a general air defense. The purpose of such a local air defense is the provision of immediate protection for the defended objective, and the operations of the active defense forces are based on that mission.

b. A local active air defense may be provided by antiaircraft artillery, by fighter aviation, or by both. The presence of both requires planned coordination between the fighter aviation and the antiaircraft in the comparatively small air space within the range of the antiaircraft artillery. The local fighter commander is charged with the active air defense of his command. To secure effective coordination and efficient exploitation of the special capabilities of each type of air defense weapon, the theater commander may either assign or attach antiaircraft artillery to the local fighter command or charge the fighter commander with the operational control of antiaircraft artillery to include—

(1) Strategical disposition of antiaircraft artillery regiments, separate battalions, and barrage balloon units based on the decision of the theater commander as to priority of areas to be defended.

(2) Tactical disposition and control of separate interceptor searchlight battalions.

(3) Restriction or release of the fire or operation of any antiaircraft weapon, searchlight, balloon, or accessory equipment. This includes authority for the fighter commander through the air defense wing commander or his designated representative, the controller, to direct "special fires" or "special illuminations" as may be demanded by the situation.

c. In local air defense, the aviation forces are disposed and operated in a manner which will give an all-around defense and which will permit the enemy to be attacked with equal facility regardless of the direction of his approach. The dis-

position and operation will be such as to permit the interception of enemy aircraft several minutes before these aircraft reach the defended objective. Although the losses sustained by the enemy after the mission has been accomplished may afford a measure of security from future enemy air operations, immediate protection of the defended objective can be afforded only by the action taken prior to the completion of the enemy air attack.

■ 25. IN GENERAL DEFENSE.—*a.* When the number and location of objectives requiring air defense exceed the capacity of the active defense forces to provide effective local protection for each, aviation may be employed in general rather than in local air defense. Rather than afford local protection for a few probable objectives and no protection for many others, frequently it is better to employ aviation in general air defense. The purpose of a general air defense is to limit the effectiveness of the enemy air offensive throughout a wide area, thereby affording a measure of security to all objectives which lie within the defended area.

b. General air defense is the only practicable means of providing air defense for large areas, extensive land communication systems, and a large number of objectives. General air defense normally is the only method by which any air defense forces can limit effectively an enemy air offensive directed against war resources within a large and highly industrialized area. It generally is the most effective means of air defense for the zone of the interior. In the zone of the interior, the employment of aviation for local air defense ordinarily will be limited to the protection of particularly vulnerable objectives which are of outstanding relative importance.

c. The provision of a general air defense involves the establishment of a line or lines of resistance about the defended area so that enemy aircraft may not enter any part of the area without opposition. This is accomplished by disposing the aviation forces in such a manner, with relation to the defended area and to each other, as to make them mutually complementary. The line of possible interception of each aviation unit overlaps those of adjacent units to establish a common line of resistance. The spacing of the interceptor airdromes is about maximum for a continuous "line of possible interception." The intensity of enemy air attacks and number of defending air units available, considered in relation to the size of the area to be defended, will determine the proper spacing of airdromes for any given situation.

d. The employment of aviation in general air defense exploits the tactical mobility of aviation.

■ 26. PATROL OPERATIONS.—*a.* The conduct of air operations in local and general air defense is predicated upon the availability of an aircraft warning service and adequate communication facilities. In the absence of such a service, aviation employed in air defense must conduct patrol operations to secure information of and gain contact with enemy aircraft. Such operations may be required along a front or a frontier. In order to intercept and attack enemy aircraft before they reach the defended objectives, it may be necessary for the patrols to operate over the enemy zone. In some situations, and particularly along the line of contact between opposing ground forces, such patrols may also be employed to afford a measure of general protection for friendly aircraft in flight. The primary purpose of such patrols is, however, the protection of surface objectives rather than the protection of friendly aircraft in flight.

b. Patrol operations to intercept hostile aircraft require the use of forces so large as to be excessive in most situations. Consequently, antiaircraft artillery should be assigned for the close-in defense of objectives whose protection by aviation would require the conduct of air-patrol operations.

■ 27. TACTICS AND TECHNIQUE.—Tactics and technique of air operations in air defense are covered in FM 1–15.

CHAPTER 3

BOMBARDMENT AVIATION

SECTION I

GENERAL

■ 28. CHARACTERISTICS.—*a.* Bombardment aviation is characterized by its ability to carry large loads of destructive agents to attack surface objectives. It includes heavy, medium, light, and dive bombardment. The operating range and bomb load of bombardment aircraft are reciprocal factors (that is, one increases when the other is decreased) and, within the limits of the total useful load, are dependent upon the distribution of that load between fuel and ammunition. The fire power of bombardment aviation is characterized by its potential concentration and cumulative effect. This effect depends upon the nature and extent of the objective, upon the enemy's measures of air defense, and upon the amount of combat aviation used against the objective. The constant threat of air attack exerts a strong influence on surface movements and operations.

b. Heavy and medium bombardment aviation constitute the offensive power of the striking forces. Its equipment is designed to carry heavy bomb loads to great distances and to conduct long range strategic reconnaissance over land and sea. Its principal weapon is the demolition bomb. It relies upon speed, defensive fire power, armor, high altitude flying, darkness, and the cover of clouds or other atmospheric conditions for security. Accompanying fighter aviation, especially in

the case of medium bombardment, is also used to increase security. It is particularly suitable for the destruction of heavy material objectives. Its radius of action is such that it can strike objectives at a great distance from its base. Its bases must be so located as to take advantage of its radius of action, either to reach the most distant enemy installations or, when practicable, to provide security against hostile air action.

c. Light and dive bombardment aviation constitute the striking element of that combat aviation which is organized, trained, and equipped to operate in support of ground, naval, or composite forces. Its principal offensive weapons are the bomb, torpedo, and cannon. Chemical spray and machine guns are secondary armament. Within its radius of action it is capable of applying these destructive agents with surprise effect to destroy material objectives, to cut off routes of communication and supply, to render airdromes temporarily useless, and to attack troop concentrations in the open or under light shelter.

■ 29. EMPLOYMENT.—*a.* The strategic air operations conducted by bombardment aviation are undertaken to nullify the enemy's war effort or to defeat important elements of the hostile military forces. The tactical employment of bombardment aviation depends to a large extent upon the situation and upon the nature of the surface objectives whose attack or destruction will contribute materially to the accomplishment of the general plan. Bombardment operations are divided into the following broad categories:

(1) Counter air force operations.

(2) Operations against war matériel and production facilities.

(3) Operations against ground forces.

(4) Operations against naval forces.

(5) Operations against joint forces.

b. The foregoing categories are not entirely mutually exclusive. For example, the destruction of an aircraft factory would deprive the enemy of an important element of its war matériel and might exert an important ultimate influence on the operations of the enemy air forces.

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■ 30. IMPORTANCE OF OBJECTIVES.—Knowledge of the specific situation is essential to determine the relative importance of bombardment objectives. Each objective must be considered in the light of the information available or required for its attack, and in the light of the probable immediate and ultimate results which will be obtained through air attack. Only by such a careful and detailed analysis can correct tactical employment be assured.

