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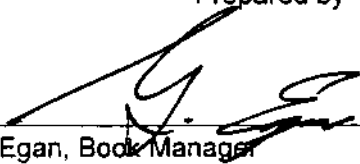
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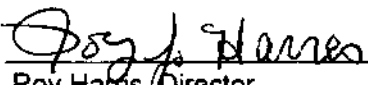
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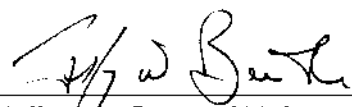

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Contract NAS9-98100

FLIGHT CONTROL OPERATIONS HANDBOOK SHUTTLE OPERATIONS

PREFACE

The Flight Control Operations Handbook Shuttle Operations document is prepared by the CSOC Human Space Flight Ground Control Group.

The primary responsibility is with the Ground Control Group.

In the event of conflict between this document and any other documentation, this document will govern. Questions concerning the technical content of this document should be directed to DB (from JSC) or J30M (from off site)/George Egan, CSOC Human Space Flight Ground Control Group, (281) 483-0749.

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**SOP 1
ADMINISTRATION**

SOP 1.1

TITLE

CONSOLE LOGS

PURPOSE

To define procedures to be used by all Mission Control Center (MCC) Flight Controllers (F/C's) for keeping logs of significant items occurring during any prelaunch vehicle test, launch pad test, validation test, simulation, flight, or other support.

PARTICIPANTS

MCC FLIGHT CONTROL (FC) TEAM

GENERAL

The purpose of a console log is to provide a method of reconstructing the activities of a given operating position for the following shifts' use, for postflight/operations analysis, and to provide a data base for contingency or failure analysis.

All personnel assigned to a console position or who have an assigned flight support function will maintain a console log during all MCC activities in which they participate.

A console log may be kept on a workstation or personal computer, using any of the basic word processing programs. The logs should be easily available to other generators (i.e., printed) and included in the console flight documentation. Format should be consistent with the guidelines of this SOP.

Pads of the console logs are kept in a recessed area at the front of the GC console. A larger supply is kept in a gray, two-door storage cabinet in building 30S, room 4301.

PROCEDURES

A. Console Logs

1. Format

The console log is a time-tagged brief narrative of events. Console log entries are made as events occur, to the best of the operator's capability.

The console log should be written, printed, or typed on the F/C's log, form 1441 (figure 1.1-1) or the console's standard log form. All information at the top of each page (flight/sim/test ID, date Greenwich mean time (GMT), orbit, console position, and page number) will be filled in. Logs may be printed, typed, or written longhand, but must be legible and reproducible.

The console log is a single continuous document for each console position for each MCC support activity, so that chronological order and continuity are maintained over shift changes for the entire support period.

2. Text

Log entries must use standard nomenclature. Abbreviations, standard or otherwise, may be used. The text, however, must be written in such a way that it can be understood by persons other than the originator.

3. Time references

The standard time reference will be GMT. Other relevant time references, such as Launch Minus (L-), Mission Elapsed Time (MET), and Entry Elapsed Time (EET), may be used; however, periodic time syncs are required such that all entries can be correlated to GMT. (Examples of time sync are MET/GMT and L-/GMT.)

Routine log entries will be tagged to the nearest minute; critical functions to the nearest second. Day of year should be entered at least once per page.

4. Content

Log contents should include:

- a. Significant events
- b. Problems or delays encountered during test
- c. Malfunctions, their possible cause, and any action taken
- d. Parameters out of normal or expected operating range
- e. Consumable status
- f. Anytime a mission rule is implemented
- g. Any Mission Action Request (MAR) initiated or received

5. Teletype/teletypewriter (TTY) messages, hardcopies, etc., when available, may be referenced and inserted as part of the logs, instead of manually transcribing the data contained in them.

6. Logs will be signed by the F/C concerned at the end of the exercise and at shift changes.

7. Changes/corrections

Log entries will not be altered after completion of the operation. Incorrect entries or significant information which were not logged in real time will be summarized at the end of the log, and a reference to such notes will be made in the margin of the log.

Real-time errors (wrong words, incorrect spelling, or other such minor errors) may be corrected by drawing a single line through them and writing in the correction above or after the error.

8. Support summary

Upon completion of a given activity and before leaving the MCC, each F/C will summarize significant anomalies, discrepancies, and procedural errors observed, and attach the summary to the console log.

