ORDER

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

7032.4

1/16/84

SUBJ: AIR TRAFFIC SERVICE OPERATIONAL REQUIREMENTS FOR VOICE SWITCHING AND CONTROL SYSTEM (VSCS)

1. PURPOSE. This order promulgates the Air Traffic Service requirements for the Voice Switching and Control System (VSCS).

2. DISTRIBUTION. This order is distributed to branch level in the Air Traffic Service, regional Air Traffic divisions, and the FAA Technical Center, ATC Systems Technology Division.

3. BACKGROUND. FAA Order 7032.2A, dated October 13, 1982, establishes procedures for the formulation and documentation of air traffic operational requirements. The VSCS System Requirements Team (SRT) was established by AAT-150, and held its initial meeting in Pasadena, California, in June 1983. The VSCS SRT consists of Jim Buckles, AAT-150, Chairman; Richard Dilley, ZLA; David Garrett, ASO-513; Fred Heaviland, ZID; Joel Hicks, ZAN-520; Terry Jackson, ZKC; Dick Jensen Boeing ATCT; Ron Johnston, Bradley ATCT; David Medina, DFW TRACON; Bill Pack, AAT-330; and Edward Simays, ZDC. The approved operational requirements will become part of the Air Traffic System Plan which supports the National Airspace System Plan.

4. DEFINITION. The Voice Switching and Control System (VSCS) is that portion of the total voice communication system composed of communication equipment at ATC operational positions, supervisory positions, maintenance positions, the switching system itself, and interfaces external to the VSCS. This VSCS will provide a computer-controlled voice communication system that meets the flexibility, expandability, reconfigurability, and reliability requirements which make it compatible with the operation of the sector suite in the Area Control Facility (ACF) of the future.

5. REQUEST FOR CHANGES. Suggested changes to this order should be addressed to the Associate Administrator for Air Traffic, AAT-1, for the attention of the Manager, System Plans and Programs Division, AAT-100, and should include complete justification/rationale for the change.

6. VSCS OPERATIONAL REQUIREMENTS. The attached Appendix 1 states the Air Traffic Service operational requirements for the Voice Switching and Control System (VSCS).

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Associate Administrator for Air Traffic

Distribution: A-W(AT)-3; A-X(AT)-2; A-Z(ST)-2

Initiated By: AAT-150

APPENDIX 1

AIR TRAFFIC SERVICE

OPERATIONAL REQUIREMENTS

VOICE SWITCHING AND CONTROL SYSTEM

Prepared by:

VSCS System Requirements Team

Pasadena, California

June 20, 1983

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A. INTRODUCTION

Air traffic controllers are responsible for the management of air traffic. They must maintain prescribed separation standards between aircraft, provide the necessary safety advisories to aircraft, and ensure efficient use of airspace through minimization of delays and maximization of service to the user.

The performance of these duties requires a voice communications system for both air-to-ground and ground-to-ground communications. The ground-to-ground system provides voice communications among air traffic controllers, supervisory personnel and support personnel at individual control facilities; it also includes communications between facilities that are involved in a contiguous area of operation.

The air-to-ground system provides voice communications between controllers and aircraft. This system includes both communication with civil aircraft (which utilize VHF frequencies in the 118-136 megahertz band) and communications with military aircraft (which utilize UHF frequencies in the 225-400 megahertz band).

Both systems include not only the equipment mounted and operating in each control facility, but also the maintenance consoles, transmission lines, and radio control equipment located at local and remote sites. In addition, about 1,300,000 circuit miles of four-wire voice transmission lines are included in the system to interconnect the various operational facilities.

The present voice communications system is over twenty years old. While this system was sufficient at the time of its installation, a number of significant changes have taken place; these included a considerable growth in the number of planes making use of the National Airspace System. In addition, a number of other changes in the National Airspace System are contemplated, such as the evolution of the Area Control Facility (ACF) concept, which mandates the development of a new voice switching and control system.

The Voice Switching and Control System (VSCS) envisioned will be that portion of the voice communications system composed of communication equipment at operational positions, supervisory positions, and support positions in addition to the switching system itself and the interfaces to the systems external to VSCS. The voice switching and control system will provide a computer-controlled voice communication system that is flexible, expandable, reconfigurable and highly reliable. It will be compatible with the sector suite concept and with future Area Control Facility operations. The implementation of the VSCS will meet the U. S. Department of Transportation's objectives expressed in the National Airspace System Plan which are listed below:

(1) Meet current and future operational requirements.

(2) Minimize total cost of service.

(3) Acquire modern reliable solid-state technology.

(4) Satisfy communication system performance criteria.

(5) Reduce the work load on controllers in using the communication system.

The VSCS operational requirements have been developed by the VSCS System Requirements Team after considerable deliberation. The team represents a varied and balanced membership from a wide geographic distribution, as well as a variety of operating environments. Careful consideration was given by team members to develop system requirements that would be operationally sound, and easily adaptable to a multitude of projected situations. This document was formatted so as to ensure that all communication functions vital to the air traffic controller were addressed with appropriate statements of requirements. These requirements are the operational requirements of the users of the VSCS and, therefore, do not comprise all the requirements that will ultimately be levied on the system. These operational requirements are described in detail in the sections that follow.

