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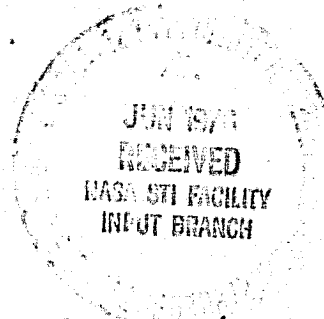
CONTINUATION OF ADVANCED CREW PROCEDURES DEVELOPMENT TECHNIQUES

DESIGN NOTE NO. 17

PPP EFFECTIVENESS STUDY

7 MAY 1976

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1.0 SUMMARY

This design note presents a study of the Procedures and Performance Program (PPP) effectiveness. The intent of the study is to determine manpower time savings and the improvements in job performance gained through PPP automated techniques. The discussion presents a synopsis of PPP capabilities and identifies potential users and associated applications, PPP effectiveness, and PPP applications to other simulation/training facilities. Appendix A provides a detailed description of each PPP capability.

2.0 INTRODUCTION

The PPP is an automated procedures recording and crew/vehicle performance monitoring system. The heart of the system is an interactive digital computer program which translates inputs from a man-in-loop simulator into crew procedures and performance data outputs. The procedures data may be compared with a stored reference, thus providing a difference procedures capability. Performance data may be displayed either alphanumerically or graphically and may be compared to a set of established criterion, thus providing a performance evaluation capability. Both procedures and performance data are available on CRT displays during real-time operations and on CRT displays and hardcopy outputs post-run. The data may also be transferred to the Generalized Document Processor (GDP) for formal documentation.

The Continuation of Advanced Crew Procedures Development Techniques (CACPDT), Statement of Work (SOW) included a task to study the effectiveness of these PPP automated techniques. Since the program has only provided operation support to one Shuttle Procedures Simulator (SPS) simulation, the Systems Management 2 (SM2) simulation, much of the study is a subjective analysis. Examples of SM2 output data are illustrated in Reference 1. This data was used to some extent to verify SM2 procedural activity and vehicle response. This

usage provides some substantiation of the analysis presented in this design note.

3.0 DISCUSSION

This design note presents a study of the Procedures and Performance Program (PPP) effectiveness. The following paragraphs describe PPP capabilities, and identify potential users and associated applications, PPP effectiveness when applied to procedures development, mission analysis, training and simulator support activities, and possible applications to other simulator/training facilities.

3.1 Synopsis of Capabilities

PPP Overview - The PPP is an automated procedures recording and crew/vehicle performance monitoring system presently operating in conjunction with the SPS. The system translates SPS crew station inputs and program data into crew procedures and crew/vehicle performance data outputs. These outputs support the procedures development and verification, systems analysis, mission analysis, flight planning, and crew training tasks for Shuttle flight operations by providing (1) an automated means of developing/recording crew procedures based on crew simulator activities, (2) an automated means of comparing actual (present run) versus reference (past run/verified) procedures during a training session, (3) a permanent record of crew/vehicle performance data during a run, (4) an automated means of evaluating critical performance parameters, (5) an automated means of developing training scripts by recording instructor action, (6) an automated means of tracking training status data resulting from all training sessions, (7) a means of transferring the data to the Generalized Document Processor (GDP) for formal documentation and distribution, and (8) an automated

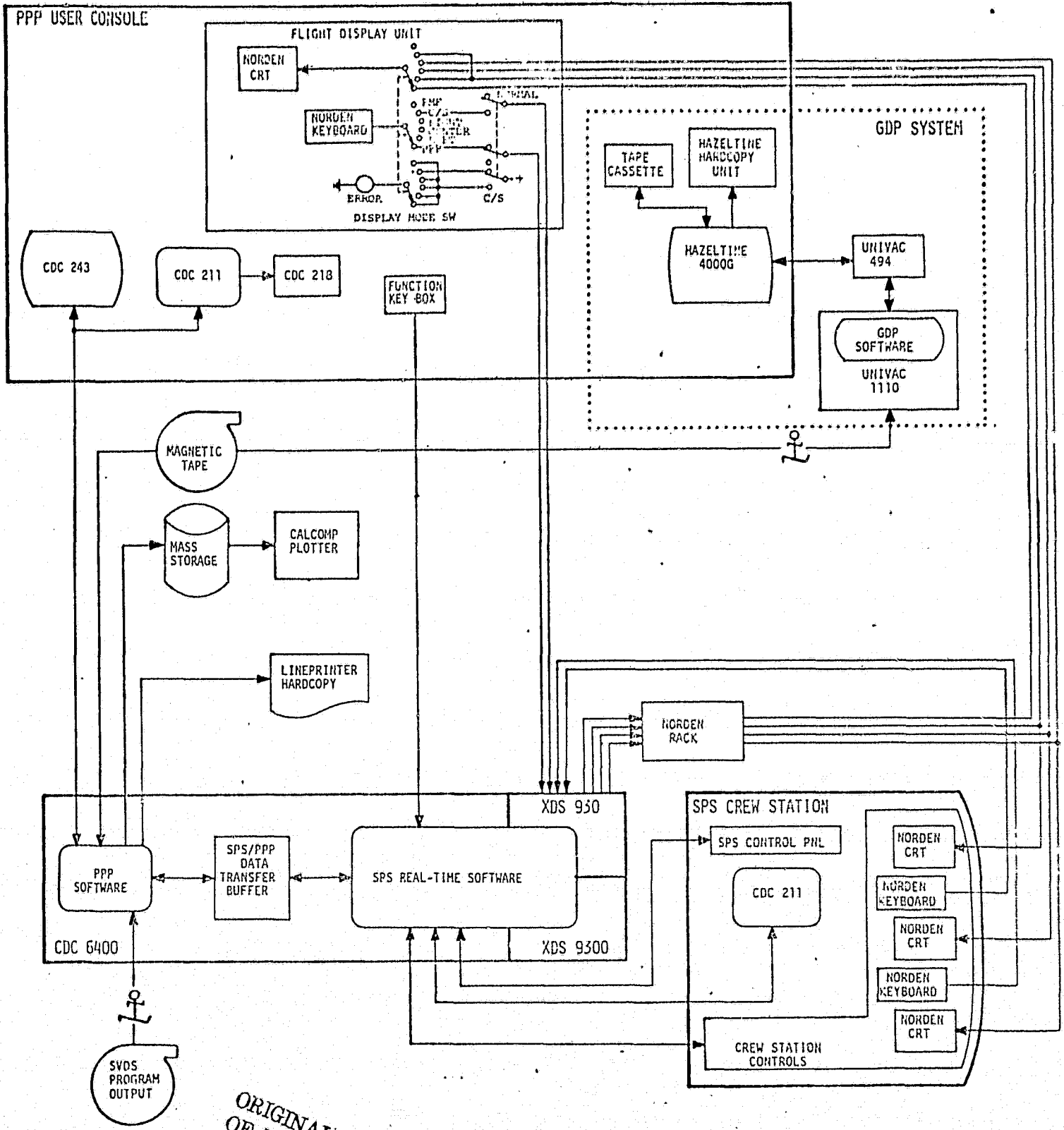
means of generating preliminary procedures data for planning simulator usage and establishing initial procedures timelines' from the Space Vehicle Dynamic Simulation (SVDS) program.

The PPP utilizes either a CDC 211 or CDC 243 terminal as the user interface device for program control and data monitoring. The CDC 211 displays alphanumeric procedures and performance data formats and the CDC 243, graphical performance data formats. Figure 1 presents the PPP hardware and program interfaces with the SPS, GDP, and SVDS systems. During a simulation run, procedures and performance data formats are available in real-time on the CDC 211 or CDC 243 terminals. During simulation holds or post-run, the data may be reconstructed at any point in past time. During post-run operations, procedures, performance, and training data formats are available on either terminal, on hardcopy outputs, and/or on magnetic tape for transfer to the GDP for formal documentation and distribution. Reference 2 describes the detailed operations required to use the PPP and details of the data outputs available.

PPP Capabilities Summary - The PPP provides the user with procedures, performance, and training data outputs. Each individual display format is user definable. This allows different users to construct formats applicable to their unique requirements within the limits of the available data. The following paragraphs provide a general description of these display formats and other PPP capabilities. Appendix A presents a detailed description of each.

Procedures formats provide time tagged data specifying major Shuttle mission events (e.g., MECO or Entry Interface), crew station input

FIGURE 1
PPP HARDWARE AND PROGRAM INTERFACES



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device activities (e.g., switches or hand controllers), crew station output responses (e.g., status lights or talkbacks), trajectory related data (e.g., station coverage or day/night status), and simulation malfunction status.

Difference procedures formats provide a unique method of data presentation and analysis. This capability allows the user to automatically compare actual simulator status and crew procedures, during real-time operations, against previously stored reference data. The reference data is generated from previous simulations and may have been edited on the GDP system. Difference procedures present time tagged data that verifies proper crew station status for the simulation initial configuration, simulation holds, and real-time run operations, and verifies user specified procedural and event sequences. The system flashes a message to the user when a difference is detected and a listing of these differences is provided for easy tracking.

Performance data formats provide alphanumeric and/or graphical outputs of simulator parameters transferred to the PPP. The system allows the user to define formats using any of the parameters transferred. Formats can contain parameters associated with trajectory data, a particular vehicle system, mission phase data, or any combination the user desires. The data outputs present the current simulation time value of the parameters displayed.

Performance evaluation formats provide an automated method of data analysis. This capability allows the user to compare selected crew/vehicle performance parameters against a set of established criterion data. When the criterion data is exceeded, the deviations are output

to the user. Formats can be established for any user defined phase of the Shuttle mission and when the criterion defining that phase has been satisfied, the system automatically advances to the next phase's format.

PPP training data provides two types of data. The first is script data which is a time sequence listing of the operator's PPP Users Console and simulator control console input activities. This data initially may be used to generate formal training script documentation. Subsequently, the data may be used to verify proper operator actions if a problem or question arises during a training session. The second type of data tracks the status of simulator training activities. These formats include crew status by crewman, exercise and time, noncrew status (training personnel activities), and total hours of system utilization.

Other PPP capabilities include data reconstruction, GDP transfers, SVDS transfers, and a flight display unit for monitoring crew station displays. Reconstruction allows a user to access past time data during simulation holds and post-run. A cue function is provided to assist in accessing the data. GDP transfers allow the user to put PPP data on the GDP system; then to edit, finalize, and document the data. The finalized GDP procedures data may then be transferred back to the PPP as reference data. SVDS transfers allow the user to generate the initial procedures timeline for any trajectory from SVDS program outputs. The flight display unit allows the user to access the same flight displays that are displayed on the crew station CRT's.

3.2 Potential Users and Applications

Identification of Potential Users

PPP real-time and post-run output capabilities can supply useful data to various Shuttle program disciplines. The first potential user identified was the flight operations discipline. In this area, PPP data can support systems analysis, mission analysis, procedures development, flight planning, and training activities. Other potential users subsequently identified include Engineering and Development (E&D), Data Systems and Analysis (DSA), and simulator support disciplines. In these areas, PPP data can support systems analysis, mission analysis, and simulator checkout and verification.

Application of PPP to User Needs

Figure 2 presents a detail matrix relating PPP capabilities to two different potential users needs. The first grouping indicates user needs for the flight operations, flight procedures development process as defined in Reference 3. The matrix shows the PPP capabilities applicable to supporting user needs for each task identified. In general, total PPP capabilities are utilized during simulation activities. Other tasks are supported by the data output gathered during these simulation activities. Similar applications exist for the E&D (data outputs were supplied for the E&D Systems Management 1 & 2 Simulations) and DSA disciplines, but a detailed identification has not been performed to date. The second grouping identifies user needs for the simulator support discipline, and also indicates the different PPP capabilities supporting each task.

The following discussions provide detailed operational flows for three of the identified users.

FIGURE 2
APPLICATION OF PPP TO USER NEEDS

		PROCEDURES AND PERFORMANCE PROGRAM CAPABILITIES																	
		PERFORMANCE DATA		PERFORMANCE EVALUATION		DIFFERENCE		PROCEDURES				TRAINING DATA				GCP TRANSFER		SVCS TRANSFER	
		PROCEDURES	ALPHANUMERIC DISPLAYS	GRAPHICAL DISPLAYS	ALPHANUMERIC DISPLAYS	GRAPHICAL DISPLAYS	INITIAL STATUS CHECK	NO. DIFFERENCES	INITIAL CONFIG CHECK	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES	STANDARD DIFFERENCES
FLIGHT PROCEDURES DEVELOPMENT TASKS	CREW OPERATIONAL REQUIREMENTS																		
	<ul style="list-style-type: none"> HARDWARE/SOFTWARE/MISSION REQUIREMENTS DOCUMENT/DESIGN REVIEW PANEL MEETINGS ENGINEERING SIMULATIONS CREW ACTIVITY TIMELINES 																		
	FLIGHT PROCEDURES/TECHNIQUES DEVELOPMENT																		
	<ul style="list-style-type: none"> FLIGHT TECHNIQUES PANEL INTERFACE PART-TASK SIMULATIONS ANALYTICAL STUDIES CREW ACTIVITY TIMELINES UPDATES 																		
	DETAILED PROCEDURES DEVELOPMENT/VALIDATION																		
	<ul style="list-style-type: none"> BASELINE VEHICLE DESIGN FLIGHT TRAJECTORY DESIGN PART-TASK SIMULATIONS PROCEDURES CONSTRAINTS/RATIONALE DETAILED PROCEDURES TRAINING CHECKLISTS FLIGHT PROCEDURES HANDBOOK 																		
	PDF DEVELOPMENT/VALIDATION																		
	<ul style="list-style-type: none"> PRELIMINARY PDF PART-TASK SIMULATIONS CONDITIONAL VALIDATION BASIC PDF CB CONTROL FLIGHT SIMULATIONS BASIC EDITION VALIDATION FINAL PDF INTEGRATED SIMULATIONS FLIGHT READINGS VALIDATION 																		
	CREW TRAINING/FLIGHT OPERATIONS SUPPORT																		
	<ul style="list-style-type: none"> BRIEFINGS/PART-TASK/FAMILIARIZATION BASIC/FLIGHT RELATED INTEGRATED REAL TIME SUPPORT DEBRIEFINGS 																		
SIMULATOR SUPPORT OPERATIONS OPERATIONAL ASSISTANCE	PRE-FLIGHT SUPPORT																		
	<ul style="list-style-type: none"> INITIAL STATUS CHECK POWER-UP SEQUENCE CONFIGURE FOR CHECKOUT STATIC AND DYNAMIC CHECKOUT 																		
	IDENTIFICATION OF AVAILABILITY AND STATUS																		
	CONFIGURE FOR UNICELY PLANNED EXERCISE																		
	ASSIST IN FINAL PREPARATION																		
	IN-FLIGHT OPERATIONS																		
	<ul style="list-style-type: none"> INFLIGHT DISPLAYS AND EQUIPMENT ASSIST IN PLANNED TRAINING EXERCISE 																		
	POST-FLIGHT OPERATIONS																		
	<ul style="list-style-type: none"> COORDINATE RECONFIGURATION ACTIVITIES FLIGHT CLOSE-OUT ACTIVITIES 																		
	IMMEDIATE CORRECTIVE ACTION																		
<ul style="list-style-type: none"> TOP LEVEL TROUBLE SHOOTING COLLECT DATA TO ANALYZE FAILURE ASSESS IMPACT IN TRAINING SESSION COORDINATE IMMEDIATE CORRECTIVE ACTION 																			
LONG RANGE FAULT ISOLATION																			
<ul style="list-style-type: none"> DEFINE DATA MONITORING REQTS FOR USERS ACQUIRE DATA FROM LATER REQMS ANALYZE DATA TO DETERMINE SOLUTION COORDINATE CORRECTIVE ACTION VERIFY SIMULATION 																			