9. Disposition

Console logs are considered to be flight data. A copy will be retained in the control center for reference until completion of the flight. A copy is to be placed in the section files after the flight and retained until the end of the following flight.

B. Flight Notes (Paper)

Flight notes are used when precise details must be relayed from one console position to another. The originator retains one copy of the Flight Note and sends one copy of the Flight Note to each necessary recipient. Instructions for filling out this form are as follows:

1. ORIGINATOR: For example: FAO/TL1... the FAO part indicates from which Flight Control Room (FCR) position the message originated. The TL1 part tells the Flight Activities Officer (FAO) from which Multipurpose Support Room (MPSR) position the message originated.
2. Time Flight Note originated.
3. Originator signs at bottom.

C. Flight Notes (Electronic)

TBD

SOP 1.2

TITLE

DOCUMENTATION CHANGE CONTROL

PURPOSE

To define the guidelines and procedures for change control of flight operations documentation.

PARTICIPANTS

*BOOK MANAGER
MCC FC TEAM

GENERAL

- A. All flight operations documentation has an assigned book manager who is responsible for technical content and publication coordination for the basic document and revisions. This responsibility exists for both preflight and flight phases. During flight phases, if the book manager is not available, an appropriate console position assumes responsibility for document control.
- B. The change request form (figure 1.2-1) is used for control of revisions to flight operations documentation. See Flight Control Operations Handbook (FCOH) SOP 2.3.3 for Flight Data File (FDF) change requests.

PROCEDURES

A. Any operator	- Identify a required revision to the book manager (or appropriate console position). - Complete the appropriate form in figure 1.2-1 (provide comprehensive rationale for technical changes).
B. Book manager	- Ensure appropriate coordination and approval. - Request typing (including word processor support) and repro support. - Ensure timely distribution of revision and data base update.
C. Transmittal	- Submit documentation request to the book manager or appropriate console position. The book manager will ensure required signature, approval, and revision publication.

- D. CPN's will be distributed as required. Procedures received and approved after the CPN cutoff date will be distributed to MCC consoles as a pen and ink (P&I) change (figure 1.2-2) and with the following CPN for distribution.

CHANGE REQUEST INSTRUCTIONS

A. General

Please print all entries and prepare markups using red ink.

TITLE: Use only the official title of the document as shown on the cover.

DATE OF DOCUMENT/REVISION: Indicate the date of publication and revision which is to be changed.

PAGE NO.: List all pages and item numbers affected by the change.

FLIGHT: Denote flight applicability; if valid for all flights - All."

CONTROL NO.: Leave blank. This number will be assigned by the book manager.

INITIATOR NAME/MAIL CODE/PHONE: Self-explanatory.

INITIATOR'S POSITION AND SIGNATURE: Self-explanatory.

LEAD POSITION (owner): Each procedure (within FCOH) has a lead position annotated under participant section with an asterisk (*). This position is the designated owner(s) of the procedure and must sign off change request prior to further disposition.

DETAIL CHANGE IN EXACT WORDING: Change should be submitted in the form to be implemented in the document. Change should be submitted as a redline or marked-up page copy. Attach extra sheets if more room is needed. DO NOT submit clean copy" unless it is a proposed new procedure.

TECHNICAL RATIONALE: Clear, concise statement justifying requested change.

FCR POSITIONS AFFECTED/REVIEW: Initiator or owner will determine which FCR position should review the change and/or would be affected by the change.

B. Definition of Change Classification

MINOR: Needs approval only by lead position and United Space Alliance (USA). Classification generally includes clarification, format changes, etc.

TECH: Needs approval by USA, lead position (owner), branch chief, and flight director. Classification generally includes technical corrections to existing procedures, new procedures, etc.

TECH/OPS: Needs all approvals. Classification generally includes technical changes which are controversial, philosophical change to planned operations, significant operational impact, etc.