VSCS is only one part of the FAA's voice communications system. The System Requirements Team also recognizes the need for an evaluation of the operational requirements on the remaining elements of the communications systems. Optimal performance of the voice communication system is dependent upon all elements of the system. The VSCS System Requirements Team suggests that the network, circuitry and remote site equipment should be examined. Efforts in this area might be directed at the feasibility of updating these networks.

B. GOALS FOR THE VOICE COMMUNICATION SYSTEM

A new voice communications system is required to meet the current and projected needs of the air traffic controllers. Five goals have been identified for this new system. The first goal is a high level of system reliability; the new system must be available for use at all times to maintain uninterrupted voice communications. The second system goal is expandability; the new communications switching network must be modular and expandable to accommodate projected growth in air traffic. The third goal is ease and speed of reconfiguration; an easily reconfigurable system is necessary to utilize air traffic controllers in the most efficient manner. The fourth goal, a simple-to-operate system, should facilitate speed and accuracy in communications. The last articulated goal is that of fail/soft system design. This is vital in order to maintain an uninterrupted voice communications link. The requirements described in the following sections have been designed to meet the needs of the users and to lead to the achievement of these five system goals.

C. OPERATIONAL SYSTEM REQUIREMENTS FOR THE VOICE SWITCHING AND CONTROL SYSTEM

The operational requirements described below are grouped according to the basic steps or functions which are taken to establish and conduct communications.

1.0 VOICE COMMUNICATIONS

1.1 GENERAL

1.1.1 Definition

Voice communications system needs include those requirements common to both ground-to-ground and air-to-ground communications. VSCS shall facilitate and support voice communications for both ground-to-ground and air-to-ground communications.

1.1.2 Ease of Use

The equipment comprising the VSCS system shall be designed to accomplish the functions and requirements described in the following sections with ease of movement and ease of visibility.

1.1.3 Expandable

VSCS equipment shall be modular in nature and shall be expandable to meet the projected levels of support for future air traffic growth according to the National Airspace System Plan.

1.1.4 Within Sector Suites

VSCS shall provide for ground-to-ground communications at all sector suite common consoles within Area Control Facilities.

1.1.5 At Other Positions

VSCS shall provide for voice communication at positions which may not be associated with sector suites. The requirements for these positions will be forthcoming. These positions include:

-Area Manager Position

-Traffic Management Position

-Enroute Metering Position

-Military Operations Specialist

-Weather Coordinating Position

-Automation Specialist

-Flight Data Communications Specialist

-NAS Manager Position

-Center Weather Service Position

1.1.6 Push-to-Talk

At positions with no air-to-ground communications capability, a push-to-talk acton will be required to transmit voice on ground-to-ground lines. This push-to-talk requirement may be removed by deselection.

1.1.7 ATIS

A capability shall be assignable to selected sector suite consoles (involved in the control of terminal area traffic) to monitor the Automated Terminal Information Service (ATIS) recordings for airports within that sector's jurisdiction. The preferred implementation of this requirement is for the "primary airport" ATIS to be monitored by selecting an ATIS monitoring push-button function on the VSCS position equipment. In cases where more than one ATIS must be monitored, access to secondary ATIS recordings shall be provided.

1.2 INTERFACES

1.2.1 Other Facilities

VSCS design shall permit interface with all communication systems in air traffic control facilities and flight service stations.

1.2.2 Power Source

VSCS shall be connected to an uninterruptable power source.

1.3 EQUIPMENT

1.3.1 Audio

The audio equipment within the system shall have a high quality audio output.

1.3.2 Noise

Noise and interference introduced by VSCS shall be minimal. Specifically, such noise shall not present a distraction or irritant to communication, nor shall it at any time interfere with the reception of communications.

1.3.3 Standard FAA Equipment

The capability shall be provided to operate the position communications equipment with a standard FAA approved headset or handset.

1.3.4 Dual Jacks

VSCS shall provide one dual jack module for each sector suite common console. This module shall be capable of accommodating two headsets or handsets.

1.3.5 Jack Operation

One of the jacks shall permit the "trainer" to preempt the push-to-talk and the voice transmission of the "trainee" in the second jack. Jack modules will be standarized and marked for preemption capability.

1.4 INDICATORS

1.4.1 Visibility

All status indicators, designators, and displays at each position shall be visible and readable under all ambient light conditions within an Area Control Facility. The brightness of illuminated displays, designators and indicators shall be continously (rather than incrementally) adjustable at each position within the facility to accommodate changes in ambient light conditions. Adjustments shall be simple to operate.

1.4.2 Radio Frequency Displays

Radio frequency displays at operational positions shall include a decimal point indicator.

1.4.3 Direct Access Buttons

Each direct access pushbutton function within VSCS shall be individually programmable to either a latching or non-latching mode.

1.5 VOLUME CONTROL

1.5.1 Automatic

VSCS shall provide for automatic volume control for each incoming line to ensure that all voice communications reaching a position are of equal volume.

