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DEPARTMENT OF THE ARMY FIELD MANUAL

ARMY AIR DEFENSE COMMAND POSTS

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ARMY AIR DEFENSE COMMAND POSTS

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* This manual supersedes FM 44-8, 30 October 1959.

CHAPTER 1

INTRODUCTION

1. Purpose and Scope

This manual is a guide for air defense commanders, staffs, and operators concerned with Army Air Defense Command Posts (AADCP) operations. Information presented concerns the organization, operation, and functioning of the AADCP. Technical information pertaining to equipment is not contained in this manual and is available in appropriate field manuals and technical manuals. The material presented is applicable to both nuclear and nonnuclear warfare.

2. Recommended Changes and Comments

Users are encouraged to submit recommended changes and comments to improve this manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to Commandant, U.S. Army Air Defense School, Fort Bliss, Tex.

3. Publications

Appendix I contains a list of reference publications pertinent to the information in this manual.

4. World Geographic Reference System

The World Geographic Reference System (GEOREF) is the reference system primarily used by air defense. Appendix II explains the system in detail.

CHAPTER 2

ARMY AIR DEFENSE COMMAND POSTS

Section 1. AADCP, GENERAL

5. General

An AADCP is the tactical headquarters of the Army Air Defense Commander (AADC) wherein representatives of his staff insure continuous and efficient control, coordination, and integration of tactical operations by assigned and attached forces. The AADCP is operated on the principle of maximum decentralization of target assignment and fire control. The AADCP collects and evaluates all available air defense information and disseminates air defense intelligence. Air defense brigades, groups, and battalions are provided TOE personnel augmentation for manning the AADCP. Additional personnel for battery level operations are provided in battery TOE.

6. Types of AADCP's

Two general types of AADCP are semiautomatic and manual. The semiautomatic AADCP's are components of the fire distribution systems (FDS) AN/FSG-1 (Missile Master); AN/GSG-5 (V) and AN/GSG-6 (BIRDIE); AN/MSG-4 (Missile Monitor). The manual AADCP's use the operations central AN/MTQ-1 and plotting equipment AN/TSA-2 and PT-171/TPS.

7. Functions of the AADCP's

The functions performed by the AADCP's of the various type fire distribution systems to maintain maximum effectiveness of the defense are basically the same; although the methods of operation may differ. These functions include—

- a. Collection of air defense information.
- b. Evaluation of air defense information.
- c. Dissemination of air defense intelligence.
- d. Monitoring and supervision of AD missile battery actions.
- e. Distribution of AD missile battery fires.
- f. Exchange of AD information and intelligence with adjacent AADCP's, Army agencies, and other Service agencies concerned with air defense activities.
- g. Coordination of liaison with other agencies.

8. Primary and Alternate AADCP's

a. Primary AADCP's are the direct responsibility of the defense commander. The duty of establishing, organizing, and operating the AADCP is normally delegated to his executive officer. The executive officer coordinates the establishment, organization, and operation of the AADCP with the S2, S3, S4, and communications officer. The S2 provides information and intelligence of the enemy air and surface situations, coordinates with the S3 in planning liaison requirements to exchange AD intelligence, and furnishes information for identification and recognition of aircraft. The S3 plans, designs, and evaluates the air defense and recommends the assignment and attachment of AD units. The S4 supports the AADCP operations as required and may obtain current support requirements of subordinate AD units through the AADCP. The communications officer plans, establishes, and maintains internal communications and coordinates external communications requirements for the FDS. The AADCP provided by TOE augmentation is a staff facility of the AADC. The AADCP performs operations as directed by the AADC through AD plans and SOP's.

b. The alternate AADCP is established by a subordinate commander designated by the AADC. The commander designated to establish the alternate AADCP prepares operations, communications, and liaison plans to facilitate rapid assumption of functions of the primary AADCP in the event the primary AADCP becomes nonoperational. The plans should be tested periodically to insure their effectiveness.

c. In addition to designating the alternate AADCP, the defense commander establishes alternate means of disseminating AD intelligence as a backup for the semiautomatic FDS. Should the automatic data link (ADL) or a major portion of the FDS become inoperative, alternate ADL communications routes or manual plottings and telling facilities are utilized to provide early warning and intelligence to the AD missile batteries.

Section II. AADCP IN CONUS

9. General

a. The combined command established to defend the continental United States (CONUS), Canada, and Alaska against air attack is the North American Air Defense Command (NORAD). The unified command established to perform air defense missions of a national nature is the Continental Air Defense Command (CONAD).

b. The U.S. Army component of NORAD and CONAD is the United States Army Air Defense Command (ARADCOM). ARADCOM is established and employed throughout CONUS to carry out the Army air defense mission under the operational control of NORAD.

c. Army Air Defense Command Posts (AADCP) are established for each Army air defense at battalion, group, or brigade level. The AADCP is under operational control of the Commander in Chief, North American Air Defense Command (CINCNORAD); however, for command, less operational control, the AADC is directly subordinate to the ARADCOM region commander.

10. CINCNORAD

The Commander in Chief, NORAD:

a. Exercises operation control over U.S. Army, U.S. Air Force, U.S. Navy, and Royal Canadian Air Force air defense forces assigned, attached, or otherwise made available. He has the authority to direct, coordinate, and control the operational activities of these forces.

b. Establishes such subordinate organizations as are necessary for the accomplishment of the mission and assigns tasks.

c. Designates objectives and issues directives concerning operational matters to component and subordinate commanders.

d. Establishes the procedures and methods for conducting air defense operations, exercising operational control of forces, and directing the attack against hostile air targets.

e. Specifies the defense readiness conditions, determines and announces conditions of air defense warning, and plans and conducts air defense exercises.

11. NORAD/CONAD

a. To facilitate coordination and operational control of all air defense forces, CINCNORAD has established NORAD regions and NORAD sectors throughout CONUS, Canada, and Alaska. At each level, an operations or coordination center is established:

- (1) NORAD Region Combat Center (NRCC).
- (2) NORAD Sector Direction Center (NSDC).
- (3) NORAD Control Center (NCC).

b. Planning, administrative, and logistical support of CONAD forces are accomplished by the U.S. Army, Air Force, and Naval components. The Commander in Chief, Continental Air Defense Command (CINCONAD) exercises operational command over

U.S. air defense components through the service component commanders without duplicating the operational responsibilities of CINCNORAD.

12. NORAD Region Combat Center

The NRCC is an intelligence, communications, and operations center established for monitoring and supervising subordinate NSDC's. The NRCC, when equipped with a semiautomatic ground environment (SAGE) electronic computer system, receives information from NORAD and subordinate NSDC's. From this information, displays of the current air defense situation are presented. This enables the NRCC commander to exercise supervision and control of air defense in his area of responsibility.

13. NORAD Sector Direction Center

The NSDC is the basic combat command post for the conduct of the air defense battle. The NSDC, when equipped with SAGE electronic computer systems, receives information from NRCC, adjacent NSDC's, short and long range radar installations, radar picket ships, and radar equipped early warning and control aircraft. The computers also receive weather reports, aircraft flight plans, and subordinate unit weapon status reports. Data are processed and displayed to enable the NSDC personnel to maintain surveillance, identify aircraft, select and direct USAF interceptors and weapons, coordinate Army AD means, and disseminate air defense intelligence. For normal operations, the AADCP is under operational control of the NSDC.

14. NORAD Control Center

The NCC is a manual backup for the SAGE system. The NCC is established subordinate to either an NRCC or an NSDC and normally is responsible for the air defense of a small area or specific installation. The NCC normally consists of an AADCP and a USAF radar squadron. The USAF radar squadron may be collocated with the AADCP (Missile Master or BIRDIE) within the NCC. The NCC controls air defense operations in NORAD mode III.

15. Communications

Communications between NSDC SAGE and semiautomatic AADCP's provide early warning by teletype and voice and track data and AD intelligence by automatic data link (ADL). Additional operational control and liaison nets are established as required.

Section III. AADCP in Theater of Operations

16. General

The theater commander is responsible for determination of air defense priorities and allocation of air defense means. Commanders of component forces are responsible for air defense operations of their air defense forces subject to the theater commander's operational and coordinating procedures. The air defenses of the communications zone and combat zone are described separately in this section.

17. Air Defense, Theater of Operations

a. The air defense of a theater of operations is the responsibility of the theater commander. The theater commander prescribes the coordinating and operational procedures for all theater air defense.

b. The theater commander may establish a theater joint air defense command (TJADC) in accordance with principles stated in Unified Action Armed Forces, JCS Pub 2. The TJADC commander has two functions:

- (1) To exercise operational control over all air defense elements assigned to his command.
- (2) To act as the coordinating authority for air defense matters in the theater of operations.

18. Air Defense, Communications Zone (COMMZ)

The theater joint air defense command (TJADC) established by the theater commander controls the air defense of the COMMZ. The TJADC integrates the planning of all service air defense elements allocated and exercises operational control in the conduct of air defense operations. Operational procedures are coordinated with the combat zone (CZ) field armies to insure compatibility of air defense operations. The theater Army commander establishes a theater Army air defense command (TAADC). The Army AD units allocated for the air defense of the COMMZ are placed under the command of the TAADC. The TAADC headquarters accomplishes the planning for Army AD at the TJADC headquarters. AADCP's are established at brigade and group levels to conduct Army air defense operations under the operational control of TJADC.

19. Air Defense, Combat Zone (CZ)

In the CZ, the field army commander is responsible for the air defense of the field army. To establish the defense, the AD brigade commander of each field army is designated the field army

air defense officer. Air defense operations are coordinated with field army tactical support operations by the Air Defense Element (ADE) of the Field Army Tactical Operations Center (FATOC). Air defense operations are conducted by AADCP's established at brigade and group levels. The AADCP coordinates air defense operations with the Army Aviation Flight Operations Center (FOC), Air Force Control and Reporting Center (CRC), and the Naval Tactical Air Control Center (TACC).

20. Communications

The FDS components require communications facilities between each echelon to exchange information throughout the system. Consequently extremely reliable, full-time tactical communications must be provided. Air defense units in the COMMZ may be supported by the theater area communications systems and air defense units in the field army by the field army area communications systems. However, the necessity for widespread and rapid dissemination of AD intelligence and coordination may require additional organic AD communications channels for fire distribution equipment.

CHAPTER 3

ARMY AIR DEFENSE COMMAND POST (MISSILE MASTER)

21. General

The fire distribution system AN/FSG-1 Missile Master collects, stores, and disseminates data and provides facilities to monitor and supervise actions by associated AD missile batteries. The equipment used consists of an AADCP, defense acquisition and height finding radars, automatic data link (ADL) to SAGE, ADL to the fire units, and battery terminal equipment (BTE) at each fire unit.

22. Fire Distribution System AN/FSG-1 (Missile Master)

a. Missile Master provides a means to integrate the air defense system. The data flow of the FDS, AN/FSG-1 (MISSILE MASTER) is shown in figure 1. The AADCP receives and correlates data from SAGE, defense acquisition radars, and height finding radars. These data are received by a tracking system consisting of surveillance and entry consoles, tracking consoles, and range-height indicator consoles. Surveillance and entry officers monitor local radar displays and SAGE displays. As tracks appear, their location, identification, altitude, and raid size are entered into the electronic computer memory system. The tracking operators and range-height indicator operators assist the surveillance and entry officers by updating track data and entering these data into the memory system. The data are continuously sent automatically to the tactical display system.

b. The tactical display system consists of the AADC console, tactical director console, and tactical monitor consoles. The tactical monitor consoles display all reference data entered into the memory system and have the necessary facilities to control or monitor the fire units. Tactical monitors can make direct target to fire unit assignments in a centralized mode of operations or monitor fire unit operations in a decentralized mode. Commands and reference data are transmitted to the fire units from either the AADCP or SAGE.

c. The friendly protector monitors all friendly tracks entered into the memory system and, by acting on battery track data,

insures no friendly tracks are fired upon by using hold fire commands.

d. The AADCP receives battery track data and status data from all associated fire units. The battery track data are also exchanged with the other associated fire units and transmitted to adjacent AADCP's. The AADCP receives reference data from the adjacent AADCP's. Status data from the associated fire units are also transmitted to SAGE.

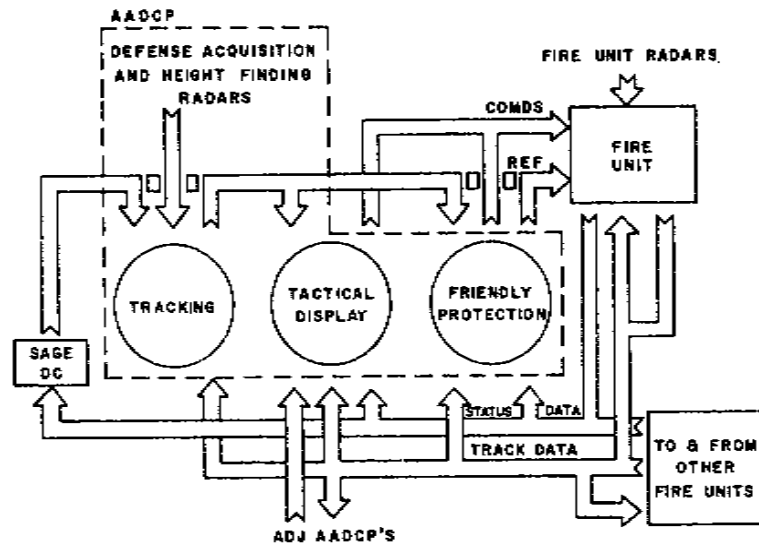


Figure 1. Data flow, FDS AN/FSG-1 (Missile Master).

23. AADCP

The AN/FSG-1 equipment facilitates maximum decentralization of target assignment and fire control. The operations room of the AADCP consists of the following equipment:

- a. Weapons control status board.
- b. Air Force flight status board.
- c. Early warning and local plotting board.
- d. Alert board and clock.
- e. Air Force equipment status board.
- f. Track status board.
- g. Antenna control units.
- h. Channel status unit.
- i. Surveillance and entry consoles.

- j. Tracking consoles.
- k. Range-height indicator consoles.
- l. AADC console.
- m. Tactical director console.
- n. Tactical monitor consoles.
- o. Friendly protector console.
- p. Air Force GPA-37 and GPA-73 equipment.

24. System Capabilities

- a. The system has the following capabilities:
 - (1) Transmits reference data on airborne objects to all missile batteries associated with the system.
 - (2) Receives tracking data from each missile battery and relays these data to all other missile batteries in the system.
 - (3) Transmits to and receives data from either SAGE or adjacent AADCP's.
 - (4) Provides facilities for monitoring data at the AADCP.
 - (5) Makes possible specific target designation to batteries when necessary.
- b. Detailed information of the above capabilities is contained in FM 44-10.