SECTION II

COUNTER AIR FORCE OPERATIONS

■ 31. PURPOSE.—Counter air force operations may be undertaken as a prerequisite to or coincident with the conduct of other more decisive military operations, or they may be undertaken as a major task.

■ 32. OBJECTIVES.—Bombardment aviation is capable of affecting the operations of enemy aviation forces by the attack of surface objectives whose denial or destruction would adversely affect enemy air operations. Bombardment aviation may prevent or limit enemy air operations by the destruction of aircraft on the surface, by the destruction of personnel on the surface, or by the denial of surface installations and supplies essential to the operation of the enemy aviation forces. Bombardment objectives in counter air force operations include—

a. Air bases, including aircraft carrier and tenders.

(1) Aircraft.

(2) Munitions, fuel, and other essential supplies.

(3) Personnel.

(4) Landing areas.

(5) Installations and facilities, such as those for shelter, administration, storage, communication, and repair.

(6) Rail, water, and motor communication essential for the supply of aviation forces.

b. Supply and repair depots.

■ 33. AIR BASES.—Air bases do not conform to any standard pattern. They may be temporary and contain only the simplest and most essential facilities, or they may be permanent

and contain the elaborate installations and facilities required for the conduct of sustained air operations; they may be on land, on water, or on both; and may be strongly defended, or practically undefended. In the case of carrier or tender-based aviation forces, the carriers and tenders constitute the most profitable objectives in counter air force operations.

a. Aircraft.—Unprotected aircraft on the surface are extremely vulnerable to air attack. Whenever possible, operations should be planned and conducted in such a manner as to permit the attack of enemy aircraft during periods of extreme vulnerability.

b. Munitions, fuel, and other essential supplies.—Widely dispersed supplies usually present many small targets, individually unimportant, which are difficult to destroy. Large concentrations of such supplies constitute profitable targets.

c. Personnel.—The attack of enemy aviation personnel generally is incidental to the attack of aircraft, supplies, installations, and facilities at airdromes. In some situations, low-altitude operations against aviation personnel on or near airdromes may be effective.

d. Landing areas.—Landing areas ordinarily are not profitable objectives for air attack. Large bombs may destroy portions of runways or may make large craters in the landing and take-off areas. Generally, however, the amount of force required and the large areas which must be covered make the use of bombs against landing areas an inefficient means of limiting or denying air operations. The use of chemicals adds to the effectiveness of this type of operations.

e. Airdrome installations and facilities.—Warehouses, shops, or other airdrome installations and facilities are vulnerable to air attack and may constitute profitable targets for bombardment aviation.

f. Communication for supply of air bases.—The rail, water, and highway communication essential to the establishment and maintenance of air bases may afford profitable targets for bombardment aviation employed in counter air force operations. This is particularly true in the case of water communication because ships and shipping are extremely vulnerable to air attack. Rail communication is generally vulnerable to air attack through the destruction of bridges,

tunnels, and other critical points along the line, as well as through the attack of locomotives and rolling stock. Highway communication is generally not so vulnerable to air attack, as there are fewer tunnels and bridges required to support much lighter loads than railroad bridges and are, therefore, more easily repaired.

■ 34. SUPPLY AND REPAIR DEPOTS.—The installations and facilities required for aviation repair and supply depots are such that it is almost impossible to protect them from air attack. Aircraft and engine repair and overhaul require a considerable concentration of supplies and shop facilities. The destruction of supply and repair depots may not exert an immediate effect on the operations of the enemy air forces, but will ultimately produce important results through the loss of such facilities.

SECTION III

OPERATIONS AGAINST GROUND FORCES

■ 35. PURPOSE.—The purpose of bombardment operations against ground forces is the denial of means essential to the conduct of operations by the enemy ground forces. Operations against ground forces by air support bombardment aviation are described in chapter 5. Heavy and medium bombardments are used to isolate the battlefield. In the pursuance of this objective, the following objectives may be attacked:

a. Logistical establishments.

b. Communication essential for the movement of personnel and matériel.

c. Equipment and supplies.

■ 36. LOGISTICAL ESTABLISHMENTS.—Logistical establishments, such as depots, arsenals, warehouses, and parks are important objectives for bombardment operations against ground forces. The destruction of important logistical establishments in the rear areas will seldom exert an immediate influence on the tactical situation in the forward areas, but will serve to decrease the material means available to the enemy

ground forces. Large logistical establishments are of such importance and are so vulnerable to air attack that considerable effort may be spent in locating and attacking such objectives.

■ 37. COMMUNICATION.—The restriction of land communication by air attack will serve to prevent or delay the arrival of reinforcements and the delivery of supplies required for operations of the ground forces. The prevention of communication in rear areas normally will not immediately affect the operations of the front line units, but continued air operations against that communication may exert an important influence on the ability of the combat troops to maintain their position. The obstruction of railroad and highway communication will seldom affect the immediate tactical situation of small ground units, but when such communication is vulnerable and capacity limited, its stoppage will quickly and seriously decrease the combat effectiveness of large ground forces.

■ 38. EQUIPMENT AND SUPPLIES.—Bombardment attacks against concentrated supplies are particularly effective. The vulnerability of munitions and other supplies and of military equipment is generally in direct proportion to the degree to which such equipment and supplies have been concentrated. In the forward areas, munitions and supplies usually are in limited quantities and so dispersed that they do not present profitable bombardment targets.

■ 39. OBJECTIVES NORMALLY UNSUITABLE FOR HEAVY AND MEDIUM BOMBARDMENT.—*a. Fortifications.* — Fortified positions, consisting of small, heavily fortified, dispersed positions are not suitable for attack by level bombing for the following reasons:

(1) Velocity required for penetration of the structure by a bomb requires a high release altitude.

(2) At high altitudes the chance of hitting an object less than 200 feet square is quite small. However, in the exceptional case of a large permanent fortification, valuable support can be rendered.

b. Trucks, trailers, armored vehicles, artillery, and troops.— These targets are only suitable when concentrated. Conse-

quently, such targets invariably are ones of opportunity, and their successful attack is dependent upon the rapid launching of the attack after the existence and location of the target has been discovered. The difficulties inherent in this type of operation are such that best results from heavy and medium bombardment are obtained by the attack of other more suitable objectives.

SECTION IV

OPERATIONS AGAINST NAVAL FORCES

■ 40. PURPOSE.—Bombardment operations against naval forces are conducted in lieu of or in support of friendly naval forces. Such operations include bombardment attacks against—

a. Armed naval vessels.
b. Naval supply ships and transports.
c. Naval bases.

■ 41. ARMED NAVAL VESSELS.—Bombardment operations against naval forces require the attack of armed vessels. The most effective immediate results are derived from the attack and destruction of the enemy carriers. Once the hostile fighter force has been thus neutralized, the principal units of the enemy force may be attacked, disabled, and/or destroyed at will from minimum, medium, and high altitudes.

■ 42. NAVAL SUPPLY SHIPS AND TRANSPORTS.—Supply ships and transports of the enemy fleet train are vulnerable to air attack. Such vessels are profitable targets for bombardment aviation in the attack of naval forces when their destruction will seriously affect the conduct of the hostile naval operations. Supply ships and transports, which are essential to the success of enemy naval operations, will be afforded all possible air defense.

