DCA CIRCULAR
310-V55-6

DEFENSE COMMUNICATIONS AGENCY

GLOBAL AUTOMATIC VOICE NETWORK (AUTOVON)

AUGUST 1980

DEFENSE COMMUNICATIONS AGENCY
WASHINGTON, D. C. 20305

DCA CIRCULAR 310-V55-6 29 August 1980

OPERATIONS

Global Automatic Voice Network (AUTOVON)

1. Purpose. This Circular describes in general terms the Global Automatic Voice Network (AUTOVON), how it works and how it is managed.

2. Applicability. This Circular applies to Headquarters, DCA and DCA field activities.

3. Relationship to Other Publications. The intent of this Circular is to provide a generalized overview of the AUTOVON system and not duplicate the detailed direction, guidance, and information contained in other DCA publications.

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CHAPTER 1. INTRODUCTION

1. Definition. The global AUTOVON system is the principal long-haul, nonsecure, common user, switched voice communications network of Department of Defense (DoD) and non-DoD agencies concerned with matters of national defense. It provides worldwide, direct distance dialing, station-to-station service through a system of Government-owned and leased automatic switching and transmission facilities. The AUTOVON is a major and integral part of the larger Defense Communications System (DCS) which comprises all DoD nontactical, long-haul, and point-to-point communications facilities. It is the nonsecure, common user, switched voice network in the DCS.

2. Mission. The mission of the AUTOVON is to provide rapid, worldwide, command and control voice communications service for the National Command Authority (NCA) and other high-priority users. Its secondary mission is to provide an acceptable grade of service for operational, intelligence, logistic, administrative, and diplomatic users.

3. History.

a. Beginning. The AUTOVON's history can be traced back to December 1961 when the Army established its Switched Circuit Automatic Network (SCAN) consisting of four automatic telephone switching centers. This was followed 2 years later by the North American Air Defense Command/Air Defense Command (NORAD/ADC) Automatic Dial Switching Network with five switching centers. In April 1964 these two single-service networks were combined to form the initial AUTOVON consisting of 9 switching centers, 728 interswitch trunks, and 2200 access lines. Approximately 2 years later, in July 1966, the Semi-automatic Ground Environment/Backup Interceptor Control (SAGE/BUIC) communications system was added to produce what was essentially the framework of the CONUS AUTOVON we know today.

b. Growth. By the end of 1968 the CONUS AUTOVON had grown to 49 switches, including the first 3 Canadian ones. The network reached its peak growth in April 1971, when it consisted of 69 switching centers. Over the next few years, as older switches were removed and new ones added, the network was consolidated and maintained an average size of 69 switching centers. The predicted growth in AUTOVON traffic did not materialize; therefore, the system enjoyed much more switching capacity than was required. Consequently, network reconfigurations carried out in June 1975 and June 1976 resulted in the removal of 10 switches from the system; in another reconfiguration in September 1979 6 more switches were removed.

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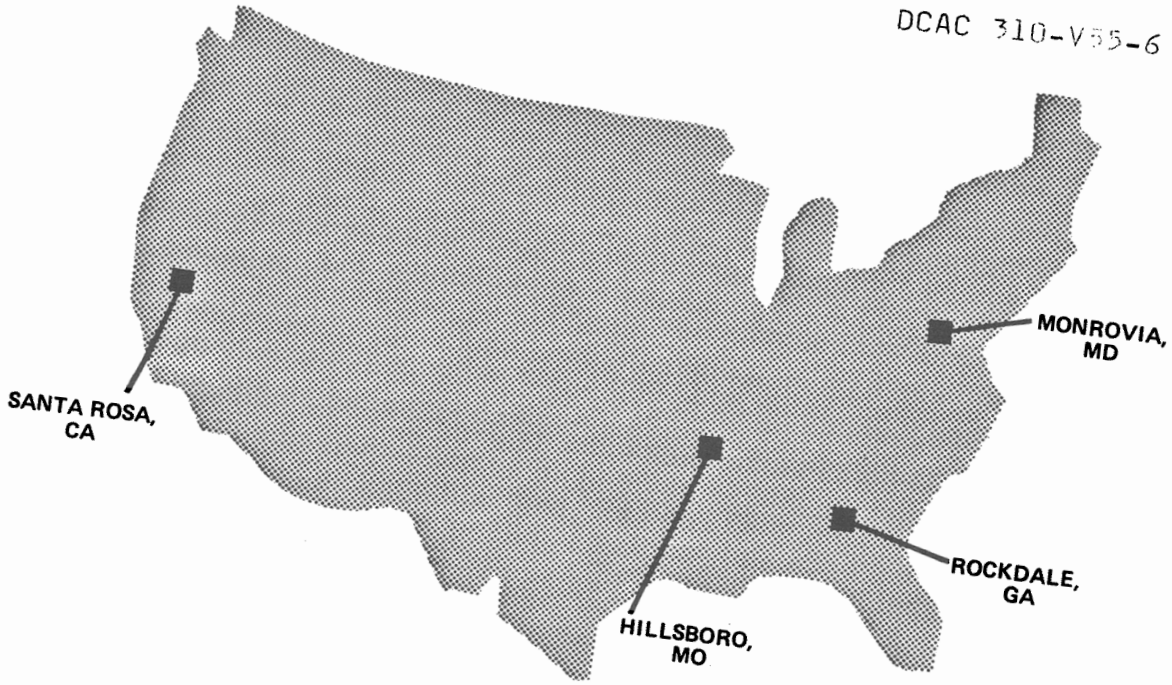


FIGURE 1-1. 1961 SCAN

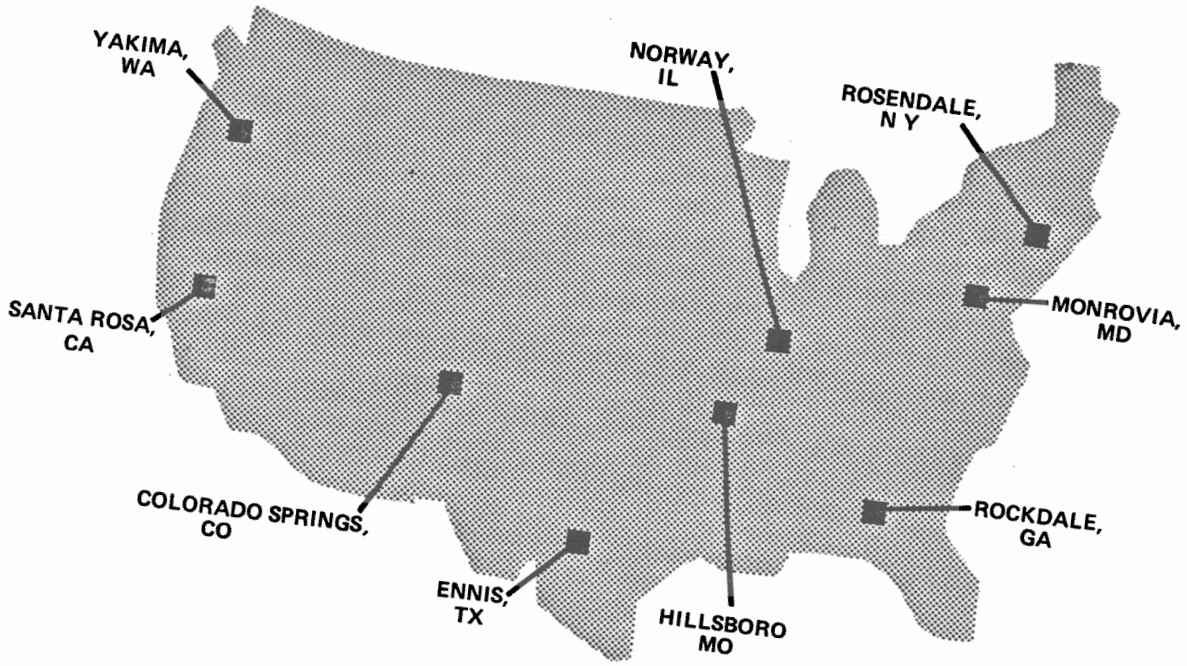


FIGURE 1-2. 1964 NORAD

c. Expansion Overseas. In 1969 the AUTOVON was extended overseas. The first overseas switching centers--three in Europe, two in the Pacific, and one in Panama--were put into service in June 1969. (At the same time an AUTOVON switch was installed at Sheppard AFB, TX, for training purposes.) This initial group of overseas switches was soon followed in November by an additional six: four in Europe and two in the Pacific. The overseas AUTOVON was increased to its planned size in March 1970 when the last five switching centers were placed into service. This made the AUTOVON a truly global network. One overseas switch (Grass Mountain, Taiwan) was removed in 1975.

4. Dual System.

a. The AUTOVON, as originally established, was a dual network. That is to say, it was designed to provide data as well as voice service to those subscribers whose data traffic volumes were too low to justify use of the Automatic Digital Network (AUTODIN). It had special grade trunks for carrying data traffic in addition to the common grade ones used for voice traffic.

b. In 1969 it was proposed to reconfigure the CONUS AUTOVON so that data as well as voice traffic would be carried over common grade trunks. Tests carried out in 1972 revealed no significant difference between the performance of special and common grade trunks for the transmission of data at the speeds used on the AUTOVON (2400, 4800 b/s) if compromise equalization was installed on all access lines used for data. Shortly thereafter, all AUTOVON interswitch trunks within CONUS were converted to common grade. This conversion resulted in a large saving in transmission facilities costs.

5. Categories of Customers. The AUTOVON serves two categories of customers: four-wire subscribers and all other users. Four-wire subscribers are normally those activities or officials that by the nature of their duties and responsibilities require immediate access to the network without even the minor delays inherent in private branch exchange (PBX) service. They access the network by means of individual telephone sets or consoles connected directly to an AUTOVON switching machine by a four-wire circuit. All other users gain access to the network through local PBX's by dialing an access code, usually "8," or by being interconnected by the local PBX attendant. This second category of customers is commonly referred to as "two-wire" users as opposed to "four-wire" subscribers.

6. Service.

a. Services Offered. Although primarily a voice communications network, the AUTOVON does offer limited data, graphics, and facsimile services. There are, however, rigid limitations on data transmission holding times, especially during normal busy hours. The AUTOVON also provides facilities for restoring the circuits of other high-priority Defense Communications System networks. Also a major user of AUTOVON switching and transmission facilities is the Automatic Secure Voice Communications (AUTOSEVOCOM) Network, a separate system not within the scope of this Circular.

b. Service Features. The AUTOVON offers the many advantages of a switched network over point-to-point dedicated communications facilities. Certainly the main advantages are the availability of numerous routes and significantly reduced costs. Its unique routing plan offers a high degree of efficiency, reliability, and survivability. It also offers many features not available in other networks or in point-to-point service such as automatic alternate routing, off-hook service, multilevel precedence preemption, and automatic and random conferencing. These unique features permit special handling of high-precedence command and control calls while at the same time providing routine telephone service to other users. (See chapter 2 for a more detailed description.)