25. Personnel

a. *Army Air Defense Commander (AADC)*. The AADC is responsible to NORAD for the operation of the AADCP. He maintains close liaison with the NORAD Sector Commander at the NSDC and insures that tactical doctrine and SOP's are complied with. The AADC may perform any or all functions of the air defense artillery operations officer (ADAOO) from the AADC console.

b. *Air Defense Artillery Operations Officer (ADAOO) (Tactical Director)*. The ADAOO supervises the internal operations of the AADCP from the tactical director console. He implements the decisions of the AADC and informs him of significant tactics and techniques, operational controls imposed by NSDC, and changes in operational status and posture of the defense.

c. *Missile Master Operations Officer (Section Leader)*. The Missile Master operations officer is responsible to the AADC for all activities of his section and for the training and the effectiveness of detachment personnel. He may act as the ADAOO.

d. *Assistant Missile Master Operations Officer (Assistant Section Leader)*. The assistant Missile Master operations officer is

the principal assistant and adviser to the operations officer. He coordinates and supervises operational details and is directly responsible for the AADCP section. He may act as ADAOO.

e. Surveillance and Entry Officer. The surveillance and entry officer is directly responsible to the ADAOO. His primary duty is to maintain continuous surveillance of the air picture. Significant characteristics of possible targets are reported to the ADAOO. His specific duties vary with the weapons control status in effect (par. 28).

f. Tactical Monitors. The tactical monitors are responsible to the ADAOO for tactical supervision of the fire units under their control. Their primary duty is to closely monitor all tactical action by associated fire units. Their specific duties vary with the weapons control status in effect (par. 28).

g. Friendly Protector. The friendly protector is directly responsible to the ADAOO. He informs the ADAOO when a track of friendly identity appears within the area of limits of the engage track circle of a fire unit tracking a hostile. He also establishes with the tactical monitors reasons for a hold fire or for the lifting of a hold fire command.

h. Range-Height Indicator Operator. The range-height indicator operator is directly responsible to the associated surveillance and entry officer. He provides height service to all entered channels, monitors SAGE data for height errors, and reports indications of ECM to the surveillance and entry officer.

i. Tracking Operators. The tracking operators are directly responsible to the surveillance and entry officer. They undertake manual rate-aided tracking of locally originated tracks assigned to the consoles by the surveillance and entry officer. In accordance with SOP, they enter locally detected tracks into the system, employ IFF challenge on locally entered or suspected hostile tracks, and monitor SAGE tracks assigned to the consoles by the surveillance and entry officer.

26. System Operations

The NSDC SAGE exercises operational control over all air defense forces within its sector through reference options. Operations in the reference options utilize early warning provided by NSDC SAGE or local sources. Assignment control may be exercised by the AADCP.

27. Console Displays

a. Symbology.

(1) *Surveillance and entry console and tracking consoles.*

- (a) Local or SAGE-manual tracks are marked as $\frac{1}{2}$ -inch

(diameter) circles for hostile tracks, partial $\frac{1}{4}$ -inch circles with the blanked portion appearing at the bottom for friendly tracks, and partial $\frac{1}{4}$ -inch circles with the blanked portion appearing at the top for unidentified tracks (local tracks may be marked with unidentified symbols but SAGE tracks are not).

- (b) SAGE tracks are indicated by the same hostile and friendly symbol markers as local tracks, but are smaller ($\frac{1}{8}$ -inch diameter).
- (c) Battery tracking data are marked as flashing crosses.
- (d) Adjacent Missile Master AADCP reference tracks are marked as flashing $\frac{1}{8}$ -inch (diameter) circles or partial circles.
- (e) A track channel leader line pointing from the center of the display screen to a track symbol indicates that symbol is under close control of the track stick of that console.
- (2) *Tactical monitor consoles, Army air defense commander console, and tactical director console.*
- (a) Track symbols consist of a dot and vector line between a 2-digit number (channel number) and dot codes above, below, and adjacent to both sides of the number. None, one, two, or three dots above the number indicates the raid size as no estimate, one, few, or many, respectively. One to three dots to the right of the number indicates height of the track in 20,000-foot brackets. Four dots indicates heights above 60,000 feet. One dot below the number indicates a friendly track. Four dots below the number indicates a hostile track. One dot to the left of the number indicates that the track has not been assigned to a fire unit. Four dots to the left of the number indicates that the track has been assigned to a fire unit.
- (b) Fire unit tracks are displayed as fire unit numbers, with the raid size dot code above the number, or as circle.
- (c) Fire unit location is displayed as a blinking fire unit number superimposed on the dot representing the unit position.
- (d) Adjacent Missile Master AADCP reference tracks are displayed as blinking dots.
- (3) *Friendly protector console.* Friendly protector console symbols are identical to those described in (2) above except adjacent AADCP tracks and fire unit location cannot be displayed.

b. *Video.* The types of video displayed are radar video, IFF video, range and angle marks, and map video. The type of video displayed varies with the specific console. The surveillance and entry and tracking consoles display radar and IFF video while the range-height indicator console is able to display only radar video.

- (1) Radar video is received from the local radar as either normal video or moving target indicator video.
- (2) IFF video provides identity means for local radar video.
- (3) Range marks (rings) and angle marks (radial lines) can be displayed to assist the console operators in estimating the position coordinates of a track.
- (4) Map video displays selected local terrain features. Map video and range and angle marks cannot be displayed simultaneously.

28. AADCP Operations

a. *General.*

- (1) The SAGE sector commander exercises operational control over Army air defense fire units through the AADCP.
- (2) The NSDC SAGE transmits to the AADCP threat warning and early warning during prebattle, battle, and post-battle phases of air defense operations. Appropriate threat warning will be passed by the AADCP to associated missile batteries.
- (3) The AADC directs, in response to defense readiness conditions, ADA alert requirements as prescribed by SOP.
- (4) The AADC informs associated NSDC SAGE of the status of the AADCP, FDS, associated missile batteries, and missiles available for air defense.

b. *Methods of Operation.*

- (1) *NORAD mode I.* The normal mode of operation in the SAGE environment is mode I. SAGE direction centers are responsible for and exercise operational control over the conduct of the air battle.
- (2) *NORAD mode II.* In the event a SAGE direction center becomes inoperative and adjacent direction centers are operational, an adjacent SAGE direction center will assume air defense responsibility and control over specified portions of the disabled sector.
- (3) *NORAD mode III.* In the event the adjacent SAGE di-

rection centers become inoperative or a situation develops that precludes the utilization of NORAD modes I and II, mode III will be adopted. In this mode, responsibility for conducting the air battle will be exercised by the commander at the NCC.

c. *Weapons Control Status.* The weapons control status that governs the engagement procedures for fire units is—

- (1) *Centralized control.* Direct target-to-fire unit assignments are made either by the NCC or the AADCP and the fire units engage only designated targets. This status should be used only when there are few hostiles in the defense system.
- (2) *Decentralized control.* This is the normal mode of AADCP operation. The fire units select targets for engagement in accordance with established rules for target selection. The AADCP furnishes track information on all hostiles and monitors fire unit actions to insure the overall effectiveness of the defense. Assignment of specific targets to individual fire units usually should not be required.

CHAPTER 4

ARMY AIR DEFENSE COMMAND POSTS (BIRDIE)

Section I. FIRE DISTRIBUTION SYSTEM AN/GSG-5(V) (BIRDIE)

29. General

a. The FDS AN/GSG-5 BIRDIE consists of an AADCP, defense acquisition radars, ADL to SAGE, ADL to the fire units, and BTE at each fire unit. The FDS is integrated with NORAD at the NSDC SAGE and NORAD manual environment.

b. The AADCP receives and correlates track data from the defense acquisition radar and SAGE and NORAD manual environment. The data flow of the FDS AN/GSG-5(V) (BIRDIE) is shown in figure 2. These data are displayed on the monitor console and their location, identification, and raid size are entered into the electronic computer and memory system. The monitor console operator updates track data and enters these data into the memory system.

c. The monitor console displays all reference data entered and has the necessary facilities to control or monitor the tactical actions of the fire units. The monitor console operator can make direct target-to-fire unit assignments in a centralized mode of operations or monitor fire unit operations in a decentralized mode. Commands and reference data are transmitted to the fire units from the AADCP.

d. The AADCP receives battery track data and status data from all associated fire units. The battery track data is also exchanged with the other associated fire units. Status data from the associated fire units is also transmitted to SAGE.

30. AADCP, AN/GSG-5(V)

The AADCP may consist of any one of four variations of the AN/GSG-5(V) system. The type used is determined by the particular requirements of the defense area and is identified by the number of monitor consoles employed. Each monitor console is capable of integrating and coordinating up to four missile fire units. Therefore, an AN/GSG-5(V) system can integrate up to 16 missile fire units by use of one to four consoles.

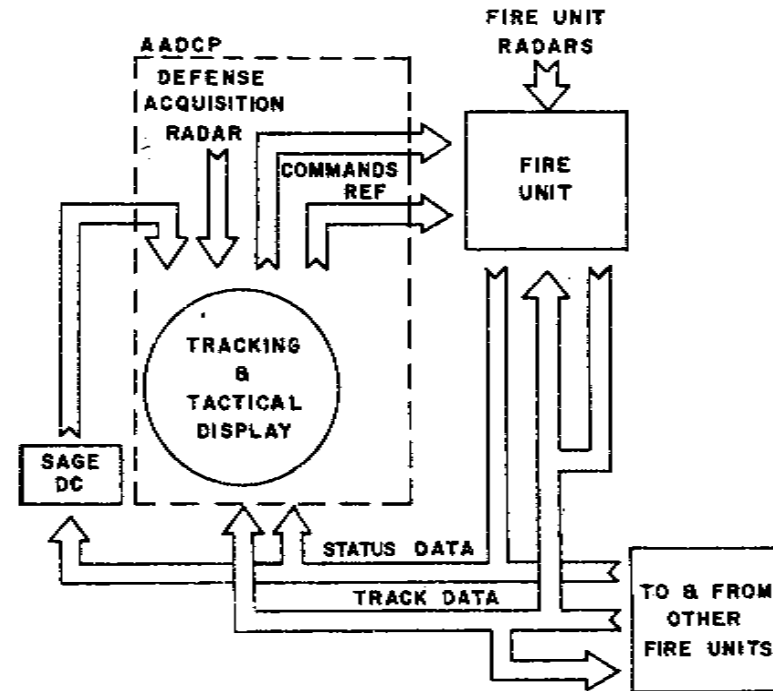


Figure 2. Data flow, FDS AN/GSG-5(V) (BIRDIE).

a. The 1-console system employs one shelter and integrates up to 4 fire units.

b. The 2-console system employs two shelters and integrates up to 8 fire units.

c. The 3-console system employs 2 shelters and integrates up to 12 fire units.

d. The 4-console system employs 3 shelters and integrates up to 16 fire units.

31. System Capabilities

a. FM 44-14 contains detailed operating instructions, system characteristics, and ECCM operations.

b. TM 11-5895-274-12 contains system operating procedures, console operating procedures, technical characteristics, ECM and

ECCM information, system checkout, and maintenance instructions.

32. Personnel

a. Army Air Defense Commander. The AADC supervises the conduct of defense operations. He maintains liaison with the commander of the NSDC. In addition, he insures that tactical doctrine and SOP's are followed. The efficiency of the defense operations are constantly analyzed and fire direction exercised when required.

b. Air Defense Artillery Operations Officer (ADAOO).

- (1) The ADAOO is responsible for the training and supervision of all personnel in his section.
- (2) He organizes the system for efficient operation by providing standby crews for training drills as well as actual operations.
- (3) He directs the defense action to implement the decisions of the AADC. In addition, he—
 - (a) Insures that the AADC and higher echelons are informed of all pertinent data concerning the status of the defense.
 - (b) Disseminates air defense warning, states of alert, and weapons control status (centralized or decentralized) to all units.
 - (c) Supervises the operations of the monitor consoles and informs all personnel of the mode under which the system is operating.
 - (d) Supervises tactical operations.
 - (e) Insures the proper warhead utilization by fire units by considering the type of target, target location, and weapons control case.
 - (f) Insures acknowledgment from the fire units and verbal reports of all unit tactical actions.
 - (g) Maintains necessary operational logs and prepares reports as prescribed by SOP.
 - (h) Performs the duties of the AADC in his absence.

c. Tactical Director.

- (1) The tactical director is the monitor console operator and monitors the tactical air situation in the immediate defense area.
- (2) In addition, he—
 - (a) Monitors each fire unit's action to determine proper correlation of fire unit engagements of target tracks.

- (b) Monitors SAGE reference data and reports track errors by voice to NSDC SAGE.
- (c) Designates SAGE reference tracks, or designates local target data to fire units in the absence of SAGE data.
- (d) Tracks local target using manual rate-aided tracking.
- (e) Constantly updates SAGE data.
- (f) Selects radar video to be displayed.
- (g) Performs other duties as directed.

d. Tactical Director Assistant. The tactical director assistant provides shift relief for the tactical director and performs such additional duties as directed.

e. Detachment Sergeant. The detachment sergeant is the primary enlisted assistant to the ADAOO. He supervises the activities of the enlisted personnel in his section. In addition to assisting the ADAOO, he—

- (1) Insures that the status boards are properly posted.
- (2) Assists in reconciling early warning information as it is received.

f. Plotters. The duties of the plotter, records plotter, and status plotter include—

- (1) Accurately posting the defense status board.
- (2) Plotting locations of aerial activity on the operations and early warning boards.
- (3) Maintaining the operations log and preparing reports in accordance with SOP.

33. System Operations

The system operations contained in paragraph 26 are applicable to FDS AN/GSG-5(V)

34. Monitor Console Displays

a. Monitor Console Symbolology. The monitor console displays five basic symbols: SAGE symbols, local symbols, SAGE manual symbols, fire unit symbols, and the leader line.

- (1) *SAGE symbols* identify the SAGE tracks as to priority (priority or nonpriority), identity (hostile or friendly), and give the positions of tracks in respect to the AN/GSG-5(V) system. All SAGE symbols are 1/8-inch in diameter.
 - (a) A priority SAGE track flashes at a distinctive rate.
 - (b) A nonpriority SAGE track remains as a constant display (does not flash).
 - (c) A hostile track is displayed as a circle.

- (d) A friendly track is displayed as a partial circle with the blanked portion of the circle appearing on the bottom.
- (2) *Local symbols* identify the tracks (friendly, unidentified, or hostile) and provide the positions of the tracks with respect to the AN/GSG-5(V) system. All local symbols are 1/4-inch in diameter.
- (a) A friendly track is displayed as a partial circle with the blanked portion of the circle appearing on the bottom.
- (b) An unidentified track is displayed as a partial circle with the blanked portion of the circle appearing on the top.
- (c) A hostile track is displayed as a circle.
- (3) *SAGE manual symbols* identify a SAGE track that has been temporarily placed under local control of the AN/GSG-5(V) system. SAGE manual symbols are identical to local symbols, except for priority tracks that flash at a distinctive rate.
- (4) *Fire unit symbols* identify and provide information on fire unit status. A fire unit symbol appears as either a dot or a cross. When a ready, effective, or ineffective status is received, a dot symbol appears at the position of the corresponding fire unit. This indicates the fire unit status as active and nontracking. When a tracking, firing, or kill status is received, the corresponding fire unit symbol is a cross and will appear at the track position. The fire unit tracks associated with a particular monitor console are 1/4-inch crosses. The same fire unit tracks are displayed on the other monitor consoles as 1/8-inch crosses.
- (5) *The leader line* is displayed to indicate the track (SAGE, SAGE manual, or local) that is under close control by that monitor console. The leader line originates at the center of the display screen and extends to the track symbol that is under close control.

b. Monitor Console Video. Four types of video that may be displayed are local radar video, IFF video, range and angle marks, and map video. The video available at each AADCP is dependent upon the type of local radar used.

