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CONTROLLER EVALUATION OF DESIGN ISSUES IN THE TRANSFER OF DATA LINK FROM THE HOST/PVD TO THE ISSS ENVIRONMENT TEST PLAN

Nicholas J. Talotta, et al.

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Engineering, Research, and Development Service
Concepts Analysis Division
FAA Technical Center
Atlantic City International Airport, N.J. 08405

1.0 INTRODUCTION

The Federal Aviation Administration's (FAA) "Impact '88" initiative mandated accelerated development of the ground-air, digital Data Link for weather and air traffic control (ATC) services. Originally planned for implementation in the later phases of Advanced Automation System (AAS) evolution, early introduction of Data Link is expected to shorten the time frame within which significant levels of aircraft Data Link equipage will be achieved, thereby reducing the load on congested voice frequency channels and increasing ATC safety and efficiency.

In response to the requirement for rapid development, efforts were begun at the FAA Technical Center (FAATC) in 1988 to design and deploy Data Link in the HOST computer, Plan View Display work station (HOST/PVD) currently used for enroute ATC. The Data Link Test Bed facility was constructed at the FAATC to support development by providing a vehicle for engineering test and for manned simulation studies of controller interfaces and procedures. In addition, an Air Traffic Data Link Validation Team (ATDLVT) composed of controllers from across the U.S. was established to participate in the design and evaluation process. Through a series of "mini" design studies and a major operational evaluation conducted in the test bed, detailed design specifications for the initial group of ATC services and functions were generated by the end of 1989.

Introduction of these Data Link services to existing enroute ATC facilities is expected during the first half of the 1990's. During approximately the same time period, initial implementation of a new controller work station is planned for the enroute ATC environment. As the AAS program evolves, this common console will eventually replace all HOST/PVD controller interfaces. In the first phase of the transition, data processing for the Initial Sector Suite System (ISSS) including the new work station will be supported by the identical HOST computer which supports the PVD work station.

Presently in the final stages of design, the ISSS common console has a number of features which differentiate it from the existing work station. Rather than the dedicated monochromatic displays and printed flight strips of the HOST/PVD, the common console will present all visual information on large CRT display surfaces using high resolution color graphics. Users of the common console will have flexible control over the positioning of various logical displays, and will interact with the system using improved keyboard and trackball devices.

1.1 PURPOSE

The Data Link research conducted at the FAATC thus far has

produced detailed designs for controller displays and procedures that are specific to the HOST/PVD workstation. Although this research has also yielded several global design concepts which may be sufficiently general to guide Data Link implementation on a broad range of potential controller workstations, it is imperative that all potential issues and problems that could affect transition from the HOST/PVD system to the ISSS environment be considered during ISSS software development.

Technical design staff and analysts familiar with the HOST/PVD Data Link design and with the ISSS can provide much information during the process of identifying and resolving these transition issues. However, because the successful development of a functional user interface will depend upon input from the operational community, air traffic controllers must be used as a major source of information about transition requirements. The purpose of the study proposed in this document will be to collect structured inputs from technically knowledgable controllers regarding the transferability of HOST/PVD Data Link concepts, procedures and displays to the ISSS environment.

1.2 OBJECTIVES

The overall objective of this study will be to obtain expert input from enroute air traffic control specialists concerning the transfer of Data Link functionality from the HOST/PVD to the ISSS. Specifically, controllers with prior exposure to the designs of the initial Data Link services and the ISSS common console will provide data regarding:

a) Perceived controller interface and procedural design problems involved in the transition of the initial Data Link services to ISSS.

b) Recommended solutions to transition problems that are identified.

c) Potential enhancements to Data Link displays and procedures made possible by the increased capability of the ISSS.

d) Additional design issues not tested during HOST/PVD Data Link development, but which may impact ISSS.

The combined results of this study will be used to document recommended design specifications for necessary and/or desirable modifications to the design of Data Link ATC services for implementation in the ISSS. In cases where no consensus can be achieved, these results will be used to identify requirements for manned simulation research that may be needed to generate a final resolution.