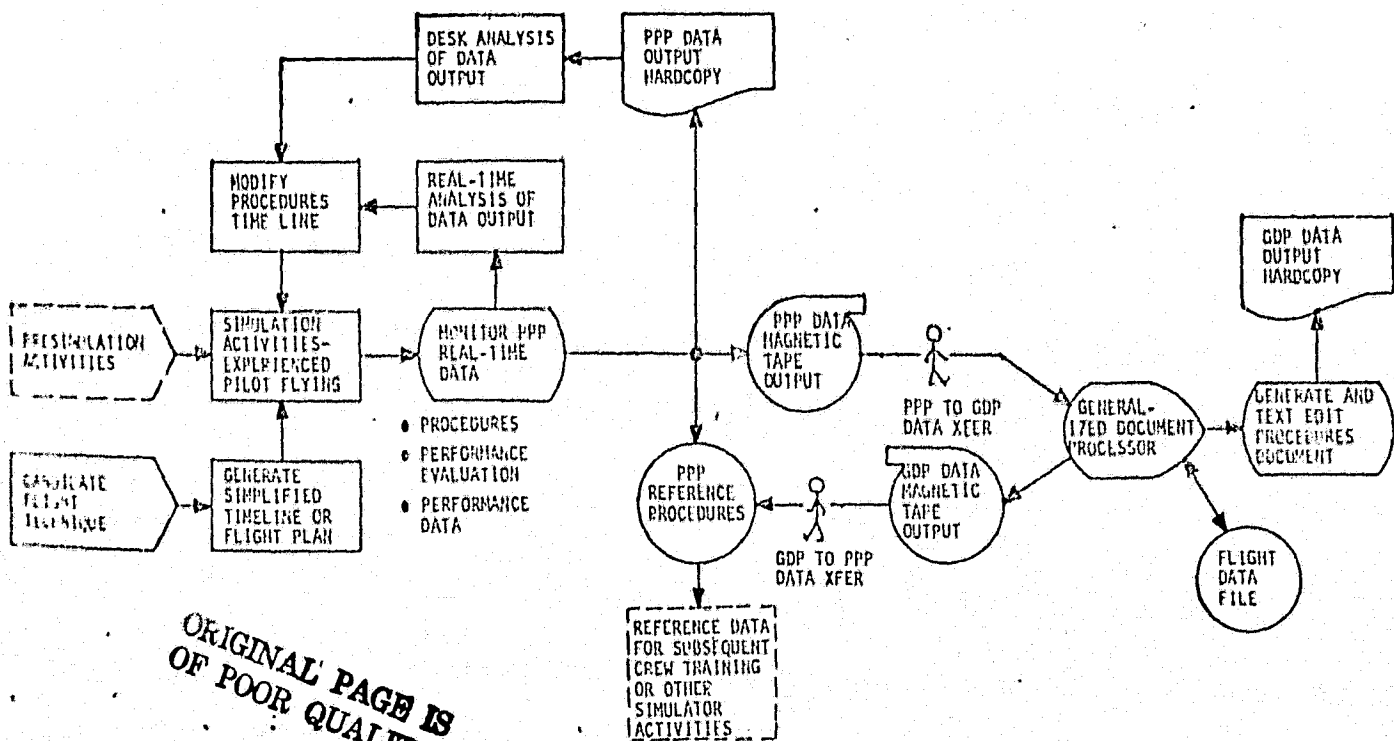
* This capability has not been implemented.

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PPP Procedures Development Operational Flow

PPP real-time and post-run outputs can be utilized to aid the flight techniques and procedures development task. Figure 3 presents an operational flow for this activity. Using an abbreviated timeline or simplified flight plan, the candidate technique can be flown in a simulator by an experienced pilot. During the real-time simulation, monitoring PPP real-time data allows the developer to check procedural steps against performance data responses. This real-time output provides for immediate procedural modifications when required. Following the simulation exercise, hardcopy outputs are available for subsequent

FIGURE 3
PROCEDURES DEVELOPMENT OPERATIONAL FLOW



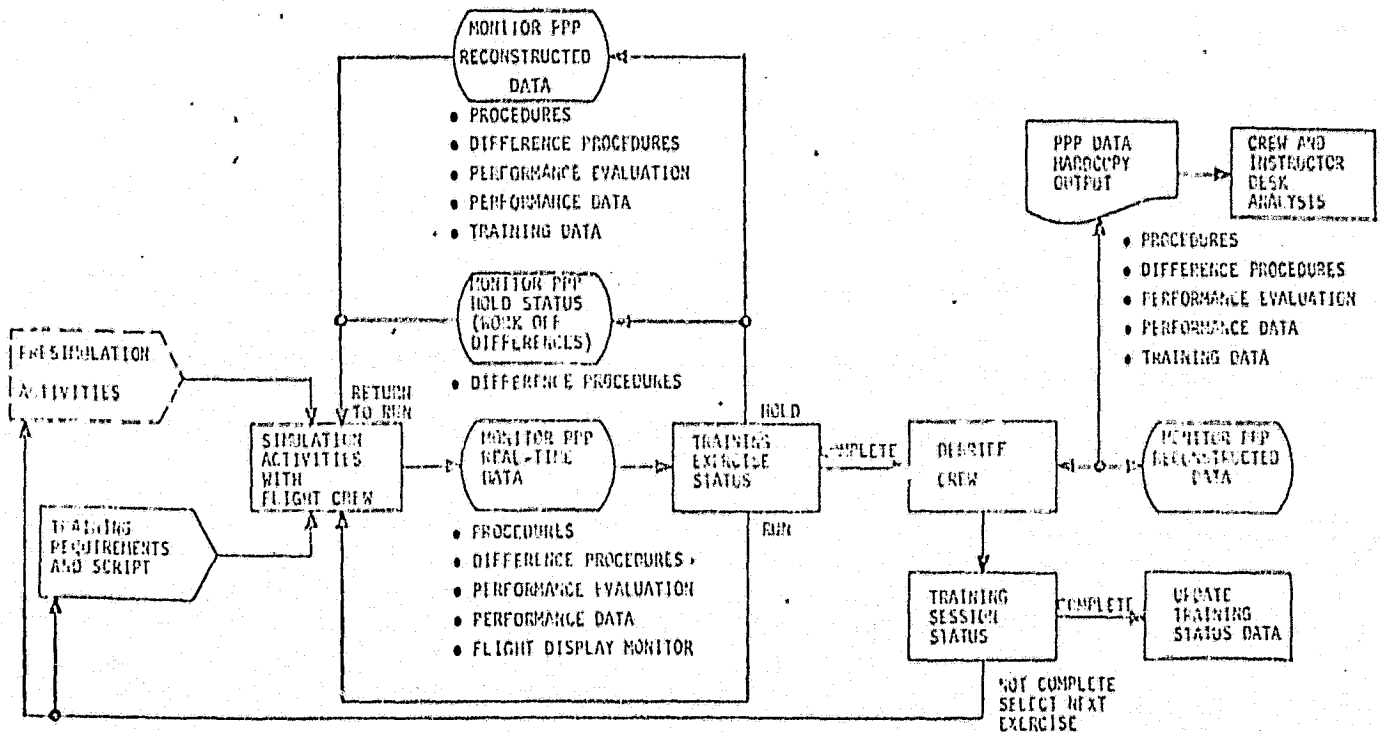
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analysis and modifications, and magnetic tape outputs are available for transfer to the GDP, thus generating the initial procedures documentation. GDP text edit capabilities provide the capability to finalize the procedures for FDF documentation. The finalized FDF data may then be transferred back to the simulator as reference procedures data.

PPP Crew Training Operational Flow

Figure 4 presents the PPP operational flow for crew training activities. Training instructors, prior to simulation activities, may automatically verify the initial crew station configuration for a training exercise. During the exercise, crew station procedures and vehicle responses are

FIGURE 4
CREW TRAINING OPERATIONAL FLOW



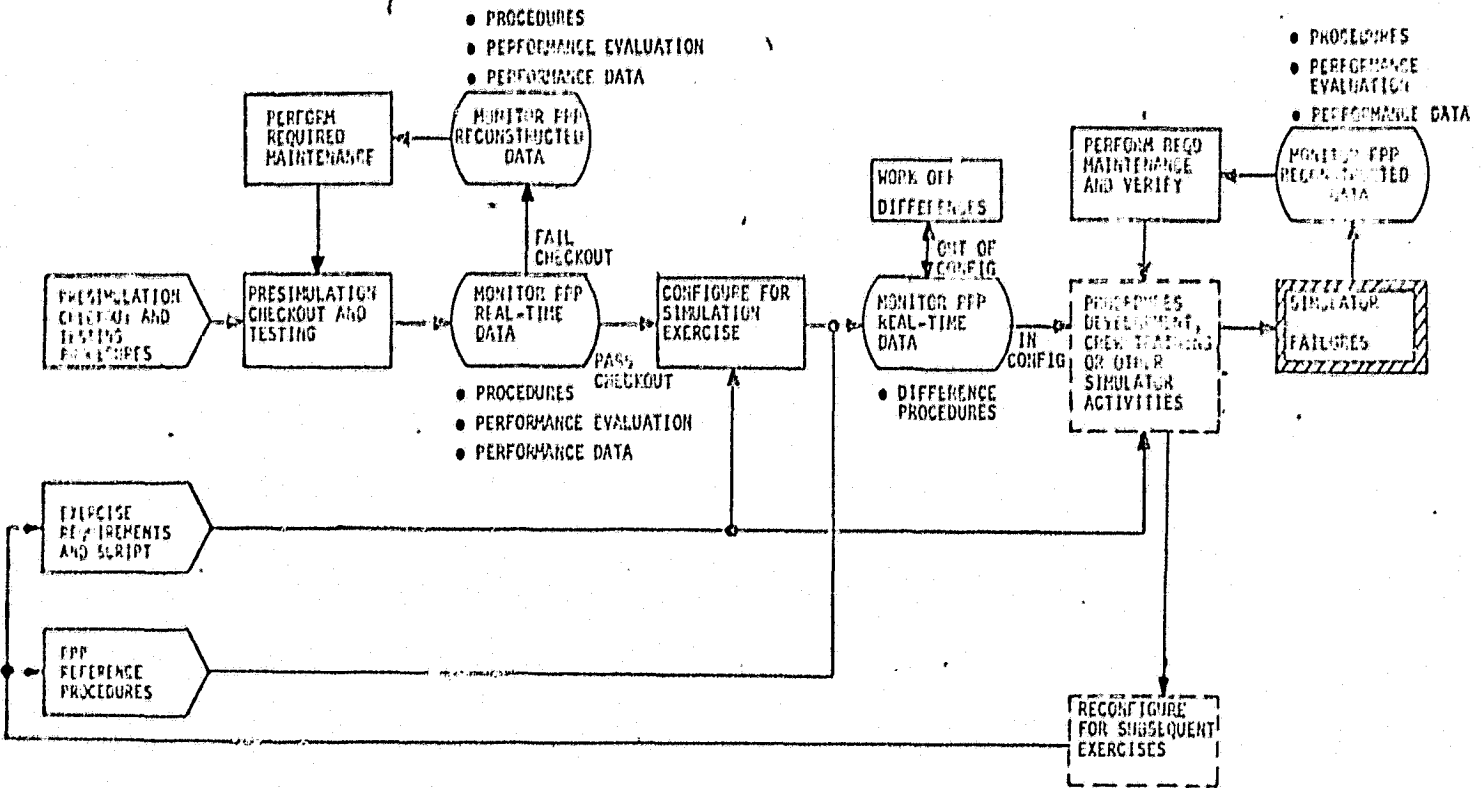
available. Included in the procedures data are malfunction status indications which allow the training instructor indications of crew responsiveness to these malfunctions. Comparisons of the procedures data may be made against the established reference procedures data. These comparisons provide the instructor a quick check on how closely the crew is following the reference procedures. Performance evaluation data provides another check of the quality of the run by comparing selected parameters against the preestablished criterion data and displaying any deviations. Also, any simulator parameter transferred to the PPP can be monitored if desired. Finally, the Flight Display Monitor allows the instructor to monitor the crew station CRT displays. When the instructor or trainee feels a simulation hold is required to discuss the past activities, the instructor has the capability to reconstruct the past time data and immediately answer any question with substantiating data. The system also automatically tracks the crew station status, during a simulation hold, and notifies the instructor of any configuration changes. Following completion of the exercise, the system provides for immediate display of the reconstructed data to support the crew debriefing. Hardcopy outputs are also available for subsequent review and discussion.

PPP Simulation Support Operational Flow

PPP output capabilities are attractive in the area of simulation support. The outputs which provide automated analysis, can speed-up the checkout and testing activities while increasing accuracy. Figure 5 presents the operational flow for the simulation support activity. During the presimulation activities, PPP real-time outputs are monitored to verify the simulator is operating within specified tolerances. If

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FIGURE 5
SIMULATION SUPPORT OPERATIONAL FLOW



the specified tolerances are exceeded, PPP data reconstruction provides a time data history to aid in the problem's solution. After completing checkout, the initial configuration difference capability is employed to aid in the establishment of proper crew station configuration. This capability is also employed post-exercise to aid in configuring for subsequent exercise. If a simulator failure occurs during simulation activities, post-exercise reconstruction capabilities provide the same time data history to aid in troubleshooting the failure. The data in this case allows support personnel to duplicate operations prior to the failure when verifying the maintenance performed.

3.3 PPP Effectiveness

PPP output capabilities provide a useful and effective tool when applied to the user needs and tasks previously discussed. Proper use of this tool can save users time in completing their tasks and supply a combination of data that will improve total job performance. Time savings are a direct result of automated techniques applied to time consuming tasks such as crew station configuration/verification, procedures documentation, performance data analysis, and training status documentation. The improvements in job performance result from properly identified and well formatted data outputs and from time savings which reduce required manpower.

The effectiveness of PPP capabilities is presented in Figure-6. The figure presents a list of PPP capabilities, specifies that capability's function and provisions, indicates any previous methods employed, and then identifies the effectiveness of the capability. The list only provides the effectiveness on an individual capability basis and thus does not provide a total picture of overall PPP effectiveness. Coupling various capabilities further increases PPP effectiveness. This can readily be seen in the case of procedures development, crew training, and simulator support activities.