- (1) *Radar video* is received from the local radar as either normal video or moving target indicator video.
- (2) *IFF video* provides identity means for local radar video.

- (3) *Range marks (rings) and angle marks (radial lines)* can be displayed to assist the console operator in estimating the position coordinates of a track.
- (4) *Map video* displays selected local terrain features. Map video and range and angle marks cannot be displayed simultaneously.

35. AADCP Operations

a. The AN/GSG-5(V) system can operate in any one of the four modes as determined by the tactical situation and the controlling NSDC SAGE.

- (1) *NORAD mode I.* Mode I is the normal mode of operation. The system operates with its associated NSDC SAGE in the reference options.
- (2) *NORAD mode II.* Mode II operation is the same as NORAD mode I except that the adjacent NSDC SAGE supplies the data to the AN/GSG-5(V) system.
- (3) *NORAD mode III.* In mode III operation the AN/GSG-5(V) AADCP is under the operational control of the NCC.
- (4) *NORAD mode IV.* In mode IV operation, if the AADCP is not collocated with the NCC and loses all communications with the NCC (except due to natural causes), the AADCP will operate autonomously. If a fire unit loses all communications with the AADCP (except due to natural causes), the battery will operate autonomously.

b. Weapons Control Status. The weapons control status governs the engagement procedures for fire units.

- (1) *Centralized.* Direct target-to-fire unit assignments are made either by the NCC or the AADCP and the fire units engage only designated targets. This status should be used only when there are few hostiles in the defense system.
- (2) *Decentralized.* In this status the fire units select targets for engagement in accordance with established rules for target selection. The AADCP furnishes track information on all hostiles and monitors fire unit actions to insure the overall effectiveness of the defense. Assignment of specific targets to individual fire units usually should not be required.

Section II. FIRE DISTRIBUTION SYSTEM AN/GSG-6 (BIRDIE)

36. General

a. The FDS AN/GSG-6 BIRDIE consists of an AADCP, de-

fense acquisition radar, ADL to SAGE, ADL to the fire units, and BTE at each fire unit. The FDS is integrated with NORAD at NSDC SAGE or manual direction centers.

b. The AADCP receives track data from the defense acquisition radar and SAGE or manual direction centers. These data are displayed on the monitor console. Since the AN/GSG-6 system does not contain an electronic computer memory system, track data cannot be updated. The data from SAGE and the defense acquisition radar are monitored. Pointing data can be transmitted to the fire units thereby designating targets.

37. AADCP, AN/GSG-6

The AADCP consists of one shelter and a monitor console to integrate two missile fire units. The defense acquisition radar provides local track data to the system.

38. System Capabilities

a. FM 44-14 contains detailed operating instructions, system characteristics, and ECCM operations.

b. TM 11-5895-275-12 contains system operating procedures, console operating procedures, technical characteristics, ECM and ECCM information, system checkout, and maintenance instructions.

39. System Operations

The system operations contained in paragraph 26 are applicable to FDS AN/GSG-6.

40. Monitor Console Operations

a. In NORAD modes I and II the monitor console operator performs the following operations:

- (1) Designates SAGE reference tracks to either or both fire units.
- (2) Monitors the action of the fire units.
- (3) Transmits fire unit tracks to the other fire unit.

b. In NORAD modes III and IV the monitor console operator performs the following operations:

- (1) Designates local tracks to either or both fire units.
- (2) Monitors the action of the fire units.
- (3) Transmits tracks of one fire unit to the other fire unit.

41. Monitor Console Displays

a. *Monitor Console Symbolology.* The monitor console displays three basic symbols: SAGE symbols, fire unit symbols, and a point symbol.

(1) *SAGE symbols* identify the SAGE track as to priority (priority or nonpriority) and identity (friendly or hostile) and give the positions of the tracks with respect to the AN/GSG-6 system. Priority tracks are displayed as 1/4-inch diameter symbols and the nonpriority tracks as 1/8-inch diameter symbols.

(a) Friendly track symbols are displayed as a partial circle with the blanked portion of the circle appearing on the bottom.

(b) Hostile track symbols are displayed as circles.

(2) *Fire unit symbols* will appear as either a dot or a 1/4-inch cross. When a ready, effective, or ineffective status is received, the corresponding fire unit symbol will appear as a dot. The dot symbol indicates an active, nontracking fire unit and appears at the coordinates of the fire unit. When a tracking, firing, or kill status is received, the corresponding fire unit cross symbol appears at the track coordinates.

(3) A *point symbol* appears as a 1/4-inch circle with a leader line for distinction. The leader line originates at the center of the display screen and extends to the point symbol.

b. *Monitor Console Video.* Four types of video may be displayed on the monitor console. They are local radar video, IFF video, range and angle marks, and map video. The video available will be determined by the type of local radar used.

(1) *Radar video* is received from the local radar as either normal video or moving target indicator video.

(2) *IFF video* identifies the local radar video.

(3) *Range marks (rings) and angle marks (radial lines)* can be simultaneously displayed to assist the monitor console operator in estimating the position coordinates of a track.

(4) *Map video* displays selected local terrain features. Map video cannot be displayed simultaneously with range and angle marks.

42. AADCP Operation.

The AADCP operations contained in paragraph 35 are applicable to FDS AN/GSG-6.

CHAPTER 5

ARMY AIR DEFENSE COMMAND POST (MISSILE MONITOR)

Section I. FIRE DISTRIBUTION SYSTEM AN/MSG-4 (MISSILE MONITOR)

43. General

The fire distribution system AN/MSG-4 Missile Monitor is a mobile, electronic air defense coordination system designed for use with AD missile systems in a theater of operations. Through the use of different methods and modes of operation the AADC assigns targets, redesignates targets, and monitors the activities of the associated AD units.

44. FDS AN/MSG-4

a. Missile Monitor links the group AADCP and associated battalion FDS's permitting the rapid exchange of information and facilitating the exercise of command. The AADCP AN/MSQ-28 consists of a frequency scan radar (FSR) AN/MPS-23, radar data processing equipment (RDPE), and group fire distribution center (GFDC). Missile Monitor integrates up to four battalion FDS's with the AADCP. The data flow of the FDS AN/MSG-4 (MISSILE MONITOR) is shown in figure 3.

b. The RDPE receives target video from the FSR and displays it on the detector-tracker consoles. The detected target data are entered into the electronic computer memory system. The tracker console operators update track data. Height data are entered by the range-height indicator operators. Raid size and identity can also be entered at the RDPE. The track data are then sent to the GFDC. The GFDC displays the track data on weapons monitoring consoles. Data are also received from Tactical Air Force (TAF) and exchanged with adjacent AADCP's. The GFDC weapons monitoring console operators monitor the tracks and transmit commands and reference data to all associated fire units through the battalion fire distribution center (BFDC).

c. The BFDC console operators monitor data received from GFDC and enter track data received from the battalion local radar into the system. The BFDC is also equipped to make weapon as-

signments independently of the GFDC. The BFDC transmits commands and reference data to all associated fire units.

d. Battery track data and status data are transmitted to the BFDC. The track data are then transmitted by the BFDC to all other associated batteries as referenced data. The BFDC also transmits the track data from all its associated batteries to the GFDC. The track data are then transmitted by the GFDC to all other BFDC's as reference data.

45. AADCP AN/MSQ-28

The AADCP of the Missile Monitor system is the command post of the air defense artillery group commander. The major AADCP operations are performed in the RDPE and the GFDC. An operations central AN/MTQ-1 is provided as manual backup for the AADCP AN/MSQ-28.

a. The RDPE provides facilities to process tracks within the AADCP. This equipment includes six detector-tracker consoles and two range-height indicators (RHI).

b. The GFDC provides the means by which the AADC exercises command supervision. Utilizing four weapons monitoring consoles, the operators monitor the activities of the associated fire units and transmit reference data for battery target selection and friendly protection.

c. Should the AADCP AN/MSQ-28 system become nonoperational (equipment malfunction, disruption of communications, or enemy action) the operations central AN/MTQ-1 provides the necessary facilities for manual operation. The operations central AN/MTQ-1 also provides flexibility by controlling those units not equipped for semiautomatic fire distribution system operation and those additional units beyond the integrating capacity of the AADCP, AN/MSQ-28. The operations central AN/MTQ-1 system is presented in chapter 6.

46. System Capabilities

FM 44-13 contains detailed operating instructions, system capabilities, and system characteristics. FM 44-1 contains operations pertinent to the AADCP, Missile Monitor.

47. Personnel

a. Section Commander.

- (1) The section commander is responsible to the AADC for all activities of the AADCP headquarters (Missile Monitor). The maintenance responsibility is carried out by command supervision of the signal corps air defense maintenance team (TOE 11-500R).

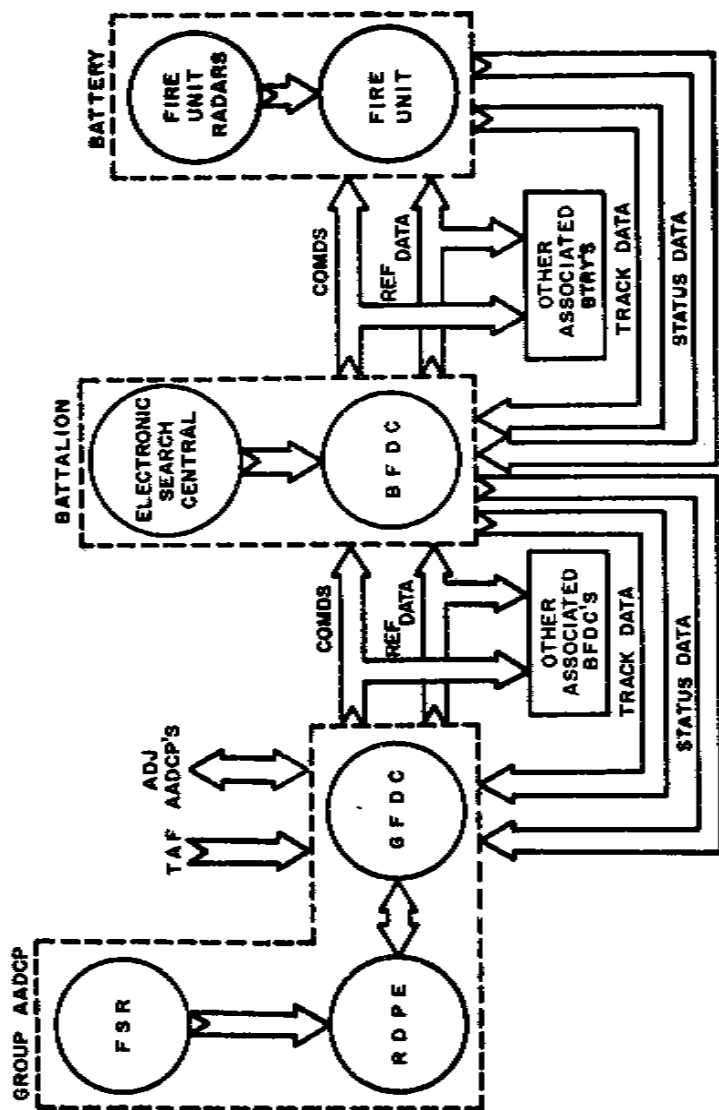


Figure 3. Data flow, FDS AN/MSG-4 (Missile Monitor).

(2) The section commander may act as the ADAOO.

b. *Executive Officer.*

(1) The executive officer assists the section commander in the control and administration of the AADCP headquarters.

(2) He may act as the ADAOO.

c. *Air Defense Artillery Operations Officer (ADAOO).*

(1) The senior officer on each shift performs duties as the ADAOO and supervises the operation of the GFDC.

(2) The ADAOO monitors the actions of other operations personnel and performs additional duties prescribed by the AADC.

d. *Tactical Directors.*

(1) The tactical directors operate the weapons monitoring consoles in the GFDC.

(2) Within the limits of SOP, they make specific action assignments and monitor fire unit action.

(3) They perform duties as prescribed by the ADAOO.

e. *Surveillance and Entry Officer.* The surveillance and entry officer is the senior officer on shift in the RDPE and is responsible to the ADAOO for RDPE operations.

f. *Operations Sergeant.*

(1) The operations sergeant is the chief enlisted assistant to the section commander and executive officer.

(2) He performs supervisory duties and assists in administrative and logistical matters.

(3) He coordinates the training of enlisted personnel.

(4) He performs additional duties as directed by the section commander.

g. *Section Chief.*

(1) The section chief is the senior noncommissioned officer assigned to each shift and performs supervisory duties under the direction of the ADAOO or operations sergeant.

(2) He is directly responsible to the ADAOO for march order and emplacement of the AADCP.

(3) He operates a detector-tracker console in the RDPE and performs additional duties prescribed by the section commander.

h. *Senior Fire Distribution Operator.*

(1) The senior fire distribution operator operates a detector-tracker console in the RDPE.

- (2) He collects and evaluates AD information through the use of his console.
- (3) He performs additional duties as directed by the section chief.

i. Fire Distribution Operators. The fire distribution operators operate detector-tracker consoles in the RDPE. They also perform additional duties prescribed by the section chief.

j. Range-Height Indicator (RHI) Operators. The RHI operators operate the RHI's in the RDPE. They perform additional duties as prescribed by the section chief.

k. Target Trackers.

- (1) The target trackers operate detector-tracker consoles in the RDPE.
- (2) They perform additional duties prescribed by the section chief.

l. Plotters.

- (1) The chief plotter and two plotters maintain a manual target plotting system to provide an alternate means of reporting AD intelligence.
- (2) The AADCP AN/MSQ-28 operators are cross-trained to provide full scale manual operations in the event the AADCP AN/MSQ-28 becomes nonoperational.

m. Radar Operator. The radar operator is the electronic counter countermeasure (ECCM) controller and operates the ECCM console in the radar van.

48. System Operations

The Missile Monitor system is capable of being operated in six different switch selected electrical configurations called methods of operations. These configurations are essentially different ways of channeling information through the automatic data link (ADL). The six methods of operation are—

a. The normal method which provides the AADC with two-way ADL with all units in the defense. GFDC can send selected reference data and commands to and receive tracking data from all fire units. BFDC cannot automatically transmit to its fire units while in this method of operation, but it can provide supplemental radar coverage by entering locally acquired radar data.

b. The sector method which provides the AADC with two-way ADL with a portion of the defense and limited ADL with the remainder. In the sector method of operation the battalion commander exercises fire supervision for his own fire units from the BFDC and receives reference data from the GFDC.

c. The independent method which provides ADL between a battalion and its own fire units but does not afford ADL with the GFDC or other BFDC's. Means may be established to receive data from TAF and exchange data with adjacent AADCP's.

d. The AADCP survey method which serves essentially to locate all units in the defense with respect to the AADCP. This survey involves determining the parallax and earth curvature corrections to all units in the defense from the AADCP.

e. The battery survey method which serves essentially to locate all units in the defense with respect to one selected battery. This survey involves determining the parallax and earth curvature corrections to all units in the defense from one of the fire units.

f. The emergency methods which are used when the GFDC is inoperative, GFDC displays are inoperative, and GFDC drum is inoperative. These emergency methods of operation are contained in FM 44-13.