CHAPTER 2. SYSTEM DESCRIPTION

1. Introduction.

a. The global AUTOVON spans the earth from Southeast Asia to the Middle East, and from Alaska to the Canal Zone. It consists of 69 automatic switching centers, approximately 8,500 interswitch trunk circuits, and about 18,000 access lines. The specific number of interswitch trunks and access lines varies as customer requirements change.

b. The system comprises three main, fully integrated, geographical areas--CONUS, Europe, and Pacific. Although taken together they form the worldwide AUTOVON, the CONUS and the overseas portions of the network display some distinct dissimilarities, including the types of routing plans and switching centers employed.

2. Continental United States (CONUS). There are 45 AUTOVON switching centers located within the continental United States, plus another eight in Canada. Canada and Alaska are considered to be part of the CONUS AUTOVON for management purposes. All CONUS AUTOVON switches are leased from the telephone industry which owns, operates, and maintains them for the DoD. CONUS switching centers are fully interconnected by numerous trunk circuits which are wholly embedded in commercial transmission facilities. A diagram of the CONUS AUTOVON switching center locations is included (figure 2-1).

3. Europe. All 10 AUTOVON switching centers located in Europe are owned, operated, and maintained by the military departments. The services also provide administrative and logistic support. The Air Force operates eight of the European switches and the Army two. These switches are interconnected by approximately 360 interswitch trunks and serve about 1100 access lines.

4. Pacific. Four of the five AUTOVON switching centers located in the Pacific are Government-owned and operated by the military departments. The exception is the switching center in Hawaii which is leased from the Hawaiian Telephone Company which owns, operates, and maintains it for DoD. Two of the Pacific area switches are operated and maintained by the Air Force and one each by the Army and Navy. The Pacific switches are interconnected by approximately 280 interswitch trunks and serve about 660 access lines. Additional information on the overseas AUTOVON can be found in DCA Circular 370-V185-7, "Overseas AUTOVON Network Switching Plan."

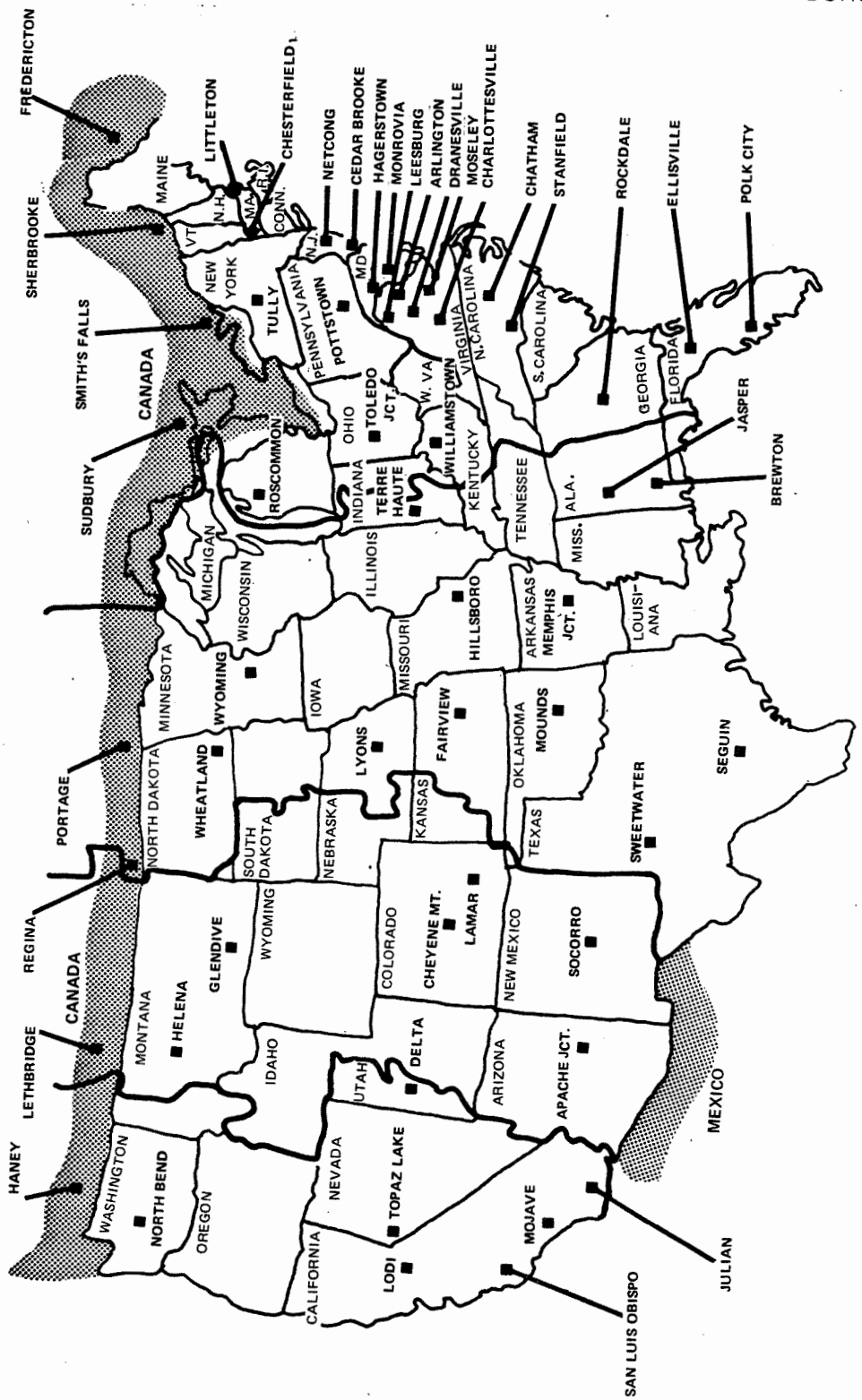


FIGURE 2-1. CONUS AUTOVON SWITCHING CENTERS

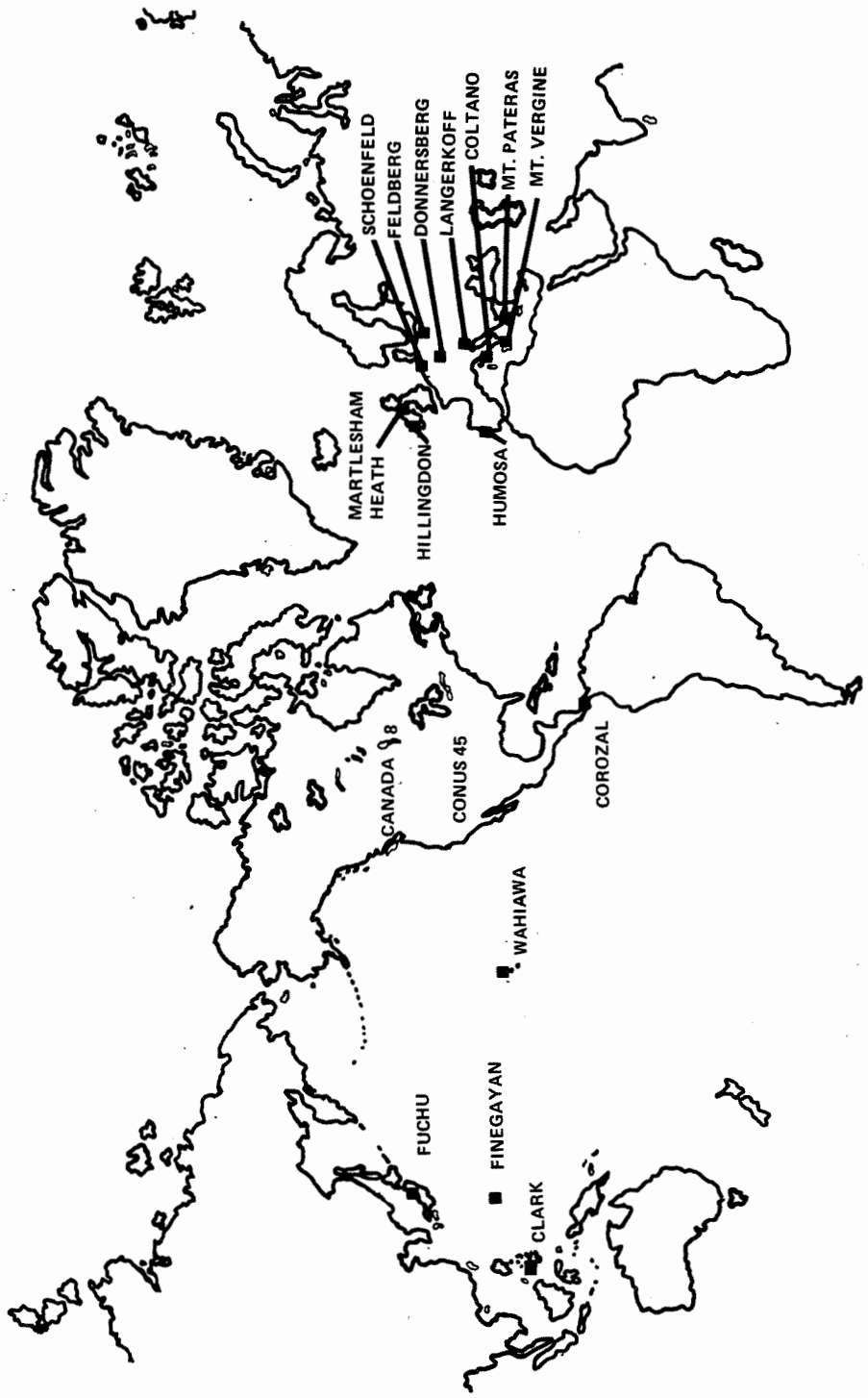


FIGURE 2-2. WORLDWIDE AUTOVON NETWORK

5. Interarea Connectivity. To facilitate interconnection of the main geographical areas, a number of AUTOVON switching centers are configured to serve as overseas gateways. There are six gateways in CONUS, two on the East coast for handling traffic to and from Europe, two on the West coast for Pacific traffic, and two in the Southeast for Caribbean traffic. These CONUS gateway switches are interconnected with designated gateway switches in the overseas areas: seven in Europe to be increased to eight, three in the Pacific and one in the Canal Zone. This funneling of interarea calling through designated gateway switches ensures maximum use of expensive transoceanic circuits.