2.0 TEST APPROACH

Unique expertise in the design of enroute Data Link ATC services for the HOST/PVD system and in the human-computer interface and operation of the ISSS resides in two separate teams of air traffic controllers appointed by the FAA to represent operational concerns in the development of these new ATC systems. Members of the Sector Suite Requirements Validation Team (SSRVT) are actively involved in the evolution of the common console hardware and display requirements. Beyond acting as overseers of this effort, SSRVT team members have the highest available level of controller experience in operating the prototype common consoles located at the prime contractor's facilities.

Members of the ATDLVT directly participated in the design of the initial enroute Data Link services, and were closely involved in the evaluation exercises conducted in the Data Link test bed. Thus, these controllers are thoroughly versed in the design philosophy underlying Data Link, as well as the detailed use of the system in the test bed under various air traffic scenarios.

The proposed study will draw upon the expertise from these two teams, as well as the members' shared operational experience in enroute ATC, by recruiting members from both teams to participate in the identification of Data Link transition issues. In order to maximize the information gained during the study, and to ensure that expressed opinions are based on accurate knowledge of the current HOST/PVD Data Link and ISSS designs, the first phase of this study will be devoted to cross training and familiarizing the ATDLVT and SSRVT participants with the two systems of interest.

In the second phase of the study, all of the subject controllers will participate in a systematic evaluation of the transition issues. This evaluation will be organized around a preliminary assessment of all display and procedural features of the existing Data Link services and functions, followed by detailed group discussion of the problems and potential enhancements revealed by the preliminary assessment. These discussions will be attended by Data Link and ISSS technical experts who will be available to assist the controllers in verifying identified problem areas and evaluating the feasibility of proposed solutions and enhancements.

The output of the study will be detailed documentation identifying:

a) Display and procedural features of the HOST/PVD Data Link design which will transition directly to the ISSS.

b) Features which will require minor modification to meet specific design constraints of the ISSS (e.g. keyboard differences).

c) Features which present major transition problems because of possible differences in operational philosophy between the PVD and ISSS centered systems.

d) Features which will transition directly, but which would benefit from enhancements available in ISSS technology (e.g. color).

e) Prioritized requirements for design modifications.

f) Recommended solutions to issues raised in b) through d) above.

g) Issues which will require manned simulation research to resolve outstanding transition questions.

3.0 TEST CONDUCT

3.1 SUBJECTS

The subjects for this study will be eight Full Performance Level (FPL) air traffic control specialists who are currently proficient in ARTCC radar control operations. Four of these controllers will be recruited from the ATDLVT, while the remaining four will be recruited from the SSRVT. In order to optimize the validity of the data to be collected, volunteers with the greatest amount of experience on their respective teams will receive preference in the subject selection process.

3.2 TEST PROCEDURES

3.2.1 Phase I: System Cross Training

The goal of the first phase of this study will be to supplement the subjects' knowledge of the ISSS common console function and of Data Link operation through system cross training experiences. The initial cross training sessions will be conducted in the Data Link test bed at the FAA Technical Center in Atlantic City, New Jersey. Following a briefing from test personnel on the objectives of the study, the ATDLVT subjects will conduct classroom instruction on the displays and procedures for the HOST/PVD Data Link services. The SSRVT subjects will then proceed to the Data Link test bed for intensive hands-on training administered by the ATDLVT subjects.

Based on prior experiences in the test bed, this training will consist of two hours instruction and hands-on operation working

in a relatively simple air traffic training scenario developed for the Data Link operational evaluation study. All aircraft in the scenario will be Data Link equipped in order to maximize the efficiency of practice. Following the training session, the subjects will adjourn for informal discussions aimed at resolving questions and consolidating the learning experience.

The subjects will then return to the test bed to participate in two additional 30-minute simulation runs. Developed as test conditions for the Data Link operational evaluation, the scenarios that will be used for these runs are more complex than the training scenario, and only 70% of the aircraft will be Data Link equipped to provide experience with a mixed voice radio and Data Link environment. The SSRVT subjects will be encouraged to record their immediate impressions regarding the transferability of the Data Link designs to the ISSS throughout the simulation runs for use during subsequent formal data collection.

Within 24 hours of the completion of Data Link training, the subjects from the ATDLVT will be exposed to the current design prototypes of the ISSS common console located at the IBM facilities in Gaithersburg, Maryland. While most of these subjects will have had minimal experience with the work station on previous occasions, the object of this one-day training session will be to provide them with an intensive opportunity to exercise all operating features of the common console.