1.5.2 Volume Control for Each Jack

VSCS shall provide a single volume control for each jack module. Volume control shall be dynamic (rather than incremental) in nature. The preferred implementation is a single volume control for the two position jacks. Attenuators on headsets would provide for individual volume controls. A second acceptable method of implemention would provide individual volume control at the position jacks for each individual headset or handset.

1.5.3 Speakers

VSCS shall provide two separate and distinct speakers. One speaker shall be for air-to-ground communications and the other for ground-to-ground communications. Each shall have a separate volume control. The two speakers shall be sufficiently separated to permit ready identification of the source of incoming messages.

1.5.4 Sidetone

Sidetone shall be provided to the controller for both radio communications and ground communications.

1.6 COMPONENT FAILURE

1.6.1 Single Component Failure

The switching system shall be designed so that the failure of a single component (e.g., junction module or sector processor) shall not cause the loss of communication functions at more than one operational position.

2.0 GROUND-TO-GROUND COMMUNICATIONS

2.1 GENERAL

2.1.1 Definition

Ground-to-ground communication enables the coordination which is vital to the safe operation of the air traffic control system. VSCS shall support communications among ground positions. VSCS shall enable communication among operational personnel at both local and remote sites.

2.1.2 Direct Access

VSCS shall be capable of sufficient expansion to provide direct access pushbuttons (or equivalent) at an operational position with the maximum determined by facility sizing requirements (not to exceed 50). Special functions (e.g., hold, monitor, transfer) which are implemented through direct access push button functions are included in this number.

2.1.3 PABX & AUTOVON Access

VSCS shall provide access to the commercial PABX function and to AUTOVON. Selective access by operational positions to these lines shall be assigned from the supervisory position.

2.1.4 Telephone Type Instruments

VSCS shall have the capability of being accessed by telephone-type end instruments from selected support positions. Such support positions shall be restricted in their access to other positions. This restriction shall be supervisory assignable.

2.1.5 Intercom/Interphone

VSCS shall provide for immediate access of an intercom/interphone circuit to initiate an outgoing call or to answer an incoming call. Multi-digit dialing access shall be provided on selected circuits. The capability to quickly clear erroneous entries shall also be provided.

2.2 INITIATE COMMUNICATION

2.2.1 Determine Priority

VSCS shall provide several modes of communication from which the user may select depending upon the priority of the communication.

2.3 SELECT TRANSMITTING MODE

2.3.1 Direct Access

A direct access communications path shall be provided from one position to other local and/or remote positions.

2.3.2 Override

VSCS shall provide each controller position with the capability of placing an override call to any other controller position located at either a local site or a remote site. A visible and an audible indication shall be provided to the position operator to signal that the position has been overridden.

2.3.3 Indirect Access

VSCS shall include an indirect access communications path from one position to another. This path is required for both local as well as remote positions. The indirect access keypad entry device shall be portable so that its location may be adjusted to suit the individual controller.

2.3.4 Indirect Access Override

VSCS shall provide for the access of an override mode through indirect access communications.

2.3.5 Conferencing

VSCS shall support both inter- and intra-facility conferencing in both a progressive and a "meet me" mode. All supervisory positions shall have the capability to conference with all controller and support positions in their area of responsibility and with other supervisory positions. Controller and support positions shall have the ability to conference with up to ten other operational positions with a maximum of three separate ten position conferences at one time within an Area Control Facility. Should a participant in a conference call receive an override, that controller shall have the ability to disconnect from the conference call and to reconnect upon termination of the override.

2.3.6 Conferencing Modes

The capability to initiate a conference call shall be possible through the activation of the conferencing push-button function followed by direct access, direct access override, or indirect access.

2.4 ESTABLISH CONNECTIVITY

2.4.1 Definition

Establishment of connectivity includes those actions which the VSCS user must take in order to prepare to transmit a message. In response to these user actions, VSCS shall establish a continuous communcations path.

2.4.2 Simultaneous Access

VSCS shall permit simultaneous access to a line. However, VSCS shall provide a visible indication that the line is in use.

2.4.3 Direct Access

VSCS shall allow for direct access via a single selector operation to initiate an outgoing call or to answer an incoming call.

2.4.4 Simplified User Methods

The indirect access component of the VSCS shall include (wherever feasible) simplified user methods of establishing connectivity. For example, the access number to dial for an individual at an adjoining sector might be the sector number or a derivative thereof.

2.4.5 Conferencing Pushbutton

VSCS shall provide a conferencing pushbutton (or equivalent) at each position. All parties called while this function is engaged shall be placed on conference.

2.4.6 Indirect Access Pushbutton

The indirect access pushbutton (or equivalent) shall be located as part of the indirect access keypad module or immediately adjacent.

2.4.7 Manual Signaling

VSCS shall provide the capability on selected lines for the initiator of a call to manually signal or "ring" the facility dialed. This requirement accommodates circuits where "ring and flash" is required.

2.4.8 Indirect Access Indication

If a communication line is selected that requires dialing by the operational position, VSCS shall provide a visible indication that the indirect

access key pad has been activated. If no indirect access entry is made within a variable time out parameter, the indirect access key pad shall be deactivated at that position.