6. Switching Centers. There are three different types of switching center equipments employed in the CONUS AUTOVON: four-wire Number 5 Crossbar (4W#5), Number 1 Electronic Switching Systems (#1ESS) and Automatic Electric Company (AECO) switches. The overseas AUTOVON employs an Automatic Electric Company electronic switch, commonly referred to as the "490L."

7. Transmission Facilities. AUTOVON transmission facilities are a diverse mix of Government-owned and leased services consisting of wire, cable (terrestrial and submarine), microwave radio, tropospheric scatter, and satellite circuits. An interarea AUTOVON call may well traverse a number of transmission media circuits without the user ever being aware of the multiple and diverse communications paths employed to complete the call. For example, a call originating in the Pacific and destined for Europe may be routed on a commercial radio carrier to the nearest satellite ground terminal (SGT), proceed across the Pacific Ocean by Government-owned satellite circuit to a ground entry point on the west coast of the United States, and continue across the CONUS on leased terrestrial cable circuits to an east coast gateway switch. From here it may cross the Atlantic by a submarine cable and, finally, reach its destination through a wire circuit tail segment.

8. Number Plan. The AUTOVON provides direct dialing service station-to-station to any point in the network. Each station is assigned a seven-digit telephone number. Any station can reach any other in its own calling area, CONUS for example, by dialing only a seven-digit number. The normal seven digits, plus a three-digit area code, must be dialed to complete a call to an overseas location.

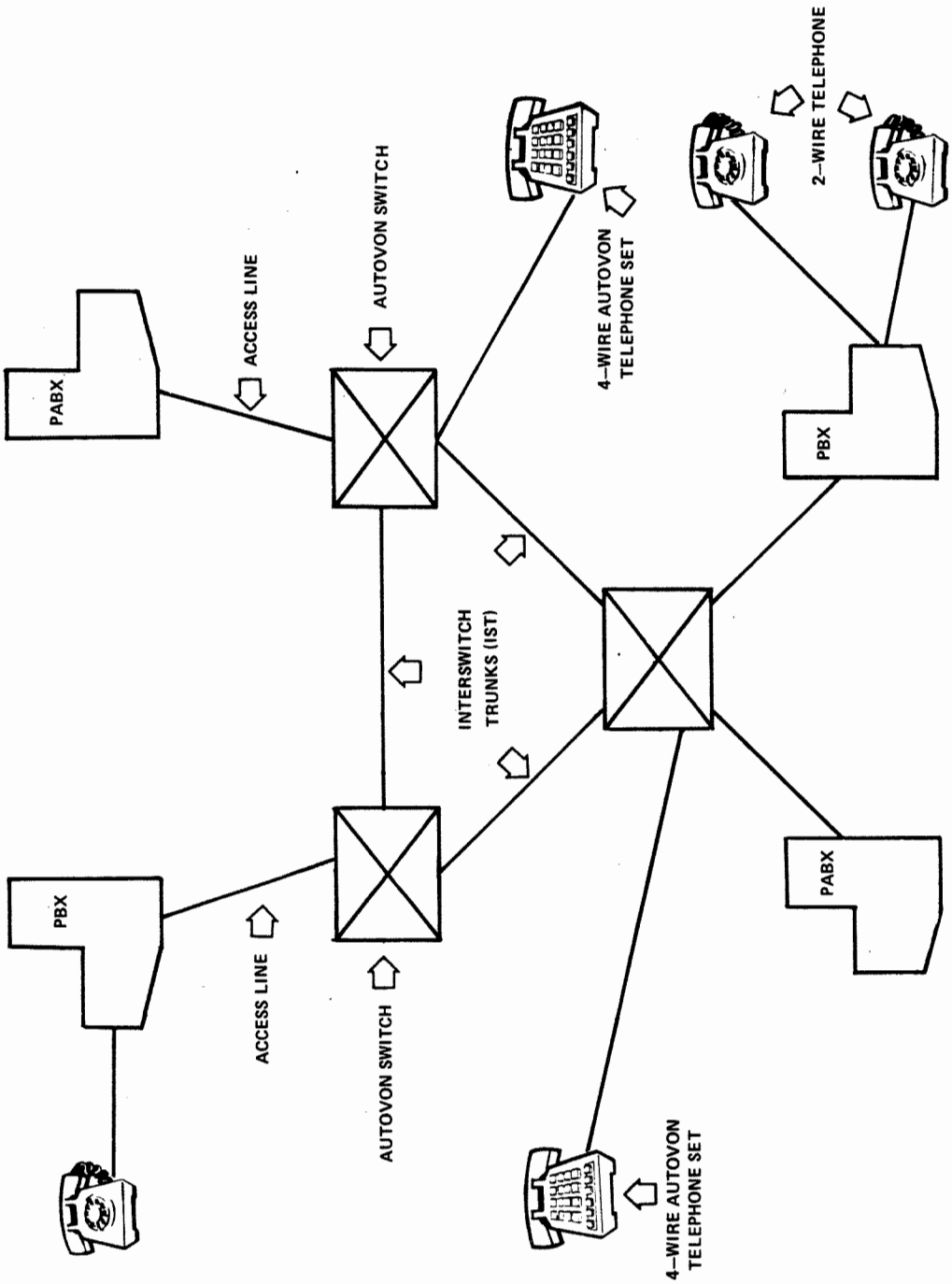


FIGURE 2-3. AUTOVON NETWORK CONNECTIVITY

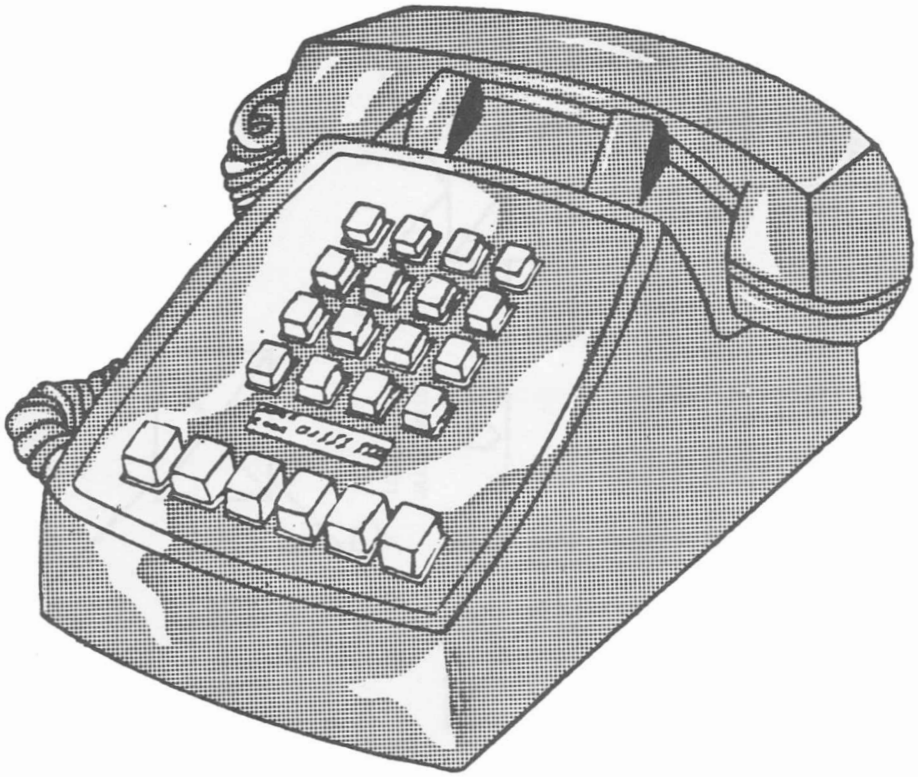


FIGURE 2-4. CONUS AUTOVON SUBSCRIBER TELEPHONE

9. Private Branch Exchange (PBX). Most AUTOVON customers access the network through their serving PBX using their regular telephone sets. Depending on the type of PBX in use and its local configuration, AUTOVON calls may be handled by an operator or placed directly by the originator who dials an access code, commonly an "8," for entry into the AUTOVON system. The same procedures apply to incoming AUTOVON calls. Where AUTOVON calls can be placed and received without operator assistance, the arrangement is termed "network-in-out-dial (NIOD)." The converse, where an operator's assistance is required, is termed "manual service." Only the PBX operator can place interarea and precedence calls for AUTOVON users.

10. Subscriber Sets and Consoles. Unlike the ordinary AUTOVON user whose access to the network is through a PBX, four-wire subscribers are connected directly to an AUTOVON switching center by a four-wire circuit and do not encounter the slight delays commonly associated with PBX service. Access lines terminate on four-wire, 16-button telephone sets or on emergency action consoles (EAC) as opposed to a PBX. With this capability, four-wire AUTOVON subscribers have rapid, direct access to the network at the calling capability levels authorized for their station.

11. Multilevel Precedence Preemption (MLPP). Probably the best known feature of the AUTOVON system is its multilevel precedence preemption (MLPP) feature where an important AUTOVON call receives preferential treatment in competition for common switching and transmission facilities, even to the point of interrupting a less urgent call already in progress. The National Communications Systems Telephone Precedence System, described in JANAP 137B, is used to assign a calling capability in keeping with the subscriber's operational function. This capability is then programed into the serving switching center's memory. The switching center uses the memory information to automatically handle precedence calls in a preprogramed manner that expedites the calling process.

12. Automatic Alternate Routing (AAR). Another unique feature of the AUTOVON system is that it automatically routes calls over alternate paths if the primary one is busy. That is, a call, finding no idle circuit on its primary route, automatically searches its programed alternate routes for a free circuit that will advance it toward its destination. As a matter of course, precedence calls have many more programed alternate routes than routine ones. Nonetheless, whatever their precedence, most AUTOVON calls have an excellent chance of being completed because of the AAR feature.

13. Off-Hook Service. This service feature, often referred to as "hotline" service, automatically establishes a communications path between the originator and receiver of the call. The act of going "off-hook" automatically puts in motion equipment at the serving switching center which sets up a connection at the authorized precedence level. When the call is completed and the receiver has been placed back "on-hook," the switching equipment and trunking used for that call are once again made available for other common users. Unlike the switching equipment and interswitch trunk used to complete the circuit, the subscriber's telephone set and access line can only be used for "off-hook" calls. The reason for this is obvious when one recalls what occurs when the "off-hook" receiver is taken off its cradle.