Considering procedures development, the obvious PPP aid is the procedures recording capability. This capability ensures recording of all crew station procedural operations on a user defined format. This output alone reduces the required typing support, subsequent review time, and correction cycle. By coupling procedures recording with difference procedures, performance data, and performance evaluation data (all time tagged), the iterative process of desk analysis work

FIGURE 6

EFFECTIVENESS OF PPF CAPABILITIES

CAPABILITY	FUNCTION AND PROVISIONS	PREVIOUS METHODS	EFFECTIVENESS
Procedures Data	<p>Automated recording and display of real-time simulation procedural operations and mission events.</p> <ul style="list-style-type: none"> Real-time recording and verification of potential procedures checklist. 	<ul style="list-style-type: none"> Manual tracking, recording, and markups of existing procedures. Tedious review of all procedures documentation. Not applicable. 	<ul style="list-style-type: none"> Precise well formatted documentation that eliminates manual errors. Precise documentation for trouble-shooting simulator failures. Eliminates nomenclature errors and saves many man-hours. System handles new or revised formats without software changes.
Performance Data	<p>Display of simulator performance data.</p> <ul style="list-style-type: none"> User definable formats allow grouping of systems or mission related parameters on one display page (graphical or alphanumeric). Post-run selection of only the required data. 	<ul style="list-style-type: none"> Search of onboard displays with a limited parameter hardcopy during real-time. Post-run search of large volume of hardcopy outputs including unwanted data. 	<ul style="list-style-type: none"> Improves data access for analysis purposes. Reduces volume of unnecessary hardcopy data outputs.
Performance (Evaluation Data)	<p>Display of simulator performance data with automatic calculations of deviations from established criterion.</p> <ul style="list-style-type: none"> User definable formats allow grouping of related critical parameters on one display page. Post-run selection of only the required data. Rapid recognition of out-of-tolerance conditions from display of calculated deviations. Snapshot calculations of desired parameters at mission critical times. Graphics provides unlimited number of traces providing the parameters past trends and including criterion plots. Scaling, labeling, parameter, and run identification automatically output with all data. 	<ul style="list-style-type: none"> Search of onboard displays with limited parameters hardcopy during real-time. Post-run search of large volume of hardcopy outputs including unwanted data. Recognition of out-of-tolerance conditions depend on user knowledge of limits and available cue card aids. Search of onboard displays at the mission critical times. Limited traces of X-Y plotter and time variant strip chart recorder outputs. Scaling, labeling, parameter, and run identification recorded manually. 	<ul style="list-style-type: none"> Improves data access for analysis purposes. Reduces volume of unnecessary hardcopy data outputs. Reduces chance of unproductive simulation runs and negative training. Ensures access of critical data. Improves data access for analysis purposes. Eliminates manual identification of data. Run identification reduces chance of data loss or mix up.
Difference Procedures Data	<p>Automatic comparison of present run procedures and simulator status against an established reference during real-time and post-run.</p> <ul style="list-style-type: none"> Rapid and accurate verification of initial crew station status (only out of configuration devices displayed). Tracking of crew station configuration during simulation holds. Rapid check of crew station configuration at random user specified times. Rapid check of crew station configuration at preestablished (critical), user specified times. Rapid check of procedural sequences during critical mission phases. Provides a listing of all detected differences. 	<ul style="list-style-type: none"> Switch by switch visual verification of total crew station configuration. None other than manual verification if the initial hold configuration is known. None. None. Manual monitoring of crew procedures against checklist in real-time. None. 	<ul style="list-style-type: none"> Man-hours and errors reduced in establishing initial crew station configuration. Reduces errors resulting from configuration changes during simulation holds. Ensures simulation exercise is proceeding per the established reference. Ensures simulation exercise is proceeding per the established reference. Immediate notification of erroneous operations reduces negative training. Saves man-hours by reducing reruns of an exercise. Ensures discussion and debriefing of all problem areas. Reduce man-hours finding and researching problem areas.
Training Data	<p>Automatic recording of simulator operators inputs (scripts) and simulator activities (status).</p> <ul style="list-style-type: none"> Records operators control inputs to the simulator and PPP. Records and accumulates exercises executed for crew training, noncrew activities, and total simulator/PPP utilization. 	<ul style="list-style-type: none"> Not applicable. Manual recording and accumulation including post-mission guessing. 	<ul style="list-style-type: none"> Provides for verification of proper execution of exercise training script. Increases accuracy of records and reduces man-hours required to assemble the data. Formatted output can be used directly for required documents.
Data Reconstruction	<p>Access for past-time procedures and performance data.</p> <ul style="list-style-type: none"> CRT outputs during simulation holds. CRT outputs post-run for subsequent review and debriefing. 	<ul style="list-style-type: none"> None. Hardcopy outputs. 	<ul style="list-style-type: none"> Aids in discussions of reviews of questionable portions of an exercise. Immediate access to data reducing wasted man-hours waiting for debriefing data. CRT review can reduce the required hardcopy outputs.
Cue Insertion	<p>Allows user to automatically record times, during simulation real-time, to be used for subsequent data access.</p> <ul style="list-style-type: none"> Time tags problem areas or desirable discussion areas of any simulation without requiring a simulation hold (reconstruction and cue table provide access at a later time). 	<ul style="list-style-type: none"> Manual recording of problem areas and subsequent search through hardcopy outputs for desired data or going to simulation hold. 	<ul style="list-style-type: none"> Quick and simple identification of questionable areas for later discussion. Reduce simulation holds for minor problems.
ESP/PPP Data Transfer	<p>Provides for direct PPP/GDP data transfers via magnetic tape.</p> <ul style="list-style-type: none"> Transfer of all PPP simulation data to GDP. Transfer of GDP procedures data to PPP. 	<ul style="list-style-type: none"> Manual transfer of simulation data monitored. Not applicable. 	<ul style="list-style-type: none"> Reduces man-hours required to format data for formal documentation. Provides FDF reference procedures.
SPDS Data Transfer	<p>Generates Shuttle trajectory, performance data file for any mission phase.</p> <ul style="list-style-type: none"> Provide initial procedures timeline definition including trajectory data. 	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Reduces manual operations.
Flight Display Unit	<p>Provides simulator operator easy access to crew station flight displays.</p> <ul style="list-style-type: none"> Allows tracking of CRT data displayed to crewmen. 	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Addition data check on crews flight display selection and response to the displayed data.

and simulator reverification of developed procedures is shortened. These same PPP capabilities support new techniques evaluation. In this case, real-time PPP outputs provide extensive on-the-spot evaluations; and post-run outputs provide the initial properly formatted procedures and the data necessary to reduce the iterative processes.

In the case of crew training activities, PPP outputs supply a set of data that can increase the training quality. From start to finish of a training exercise, PPP data aids the training instructor in ensuring proper exercise execution. Prior to an exercise, difference procedures allow the instructor to quickly eliminate initial crew station configuration errors; then through preestablished and random comparisons, proper configuration may be checked during the run. Also, during a run, sequence difference capabilities provide an automatic check on pre-defined sequential operations. Since all data is time tagged, the effects of any detected difference can be quickly determined by accessing the appropriate performance and performance evaluation data displays. Malfunction indications in the procedures data allow the instructor to track malfunction insertion, vehicle response to the malfunction and crew reaction to these vehicle responses. Together this data aids the instructor in evaluating the quality of an exercise. The trends noted through the data can lead the instructor to place the simulator in hold to discuss potential problems, reestablish proper configuration or even terminate an exercise if it does not appear constructive. After exercise completion, the data provides a broad base for crew debriefings and exercise evaluation. Access of the data is easy and rapid using PPP data reconstruction, and therefore, reduces wasted time waiting for data outputs. In total, this data provides a positive training atmosphere and wasted runs and negative training can be held to a minimum.

Finally, PPP data can aid simulator support personnel in the performance of simulator verification and maintenance operations. Procedures data provides a record of crew station input/output discrete interaction, including reaction time. This data coupled with performance data provides an indication of crew station input and vehicle dynamic characteristics interaction. The total data output provides vital documentation for simulator hardware and software verification. These same outputs provide firm documentation for analyzing simulator malfunctions, and reduce the verbal communication required between simulator user and maintenance personnel. Detailed documentation then allows maintenance personnel to easily duplicate simulator malfunctions and duplicate procedural steps leading to the malfunction during maintenance verification.

In summary, the PPP can effectively produce manpower savings and improve job performance. In the areas of procedures development, crew training and simulator support activities, the PPP can improve simulator utilization by removing guess work and reducing the need to rerun simulation exercises.

3.4 Technology Applications to Other Simulator/Training Facilities

Typically, a man-in-loop simulator is developed to fulfill all or part of the following functions: (1) evaluation and improvement of a complex systems design, (2) development and refinement of the systems operational procedures, and (3) training operators to control the system and react to its response characteristics (often in real-time). Fulfillment of any of the functions is supported through the acquisition and analysis of pertinent data. Often simulator/training facilities apply manual methods to monitor, record, and analyze data using post-run lineprinter outputs. Then pertinent data, often contained in a large volume of

columnar outputs is extracted, interpreted, plotted, and analyzed. These manual methods are tedious, prone to error, and time consuming.

The application of existing PPP automated technology to any man-in-loop simulation can reduce time consuming manual operations. This includes aerospace, military, and commercial facilities. In the aerospace field, requirements for the PPP capabilities have been established for the fixed and motion base Shuttle Mission Simulator (SMS) and the Phase II SPS. Although no requirements have been established in the other areas, similarity of simulation complexes, simulator activities, and training requirements indicate applications to military and commercial aircraft, marine, and other complex vehicle simulators. Finally possibilities may exist for industrial complex simulations such as refineries, chemical plants, and nuclear power plants.

4.0 CONCLUSIONS/RECOMMENDATIONS

Automated PPP capabilities provide an effective tool in support of man-in-loop simulation activities. The capabilities can reduce manpower required and improve total job performance especially for the potential users previously identified.

Since PPP capabilities can be effective and have application for future man-in-loop simulators, it is recommended that:

- (1) Development of new and refinement of existing PPP capabilities continue.
- (2) PPP capabilities be utilized when possible for the remaining SPS Phase I simulations.
- (3) PPP capabilities be implemented for all SPS Phase II simulations.
- (4) PPP capabilities be implemented for SMS fixed and motion base simulations.

5.0 REFERENCES

1. JSC-10941, JSC Internal Note, Simulation Report Systems Management Simulations Systems Management 2 & 3, dated March 1976, Engineering Simulations Branch, ASED.
2. McDonnell Douglas Report, MDC W1009, Advanced Crew Procedures Development Techniques, Procedures and Performance Program Users Guide, dated 29 August 1975.
3. JSC-09103, Flight Operations Directorate, Basic Space Shuttle Crew Procedures Development Plan, dated April 30, 1976, Training Development and Integration Branch, CTPD.

APPENDIX A

PPP CAPABILITIES DETAILED DESCRIPTION

A.1 PPP CAPABILITIES DETAILED DESCRIPTION

Figures A1 through A19 present detail descriptions of the various PPP capabilities. Each figure provides a summary description of the capability, the typical simulator control console and PPP user console operations, and the available PPP displays and their content.

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FIGURE A1

PPP PROCEDURES RECORDING CAPABILITY FORMAT: GMT2xx

SUMMARY DESCRIPTION
THE PROCEDURES RECORDING CAPABILITY PROVIDES A TIME HISTORY OF THE OPERATIONS PERFORMED IN THE SIMULATOR CREW STATION AND MISSION EVENTS, OR A SUMMARY OF MISSION EVENTS. PROCEDURES DATA DISPLAYS ALLOW FOR THE PRESENTATION OF DATA RELATIVE TO THE PRESENT RUN AND THE REFERENCE RUN. THE CONTENT AND FORMAT OF THE PROCEDURES DATA DISPLAYS ARE USER DEFINABLE.

TYPICAL SIMULATOR/PPP OPERATIONS	SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS
	INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1 I,RUN	PPP TO RUN MODE
	SIMULATOR TO RUN MODE		
	SIMULATOR TO HOLD MODE	MONITOR PROCEDURES DATA DISPLAY I,REPEAT=GET,0/00/00 I,DISPLAY=2,1,1	MONITOR PROCEDURES FORMAT AT RECONSTRUCTION TIME REQUEST DIFFERENT PROCEDURE FORMAT. TIME EQUALS RECONSTRUCTION TIME OBSERVE AUTOMATIC RESYNCHRONIZATION AND CONTINUATION OF DATA DISPLAY AT CURRENT TIME TERMINATE PPP REAL TIME OPERATIONS
	SIMULATOR TO RUN MODE	I,ENDRT	
	SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION 2) TERMINATE TRAINING SESSION	I,DISPLAY=2,4,1 I,REPEAT=GET,0/05/00	REQUEST DIFFERENT PROCEDURES FORMAT RECONSTRUCT PROCEDURES DATA DISPLAY STARTING AT 5 MINUTES ADVANCE DISPLAY 1 FULL PAGE
	3) TERMINATE THIS RUN - RECONFIGURE FOR NEXT RUN	I,↑ I,TERMINATE	END PPP OPERATIONS

AVAILABLE DISPLAY AND CONTENT	FREEZE KEY	ACTUAL	
	SM SIMULATION DATA R000E000H002C0G0P000I000	RUN 09/19/75 FMT241	
	ELAPSED TIME	HALF IDENT	C/W ALERT, CRT DISPLAY AND SW/CB PROCEDURE PNL
	0/00/43		SM ALERT LT-ON
	0/01/10		CABIN TEMP CONT-OFF L2
	0/01/15		CABIN FAN 1-ON L1
	0/01/20		C/W CBN FLOW LT-OFF
	0/01/30		DISPLAY-0701-E C2L
	0/01/31		20701-L
	0/01/40		DISPLAY 0711 F C2R
	0/01/41		20711-R
	0/01/46		KEYBOARD SEL-LEFT C2
	0/01/54		DISPLAY 0721 E C2L
	0/01/55		20721-C
	0/03/09		ACK C2L
	0/03/10		SM ALERT LT-OFF
	0/03/26	MEACF1 1 A	
		.T.	
	0/03/28		C/W CBN FLOW LT-OFF
	0/03/28		MASTER ALARM LT-OFF
	0/03/28		MASTER ALARM LT-OFF
	0/03/28		MASTER ALARM LT-OFF
	0/03/35		C/W BKUP C/W LT-OFF
	0/03/42		SM ALERT LT-OFF
	0/03/55	MEACF1 1 B	
		.F.	