Flight Operations Documentation
Change Request

DOCUMENT AFFECTED				
Title of Document	Date of Document Rev:	Page & Item No.:	Flight:	Control No.
CHANGE REQUEST				
Initiated By:	Organization Phone No.	Initiators' Position/ Signature	Date Submitted:	

Detail Change in exact wording:

Technical Rationale

Other Data Affected:

For Positions Affected/Review (Date)

GNC _____	FDO _____	PAYLOAD _____	EECOM _____
INCO _____	GC _____	CAPCOM _____	BOOSTER _____
DPS _____	PROP _____	COMMAND _____	GUIDANCE _____
FAO _____	MMACS _____	EVA _____	SURGEON _____
PDRS _____	EGIL _____	DFE _____	COMM TECH _____

OTHER SUPPORT AFFECTED _____

DISPOSITION			
Change Classification:	<input type="checkbox"/> Minor	<input type="checkbox"/> Tech	<input type="checkbox"/> Tech Ops
USA APPROVAL			
Signature / Book Manager	Date	<input type="checkbox"/> APPROVED	<input type="checkbox"/> DISAPPROVED
Signature / Group Manager	Date	<input type="checkbox"/> APPROVED	<input type="checkbox"/> DISAPPROVED
LEAD POSITION APPROVAL			
Signature	Date	<input type="checkbox"/> APPROVED	<input type="checkbox"/> DISAPPROVED
Signature / (Branch Chief)	Date	<input type="checkbox"/> APPROVED	<input type="checkbox"/> DISAPPROVED
FLIGHT DIRECTOR APPROVAL			
Signature	Date	<input type="checkbox"/> APPROVED	<input type="checkbox"/> DISAPPROVED

USA 8330-K New 4-98 (Flow)

Figure 1.2-1. Change Request form

P & I Date: _____

**FCOH (JSC-26843)
(FOR SHUTTLE OPERATIONS)**

**PEN AND INK
CHANGE NO. _____
TO
FINAL, Rev B
DATED JULY 31, 1996**

INSTRUCTIONS

POST THIS PAGE DIRECTLY BEHIND THE FRONT COVER

AUTHORIZED FOR FLIGHT OPERATIONS

BOOK MANAGER

Figure 1.2-2. On-console change notice

SOP 1.2.1

TITLE

REAL-TIME FLIGHT RULE CHANGES

PURPOSE

To define when real-time processing of Flight Rules Change Requests start, and to define the procedures and approval requirements for real-time changes to the Flight Rules documentation; i.e., All Flights Flight Rules (JSC-12820) and Flight Specific Annex Flight Rules (JSC-13308). Also, PAM, IUS, and Spacelab Generic Flight Rules Annexes, respectively, JSC-22683, JSC-20838, and JSC-22081, may be included.

PARTICIPANTS

MISSION OPERATIONS DIRECTOR
* LEAD FLIGHT DIRECTOR
BOOK MANAGER

GENERAL

- A. CR's processed after the L - 2 day Mission Management Team review will be processed as real-time changes.
- B. Final signature authority for real-time changes rests with the Mission Operations Director for generic changes, and with the Lead Flight Director for flight-specific annex changes.
- C. Prior to full-up manning of the MCC, the Flight Rules Book Manager will coordinate CR changes through signature approval and on-console distribution.
- D. CR's not approved by close of business at L - 1 day will be processed on console.
- E. After full-up manning of the MCC, the Lead Flight Director will coordinate CR changes through signature approval and distribution.
- F. On shifts when the Lead Flight Director is not present, the on-console Flight Director will coordinate CR changes through signature approval and distribution.
- G. Notification of the flight rule change will be by on-console delivery of a copy of the approved CR via Distribution E.
- H. Figures 1.2.1-1, 1.2.1-2, and 1.2.1-3 are copies of the CR forms and instructions for completing them.

PROCEDURE

- | | |
|-------------------------|---|
| A. Initiator | <ul style="list-style-type: none">- Document the flight rule change/rationale on a CR form providing the information requested. CR control numbers will be added postflight from the Flight Director Office.- Coordinate rule change with the Lead Flight Director and obtain additional concurrence as required by the Flight Director.- For CR's that affect crew procedures, attach marked-up copies of all the affected procedures to the CR, and give a coordination copy of the CR to the Lead FDF Manager or to the on-console FAO, as applicable. |
| B. Book manager | <ul style="list-style-type: none">- Assure appropriate coordination and approval is obtained until full-up console manning.- Initiate typing and reproduction support.- Assure timely distribution of changes. |
| C. Lead Flight Director | <ul style="list-style-type: none">- Coordinate flight rule change with the Mission Operations Director.- Obtain/verify all necessary signatures/concurrences.- Initiate action for timely distribution (Distribution E). |
| D. Mission | <ul style="list-style-type: none">- Coordinate flight rule change with the Mission Management Team as required.- Provide approval/concurrences as required. |