14. Conferencing. The AUTOVON offers both automatic and random conferencing services. In the former, arrangements can be made for preset conferences whereby a number of subscribers are called up automatically when the originator dials a designated conference number. This feature applies where operational requirements dictate regular, rapid communications among a number of subscribers. Random conferences are set up manually on request by the AUTOVON Assistance Operator (AAO). In this case the AAO, at the time the request is received or at an appointed time, dials the conferees individually. A "meet me" conference can also be scheduled in advance by a subscriber. Here the conferees are requested to dial a specific conference number at a prearranged time.

15. Semiautomatic Ground Environment/BackUp Interceptor Control System (SAGE/BUIC).

a. In addition to the general purpose network, there is an operational subnetwork within the CONUS AUTOVON which uses the common switching and transmission facilities. This subnetwork is the Semiautomatic Ground Environment/Backup Interceptor Control (SAGE/BUIC) System. It provides voice and limited data communications service for the North American Air Defense Command (NORAD), Strategic Air Command (SAC), and Tactical Air Command (TAC) in support of their missions of detecting and identifying all aircraft operating over CONUS and Canada.

b. The SAGE/BUIC system uses the general AUTOVON facilities but is segregated from the general AUTOVON operationally by a discrete numbering plan. This precludes SAGE/BUIC users from communicating directly with general AUTOVON users and vice versa. There are, however, several points in the network where manual interconnections are possible to meet operational requirements.

c. The SAGE/BUIC system is being phased out and replaced by the Joint Surveillance System/Regional Operations Control Center (JSS/ROCC). The JSS/ROCC system, like its predecessor, will continue to use the general purpose AUTOVON switching and transmission services.

16. Joint Military Switched Network (JMSN). The Joint Military Switched Network (JMSN), which is strictly a managerial entity, consists of the CONUS AUTOVON and the Canadian Switched Network (CSN). It has no facilities of its own and exists only as a convenient management tool for coordinating U.S.-Canada crossborder communications in support of NORAD activities.

CHAPTER 3. NETWORK SURVIVABILITY

1. Design Concept. The AUTOVON system was designed and established with its survivability in mind. As a command and control network, it must be able to function and handle essential communications even in times of stress. That is, it must be able to pass traffic even with damage to, or loss of, some of its switching and transmission facilities. A number of the measures described in this chapter were taken to enhance network survivability.

2. Switch Location. The decision was made to build AUTOVON switching centers in remote locations wherever possible. This choice of location lessens the probability of their sustaining collateral damage in the event of attacks on population centers or other prime target areas. At the same time, it reduces the likelihood of inadvertent damage caused by activities associated with densely populated areas.

3. Facility Hardening. Many AUTOVON switching centers have been constructed to withstand damage from natural and manmade destructive forces. The protective measures also apply, to a high degree, to their transmission facilities; cables are sheathed in protective coverings and buried deep in the ground. These hardening measures, along with avoidance routing to bypass populated areas, significantly increase the probability that AUTOVON facilities will survive anything except a direct hit. Even if a cable is cut, essential circuits can be put back into service rapidly through the wideband restoration procedures employed by the telephone industry. By these procedures whole groups (12 circuits) or even master groups (600 circuits) are restored at once rather than individually.

4. Network Routing.

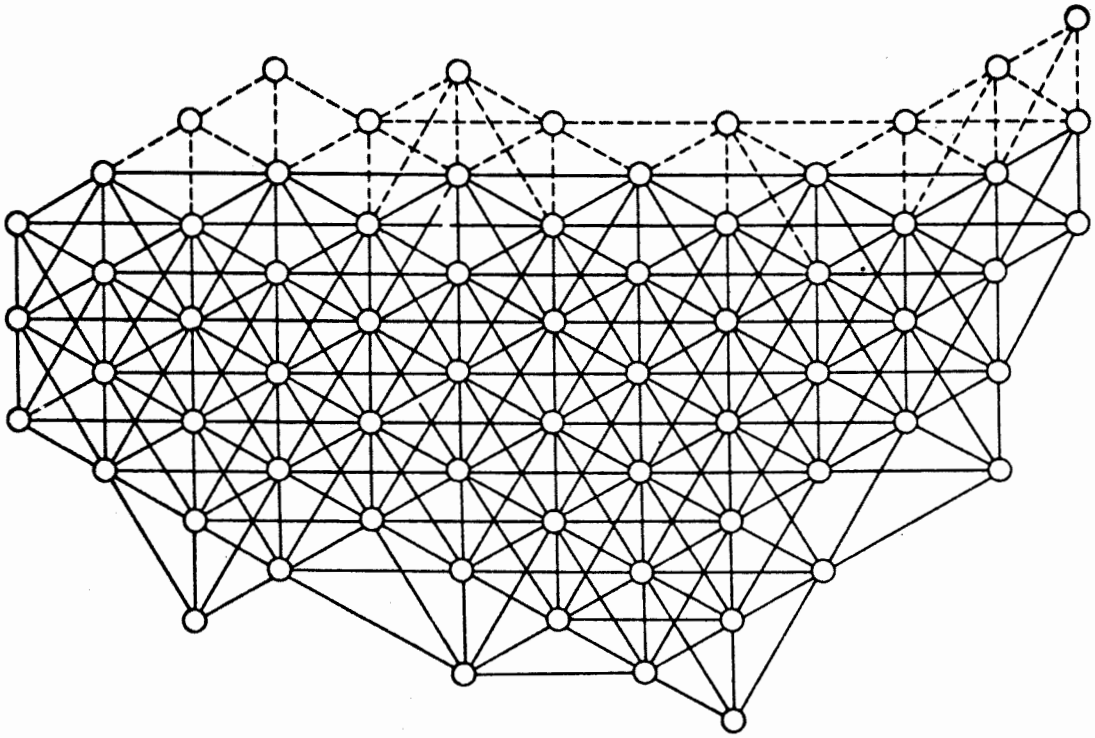
a. The CONUS AUTOVON traffic routing plan is not hierarchial; all switching centers are considered as being of equal importance. AUTOVON switching centers are interconnected by interswitch trunk groups in hexagonal patterns (home grids) which overlap to form a polygrid. (See figure 3-1.) In addition to the regular grid, direct routes are provided to the destinations with high-traffic volumes. (A more detailed description of the polygrid routing philosophy can be found in the DCA Circular 370-V120-1.)

b. In the overseas AUTOVON, the routing system does not fall into the polygrid or hierarchical pattern. Overseas routing was designed to meet specific area requirements. Multiple connectivities, with the automatic alternate routing

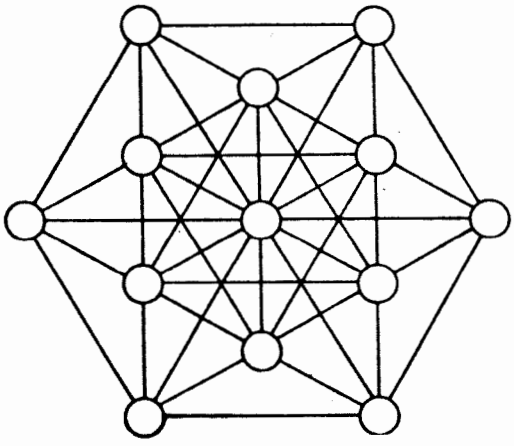
feature discussed earlier, provide numerous communication paths over which essential calls can be completed, even with the loss of some switching centers and transmission facilities. Sufficient call processing capability should always remain to serve any surviving subscribers.

5. Diverse Routing. Other special efforts such as use of diverse media and physical routes can reduce the risk of loss of transmission facilities. For example, circuits can be dispersed geographically over several different routes and on various types of transmission media; i.e., cable, microwave radio, satellite. In this way some paths can be damaged or destroyed without a total loss of connectivity between any two points. These measures are very expensive and can only be justified in the case of important operational circuits.

6. Dual And Split Homing. Important AUTOVON subscribers can have their access lines connected to two separate AUTOVON switching centers. This arrangement leaves the subscriber with access to the network, even in the event of a total failure of one of the serving switches. When a single telephone number is used for both groups of access lines, the configuration is known as dual homing. Split homing exists when a separate telephone number is provided for each set of lines. (See figure 3-3.)