TIME OF PROCEDURAL ACTIVITY IN HR/MIN/SEC (GET, GMT, PET, OR SRT)

USER REQUESTED DISPLAY OF C&W ALERT DATA IN THIS COLUMN

USER REQUESTED DISPLAY OF SWITCH/CIRCUIT BREAKER PROCEDURES IN THIS COLUMN

USER REQUESTED CRT DISPLAY NUMBER UPDATES IN THIS COLUMN

SWITCH PANEL LOCATION

MALFUNCTION ACTIVATED

MALFUNCTION DEACTIVATION

ORIGINAL PAGE IS
OF POOR QUALITY

FIGURE A2

PPP INITIAL CONFIGURATION DIFFERENCE CAPABILITY		FORMAT: FMT311														
SUMMARY DESCRIPTION	<p>THE INITIAL CONFIGURATION DIFFERENCE CAPABILITY DISPLAYS THE DIFFERENCE BETWEEN THE SIMULATOR CREW STATION SWITCH STATUS AND THE STATUS WHICH EXISTS ON THE REFERENCE DATA FILE THE USER HAS SELECTED FOR THE REFERENCE CONFIGURATION. TO INITIATE THE CAPABILITY, THE USER MUST INITIATE THE COMMAND, ICOMPARE. IF ANY SIMULATOR SWITCH CONFIGURATION DOES NOT AGREE WITH THE REFERENCE, AN AUTOMATIC DISPLAY OF FMT311 AND A MESSAGE "INITIAL CONFIGURATION DIFFERENCE" WOULD RESULT.</p>															
	TYPICAL SIMULATOR/PPP OPERATIONS	<table border="1"> <thead> <tr> <th>SIMULATOR OPERATIONS</th> <th>PPP OPERATIONS</th> <th>REMARKS</th> </tr> </thead> <tbody> <tr> <td>INITIALIZE SIMULATOR COORDINATE WITH PPP</td> <td>INITIALIZE PPP I,DISPLAY=1,2,1</td> <td>ACCESS REFERENCE DATA SELECTION SELECT DESIRED REFERENCE</td> </tr> <tr> <td>SIMULATOR TO RUN MODE SIMULATOR TO HOLD MODE</td> <td>I,N I,ACCEPT I,RUN COORDINATE WITH SIMULATOR</td> <td>PPP TO REAL TIME SIMULATOR TO REAL TIME</td> </tr> <tr> <td>CONFIGURE CREW STATION SWITCHES TO STATUS OF REFERENCE SIMULATOR TO RUN MODE</td> <td>I,COMPARE</td> <td>REQUEST INITIAL SWITCH COMPARISON OBSERVE: 1) FLASHING MESSAGE "INITIAL CONFIGURATION DIFFERENCE EXISTS" 2) AUTOMATIC DISPLAY OF FMT 311 DIFFERENCES WILL BE RE- MOVED AS RECONFIGURATION OCCURS</td> </tr> <tr> <td colspan="3"> <p>NOTE: BECAUSE OF A DESIGN CONSTRAINT, A STRICT ADHERENCE TO THE PROCEDURAL SEQUENCE IS REQUIRED TO ACTIVATE THIS CAPABILITY.</p> </td> </tr> </tbody> </table>	SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS	INITIALIZE SIMULATOR COORDINATE WITH PPP	INITIALIZE PPP I,DISPLAY=1,2,1	ACCESS REFERENCE DATA SELECTION SELECT DESIRED REFERENCE	SIMULATOR TO RUN MODE SIMULATOR TO HOLD MODE	I,N I,ACCEPT I,RUN COORDINATE WITH SIMULATOR	PPP TO REAL TIME SIMULATOR TO REAL TIME	CONFIGURE CREW STATION SWITCHES TO STATUS OF REFERENCE SIMULATOR TO RUN MODE	I,COMPARE	REQUEST INITIAL SWITCH COMPARISON OBSERVE: 1) FLASHING MESSAGE "INITIAL CONFIGURATION DIFFERENCE EXISTS" 2) AUTOMATIC DISPLAY OF FMT 311 DIFFERENCES WILL BE RE- MOVED AS RECONFIGURATION OCCURS	<p>NOTE: BECAUSE OF A DESIGN CONSTRAINT, A STRICT ADHERENCE TO THE PROCEDURAL SEQUENCE IS REQUIRED TO ACTIVATE THIS CAPABILITY.</p>	
SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS														
INITIALIZE SIMULATOR COORDINATE WITH PPP	INITIALIZE PPP I,DISPLAY=1,2,1	ACCESS REFERENCE DATA SELECTION SELECT DESIRED REFERENCE														
SIMULATOR TO RUN MODE SIMULATOR TO HOLD MODE	I,N I,ACCEPT I,RUN COORDINATE WITH SIMULATOR	PPP TO REAL TIME SIMULATOR TO REAL TIME														
CONFIGURE CREW STATION SWITCHES TO STATUS OF REFERENCE SIMULATOR TO RUN MODE	I,COMPARE	REQUEST INITIAL SWITCH COMPARISON OBSERVE: 1) FLASHING MESSAGE "INITIAL CONFIGURATION DIFFERENCE EXISTS" 2) AUTOMATIC DISPLAY OF FMT 311 DIFFERENCES WILL BE RE- MOVED AS RECONFIGURATION OCCURS														
<p>NOTE: BECAUSE OF A DESIGN CONSTRAINT, A STRICT ADHERENCE TO THE PROCEDURAL SEQUENCE IS REQUIRED TO ACTIVATE THIS CAPABILITY.</p>																
AVAILABLE DISPLAY AND CONTENT	<div style="border: 1px solid black; padding: 10px;"> <pre> I,INITIAL CONFIGURATION DIFFERENCE EXISTS INITIAL CONFIGURATION DIFFERENCE ACTUAL R000E000H002C000P000I000 HOLD 09/19/75 FMT311 SIMULATOR STATE REFERENCE STATE PNL IMU FAN A-OFF IMU FAN A-ON L1 IMU FAN B-OFF IMU FAN B-ON L1 MTU 1-IN MTU 1-OUT L4 MTU 2-IN MTU 2-OUT L4 FDAI SEL-EULER FDAI SEL-ARTF L2 NH3 VLV TK 1-CLOSE NH3 VLV TK 1-B OPEN L1 NH3 VLV TK 2-CLOSE NH3 VLV TK 2-B OPEN L1 </pre> <p style="text-align: center;">GET 0/15/37</p> </div> <p>FLASHING MESSAGE ON COMMAND LINE</p> <p>STATUS OF REFERENCE SWITCHES</p> <p>STATUS OF SIMULATOR SWITCHES</p> <p>TIME OF RUN (CONTAINS BIAS FOR GROUND ELAPSED TIME FROM SIMULATOR ELAPSED TIME)</p>															

FIGURE A3

PPP HOLD CONFIGURATION DIFFERENCE CAPABILITY		FORMAT: (M31)	
SUMMARY DESCRIPTION	THE HOLD CONFIGURATION DIFFERENCES CAPABILITY DISPLAYS THE DIFFERENCE BETWEEN THE CURRENT SIMULATOR CREW STATION SWITCH STATUS AND THE STATUS WHICH EXISTED WHEN THE SIMULATOR WENT INTO THE HOLD MODE. IF ANY SIMULATOR CREW STATION SWITCH IS ACTUATED DURING THE HOLD MODE, PNT 311 WILL AUTOMATICALLY BE DISPLAYED WITH A FLASHING MESSAGE, "A HOLD CONFIGURATION DIFFERENCE EXISTS" ON THE PPP USER INTERFACE COMMAND LINE.		
	TYPICAL SIMULATOR/PPP OPERATIONS	REMARKS	
	<p>SIMULATOR OPERATIONS</p> <p>SIMULATOR TO HOLD MODE</p> <p>CHANGE SIMULATOR CREW STATION CONFIGURATION BY FLIPPING THE FOLLOWING SWITCHES: GUID-MAN RCS YAW ATT HOLD-ON</p> <p>RETURN SIMULATOR CREW STATION ORIGINAL CONFIGURATION</p> <p>SIMULATOR TO RUN MODE</p>	<p>PPP OPERATIONS</p> <p>MONITOR DESIRED PPP DISPLAY</p> <p>MONITOR "HOLD CONFIGURATION DIFFERENCE DISPLAY"</p> <p>RETURN TO DESIRED PPP DISPLAY</p>	<p>REMARKS</p> <p>SIMULATOR IN HOLD MODE MONITOR PROCEDURES AND PERFORMANCE DATA ON PPP DISPLAY</p> <p>OBSERVE: 1) FLASHING MESSAGE "A HOLD CONFIGURATION DIFFERENCE EXISTS" 2) AUTOMATIC DISPLAY ON PNT 311</p> <p>OBSERVE: AS SWITCHES RETURNED TO ORIGINAL STATUS, DIFFERENCES ARE REMOVED.</p>
AVAILABLE DISPLAY AND CONTENT	<pre> I, A HOLD CONFIGURATION DIFFERENCE EXISTS HOLD CONFIGURATION DIFFERENCES R000E002H001C000P0001JL: HOLD 12/14/74 PNT 311 SIMULATOR STATE REFERENCE STATE GUID-MAN GUID-AUTO RCS YAW ATT HOLD-ON RCS YAW ATT HOLD-OFF </pre> <p>FLASHING MESSAGE ON COMMAND LINE</p> <p>STATUS OF REFERENCE (HOLD) SWITCHES</p> <p>STATUS OF SIMULATOR SWITCHES WHILE IN HOLD</p> <p>TIME OF RUN AT WHICH SIMULATOR WENT TO HOLD</p>		

ORIGINAL PAGE IS
OF POOR QUALITY

FIGURE A4

PPP SWITCH CONFIGURATION DIFFERENCE CAPABILITY		FORMAT: FMT321																														
SUMMARY DESCRIPTION	<p>THE SWITCH CONFIGURATION DIFFERENCE CAPABILITY COMPARES THE SIMULATOR CURRENT CONFIGURATION WITH THE SELECTED REFERENCE CONFIGURATION. PREESTABLISHED COMPARISONS ARE AUTOMATICALLY INITIATED AND COMPARE A PREDEFINED SET OF SWITCHES AT A PRE-ESTABLISHED EVENT RELATED TIME. RANDOM COMPARISONS ARE MANUALLY INITIATED THROUGH THE COMPARE COMMAND AND COMPARE THE TOTAL CREW STATION AT THAT EVENT RELATED TIME. IF A DIFFERENCE EXISTS AS A RESULT OF A COMPARISON, THE FLASHING MESSAGE "PROCEDURE DIFFERENCE DETECTED" APPEARS ON THE COMMAND LINE.</p>																															
	TYPICAL SIMULATOR/PPP OPERATIONS	<table border="1"> <thead> <tr> <th>SIMULATOR OPERATIONS</th> <th>PPP OPERATIONS</th> <th>REMARKS</th> </tr> </thead> <tbody> <tr> <td>INITIALIZE SIMULATOR</td> <td>INITIALIZE PPP I,DISPLAY=2,4,1</td> <td>INCLUDE REFERENCE SELECTION OR APPROPRIATE PERFORMANCE FORMAT</td> </tr> <tr> <td>SIMULATOR TO RUN MODE</td> <td>I,RUN</td> <td>PPP TO RUN MODE</td> </tr> <tr> <td></td> <td>MONITOR PPP DATA DISPLAY</td> <td>IF DIFFERENCE EXISTS AT PRE-ESTABLISHED TIME OBSERVE: FLASHING MESSAGE "PROCEDURE DIFFERENCE DETECTED" MONITOR DIFFERENCES AND TAKE APPROPRIATE ACTION</td> </tr> <tr> <td></td> <td>I,DISPLAY=3,2,1</td> <td></td> </tr> <tr> <td></td> <td>I,DISPLAY=2,4,1 AT USER DISCRETION</td> <td></td> </tr> <tr> <td></td> <td>I,COMPARE</td> <td></td> </tr> <tr> <td></td> <td>I,DISPLAY=3,2,1</td> <td>IF DIFFERENCE EXISTS AT RANDOM TIME OBSERVE: FLASHING MESSAGE "PROCEDURES DIFFERENCE DETECTED" MONITOR DIFFERENCES AND TAKE APPROPRIATE ACTION</td> </tr> <tr> <td></td> <td>I,ENTRT</td> <td>TERMINATE PPP REAL-TIME OPERATIONS</td> </tr> <tr> <td></td> <td>I,TERMINATE</td> <td>END PPP OPERATION</td> </tr> </tbody> </table>	SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS	INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1	INCLUDE REFERENCE SELECTION OR APPROPRIATE PERFORMANCE FORMAT	SIMULATOR TO RUN MODE	I,RUN	PPP TO RUN MODE		MONITOR PPP DATA DISPLAY	IF DIFFERENCE EXISTS AT PRE-ESTABLISHED TIME OBSERVE: FLASHING MESSAGE "PROCEDURE DIFFERENCE DETECTED" MONITOR DIFFERENCES AND TAKE APPROPRIATE ACTION		I,DISPLAY=3,2,1			I,DISPLAY=2,4,1 AT USER DISCRETION			I,COMPARE			I,DISPLAY=3,2,1	IF DIFFERENCE EXISTS AT RANDOM TIME OBSERVE: FLASHING MESSAGE "PROCEDURES DIFFERENCE DETECTED" MONITOR DIFFERENCES AND TAKE APPROPRIATE ACTION		I,ENTRT	TERMINATE PPP REAL-TIME OPERATIONS		I,TERMINATE	END PPP OPERATION
SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS																														
INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1	INCLUDE REFERENCE SELECTION OR APPROPRIATE PERFORMANCE FORMAT																														
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	MONITOR PPP DATA DISPLAY	IF DIFFERENCE EXISTS AT PRE-ESTABLISHED TIME OBSERVE: FLASHING MESSAGE "PROCEDURE DIFFERENCE DETECTED" MONITOR DIFFERENCES AND TAKE APPROPRIATE ACTION																														
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	I,ENTRT	TERMINATE PPP REAL-TIME OPERATIONS																														
	I,TERMINATE	END PPP OPERATION																														
AVAILABLE DISPLAY AND CONTENT	<p>PROCEDURES DIFFERENCE DETECTED - FLASHING MESSAGE</p> <p>SWITCH CONFIGURATION DIFFERENCE IDENTIFICATION OF PREESTABLISHED OR RANDOM COMPARISON</p> <p>RCASE004NCO1CRLBPAAMIJDA - RUN 12/04/75 FMT321</p> <p>PRE-ESTABLISHED TIME-ENTRY INTERFACE + 0/00</p> <table border="1"> <thead> <tr> <th>ACTUAL STATE</th> <th>REFERENCE STATE</th> <th>PNL</th> </tr> </thead> <tbody> <tr> <td>KEYBOARD SEL-RIGHT</td> <td>KEYBOARD SEL-OFF</td> <td>C2</td> </tr> <tr> <td>QTY SEL-RCS R</td> <td>QTY SEL-OMS R</td> <td>03</td> </tr> <tr> <td>RDR ALTM-1</td> <td>RDR ALTM-2</td> <td>F8</td> </tr> </tbody> </table> <p>COMPARISON START TIME (EVENT + DELTA TIME)</p> <p>SWITCH PANEL LOCATION</p> <p>GETO/16/35</p> <p>STATUS OF SIMULATOR SWITCHES</p> <p>STATUS OF REFERENCE SWITCHES</p> <p>ACTUAL GET OF COMPARISON</p> <p>ORIGINAL PAGE IS OF POOR QUALITY</p>			ACTUAL STATE	REFERENCE STATE	PNL	KEYBOARD SEL-RIGHT	KEYBOARD SEL-OFF	C2	QTY SEL-RCS R	QTY SEL-OMS R	03	RDR ALTM-1	RDR ALTM-2	F8																	
ACTUAL STATE	REFERENCE STATE	PNL																														
KEYBOARD SEL-RIGHT	KEYBOARD SEL-OFF	C2																														
QTY SEL-RCS R	QTY SEL-OMS R	03																														
RDR ALTM-1	RDR ALTM-2	F8																														