■ 43. NAVAL BASES.—The destruction of essential elements of naval bases may affect the strategic employment of naval forces and thereby restrict enemy naval operations, but such destruction normally will not affect the immediate tactical operations of the enemy naval forces. Naval bases normally

cover a considerable area and consist of a large number of important components such as wharves, drydocks, machine shops, fuel storage and loading installations, power plants, and warehouses for the storage of munitions and naval stores. Bombardment operations are directed toward the destruction of vital installations of a naval base rather than against the base as a whole. One bomb may render a drydock or other essential component of a naval base useless for a considerable period of time.

SECTION V

OPERATIONS AGAINST JOINT FORCES

■ 44. PURPOSE.—Bombardment aviation can be effectively employed against enemy joint forces during hostile oversea movements. A joint expedition consists essentially of the escorted vessels utilized for the movement of personnel, equipment, and supplies of ground or air forces; and the accompanying armed naval vessels protecting the convoy during its movement.

■ 45. OBJECTIVES FOR ATTACK.—Bombardment aviation normally operates first against accompanying aircraft carriers and second against the escorted vessels. Other accompanying armed naval vessels are attacked only when more profitable targets are not available. Aircraft carriers, troop transports, and cargo vessels of a joint oversea movement constitute such important objectives for air attack that operations must be directed against them.

SECTION VI

OPERATIONS AGAINST WAR MATÉRIEL

■ 46. OBJECTIVES.—War matériel may include installations and facilities necessary for the production or procurement of raw materials, for processing or manufacture, for transportation, and for storage. Bombardment objectives may include rail, water, and motor communication; power plants, transmission lines, and other utilities; factories and processing plants, steel mills, oil refineries, oil storage facilities, and other similar establishments.

■ 47. NATURE OF OPERATIONS.—Bombardment operations against war matériel usually are conducted beyond the sphere of action of ground forces. Such operations must be based upon a detailed study of the industrial capacity and organization of the enemy territory. The bombardment operations must be planned and conducted according to a definite pattern for the accomplishment of a definite purpose. Systematic and sustained operations are conducted against the objectives selected as being the most profitable for air attack. The air attacks in such operations must be closely coordinated in order to secure the greatest cumulative effect from the air offensive as a whole. The haphazard destruction of nonrelated factories or other installations which comprise war matériel will rarely, if ever, produce the most effective results. Air operations for the denial of essential war matériel produce important results against an enemy whose territory is highly industrialized, whose industries are concentrated, and whose population is dense.

CHAPTER 4

FIGHTER AVIATION

SECTION I

GENERAL

■ 48. CHARACTERISTICS.—*a.* Fighter aviation is characterized by its ability to seek out and destroy, by offensive air fighting, enemy aircraft while they are airborne. It is also characterized by high speed, high rate of climb, relatively short range, and endurance. Fighter aviation comprises all aircraft designed for offensive air fighting, and the organizations equipped with such aircraft.

b. Fighter aviation is designed primarily for offensive air fighting and is employed in the air defense of important areas, installations, and forces and for the protection of other aircraft in flight. Fighter aviation is generally divided into the following three classes, depending upon their mission and the equipment used:

(1) Medium altitude fighter.
(2) High altitude fighter.
(3) Night fighter.

c. The fighter, medium altitude, is designed to fight by day primarily. It is normally employed in a general air defense of an area from ground alert status but it may also be employed in local defense, in air support, or in ground support, and it may be used from either ground alert or air alert. Rarely, because it is not economical, fighters may be used for search and patrol missions. This type is a relatively small and powerful single-seater airplane having great speed and maneuverability below 30,000 feet altitude.

d. The fighter, high altitude, is essentially a form of fighter designed and built to operate by day at a high altitude where special high-altitude equipment such as pressurizing is required. To attain a high combat ceiling and good performance at high altitude, it is necessary to design the airplane for high-altitude operation and to provide greater supercharging capacity with attendant intercooling, pressure cabin equipment, and increased fuel supply. Also, there must be special provision for preventing frost and ice on cabin and instruments, for gun warming, and for operation of controls under conditions of extremely low temperatures.

e. The night fighter is a multiplace fighter especially designed and equipped to intercept and destroy hostile aircraft at night. It must have more range and endurance than the conventional fighter and be capable of returning to its base in practically any kind of weather conditions. It carries all radio aids for interception, navigation, and blind landings, and possesses very strong fire power.

f. Both the medium-altitude fighter and the high-altitude fighter can be used as accompanying fighters, within limits, by extending their range through the expediency of auxiliary tanks generally externally mounted.

g. Fighter aviation is well suited for the attack of balloons and airplanes. Within the limits imposed by the endurance and armament of fighter aircraft, fighter aviation is suitable for the air attack of light and vulnerable targets of opportunity, such as motor transport and mechanized forces, and may be so employed when not required in its normal role. The use of fighter aviation for ground attack missions is only justified when—

(1) No other means will suffice.

(2) Fighter aviation is not needed to gain or maintain air supremacy.

(3) Fighter aviation does not need to be conserved for future employment in its normal role.

■ 49. EMPLOYMENT.—The requirements for air defense and for protection of aircraft in flight usually will necessitate the employment of all available fighter aviation, and its use for the express purpose of attacking surface objectives when enemy aviation is active should be kept to a minimum.

SECTION II

AIR DEFENSE

■ 50. EMPLOYMENT.—*a.* The employment of fighter aviation in both general and local air defense is based upon the time and space factors involved in the interception of enemy aircraft while still a considerable distance from the defended area or objective.

b. Within certain limits, the combat effectiveness of a fighter force increases as a function of the distance outward from the defended area or objective at which interception takes place. Best results are obtained when the distance outward at which the interception takes place is equal to the distance the enemy aircraft will travel during the time the fighter force joins combat and delivers its total ammunition load with maximum fire effect. Less effective results are obtained when interception takes place so close to the defended area or objective as to limit the fire effect of the fighter force.

■ 51. IMPORTANCE OF AIRCRAFT WARNING SERVICE.—*a.* Fighter aviation is most effectively employed when directed from the ground by a controller having full and up-to-the-minute intelligence of both enemy and friendly aircraft positions in the air, and direct voice communication to the fighter unit being controlled. Intelligence of enemy aircraft is gathered by the aircraft warning system and presented on display boards in an information center. Intelligence of friendly fighters is obtained through dead reckoning calculations, pilot reports (air to ground), radio direction-finding station reports and the aircraft warning service. The maximum defensive value of a fighter force employed in air defense is realized only when a wholly adequate aircraft warning service is available to that force.

b. The several methods of employing fighter aviation in air defense are predicated upon and designed to meet the various conditions imposed by the presence or absence of an aircraft warning service. These methods are designated as—

(1) Ground alert method.

(2) Air alert method.

(3) Search patrol method.