49. Frequency Scan Radar (FSR)

a. The FSR is packaged in two trailers. One contains the frequency scan antenna and the other contains transmitter and receiver equipment, operating consoles, ECCM console, and maintenance equipment.

b. The FSR provides three-dimensional surveillance. It supplies azimuth angle, elevation angle, and range data simultaneously from a single antenna, transmitter, and receiver.

c. The FSR incorporates moving target indication (MTI) circuitry which blanks out background clutter. It is capable of azimuth sector scanning (manually) as well as 360° rotation. It provides variable scan rates in elevation and azimuth and uses variable pulse repetition frequencies. The changing radiation frequency gives this radar inherent resistance against active enemy jamming.

50. Radar Data Processing Equipment (RDPE)

The RDPE is contained within one trailer. The FSR data received by the RDPE is used to generate the plan position indicator (PPI) and RHI sweeps in order to display video on the six-detector-tracker and two range-height indicators. The FSR data is also digitalized for use by the high speed tracking computer. This computer performs automatic tracking for many targets simultaneously and aids the operators in performing manual tracking. The digital track data generated by the computer are stored in a drum memory, then converted to analog form for display as track marker symbols on the detector-tracker consoles.

51. Group Fire Distribution Center (GFDC)

a. The four weapons monitoring consoles and equipment of the GFDC are contained within one van. All the track data stored in the GFDC drum memory can be displayed on the weapons monitoring consoles. Because of the large number of tracks being received from the RDPE, BFDC's, adjacent AADCP's, and TAF, selection switches are provided at each console for screening out unwanted tracks. Tracks may be accepted for display or screened according to several tactical criteria, including source, altitude, range, and identity. Blinking of remote tracks distinguishes them from the locally generated tracks. The battery locations are also displayed.

b. A hostile track engaged by an associated fire unit is displayed at the GFDC. The GFDC can direct a specific target to be engaged by a specific fire unit.

52. Console Displays

a. *Console Symbolology (RDPE and GFDC).* Information received over the ADL is displayed as symbols. All or any part of the following markers may be displayed.

- (1) Remote engagements are displayed by a flashing cross or an association line. If the symbol appears but does not flash, it is a local engagement.
- (2) A track identified as hostile is indicated by crossed vertical and horizontal ellipses. Tracks identified as friendly are indicated by a circle and unknown tracks are indicated by concentric circles.
- (3) Concentric circles (two times as large as the unknown marker) indicate a new drum memory channel. This symbol at GFDC indicates the position of the hand control.
- (4) A horizontal ellipse indicates the battery has transmitted an effective report for that track.
- (5) A focused dot (displayed only on the weapons monitoring consoles) indicates battery location. A dotted line between the battery markers and a hostile track indicate an assignment. A solid line between the battery markers and hostile tracks indicates engagement.

b. *Console Video.* Two types of video may be displayed on the detector-tracker consoles in the RDPE. They are IFF video and radar video.

- (1) IFF video identifies the local radar video.
- (2) Radar video is received from the local radar as either normal video or moving target indicator video.

53. AADCP Operations

The centralized or the decentralized mode of operation may be used in the normal, sector, or independent methods of operation. The desired mode is put into effect verbally and does not require system changes.

a. In the centralized mode, target assignments are made directly from GFDC or BFDC, depending on the method of operation, and fire units are permitted to attack only designated targets. The primary advantage of the centralized mode is that fire distribution is retained at the highest possible echelon of command. The disadvantages of this mode are that the air defense situation may develop too rapidly for a small group of operators to provide efficient control and that reliance on the prime acquisition radar increases ECM vulnerability.

b. In the decentralized mode of operation, the fire unit commander selects targets for attack in accordance with standing operating procedures and through judicious use of furnished reference data. The GFDC or BFDC provides the fire unit commanders with the most accurate information available by ADL and monitors fire unit actions. Although the flexibility of operation afforded by the FDS allows efficient operation in this mode, the coordination of the overall effort of the air defense complex may require direction of fires by the GFDC. In instances where a sector is saturated or the prime acquisition radar rendered ineffective due to ECM or electronic failure the decentralized mode is preferred.

c. The defense or portions of the defense may be operated in either the centralized or decentralized modes or some appropriate combination depending upon the momentary tactical situation and the defense SOP.

Section II. FIRE DISTRIBUTION SYSTEM AN/MSQ-18

54. General

a. The FDS AN/MSQ-18, while designed to operate as a portion of the FDS AN/MSG-4 (Missile Monitor), may be employed independently. The BFDC would then be established as the AADCP and the battalion commander would assume the duties of the AADC.

b. Another FDS similar to the FDS AN/MSQ-18 is the FDS AN/TSQ-38 (air transportable). It is a semiautomatic air defense coordination system contained in shelters rather than in vehicles to improve its air transportability. The FDS AN/TSQ-38 (air transportable) is employed as a portion of the FDS AN/

MSG-4 (Missile Monitor) or independently in the same manner as the FDS AN/MSQ-18. TM 11-5895-291-10 contains operating instructions for the FDS AN/TSQ-38 (air transportable).

55. FDS AN/MSQ-18

The FDS AN/MSQ-18 consists of a battalion fire distribution center (BFDC), electronic search central AN/GSS-1, and battery terminal equipment with each associated fire unit. The FDS AN/MSQ-18 integrates up to eight fire units with the BFDC.

56. AADCP AN/MSQ-18

The battalion commander establishes the AADCP at the BFDC when operating independently. The operations performed include monitoring the air defense situation, disseminating reference data to the associated fire units, assigning targets to fire units as necessary, and supervising the actions of the fire units. The FDS AN/MSQ-18 does not contain an electronic computer memory system. Track data received from the local radar can be transmitted to the fire units and a pointing method used to assign a specific target to a specific fire unit.

57. System Capabilities

a. FM 44-13 contains operating instructions, system capabilities, and system characteristics.

b. TM 11-5895-262-10 contains operating instructions for the operators of the FDS AN/MSQ-18.

58. Personnel

a. *Section Chief.* The section chief is in charge of the battalion section. He supervises all activities of the section and is responsible to the battalion commander for—

- (1) Training and efficiency of personnel and rotation of duties.
- (2) Assisting in selection of the site for the BFDC.
- (3) Emplacement, march order, and efficient operation of all equipment used by the section.
- (4) The check for insertion of the proper parallax on the coordinate data set.
- (5) The observance of all safety precautions pertaining to service of the system.
- (6) The preparation of field fortifications for the protection of the BFDC and personnel.
- (7) Supervision of the entries in the operations logbook and record books.

b. *Senior Fire Distribution Operators.*

- (1) The senior operators operate the two consoles during operation.
- (2) They stow all of the internal BFDC equipment during march order.
- (3) They perform additional duties prescribed by the section chief.

c. *Fire Distribution Operators.*

- (1) These operators are employed as relief operators when directed by the section chief.
- (2) During emplacement or march order, they connect or disconnect BFDC connectors and perform additional duties prescribed by the section chief.

59. System Operations

a. The FDS AN/MSQ-18 is designed to normally operate as a portion of the FDS AN/MSG-4 (Missile Monitor). In this role the BFDC serves as a distribution center for the transmission of track and status data and voice communications between the AADCP and the fire units. The BFDC monitors the data transmissions and, based on data from its local radar, provides additional defense acquisition data when required.

b. The methods of operations used when the BFDC operates as a portion of Missile Monitor (par. 48) are not used when the FDS AN/MSQ-18 operates independently.

60. Console Displays

a. *Console Symbology.* The BFDC contains two identical consoles that display incoming information as symbology.

- (1) A track identified as hostile is indicated by a semicircle with the blanked portion on the bottom.
- (2) A track identified as friendly is indicated by a circle.
- (3) Information originating at the batteries is displayed as battery return markers. These markers are displayed as a semicircle with the blanked portion on the top. The battery return markers from batteries not tracking targets are displayed as positions corresponding to the locations of the batteries. The markers for batteries tracking targets are displayed at positions corresponding to the locations of the targets and are associated with the radar video of the targets.

b. *Console Video.* Two types of video are displayed on the BFDC consoles. They are IFF video and radar video.

61. AADCP Operations

The battalion commander establishes the mode of operation for the associated fire units as centralized or decentralized. The modes are described in paragraph 53.

CHAPTER 6

ARMY AIR DEFENSE COMMAND POST (MANUAL)

Section I. AADCP, MANUAL

62. General

A manual AADCP receives and transmits AD information and intelligence verbally by means of wire and radio. Information displayed in the AADCP is plotted and posted manually by the AADCP section. No automatic display and automatic data transmission means are available. Disadvantages of the manual AADCP include time loss in plotting and telling procedures, possibility of human error, and lack of complete information on targets being attacked by other AD fire units.

63. Requirements

a. Regardless of the echelon establishing the AADCP or the type of plotting equipment used, the following requirements exist:

- (1) *Communications.* Air defense artillery communications include all the means employed to transmit information, intelligence, and commands between ADA units and the means to establish liaison with other agencies. The basic means of communications available to all ADA units are radio, wire, and messenger. Available equipment and the tactical situation will govern the type of communications to be used.
- (2) *Early warning.* Early warning information is furnished to the AADCP and plotted either in the early warning rings of the operation board AN/MTQ-1 or on the early warning boards AN/TSA-2 and PT-171/TPS.
- (3) *Radar information.* Radar information is furnished to the AADCP from radars of the defense. This information normally is plotted on the operations board.
- (4) *Visual observer warning.* Visual observer warnings are furnished to the fire units and the AADCP by observers on OP's and with forward line units. The AADCP records this information on the auxiliary data display board or on the OP flashboard.
- (5) *Other warnings.* Other warnings may be received (e.g., from adjacent AADCP's) and displayed in the AADCP as required by the local situation.

(6) *Defense status.* Defense status depends on current equipment operating status, air defense warning, defense readiness condition, weapons control status, or the conditions of readiness (states of alert). In the AADCP such items are displayed on status boards.

b. The systems provided by TOE at brigade, group, battalion, or battery level for use with manual plotting and telling procedures are—

- (1) Operations center AN/MTQ-1.
- (2) Plotting equipment AN/TSA-2.
- (3) Plotting board PT-171/TPS.

Section II. PERSONNEL

64. General

Personnel to operate the manual AADCP are provided by augmentation to the TOE's of the ADA brigades, groups, and battalions. The personnel required to operate the manual AADCP are determined by the requirements of a specific situation. The personnel provided by TOE and their specific duties are listed in paragraphs 65 through 72.

65. Army Air Defense Commander (AADC)

The AADC establishes the AADCP. Further responsibilities of the AADC are contained in FM 44-1.

66. Air Defense Artillery Operations Officer (ADAOO)

The operations officer is the senior officer on duty in the AADCP. His duties include—

- a. Conducting the defense in the absence of the AADC.
- b. Supervising the operation of the AADCP.
- c. Evaluating information received by the AADCP.
- d. Disseminating AD intelligence.
- e. Exercising tactical supervision and fire distribution as necessary.
- f. Insuring compliance with operational directives of the AADC.
- g. Disseminating air defense warning.
- h. Establishing the condition of readiness (states of alert) of the defense in accordance with published SOP's.
- i. Passing track information to the Air Force identification agency and track information from the Air Force or other agencies to elements of the defense in accordance with SOP.

j. Supervising maintenance of journals.

k. Coordinating unit maintenance schedules in order to permit major items of equipment to be withdrawn from the defense for short periods of time without sacrificing the integrity of the defense.

67. Assistant Air Defense Artillery Operations Officer

Assistant operations officers will be required for sustained operations. The number will depend on the size and type of defense and the degree of activity. Their duties include—

- a. Assisting the ADAOO as directed in the exercise of his functions.
- b. Assisting the ADAOO by monitoring the activities of the plotters and tellers.
- c. Assisting the ADAOO by monitoring the activities of fire units.
- d. Performing such other duties as directed by the ADAOO.

68. Identification Officer

When operating autonomously, every attempt must be made to identify aircraft. The identification officer will do this by establishing liaison with available Air Force agencies. He will also establish procedures for radars equipped with IFF capabilities. The identification officer at defense level is not provided by TOE but appointed by the AADC.

69. Chief Plotter

The chief plotter supervises the activities of all enlisted personnel on duty in the AADCP. His duties include—

- a. Insuring that the status boards are properly posted.
- b. Supervising the activities of the plotters and insuring that information is properly plotted.
- c. Supervising the changing of enlisted personnel during the change of shifts.
- d. Insuring that track stands for each track appear on the operations board (horizontal plotting).
- e. Assisting reconciliation of early warning information received from other agencies.
- f. Assigning track numbers to tracks originated by the AADCP.
- g. Performing other duties as directed by the ADAOO.

70. Plotters

a. The radar plotters are provided communications with one or more defense acquisition radars. During periods of hostile air

activity, one plotter normally is required to receive information from each defense acquisition radar in operation. During periods of lesser activity, one trained plotter can plot the information received from more than one defense acquisition radar. Duties of the plotters include—

- (1) Receiving target information from defense acquisition radars.
- (2) Plotting locations of aerial activity on the operations board.
- (3) Placing tracks to the operations board adjacent to the plotting arrows to which the information pertains (horizontal plotting), or verifying target information recorded on the operations board (vertical plotting).

b. The early warning plotter has direct wire or radio communications with the Air Force early warning agency. Duties of the early warning plotter include—

- (1) Receiving AD intelligence concerning friendly and hostile aircraft from Air Force agencies.
- (2) Plotting locations of targets in the early warning rings on the operations board (AN/MTQ-1), or on the early warning board (AN/TSA-2 and PT-171/TPS).

c. The OP flash recorded monitors the OP flash net and records pertinent target information on the auxiliary data display board (AN/MTQ-1) or on the OP flashboard. As soon as the ADAOO evaluates the message and takes any necessary action, the OP flash recorded removes the information.

d. Additional plotters may be necessary if data are being received from other agencies. Their duties are the same as described above.

71. Intelligence Teller

The intelligence teller transmits pertinent track information displayed on the AADCP operations board to the elements of the defense. His duties include—

- a. Transmitting intelligence as directed by the ADAOO.
- b. Assisting in maintaining journals.

72. Operations Journal Recorder

The AADCP operations journal is maintained by the operations journal recorder under the supervision of the ADAOO. The consolidation of Army air defense after action reports will also be maintained by the journal recorder based on information received from the units.

Section III. EQUIPMENT

73. General

The manual AADCP equipment is provided by augmentation to the ADA brigade, group, and battalion TOE's. General descriptions of the manual AADCP equipment are listed in paragraphs 74 through 82. The appropriate field manuals and technical manuals of the associated equipment should be consulted for more specific descriptions and operations.

74. Operations Center AN/MTQ-1

a. The operations center provides the communications, display boards, plotting equipment, and operating and control positions in a semitrailer van to facilitate the AADCP operations using manual plotting and telling procedures. A cutaway view of the operations center AN/MTQ-1 is shown in figure 4.

b. A description of the equipment, communications requirements, site selection, duties of personnel, and operations are contained in FM 44-9. Technical details and adjustments are contained in TM 11-5550.

c. The principal functions performed within the operations center are to—

- (1) Receive early warning of aircraft flights by wire or radio. This information is plotted on the early warning rings of the operations board.
- (2) Receive information of aircraft flights within the defense area from radar reporting posts by wire or radio.
- (3) Receive identification of the plotted aircraft flights by wire or radio.
- (4) Receive fire unit status reports by wire or radio and post on status board.
- (5) Disseminate early warning, target location and identification, and operational and administrative information by wire or radio.