Basic Network



Home Grid

FIGURE 3-1. NETWORK ROUTING CONFIGURATION

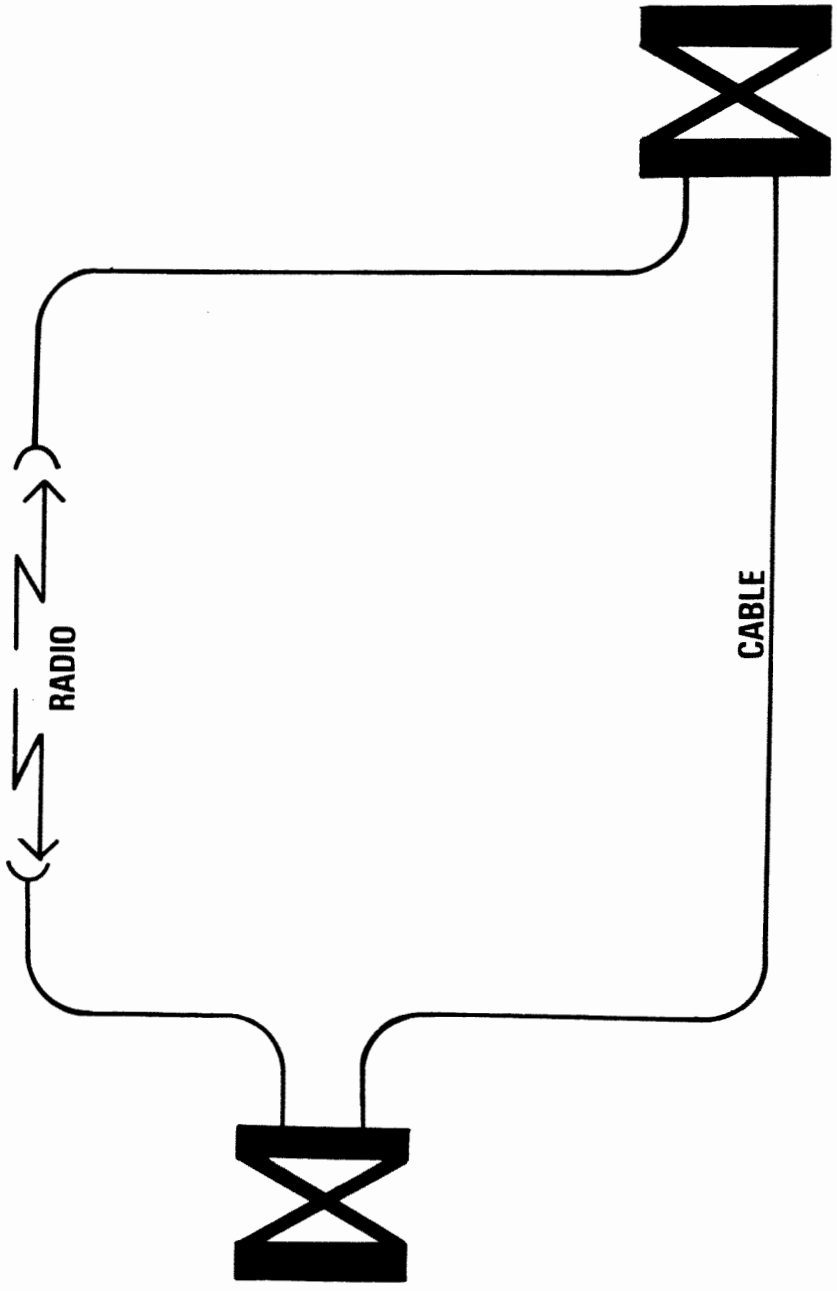


FIGURE 3-2. DIVERSE ROUTING

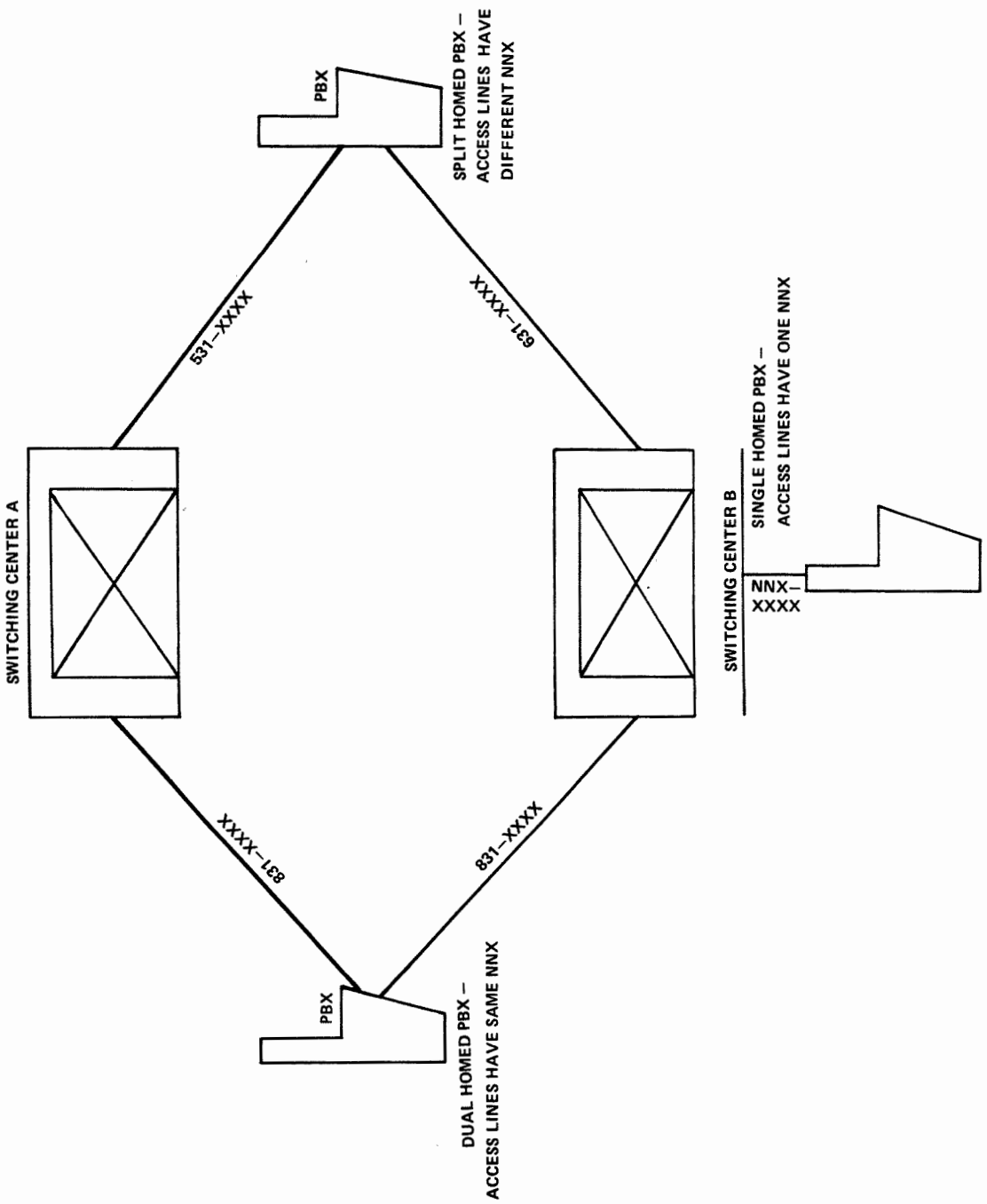


FIGURE 3-3. AUTOVON HOMING ARRANGEMENTS

CHAPTER 4. ORGANIZATIONS AND ELEMENTS

1. Introduction.

a. While DCA is the overall manager of the AUTOVON system, other organizations and elements operate, maintain, and, in the case of the CONUS AUTOVON, own the actual switching and transmission facilities. Needless to say, this mix of owners and operators causes some difficulty in effecting end-to-end management and quality assurance. Consequently, workable relationships between these diverse groups must be fostered to facilitate efficient operation and management of the AUTOVON system.

b. Those organizations and elements playing an important role in the provision, operation, maintenance, and support of AUTOVON facilities are identified in the following paragraphs. Paragraph 12 contains a more detailed schedule of their duties and responsibilities.

2. Secretary of Defense. The Secretary of Defense establishes AUTOVON policy, concepts, and objectives; evaluates network operational effectiveness; and approves interconnections between the voice networks of non-DoD Government agencies, allied nations, and the AUTOVON. The Secretary of Defense authorizes the operations of a Communications Services Industrial Fund (CSIF) to pay the cost of AUTOVON leased facilities (switching services, interswitch trunking, and special features) and approves AUTOVON budgets, programs, and subscriber rate schedules for the various types of AUTOVON service (calling area and precedence capability, voice, voice-data).

3. Joint Chiefs of Staff (JCS). The Joint Chiefs of Staff oversee the operational effectiveness of the AUTOVON. Within the DoD objectives, they establish performance and service objectives; approve the size and configuration of the AUTOVON; set requirements for FLASH, FLASH OVERRIDE, and interarea calling capability, and approve requests for waivers to the AUTOVON interface criteria and for any new features which will increase the total cost of the network.

4. Defense Communications Agency (DCA). The Defense Communications Agency ensures that the global AUTOVON system is established, operated, and improved in such a manner that it will be able to meet the long-haul, automatic voice and voice-data switched network requirements of the DoD and other authorized Government agencies. In carrying out this mission, the DCA exercises management control and operational direction over the

AUTOVON to ensure its maximum efficiency, economy, effectiveness, and responsiveness to customer needs. The DCA also prepares AUTOVON financial estimates and subscriber rates, based on access lines and backbone requirements, for inclusion in the CSIF budget for Secretary of Defense approval as outlined in paragraph 3.

5. Military Departments (MILDEPS). The Secretaries of the military departments, within their available resources as approved by the Secretary of Defense, support and assist the DCA in operating and maintaining the AUTOVON. This assistance encompasses but is not limited to technical, administrative, budgeting, training, logistic, research, and development support with respect to the AUTOVON. They also advise the DCA on problem areas such as shortages of resources which could affect the operation and maintenance of the system. They also exercise review and approval authority over requests for AUTOVON services.

6. Unified and Specified Commands. Commanders of the unified and specified commands assess the responsiveness of the AUTOVON to their operational needs, conduct and participate in exercises and technical tests, and develop agreements to ensure mutual responsiveness and coordination of efforts between themselves and DCA field activities. They also review, validate, and approve AUTOVON requirements of their subordinate elements.

7. Air Force Logistics Command (AFLC). Air Force Logistics Command provides life-cycle engineering and logistics support for overseas AUTOVON switching facilities for all the military services.

8. Non-DoD Government Agencies. Non-DoD Government agencies validate and budget for their respective requirements for AUTOVON service, coordinating, as appropriate, with the overseas unified and specified commands. Their service must be approved by the DoD.

9. National Defence Headquarters (NDHQ), Canada. National Defence Headquarters is responsible for the Canadian Switched Network (CSN) which is fully integrated with the CONUS AUTOVON to form the Joint Military Switched Network (JMSN). It discharges this responsibility through the Canadian Forces Communication Command (CFCC) which exercises management control and operational direction over the CSN. As joint manager of the JMSN with DCA, CFCC coordinates policy, cost sharing, traffic analysis, and crossborder communications matters on Canada's behalf. The CSN fully conforms technically and operationally with the CONUS AUTOVON.

10. Telephone Industry. The telephone industry plays a major role in the AUTOVON; all CONUS switching and transmission services are leased from the American Telephone and Telegraph Company (AT&T), General Telephone and Electronics Corporation (GTE), and a number of independent telephone companies. The AT&T is by far the major participant providing 35 of the CONUS switching centers. GTE affiliates own and operate three, while the remaining seven CONUS switches are owned and operated by individual companies. The AT&T is the overall coordinator for CONUS AUTOVON activities for the telephone industry. In Canada, the TransCanada Telephone System (TCTS) coordinates AUTOVON activities with telephone industry members providing switching and transmission facilities in that country. The United States Independent Telephone Association (USITA) also coordinates AUTOVON activities affecting its members companies, as does Government Communications Associates (GCA), which represents seven independent telephone companies furnishing AUTOVON switching centers. In this manner the telephone industry coordinates network service requirements, technical and operational compatability, traffic analysis studies, and phasing and timing of CONUS network changes or improvements.

11. International Record Carriers. The international record carriers (IRC) are also involved in providing leased services for the AUTOVON primarily in the overseas areas. They are directly involved in the provision, maintenance, and restoral of those circuits falling within their respective purviews.

12. Specific Duties and Responsibilities. A more detailed summary of the duties and responsibilities of the various elements and organizations involved in the management and support of the AUTOVON follows:

a. Secretary of Defense.

(1) Establishes AUTOVON policy, concepts, and goals.

(2) Evaluates the operational effectiveness of the AUTOVON.

(3) Approves any interconnections between the AUTOVON and other voice networks.

(4) Authorizes the operation of the CSIF.

(5) Conducts annual budget hearings and periodic budget reviews.

(6) Approves subscriber rate schedules for AUTOVON service.

(7) Approves and allocates funds and establishes guidelines and necessary constraints on new equipment, circuits, and grades of service (GOS) within available funds.