■ 52. GROUND ALERT METHOD.—*a.* The ground alert method of fighter employment involves the maintenance of the defending fighter force in an alert status on the ground. The fighter force takes off only after receiving information of the approach of enemy aircraft.

b. The ground alert method may be employed effectively only when the presence of enemy aircraft can be reported in sufficient time to permit the fighter force to take-off, climb to the desired altitude, and intercept the enemy several minutes before the enemy aircraft can reach the defended area or objective. This requirement is met only when the aircraft warning services extend outward sufficiently to provide timely information.

c. In the absence of an aircraft warning service, or when such a service is available but cannot be extended outward the required distance, the ground alert method of employment is ineffective. Under such conditions one of the other and less efficient methods is employed.

■ 53. AIR ALERT METHOD.—*a.* The air alert method involves the maintenance of a fighter force in the air in the vicinity of an initial point. This point will be so located as to make interception possible in the desired area.

b. The air alert method is effective when the presence of enemy aircraft can be reported by an aircraft warning service, and when this service extends outward a sufficient distance to permit the defending fighter force to intercept at an appropriate distance from the defended area or objective. The air alert method is employed only when the ground alert method cannot be used.

■ 54. SEARCH PATROL METHOD.—*a.* The search patrol method of fighter employment involves the systematic search for and subsequent attack of enemy aircraft by fighter forces. Fighter patrols, dispersed to discover and locate enemy aircraft, are employed to perform the functions of an aircraft warning service.

b. The provision of a fighter screen to locate enemy aircraft requires the employment of such large numbers of fighter aircraft as to be prohibitive in the general case. The search patrol method is not employed when an adequate

aircraft warning service can be provided. This method is employed only when fighter protection must be provided and an aircraft warning service cannot be established.

■ 55. COMPARISON OF METHODS.—*a.* The ground alert method, being the most efficient, may be considered as a standard by which the three methods of fighter employment in air defense may be compared. The great advantage of the ground alert method lies in the fact that the entire fighter force is constantly available for the attack of enemy aircraft, and the total force required to obtain desired air combat strength is much smaller than that required by other methods.

b. The air alert method requires the continual maintenance of a force on the alert in the air. Personnel fatigue, endurances of the aircraft, and other factors prohibit the continual maintenance of the entire force in the air. Not more than one-third of a force can be maintained on the alert in the air. For this reason the total force required by the air alert method is at least three times as great as that required by the ground alert method.

c. The search patrol method involves all of the disadvantages of the air alert method and, in addition, involves the necessity for conducting systematic and continuous air observation. The aircraft of the observing screen are so dispersed as to make it impracticable to assemble an appropriate combat force in the event an enemy formation is discovered. Therefore, additional fighter forces are required to engage the enemy. The total force required for the search patrol method of fighter employment usually is prohibitive.

SECTION III

PROTECTION OF AIRCRAFT IN FLIGHT

■ 56. ACCOMPANYING SUPPORT.—*a.* A fighter force may be employed to furnish close or immediate protection for a particular formation engaged in an important air operation. The only method by which fighter forces are able to provide close protection for aircraft in flight is by accompanying those aircraft and engaging any and all enemy aircraft which threaten the security of the friendly formation. This method of providing close protection is known as accompanying support.

b. The need for accompanying support is determined by the effectiveness of the enemy fighter forces. Accompanying support is required by friendly aircraft when the defensive fire power of the latter is inadequate. All aircraft in flight possess a measure of inherent security, and most aircraft possess considerable defensive fire power.

c. Fighter aircraft have less radius of action than the majority of those comprising the striking forces. The lesser radius of action of the fighter aircraft limits the distance to which the fighter force can accompany friendly aircraft. This limitation may be reduced by basing the accompanying force as far outward as possible, thereby extending the distance to which it may accompany the friendly aircraft, and by the provision of external, auxiliary fuel tanks, which may be dropped.

d. The accompanying support method of fighter employment is adapted to the protection of a particular airplane or formation and is not used to afford general protection for friendly air operations throughout the area.

e. In many situations the provision of accompanying fighter support may not be feasible.

■ 57. OFFENSIVE PATROLS.—*a.* The offensive patrol method of fighter employment is designed to provide general support for friendly air operations throughout an area which is within range of hostile fighter aircraft. This method involves the maintenance of fighter patrols throughout the area to locate and attack hostile aircraft.

b. The employment of fighter forces on offensive patrol requires the use of large fighter forces and is relatively inefficient. This method involves the maintenance of fighter patrols throughout the area to confuse the enemy air defenses, divert hostile fighters, and to locate and attack hostile aircraft.

CHAPTER 5

AIR OPERATIONS IN SUPPORT OF GROUND FORCES

SECTION I

GENERAL

■ 58. GENERAL.—*a.* The employment of aviation in support of the operations of ground troops is essential in battle between modern armies. Such air support is necessary in any theater of operations from the time the opposing ground forces enter the theater until one or the other is vanquished.

b. Aviation placed in support of large units operates to further the mission of the supported command. The superior commander, under whom such support aviation is operating, is responsible for the assignment of air missions and for its employment within or beyond the sphere of action of ground forces.

c. The hostile rear area is the most profitable zone of action of support aviation since operations in this area permit the full utilization of striking power against concentrated targets with the minimum losses and the maximum results. Support aviation is not generally employed against objectives which can be effectively engaged by available ground weapons within the time required. Aviation is poorly suited for direct attacks against small detachments or troops which are well entrenched or disposed.

d. Aircraft can operate at any point within a wide area without the necessity for moving their bases, and air action can be applied with extreme rapidity at decisive points. Hence, support aviation constitutes a powerful weapon in the hands of higher commanders for influencing the course of ground combat before, during, and after the battle phase.

In critical situations, support aviation may be the only means which possesses the requisite capabilities of speed and fire power. The increased application of motorization and mechanization extends the possibilities and needs for air attack. The difficulty of gaining fire superiority over a well-organized defense indicates an increasing need for air attack in support of ground troops, especially in critical situations when the available means of support on the ground are not adequate or cannot be applied in time for a favorable decision.

e. In general, support aviation is a theater-of-operations weapon and its maximum effectiveness is secured through centralized control. When decentralization becomes necessary in situations requiring immediate tactical support of specified units, the superior commander may attach to or place in support of specified large units a part or all of his support aviation. Support aviation may thus act with greater promptness and better understanding in meeting the requirements of the supported unit. When combat aviation is employed for the immediate tactical support of surface forces, the requirements of the supported force will be of paramount importance in the selection of objectives for air operations.

■ 59. ORGANIZATION.—*a.* Aviation in support of ground forces is normally constituted into air support commands which are ordinarily component parts of air forces. There is usually an air force, including a bomber command, fighter command, air support command, and an air force service command, assigned to each theater of operations. An air support command is habitually attached to, or supports, an army in the theater.

b. Observation, light, and dive bombardment types of aviation are organic to an air support command; other types are assigned or detached as the situation requires.

c. Control of aviation units designated in support of a major ground force is centralized in an air support commander. In addition to his duties as commander of this support aviation, the air support commander acts as adviser to the army, theater, or task force commander, under whom he normally functions.

d. The command post of the air support command is adjacent to the command post of the supported unit. A representative of the ground commander of the supported unit is always present at the support command post. An air support liaison officer is always at the command post of the supported unit.