75. Plotting Equipment AN/TSA-2

The plotting equipment AN/TSA-2 consists of display boards and plotting equipment required for the operations room of an AADCP using manual plotting and telling procedures. Communications, power, and lighting equipment are not included in the equipment set. Technical instructions and maintenance are contained in TM 11-2582.

76. Operations Board

The operations board is prepared specifically for each defense area. It is a plotting board gridded to portray GEOREF

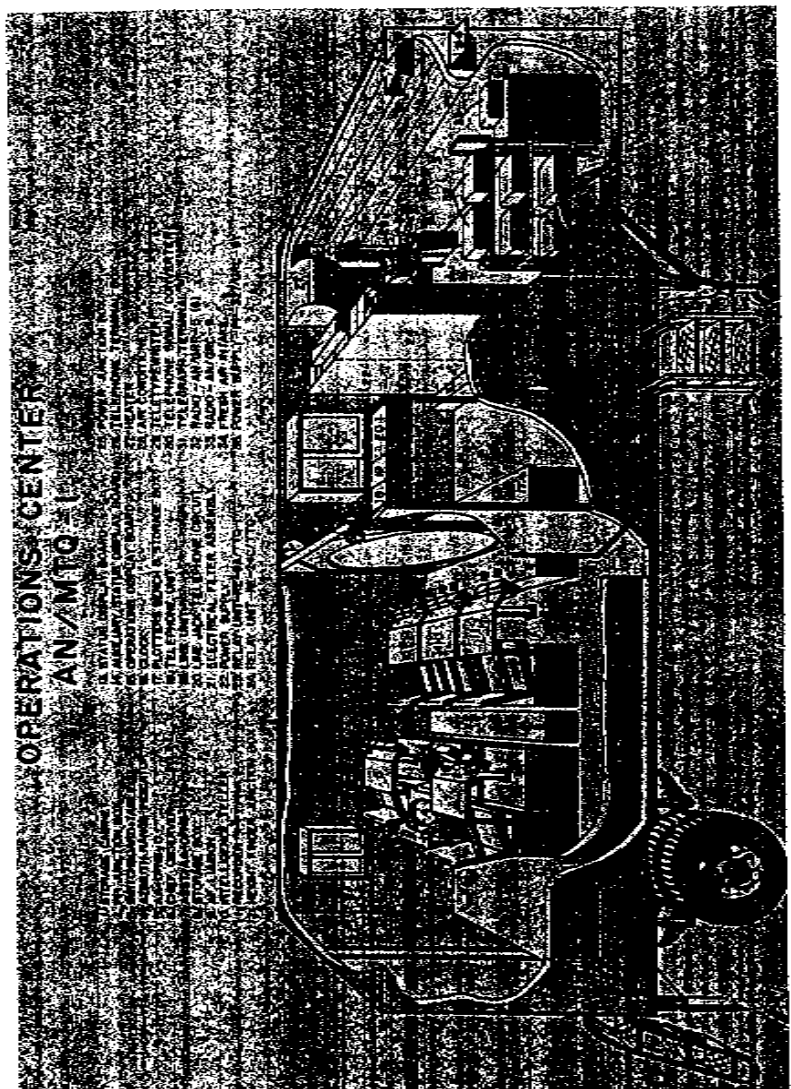


Figure 4. Operations center, AN/MTQ-1 (cutaway view).

coordinates with the vital area plotted in the center. The scale of the operations board will vary with the area that must be displayed. The area represented should extend sufficiently beyond fire unit acquisition range to permit detection, identification, and transfer of targets to fire units in time to permit engagement at maximum possible range. Only enough detail should be included on the plotting board to facilitate its use. A typical operations board with track stands is shown in figure 5. The range capabilities of individual units and the primary sectors of fire should be included. An example of sectors of fire is shown in figure 6. The board should be large enough that displayed tracks and track data can be easily viewed from any position in the operations room. Communications outlets should be made available at the operations board to facilitate plotting information from radar reporting, early warning, and other air defense information nets.

77. Track Stands

When horizontal plotting techniques are used, the track stand is used to display track data. While they are issued with TOE equipment to certain units, they may also be improvised. Flagged track stands display such target data as track number, number of aircraft, identity, and altitude.

78. Track Status Board

A track status board is used to display significant tactical and intelligence data and pertinent track information relating to each track. In the AN/MTQ-1 operations center, it may be used to display OP flash messages as well as track data.

79. Defense Status Board

The operating status of units in the defense and other pertinent data are displayed on a status board. The use and design of the board will vary with the individual defense area and the particular AADCP requirements. Information of local defense operations displayed can include—

- a. Defense readiness condition.
- b. Air defense warning.
- c. Weapons control status.
- d. States of alert.
- e. Unit and material status.
- f. Radar operational schedules.

80. Early Warning Board

The early warning board is a plotting board gridded to portray GEOREF coordinates. It contains the area displayed on the

OPERATIONS CENTER AN/MTQ-1

- | | | |
|------------------------------|-----------------------------------|----------------------------------|
| 1 STORAGE CABINET | 13 STATUS DISPLAY BOARD | 25 POWER JUNCTION BOX |
| 2 PPL JUNCTION BOX | 14 AUXILIARY STATUS DISPLAY BOARD | 26 TELEPHONE TERMINAL BOX |
| 3 OPERATOR'S SEAT | 15 OPERATIONS DISPLAY BOARD | 27 HEATER |
| 4 SIGNAL RANGE INDICATOR | 16 CLOCK | 28 AIR CONDITIONER |
| 5 AA-OPMG-D | 17 PLATTERS BENCH & STORAGE BOX | 29 TELETYPEWRITER |
| 6 CHIEF OBSERVER | 18 TELEPHONE UNIT | 30 TELEPHONE SIGNAL CONVERTER |
| 7 ASST. AA-OPMG-D | 19 LINE JACK TELEPHONE CIRCUIT | 31 TELEPHONE TERMINAL |
| 8 STORAGE BOX | 20 LINE JACK TELEPHONE CIRCUIT | 32 RADIO - AN/URR-5 (B) |
| 9 AF LIAISON | 21 ELECTRICAL FILTER ASSEMBLY | 33 RADIO - AN/URC-8 |
| 10 INTELLIGENCE TELLER | 22 POWER SUPPLY | 34 FRESH AIR INTAKE |
| 11 RECORDER | 23 RELAY UNIT - RE-8A/TTC-1 | 35 POWER SUPPLY - PPL-227/URC-97 |
| 12 HEAVY-FINDER JUNCTION BOX | 24 RELAY UNIT - RE-5C/TTC-3 | |

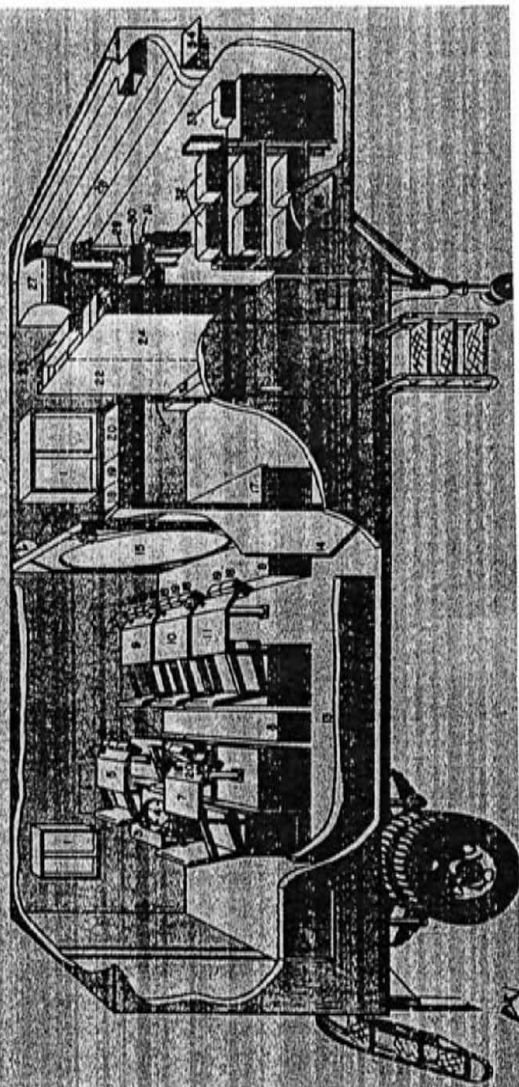


Figure 4. Operations center, AN/MTQ-1 (cutaway view).

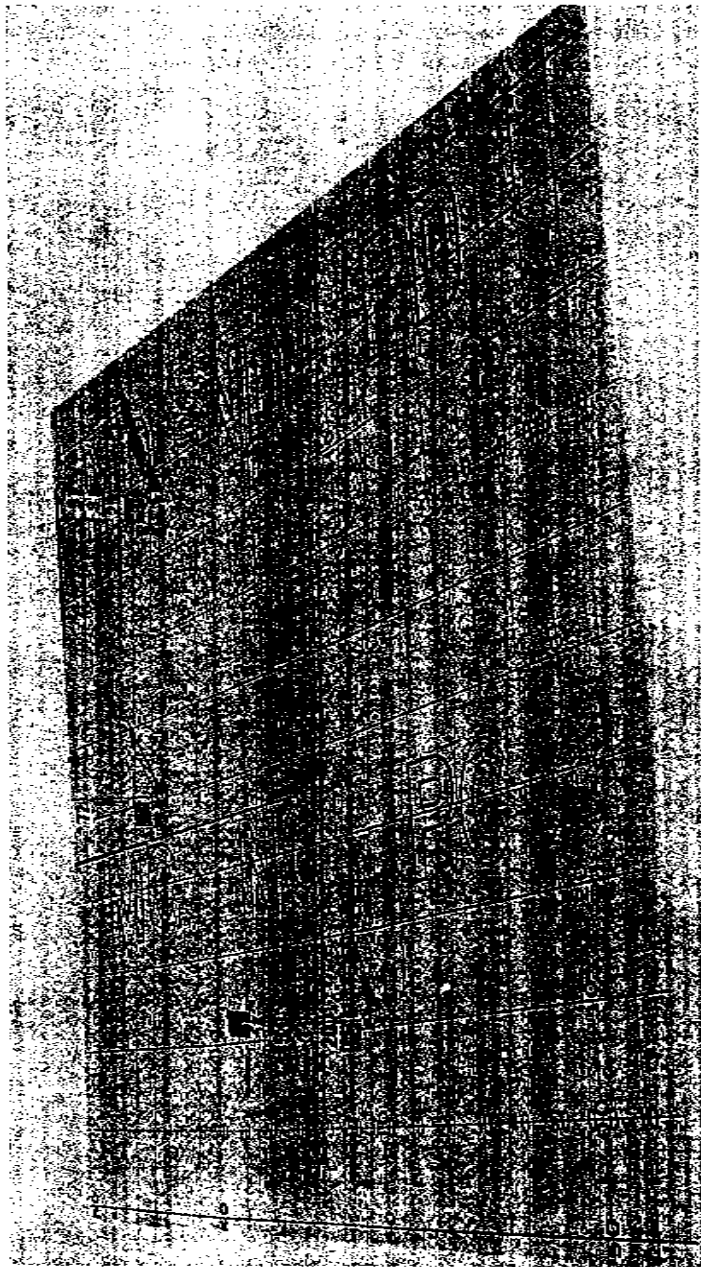


Figure 5. Typical operations board with track stands.

operations board and sufficient additional surrounding area to permit the display of early warning information. The size and area included on the early warning board will vary with the requirements of a particular defense.

81. Plotting Board PT-171/TPS

The plotting board PT-171/TPS contains an azimuth scale graduated in mils and a cursor graduated from 10 to 180 (in terms of thousands of yards) that pivot around a stud in the center of the board. This board is normally used as an early warning board in an AADCP and is also provided with the electronic search central AN/GSS-1 for plotting radar data. Technical information is contained in TM 11-1162.

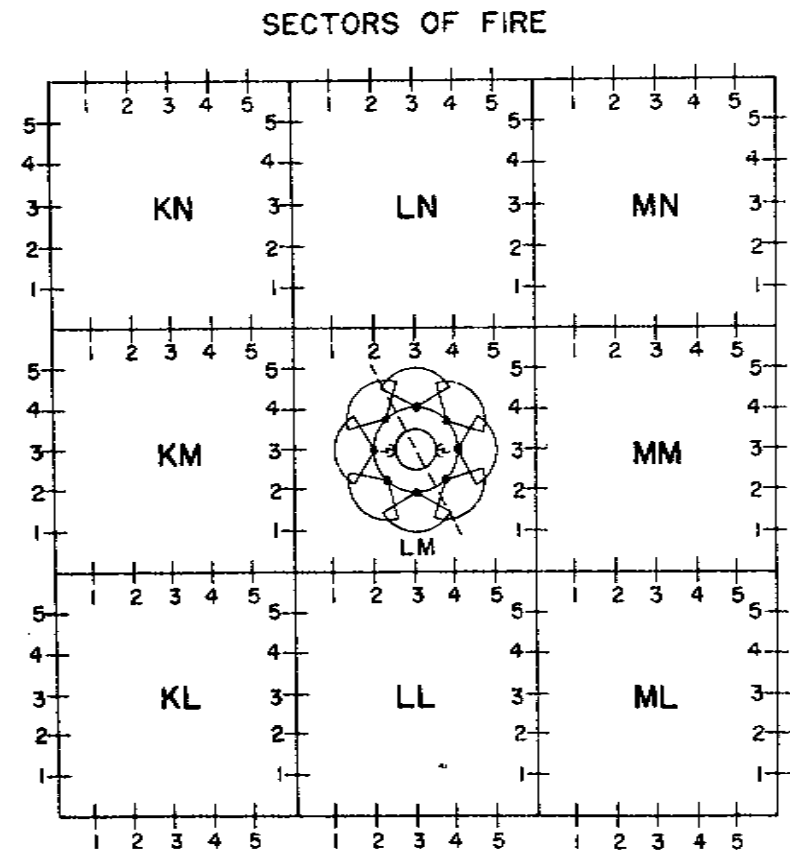


Figure 6. Example of sectors of fire.

82. Electronic Search Central AN/GSS-1

The AN/GSS-1 with its associated acquisition radar and IFF equipment is utilized for detecting targets. When the target is detected, the operator in the AN/GSS-1 plots the information (range and azimuth) on the PT-171/TPS within the AN/GSS-1. Concurrently he transmits the information and identity by radio or wire to the AADCP to be used by the manual plotters for early warning and plotting information. Several tracks can be controlled simultaneously when using this method. Description of equipment, emplacement and march order, operations, and duties of personnel are contained in FM 44-7. Technical information is contained in TM 11-1162.