Each of the four subjects will work with one of the SSRVT subjects who will offer in-depth instruction and answer questions as they arise regarding aspects of the ISSS not yet represented in the prototypes. IBM technical personnel will also attend this cross training session to assist in the instruction. Test personnel will be present to encourage the ATDLVT subjects to record their preliminary impressions regarding potential transition issues for use during subsequent formal data collection.

It should be noted that during the cross training activities, neither the quality of the subjects' air traffic control performance nor their perceptions of the optimality of the HOST/PVD Data Link and ISSS designs will be of direct interest to the study described here. Rather, the two cross training experiences are intended soley to provide the subjects with sufficient experience on the systems to make confident judgements about Data Link transition issues.

3.2.2 Phase II: Data Collection

3.2.2.1 Preliminary Identification of Transition Issues

Formal data collection will occur during the cross training

activities and in subsequent group sessions. The initial evaluation will consist of a paper and pencil categorization task in which the subjects will work individually to classify each of the display and procedural features of the initial HOST/PVD Data Link services in terms of its transferability to the ISSS. Prior to the start of cross training, the subjects will be supplied with booklets containing a classification scale for each feature of the HOST/PVD Data Link design. On each scale, the subjects will indicate which of the following categories best describes the transitionability of the feature in question:

1. "O.K. As Is" - Feature should transfer directly. No changes are necessary or desirable.

2. "O.K., but could be enhanced in ISSS" - Feature will transfer directly, but could be improved using new ISSS capabilities.

3. "Minor changes are needed" - Feature will transfer in principle, but changes are needed to match existing ISSS display or control design.

4. "Major transition problem" - Feature will not transfer. Fundamental differences in ISSS concept of operation or restriction due to prior ISSS design decisions.

When the booklets are distributed, the subjects will be briefed by test personnel on the precise definition of each category including examples appropriate to each case. Additional space will be provided on the rating form for subjects to explain their classification or to suggest solutions and enhancements, as appropriate. A final page in the evaluation booklet will ask the subjects for a rating of the perceived adequacy of the training/ exposure received on the HOST/PVD Data Link and the ISSS common console in order to assess the subjects' confidence in their judgements.

An appendix to this test plan contains instructions for the classification task, a sample categorization form, and the form for rating training adequacy. The appendix also includes a list of the HOST/PVD Data Link design features that will be classified on the categorization forms.

The subjects will complete the classification task as time becomes available during and between the cross training sessions. After the final ISSS session, they will return the booklets to test personnel who will analyze and summarize the data to prepare for the second stage of data collection. The analysis will tally the data for each design feature by category and subject subgroup (ATDLVT vs. SSRVT) in order to identify and prioritize the issues

which will be considered during the group discussion.

3.2.2.2 Group Discussion

The second stage of the data collection effort will be a group discussion session convened at the FAA Technical Center as rapidly as possible after ISSS cross training. This discussion will be organized around the results of the classification task. Data Link design issues which are not unanimously classified as directly transferable in unchanged form to the ISSS will be addressed during the discussion. Because of the potentially large number of transition issues that may emerge at this stage, they will be prioritized for attention depending upon the seriousness the transition problem, and by the number of subjects who place a design feature in a given category.

In order to organize the group discussion and maintain the focus on the objectives of this study, the design features which are identified for attention by the results of the categorization task will be presented to the subject group in an overhead projection slide format. Each slide will briefly describe a single HOST/PVD Data Link design factor along with a summary of the classification results obtained. The discussion leader will first summarize any commments which accompanied the classification data and, if the subjects' opinions were not unanimous, will then attempt to achieve a group consensus to define the transition issue or problem in question.

If it is determined that changes to the design for the ISSS environment are necessary or desirable, the discussion will be directed toward the development of proposed solutions or enhancements, as appropriate. In each case, notes compiled by attending test personnel and an audio tape recording will be used to document the precise nature of each transition issue and suggested design changes. If no consensus is reached at either stage of the discussion, all opinions will be recorded as well as suggestions for research or other information gathering activities that will be needed to resolve remaining questions.