■ 60. TYPES OF SUPPORT AVIATION.—*a.* Types of support aviation may include—

(1) Combat.
(2) Observation and photographic.
(3) Troop carrier, including glider.

b. As previously indicated, observation aviation, and light and dive bombardment are organic to an air support command. Other types are assigned or attached as the situation requires. In most situations, photographic and mapping aviation will also constitute an organic part of the command. Heavy and medium bombardment, and fighter and troop carrier aviation are normally placed in support of ground forces only for specific and decisive operations, the attachment terminating immediately on completion of the operations. The tactical mobility, flexibility, and striking power of combat aviation will seldom justify attachment over extended periods of time to ground forces not actively engaged in combat operations.

■ 61. FIELD ORDERS.—*a.* In addition to normal data concerning reconnaissance and intelligence missions, the field orders of the supported commander should contain at least the following instructions to air support aviation:

(1) Mission of support aviation.
(2) Method of air support.
(3) Designation of units to receive direct support.
(4) Area in which support aviation is to operate or be prepared to operate.

b. The air commander must be so trained in the tactical employment of elements of his command that, given a specific objective, he can evolve a plan of action to fit the situation at hand. However, the situation may change prior to arrival at the objective, in which case the secondary plan of action will be put into effect.

c. The air support commander will issue complete orders when time permits, but normally the instructions will be in fragmentary form or according to a prearranged form. The following items are necessary for lower air units to enable them to prepare for operations:

(1) Assignment of units to support the ground force, including priority, limiting times of attack, bomb loading, routes, and aviation assistance.

(2) Instructions to units detailed for support of particular subordinate units.

(3) Necessary instructions as to bomb loadings.

(4) Instructions concerning bomb safety lines with effective time limits.

(5) Assignment of missions to observation units.

(6) Allocation of air support control and air support parties.

(7) Special signal communication instructions.

SECTION II

COMBAT AVIATION

■ 62. GENERAL.—The basis of effective air support of ground forces is teamwork. The air and ground units in such operations, in fact, form a combat team. Each member of the team must have the technical skill and training to enable it to perform its part in the operation and a willingness to cooperate thoroughly.

■ 63. EMPLOYMENT.—*a.* The most effective employment of support combat aviation requires—

(1) Local air superiority.

(2) Economy of force by application to the right target at the right time.

(3) Consideration of time and space factors which involve an appraisal of the mission, the distance from the airdrome to the point of action, the speed and reliability of signal communication, and the status of readiness of aircraft assigned to the effort.

(4) The ability to concentrate the air effort at short notice on a particular point or to distribute it to many points within a relatively short time.

(5) Knowledge of limitations of aircraft by such factors as weather, enemy action, or mechanical capabilities.

(6) A field of operation sufficiently broad to permit timely attacks on enemy forces that jeopardize the success of operations of supported forces.

(7) Adequate number of aircraft employed and operations conducted at such a rate as to achieve maximum demoralization and destruction of the enemy.

(8) Close cooperation and coordination with other air force elements in the same area.

b. The ground force commander, in collaboration with the air support commander, decides the air support required. The following are general methods for employment of combat aviation:

(1) All combat aviation initially assigned to support of the major ground force, with provisions for certain subordinate unit support assignment later.

(2) A part assigned to support of the major ground force with the remainder assigned to support of subordinate elements.

(3) Assignment of all combat aviation to support of the major ground force, with provisions for a change to specific subordinate unit support while the aircraft are in flight.

(4) All combat aviation assigned initially to support of subordinate units, with provisions for control or target designation by certain units directly from an air support control, or an air support officer to aircraft in flight.

■ 64. OPERATIONS.—*a.* All operations should be conducted in accordance with well-defined and practical plans; therefore, combined operations of air and ground forces must be closely coordinated by the commander of the supported ground force.

b. Combat support aviation may be employed on the following types of missions:

(1) Search attack.

(2) Attacks on defensive organizations.

(3) Attacks on enemy reserves and reinforcements.

(4) Attacks on hostile mechanized forces.

(5) Attacks on hostile aircraft.

(6) Support of parachute and other airborne troops.

c. Rules cannot be laid down for the selection of the type of aviation to be employed against certain types of targets. Unless the situation is critical, targets will not be selected within the effective range of the weapons of ground forces. Small targets, due to dispersion, camouflage, or concealment, are not suitable targets for support aviation. Air support targets on the immediate front or flanks of supported units are generally transitory targets of opportunity. Targets not on the immediate front or flanks may include command post, lines of communication, ammunition and bomb dumps, troop concentrations, etc. The most important target at a particular time usually will be that target which constitutes the most serious threat to the operations of the supported ground force. Secondary targets should be assigned in each attack mission in case the primary target cannot be attacked. Target locations may be developed by ground reconnaissance, observation aviation, or aerial photography. Targets must be accurately indicated to the attacking aircraft; therefore, all ground units must be trained so as to assist air units in every way possible in reaching their targets.

■ 65. PROCEDURE.—*a.* Combat support aviation normally operates on mission type orders. Special requests for air support may originate with any unit commander and follow normal command channels until they reach a command post where there is an air support party.

(1) At the air support party the air support officer will advise the commander of the ground unit, with which he is operating, as to the practicability of the execution of a mission and as to the advisability of requesting it. If the ground commander approves the request, it will be forwarded without delay to the air support control.

(2) At air support control the air support officer, in collaboration with the commander of the supported unit, evaluates the request considering the following factors:

(*a*) Identification of target and location.

(*b*) Time limits of attack.

(*c*) Importance of target in furtherance of ground plan.

(*d*) Number of airplanes required to destroy or neutralize the target.

(*e*) Number of airplanes available at airdrome and their status of readiness.

(*f*) Weather conditions along route and at target.

(*g*) Type of bombs and ammunition required.

b. The decision as to whether or not an air support mission will be ordered rests with the commander of the supported unit. Such decision must comprehend full consideration of the air support commander's advisement as to air means available and the ability of aviation to perform successfully the mission ordered.

(1) When the decision has been reached as to whether or not the mission will be ordered, the air support control will in all cases advise the requesting unit through the air support party as to the action taken, stating reasons if mission is not ordered.

(2) If the request is approved, it will be forwarded in attack order form directly to airdrome of supporting unit for compliance.

c. Upon receipt of an attack order, the unit at the airdrome will take the necessary action in conformance with its state of readiness, to insure success of the attack. Immediately upon return of the airplanes to the airdrome, the air unit commander will report directly to the air support control where the order originated, giving results of mission and all pertinent intelligence data. After the attack by support aviation, the commander who requested the support will report results of attack to air support control through the same channels that were used for the original request.

d. Requests for air support should have priority over all other matters on the air support control net.

e. The timing of the air attack is of primary importance in securing the maximum effect. In some cases an attack may be ordered when a particular condition occurs (crossing bridges or exposed area, debouching from cover, within a defile, etc.) rather than at a precise time.

f. When friendly troops might be endangered, definite time limits for the commencement and termination of the attack should be prescribed. Time allowances for action upon air requests, the transmission of the attack order through chan-

nels, the aircraft to leave the ground, and for the flight to the objective must be carefully computed in determining the time of attack. When the nature of the attack permits, the firing of prearranged flares by the last element of the combat aviation may serve to signal the end of the air attack as well as a signal to launch the ground attack. The ground attack may be launched on the signal from the combat aviation or at the end of the time bracket, whichever comes first.

g. In support operation, when targets cannot be foreseen and developed sufficiently in advance for normal air operating procedure, special provision must be made to minimize the time lag between request for missions and their execution. To meet this time requirement, a suitable portion of supporting combat aviation should be maintained on "alert" status (either ground or air) prepared to proceed to an attack with the least practicable delay, on any assigned target. Air alert should be employed only in exceptional circumstances. For detail procedure for alert status see FM 31–35.

h. To minimize the chances of bombing friendly troops through error, careful attention should be given to the following:

(1) Briefing of combat crews prior to a mission, giving them as accurate and up-to-the-minute picture of friendly ground activity and location as is possible before take-off.