Section IV. OPERATIONS

83. General

The AADCP receives information from three primary sources: other air defense agencies, organic radars, and visual OP's. This information must be evaluated for dissemination to the subordinate units. Effective fire distribution from an AADCP is dependent on the proper collection and evaluation of available AD information from all sources.

84. Collection and Evaluation of Target Information

a. The early warning that is received from other agencies is transmitted to the AADCP by the Army air defense liaison officer (AADLO). The AADCP may have communications with one or more agencies, depending upon the expected value of the information to be received from each and the communications available. A plotter in the AADCP is connected by direct communications to the teller at each agency. Information received concerning approaching targets is plotted on the early warning board or in the early warning rings (AN/MTQ-1). This initial location information is recorded as a plot and next to it or on a separate data display board, pertinent details that the warning source is able to offer are recorded. Each recorded target is assigned a target number to identify it. When further location information is received, the plot becomes a track and continues to be recorded until it is at a sufficiently close range to be detected by the organic radars and plotted on the operations board. The track may then be erased from the early warning board. The AADLO should then be advised to cease telling on that track.

b. Each organic radar teller is connected by direct communications to a plotter at the operations board in the AADCP. This

plotter records, as a track, all target information that he receives from his radar. Targets observed on the radar PPI screen will be reported in accordance with SOP. Telling will cease on targets as directed by the AADCP.

c. The evaluation of information received in the AADCP is accomplished by the AADC or his representative, the ADAOO. Although much of the transmission of information from other agencies and the defense acquisition radars is routine, the ADAOO utilizes all available information in evaluation of targets. The ADAOO must evaluate track information reported by organic radars. He should request identification on significant tracks as determined by location, speed, direction of travel, or other criteria established by local SOP. Excessive radar reporting can saturate the operations board. Indiscriminate requests for identification can saturate the identification agency. Screening must start with the ADAOO and be carried out at all echelons. Only when information has been properly evaluated may it be treated as AD intelligence, and then acted upon.

85. Dissemination of Target Data

a. Target information is disseminated to units subordinate to the AADCP by the intelligence teller who is in direct communication with lower echelons. In the AADCP, he is located in a place that affords a clear view of the various display boards. The teller immediately transmits to lower echelons information on all plots as they appear on the operations board. He should tell as many plots as possible on all tracks.

b. The ADAOO disseminates, over the intelligence net, the defense readiness condition, air defense warning, weapons control status, states of alert, IFF code changes, special flight regulations, location of aircraft of interest to the defense, and other essential elements of information. In defenses where large numbers of units are involved, the dissemination of this information may necessitate additional communications lines from the AADCP. This increase in communications lines will result in a number of command nets controlled by the ADAOO but manned by other personnel in the AADCP. In order for intelligence disseminated by the AADCP to have any real value at lower levels, these echelons must be capable of understanding its meaning correctly and acting upon it confidently. Thus all lower levels must possess plotting equipment gridded in the appropriate positioning referencing grid. The combined use of a common grid system and target numbering, will make target data exchange more accurate. Only by the correct use of such facilities can disseminated intelligence be properly utilized.

86. Plotting Procedures

a. Plotting procedures are prescribed for use on the vertical operations board in the manual AADCP. The use of standard plotting procedures facilitates the rapid exchange of information between all air defense levels.

b. The operations board is used to display the local air defense situation. The area displayed should encompass the maximum radar coverage of the battery acquisition radars of the defense plus a minimum of 100 kilometers. Permanent markings are made on the side of the transparent board facing the control personnel and should be limited to GEOREF grid lines and designation for each 1° quadrangle, outlines of major terrain features, fire unit locations, primary target lines, acquisition radar coverage, and fire unit capabilities. Marking the grid lines every 10' will facilitate reading complete GEOREF coordinates by the control personnel.

c. Plotting procedures below are temporary markings made on the reverse side of the transparent board using china marking pencils.

- (1) Color coding of a plot is used to reflect track identity as follows:
 - (a) Red-hostile.
 - (b) Orange-unknown.
 - (c) White-friendly.
- (2) The track designator marking indicates the agency assigning the track number, the track number, and the agency reporting the track.
- (3) The initial plot is marked at the GEOREF grid position by a dot surrounded by a circle. The time of the plot is shown by a 2-digit figure placed adjacent to the plot.
- (4) Subsequent plots are marked at their GEOREF grid position by a dot and line connecting the previous plot, thereby creating a track. Direction is indicated by an arrowhead at the plot and the time of the plot is shown by a 2-digit figure adjacent to the arrowhead.

87. Telling Procedures

a. Telling procedures are prescribed for use by intelligence tellers in the manual AADCP. The use of standard telling procedures facilitates the rapid exchange of information between all air defense levels. The teller selects appropriate information from the operations board as it is plotted and disseminates it using the prescribed format.

b. Information is disseminated by tellers in the AADCP in the following sequence:

- (1) *Initial report.*
 - (a) INITIAL TRACK-alerts the fire unit plotters.
 - (b) IDENTITY-identifies the target as hostile, unknown, or friendly.
 - (c) TARGET POSITION AND COURSE-indicates the GEOREF position of the target in four digits and the direction of travel.
 - (d) TIME OF OBSERVATION-indicates the time the target was observed to the closest minute. The time is expressed in minutes only from "zero zero" to "five nine" with the hour omitted.
 - (e) TRACK DESIGNATOR-indicates the track number designator, the track number, and the agency reporting the track.
 - (f) NUMBER OF OBJECTS-indicates the number of objects in the track as one, few, many.
 - (g) TARGET SPEED-indicates the speed of the target in tens of knots.
 - (h) TARGET ALTITUDE-indicates the altitude of the target expressed as "Angels." ("Angels 4" is 4,000 feet; "Angels 40" is 40,000 feet; below 1,000 feet the altitude in feet is used.)
 - (i) ADDITIONAL REMARKS-provides additional information as ECM, SOS, etc.
 - (j) *Example:* "INITIAL TRACK.....HOSTILE.....AT LIMA CHARLIE ONE SIX FOUR ONE.....SOUTH-EAST.....TIME FIVE EIGHT..... TRACK PAPA WHISKEY THREE ZERO ONE CHARLIE DELTAOBJECTS ONE.....SPEED THREE FIVE..... ANGELS THREE ZERO."
- (2) *Subsequent reports.*
 - (a) TRACK DESIGNATOR.
 - (b) TARGET POSITION.
 - (c) TIME.
 - (d) REMARKS-indicates changes in initial report information not already mentioned.
 - (e) *Example:* "PAPA WHISKEY THREE ZERO ONE CHARLIE DELTA.....LIMA CHARLIE THREE ZERO THREE TWO.....TIME ZERO TWO."

c. Information is reported by acquisition radar personnel to the AADCP in the following sequence:

- (1) *Initial report.*

- (a) TRACK-alerts the AADCP plotter. FLASH may be used for high speed aircraft within an established FLASH line.
- (b) TRACK SUFFIX-indicates the agency reporting the track. This suffix is reported alone for initial plots only. After assignment of the track designator it is reported as part of the track designator
- (c) TARGET POSITION AND COURSE-indicates the GEOREF position of the target in four digits and the direction of travel.
- (d) TIME OF OBSERVATION-indicates the time the target was observed to the closest minute. Time is expressed in minutes only from "zero zero" to "five nine" with the hour omitted.
- (e) FORMATION-applies to multiple aircraft carried as a single track. This information is given in initial report or when there is additional information.
- (f) ADDITIONAL INFORMATION-includes amplifying information when necessary. Additional information should be held to the minimum and be brief.
- (g) *Example:* "TRACK.....CHARLIE DELTA.....LIMA CHARLIE ONE SIX FOUR ONE.....SOUTHEASTTIME FIVE EIGHT."

(2) *Subsequent report.*

- (a) TRACK DESIGNATOR-indicates the track number designator, track number, and reporting radar suffix. The radar personnel are notified the track designator after it has been established as a defense track. The track designator is abbreviated for radar reporting, but the reporting radar suffix is always given.
- (b) TARGET POSITION.
- (c) TIME.
- (d) FADED-indicates that the track has faded from the radar display screen several times. The track may be visible to another radar.
- (e) *Example:* "TRACK.....ZERO ONE CHARLIE DELTA.....LIMA CHARLIE THREE ZERO THREE TWO.....TIME ZERO TWO."

88. Fire Distribution

a. Manual fire distribution is the systematic application of fire on targets in order of their importance. Correct fire distribution is the responsibility of all fire unit commanders. Fire supervision to insure the most efficient distribution of fire is the responsibility of the AADC.

b. The ADAOO monitors the fire unit action to insure all targets are engaged and supervises the situation by shifting fires or assigning targets to specific fire units. All fire direction orders are transmitted to the fire units from the AADCP over the command net.

c. Rules for manual fire distribution are—

- (1) Engage all hostile aircraft at maximum permissible range with at least one fire unit engaging each target.
- (2) Engage the greatest immediate threat first. If all targets cannot be engaged at maximum range by at least one fire unit, those representing the greatest immediate threat are engaged first.
- (3) Engage until the target is destroyed. The engagement is discontinued after the target has passed over the defense if other incoming targets are not engaged by at least one other fire unit.

APPENDIX I

REFERENCES

Publication indexes, Department of the Army pamphlets of the 310-series, should be consulted for latest changes or revisions of references given in this appendix and for new publications relating to material covered in this manual.

AR 220-50Regiments—General Provisions
AR 220-60Battalions, Battle Groups, Squadrons;
General Provisions.
AR 220-70Companies; General Provisions.
AR 320-5Dictionary of United States Army
Terms.
AR 320-50Authorized Abbreviations and Brevity
Codes.
AR 380-seriesMilitary Security.
FM 21-5Military Training.
FM 21-6Techniques of Military Instruction.
FM 24-18Field Radio Techniques.
FM 24-20Field Wire and Field Cable Techniques.
FM 30-5Combat Intelligence.
FM 44-1Air Defense Artillery Employment.
FM 44-1AAir Defense Artillery Employment
(U).
FM 44-7Electronic Search Central AN/GSS-1
and Radar Sets AN/TPS-1D, 1G,
and AN/FPS-36.
FM 44-9Service of the Operations Center AN/
MTQ-1.
FM 44-10U.S. Army Air Defense Fire Distribu-
tion System, AN/FSG-1 (Missile
Master) (U).
FM 44-13U.S. Army Air Defense Fire Distribu-
tion System AN/MSG-4 (Missile
Monitor) (U).
FM 44-14U.S. Army Air Defense Fire Distribu-
tion Systems AN/GSG-5(V) and
AN/GSG-6 (U).

FM 44-85Air Defense Artillery Missile Battal-
ion, Nike Ajax.
FM 44-95Air Defense Artillery Missile Battal-
ion, Nike Hercules (U).
FM 44-95AAir Defense Artillery Missile Battal-
ion, Nike Hercules (U).
FM 44-96Air Defense Artillery Missile Battery,
HAWK (U).
FM 44-97Air Defense Artillery Missile Battal-
ion, HAWK.
FM 44-97AAir Defense Artillery Missile Battal-
ion, HAWK (U).
FM 100-1Doctrinal Guidance (U).
FM 100-5Field Service Regulations; Operations.
FM 100-10Field Service Regulations; Adminis-
tration.
FM 101-5Staff Officers' Field Manual; Staff Or-
ganization and Procedure.
FM 101-10, Part IOrganizational, Technical and Logisti-
cal Data.
JCS Pub 1Dictionary of United States Military
Terms for Joint Usage.
JCS Pub 2Unified Action Armed Forces
(UNAAF).
TM 11-1162Radar Surveillance Central AN/GSS-
1 (U).
TM 11-2582Plotting Equipment AN/TSA-2.
TM 11-5550Operations Centers AN/MTQ-1, AN/
MTQ-1A, and AN/MTQ-1B.
TM 11-5895-262-10Operator's Manual: Operations Cen-
tral AN/MSQ-18 and Coder-De-
coder Group OA-1593/MSQ-18.
TM 11-5895-274-12Operator and Organizational Mainte-
nance Manual: Antiaircraft De-
fense System AN/GSG-5(V) (U).
TM 11-5895-275-12Operator's and Organizational Main-
tenance Manual: Antiaircraft De-
fense System AN/GSG-6 (U).
TM 11-5895-291-10Operator's Manual: Operations Cen-
tral AN/TSQ-38 and Coder-Decoder
Group OA-2789/TSQ-38.

APPENDIX II

THE WORLD GEOGRAPHIC REFERENCE SYSTEM

1. General

a. The World Geographic Reference System (GEOREF) is used in all joint air defense operations. Army air defense uses GEOREF on early warning plotting boards, gridding of PPI screens, and for reporting and entering installation and target positions into the air defense system.

b. GEOREF is a worldwide position reference system that may be applied to maps or charts graduated in latitude and longitude, regardless of projection. It is a method of expressing latitude and longitude in a form suitable for rapid reporting and plotting.

2. Geographic Coordinates

The geographic coordinate system divides the earth's surface into quadrangles formed by meridians of longitude and parallels of latitude (fig. 7).

a. The distance a point is north or south of the equator is called its latitude, and the rings around the earth parallel to the equator are called parallels of latitude. Starting at the equator, the parallels of latitude are numbered from 0° to 90° , both north and south. Thus the value of the North Pole is 90° north and the South Pole is 90° south.

b. The distance a point is east or west of the base line (prime meridian) through the poles is called its longitude, and the lines converging at the poles are called meridians of longitude. The prime meridian used is the meridian that passes through Greenwich, England. From the prime meridian, longitude is measured both east and west around the world to the meridian exactly opposite the prime meridian. Lines west of the prime meridian are numbered from 0° to 180° and are called west longitude. The meridian exactly opposite to the prime meridian has a value of 180° longitude.