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FLIGHT RULES

REAL-TIME CR EVALUATION SUMMARY			CONTROL NUMBER:			RULE NUMBER:		
TITLE:								
SUBMIT COMMENTS TO: FLIGHT DIRECTOR								
SIGN, DATE, AND CHECK APPROPRIATE BLOCK BELOW								
MANDATORY (R)	REVIEW/EVALUATOR	REVIEW DATE	A	A	D	SIGNATURE		
			P	P	I			
	LEAD FLIGHT DIRECTOR							
	BOOSTER							
	CAPCOM							
	COMMAND							
	DPS							
	EVA							
	FAO							
	FDO							
	GC							
	GNC							
	GUIDANCE							
	INCO							
	MMACS							
	MMT							
	PAYLOAD							
	SPAN							
	SURGEON							
	Originator:							
RESPONSE TO THE FOLLOWING QUESTIONS IS MANDATORY IF CHECKED						YES	NO	
	D	DOES THIS REQUIRE A CHANGE TO RATIONALE FOR A CONTROLLED HAZARD?						
	DF	DOES THIS REQUIRE A CHANGE TO CIL RETENTION RATIONALE?						
COMMENTS: *REQUIRES COMMENT **REQUIRES IMPACT STATEMENT								

VERSION: 01/31/89

843_004

Figure 1.2.1-1. Flight Rules Real-Time CR Evaluation Summary form

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FLIGHT RULES

REAL-TIME CHANGE REQUEST

Page 1 of ____

DATE	INITIATED BY: ORG / NAME / PHONE	CONTROL NUMBER	RULE NUMBER
FLIGHT EFFECTIVITY	OTHER AFFECTED FLIGHT RULES	DOCUMENT DATE / PCN	<input type="checkbox"/> ALL FLIGHTS <input type="checkbox"/> ANNEX <input type="checkbox"/> GENERIC
SHORT DESCRIPTIVE TITLE OF CHANGE			<input type="checkbox"/> RULE <input type="checkbox"/> RATIONALE
REASON FOR CHANGE.			
APPROVED: _____ SUBMITTING ORGANIZATION DATE: _____	DOES THIS CHANGE MODIFY EXISTING CIL RETENTION RATIONALE? YES <input type="checkbox"/> NO <input type="checkbox"/>	APPROVED: _____ MISSION OPERATIONS DIRECTOR DATE: _____	
CONCURRENCE: _____ _____ _____	DOES THIS CHANGE MODIFY RATIONALE FOR A CONTROLLED HAZARD? YES <input type="checkbox"/> NO <input type="checkbox"/>	APPROVED: _____ LEAD FLIGHT DIRECTOR (ANNEX ONLY) DATE: _____	
	RECEIVED: _____ INCORPORATED: _____		

i 28R08 005

Figure 1.2.1-2. Real-Time Change Request form

INSTRUCTIONS

1. DATE - Enter CR initiation date
2. INITIATED BY: ORG/NAME/PHONE - Enter the originator's organization, name, and phone number (including FTS if other than JSC)
3. CONTROL NUMBER - Leave blank; will be assigned and entered by the document manager.
4. RULE NUMBER - Enter the existing rule number to be modified. If this is a new rule, enter the section number, the document manager will assign a rule number.
5. FLIGHT EFFECTIVELY - Enter the first flight for which the rule is required. If generic, enter "ALL".
6. OTHER AFFECTED FLIGHT RULES - Enter other rules which either reference this rule or which this rule references.
7. DOCUMENT DATE/PCN - Enter the "FINAL" document date and the PCN (if applicable) that contains the rule to be modified.
8. ALL FLIGHTS. ANNEX. GENERIC - Check the appropriate box for the document for which the CR is intended.
9. SHORT DESCRIPTIVE TITLE OF CHANGE - To be short descriptive title of change.
10. RULE. RATIONALE - Check appropriate box for rule and/or rationale.
11. CHANGE TO RULE AND/OR RATIONALE - Enter the rule and rationale exactly as it will appear in the document to be changed. The format should be as follows:
TITLE - In capital letters and underlined.
Rule - In capital letters exactly as it will appear in the document
Rationale - Enter the word "Rationale" followed by the rule rationale in lower case letters.
12. REASON FOR CHANGE: - Enter the technical or philosophical reason for changing the existing rule or why a new rule is required.
13. APPROVED: SUBMITTING ORGANIZATION - This block is to be signed by the submitting organization Lead Flight Controller or his representative.
14. CONCURRENCE: - This block is to be used for additional optional concurrences.
15. DOES THIS CHANGE MODIFY EXISTING CIL RETENTION RATIONALE? YES NO - Optional, the originator may attempt to answer this question, however the responsibility lies with DF to make this assertion.
16. DOES THIS CHANGE AFFECT CREW PROCEDURES? YES NO - The originator should attempt to answer this question and make reference to changes in the crew procedures document in item 11.
17. DOES THIS CHANGE MODIFY RATIONALE FOR A CONTROLLED HAZARD? YES NO - Optional, the originator may attempt to answer this question, however the responsibility lies with the Systems or Operations Divisions to make this assessment.
18. RECEIVED/INCORPORATED: - Leave blank; this block is used for internal document control by the document manager.
19. APPROVED: MISSION OPERATIONS DIRECTOR - This block is to be signed by the Mission Operations Director or his alternate.
20. APPROVED LEAD FLIGHT DIRECTOR - This block is to be used only for Lead Flight Director concurrence for changes to the flight-specific annexes.