(2) Complete and detailed location and disposition of target with respect to landmarks. Also direction and rate of movement of target or its probable movement.

(3) Timely notification of situation changes by immediate priority advisement by ground commander to associate air support agency.

(4) Thorough training and indoctrination of air and ground personnel in visual identification of enemy and friendly uniforms, matériel, formation markings, and signals.

(5) Establishment of bomb safety lines readily identified from the air.

(6) Visual signal prescribed to identify ground elements to friendly aviation.

(7) Radio communication with aircraft in flight.

SECTION III

OBSERVATION AND PHOTOGRAPHIC AVIATION

■ 66. GENERAL.—*a.* It is the function of observation aviation to support the ground units by the execution of reconnaissance, artillery, and liaison missions. Observation aviation will generally be sufficiently decentralized to permit each corps and division to plan the use of and to call directly upon its supporting observation squadron for missions.

b. The primary function of photo squadrons is to accomplish all aerial photography required by the army, or armored force to which assigned, except the reconnaissance photography performed by observation squadrons.

c. Mapping squadrons are constituted for the use of theater headquarters to perform mapping in any area which is likely to become of military interest.

d. Ordinarily, a photographic group consisting of one mapping squadron and three photographic squadrons will be assigned to an air force.

■ 67. ORGANIZATION.—*a.* Based on present Tables of Organization the amount of observation aviation which is expected to be available for support of ground forces is—

(1) Theater headquarters—one or more mapping squadrons.

(2) Each army—an observation group, consisting of two observation squadrons and a photo squadron.

(3) Each army corps—an observation group, consisting of one observation squadron per corps headquarters and one observation squadron per division.

(4) Each armored and cavalry corps—one observation group consisting of one observation squadron per corps headquarters and one observation squadron per division.

(5) Force headquarters, armored force—one photo squadron.

(6) Each separate armored or cavalry division—one observation squadron.

b. While generally each echelon depends upon the observation aviation indicated in paragraph 69*a*, higher echelons, where the situation warrants, use their aviation to carry out

missions for lower units, normally retaining centralization of control in the air support command.

c. For the number of airplanes as basic equipment for observation, photo, and mapping squadrons, see paragraph 54, FM 31–35.

■ 68. EMPLOYMENT.—*a.* In order to insure intelligent execution of all observation missions, every pilot and observer must be familiar with the general scheme of maneuver of the supported unit and with the details of every operation in which he may be called upon to participate. The plan of employment of other friendly operations, both ground and air, should be maintained with adjacent air units to permit rapid exchange of information vital to their operations.

b. It is important that pilots and observers keep posted on the enemy situation, both ground and air, not only for the intelligent execution of their mission but for their own safety. Such knowledge enables them to determine more thoroughly the requirements of their mission than would be possible without it. Their safety is dependent upon their knowledge of the locations of ground installations which might oppose the execution of their mission and enemy air activity which they might desire to avoid.

c. It is particularly important that pilots and observers in observation squadrons be thoroughly familiar with the terrain over which they operate in order that they will know at all times where they are and be able to find their objectives by reference to landmarks while flying at low altitudes with the minimum reference to maps in flight. Orientation is important in locating and reporting observation. They should make a thorough study of the area beforehand to permit constant orientation without reference to maps particularly during darkness when the minimum number of landmarks are visible.

d. Only general rules can be stated regarding the altitudes at which observation missions can be performed. The most suitable altitude depends upon such factors as mission, performance and characteristics of the aircraft employed, armor and armament carried, range and effectiveness of hostile small-arms fire from ground weapons, amount of effectiveness of antiaircraft fire, hostile air activity, camouflage

of the airplane, and weather conditions such as ceiling, visibility, and clouds. Considering ground combat interference, operations of observation aviation over friendly territory are restricted only by the range depth of fire from hostile weapons on or close to visual front lines. The weapons available to the hostile ground arms, then, will determine dangerous altitudes.

e. Observation units will be trained and equipped for reconnaissance including reconnaissance photography, artillery support, and liaison missions as may be required by the supported unit.

f. Reconnaissance, as a function of observation aviation, may be carried on either at day or at night. Reconnaissance missions carried on in daylight over hostile territory require maximum speed at either minimum altitude or at relatively high altitudes. This limits the effectiveness of visual reconnaissance and necessitates reliance upon photographic and night reconnaissance. Missions will generally be carried out by making a series of brief flights into enemy territory taking full advantage of high speed and using clouds or irregularities of the terrain for cover. Night reconnaissance is habitual and is productive of a great deal of valuable information, particularly to the experienced observer who is familiar with the terrain. Normal conditions will sometimes permit, without artificial illumination, the observation of activities which rely for their success upon the cover of darkness, such as troop and supply movements. Artificial illumination may permit closer examination when necessary. Even though information obtained by night reconnaissance may be meager, the moral effect on the enemy is considerable as he will be uncertain as to whether his movements have been discovered.

■ 69. MISSIONS.—*a. Liaison.*—Liaison missions are performed to provide the superior commander with information required in special situations and not obtainable through routine channels, or to transmit information or orders when such transmission can be more effectively accomplished by air messengers than by other means of communication. Where the situation permits, the mission may be performed by the liaison type airplane. However, all concerned must realize

that this type airplane is extremely vulnerable to hostile ground and air fire; that normally it must be employed only over friendly territory; and that conditions of modern warfare may not provide a definite line of demarcation between hostile and friendly territory behind which such airplanes can operate. Additionally, while this airplane is designed to operate from small, unprepared fields, the latter may not be available.

b. Reconnaissance.—Reconnaissance missions include the location of the opposing front lines, observation of the progress of combat, location of hostile resistance or enemy penetrations into our positions, and assembly of hostile troops for attack or counterattack. Commanders of all echelons of ground forces are interested in the progress of battle. It is the primary responsibility of the lower units of the ground forces themselves to furnish this information to their commanders. When these agencies prove inadequate, observation aviation may be called upon to assist in obtaining this information. Before directing missions of this type, commanders should take into consideration the high casualty rate to be expected, and should balance this factor against the value of the information desired. Frequently a single flight may be able to determine the desired information, in which case the mission should not be burdened with requests for additional reconnaissance.