FIGURE A5

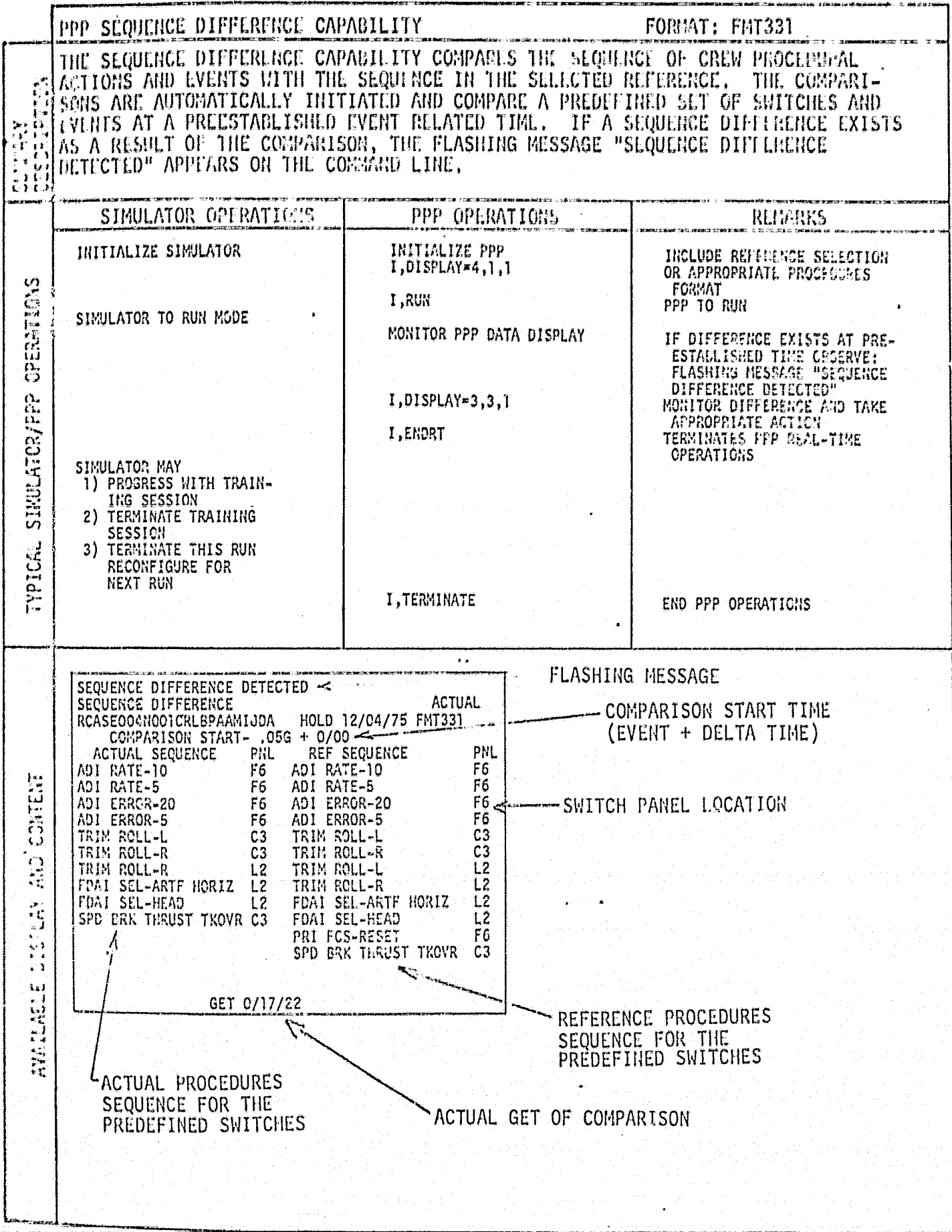


FIGURE A6

PPP SUMMARY PROCEDURES DIFFERENCE CAPABILITY		FORMAT: FMT341																				
SUMMARY DESCRIPTION	THE SUMMARY PROCEDURES DIFFERENCE CAPABILITY PROVIDES A COMPARISON OF THE ACTUAL AND SELECTED REFERENCE SUMMARY PROCEDURES. THE COMPARISON INDICATES THE ACTUAL AND REFERENCE RUN EVENTS ON THE ACTUAL RUNS TIME SCALE.																					
	TYPICAL SIMULATOR/PPP OPERATIONS	<table border="1"> <thead> <tr> <th>SIMULATOR OPERATIONS</th> <th>PPP OPERATIONS</th> <th>REMARKS</th> </tr> </thead> <tbody> <tr> <td>INITIALIZE SIMULATOR</td> <td>INITIALIZE PPP I,DISPLAY=2,4,1</td> <td>INCLUDE REFERENCE SELECTION OR APPROPRIATE PERFORMANCE FORMAT PPP TO RUN MODE</td> </tr> <tr> <td>SIMULATOR TO RUN MODE</td> <td>I,RUN</td> <td></td> </tr> <tr> <td></td> <td>MONITOR PPP DATA DISPLAY AND AT USER DISCRETION I,DISPLAY=3,4,1</td> <td>MONITOR SUMMARY PROCEDURES DIFFERENCE MONITOR REMAINDER OF RUN</td> </tr> <tr> <td></td> <td>I,DISPLAY=2,4,1 I,ENDRT</td> <td>TERMINATE PPP REAL-TIME OPERATIONS MONITOR SUMMARY PROCEDURES DIFFERENCE</td> </tr> <tr> <td>SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION 2) TERMINATE TRAINING SESSION 3) TERMINATE THIS RUN RECONFIGURE FOR NEXT RUN</td> <td>I,DISPLAY=3,4,1</td> <td></td> </tr> <tr> <td></td> <td>I,TERMINATE</td> <td>END PPP OPERATIONS</td> </tr> </tbody> </table>	SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS	INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1	INCLUDE REFERENCE SELECTION OR APPROPRIATE PERFORMANCE FORMAT PPP TO RUN MODE	SIMULATOR TO RUN MODE	I,RUN			MONITOR PPP DATA DISPLAY AND AT USER DISCRETION I,DISPLAY=3,4,1	MONITOR SUMMARY PROCEDURES DIFFERENCE MONITOR REMAINDER OF RUN		I,DISPLAY=2,4,1 I,ENDRT	TERMINATE PPP REAL-TIME OPERATIONS MONITOR SUMMARY PROCEDURES DIFFERENCE	SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION 2) TERMINATE TRAINING SESSION 3) TERMINATE THIS RUN RECONFIGURE FOR NEXT RUN	I,DISPLAY=3,4,1			I,TERMINATE
SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS																				
INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1	INCLUDE REFERENCE SELECTION OR APPROPRIATE PERFORMANCE FORMAT PPP TO RUN MODE																				
SIMULATOR TO RUN MODE	I,RUN																					
	MONITOR PPP DATA DISPLAY AND AT USER DISCRETION I,DISPLAY=3,4,1	MONITOR SUMMARY PROCEDURES DIFFERENCE MONITOR REMAINDER OF RUN																				
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SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION 2) TERMINATE TRAINING SESSION 3) TERMINATE THIS RUN RECONFIGURE FOR NEXT RUN	I,DISPLAY=3,4,1																					
	I,TERMINATE	END PPP OPERATIONS																				
AVAILABLE DISPLAY AND CONTENT																						

FIGURE A7

SUMMARY DESCRIPTION		PPP DETAILED DIFFERENCE LISTING		FORMAT: FMT351															
<p>THE DETAILED DIFFERENCE LISTING PROVIDES A HISTORY OF THE DETECTED DIFFERENCES (HOLD, PREESE, BLISHED, RANDOM, AND SEQUENCE) DURING A SIMULATOR RUN. THE LISTING INDICATES THE TIME, TYPE, AND UP TO THE FIRST THREE ACTUAL DIFFERENCES FOR EACH TEST WHERE A DIFFERENCE IS DETECTED. IF MORE THAN THREE DIFFERENCES ARE DETECTED FOR ONE TEST, THE EXCESS OVER THREE IS NOTED AS AN ADDENDUM (N) OTHERS.</p>																			
TYPICAL SIMULATOR/PPP OPERATIONS	SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS																
	<p>INITIALIZE SIMULATOR</p> <p>SIMULATOR TO RUN MODE</p> <p>SIMULATOR TO HOLD MODE</p> <p>SIMULATOR MAY</p> <p>1) PROGRESS WITH TRAINING SESSION</p> <p>2) TERMINATE TRAINING SESSION</p> <p>3) TERMINATE THIS RUN RECONFIGURE FOR NEXT RUN</p>	<p>INITIALIZE PPP</p> <p>I,DISPLAY=2,4,1</p> <p>I,RUN</p> <p>MONITOR ALL DESIRED PPP REAL-TIME DATA</p> <p>I,ENDRT</p> <p>I,DISPLAY=3,5,1</p> <p>I,DISPLAY=3,1,1</p> <p>I,DISPLAY=3,2,1</p> <p>I,DISPLAY=3,3,1</p> <p>I,TERMINATE</p>	<p>INCLUDE REFERENCE SELECTION OR APPROPRIATE PROCEDURES FORMAT</p> <p>PPP TO RUN MODE</p> <p>DISCUSS PREVIOUS OR SUBSEQUENT OPERATIONS</p> <p>TERMINATE PPP REAL-TIME OPERATIONS</p> <p>MONITOR DISPLAY OF DETECTED DIFFERENCES FOR DATA ANALYSIS AND RECONSTRUCT DATA AS REQUIRED</p> <p>MONITOR HOLD DIFFERENCES</p> <p>MONITOR SWITCH DIFFERENCES</p> <p>MONITOR SEQUENCES DIFFERENCES</p> <p>END PPP OPERATIONS</p>																
AVAILABLE DISPLAY AND CONTENT	<div style="border: 1px solid black; padding: 5px;"> <p>DETAILED DIFFERENCE SUMMARY</p> <p>0000002N001000000010LM RUN 12/03/74 FMT 351</p> <table border="1"> <thead> <tr> <th>GET</th> <th>TYPE</th> <th>DIFFERENCE</th> </tr> </thead> <tbody> <tr> <td>16/35</td> <td>PRE SEL</td> <td>ILS-NEEDLES TPHASE-AUTO L CRT-SAC (1) OTHERS</td> </tr> <tr> <td>17/00</td> <td>RANDOM</td> <td>RCS +ROLL-ON</td> </tr> <tr> <td>17/10</td> <td>HOLD</td> <td>RCS +PITCH-ON RCS +ROLL-OFF RCS +PITCH-OFF</td> </tr> <tr> <td>17/22</td> <td>SEQ</td> <td>ALPHA CONTROL FLT PATH CONT HYERIC PITCH (2) OTHERS</td> </tr> </tbody> </table> </div> <p>← DIFFERENCE TEST START TIME</p> <p>← DIFFERENCE TYPE</p> <p>← DIFFERENCE DETAILS</p> <p>ORIGINAL PAGE IS OF POOR QUALITY</p>				GET	TYPE	DIFFERENCE	16/35	PRE SEL	ILS-NEEDLES TPHASE-AUTO L CRT-SAC (1) OTHERS	17/00	RANDOM	RCS +ROLL-ON	17/10	HOLD	RCS +PITCH-ON RCS +ROLL-OFF RCS +PITCH-OFF	17/22	SEQ	ALPHA CONTROL FLT PATH CONT HYERIC PITCH (2) OTHERS
GET	TYPE	DIFFERENCE																	
16/35	PRE SEL	ILS-NEEDLES TPHASE-AUTO L CRT-SAC (1) OTHERS																	
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17/10	HOLD	RCS +PITCH-ON RCS +ROLL-OFF RCS +PITCH-OFF																	
17/22	SEQ	ALPHA CONTROL FLT PATH CONT HYERIC PITCH (2) OTHERS																	

ORIGINAL PAGE IS
OF POOR QUALITY FIGURE A8

PPP PERFORMANCE EVALUATION CAPABILITY FORMAT: TMT4XX

SUMMARY DESCRIPTION

PERFORMANCE EVALUATION CAPABILITY PROVIDES FOR THE AUTOMATIC MONITORING AND DISPLAY UPON USER REQUEST OF THE COMPARISON OF SELECTED SIMULATOR AND CREWMAN PERFORMANCE PARAMETERS WITH ESTABLISHED PERFORMANCE CRITERIA DATA. THE DISPLAYS PROVIDE A DESCRIPTION OF THE PARAMETER BEING MONITORED, ITS CRITERIA VALUE, AND ITS CURRENT VALUE. WHEN PERFORMANCE EXCEEDS THE ESTABLISHED CRITERIA, THE MAXIMUM AND/OR MINIMUM VALUE IS DISPLAYED. ACTUAL VALUES MAY REFLECT ONE-TIME OCCURRENCE (SNAP SHOTS) OR MAX/MIN VALUE EXPERIENCE DURING THE SIMULATION

TYPICAL SIMULATOR/PPP OPERATIONS

SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS
INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=4,1,1 I,RUN	PPP TO RUN MODE
SIMULATOR TO RUN MODE	MONITOR PERFORMANCE EVALUATION DISPLAYS	OBSERVE AUTOMATIC ADVANCEMENT TO PROPER MINI-PHASE CONDITION TO MATCH TRAJECTORY STATE
SIMULATOR TO HOLD MODE	I,DISPLAY=4,2,1	MONITOR END-OF-MINI-PHASE DATA DURING HOLD
SIMULATOR TO RUN MODE	I,REPEAT=GET,0/15/10	MONITOR MINI-PHASE DATA AT RECONSTRUCTION TIME
SIMULATOR TO RUN MODE	I,ENDRT	OBSERVE AUTOMATIC SEQUENCE TO PROPER MINI-PHASE
SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION 2) TERMINATE TRAINING SESSION 3) TERMINATE THIS RUN - RECONFIGURE FOR NEXT RUN	I,DISPLAY=4,1,1 I,REPEAT=GET,0/00/5,5 I,↑ I,TERMINATE	TERMINATE PPP REAL-TIME OPERATIONS MONITOR END-OF-MINI-PHASE DATA MONITOR MINI-PHASE DATA AT RECONSTRUCTION TIME ADVANCE MINI-PHASE DISPLAY 5 SECONDS IN THE FUTURE END PPP OPERATION

AVAILABLE DISPLAY AND CONTENT

ENTRY FLIGHT PHASE RCASE003R01CRLBPAAMIJDA HOLD 11/07/75 GMT441
GET 0/15/20 GW

PARAMETER	CRITERION	ACTUAL	DEVIATIONS
ATT. AT .05G			
ALPHA	30.4/+3.	29.	
BANK	0.4/-3.	0.	
SIDESLIP	0.4/-2.	0.	
MAX G-LOAD	<2.	13.	11.
MAX QDOT	<100.	96.	
MAX HEADING	0.1/-20.	-7.	104. 84.
MAX TEMP	<2300.		
RANGE IMPL'S	+300. +370.	302.	
MAX HDOT	-700. +200.	-608.	108.
MAX EL HIG B	0.4/-1000.		
MAX BANK ANG	0.4/-120.	-107.	71.