2.4.9 Direct Access With No Corresponding Position

Calls placed via direct access (not override) to positions for which there is not a corresponding direct access pushbutton shall be placed in the called party's common answer queue.

2.5 TRANSMIT MESSAGE

2.5.1 Definition

VSCS shall facilitate the transmission of ground-to-ground communications.

2.5.2 Push-to-Talk

After the initiation of a direct access override call, a push-to-talk action is required of the call originator in order to transmit voice communications on direct access lines that are programmed to be latching. On direct access override lines which are programmed to be non-latching, no push-to-talk shall be required by the call originator. When push-to-talk action is initiated for air-to-ground communications with a non-latching push button function, ground-to-ground communication shall be muted.

2.5.3 Voice Calls

Voice calls shall be heard through the position loud speaker at only the positions which are on the selected voice call circuit. It is anticipated that the availability of override between terminal and enroute sectors within an Area Control Facility will eliminate the need for most non-override voice call circuits.

2.6 RECEIVE REPLY

2.6.1 Definition

VSCS shall enable the communications paths necessary to the receipt of replies from ground personnel to other ground personnel.

2.6.2 Hold

VSCS shall provide for the establishment of a hold condition on any incoming ground communication with the exception of an override. A visible indication of the hold condition is required.

2.7 RELEASE CONNECTIVITY

2.7.1 Release Pushbutton

A release pushbutton function shall permit the disconnection of any ground-to-ground communication with the exception of incoming override calls and calls in hold status.

2.7.2 Release by Selection of Another Circuit

Selection of a subsequent ground-to-ground circuit shall release the previous selected circuit. VSCS shall provide for a visible indication of the release of connectivity.

2.8 RECEIVE COMMUNICATION

2.8.1 Voice Overrides

VSCS shall not restrict the number of simultaneous incoming voice override calls at a position.

2.8.2 Volume Control

VSCS shall provide for the separate volume control for the volume of both the speaker and the chime at each position.

2.9 DETERMINE ACCEPTANCE PRIORITY

2.9.1 Override Indication

Incoming override calls shall be indicated by both audible and visible signaling. Under no situation shall the audible indication be transmitted over the air-to-ground communication system.

2.9.2 Call Forward

The VSCS system shall include the capability to forward all ground-to-ground communications from one operating position to another. The implementation of this capability shall require positive action by the controller.

2.9.3 Source Identification

For calls initiated within VSCS or within any other system capable of providing source identification, the position called shall receive a visible

indication of the origin of these calls. Where source identification cannot be provided, the line designation shall appear in the common answer queue. In addition, the called position shall have the capability to choose the order that queued calls shall be answered.

2.9.4 Common Answer Queue

VSCS shall allow for a maximum of four common answer calls to be held in queue. The call in progress shall be included in this number. All subsequent calls may be provided with a busy signal.

2.9.5 Call Transfer

VSCS shall provide the capability to transfer calls held in the common answer queue. VSCS shall also provide the capability to transfer individual calls. The implementation of this capability shall require action by the controller.

2.10 SELECT RECEIVING MODE

2.10.1 Choice of Modes

Several modes of receiving communications shall be made available to operating personnel.

2.10.2 Headset/Loudspeaker

VSCS shall provide for the independent selection of either headset or loudspeaker for override and/or intercom/interphone communications. If override communication is set to the speaker, the controller shall have the capability to transfer an override call to the headset. Any additional incoming override calls received during the time that the original override call is in progress shall also be directed to the headset. After all incoming override calls are released, all subsequent incoming calls shall be received through the speaker.

2.10.3 Routing to Speaker

If all headsets or handsets are disconnected from an active position all incoming voice communications shall be routed automatically to the position speaker.

2.11 ADJUST VOLUME

2.11.1 Adjustments in All Modes

VSCS shall allow system users to adjust the volume of incoming communications. Volume adjustments shall be possible for each mode of communication (see 1.0).

2.12 RECEIVE MESSAGE

2.12.1 Transfer Incoming Calls

VSCS shall provide the capability of transferring any incoming non-override call to any other position within the same facility.

2.12.2 Ring Line Indications

Incoming ring line calls shall be indicated by both an audible and a visible signal. The audible signal shall be only at the position being called. The volume control for this signal shall be lower than the voice volume control such that the lowest voice setting shall render the chime silent. All positions at a facility shall be provided with the same type of audible signal. However, five distinct variations on the signal shall be provided. If the audible signal is in the off position, a visible indication of the off condition shall be provided.

2.12.3 Override Indication

VSCS shall provide both a visible and audible indication of an incoming override call. A separate and distinct audible indication shall be provided for multiple override calls.

2.13 TRANSMIT REPLY

2.13.1 Answering Overrides

A push-to-talk operation shall not be required to answer a override call.

2.14 RELEASE CONNECTION

2.14.1 Releasing Actions

On VSCS-originated calls, the receiving position shall not be required to take any action to release connectivity when a communication is terminated by the initiating position. The receiving position shall have the capability of releasing the connection at any time on any incoming call with the exception of override calls.