Figure 1.2.1-2. Concluded

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FLIGHT RULES

REAL-TIME CHANGE REQUEST CONTINUATION SHEET

Page ___ of ___

DATE:	INITIATED BY: ORG / NAME / PHONE	CONTROL NUMBER:	RULE NUMBER:

Figure 1.2.1-3. Flight Rules Real-Time Change Request Continuation Sheet

SOP 1.3

TITLE

SHIFT HANDOVER GUIDELINES AND MOD SCHEDULE UPDATES

PURPOSE

To define procedures to be used by all MCC Flight Control Team (FCT) members to allow an effective and orderly shift handover.

SCOPE

This procedure is applicable for FCT shift to shift handover and shift schedule updates.

PARTICIPANTS

FCT
*GC
FOM

PROCEDURES

A. Shift Handover Guidelines

1. Review the mission status and accomplishments by reading the appropriate console log, MAR forms, status reports, and crew voice transcript.
2. Review trend plots and the history data for the telemetry parameters associated with that console position.
3. The above functions should be accomplished while monitoring the voice loop to allow the present mission activities to be monitored.
4. After the above items have been accomplished, the console operator briefs the oncoming controller prior to handing over the console position.
5. The FCT shifts overlap 1 hour in order to provide time for a through briefing.
6. The first 30 minutes of each handover will nominally be used to conduct a face-to-face handover between the oncoming and on-console FCT members.
7. Prior to accepting operations of the console, the oncoming controller performs a workstation shift handover on each workstation.
8. On-the-job training (OJT) personnel are requested to leave the FCR during shift handover unless they are active participants in the handover discussion.
9. The on-console FD stays on console until the oncoming FD concludes a handover briefing with each FCT discipline.

B. MOD Schedule Updates

1. The MOD scheduling recorder is used by the MCC FCTs to obtain current schedule information for prelaunch tests, pad tests, simulations, or flight.
 - a. Action Center staff will update the recorder message for all activities as changes to the schedule develop.
 - b. The ground controller (GC) will update the recorder for pad tests, prelaunch tests, and Mission Information when the Action Center is not staffed.
 - c. The facility operations manager (FOM) will update the recorder under the following conditions:

The Action Center and GC positions are not staffed and FOM identifies a loss of capability within the MCC that will ultimately cause an activity to be cancelled or rescheduled.

2. MCC FCs should call the following numbers to receive the most current information:
3-1077 - Mission Information 3-1076 - Integrated Sim Information

SOP 1.4

TITLE

CONSOLE/CALL SIGN/LOOP

PURPOSE

To list console numbers, console positions, call signs, corresponding loops.

PARTICIPANTS

MCC FC TEAM

*BOOK MANAGER

PROCEDURES

- A. Each MCC console operator monitors a call loop. Some consoles have a prime loop which is used for extended conversations. In some instances, several console operators monitor the same call loop for incoming calls. For some console operators, the call loop also serves as a prime loop.
- B. Multioperator call loops are used to call a console operator and are not to be used for extended conversations, unless that is the only loop common to both operators. Should extended conversations be necessary, the calling operator uses a call loop to request a conversation on another specific loop; for example: MMACS, this is INCO on MOCR SYS. Meet me on INCO."
- C. WFCR/MPSR consoles are listed in table 1.4-1 by number, location, position title, position call sign, call loop, and an alternate loop, as applicable. Multioperator call loops are identified with an asterisk(*).