OTHER USER DEFINED PERFORMANCE DATA

DEVIATIONS FROM CRITERION VALUES

USER DEFINED PARAMETER LABELS

MAX AND/OR MIN PERFORMANCE VALUES EXPERIENCED DURING RUN

USER DEFINED PERFORMANCE CRITERION DATA

DISPLAY TIME
HR/MIN/SEC

FIGURE A9

PPP PERFORMANCE DATA RECORDING CAPABILITY		FORMAT: FMT5XX/GMTXXX
<p>SUPPLY DESCRIPTION: THE PERFORMANCE DATA RECORDING CAPABILITY PROVIDES MONITORING OF CREW/VEHICLE PERFORMANCE DATA PARAMETERS. FIXED FORMAT ALPHANUMERIC DISPLAYS AND DYNAMIC GRAPHICAL DISPLAYS ARE AVAILABLE. THE GRAPHICAL FORMATS MAY CONTAIN UP TO THREE SEPARATE GRIDS WITH A MAXIMUM OF THREE DEPENDENT VARIABLES PER GRID. THE ALPHANUMERIC AND GRAPHICAL FORMATS CONTENT AND ARRANGEMENT ARE USER DEFINABLE.</p>		
TYPICAL SIMULATOR/PPP OPERATIONS	SIMULATOR OPERATIONS	PPP OPERATIONS
	INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=5,6,1 I,RUN
	SIMULATOR TO RUN MODE	
	SIMULATOR TO HOLD MODE	MONITOR PERFORMANCE DATA DISPLAYS (ALPHANUMERIC OR GRAPHIC) I,REPEAT=GET,0/00/00
	SIMULATOR TO RUN MODE	I,DISPLAY=5,4,1
	SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION 2) TERMINATE TRAINING SESSION 3) TERMINATE THIS RUN - RECONFIGURE FOR NEXT RUN	I,ENDRT I,DISPLAY=5,1,1 I,REPEAT=GET,0/00/0,5 I,+ I,GRAPH=4,1,2 I,TERMINATE
		REMARKS PPP TO RUN MODE MONITOR PERFORMANCE DATA FORMAT ALPHANUMERIC - AT REPEAT TIME GRAPHICAL - FROM REPEAT TIME TO CURRENT TIME MONITOR DIFFERENT PERFORMANCE DATA DISPLAY AT REPEAT TIME MONITOR AUTOMATIC RESYNCHRONIZATION AND CONTINUATION OF DATA DISPLAY AT CURRENT TIME TERMINATE PPP REAL-TIME OPERATIONS MONITOR DISPLAY 511 DATA FOR END OF RUN MONITOR DISPLAY 511 DATA AT START OF RUN ADVANCE 5 SEC AHEAD IN TIME MONITOR GRAPHICS DISPLAY 412 FROM START TO END OF RUN END PPP OPERATIONS

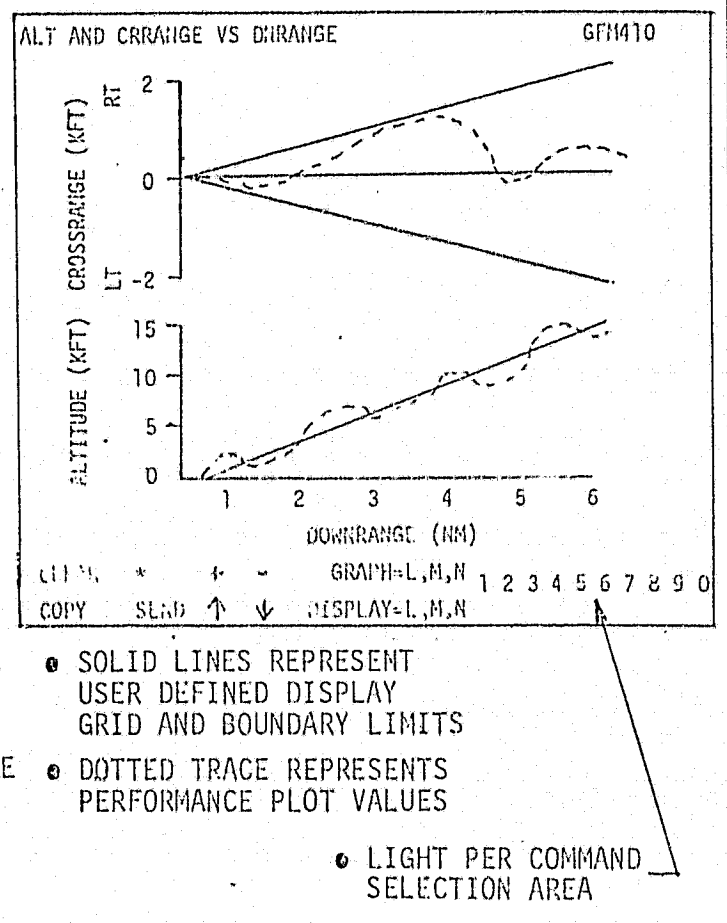
AVAILABLE DISPLAY AND CONTENT

DISPLAY TIME HR/MIN/SEC

PERFORMANCE PARAMETERS 1 THRU 32	ACTUAL
CR RANGE 565100.	LOCLZR ERR 0.
DR RANGE 2627704.	GLOSIP ERR 0.
RANGE 662.	ELV DEFLECT 0.
QDOT 51.	B F DEFLECT 0.
HEOT -103.	ALTITUDE 171750.
REL VEL 13128.	BANK CHDED 12.
G LOAD 1.	MACH NO 11.
G X-AXIS 0.	AZ1 0.
G Z-AXIS -1.	EL1 0.
WIND SPEED -125.	AZ2 0.
ICORD 0	EL2 0.
BANK 57.32	AZ3 0.
ANG OF ATT 29.	EL3 0.
LATITUDE 0.	THETADOT 0.
LONGITUDE 1.	PHI00T 0.
	PSI00T 0.

USER DEFINED PARAMETER LABELS

CREW/VEHICLE PERFORMANCE VALUE



ORIGINAL PAGE IS
OF POOR QUALITY

FIGURE A10

PPP TRAINING SCRIPT RECORDING CAPABILITY FORMAT: FMTG11

THE TRAINING SCRIPT CAPABILITY PROVIDES A PERMANENT RECORD OF THE INSTRUCTOR INPUT TO THE PPP AND SIMULATOR PROGRAMS. A TIME SEQUENCED DISPLAY MAY BE ACCESSED DURING HOLD OR POST-RUN WHICH CONTAINS: 1) PPP OPERATOR COMMANDS, 2) ERRONEOUS INPUTS AND ASSOCIATED ERROR MESSAGE, 3) SIMULATOR OPERATOR COMMANDS, AND 4) CODED INITIAL SIMULATOR SWITCH CONFIGURATION DATA.

TYPICAL SIMULATOR/PPP OPERATIONS

SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS
INITIALIZE SIMULATOR	INITIALIZE PPP PPP TO RUN MODE	
SIMULATE TO RUN MODE PERFORM TRAINING SESSION	ACCESS VARIOUS DISPLAYS TO MAINTAIN PROGRESS OF SIMULATION	
SIMULATOR TO HOLD MODE	I,DISPLAY=6,1,1 I,↑	OBSERVE SCRIPT OF PPP AND SIMULATOR OPERATOR ACTIVITIES DISPLAY ALWAYS BEGINS AT TIME ZERO, COMMAND NECESS- SARY TO ADVANCE TO NEXT PAGE
SIMULATOR TO RUN MODE	MONITOR DESIRED PPP DISPLAY I,ENDRT	TERMINATE PPP REAL TIME OPERATIONS
SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION	I,DISPLAY=6,1,1	OBSERVE SCRIPT OF PPP AND SIMULATOR OPERATOR ACTIVITIES FOR ENTIRE RUN PERMANENT HARDCOPY OF TRAINING SCRIPT AVAILABLE AT END OF RUN
2) TERMINATE TRAINING SESSION	I,↑	
3) TERMINATE THIS RUN - RECONFIGURE FOR NEXT RUN	I,TERMINATE	END PPP OPERATIONS

AVAILABLE DISPLAY AND CONTENT

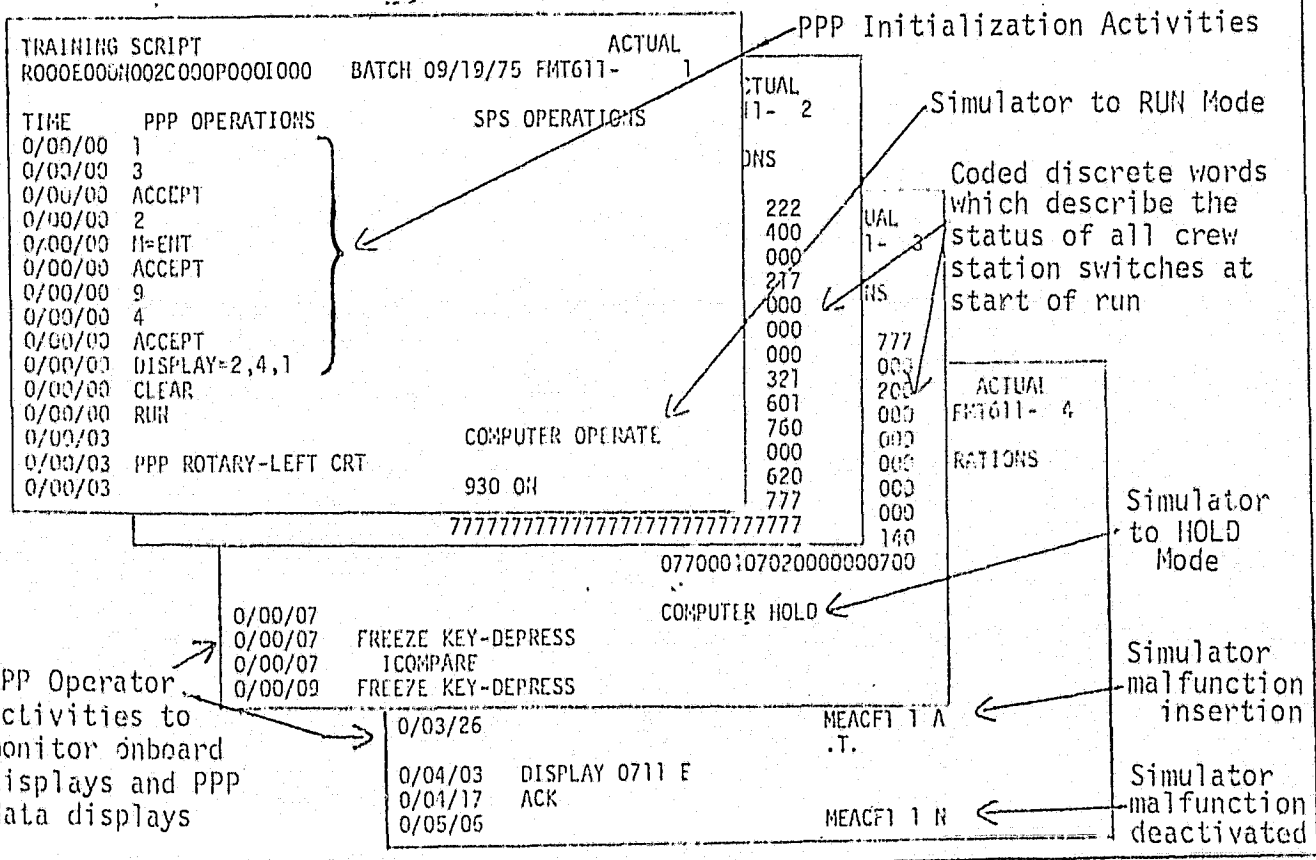


FIGURE A11

PPP CREW TRAINING STATUS CAPABILITY		FORMAT: FMT621											
SUMMARY DESCRIPTION	THE CREW TRAINING STATUS CAPABILITY PROVIDES A RECORD OF ALL CREW RELATED SIMULATOR UTILIZATION AS FOLLOWS: 1) ALL EXERCISES CHRONOLOGICALLY, STARTING WITH THE MOST RECENT RUN AND PROGRESSING BACK IN TIME, 2) A SUMMARY OF EACH CREWMAN'S TRAINING ACTIVITIES LISTED BY EXERCISE, 3) A SUMMARY OF EACH CREW'S TRAINING ACTIVITIES LISTED BY MISSION PHASE, AND 4) A SUMMARY OF EACH CREW'S TRAINING ACTIVITIES LISTING THE NUMBER OF EXERCISES COMPLETED.												
	TYPICAL SIMULATOR/PPP OPERATIONS	<table border="1"> <thead> <tr> <th>SIMULATOR OPERATIONS</th> <th>PPP OPERATIONS</th> <th>REMARKS</th> </tr> </thead> <tbody> <tr> <td>INITIALIZE SIMULATOR</td> <td>INITIALIZE PPP I,DISPLAY=2,4,1 I,RUN</td> <td>OR APPROPRIATE DISPLAY PPP TO RUN MODE</td> </tr> <tr> <td>SIMULATOR TO RUN MODE</td> <td>MONITOR APPROPRIATE DISPLAYS I,ENDRT</td> <td>TERMINATE PPP REAL-TIME OPERATIONS</td> </tr> <tr> <td>TERMINATE SIMULATOR OPERATIONS</td> <td>I,DISPLAY=7,1,1 I,DISPLAY=7,2,1 I,DISPLAY=6,2,1 I,+ I,DISPLAY=6,2,2 I,XXX I,+ I,DISPLAY=6,2,3 I,YYY I,+ I,DISPLAY=6,2,4 I,ZZZ I,TERMINATE</td> <td>INPUT TRAINING DATA COMPLETE REQUIRED POST-RUN DATA OBSERVE: LATEST TRAINING INPUT AND ANY PREVIOUS DATA ADVANCE DISPLAY TO OTHER PAST RUN DATA OBSERVE: FIRST DISPLAY PAGE WITH I.D. CODE FOR EACH CREWMAN XXX = CREWMAN CODE OBSERVE: CREWMAN XXX'S DATA ADVANCE DISPLAY TO OTHER PAST RUN DATA OBSERVE: FIRST DISPLAY PAGE WITH I.D. CODE FOR EACH MISSION YYY = CREW CODE OBSERVE: PRIMARY CREW YYY'S DATA ADVANCE DISPLAY TO BACKUP CREW YYY'S DATA OBSERVE: FIRST DISPLAY PAGE WITH I.D. CODE FOR EACH MISSION ZZZ = CREW CODE OBSERVE: CREW ZZZ'S DATA END PPP OPERATIONS OBTAIN HARDCOPY OUTPUT FOR DOCUMENTATION</td> </tr> </tbody> </table>	SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS	INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1 I,RUN	OR APPROPRIATE DISPLAY PPP TO RUN MODE	SIMULATOR TO RUN MODE	MONITOR APPROPRIATE DISPLAYS I,ENDRT	TERMINATE PPP REAL-TIME OPERATIONS	TERMINATE SIMULATOR OPERATIONS	I,DISPLAY=7,1,1 I,DISPLAY=7,2,1 I,DISPLAY=6,2,1 I,+ I,DISPLAY=6,2,2 I,XXX I,+ I,DISPLAY=6,2,3 I,YYY I,+ I,DISPLAY=6,2,4 I,ZZZ I,TERMINATE
SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS											
INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1 I,RUN	OR APPROPRIATE DISPLAY PPP TO RUN MODE											
SIMULATOR TO RUN MODE	MONITOR APPROPRIATE DISPLAYS I,ENDRT	TERMINATE PPP REAL-TIME OPERATIONS											
TERMINATE SIMULATOR OPERATIONS	I,DISPLAY=7,1,1 I,DISPLAY=7,2,1 I,DISPLAY=6,2,1 I,+ I,DISPLAY=6,2,2 I,XXX I,+ I,DISPLAY=6,2,3 I,YYY I,+ I,DISPLAY=6,2,4 I,ZZZ I,TERMINATE	INPUT TRAINING DATA COMPLETE REQUIRED POST-RUN DATA OBSERVE: LATEST TRAINING INPUT AND ANY PREVIOUS DATA ADVANCE DISPLAY TO OTHER PAST RUN DATA OBSERVE: FIRST DISPLAY PAGE WITH I.D. CODE FOR EACH CREWMAN XXX = CREWMAN CODE OBSERVE: CREWMAN XXX'S DATA ADVANCE DISPLAY TO OTHER PAST RUN DATA OBSERVE: FIRST DISPLAY PAGE WITH I.D. CODE FOR EACH MISSION YYY = CREW CODE OBSERVE: PRIMARY CREW YYY'S DATA ADVANCE DISPLAY TO BACKUP CREW YYY'S DATA OBSERVE: FIRST DISPLAY PAGE WITH I.D. CODE FOR EACH MISSION ZZZ = CREW CODE OBSERVE: CREW ZZZ'S DATA END PPP OPERATIONS OBTAIN HARDCOPY OUTPUT FOR DOCUMENTATION											
AVAILABLE DISPLAY AND CONTENT	CONTINUED ON NEXT PAGE												
<p>ORIGINAL PAGE IS OF POOR QUALITY</p>													