2.14.2 Release Indication

VSCS shall provide a visible indication of the release of connectivity at the receiving position.

2.14.3 Release from Conference

Any party on a conference call shall have the ability to release from that conference call at any time.

2.15 GROUND-TO-GROUND BACKUP COMMUNICATIONS

2.15.1 Priorities

In the event of any fault or failure within the system, all ground-to-ground communications shall be maintained. Operational communications functions shall take priority over maintenance, reconfiguration, data collection and other support functions.

2.16 MONITORING OF OTHER POSITIONS

2.16.1 Modes

VSCS shall provide for operational monitoring via both direct access and indirect access. The capability to assign a monitor function to each position shall be provided. To monitor another position's communications, selection of the monitor function is followed by direct access or indirect access selection of the desired position. Monitoring shall also be accomplished via an assignable direct access function for monitoring, or indirect access alone.

2.16.2 No Indication of Monitoring

Monitoring is also necessary for performance evaluation of controllers. Therefore, the position being monitored shall receive no zip tone or other indication of being monitored. When the monitoring party selects another communication function, the monitoring will automatically disconnect.

3.0 AIR-TO-GROUND COMMUNICATION

3.1 GENERAL

3.1.1 Definition

VSCS shall support communications between ground positions and aircraft. Air-to-ground communication is vital to the safe utilization of the national airspace.

3.1.2 Main/Standby

VSCS shall provide operational positions with the immediate selection between main and standby transmitters and receivers. VSCS shall provide for a visible indication of the selected mode of transmission. Transmitters and receivers shall be independently selectable between main and standby. The capability to access both main and standby transmitters and receivers shall be provided to all positions with radio communications access. The capability for main and standby transmitter and receiver selection shall also be provided at the NAS Manager's position for any frequency available at the facility.

3.1.3 Cross-Coupling

VSCS shall provide access to a VHF/UFH cross-coupling function at each operational position with air-to-ground capability. The VSCS position equipment shall provide the capability to select/deselect this function with a single action, and shall provide a visible indication of the on/off status of the function.

3.1.4 Main/Standby Classmarks

VSCS shall provide for supervisory-assigned class marks to the various assigned operational positions for the assignment of the selection of main and standby transmitters and receivers. The NAS Manager's position shall always be classmarked for main and standby selection on all frequencies available at a facility.

3.1.5 Transmitter/Receiver Selection

VSCS shall provide the capability at each position for the separate selection of the transmitter and the receiver.

3.1.6 Function Display

VSCS shall provide the capability for any position within a sector suite to be able to display and access the air-to-ground communication functions assigned to that sector suite.

3.1.7 Indication of Voice

Visible indication of incoming radio voice communication shall be provided for each enabled air-to-ground receiver.

3.1.8 Multiple Transmitter/Receiver Site Selections

If multiple transmitter and receiver site selections are available for a given frequency, each position with radio capability shall have transmitter and receiver site selection capability, display of frequency selected, indication of frequency selected and site identification. If automatic transmitter and receive site selection is provided at the Area Control Facility, positive identification of frequency and site location shall be provided.

3.1.9 Display of Frequencies

VSCS shall provide the capability to select and display radio frequencies at operational positions on a fulltime basis. The capability to display site assignments of each frequency selected shall be provided on an on-request basis.

3.1.10 Tower Frequencies

VSCS positions at Area Control Facilities shall be capable of accessing not only those frequencies assigned to the facilities, but also those frequencies used by nearby tower facilities during those periods when the tower is not operational.

3.1.11 Frequency Preemption

VSCS shall provide the capability for an operational position within an Area Control Facility to assume frequency preemption over selected tower frequencies. The tower controller shall receive a visible or audible indication whenever preemption is taking place. This capability shall be assigned from the supervisory position. [Note: this requirement is for approach control positions at Area Control Facilities and tower frequencies where parallel ILS approaches are used.]

3.1.12 Push-to-Talk Methods

VSCS shall allow for transmission of air-to-ground communications via either a hand-activated or a foot-activated push-to-talk device. Both methods shall be available to position operators.

3.2 SELECT TRANSMITTING FREQUENCIES

3.2.1 Definition

Air-to-ground communication begins with the VSCS user's decision to initiate communication. Once the decision to initiate communication has been made, the system user's first step is to select the available/appropriate frequency.

3.2.2 Frequency Assignment

VSCS shall include the capability for all supervisory positions to assign any frequency available at an operating facility to any operating position within the supervisor's area of responsibility.

3.2.3 Frequencies Displayed

Not all available frequency pairs must be displayed, but the system shall be capable of displaying and accessing up to twelve frequency pairs at one time.

3.3 SELECT TRANSMITTER

3.3.1 Automatic Return

After selecting a frequency the system user must then select the available transmitter which may be either the main or standby transmitter or the backup transceiver. After any system reconfigurations or failures, individual position equipment shall automatically return to the previously selected transmitter.

3.4 ESTABLISH CONNECTIVITY

3.4.1 No Delay

Connectivity shall be established with no perceptible delay once the action to initiate communication is taken.