c. Artillery.—These missions will normally be performed by the organic aviation of field artillery units. When missions are beyond the capabilities of organic field artillery aviation, observation units may be called upon to perform them with high performance aircraft. Observation units are not responsible for any missions for field artillery units which can be performed by liaison aircraft. The artillery and observation liaison type airplanes will operate over friendly territory for the adjustment of artillery. Due to its extreme vulnerability, even to ground fire near the front lines, this type airplane must be looked upon more as an elevated observation post rather than an observation airplane for the adjustment of artillery. Enemy air activity will more readily curtail the use of this type airplane than the high performance observation type. With the realiza-

tion of these factors, observation and artillery units must depend upon the normal high performance observation airplane to some degree for adjustment of fire. Long range artillery fire, defilade, and poor visability may require that such adjustment be carried out over hostile territory. Proper planning and prearrangement must be thoroughly considered for rapidity of adjustment to reduce to a minimum the time which the airplane spends over hostile territory. The use of suitable fire control photographs aids in such planning. For details concerning tactics and technique employed in artillery missions see FM 1–20.

d. Cooperation with cavalry.—Observation aviation does not replace or supplant cavalry as a reconnaissance agency but by proper cooperation increases the effectiveness of that arm by extending its radius of action and by directing attention to known or suspected hostile forces, thereby reducing useless marching and conserving men, horses, and matériel. Observation for cavalry is particularly important in the initial phases of a strategic or tactical movement. During combat the observation aviation mission with cavalry is essentially the same as that with infantry.

e. Cooperation with armored and motorized forces.—The rapid movement of armored and motorized units calls for the use of observation aviation for distant and route reconnaissance, march liaison, observation for artillery, and normal liaison. Observation aviation is of vital importance in the operation of armored forces.

f. Cooperation with seacoast artillery.—In the organization of air support commands no observation aviation is specifically provided to serve seacoast artillery but occasions may arise wherein such may be required, in which case it will be provided by the appropriate air support commander as directed by the theater or army commander. Long range reconnaissance at sea for the discovery of targets is beyond the realm of the function of observation aviation operating on such missions, but it may be used for short range reconnaissance and for the adjustment of fire on targets. (See FM 1–20.)

g. Cooperation with combat support aviation.—On occasion, certain specified observation missions may be authorized

to call directly on air support control, on airdromes, or on combat support aviation on air alert, for the purpose of reporting targets for combat support aviation. Observation missions may be dispatched primarily for the purpose of locating such targets. It should be noted that an observation mission authorized to make such requests for combat air support is in the same status as a ground air support party. After it files a request and receives an approval it will, if desired, lead the combat aviation to the target.

■ 70. PHOTOGRAPHY AND MAPPING.—*a.* A major use of aerial photography in an active theater is to secure information for the purpose of intelligence. It should be the normal custom for these same photographs to be used for terrain studies and map correction. However, the vital function is to provide information, either positive or negative, concerning the location and extent of enemy installations, supplies, vehicles, and troops.

b. The performance of required aerial photography, during periods when there is friendly control of the air, presents no particular problem other than that presented by the weather. However, it must be constantly borne in mind by supported units that, in the face of active enemy aerial opposition, it is suicidal to attempt to photograph a specific objective at regular intervals. Photographic aviation will depend upon speed, altitude, and the element of surprise in order to secure desired photography in the face of strong opposition. The office in charge of photographic operations must employ a great deal of ingenuity in avoiding any pattern in photographic flight over a specific area. It is quite practical to secure a strip of photographs of the enemy area, utilizing surprise, speed, and extreme altitudes. It is thus possible, by careful planning of successive photographic flights undertaken primarily for intelligence photography, to secure overlapping coverages of wide areas.

c. A general exposition of night aerial photography is found in FM 1–35. Excellent results are produced with artificial illumination under good visibility conditions although only a small area is covered with success, dependent upon the degree of accuracy in locating the desired area.

d. Orders for photographic missions must be specific. At the altitudes at which missions are generally conducted in the face of active opposition, the photographic pilot cannot observe troops or installations upon the ground and then secure photographs. Instead, photography must be obtained on a specific strip of terrain without regard to the pilot's ability to see enemy installations, troops, etc. Photography secured in this fashion is capable of giving negative information as well as positive. While it is possible for a clever and ingenious enemy to camouflage and conceal his actions from visual observation, the camera cannot be fooled, particularly when a resultant photograph is studied by highly trained photographic interpreters.

e. Special mapping squadrons are constituted for the use of theater headquarters. They normally perform the mapping of large areas. Their operations should be planned to cover all areas of possible military action to permit the production of accurate maps as far in advance of the needs of the troops as practicable. In order to provide for maps or for map revision a mapping squadron will normally be provided for each oversea theater. Proper anticipation of mapping requirements will generally permit greater coverage with more satisfactory results without enemy opposition than is possible under conditions of actual hostilities.

SECTION IV
TROOP CARRIER

■ 71. GENERAL.—*a.* The movement of troops and their equipment and the movement of emergency supplies by air transportation are entirely practicable within the limitations of aircraft in general, and the available types of airplanes and gliders in particular. The principal factors limiting the use of aircraft in air transport operations are—

(1) Availability by suitable and sufficient aircraft and crews within the time limit allowed by the situation.

(2) Performance characteristics, that is, speed, range, and carrying capacity.

(3) Ground facilities at points of departure, intermediate landing points, and points of destination.

(4) Weather.

(5) Enemy activities.

b. Air transportation is usually thought of in terms of its rapidity. However, it is faster than other methods only after the airplanes are under way. The coordinating and planning, movements to points of departure, and loading require fully as long as the older methods. The difficulty of reaching an objective, due to its geographical location and enemy activity, rather than the time element, will be the chief factor calling for the transportation of large detachments by air.

c. Large concentrations of airplanes will not usually be immediately at hand and contemplated troop movements will have to be foreseen or delayed a sufficient time to permit the necessary troop carrier units to become available. Generally, large troop movements by air, except to relatively inaccessible destinations, will require an overall time interval comparable to or even longer than that for other means more immediately available.

d. The necessity for planning for air transportation operations in the greatest detail and with thoroughness must be recognized if confusion, delay, and even disorganization are to be avoided. Such operations are more delicate than are similar ones by more conventional means. Efficient liaison between transporting and transported units is a prerequisite, and opportunities for rehearsal and practice should not be neglected.

e. Protection for the troop movements is a primary consideration for all concerned. Two major factors which contribute to such protection are secrecy of projected operations and friendly aviation.

f. Steps to maintain secrecy regarding large troop movements must begin with the inception of the plan so that reports of unusual concentration or activities involving transport airplanes, even those occurring in interior zones, will not reach the enemy. Actual flights should avoid thickly populated areas and preferably should be made at a very low altitude or at night.

g. Adequate fighter protection must be arranged for. It is evident that air superiority is a prerequisite to successful aerial troop movements.