During the discussion sessions, the subjects will be permitted to consult with attending technical personnel possessing expertise on the design and operation of the ISSS, and on the design and use of the HOST/PVD Data Link design.

If sufficient discussion time is available after all documented transition issues are addressed, consideration will be given to the ISSS impact of Data Link issues which have not yet been formally evaluated in the Data Link test bed or included as part of the HOST/PVD design. These issues will include potential approaches to the implementation of new Data Link services (e.g. heading clearances or aircraft downlinks) and procedures for assigning Data Link duties to members of a sector control team

other than the Radar Controller.

3.3 DATA REPORTING

The product of this study will be a formal report containing the results of both the preliminary transition issue classification data and the group discussion. Recommendations derived from these findings will be used to define Data Link controller interface and procedural requirements for the ISSS common console, and to focus any human factors research that may be needed to support optimal transition of Data Link to the ISSS.

4.0 PROPOSED TEST SCHEDULE

DAY 1

MORNING

- Subjects Arrive FAA Technical Center.

AFTERNOON

- Briefing on Test Objectives and Categorization Task. Distribution of Booklets. (45 min.)
- Data Link Classroom Cross Training. (1 hr.)
- Data Link Test Bed Cross Training. (2 hr.)
- Adjourn for Team Discussion and Training Consolidation.

DAY 2

MORNING

- Data Link Test Bed Scenarios. (1 hr. 30 min.)

AFTERNOON

- Travel to IBM Facility.

DAY 3

MORNING

- ISSS Cross Training. (3 hr.)
- Adjourn for Team Discussions and Training Consolidation.

AFTERNOON

- ISSS Cross Training (3 hr.)
- Subjects Submit Completed Categorization Booklets.

DAY 4

MORNING

- Travel to FAA Technical Center.
- Categorization Data Analysis.

AFTERNOON

- Session 1 Group Discussion (2 hr.)

DAY 5

MORNING

- Session 2 Group Discussion (4 hr.)

AFTERNOON

- Subjects Depart FAA Technical Center

APPENDIX

DATA COLLECTION MATERIALS

1. Categorization Task Instructions

2. Categorization Task Form

3. Training Adequacy Rating Form

4. HOST/PVD Design Features

DATA LINK TRANSITION ISSUE
CLASSIFICATION TASK

INSTRUCTIONS

The purpose of this task is to record your initial evaluations of the transferability of the HOST/PVD Data Link design to the ISSS. The results will be used to focus and direct a structured discussion session intended to fully define transition issues and generate solutions.

Each of the following pages of this booklet is devoted to one design feature of the initial Data Link ATC services that have been implemented on the HOST/PVD system. In each case, you will be asked to assign the design feature to one of four categories which you feel best describes its transferability to the ISSS:

1. "O.K. as is"

You should assign a feature to this category if you feel that it can, and should, transfer in an essentially unchanged form to the ISSS.

2. "O.K.,but could be enhanced in ISSS"

Use this category if the feature could be directly transferred without changes, but could be improved by using a capability of the ISSS workstation that doesn't exist in the HOST/PVD system. An example of this might be substituting color coding for a monochromatic graphic symbol.

3. "Minor changes are needed"

Use this category if the design feature would work IN PRINCIPLE in ISSS, but will have to be changed because the displays and input devices are different in the HOST/PVD and ISSS systems. For example, you might choose this category if the keys used for a data entry in HOST/PVD Data Link will have to be different on the common console.

4. "Major transition problem"

If you choose this category, you feel that there is a serious problem which could prevent any translation of this feature of the Data Link design to the ISSS. Such problems might include fundamental differences between the HOST/PVD and ISSS concepts of operation, or an inability to transfer a feature because previous ISSS design decisions have made a particular input, display format or display location unavailable for use.

Generally, you should be able to assign each feature in the booklet to ONE of the four categories. However, if you feel that no category applies, or if more than one applies, mark each relevant box and explain your response in the space provided at the bottom of each sheet.

In all cases, please briefly record any comments about problems that you detect, possible solutions, and enhancements in this space.

The final sheet in the booklet will ask you to indicate the quality of your team and cross training experiences with Data Link and the ISSS workstation. Please return this booklet to one of the test personnel after you have completed the two rating scales on the last page.