3.4.2 Confirmation of Transmission

The operational position shall be provided with confirmation of transmission. When an operating position keys the transmitter on a particular assigned frequency, all other positions shall be locked out from keying the transmitter except in the case of preemption.

3.4.3 Lockout Indication

Indication of lock-out shall be provided by a visible means to all operating positions having access to a frequency. If push-to-talk is attempted on a locked-out frequency, an audible signal shall be provided.

3.4.4 Transmission Disruption

Air-to-ground communications shall not be disrupted by failure of radio control processor or portions of the VSCS.

3.4.5 Frequency Assignment/Lockout

VSCS shall provide for the assignment of the same frequency to multiple operating positions along with the multiple assignment of the push-to-talk frequency lockout capability.

3.5 TRANSMIT MESSAGE

3.5.1 Push-to-Talk Indicator

All air-to-ground communications shall be initiated by a push-to-talk feature. A visible indication of push-to-talk function shall be provided for each enabled transmitter.

3.5.2 Sidetone

Sidetone shall be provided to the headset or handset, and it shall not be audible through the position speaker at any time.

3.5.3 Weather Information

VSCS shall include the capability to broadcast recorded weather information from each position at the command of each position operator. The position operator shall have the capbility to listen via position headsets to the recorded information prior to its transmission. Push-to-talk preemption capability shall be incorporated to allow the position operator to interrupt the broadcast as necessary.

3.6 RECEIVE COMMUNICATIONS

3.6.1 Definition

VSCS shall enable the receipt of communications from aircraft to ground-based operating personnel.

3.7 SELECT RECEIVER

3.7.1 General

In order to receive communications, the user must select an available/usable receiver.

3.7.2 Automatic Return

The controller must select either the main or standby receiver or the backup transceiver. After any system reconfigurations or failures, individual position equipment shall return automatically to the previously selected receiver.

3.8 SELECT MODE

3.8.1 Headset/Loudspeaker

VSCS shall provide the capability for position operators to selectively route incoming radio communications to either the headset or the loudspeaker. VSCS shall provide the capability to select any of the reception modes cited previously for each frequency. Visible indications of the reception mode selected shall be provided.

3.8.2 Automatic Transfer

VSCS shall provide for the automatic transfer of incoming radio calls to the position speaker at those positions having both radio and intercom/interphone capability whenever an intercom/interphone circuit has been selected. Supervisors shall have the capability to assign the automatic transfer function. However, each controller shall have the option of disabling this function at the individual position.

3.9 ADJUST VOLUME

3.9.1 General

VSCS shall include volume adjustments for air-to-ground communications.

3.9.2 Muting

VSCS shall provide the capability to selectively mute individual frequencies assigned to a position. Specifically, the capability to mute paired frequencies shall be provided separately. This capability shall permit a controller to mute any number of the frequencies assigned to a particular operational position. This feature shall be implemented via a mute pushbutton function. A distinct visual indication of muting status shall be provided.

3.9.3 Remote Muting

VSCS shall provide for supervisory assignment of the capability of remote muting for specific frequencies.

3.10 RECEIVE MESSAGE

3.10.1 Indication of Voice

The VSCS system shall include a visible signal at each position to indicate the presence of voice on a given receiver.
VSCS shall facilitate the receipt of messages from aircraft to ground personnel.

3.11 BACKUP AIR-TO-GROUND COMMUNICATIONS IN THE EVENT OF A VSCS FAILURE

3.11.1 Interface

Interface with a backup communications system is required in the event of a VSCS failure.

3.11.2 Entry Device Failure

A failure of the entry device shall not preclude access to the backup communications system.

3.11.3 Priorities

The communications capabilities of the backup system need not be as complete as those provided through the normal VSCS operations. However, the backup system must provide access to those frequences which were in use at each operating position at the time of the VSCS failure.

3.12 MONITORING OF OTHER POSITIONS

3.12.1 General
Monitoring of other positions facilitates enhanced coordination.

3.12.2 All Communications

VSCS shall include the capability to mon . communications of one position at other selected operational positions. The monitoring shall in no way degrade the audio quality of the communications at the position being monitored. This monitoring capability shall automatically disconnect when a ground-to-ground communications mode is selected.

4.0 RECORDING OF COMMUNICATION

4.1 GENERAL

4.1.1 Regulations

Federal regulations currently require that all operational voice communications be recorded and retained for a period of fifteen days.

4.2 REQUIRED RECORDING

4.2.1 Recordings Same as That Received

The VSCS must include provisions for recording and temporarily retaining all air-to-ground and ground-to-ground transmissions and receptions to and from each operating position. All recorded communications shall have the same volume and interference characteristics as that received by position personnel.

4.3 RELIEF BRIEFING RECORDING

4.3.1 Procedures

Current operating procedures require that each time a controller is relieved the exiting controller must brief the incoming controller on the status of the sector.

4.3.2 No Interruption of Communications

VSCS shall provide the capability to record position relief briefings. Activation of this capability shall not interrupt or alter the communication functions at that position. Specifically, in no way will the ability to receive incoming radio messages or override calls be affected by the activation of position relief briefing recording.