3. The GEOREF Identification Code

The GEOREF system uses an identification code that is divided into three main divisions. The GEOREF designations are read by the same rule as military grid coordinates: READ RIGHT-UP. The complete GEOREF coordinate is expressed by combining the identification letters for the first and second divisions with the numbers identifying the third division.

a. *First Division.* To construct the first division, 15° quadrangles, GEOREF, the surface of the earth is divided into 24 longitudinal zones of 15° each and 12 latitude bands of 15° each (fig. 8). The longitudinal zones are lettered A through Z (omitting I and O) eastward from the 180th meridian. The first letter of a GEOREF designation signifies in which longitudinal zones a point is located. The 12 bands of latitude are lettered A through M (omitting I) northward from the South Pole. The second letter in a GEOREF designation signifies in which latitude band a point is located.

b. *Second Division.* To construct the second division, 1° quadrangles, GEOREF, each basic 15° quadrangle is further divided into quadrangles of 1° by dividing the 15° quadrangle into 15 longitudinal zones of 1° east and west and 15 latitudinal bands of 1° north and south (fig. 9). The longitudinal zones are lettered west to east from A through Q (omitting I and O). The third letter of a GEOREF designation signifies in which 1° longitudinal zone (within the 15° quadrangle) a point is located. The latitudinal bands are lettered south to north from A through Q (omitting I and O). The fourth letter of a GEOREF designation signifies in

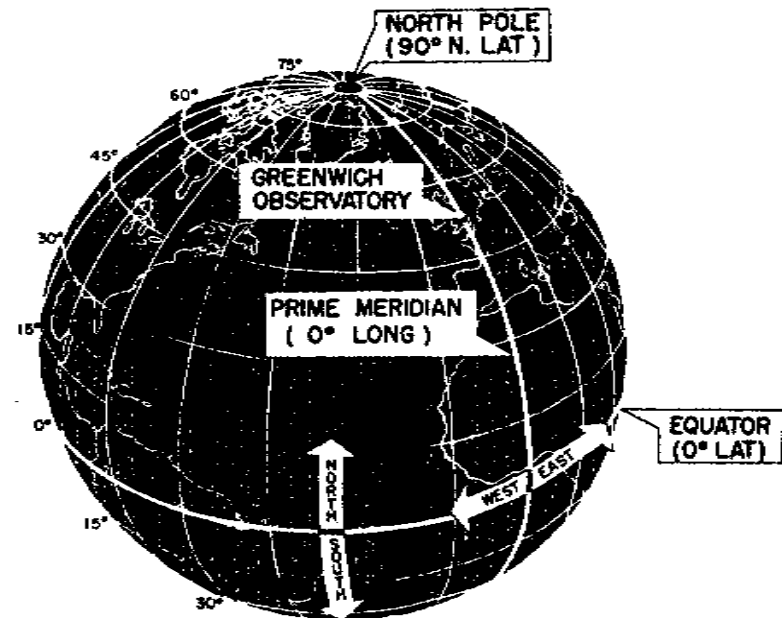


Figure 7. Geographic coordinates.

which 1° latitudinal band (within the 15° quadrangle) a point is located.

c. *Third Division.* To construct the third division, 1' quadrangles, GEOREF, each 1° quadrangle is divided into 1' quadrangles by dividing the 1° quadrangle into 60 longitudinal zones of 1' east and west and 60 latitudinal bands of 1' north and south (fig. 10). The longitudinal zones are numbered west to east from 00 through 59. The latitudinal bands are numbered south to north from 00 through 59. The first pair of numbers of a GEOREF designation signifies in which 1' longitudinal zone (within the 1° quadrangle) a point is located. The second pair of numbers of a GEOREF designation signifies in which 1' latitudinal band (within the 1° quadrangle) a point is located.

d. *Quadrangles.* The manner of lettering and numbering quadrangles does not vary even though the location may be east or west of the prime meridian or north or south of the equator. A third division quadrangle encompasses an area that is approximately one nautical mile on a side. (One minute of latitude is approximately one nautical mile; one minute of longitude dimin-

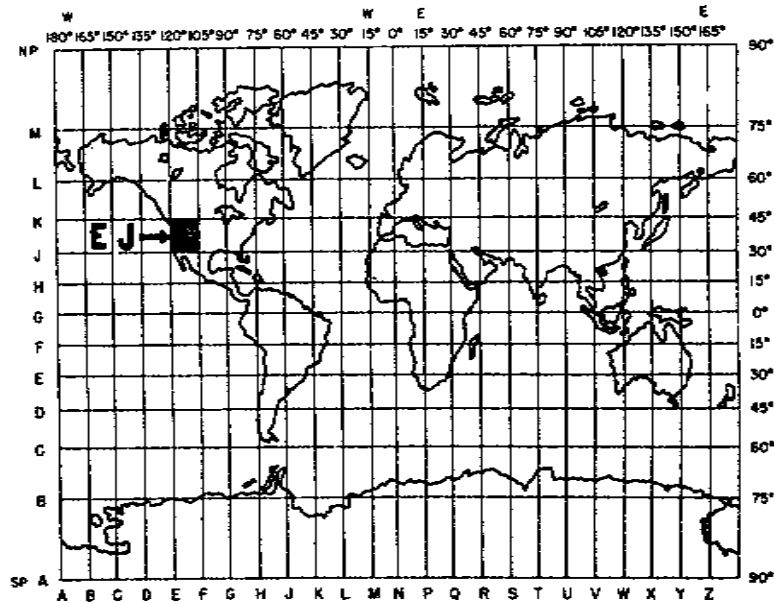


Figure 8. First division, 15° quadrangles.

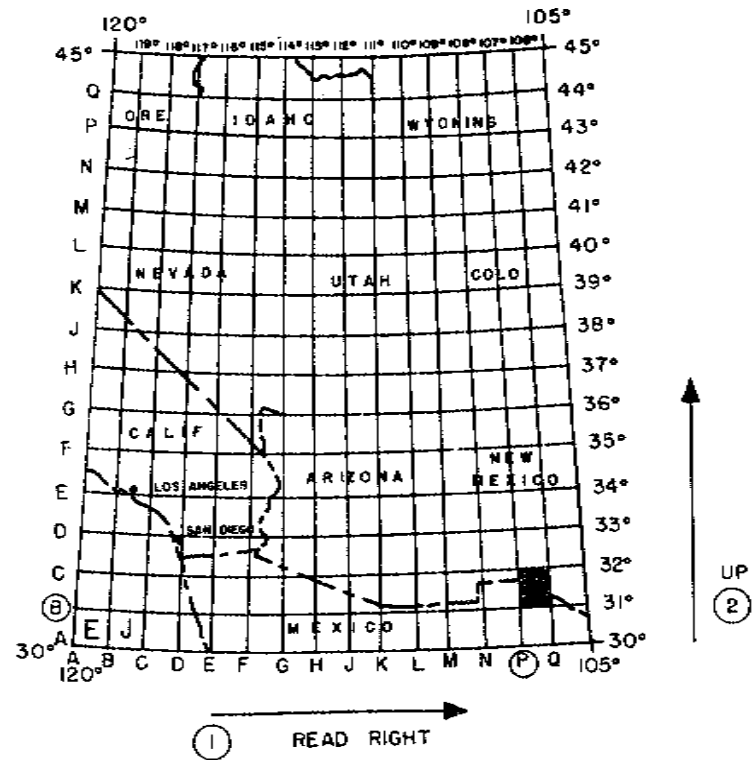


Figure 9. Second division, 1° quadrangles.

ishes from approximately one nautical mile at the equator to zero at the poles.)

e. *Example.* The geographic coordinates of El Paso, Tex. are 31° 48' 06" N; 106° 25' 48" W. As indicated in figures 8, 9, and 10, the component parts of GEOREF coordinates of the El Paso, Texas area are:

- (1) First division (15° quadrangle)—EJ.
- (2) Second division (1° quadrangle)—PB.
- (3) Third division (1' quadrangle)—3448.

The complete GEOREF coordinates are EJPB3448.

4. Conversion of Geographic Coordinates to GEOREF Coordinates

a. The first division of GEOREF coordinates are converted

from geographic coordinates by determining in which 15° longitudinal zone (eastward from the 180th meridian) and 15° latitudinal band (northward from the South Pole) the point is located.

Example: geographic coordinates of a position is Lat 29 13' 54" N; Long 104 21' 06" W. Determination of the first division of GEOREF coordinates as shown in figure 11 is FH.

b. The second division of GEOREF coordinates are converted from geographic coordinates by determining in which 1° longitudinal zone and 1° latitudinal band within the 15° quadrangle the point is located. Determination of the second division of GEOREF coordinates as shown in figure 12 is AQ.

c. The determination of the third division of GEOREF coordinates is facilitated by the use of the following rules:

- (1) *Rule 1.* If a point is located *north* in latitude or *east* in longitude, the minute location of the geographic coordi-

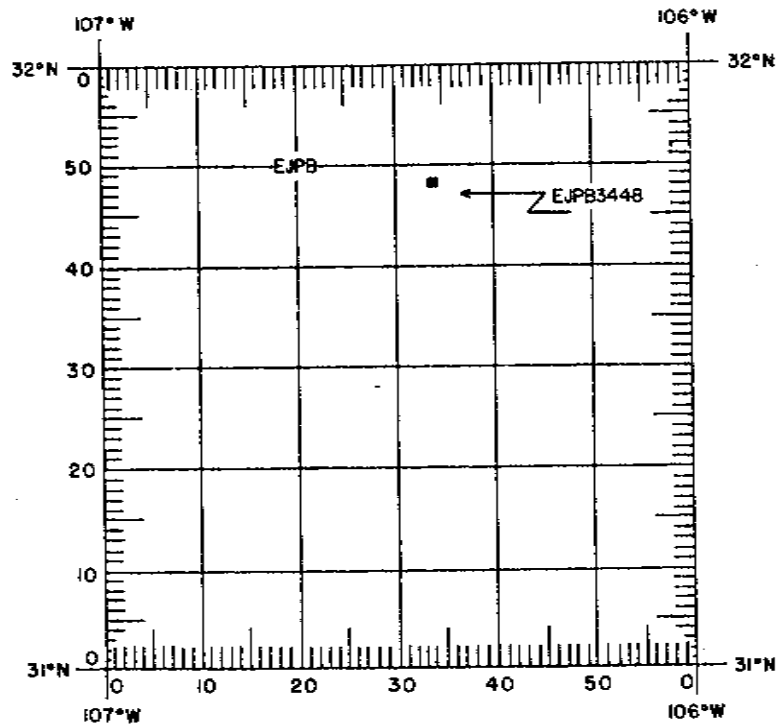


Figure 10. Third division, 1' quadrangles.

nates is the numerical designation of the third division of GEOREF.

- (2) *Rule 2.* If a point is located *south* in latitude or *west* in longitude, round the minute location up to the next higher minute, subtract from 60, and record the remainder as the third division of GEOREF.

d. The third division of GEOREF coordinates are converted from geographic coordinates in the example above by using rule 2 for longitude and rule 1 for latitude.

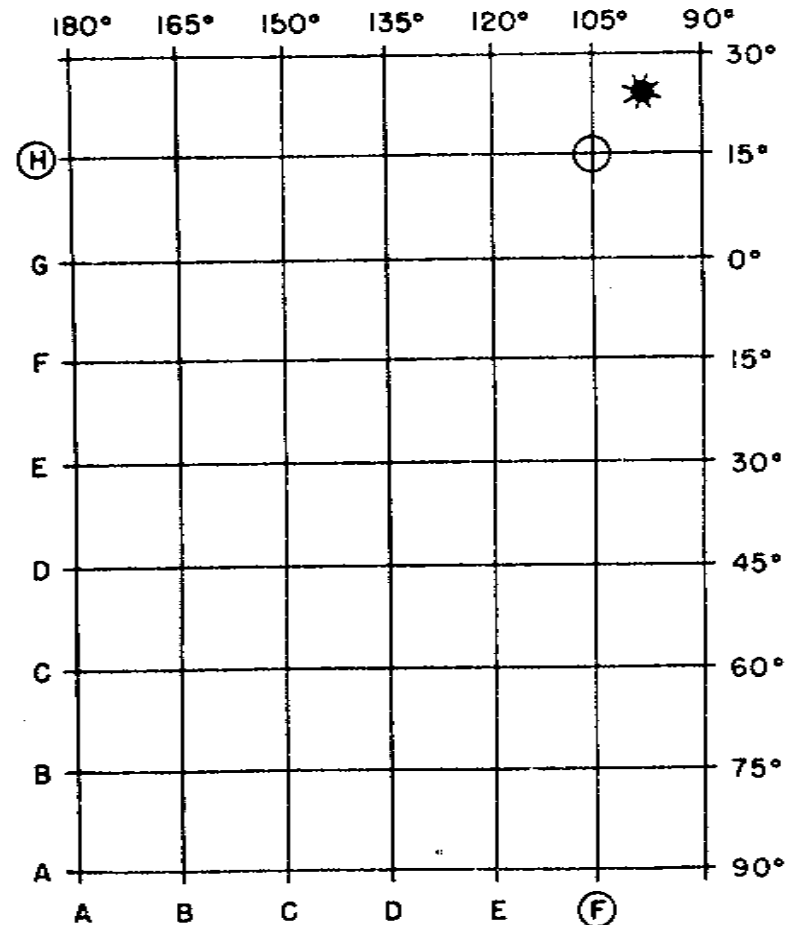


Figure 11. Determination of first division.

- (1) *Longitude.* Round 21' to 22', subtract from 60, and record 38' as the longitude designation of the third division.
 - (2) *Latitude.* Record minute location 13' as the latitude designation of the third division.
 - (3) The complete third division of GEOREF is 3813.
- e. The complete GEOREF coordinate for the example above is therefore, FHAQ3813.

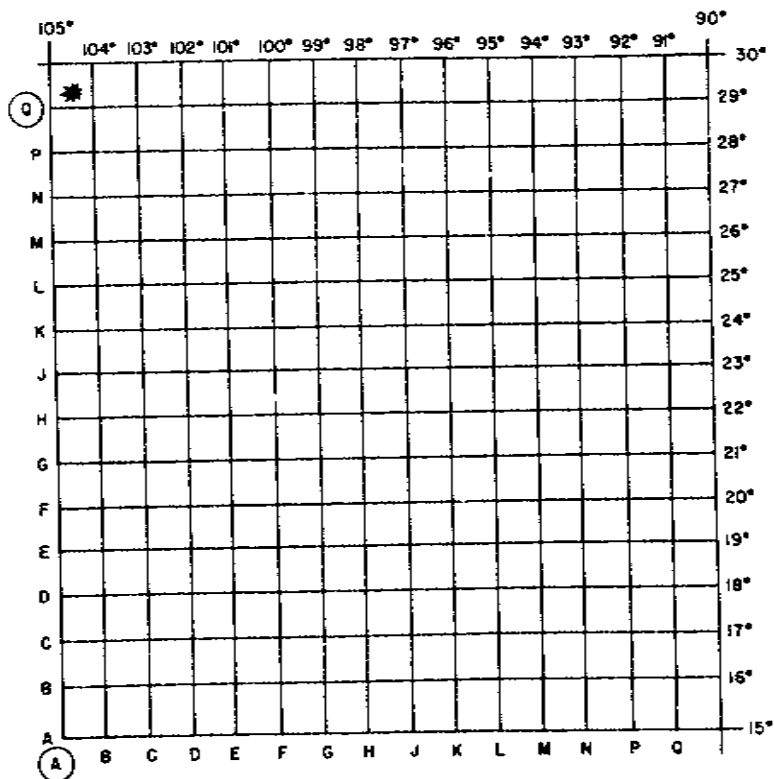


Figure 12. Determination of second division.

GLOSSARY

Abbreviations listed are those used in this manual and not contained in AR 320-50.

- ADE Air defense element.
 BFDC Battalion fire distribution center.
 BIRDIE Battery integration and radar display equipment.
 BTE Battery terminal equipment.
 FDS Fire distribution system.
 GFDC Group fire distribution center.
 NCC NORAD control center.
 NRCC NORAD region combat center.
 NSDC NORAD sector direction center.
 RDPE Radar data processing equipment.
 RHI Range-height indicator.
 TAADC Theater army air defense command.
 TJADC Theater joint air defense command.

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BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,
*General, United States Army,
Chief of Staff.*

Official:

J. C. LAMBERT,
*Major General, United States Army,
The Adjutant General.*

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NG: Units organized under following TOE: 44-2, 4412 (4), 44-15, 44-85, 44-445, 44-545 (2), ADA Btry (1).

USAR: Same as Active Army except allowance is one copy each unit.

For explanation of abbreviations used, see AR 320-50.