(8) Approves service for non-DoD subscribers.

b. Joint Chiefs of Staff:

(1) Provide guidance on policy and procedures for operation and use of AUTOVON.

(2) Establish AUTOVON performance and service goals with DoD guidance.

(3) Approve configuration and size of the overseas AUTOVON.

(4) Approve FLASH and FLASH OVERRIDE and interarea calling capability.

(5) Prescribe target grades of service within DoD guidance.

(6) Approve any new AUTOVON features that increase network cost.

(7) Approve or disapprove waiver of interface criteria requests.

(8) Oversee AUTOVON operational effectiveness.

c. Defense Communications Agency.

(1) Exercises management control and operational direction over the AUTOVON.

(2) Performs network analysis.

(3) Analyzes abnormal network conditions and assesses their severity and impact on AUTOVON capability.

(4) Monitors network status, including CONUS gateway switching centers and interarea trunks.

(5) Maintains and disseminates information on the operational and traffic status of the AUTOVON.

(6) Takes action to correct interarea deficiencies beyond the capability of DCA areas.

(7) Directs major restoral and rerouting actions.

(8) Resolves interarea network traffic problems.

(9) Authorizes implementation of network control procedures at CONUS AUTOVON switching centers when indicated.

(10) Monitors the effectiveness of control measures taken.

(11) Advises user commands of any impairment of network capability, isolation of major users, and application of control measures.

(12) Receives, evaluates, and acts on subscriber complaints.

(13) Coordinates with JCS, unified and specified commands, O&M commands, and other Government agencies regarding AUTOVON service and requirements.

(14) Develops, coordinates, and implements operational policy, procedures, and standards for the AUTOVON.

(15) Develops management indexes and thresholds for assessing present and future operational effectiveness of the AUTOVON.

(16) Monitors the effectiveness of AUTOVON management information.

(17) Compiles and publishes the Global AUTOVON Directory.

(18) Reports to the JCS actions and conditions having an adverse affect on the AUTOVON.

(19) Ensures that technical and operational interface criteria are met by those requesting AUTOVON service.

(20) Reviews all requests for waivers of interface criteria from the technical point of view.

(21) Reviews and evaluates the operational impact of user contingency operations and communications support plans.

(22) Participates and assists in customer management of special voice communications.

(23) Performs traffic engineering functions to evaluate the effectiveness of the AUTOVON.

(24) Develops and publishes methods and procedures for the collection and analysis of AUTOVON traffic engineering data for periodic and special studies aimed at assessing the network's adequacy to meet the service objectives.

(25) Provides predictions, based on network traffic flow and system operation data, on future network effectiveness.

(26) Develops parameters for simulator modeling techniques for evaluating AUTOVON performance and studying new network configurations.

(27) Recommends PBX access line configuration and size changes to improve grades of service.

(28) Provides configurative, traffic loading, and other data for research and development programs.

(29) Develops and implements policy, procedures, and standards with respect to the overseas AUTOVON switch encoding program.

(30) Develops AUTOVON cost estimates for inclusion in the CSIF budget.

(31) Develops and recommends AUTOVON subscriber rates based on AUTOVON access lines and backbone costs.

(32) Publishes approved subscriber rates.

(33) Participates in OSD and OMB budget review, appropriation, and apportionment hearings.

(34) Conducts review and analysis of AUTOVON program execution and reprograms funds as required.

(35) Provides AUTOVON subscribers with financial and access line status reports and billing data.

(36) Provides budgetary guidance to AUTOVON subscribers.

(37) Collaborates with Canadian representatives in developing cost-sharing agreements.

d. Military Departments.

(1) Provide support and assistance to the AUTOVON, particularly in the O&M of DCS facilities.

(2) Provide technical specifications and related data on proposed procurement programs affecting the AUTOVON.

(3) Advise DCA of shortages of funds, personnel, facilities, or materials having an adverse impact on the AUTOVON.

(4) Exercise review and approval authority over requests for AUTOVON service.

e. Unified and Specified Commands.

(1) Assess and report the responsiveness of the AUTOVON to their operational needs.

(2) Develop agreements to delineate command and operational relationships with DCA field organizations.

(3) Conduct and participate in exercises and technical tests.

(4) Exercise review and approval authority over requests for AUTOVON service.

f. Air Force Logistics Command.

(1) Provides engineering and logistic support for the overseas AUTOVON system.

(2) Maintains a software programing capability to update, correct, and develop new test and diagnostic software routines as required.

g. National Defence Headquarters, Canada.

(1) Acts as joint manager of the JMSN.

(2) Coordinates policy, cost sharing, traffic analysis, and crossborder communications on Canada's behalf.

(3) Ensures that the CSN conforms technically and operationally with the CONUS AUTOVON.

h. American Telephone and Telegraph Company.

(1) Provides, operates, and maintains AUTOVON switching and transmission facilities for the CONUS AUTOVON.

(2) Operates a network management center to maintain near real-time status information on the CONUS AUTOVON.

(3) Acts as overall telephone industry coordinator for the CONUS AUTOVON.

(4) Reports significant commercial transmission facilities failures and threatening conditions to DCA.

(5) Directs implementation of network control procedures to CONUS AUTOVON switching centers.

(6) Assists in network design of the CONUS AUTOVON.

i. General Telephone and Electronics Corporation.

(1) Provides, operates, and maintains CONUS AUTOVON switching centers.

(2) Operates a technical assistance center in support of GTE affiliates and independent operators of AECO-type switching centers.

j. Government Communications Associates. Represents the independent telephone companies that provide, operate, and maintain CONUS AUTOVON switching centers.

k. United States Independent Telephone Association. Coordinates AUTOVON activities affecting its member companies.

l. TransCanada Telephone System. Coordinates AUTOVON activities for Bell Canada and the Independent Telephone Companies providing AUTOVON services within Canada.

m. International Record Carriers.

(1) Provide leased services in support of the global AUTOVON.

(2) Coordinate with other AUTOVON service providers regarding circuit quality checks and restoral actions.

CHAPTER 5. SYSTEM MANAGEMENT

1. Definition. Within the context of this Circular system management is defined as "being all those measures taken to ensure the economical, efficient and effective operation of the worldwide Automatic Voice Network." Besides those actions taken by the DCA, the overall network manager, it includes the efforts of the various organizational elements which support the AUTOVON. Management functions range from research and development, through systems engineering and implementation, to operational direction and management control. For functional convenience, system management is divided into two main activities: operational direction and management control, which are defined and discussed in this chapter.

2. Scope. The depth of material presented herein is considered sufficient to provide a general insight into how the AUTOVON is managed. It is not intended to replace detailed descriptions set forth in the various AUTOVON publications and agreements.

3. Purpose. The AUTOVON management system exists to assist the Director, DCA in discharging responsibilities with respect to the AUTOVON.

4. Objectives. The objectives of the management system are to assign, sense, report, analyze, and react to ensure that the AUTOVON is planned, improved, operated, maintained, and managed efficiently, effectively, and economically in order to meet user requirements. How these objectives are met is the subject of the remainder of this chapter.

5. Organization. The DCA responsibility for management control and operational direction of the AUTOVON is vested in the Operations and Readiness Directorate. Management control is defined as the review, evaluation, coordination, and management actions necessary to fulfill the responsibilities of operational direction, which is the authoritative direction necessary to ensure effective operation of the AUTOVON.

6. Role of DCA Europe and DCA Pacific. In view of the global scope of the AUTOVON, centralized management from Headquarters, DCA would obviously be too unwieldy. Hence, two major DCA field activities, DCA European Area and DCA Pacific Area, manage AUTOVON facilities within their respective zones of responsibility. DCA Europe and DCA Pacific take actions necessary to provide AUTOVON support to the CINC's and other DoD elements and agencies within their areas. They also exercise command authority over subordinate field activities in their respective areas.

7. Role of Defense Commercial Communications Office (DECCO). An operation the size of the AUTOVON entails considerable bookkeeping; leased costs alone amount to more than $100 million annually. The Defense Commercial Communications Office handles this aspect of AUTOVON management. It procures, accounts, and pays for all leased facilities, services, and equipment called up for the AUTOVON. It also administers contracts, operates the CSIF, prepares financial data, and collects from the military departments and other Government agencies for AUTOVON service. DECCO also has regional offices in Europe and the Pacific which perform related functions, as authorized.

8. Operational Direction. The DCA Operations Control Complex (DOCC) exercises operational direction over the AUTOVON system and collects and disseminates network status information. It consists of the DCA Operations Center (DCAOC) in Washington, DC and two Area Communications Control Centers (ACOC's), one in the Pacific (Wheeler AFB, Hawaii) and the other in Europe (Vaihingen, Germany). The DOCC functions through area operations elements and the appropriate elements of overseas O&M agencies.

a. DCAOC and ACOC. The DCAOC and the ACOC's are the operating arms of the DOCC. They collect status information, evaluate and react to it as appropriate, direct and supervise circuit restoration activities, oversee the reallocation of resources, monitor tests and exercises, and develop standard operating procedures for all elements acting in support of the AUTOVON. The DCAOC, as overall system coordinator, interacts with the ACOC's, the telephone industry, and international record carrier operations centers to resolve interarea problems and oversee the entire AUTOVON system.

b. Dranesville Network Management Center (NMC). The DCAOC is supported in the CONUS AUTOVON by the Dranesville NMC. This facility, owned and operated by the AT&T, maintains near real-time CONUS AUTOVON status information. Within the constraints imposed by the DCAOC, the NMC directs the implementation of network control procedures at CONUS AUTOVON switching centers. The NMC reports to the DCAOC significant commercial landline cable, carrier system, or other facility failures affecting high-priority AUTOVON circuits. It also reports any other threatening conditions that could result in major service interruptions, so that measures can be taken to minimize any unavoidable service disruptions.

9. Management Control. Responsibility for management control of the AUTOVON rests with the DCA Voice Network Management

Division. This Division is charged with the day-to-day management of the system. It is tasked with ensuring that the system performs with optimum efficiency, economy, effectiveness, and responsiveness to customer needs. Network management actions involved can be placed into three broad categories: operations, traffic engineering, and computer software management.

10. AUTOVON Operations. The burden of ensuring that the requisite levels of switching and transmission facilities are in place, functioning efficiently, and fully satisfying AUTOVON user requirements rests with the DCA Voice Network Management Division. This responsibility entails continuous assessment and adjustment of the network as operational conditions change. The Voice Network Management Division develops the appropriate policies, procedures, and technical standards to achieve the maximum network efficiency. It also reviews and updates the AUTOVON network service criteria to accommodate new technology and preserve technical and operational integrity of the network.