4.4 TRAINING/SUPERVISORY RECORDING

4.4.1 Recording for Performance Evaluation

Supervisory personnel must be provided with the capability to record voice communications of air traffic controllers under their direction. Those recorded communications enable supervisors to do the necessary performance evaluations and documentation.

4.4.2 Recording of All Sectors

Supervisory positions shall have the capability to simultaneously record all VSCS communications at a maximum of five sectors within a supervisory

area of responsibility. This shall be accomplished with five voice-activated audio cassette recorders located at supervisory positions. These recorders shall be capable of recording sixty minutes of communication. The audio cassettes shall be compatible with existing commercial cassette recording equipment. The capability to play back one cassette through a standard position equipment jack shall be provided at the supervisory position.

5.0 ADMINISTRATIVE SUPERVISION

5.1 GENERAL

5.2 CONFIGURATION RECORDING

5.2.1 Data on Frequencies and Lines

Configuration recording capabilities shall be provided. Recordings shall include data on frequencies and communication lines assigned and sectors being served under different system configurations. Recordings shall be readily accessible to those administrative, operational, and maintenance personnel who must utilize them.

5.3 SYSTEM STATISTICS

5.3.1 Categories

System statistics to be maintained shall include the following categories: Information regarding each attempted call shall be recorded in a storage facility for off-line analysis. Data to be recorded shall include time of day, calling station identification, called station identification, any call options requested, time the connection is accomplished, time the disconnect is accomplished, and any other information necessary to determine the status of the call.

5.3.2 Reduced Data

Reduced data shall include the statistics concerning throughput timing, duration, number of calls to and from an individual position, number of calls in the system at any given time, numbered calls requiring processing at any given time, number of uncompleted calls, length of the common answer queues, and switch loading. A program shall be included for off-line statistical evaluation of the traffic data collected by the system.

5.3.3 Analysis Programs

Sufficient analysis programs shall be provided to determine equipment overload and time periods in which excessive loading occurs. Traffic trend analysis programs shall be included to predict future loading based upon traffic collected.

5.4 SYSTEM SELF-TEST

5.4.1 Self-Test Parameters

VSCS shall contain provisions for self-testing and fault isolation of the component equipment. Monitoring and testing systems should be as part-specific as feasible, in order to reduce the search time for the problem area. Self-testing shall require minimal controller participation.

6.0 OPERATIONAL SUPERVISION

6.1 GENERAL

6.1.1 Communications Capabilities

Supervisory positions shall be provided with the same ground-to-ground communication capabilities as operational positions as well as PABX capability, supervisory monitoring capability, and supervisory communication recording capability.

6.2 SUPERVISORY SYSTEM STATUS MONITORING

6.2.1 Printouts

VSCS shall provide the capability to generate hard copy print-outs of all sectors and positions assigned to a given frequency along with the assignment of all direct access lines.

6.3 OPERATIONAL SUPERVISORY MONITORING

6.3.1 No Indication of Monitoring

VSCS shall permit supervisory positions to monitor all communications of any operational position within its area of responsibility. There shall be no indication provided to the monitored position that monitoring is in effect. VSCS shall provide for simultaneous monitoring of all positions within a sector suite.

6.3.2 Monitor Pushbutton

Supervisory positions shall be provided with a monitor pushbutton (or equivalent) which would permit the monitoring of any position or communication line.

6.3.3 Monitoring FTS

The capability shall be provided at selected supervisory positions to interface any radio frequency into an FTS trunk line on a monitor only basis.

6.4 SUPERVISORY TRAINING MONITORING

6.4.1 Dual Jacks

VSCS shall include dual instrument jacks at each position. These jacks shall be usable in two ways. First, under training conditions, one jack shall be capable of preempting all voice transmissions. Second, when both

jacks are vacated, line selection shall be inhibited and all forms of incoming communication shall terminate in the position speaker unless call forwarding is in effect.

6.5 RECONFIGURATION OF POSITIONS

6.5.1 Push-to-Talk Release

Reconfiguration shall not transfer a radio frequency from an operational position without a push-to-talk release being provided by that position. Positions with active communication circuits shall not be reconfigured until release of that circuit. Automatic (map) reconfiguration of the communications at operational positions shall be completed within ten seconds or less of initiation with the exception of the positions where reconfiguration was locked out due to active circuits or lack of push-to-talk commands.

6.5.2 Reassignment of Radio Communications

The VSCS system must include the ability to automatically reassign radio communications to the position equipment as it is reconfigured. A manual radio communications reassignment capability must also be provided. It shall be provided at all supervisory positions. Frequency designations at operating positions should be automatically changed to correspond to frequency and site reassignments.

6.5.3 Indication of Reconfiguration

An indication shall be provided at each position to confirm completion of reconfiguration.

6.5.4 Automatic Redirection of Calls

Calls placed in a given mode (such as direct access) to positions for which the corresponding reception mode does not exist shall be redirected to the called position through another mode.

6.5.5 No Lost Calls

VSCS shall not lose incoming communication during reconfiguration. If a line or an incoming call has a termination under one configuration it shall have a termination within the facility for all configurations. When the entire VSCS system or an individual sector or position is reconfigured, all incoming ground-to-ground calls shall be directed to the appropriate position under the new configuration.