Data Link Transfer Issue

Place an "X" in the box next to the category which best describes the transferability of this HOST/PVD Data Link feature to the ISSS.

☐ **"O.K. as is"**

Feature should transfer directly. No changes are necessary or desirable.

☐ **"O.K., but could be enhanced in ISSS"**

Feature will transfer directly, BUT could be improved using the new ISSS capabilities.

☐ **"Minor changes are needed"**

Feature will transfer IN PRINCIPLE, but changes are needed to match existing ISSS display or control design.

☐ **"Major transition problem"**

Feature will not transfer. Fundamental differences in ISSS concept of operation OR restriction due to prior ISSS design decisions.

Comments on problem, solutions, and/or enhancements:

THIS IS THE LAST PAGE OF THE
TRANSITION ISSUES BOOKLET

In order to indicate your confidence in your judgements about the transferability of the HOST/PVD Data Link design to the ISSS, please use the following two scales to rate the adequacy of your exposure to the two systems. Base your ratings on the knowledge gained from your prior team experience or from the cross training for this study, as appropriate.

DATA LINK EXPOSURE

Inadequate			Sufficient for most issues			Completely adequate
1	2	3	4	5	6	7

RATING ☐

ISSS EXPOSURE

Inadequate			Sufficient for most issues			Completely adequate
1	2	3	4	5	6	7

RATING ☐

DESCRIPTION OF HOST/PVD SERVICE DESIGN FEATURES FOR USE IN THE TRANSITION ISSUES CLASSIFICATION TASK

Each of the following design features will appear on a separate classification form for placement into one of the four transition issue categories. To assist the controllers in interpreting the descriptions, examples of the status list and menu will be included. A picture of the PVD workstation keyboard and function key layout also will be provided with the keys relevant to Data Link clearly marked.

GENERAL DISPLAY FEATURES

1. Data Link Equipage/Eligibility Indicator

The first position of the first line of the full data block (next to the flight ID) is used to indicate whether the aircraft is equipped with an operating Data Link, and whether the sector position is eligible to send Data Link messages to that aircraft.

No symbology in this position indicates that the aircraft is not equipped with an operable Data Link.

An "unfilled diamond" symbol (◇) indicates that the aircraft has an operable Data Link, but that Data Link and voice communication eligibility resides with another sector.

An "hour glass" symbol (⧗) indicates that the aircraft has Data Link and that the sector displaying the symbol is eligible to communicate with the aircraft.

GENERAL DISPLAY FEATURES

2. Data Link Status List Format/Content

Information about the status of ongoing Data Link transactions is displayed in a special list located on the Plan View Display. Each line of the list maintains information about a single ongoing transaction.

A status list entry line includes:

1) the Aircraft Identification (AID).

2) The ATC service/function being provided (abbreviated as AA,TC,FT,or MT).

3) A short description of the data being transmitted in the message (e.g. altitude assigned, new radio frequency, or first six characters of a free text or menu text message).

4) The current status of the transaction. These status indicators are: SNT - message sent to aircraft, DLV - message has been succesfully and accurately received by the airborne Data Link avionics, WIL - the pilot has received the message and intends to comply, NAK - the message was not technically acknowledged by the avionics and did not reach the pilot, and FAI - the message was received by the avionics but the pilot failed to WILCO the message within a period of 40 seconds.

GENERAL DISPLAY FEATURES

3. Turn On/Off Status List

Pressing DLC (DATA LINK) category function key followed by S acts as a toggle switch to display the status list or to suppress it, if currently on.

GENERAL DISPLAY FEATURES

4. Reposition Status List

The QP quick action key followed by T permits the controller to reposition the status list on the PVD using the track ball.

TRANSFER OF COMMUNICATION

1. Preparation of a TOC Message

The new radio frequency message is prepared automatically after a hand-off is accepted by the receiving controller. This message appears in the sending controller's status list with an indication of HLD (held) in the status indicator field.

TRANSFER OF COMMUNICATION

2. Inputs to Send the TOC

The message is sent either by track ball designation of the held TOC message in the status list OR by pressing the DLC category function key followed by typing the FLID (aircraft identification or computer identification).