PPP CREW TRAINING STATUS CAPABILITY (CONTINUED)

CHRONOLOGICAL HISTORY

DATE	CREWMEN	EXERCISE DESCRIPTION	FMT621 TIME
01/23/75	SPA L	702 EPS MALFUNCTIONS	1/10
	HAW C	102 MODE I, II ABORTS	0/20
	ARB P		
01/22/75	HAW C	102 MODE I, II ABORTS	0/20
	ARB P		
	BEH M	301 NOMINAL RENDEZVOUS	4/30
	MCG P	602 ECS MALFUNCTIONS	2/45

SIMULATION RUN TIME OF EXERCISE IN HR/MIN

DATE OF RUN (LATEST FIRST)

EXERCISE NUMBER AND TITLE (LATEST EXERCISE OF DAY, FIRST)

CREWMEN ID CODE (INITIALS)

CREW POSITION DURING EXERCISE
 C = COMMANDER
 P = PILOT
 M = MISSION SPECIALIST
 L = PAYLOAD SPECIALIST

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AVAILABLE DISPLAY AND CONTENT

ID CODE (INPUT TO SELECT CREWMAN'S DATA)

CREWMAN SUMMARY

FMT622

SELECT CREWMAN SUMMARY BY INPUTTING THE APPROPRIATE NAME CODE

CODE	NAME	CODE	NAME	CODE	NAME
ARB	ARBET				
BEN	BENBOW				
HAW	HAWK				
LEW	LEWIS				
MAG	MANGIARACH				

CREWMAN'S NAME

CREW SUMMARY

FMT622

ARBET	EXERCISE DESCRIPTION	POS	TIME	CC	DATE
	102 MODE I, II ABORTS	P	0/20	0	01/23/75
	102 MODE I, II ABORTS	P	0/20	1	01/23/75
	301 NOMINAL RENDEZVOUS	P	4/30	1	01/22/75

DATE OF RUN

COMPLETION CODE (1 IF RUN COMPLETED)

CREW POSITION DURING EXERCISE

EXERCISE NUMBER & TITLE (IN NUMERICAL ORDER-LATEST FIRST)

SIMULATION RUN TIME OF EXERCISE IN HR/MIN

CONTINUED ON NEXT PAGE

PPP CREW TRAINING STATUS CAPABILITY (CONTINUED)

AVAILABLE DISPLAY AND CONTENT

ID CODE (INPUT TO SELECT MISSION'S DATA)

MISSION IDENTIFICATION

CREW TIME SUMMARY

FMT623

SELECT CREW TIME SUMMARY BY INPUTTING THE APPROPRIATE MISSION CODE

CODE	MISSION	CODE	MISSION	CODE	MISSION
1	ALT CF 8	13	OFT 1	25	
2	ALT CF 9	14	OFT 2	26	

MISSION PHASE ID

TIME SUMMARY

FMT623

ALT CF 9	-----PRIME CREW-----				TOTAL
EXERCISES	HAW	ARB	BEN	SPA	
LAUNCH	0/40	0/40			1/20
ORBITAL					
RENDEZ	4/30	4/30	4/30		13/30

TIME SUMMARY

FMT623

ALT CF 9	-----BACKUP CREW-----				TOTAL
EXERCISES	LEW	MCG	MAN	PUB	
LAUNCH					
ORBITAL					
RENDEZ					
DEORB/ENT					
TOTAL					
COMM					2/45
ECS					
EPS					
MECH					
TOTAL					2/45

CREWMEN IDENTIFICATION

CUMMULATIVE TIME

ID CODE (INPUT TO SELECT MISSION'S DATA)

MISSION IDENTIFICATION

EXERCISES COMPLETED

FMT624

SELECT CREW EXERCISES COMPLETED BY INPUTTING THE APPROPRIATE MISSION CODE

CODE	MISSION	CODE	MISSION	CODE	MISSION
1	ALT CF 8	13	OFT 1	25	
2	ALT CF 9	14	OFT 2	26	

EXERCISE NUMBER

EXERCISES COMPLETED

FMT624

ALT CF 9	-----PRIME CREW-----				-----BACKUP CREW-----			
EXER	HAW	ARB	BEN	SPA	LEW	MCG	MAN	PUB
101								
102	1	1						
103								
201								
301	1	1	1					

CREWMEN IDENTIFICATION

NUMBER OF TIMES EXERCISE COMPLETED

FIGURE A12

SUMMARY DESCRIPTION		PPP NONCREW TRAINING STATUS CAPABILITY		FORMAT: FMT631																																																																																																
THE NONCREW TRAINING STATUS CAPABILITY PROVIDES A RECORD OF ALL NONCREW RELATED SIMULATOR UTILIZATION STARTING WITH THE MOST RECENT EXERCISE AND PROGRESSING IN CHRONOLOGICAL ORDER BACK IN TIME.																																																																																																				
TYPICAL SIMULATOR/PPP OPERATIONS	SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS																																																																																																	
	INITIALIZE SIMULATOR SIMULATOR TO RUN MODE TERMINATE SIMULATOR OPERATIONS	INITIALIZE PPP I,DISPLAY=2,4,1 I,RUN MONITOR APPROPRIATE DISPLAYS I,ENORT I,DISPLAY=7,11 I,DISPLAY=7,2,1 I,DISPLAY=6,3,1 I,+ I,TERMINATE	OR APPROPRIATE DISPLAY PPP TO RUN MODE TERMINATE PPP REAL-TIME OPERATIONS INPUT TRAINING DATA COMPLETE REQUIRED POST-RUN DATA OBSERVE: LATEST TRAINING INPUT AND ANY PREVIOUS DATA ADVANCE DISPLAY TO OTHER PAST RUN DATA END PPP OPERATIONS OBTAIN HARD COPY OUTPUT FOR DOCUMENTATION																																																																																																	
AVAILABLE DISPLAY AND CONTENT	<table border="1"> <thead> <tr> <th colspan="5">CHRONOLOGICAL HISTORY</th> <th>ACTUAL</th> </tr> <tr> <th colspan="5">RCASE02N001CRLEBPAAIJDJDA BATCH 11/18/75 FMT631 - 1</th> <th></th> </tr> <tr> <th>DATE</th> <th>CREWMEN</th> <th>EXERCISE</th> <th>DESCRIPTION</th> <th></th> <th>TIME</th> </tr> </thead> <tbody> <tr> <td>11/18/75</td> <td>VDB</td> <td>C</td> <td>142 ENTRY RANGE CONTROL</td> <td></td> <td>0/24</td> </tr> <tr> <td>11/18/75</td> <td>KJB</td> <td>P</td> <td>142 ENTRY RANGE CONTROL</td> <td></td> <td>0/24</td> </tr> <tr> <td>11/18/75</td> <td>RHT</td> <td>C</td> <td>200 ASCENT MANUAL TECH</td> <td></td> <td>1/14</td> </tr> <tr> <td>11/18/75</td> <td>GPC</td> <td>P</td> <td>200 ASCENT MANUAL TECH</td> <td></td> <td>1/14</td> </tr> <tr> <td>11/18/75</td> <td>REE</td> <td>C</td> <td>200 ASCENT MANUAL TECH</td> <td></td> <td>1/20</td> </tr> <tr> <td>11/18/75</td> <td>JRL</td> <td>P</td> <td>200 ASCENT MANUAL TECH</td> <td></td> <td>1/20</td> </tr> <tr> <td>11/13/75</td> <td>REE</td> <td>C</td> <td>42 **NO DESCRIPTION AVAIL</td> <td></td> <td>1/27</td> </tr> <tr> <td>11/13/75</td> <td>RHT</td> <td>P</td> <td>42 **NO DESCRIPTION AVAIL</td> <td></td> <td>1/27</td> </tr> <tr> <td>10/30/75</td> <td>JRL</td> <td>C</td> <td>250 ASCENT RTLS ABORT</td> <td></td> <td>1/36</td> </tr> <tr> <td>10/24/75</td> <td>KJB</td> <td>C</td> <td>250 ASCENT RTLS ABORT</td> <td></td> <td>1/30</td> </tr> <tr> <td>10/24/75</td> <td>RHT</td> <td>P</td> <td>250 ASCENT RTLS ABORT</td> <td></td> <td>1/30</td> </tr> <tr> <td>10/24/75</td> <td>RHT</td> <td>P</td> <td>250 ASCENT RTLS ABORT</td> <td></td> <td>1/24</td> </tr> <tr> <td>10/24/75</td> <td>GPC</td> <td>P</td> <td>250 ASCENT RTLS ABORT</td> <td></td> <td>1/24</td> </tr> </tbody> </table> <p>DATE OF RUN</p> <p>CREWMEN ID CODE</p> <p>EXERCISE NUMBER AND TITLE</p> <p>CREW POSITION DURING EXERCISE</p> <p>SIMULATION RUN TIME OF EXERCISE IN HR/MIN</p>				CHRONOLOGICAL HISTORY					ACTUAL	RCASE02N001CRLEBPAAIJDJDA BATCH 11/18/75 FMT631 - 1						DATE	CREWMEN	EXERCISE	DESCRIPTION		TIME	11/18/75	VDB	C	142 ENTRY RANGE CONTROL		0/24	11/18/75	KJB	P	142 ENTRY RANGE CONTROL		0/24	11/18/75	RHT	C	200 ASCENT MANUAL TECH		1/14	11/18/75	GPC	P	200 ASCENT MANUAL TECH		1/14	11/18/75	REE	C	200 ASCENT MANUAL TECH		1/20	11/18/75	JRL	P	200 ASCENT MANUAL TECH		1/20	11/13/75	REE	C	42 **NO DESCRIPTION AVAIL		1/27	11/13/75	RHT	P	42 **NO DESCRIPTION AVAIL		1/27	10/30/75	JRL	C	250 ASCENT RTLS ABORT		1/36	10/24/75	KJB	C	250 ASCENT RTLS ABORT		1/30	10/24/75	RHT	P	250 ASCENT RTLS ABORT		1/30	10/24/75	RHT	P	250 ASCENT RTLS ABORT		1/24	10/24/75	GPC	P	250 ASCENT RTLS ABORT		1/24
CHRONOLOGICAL HISTORY					ACTUAL																																																																																															
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10/24/75	GPC	P	250 ASCENT RTLS ABORT		1/24																																																																																															

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FIGURE A13

PPP SYSTEM UTILIZATION CAPABILITY		FORMAT: FMT641							
SUMMARY DESCRIPTION	THE SYSTEM UTILIZATION CAPABILITY PROVIDES A RECORD OF THE TOTAL CREW AND NONCREW RELATED UTILIZATION OF THE SIMULATOR/PPP SYSTEM.								
	TYPICAL SIMULATOR/PPP OPERATIONS	SIMULATOR OPERATIONS	PPP OPERATIONS						
		INITIALIZE PPP I,DISPLAY=6,4,1 I,TERMINATE	REMARKS REQUIRE INITIALIZATION ONLY MONITOR UTILIZATION DATA END PPP OPERATIONS OBTAIN HARDCOPY OUTPUT FOR DOCUMENTATION						
AVAILABLE DISPLAY AND CONTENT	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>SYSTEM UTILIZATION SUMMARY ACTUAL RCASE002N001CRLBPAAM13DA BATCH 11/18/75 FMT641</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">CREW RELATED UTILIZATION</td> <td style="text-align: right;">7/36/37</td> </tr> <tr> <td>NON-CREW RELATED UTILIZATION</td> <td style="text-align: right;">3/09/49</td> </tr> <tr> <td>TOTAL SYSTEM UTILIZATION</td> <td style="text-align: right;">10/46/26</td> </tr> </table> </div> <p style="margin-left: 400px;">UTILIZATION TIME IN HR/MIN/SEC</p> <p style="margin-left: 100px;">UTILIZATION CATEGORIES</p>			CREW RELATED UTILIZATION	7/36/37	NON-CREW RELATED UTILIZATION	3/09/49	TOTAL SYSTEM UTILIZATION	10/46/26
CREW RELATED UTILIZATION	7/36/37								
NON-CREW RELATED UTILIZATION	3/09/49								
TOTAL SYSTEM UTILIZATION	10/46/26								

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FIGURE A14

PPP DISPLAY RECONSTRUCTION CAPABILITY		FORMAT: PPIIXX
TYPICAL SIMULATOR/PPP OPERATIONS	<p>THE DISPLAY RECONSTRUCTION CAPABILITY ALLOWS THE USER, DURING A SIMULATION HOLD OR POST-RUN, TO DISPLAY PAST TIME RUN DATA ON THE APPROPRIATE PROCEDURES, PERFORMANCE, OR EVALUATION DISPLAYS. ALPHANUMERIC FORMATS ARE RECONSTRUCTED AT THE REPEAT TIME AND GRAPHICAL FORMATS ARE RECONSTRUCTED FROM THE REPEAT TIME TO THE CURRENT OR END OF RUN TIME.</p>	
	SIMULATOR OPERATIONS	PPP OPERATIONS
INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1 I,RUN	PPP TO RUN MODE
SIMULATOR TO RUN MODE		
SIMULATOR TO HOLD MODE	MONITOR PROCEDURES I,REPEAT=GET,0/0/0	MONITOR PAST TIME DATA PROCEDURES AT GET 0/0/0 PERFORMANCE AT GET 0/0/0 GRAPHICAL FROM GET 0/0/0 TO SIMULATION HOLD TIME
SIMULATOR TO RUN MODE	I,DISPLAY=5,6,1 I,GRAPH=4,1,0	PROCEDURES AT GET 0/0/0 MONITOR CURRENT TIME DATA
SIMULATOR MAY	I,DISPLAY=2,4,1	TERMINATE PPP REAL-TIME OPERATIONS
1) PROGRESS WITH TRAINING SESSION	I,ENDRT	MONITOR PAST TIME DATA PROCEDURES AT GET 0/15/0
2) TERMINATE TRAINING SESSION	I,REPEAT=GET,0/15/0	PERFORMANCE AT GET 0/15/0 GRAPHICAL FROM 0/15/0 TO END OF RUN TIME
3) TERMINATE THIS RUN RECONFIGURE FOR NEXT RUN	I,DISPLAY=5,6,1 I,GRAPH=4,1,0	TRAINING SCRIPT AT GET 0/15/0
	I,DISPLAY=6,1,1	END PPP OPERATIONS
	I,TERMINATE	

AVAILABLE DISPLAY AND CONTENT	FREEZE KEY				PERFORMANCE PARAMETERS 1 THRU 32														
	SM SIMULATION DATA	HALF	C/W ALERT, CRT DISPLAY AND SW/CR. PROCEDURE	PNL	CR RANGE	DR RANGE	RANGE	QDOT	HQDT	REL VEL	G LOAD	S X-AXIS	G Z-AXIS	HQDT CRSD	ICORD	BANK	ANG OF ATT	LATITUDE	LONGITUDE
	00000000000000000000		SM ALERT-LT-OFF	L2	065100.	2627704.	002.	51.	-103.	13128.	1.	0.	-1.	-125.	0	57.32	29.	0.	1.
	09/19/75		CABIN TEMP CONT-OFF	L2															
			CABIN FAN 1-ON	L1															
			C/W CRN FLOW LT-OFF																
	0/00/43		DISPLAY 0701 E	C2L															
	0/01/10		20701-L																
	0/01/15		DISPLAY 0711 E	C2R															
	0/01/20		20711-R																
	0/01/31		KEYBOARD SEL-LEFT	C2															
	0/01/40		DISPLAY 0721 E	C2L															
	0/01/41		20721-C																
	0/01/46		ACK	C2L															
	0/01/54		SM ALERT LT-OFF																
	0/01/55																		
	0/03/09																		
	0/03/10																		

ENTRY FLIGHT PHASE		ACTUAL		
PARAMETER	CRITERION	ACTUAL	DEVIATIONS	
ATT. AT .05G				
ALPHA	30.+/-3.	29.		
BANK	0.+/-3.	0.		
SIDESLIP	0.+/-2.	0.		
MAX G-LOAD	<2.	13.	11.	
MAX QDOT	<100.	96.		
MAX HEADING	0,+/-20.	-7.	104.	84.
MAX TEMP	<2300.			
RANGE NHILES	+300. +370.	362.		
MAX HQDT	-700. +200.	-608.	108.	
MAX EL HNG M	0.+/-1000.			
MAX BANK ANG	0,+/-120.	-107.	71.	