11. AUTOVON Switch Software Management. Since nearly all AUTOVON switching centers are computer controlled, considerable software support is required to accommodate changes and user requirements. Coordination of software changes in the CONUS AUTOVON is handled by the appropriate telephone companies, with implementation by the individual switching center's personnel. The DCA performs and administers the overseas AUTOVON switch encoding program. It also serves as office of record for all overseas memory and cross-connect data, establishes policies on encoding changes, and directs global AUTOVON number assignments to ensure the compatibility of overseas and CONUS networks.

12. Committees and Steering Groups. Because of the AUTOVON system's size and complexity, a number of committees and steering groups have come into being to help solve managerial and operational problems and concerns associated with the network. The three main groups are discussed in the following paragraphs.

a. AUTOVON Operations Group (AVOG). The AUTOVON Operations Group provides a forum for identifying, discussing, coordinating, and resolving matters pertinent to the AUTOVON, with the aim of achieving a cost-effective and responsive network. This group serves as the standing committee for AUTOVON communications policies, practices, procedures, and operational matters. The principal members--the DCA, Departments of the Army, Navy, and Air Force, and the Defense Logistics Agency--each have one vote on matters before the board. In addition to the principals, there are a number of participating members, such as the CINC's and DECCO, who provide advice and counsel to voting members. The AVOG meets at least annually and is chaired by the Defense Communications Agency.

b. Overseas AUTOVON (490L) Steering Group.

(1) The Overseas AUTOVON Steering Group provides technical guidance and direction for the engineering support, logistics support, maintenance, and operation of the overseas AUTOVON (490L) switches. The Steering Group meets quarterly at the Sacramento Air Logistics Center (SMALC), McClellan AFB, CA, which has life-cycle engineering and logistics support responsibility for the overseas AUTOVON switches.

(2) Representatives of the SMALC, the MILDEP O&M and engineering agencies, the Defense Communications Engineering Center (DCEC), and the Defense Communications Agency are regular participants. Other commands and agencies send representatives to steering group meetings as required.

(3) Each steering group session reviews approximately 20 technical matters which range in subject from maintenance problems submitted by switch sites, to O&M policy matters, to specifications for major switch subsystems. Each quarterly session reviews ongoing overseas AUTOVON support programs costing 2 to 3 million dollars.

(4) Quarterly reports of AUTOVON Steering Group activities can be requested through the Director of Materiel Management, Sacramento Air Logistics Center, ATTN: MMCREX, McClellan AFB, CA, 95652.

c. U.S.-Canada Joint Industry Steering Committee (JISC). The JISC was formed to coordinate actions and to disseminate information on the Joint Military Switch Network (JMSN). Its membership consists of representatives from the military and the telephone industry in the U.S. and Canada. The DCA represents the U.S., and Canadian Forces Communications Command represents Canada. The JISC serves as a forum for senior management levels to jointly establish, review, and amend JMSN policies. It meets annually and is cochaired by DCA and CFCC. Within the JISC framework is a Technical Coordination Group (TCG) which meets more frequently to deal with JMSN matters referred to it by the JISC. The TCG can be considered the working level technical and operational advisory group.

13. AUTOVON Training.

a. There are few training courses available in the operation, maintenance, and management of the AUTOVON system. Most courses are sponsored by the telephone industry. The AT&T offers a general telephone network management course at Morristown, NJ, and an AUTOVON network management course at

Dranesville, VA. Operating telephone companies also provide customer education and training services on location whenever new AUTOVON services are provided. Followup training on AUTOVON procedures for new personnel can usually be arranged through the operating telephone company.

b. The Air Training Command (ATC) trains technicians in the maintenance of overseas AUTOVON switches and new switch subsystems at Sheppard AFB. These courses are designed for personnel who will be working at an overseas switch for the first time or were trained before the introduction of the new subsystems.

c. As the need arises, DCA sponsors and arranges for an in-house training course on the AUTOVON on an ad hoc basis. On these occasions, the agency contracted to provide the training presents the courses at Headquarters, DCA in Washington, DC.

CHAPTER 6. TRAFFIC ENGINEERING

1. Network Size and Configuration. The task of balancing AUTOVON facilities with operational requirements is a delicate one. It is accomplished by network traffic engineers who process, analyze, and review the traffic data collected throughout the AUTOVON system. They assess the results of their studies and recommend changes to trunk group size and connectivity. Of course, these adjustments are aimed at obtaining the most economical network commensurate with operational requirements. The principal AUTOVON traffic detail collection systems are described in paragraphs 3 and 4.

2. Major Network Adjustments. Where large-scale changes such as the addition or removal of AUTOVON switching centers are planned, the services of the Defense Communication Engineering Center (DCEC) are enlisted. DCEC tests the proposed changes using computer simulation techniques and produces reliable indicators of how the reconfigured network may be expected to perform. This method reduces the possibility of errors occurring in the new configuration and allows for the correction of any that do occur before any physical change is made to the network.

3. Traffic Data Collection System (TDCS). The Traffic Data Collection System (TDCS), incorporated in the overseas AUTOVON switching centers, provides traffic and call information and is an important management tool. Usage, duration, and count data on switch actions are of immeasurable value to the traffic engineers; call data can be used to identify precedence and calling area abuses, excessive holding times, and inefficient access line configurations. These call data are disseminated to major AUTOVON users for appropriate administrative action. A more detailed description can be found in DCA Circular 310-V70-45.

4. Message Call Detail System (MCDS). Another valuable traffic engineering tool is the Message Call Detail System (MCDS). This system was installed in 1979 at a number of CONUS AUTOVON switching centers. It provides for the collection of call detail and call disposition information on messages originated on access lines homed on nine AUTOVON switching centers selected because they handle a very high percentage of the total network interarea and high-precedence traffic. Data provided by the MCDS include the percent of calls completed, disposition of uncompleted calls, average holding times, calls exceeding specific thresholds, and calling and called numbers.

5. AUTOVON Network Administration Computer Programs. Traffic count and usage data in the CONUS AUTOVON are automatically collected, processed, and summarized by the AT&T Company every two months. The traffic data received are analyzed by AT&T and DCA, using AT&T AUTOVON Network Administration (ANA) and AUTOVON Network Engineering (ANE) computer programs. These programs are used to evaluate the performance of the current network, develop specific trunk adjustments, provide access line analysis and recommendations, and engineer major network reconfigurations when required.

6. AUTOVON Access Lines. The military departments determine the number and type of access lines installed at their respective posts, camps, and stations (based on the JCS requirements for a number sufficient to meet a specific minimum grade of service). The importance of having the appropriate number of circuits cannot be overemphasized since, in addition to the economics involved, the number can affect the call completion rate of the entire network. For example, if a location has an insufficient number of lines to handle its incoming traffic, callers encounter busy signals and generate repeated attempts to reach that location.

7. Recommendations on Grades of Service. As part of its work in network traffic engineering, DCA also determines the grades of service (GOS) at major PBX locations, because of their large impact on the AUTOVON backbone. By measuring the inward, and computing the outward, grades of service at PBX's, DCA can assist the military departments in planning the most efficient and cost effective number and combination of access lines. Recommendations are made to the military departments twice a year for PBX's having five or more AUTOVON access lines.

8. Access Line Configurations. A number of access line configurations and hunt sequences have proved to be very efficient, both from the operational and economic point of view. These standard configurations make maximum use of one-way and two-way groups. Incoming preemption, as well as originating precedence capability, is normally installed on two-way circuits because the same preemption equipment at the AUTOVON switching center can be used for both incoming and outgoing precedence calls. Similarly, more efficient operation can be achieved through proper circuit hunt sequence arrangements for any given number of access lines. DCA is prepared to offer advice and assistance in this area also.

CHAPTER 7. AUTOVON POLICY

1. Introduction. The DCA derives its authority to direct and manage the AUTOVON system from DoD Directive 5105.19, Defense Communications Agency, 10 August 1978, as amended. Other relevant and useful publications are discussed below.

2. Joint Policy. The JCS MOP 151 establishes joint policy for use of the AUTOVON, including criteria for the selection of the type of service required and procedures for validating and processing requirements. It outlines the validation process with respect to specific types and levels of service, including which particular echelons of authority can approve them. This document also describes the validation and approval procedures for those DoD and non-DoD agencies not under the authority of the JCS. These agencies have been delegated validation responsibility by the Secretary of Defense. The JCS MOP 151 has limited distribution, but the substantial content may be found in ACP 121.

3. Approval of Service. The Chiefs of the MILDEPS, Commanders of unified and specified commands, and Heads of DoD agencies and activities responsible to the JCS, exercise review and approval over AUTOVON service requests within their respective spheres of responsibility. However, a few AUTOVON services, because of their impact on the system, require approval of higher authority.

a. Interconnections with other telecommunications networks require the approval of the Secretary of Defense.

b. The JCS has approval authority over FLASH and FLASH OVERRIDE calling capability, interarea calling capability without a circuit with equivalent calling capability being offered as a tradeoff, waiver of the 40-percent restriction of official mainline telephones for AUTOVON service, and any request for AUTOVON service on which the views of the requester and DCA are not in accord.

4. Direction, Guidance, and Information. A considerable number of other DCA Circulars and Instructions pertaining to the various aspects of operation, maintenance, and management of the AUTOVON have been distributed to those organizations and elements which require the information or direction contained in them. A complete list of circulars relating to the AUTOVON may be found in DCA Notice 210-0-1. Two of the most important and useful publications concerning the AUTOVON are:

a. System Interface Criteria (DCAC 370-V175-6). This Circular establishes the criteria to provide engineering guidance for the interfacing between connecting telecommunications systems and equipment and the global AUTOVON. It covers, among other matters, the technical handling of precedence calls, transmission criteria, signaling, typical access line configurations, subscribers' equipment and features, PBX/EPBX and consoles, interfaces with other systems, testing, and maintenance. This Circular contains a wealth of technical information on AUTOVON service and is continually being updated through the coordinated efforts of DCA and participating telephone companies. The Defense Communications Engineering Center (DCEC) is the office of primary responsibility for this Circular.

b. Network Dial Service Criteria, DCS General Purpose AUTOVON (DCAC 310-V175-2). This Circular establishes the DCS criteria for ordering, converting, and reconfiguring network dial service on the general purpose AUTOVON to ensure that subscriber facilities are operationally compatible with a switched network and that service features are in consonance with JCS AUTOVON policies. It covers administrative controls, minimum acceptable PBX features, handling of precedence calls, acceptable access line configurations, off-netting of calls, conferencing, and many other details which must be considered when ordering new, or changing existing, AUTOVON service. This Circular is of immeasurable value to those personnel charged with planning and ordering voice telecommunications, equipment, and services.