7.0 VSCS TRAINING SUPPORT FUNCTIONS

7.1 GENERAL

7.2 EQUIPMENT FAMILIARIZATION AND CERTIFICATION

7.2.1 Equipment Training Capabilities

Each operational position shall provide the capabilities necessary for familiarization and certification of air traffic controllers on the voice communication system. These capabilities shall be provided at positions in a separate training laboratory or at operational positions reconfigured for certification and familiarization or a combination thereof.

7.2.2 Restricted Communications During Training

VSCS shall provide for restricting or inhibiting outgoing communications from such positions while providing access to incoming communications and the monitor function.

7.3 OPERATIONAL AIR TRAFFIC TRAINING SUPPORT

7.3.1 New Controller Training

Each operational position shall support the training of new controllers by providing intercom communications in conjunction with simulation of other air traffic control functions. This simulation shall be provided at positions in a training laboratory or at an operational position reconfigured for training or a combination thereof.

7.3.2 Restricted Communications During Training

VSCS shall provide for restricting or inhibiting outgoing communications from such positions while providing access to incoming communications and the monitor function.

D. GLOSSARY OF SELECTED COMMUNICATION TERMS

Area Control Facility (ACF) - A planned future facility which would integrate the function of the present terminal and enroute centers.

AUTOVON - A military telephone communications system.

Busy - Circuit in use.

Call Forwarding - Automatic routing of incoming calls to a position other than that to which the calls were directed.

Call Transfer - Manual (as opposed to automatic) routing of calls from one position to another.

Classmark - A restriction from or an ability to access certain options (i.e. a classmark can prohibit office workers from accessing long distance telephone circuits).

Common Answer Queue - An area where incoming indirect access calls are displayed.

Cross-Coupling Function - A function which permits all VHF and UHF radio transmissions on a frequency pair to be heard by aircraft with either type of receiver. This makes pilots aware of all radio communications being received by a given controller.

Direct Access (DA) - Communication to another position or circuit achieved by a activating a single button as opposed to dialing a series of numbers.

Fail Soft - If a system failure occurs, that failure will not disrupt the entire system. There may be a degradation of service, but basic service will continue.

FTS - A U.S. telephone communications system for government use.

Frequency - A portion of the radio spectrum used by the FAA to carry communications between controllers and pilots. The spectrum contains both ultra-high (UHF) and very high (VHF) frequencies. UHF is used for military air traffic, while VHF is used for civilian traffic.

Frequency Pairs - A combination of a VHF and a UHF frequency paired on a single radio communication channel.

Guard Frequency - Emergency frequencies (121.5/243.0) available to all users.

Hold - Retaining a call while another action is undertaken (such as answering a second call or obtaining information).

ILS - Instrument Landing System which assists aircraft in landing under less than optimal visual conditions.

Immediate Access - Ability to place communications with no perceivable delay.

Indirect Access (IA) - Communication to another position achieved by activating a series of buttons.

Intercom/Interphone - A mode of ground communications between controllers. An intercom system links controllers within a facility, while an interphone system connects controllers at different facilities.

Lockout - Preclusion of potential users from accessing a particular frequency.

Main/Standby Radios - Main are the primary (or first choice) radios assigned to an operating position. Standby radios are also available for use when main is not usable.

Monitor - To listen to all communications taking place at another operational position.

Mute - Silence those frequencies not being used in order to more clearly hear communications on the frequency being used.

NAS Manager - A support (rather than an operational) function responsible for the monitoring and repair of the controller's communications equipment.

Operational Position - The work station for an air traffic controller.

Override - A voice communication placed to a position which connects even though the position operator may be engaged in another communication.

PABX - Private Automatic Branch Exhange - An internal communication system linking administrative functions within an ACF.

Preemption Capability - Ability to take over all existing communications on a given frequency or frequencies at an operational position.

Pushbutton - The activation of a switch. This activation may take place by a mechanical operation (such as pushing a button) or its equivalent (such as an electronic touch membrane.)

Push-to-Talk - Activation of a switch which enables communication.

Receiver - Equipment which picks up radio signals sent by transmitters.

Reconfiguration - Air Traffic Control demands change throughout the day as the volume of aircraft increases or decreases. Under the VSCS, the amount of airspace within a controller's jurisdiction may be reapportioned (reconfigured) several times a day to reflect these changes in demand. The connectivities within the controller's communications equipment will also be changed (reconfigured) to match the reconfigured airspace.

Ringback - Signal of a communication waiting to be acknowledged.

Sector - A three dimensional portion of airspace.

Sector Suite - The controller's future work environment which will contain the VSCS communications equipment.

Sidetone - The ability of a speaker to hear his or her own communication.

Supervisory Position - The first line supervisory function at Area Control Facilities.

Support Position - Any function within an Area Control Facility which supports but does not directly control air traffic.

Transmitter - Equipment which sends radio signals to the outside world. These signals are picked up by receivers.

Voice Call - A call received via the position loudspeaker.