PERFORMANCE PARAMETERS 1 THRU 32		ACTUAL
CR RANGE	DR RANGE	ACTUAL
065100.	2627704.	0/13/20
002.		TIME 899.30
51.		LOCLZR ERR 0.
-103.		GLOSLP ERR 0.
13128.		ELV DEFLCT 0.
1.		B F DEFLCT 0.
0.		ALTITUDE 171750.
-1.		BANK CRSD 12.
-125.		MACH NO 11.
0		AZ1 0.
57.32		EL1 0.
29.		AZ2 0.
0.		EL2 0.
1.		AZ3 0.
		EL3 0.
		THETA DOT 0.
		PHI DOT 0.
		PSI DOT 0.

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FIGURE A15

PPP CUE INSERTION CAPABILITY

THE CUE INSERTION CAPABILITY ALLOWS THE USER TO AUTOMATICALLY RECORD TIMES, DURING SIMULATION REAL-TIME, ASSOCIATED WITH CRITICAL PHASES, PROBLEM AREAS, OR DESIRABLE DISCUSSION AREAS. THE RECORDED TIMES ARE AVAILABLE DURING SIMULATION HOLDS AND POST-RUN TO FACILITATE DATA RECONSTRUCTION.

TYPICAL SIMULATED OPERATIONS

SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS
INITIALIZE SIMULATOR	INITIALIZE PPP I,DISPLAY=2,4,1 I,RUN	OR APPROPRIATE DISPLAY PPP TO REAL-TIME
SIMULATOR TO RUN	MONITOR PPP DATA CUE KEY DEPRESS I,DISPLAY=2,4,1 I,ENDRT	SELECT DESIRED DISPLAYS UP TO 30 INPUTS AVAILABLE
SIMULATOR MAY 1) PROGRESS WITH TRAINING SESSION 2) TERMINATE TRAINING SESSION 3) TERMINATE THIS RUN RECONFIGURE FOR NEXT RUN	I,CUE I,2 I,GRAPH=4,1,0 I,TERMINATE	TERMINATE PPP REAL-TIME OPERATIONS DISPLAYS CUE TABLE RECONSTRUCTS DATA AT GET 9/15 (HIT 241) FROM GET 9/15 TO END OF RUN (GFM 410)
		END PPP OPERATIONS

AVAILABLE DISPLAYS AND CONTENT

CUE RECORD SUMMARY TABLE

SN	GET	SN	GET	SN	GET
1	5/57	11	XXX/XX/XX	21	XXX/XX/XX
2	9/15	12	XXX/XX/XX	22	XXX/XX/XX
3	30/32	13	XXX/XX/XX	23	XXX/XX/XX
4	1/00/00	14	XXX/XX/XX	24	XXX/XX/XX
5	1/05/21	15	XXX/XX/XX	25	XXX/XX/XX
6	XXX/XX/XX	16	XXX/XX/XX	26	XXX/XX/XX
7	XXX/XX/XX	17	XXX/XX/XX	27	XXX/XX/XX
8	XXX/XX/XX	18	XXX/XX/XX	28	XXX/XX/XX
9	XXX/XX/XX	19	XXX/XX/XX	29	XXX/XX/XX
10	XXX/XX/XX	20	XXX/XX/XX	30	XXX/XX/XX

ACTUAL CUE SEQUENCES NUMBER

GET TIME AT CUE INSERTION

USAGE - TO RETURN TO A SPECIFIED CUE TIME,
PLACE SPS IN HOLD AND DO ONE OF THE FOLLOWING
(1) SELECT AND KEY IN SN- THIS DISPLAY MUST BE UP
(2) USE REPEAT=L,M COMMAND

GET 2/00/00

CUE SEQUENCES NUMBER

GET TIME AT CUE INSERTION

TUTORIAL INSTRUCTIONS FOR RECONSTRUCTION OPERATIONS

GET TIME OF CUE DISPLAY ACCESS

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FIGURE A16

GDP TO PPP DATA TRANSFER CAPABILITY

THE GDP TO PPP DATA TRANSFER CAPABILITY ALLOWS THE USER TO ACCESS FLIGHT DATA FILE PROCEDURES DATA STORED ON THE GDP AND TRANSFER THE DATA VIA MAGNETIC TAPE TO THE PPP.

SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS
INITIALIZE SIMULATOR	REQUEST "STORE" TAPE FROM GDP PERSONNEL SUBMIT TAPE AND PROGRAM "CRIS"	IDENTIFY REQUIRED DOCUMENT GENERATES STANDARD CDS6400 TAPE
SIMULATOR TO RUN MODE	SUBMIT PROGRAMS "GDPSTRT" AND "GDPXLC" PROCESS DATA PER TUTORIAL DISPLAY TERMINATE "GDPXLC" SUBMIT PROGRAM "CREF"	ENABLES GENERATION OF NEW REFERENCE FILE GENERATES NEW FILE PERMANENTLY STORES DATA AS REFERENCE DATA INCLUDE REFERENCE SELECTION PPP TO RUN
TERMINATE SIMULATION	INITIALIZE PPP I, DISPLAY=2,4,1 I, RUN MONITOR PPP DATA DISPLAY I, DISPLAY=3,3,1 I, ENDRT I, DISPLAY=2,4,1 I, / I, TERMINATE	IF DIFFERENCE EXISTS OBSERVE FLASHING MESSAGE OR APPROPRIATE DISPLAY REVIEW REFERENCE DATA END PPP OPERATIONS

REFERENCE IDENTIFICATION

DETAILED PROCEDURES TIMELINE		REFERENCE
RCASE02NCC10RLRPAAMTJDA	RUN	05/06/76 FMT211
GET LT	OPERATIONS	PUL
0717	H20 BYD CONT PRT-OUT	L4
	H20 BYD CONT PRT-IN	L4
	H20 BYD CONT SEC-OUT	L4
	H20 BYD CONT SEC-IN	L4
	PRN PUMP LF 1-OFF	L1
	H20 PUMP SEC-OFF	L1
	H20 PUMP SEC-ON	L1
	H20 BYPASS PRT-MAN	L1
	H20 BYPASS PRT-OFF	L1
	H20 BYPASS PRT-AUTO	L1
	H20 BYPASS PRT-TRIP	L1

REFERENCE PROCEDURES DATA

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TYPICAL SIMULATOR OPERATIONS

REFERENCE PROCEDURES DATA

FIGURE A17

PPP TO GDP DATA TRANSFER CAPABILITY

THE PPP TO GDP DATA TRANSFER CAPABILITY ALLOWS THE USER TO TRANSFER ALL OR ANY PART OF THE PPP SIMULATION DATA TO THE GDP. EDITING, FINALIZATION AND FORMAL DOCUMENTATION PROCESSES ARE PERFORMED PER GDP SYSTEM OPERATIONS.

FUNCTIONS

TYPICAL SIMULATOR/PPP OPERATIONS

SIMULATOR OPERATIONS	PPP OPERATIONS	FUNCTIONS
<p>INITIALIZE SIMULATOR</p> <p>SIMULATOR TO RUN MODE</p> <p>TERMINATE SIMULATION</p>	<p>INITIALIZE PPP I, DISPLAY-2,4,1 I, RUN</p> <p>I, COPY-GDP</p> <p>COMPLETE EXERCISE I, COPY-GDP</p> <p>I, ENDRT I, TERMINATE SUBMIT "RITIT" TRANSFER TAPE TO GDP PERSONNEL CALL UP DATA ON GDP SYSTEM</p>	<p>OR APPROPRIATE DISPLAY PPP TO RUN MODE</p> <p>IDENTIFIES START OF DATA TO BE TRANSFERRED TO GDP</p> <p>IDENTIFIES END OF DATA TO BE TRANSFERRED TO GDP</p> <p>END PPP OPERATIONS COPIES DATA TO ELECTRIC TAPE</p> <p>REMAINING OPERATIONS PER GDP SYSTEM</p>

AVAILABLE DISPLAY AND CONTENT

ANY PROCEDURES, DIFFERENCE PROCEDURES, PERFORMANCE,
PERFORMANCE EVALUATION, OR TRAINING FORMAT DISPLAY
MAY BE TRANSFERRED TO THE GDP SYSTEM.

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FIGURE A18

SYSTEM TO PPP DATA TRANSFER CAPABILITY

THE SYSTEM TO PPP DATA TRANSFER CAPABILITY ALLOWS THE USER TO GENERATE AN INITIAL PROCEDURES TIMELINE FROM SVDS DATA.

TYPICAL SIMULATOR/PPP OPERATIONS

SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS
	<p>HAVE SVDS RUN AND REQUEST TAPE OUTPUT SUBMIT TAPE AND PROGRAM "PERCON"</p> <p>INITIALIZE PPP USING SIMULATED REAL-TIME OPTION I,DISPLAY=2,2,1 I,REM COMPLETE DATA RUN I,ENDRT INPUT REQUEST FOR LINEPRINTER AND MAGNETIC TAPE HARDCOPY I, TERMINATE</p>	<p>GENERATES STANDARD CUC6400 TAPE</p> <p>PPP TO RUN MODE</p> <p>PROVIDES DATA FOR ANALYSIS AND INITIAL PROCEDURES TIMELINE END PPP OPERATIONS</p>

AVAILABLE DISPLAY AND CONTENT

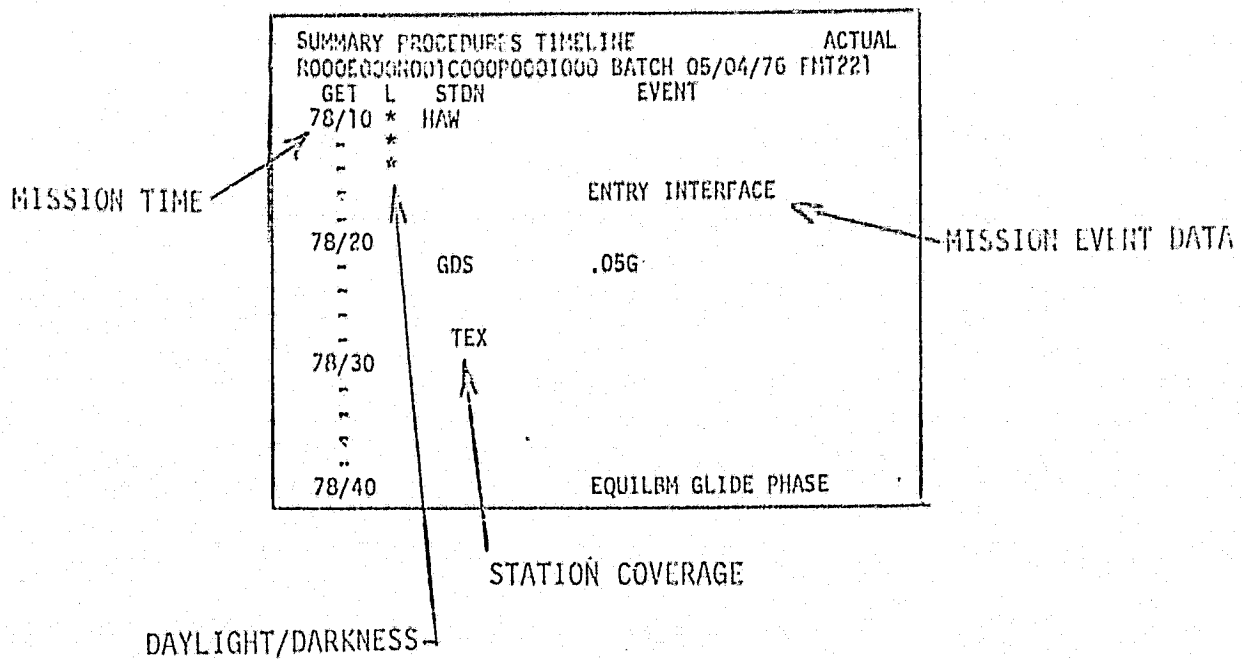


FIGURE A19

PPP FLIGHT DISPLAY UNIT

THE PPP FLIGHT DISPLAY UNIT ALLOWS THE USER TO MONITOR THE SIMULATOR C/S STATION FLIGHT CRT DISPLAY ACTIVITIES.

TYPICAL SIMULATOR/PPP OPERATIONS

SIMULATOR OPERATIONS	PPP OPERATIONS	REMARKS
<p>INITIALIZE SIMULATOR</p> <p>SIMULATOR TO RUN MODE ENTER THE FOLLOWING: LEFT C/S KEYBOARD DISPLAY 701 ENTER</p> <p>RIGHT C/S KEYBOARD DISPLAY 711 ENTER</p> <p>TERMINATE SIMULATION</p>	<p>INITIALIZE PPP 1,RUN</p> <p>PPP ROTARY-LEFT CRT</p> <p>PPP ROTARY-RIGHT CRT 1,ENDRT 1,TERMINATE</p>	<p>PPP TO RUN MODE</p> <p>MONITOR C/S DISPLAY 701</p> <p>MONITOR C/S DISPLAY 711</p> <p>END PPP OPERATIONS</p>

AVAILABLE DISPLAY AND CONTENT

ANY FLIGHT CRT DISPLAY ACTIVE IN THE SIMULATOR IS AVAILABLE ON THE PPP FLIGHT DISPLAY UNIT.

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