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ARMY AIR DEFENSE COMMAND POSTS

FM 44-8 }
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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 13 January 1964

FM 44-8, 29 August 1962, is changed as follows:

2. Recommended Changes and Comments

Users are encouraged * * * and complete evaluation. Comments should be forwarded direct to Commanding Officers, U. S. Army Combat Developments Command Air Defense Agency, Fort Bliss, Texas 79916.

6. Types of AADCP'S
(Superseded)

AADCP's can operate using either semiautomatic or manual equipment. With semiautomatic equipment, AADCP's use components of the fire distribution systems (FDS) AN/FSG-1 (Missile Master), AN/GSG-5(V) and AN/GSG-6 (BIRDIE), and AN/MSG-4 (Missile Monitor); and Radar Tracking Station (RTS). The manual AADCP may use the search central AN/GSS-1 or AN/GSS-7 and plotting equipment.

14. NORAD Control Center
(Superseded)

The NCC is a manual back-up for the SAGE system. The NCC is established subordinate to either an NRCC or an NSDC and normally is responsible for the air defense of a small area or specific installation. The NCC control air defense operations in NORAD mode III (par. 28b).

Section III. AADCP IN THEATER (AREA) OF OPERATIONS

16. General

(Superseded)

The unified commander is responsible for determination of theater (area) air defense priorities and allocation of air defense

means. Commanders of component forces are responsible for air defense operations of their air defense forces subject to the unified commander's operational and coordinating procedure. The air defenses of the communication zone and combat zone are described separately in this section.

17. Air Defense, Area of Operations (Superseded)

The air defense of an area of operations is the responsibility of the unified commander. The unified commander, in order to achieve a coordinated and integrated air defense system where substantial forces of each Service are deployed, normally appoints the Air Component Commander as Area Air Defense Commander. The Area Air Defense Commander will establish broad policies and procedures for the employment of air defense means and the coordination of such means with the operations of other elements to attain the optimum effectiveness of all air defense means.

17.1. Air Defense, Region (Added)

a. In the exercise of his responsibility, the Area Air Defense Commander will establish air defense regions. The Tactical Air Force Commander will be designated as the Regional Air Defense Commander for his assigned area of responsibility for tactical air operations. He will be fully responsible for, and will have full authority in the air defense of his region.

b. In other land regions where the situation indicates that there will be no likelihood in war of extensive tactical air offensive operations for attaining air superiority, interdiction or close support; and the threat is essentially that of enemy air attack, the Area Air Defense Commander may establish a Joint Air Defense Command (JADC). The commander may come from any component depending on the organization and the operational situation within the region, and the air defense means available.

18. Air Defense, Communications Zone (COMMZ) (Superseded)

The commander of the JADC or air defense region established by the Area Air Defense Commander has operational control of the air defense means in the COMMZ. AADCP's are established at brigade, group, and battalion levels to conduct Army air defense operations.

19. Air Defense, Combat Zone (CZ) (Superseded)

In the CZ, the field army commander is normally delegated authority for control and operational employment of his air defense means. Air defense operations are coordinated with field army tactical support operations by the Air Defense Element (ADE) of the Field Army Tactical Operations Center (FATOC). Air defense operations are conducted by AADCP's established at brigade, group, and battalion levels. The AADCP coordinates air defense operations with the Army Aviation Flight Operations Center (FOC), Air Force Control and Reporting Center (CRC), and the Naval Tactical Air Control Center (TACC).

21. General

The fire distribution * * * AD missile batteries. The equipment used consists of an AADCP, defense acquisition and height finding radars, automatic data link (ADL) to SAGE, ADL to the fire units, and a fire unit integration facility (FUIF) (AN/FSA-25) () at each fire unit.

22. Fire Distribution System AN/FSG-1 (Missile Master)

* * * * *
b. (Superseded) The tactical display system consists of the AADC console, tactical director console, and tactical monitor consoles. The tactical monitor consoles display all reference data entered into the memory system and have the necessary facilities to control or monitor the fire units. Tactical monitors can make target assignments direct to fire units in a centralized mode of operations or monitor fire unit operations in a decentralized mode. Reference data are transmitted to the fire units from either the AADCP or SAGE. Commands are sent to the fire units from the AADCP.

* * * * *

23. AADCP

The AN/FSG-1 equipment * * * the following equipment.

* * * * *

b. Rescinded

* * * * *

c. Rescinded

* * * * *

d. Rescinded

* * * * *

27. Console Displays

a. Symbolology.

(1) Surveillance and entry console and tracking console

(a) Local or SAGE-manual tracks are marked as 1/4-inch (diameter) circles for hostile tracks, partial 1/4-inch circles with the blanked portion appearing at the bottom for friendly tracks, and partial 1/4-inch circles with the blanked portion appearing at the top for unidentified tracks (local tracks may be marked with unidentified symbols but SAGE tracks are not).

(d) Adjacent Missile Master AADCP reference tracks are marked as flashing dots.

28. AADCP Operations

b. Methods of Operation.

(4) (Added) *NORAD mode IV*. In mode IV operations, if an AADCP loses all communication with the NSDC and NCC, the AADCP will operate autonomously. If a fire unit loses all communications with the AADCP, the battery will operate autonomously.

c. *Weapons Control Status*. The weapons control status that governs the engagement procedures for fire units is—

(1) *Centralized control*. (Superseded) Direct target-to-fire unit assignments are made by the AADCP and the fire units engage only designated targets. This status should be used only when there are few hostiles in the defense system.

29. General

a. The FDS AN/GSG-5(V) BIRDIE consists of an AADCP, defense acquisition radar, ADL to SAGE, ADL to the fire units, and a FUIF at each fire unit. The FDS is * * * NORAD manual environment.

35. AADCP Operations

a. AN/GSG-5(V) system can operate in any one of the four modes as determined by the tactical situation and the controlling NSDC SAGE.

(4) *NORAD mode IV*. (Superseded) (See par. 28b(4).)

b. *Weapons Control Status*. The weapons control status governs the engagement procedures for fire units.

(1) *Centralized*. (Superseded) Direct target to fire unit assignments are made by the AADCP and the fire units engage only designated targets. This status should be used only when there are few hostiles in the defense system.

* * * * *
So much of paragraphs 44, 45, 47, 50, 51, 52, and figure 3 as reads "Radar Data Processing Equipment (RDPE)," is changed to read "Radar Data Processing Center (RDPC)." So much of paragraphs 44, 45, 47, 48, 51, 52, 53, and figure 3 as reads "Group Fire Distribution Center (GFDC)" is changed to read "Weapons Monitoring Center (WMC)."

So much of paragraphs 44, 48, 51, 53, 54, 56, 58, 59, 60, and figure 3 as reads "Battalion Fire Distribution Center (BFDC)" is changed to read "Operations Central (OC)."

44. FDS AN/MSQ-4

a. Missile Monitor links * * * exercise of command. The AADCP AN/MSQ-28 (AN/MSQ-56 in the NATO environment) consists of a frequency scan radar (FRS) AN/MPS-23, radar data processing center (RDPC), and weapons monitoring center (WMC). Missile Monitor integrates * * * in figure 3.

b. The RDPC receives * * * update track data. Height data can be entered automatically or by the range-height indicator operators. Raid size and * * * fire units through operations central (OC).

45. AADCP AN/MSQ-28 (AN/MSQ-56)

The AADCP of * * * artillery group commander. In the NATO environment the AN/MSQ-28 becomes the AN/MSQ-56. This change is due to installation of equipment modifications (electronic buffers) which accept digital messages in standard NATO-approved formats. The major AADCP * * * in the RDPC and WMC. (Delete last sentence.)

* * * * *
b. The WMC provides * * * exercises command supervision. Utilizing five weapons monitoring consoles, the operators monitor the activities of the associated fire units and transmit reference

data for battery target selection and friendly protection. One of these consoles is available for monitoring by the defense commander or his representative. Direct battery assignments can be made from this console.

c. Rescinded

50. Radar Data Processing Center (RDPC)

The RDPC is * * * performing manual tracking. The digital track data generated by the computer are stored in a drum memory, then converted to analog form for display as track marker symbols on the detector-tracker consoles and range-height indicator consoles. All digital track data are automatically transmitted to the WMC.

51. Weapons Monitoring Central (WMC)

a. The five weapons monitoring consoles and equipment of the WMC are contained within one van. All the tracks * * * weapons monitoring consoles. Because of the large number of tracks being received from the RDPC, OCs, adjacent AADCP's, and TAF, selection switches are provided at all consoles for screening out unwanted tracks. Tracks may be * * * are also displayed.

52. Console Displays

a. *Console Symbology (RDPC and WMC)*. Information received over the ADL is displayed as symbols. All or any part of the following markers may be displayed.

(1) (Superseded) Engagements are displayed by a cross.

(3) (Superseded) Concentric circles (two times as large as the unknown marker) are displayed when a new drum memory channel is selected. This symbol at WMC indicates the position of the hand control.

b. *Console Video*. Two types of video may be displayed on the detector tracker console in the RDPC. They are IFF video and Radar video.

(1) IFF video identifies the challenged target.

(3) (Added) Radar video is not normally displayed in the WMC though it can be provided if the RDPC and the WMC are collocated.

55. FDS AN/MSQ-18

(Superseded)

The FDS AN/MSQ-18 consists of an operations central (OC) at battalion level and the coder-decoder group (CDG) at battery level. Radar video is furnished to the OC by the organic defense acquisition radar (normally AN/GSS-1 or AN/GSS-7).

57. System Capabilities

c. (Added) TM 11-5895-291-10 contains operating instructions for operators of the FDS AN/TSQ-38.

59. System Operations

a. The FDS AN/MSQ-18 or FDS AN/TSQ-38 are designed to normally operate as a portion of the FDS AN/MSQ-4 (Missile Monitor). In this role * * * data when required.

b. The methods of operation used when the OC operates as a portion of the Missile Monitor (par. 48) are not used when the FDS AN/MSQ-18 or FDS AN/TSQ-38 operate independently.

63. Requirements

a. Regardless of the echelon establishing the AADCP or the type of plotting equipment the following requirements exist:

(2) (Superseded) *Early Warning*. Early warning information is furnished to the AADCP and plotted on the early warning plotting boards.

(4) Rescinded

b. Rescinded

64. General

(Superseded)

The personnel required to operate the manual AADCP and their specific duties are listed in paragraphs 65 through 72.

68. Identification Officer

Rescinded

69. Chief Plotter

* * * * *
d. Rescinded

* * * * *

70. Plotters

a. The radar plotters * * *. Duties of the plotters include—

* * * * *

(3) Rescinded

b. The early warning * * *. Duties of the early warning plotter include—

* * * * *

(2) (Superseded) Plotting locations of targets on the early warning plotting board.

c. Rescinded

71. Missile Teller

The missile teller transmits pertinent track information displayed on the AADCP operations board to the elements of the defense. His duties include—

* * * * *

73. General

Rescinded

74. Operations Center AN/MTO-1

Rescinded

*Figure 4. Operations center, AN/MTQ-1 (cutaway view).
Rescinded.*

75. Plotting Equipment AN/TSA-2

Rescinded

Figure 5. Typical operations board with track stands. Rescinded

Figure 6. Example of sectors of fire. Rescinded.

76. Operations Board

(Superseded)

The operations board is prepared specifically for each defense area. It is a plotting board gridded to portray GEOREF coordinates with the vital area plotted in the center. The scale of the operations board will vary with the area that must be displayed.

The area represented should extend sufficiently beyond fire unit acquisition range to permit detection, identification, and transfer of targets to fire units in time to permit engagement at maximum possible range. Only enough detail should be included on the plotting board to facilitate its use. The range capabilities of individual units and the primary target lines should be included. The board should be large enough that displayed tracks and track data can be easily viewed from any position in the operations room. Communications outlets must be made available at the operations board for receiving plotting information from radar reporting, early warning, and other air defense information nets.

77. Track Stands

Rescinded

78. Track Status Board

(Superseded)

A track status board is used to display significant tactical and intelligence data and pertinent track information relating to each track.

79. Defense Status Board

The operating status * * * display can include—

* * * * *

g. (Added) Weapons control case.

81. Plotting Board PT-171/TPS

Rescinded

82. Electronic Search Central AN/GSS-1 or AN/GSS-7

The AN/GSS-1 or AN/GSS-7 with its associated acquisition radar and IFF equipment is utilized for detecting targets. When the target is detected, the operator in the AN/GSS-1 or AN/GSS-7 plots the information (range and azimuth) on the PT-171/TPS within the AN/GSS-1 or AN/GSS-7. The plotting board PT-171/TPS contains an azimuth scale graduated in mils and a cursor graduated from 10 to 180 (in terms of thousands of yards) that pivot on a stud in the center of the board. Concurrently he transmits * * * contained in TM 11-1162.

83. General

The AADCP receives information from two primary sources: other air defense agencies and organic radars. This information must * * * from all sources.

84. Collection and Evaluation of Target Information

a. (Superseded) Liaison is established between the AADCP and agencies responsible for furnishing air defense information. The (Army) operations officer with the liaison sections at these agencies is responsible for the transmission of early warning information to the AADCP. A plotter in the AADCP is connected by direct communications to the teller at each agency. Information received concerning approaching targets is plotted on the early warning plotting board. This initial location information is recorded as a plot, and next to it or on a separate data display board pertinent details that the warning source is able to offer are recorded. Each recorded target is assigned an identifying number. When further location information is received, the plot becomes a track and continues to be recorded until it is at a sufficiently close range to be detected by the organic radars and plotted on the operations board. The track may then be erased from the early warning board, and the teller advised to cease telling on that track.

* * * * *

85. Dissemination of Target Data

a. Target information is disseminated to units subordinate to the AADCP by the missile teller who is in direct communication with lower echelons. In the AADCP, * * * on all tracks.

* * * * *

86. Plotting Procedures

- a. Rescinded
- b. Rescinded

c. Plotting procedures below are temporary markings made on the reverse side of a transparent board using china marking pencils.

(1) Color coding of a plot is used to reflect track identity as follows:

* * * * *

(d) (Added) Yellow—special interest.

* * * * *

87. Telling Procedures

a. Telling procedures are prescribed for use by missile tellers in the manual AADCP. The use of * * * the prescribed format.

* * * * *

Glossary

(Superseded)

-
- ADE..... Air defense element.
 - BIRDIE..... Battery integration and radar display equipment.
 - CDG..... Coder-decoder group.
 - FDS..... Fire distribution system.
 - JADC..... Joint air defense command.
 - NCC..... NORAD control center.
 - NRCC..... NORAD region combat center.
 - NSDC..... NORAD sector direction center.
 - OC..... Operations central.
 - RHI..... Range-height indicator.
 - RTS..... Radar tracking station.

By Order of the Secretary of the Army:

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General, United States Army,
Chief of Staff.

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Major General, United States Army,
The Adjutant General.

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USAAVNCDA (1)	ADA Bn (5)
USACBRCDA (1)	ADA Btry (2)
USAICDA (1)	USAWC (2)
USACECDA (1)	Br Svc Sch (2) except
USAADCDA (5)	USAADS (50)
USAARTYCDA (1)	

NG: Units org under fol TOE: 44-2 (4); 44-12 (4); 44-15 (2); 44-85 (2); 44-445 (2); 44-545 (2); ADA Btry (1).

USAR: Units—Same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320-50.

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