TRANSFER OF COMMUNICATION

3. Displays During the TOC

Sending the held TOC message results in a SNT being displayed in the status list, which changes to DLV when a technical acknowledgement is received from the airborne data link avionics. The Data Link equipage/eligibility indicator in both the sending and receiving sectors changes from an hourglass (sending sector) or open diamond (receiving sector) to an up-arrow symbol (↑) while the message is sent and delivered.

TRANSFER OF COMMUNICATION

4. Displays after the Pilot Response

When the pilot responds to the new radio frequency message by downlinking a WILCO, the WIL message appears in the status list, and the sending sector's equipage/eligibility indicator in the full data block changes from the up-arrow to an open diamond, while the receiving sector's symbol changes to the hourglass. Receipt of the WILCO automatically deletes the corresponding line of the sending sector's status list after 6 seconds.

TRANSFER OF COMMUNICATION

5. Displays After a Response Failure

If a TOC fails, either because of a failed technical acknowledgement or a failure of the pilot to WILCO the message after 40 seconds, the up-arrow in the first position of the first line of the full data block reverts to the hour glass in the sending sector and an open diamond in the receiving sector. The entire data block is displayed in high intensity, as is the FAI message in the status list to alert the controller.

TRANSFER OF COMMUNICATION

6. Resend After Failure

To attempt a resend after a failed TOC, the status list line can be designated by trackball OR the controller can press the DLC followed by typing TC and the FLID. If the controller chooses instead to contact the aircraft by voice radio, the Data Link transaction can be cancelled and the status list entry cleared by typing D and designating the status list line with the track ball OR typing DLC, TC and the FLID.

TRANSFER OF COMMUNICATION

7. Acquiring Data Link Eligibility

A sector which has track control of an aircraft can acquire Data Link eligibility by pressing the DLC key followed by /OK and the FLID. This action will change the equipage/eligibility symbol in the sector's full data block to the hour glass, and to the open diamond in the FDB at the sector which formerly had Data LInk eligibility.

ASSIGNED/INTERIM ALTITUDE (MANUAL ENTRY)

1) Inputs to Send Altitudes

An assigned or interim altitude is sent by pressing the appropriate Quick Action Key (QZ or QQ), typing the new altitude, S (send) and the FLID.

ASSIGNED/INTERIM ALTITUDE (MANUAL ENTRY)

2) Displays During Altitude Uplink

When an altitude is sent, the status list displays the transaction with a SNT status which changes to DLV when a technical acknowledgement is received from the Data Link avionics onboard the aircraft. Sending the altitude also causes the altitude field in the second line of the full data block to display the new altitude followed by an S. This indication is timeshared with the previously assigned altitude and conformance indicator.

ASSIGNED/INTERIM ALTITUDE (MANUAL ENTRY)

3) **Displays After Pilot Response**

When the pilot downlinks a WILCO, the transaction status in the status list is changed to WIL and the new uplinked altitude is followed by a W rather than a S in the full data block. After 6 seconds, the status list line is cleared and the time shared full data block display changes to a continuous indication of the newly uplinked altitude.

ASSIGNED/INTERIM ALTITUDE (MANUAL ENTRY)

4) **Displays After a Response Failure**

If an altitude message fails either because of a failed technical acknowledgement or because the pilot fails to downlink a WILCO within 40 seconds, the uplinked altitude is followed by FAIL (rather than S or W) in the full data block display. This indication is timeshared with the currently displayed altitude, conformance indicator, and Mode C altitude. The status list status field also displays a failure indication, and both the full data block and the status list failure message are displayed in high intensity print to alert the controller.

ASSIGNED/INTERIM ALTITUDE (MANUAL ENTRY)

5) **Resend After Failure**

If the controller chooses to resend a failed message via Data Link, he/she may designate the status list entry OR press DLC and type AA followed by the FLID. Should the controller choose to send the clearance by voice, the message can be cancelled and the displays cleared by pressing D and track ball designating the status list entry OR pressing DLC and typing AA followed by the FLID.

INTERIM ALTITUDE MENU TEXT

1) **Menu Format/Content**

This service provides the controller with a list of commonly used interim altitude clearances which can be sent by designating the menu item. The menu items may include altitudes alone or altitudes combined with crossing restrictions and other clearances typically associated with the altitude.