■ 72. TROOPS INVOLVED.—*a. Parachute.*—(1) Parachute troops are especially organized for and trained in moving by air. Their equipment is such that no difficulty is experienced in carrying it by airplane except that a certain number of the airplanes must have large "cargo" doors through which equipment bundles may be dropped in tactical operations. All airplanes carrying parachute troops must be equipped with a suitable longitudinal steel cable for the attaching of parachute "static" lines. Parachute troops provide their own parachutes. Strategical movements of parachute troops may or may not be made by air; tactical missions always involve air transportation.

(2) Troop carrying operations involving parachute troops consist of carrying them to a jumping point over or near their objective, protecting them en route, and supplying their essential needs by air thereafter for as long as the situation demands or permits. Frequently, bombardment support at the objective will be indicated.

b. Airborne.—(1) Airborne troops, other than parachute troops, will consist of the combat elements of ground units plus a minimum of essential service troops. These troops may be permanently organized airborne units. In small scale operations, these troops will generally be from infantry units. Large-scale operations will usually include combat elements of other arms and service units. Emergency parachutes for these troops will be supplied by transporting units.

(2) Air operations involving airborne troops other than parachute troops may be undertaken independently, but usually will be made in conjunction with the parachute troops. Such operations will consist of transporting these troops to and landing them at their destination, protecting them en route, and providing a supply and evacuation service for as long as the situation demands or permits.

■ 73. EQUIPMENT.—*a.* Transportation equipment primarily consists of troop carrier airplanes and gliders. Other types of airplanes, such as medium and heavy bombardment, may be used; but troop carrier airplanes and gliders of available troop carrier units will normally be made available.

b. The determination of the carrying capacity of the aircraft and consequently the number of airplanes for each

particular operation is a technical task for the air staffs concerned. Aircraft are not standardized to the extent of other forms of transportation, and small variations in weight and size are important.

c. Present troop carrier airplanes have medium cruising speeds ranging from 140 to 175 miles per hour depending upon design, can carry up to about 6,000 pounds, and can land in about 1,800 feet over a 50-foot obstacle. Capabilities of the aircraft will be reduced when gliders are being towed. Present troop carrier airplanes carry no armament.

d. The gliders are intended to be towed to and cast loose in the vicinity of their destination, and to glide to a landing. Among the advantages possessed by gliders are their cheapness, rapidity of construction from material readily obtainable, ease of maintenance and repair, silent approach, and slow landing speeds which enable them to land in small fields. Most of the problems involved in air transportation are common to the use of both airplanes and gliders.

■ 74. OPERATIONS.—In strategical and tactical movements, transporting units will be under the control of the air force commander and normally assigned to the appropriate air support command with direct communication authorized between transporting and transported units. For operations of an independent and continuous nature, ground troops to be transported and the troop carrier units may be organized into an airborne task force with the operational control of all components vested in the task force commander.

■ 75. COORDINATION.—*a.* As soon as possible after a troop carrying movement has been directed, qualified liaison officers should be exchanged between the transported and transporting units for the duration of the operation, and a conference between the commanders should be held. At this time a clear delineation of the activities and responsibilities of each should be understood.

b. The delineation of activities and responsibilities between transported and transporting units will include these points: the transporting unit will be responsible for the preparation of all plans pertaining to the use and allocation of the air

force equipment and personnel in a manner as favorable to the desires of the transported units as technical and tactical conditions permit; the transported unit will be responsible for proper loading and unloading of personnel and supplies under the supervision of and in accordance with plans provided by the transporting unit. The movement will be under the command of the troop carrier unit commander during time of actual flight except that, when parachute troops are being carried, direction of individual airplanes may be temporarily relinquished to the jumpmasters on the final approach to the objective.

c. The commander of the troops to be transported should furnish the following information for each of his units, to the troop carrier commander at their conference:

(1) Point or points of departure.
(2) Time of departure or arrival.
(3) Intermediate stops.
(4) Destinations.
(5) Method of movement, such as by one flight or by shuttling.
(6) Number of men to be carried and average weight of each, including personal equipment. In movements likely to culminate in combat, this information may be given in terms of numbers of combatant units, each composed of personnel, combat equipment, and supplies. These combat units should be standardized into a minimum of types. For example, a rifle battalion can be organized for the movement into two types of small units, one being similar to a rifle squad and the other being similar to an antitank squad. The composition of such units will be furnished. Each airplane will then carry whole multiples of these small units with remaining capacity devoted to other items.
(7) Weight of equipment and supplies to be carried.
(8) Information relative to equipment and supplies of unusual weight or bulk such as antitank weapons, reconnaissance, or other vehicles. Any object too large to be carried through an airplane passenger-size door is in this category.
(9) Information relative to type of formation to be flown.
(10) Information relative to the transportation of subse-

quent supplies to the troops during the course of operation, if such is contemplated.

(11) Information relative to practices or rehearsals desired.

■ 76. PLANNING.—*a.* After, or concurrently with the foregoing conference, the troop carrier commander and his staff should proceed to plan the operation in great detail. This planning will include among other things the following:

(1) The assembling of equipment, supplies, and ground personnel, and the assembly points therefor.

(2) Signal communication.

(3) Preoperation training for the movement.

(4) Movements of troop carrier units to advanced bases.

(5) Each troop-carrying phase of the operation.

(6) Movement of supplies.

b. In view of the hazardous nature of even the initial phase of an operation of this kind, every effort should be made by all concerned to avoid last minute changes in plans. Such changes usually result in much additional work for the air units involved and may easily lead to delay and confusion, if not jeopardy. Some last minute changes are probably inevitable in field operations, but they should not be due to lack of study or foresight.

■ 77. EMERGENCY SUPPLIES BY AIR.—In general, the same limitations and fundamentals of procedure and planning that govern the movement of personnel, also govern the emergency movement of supplies by air, except where obviously inapplicable. Emergency supplies may be delivered at their destinations by dropping, in gliders, or by airplanes landing.

a. The delivery of supplies by dropping may be the most practicable means in the situation to be met, but it is in every way a laborious procedure. Supplies to be dropped have to be strongly and carefully packed in bundles of limited size, dropping equipment is required for most articles, a portion of the supplies dropped will probably be damaged or irrecoverable by the recipients, and facilities available will usually limit the quantities which can be delivered in this manner.

b. Supplies to be dropped by parachute should be packed in bundles weighing approximately 200 pounds. Special

equipment parachutes and containers have been developed but if these are unavailable, personnel parachutes with an arrangement for pulling the ripcords can be used.

c. Gliders may be used for delivering emergency supplies with all the advantages peculiar to that type aircraft. They are particularly valuable because of their comparatively large carrying capacity and their ability to land in comparatively small areas.

d. Where landing areas are available and enemy activity permits, airplanes may deliver emergency supplies in normal manner and the problem is correspondingly simplified.

■ 78. AIR AMBULANCES.—*a.* Evacuation of sick and wounded personnel by air will often be necessary. The majority of troop carrier airplanes are equipped for carrying litters, but certain improvisations may be desirable. The number of litters, in contrast to the number of ambulant patients, must be included in the information furnished the troop carrier commander.

b. In movements of this kind, close coordination and cooperation should be effected with the medical units involved.

c. Airplanes used exclusively for carrying sick and wounded personnel will be marked in accordance with international law.

d. Medical Corps field hospital units have been organized and equipped for movement by air to support other airborne operations.