5. Waivers of Interface Criteria.

a. On occasion it may not be possible for an AUTOVON customer location to meet all the engineering or operating criteria for AUTOVON service. In these instances the subscriber must request a waiver of the criteria from DCA. The request will be evaluated for possible impact on the network if it is granted. DCA will then recommend approval or disapproval of the waiver to the JCS.

b. One of the most common waiver requests deals with a subscriber's inability to handle incoming precedence calls in the prescribed manner. Such a situation arises when new PBX equipment does not meet all AUTOVON interface criteria; this clearly is an avoidable situation. It is the current DCA policy to grant a temporary waiver for 6 months, or in rare cases up to a year, provided the requester offers in the request a concrete plan for correcting the situation within an acceptable time frame. However, there is no guarantee that a waiver will be granted; a subscriber not able to meet the interface criteria

may well be denied or forced to discontinue AUTOVON service. For this reason, those personnel charged with procurement of telephone equipment must ensure that any equipment being considered meets the interface criteria if AUTOVON service is contemplated.

CHAPTER 8. AUTOVON FUNDING

1. Philosophy. AUTOVON funding is based on the premise that users should pay for the level of service they require. For example, a subscriber needing a FLASH precedence and global calling capability pays more than one having only a ROUTINE precedence and local calling capability. The reason for this is quite simple; the precedence user has preferential access to the common AUTOVON facilities, even to the point of interrupting the calls of other users. The same reasoning applies to the interarea caller who, as a general rule, uses more switching and transmission facilities (for example, high-cost transoceanic circuits) than the local area caller. Similarly, AUTOVON subscribers who wish to transmit data over AUTOVON facilities also pay a higher rate because they tend to have longer holding times than voice callers.

2. Communications Services Industrial Fund (CSIF) Subscriber Rates. The costs of AUTOVON leased facilities are paid through a Communications Services Industrial Fund (CSIF) administered by the Defense Communications Agency. This is basically a working capital or revolving fund under which the recovery of costs is effected by predetermined subscriber rates set each year. The CSIF is a convenient vehicle for the centralized accounting of AUTOVON costs as well as the apportioning of backbone costs among AUTOVON users. An annual budget is prepared which predicts the total costs of operating AUTOVON facilities for the coming year based on access line projections received from each subscriber. The backbone costs are then distributed among AUTOVON users on the basis of the number and calling capability of their access lines.

3. Other User Costs. The subscriber rate charges refer to the shared costs of operating the network backbone; that is, the switching centers and interswitch trunking. In effect, they are an entry fee for AUTOVON service. AUTOVON users must also pay other costs associated with their service such as installation charges, terminal equipment charges, and mileage costs to the serving AUTOVON switching center.

CHAPTER 9. CUSTOMER SERVICE

1. Service Ordering. Complete details on the procedures for ordering AUTOVON service can be found in DCAC 310-130-1, Submission of Telecommunications Service Requests. Typically, AUTOVON access line requirements are processed as follows:

a. CONUS.

(1) When a requirement for AUTOVON service is identified, the originator forwards it to the appropriate Telecommunications Certification Office (TCO) for validation.

(2) After it has been certified as a valid requirement and after CINC, JCS, or other approval is obtained if required (for example, for FLASH precedence or interarea calling capability), the TCO forwards it to the DCAOC Allocations and Engineering Division (AED) as a Telecommunications Service Request (TSR) with an information copy to the camp, post, or station concerned.

(3) AED reviews the requirement and issues a Telecommunications Service Order (TSO) for the Defense Commercial Communications Office (DECCO) to take necessary leasing actions.

(4) A completion report is submitted by the designated agency when the ordered service has been provided.

b. Overseas. The procedure for ordering AUTOVON access lines in areas other than CONUS is somewhat different. The TCO forwards the validated requirement to the DCA action agency tasked with providing service in the area. If the service can be provided from DCS resources, AED selects the specific trunks or channels to satisfy the requirement. Should a leasing action be required, a TSO is issued to the appropriate area leasing office for action. A completion report is submitted by the designated agency.

2. AUTOVON Assistance Operator (AAO). AUTOVON Assistance Operators can provide information not available in the Global AUTOVON Directory, extend official calls at a higher precedence and also to another geographical area, and arrange conferences on request. This service is available only to four-wire subscribers and PBX attendants; AUTOVON users requiring assistance must address their requests to their local PBX attendants. Any requests for a raise in precedence or for extension of a call to another area must be justified in accordance with existing regulations, since AUTOVON service is predicated on the basis that all customers have the level of service commensurate with their office function.

3. AUTOVON Trouble Reporting. There may be occasions when difficulty is encountered in placing an AUTOVON call. If the trouble was not due to dialing of an incorrect number, it should be reported to the local switchboard attendant who has instructions on obtaining assistance. Subscribers, that is, those customers who receive their service directly from an AUTOVON switching center, should dial the universal trouble reporting number (550-1611). This number routes the call to the trouble desk of the serving switching center. If possible, the circuit on which the trouble is encountered should be kept connected to make it easier for maintenance personnel to trace the problem. Additional trouble reporting instructions can be found in the Global AUTOVON Directory.

4. Distribution of Global AUTOVON Directory.

a. DCA prepares, publishes, and distributes a Global AUTOVON Telephone Directory three times a year. This directory is distributed to AUTOVON subscribers as follows:

(1) One copy to each AUTOVON four-wire subscriber.

(2) One copy to each PBX operator position plus one for the chief telephone operator.

(3) Copies to unified and specified commands and major DoD activities for management purposes.

b. Headquarters, DCA and DCA areas stock a limited number of directories to meet emergency, supplemental, and new subscriber requirements. AUTOVON users must obtain their directories through normal publication procurement channels. Both AUTOVON subscriber and user subscription order forms are included in each directory for customer convenience.

5. Organization of Global AUTOVON Directory. The AUTOVON Directory lists only four-wire subscribers and those PBX's having AUTOVON service. It is divided into the following geographical subsections: CONUS, Alaska, Europe, Pacific, and the Caribbean. The directory is further broken down into departmental subsections: Department of Defense, Departments of the Army, Navy, and Air Force, and Miscellaneous (non-DoD). DCA Code 520 is the office of record and maintains a master list of subscriber listings and mailing addresses. There is a form enclosed in all directories for submitting listing and address corrections to DCA.

CHAPTER 10. SERVICE IMPROVEMENTS

1. General. The DCA is continually striving to improve the AUTOVON system and enhance the service. It has a standing policy of soliciting from AUTOVON customers suggestions for improvement. The DCA is currently examining the problem of what the next generation of AUTOVON should be. This is no easy task in an era of onrushing new technology. There are, however, a number of specific areas which are attracting the attention of network engineers and are likely to remain prominent in the AUTOVON of the future. The main ones are discussed briefly in the following paragraphs.

2. Digital Communications.

a. The trend in communications technology is away from analog and toward digital switching and transmission facilities. There are a number of excellent reasons for choosing digital technology. They include lower cost, reduced equipment size, less maintenance, increased simplicity, and greater reliability. However, the existing capital investment in analog facilities means they cannot be discarded while they are still viable. Therefore, the introduction of digital equipment into the AUTOVON will be gradual, on a replacement basis.

b. As an example of this case-by-case consideration, the Fairview, KS, AUTOVON switching center stands out. When this switch was no longer able to handle its traffic load, the telephone company submitted a proposal for a new digital switch that could operate in the existing analog network. Consequently, the first digital AUTOVON switching center is scheduled to come into service early in 1981. This digital switch is expected to be fully compatible with the next generation AUTOVON, no matter what technological architecture is chosen. At the same time, planning is in progress for the installation of two digital AUTOVON switches in Alaska in 1982.

3. Satellite Communications. The use of satellite circuits in the AUTOVON is growing steadily as additional capacity becomes available. Satellite circuits are very attractive for long-haul, interswitch trunks, and long access lines because their cost is not distance sensitive, unlike terrestrial transmission facilities which are tariffed on mileage. The main costs associated with satellite circuits are the satellite itself and the ground entry equipment. Once these are provided, the transmission is essentially "free." At present the AUTOVON uses both Defense Satellite Communications System (DSCS) and commercial satellites primarily for transoceanic traffic on long-haul links to overseas areas. The trend toward wider use

of satellite circuits is expected to accelerate. Satellites, however, are not without disadvantages, including speech delay and vulnerability to jamming, monitoring, and attack.

4. Wideband Leases. DCA is also acquiring wideband leases to meet operational requirements for both technical and economic reasons. For example, a 1.544 mb lease lends itself to bulk encryption of many communications channels and also offers economies through special tariff rates. The savings can be substantial; in some cases halving circuit costs. Moreover, as commercial carriers increase satellite channel capacity through improved technology, costs should continue to fall, allowing improvements in AUTOVON service at acceptable budget levels.

5. Software-Controlled PBX. Sharp reductions in the cost of electronic technology in recent years have led to a flood of new computer-controlled, private branch exchanges (PBX's) coming into the market. The new PBX's can provide much better service to users and should be exploited. However, any new PBX being considered must meet the technical and operational interface criteria if AUTOVON service is contemplated. Many of these new PBX's are being tested for suitability for AUTOVON service. Those that can meet the interface criteria are so certified and will present no problems to the user with respect to AUTOVON compatibility, assuming the requisite features are ordered. It cannot be emphasized too strongly that PBX's must conform to the AUTOVON parameters and not the converse.

6. Defense Metropolitan Area Telephone System (DMATS). There is also a continuing trend toward the consolidation of telephone services within metropolitan areas. Existing services have grown over the years as new requirements have arisen. So that these systems will interface with the Defense Switched Network proposed by ASD (C3I), DCA is currently preparing DCS switch criteria for the military departments to include in future DMATS and post and base switch procurements. In essence, the DMATS program consists of studying a metropolitan area's existing services, communities of interest, and service requirements, followed by comprehensive planning in an integrated approach to meeting these requirements at the least possible cost. The availability of new switching and transmission technology in the form of microprocesser-controlled PBX's and digital carrier systems opens the door to imaginative new approaches.

7. Consolidation of Service. The advantages of a consolidated telephone system, with a main switching center providing service through satellite switches to many metropolitan area customers, have been clearly demonstrated in those cities where they have been put into service. Through better utilization of facilities

and personnel, significant cost reductions have resulted, concomitant with improved service. Moreover, service consolidation facilitates better operational and administrative control through the use of least-cost-routing and message accounting features now available. These innovations, while appropriate and desirable, present some problems for AUTOVON managers who must ensure that technical and operational network interface criteria are met. The DCA, the AUTOVON users, and the telephone industry are working together to coordinate the planning and implementation of new service consolidations.