Each item in a menu has a letter designation in the first column followed by a field which is blank when the selection of the item will not update the full data block, and contains a + when the selection will update the full data block. The clearance (up to 20 characters) is printed in the final field.

INTERIM ALTITUDE MENU TEXT

2) **Menu Item Types**

Menu items are tailored to individual sectors and can be assigned any alphabetical letter designation during the menu build process. However, items Z and R are always reserved for special functions.
The R item permits the controller to remove any interim altitude displayed in the full data block and uplink the aircraft's final assigned altitude or an altitude which was previously requested by a pilot and entered into the system. The Z item uplinks the altitude currently displayed in the full data block.

INTERIM ALTITUDE MENU TEXT

3) **Inputs to Send Menu Item**

Pressing the interim altitude (QQ) quick action key, the selected menu item alphabetic letter designation, and the FLID uplinks a menu item.

INTERIM ALTITUDE MENU TEXT

4) **Displays During Uplink**

Upon sending the item, the uplinked altitude and an S (send) appear in the second line of the data block. These data time share with the currently displayed altitude and conformance indicator. The status list line for the message displays the SNT and DLV status messages when the message is sent and delivered, respectively.

INTERIM ALTITUDE MENU TEXT

5) **Displays After Pilot Response**

When the pilot downlinks a WILCO, the letter following the uplinked altitude changes from S to W. The transaction status list changes to WIL. After 6 seconds, the status list line is cleared and, if the menu entry contained the + symbol, the uplinked altitude is displayed consistently in the full data block.

INTERIM ALTITUDE MENU TEXT

6) **Displays After Response Failure**

If a menu message fails, either because of a failure to receive a technical acknowledgement or a pilot's failure to WILCO within 40 seconds, the uplinked altitude is displayed in the second line of the full data block followed by the word FAIL. This is timeshared with the currently assigned altitude, conformance indicator and Mode C altitude. The status list also presents a failure message, and both the FDB and status list message are displayed in high intensity to alert the controller.

INTERIM ALTITUDE MENU TEXT

7) **Resend After Failure**

To attempt to resend the message via Data Link, the controller may use the trackball to designate the appropriate line in the status list OR press the DLC key and type MT and the FLID. If the controller chooses instead to contact the aircraft by voice radio, the message can be cancelled and cleared from the status list by typing D and designating the status list line with the track ball OR pressing the DLC key and typing MT and the FLID.

INTERIM ALTITUDE MENU TEXT

8) **Turn On/Off Menu**

The menu can be displayed by pressing the DLC key and M. The menu is removed by the same input sequence.

INTERIM ALTITUDE MENU TEXT

9) **Reposition Menu**

The menu can be positioned on the PVD by pressing the QP quick action key, T, and designating a new position with the track ball.

COMMUNICATIONS BACKUP UPLINK

1) **Inputs To Send Message**

A free format text message can be uplinked to an aircraft by pressing the DLC key, T, typing the string of text, and the FLID. Typing ALL instead of the FLID will cause the message to be sent to all aircraft in Data Link communication with the sending sector.

COMMUNICATIONS BACKUP UPLINK

2) **Displays During Uplink**

The first 20 characters of the text message are displayed in the data field of the status list with SNT in the status field when the uplink is initiated. The status is updated to DLV when a technical acknowledgement is received. No indication is provided in the data block.

COMMUNICATIONS BACKUP UPLINK

3) **Displays After Pilot Response**

The transaction status field in the status list changes to WIL when the pilot downlinks a WILCO. After 6 seconds, the free text entry is cleared from the status list.

COMMUNICATIONS BACKUP UPLINK

4) **Displays After Response Failure**

If the transaction fails because of a failed technical acknowledgement or the pilot failed to WILCO the message within 40 seconds, the full data block is displayed in high intensity. A high intensity FAI message also appears in the status list entry.

COMMUNICATIONS BACKUP UPLINK

5) **Resend After Failure**

If the controller wishes to resend the message by Data Link, the track ball can be used to designate the status list entry OR the controller can press the DLC key,and type FT followed by the FLID.
If the controller instead chooses to contact the aircraft by voice radio, the Data Link message can be cancelled and the status list line cleared by typing D and track ball designating the status list line OR pressing DLC and typing FT and the FLID.