Table 1.4-1. Console/call sign/loop

Workstation number(s)	Console position	Call sign	Call loop	Alternate loop
<u>WFCR (room 2306)</u>				
9, 28	Flight Director	FLIGHT	FD	AFD CONF
10, 29	Flight Dynamics Officer	FDO	*MOCR DYN	
5, 24	Integrated Communications Officer	INCO	INCO	OIS 155 ORB COMM
27	Booster Engineer	BOOSTER	*MOCR SPEC	BOOSTER MPSR
13, 32	Maintenance, Mechanical, Arm, and Crew Systems	MMACS	*MOCR SYS	
1, 20	Propulsion Engineer	PROP	*MOCR GNC/PROP	
11, 30	Guidance Procedures Officer	GPO	*MOC DYN	
18, 37	Surgeon	SURGEON	*SURGEON	
4, 23	P/L Officer	PAYLOADS	PAYLOADS	PAYLOADS SYS ENGR
11, 30	Trajectory	TRAJ	*MOCR DYN	
15, 34	Flight Activities Officer	FAO	FAO	CREW OPS
19, 38	Spacecraft Communicator	CAPCOM	FD	AFD CONF
17, 36	Payload Deploy Retrieval	PDRS	MOCR SPEC	RINT
7, 26	MOD Manager	MOD MANAGER		
16, 35	Electrical, Environmental, Consumables Manager	EECOM	*MOCR SYS	EECOM
14, 33	Electrical Generation and Illumination Engineer	EGIL	*MOCR SYS	EGIL
2, 21	Guidance, Navigation and Controls Systems Engineer	GNC	*MOCR GNC/PROP	GNC MPSR
8	EVA Officer	EVA	EVA	*MOCR SPEC
12, 31	Ground Controller	GC	GC CALL	
6	Public Affairs Officer	PAO	*PAO	

Table 1.4-1. Console/call sign/loop

<u>Workstation number(s)</u>	<u>Console position</u>	<u>Call sign</u>	<u>Call loop</u>	<u>Alternate loop</u>
<u>WFRC (room 2306) (cont'd)</u>				
3, 22	Data Processing System Engineer	DPS	MOCR DPS/CDMS	DPS MPSR
21	Russian Interface Operator	RIO	RIO MOCR	RIO INTERPRETER
<u>WMPSR (room 2300)</u>				
1	In-Flight Maintenance	IFM	*IMF COORD	MMACS
2	Mechanical Systems Support	MECHANICAL	*SSR-1	MMACS
3, 21	Electrical Power System	EPS	*SSR-1	EGIL
4	S/L Electrical Power System		SSR-1	EGIL
5	Instrumentation	INSTRUMENTA- TION	INSTR COORD	INCO
13	RF COM	COMM SUPPORT	INCO SUPPORT	INCO
10	DATA COM	COMM SUPPORT	INCO SUPPORT	INCO
6	DPS Support	DPS SUPPORT	*SSR-1	MOCR DPS/CDMS
8	Life Support	LIFE SUPPORT	*SSR-1	EECOM
7	Thermal	THERMAL	*SSR-1	EECOM
9	Command Data Management System (S/L)	CDMS	CDMS/IPS	MPSR-1
<u>SVO (room 2326)</u>				
1, 2	Crew Procedures Engineer	CPE	CREW PROCEDURES	DPS ACTION
3, 19	Payload Support Engineer	PSE	*OPS ACTION	MPSR-2
4, 20	Payload Support Engineer	PSE	*OPS ACTION	MPSR-2
5	Operations Controller	OC	*PRIME OPS	OPS ACTION

Table 1.4-1. Console/call sign/loop

<u>Workstation number(s)</u>	<u>Console position</u>	<u>Call sign</u>	<u>Call loop</u>	<u>Alternate loop</u>
<u>SVO (room 2326) cont'd</u>				
6	Crew Interface Coordinator	CIC	CAPCOM/CIC	OPS ACTION
7, 21	Mission Scientist	MISSION SCIENCE	*PRIME OPS	OPS ACTION
8, 22	JSC Projects	PROJECTS		
9, 10	Payload Operations Director	POD	*PRIME OPS	OPS ACTION
11	Data Management Coordinator	DMC	*POCC COORD	MCC COORD
12	Data Flow Analyst	DFA	*POCC COORD	MCC COORD
13	Payload Activity Planner	PAP	OPS SUPPORT	OPS ACTION
14	Timeline Engineer	TLE	*REPLAN	CREW PROCEDURES
15, 23	TV Operations	TV OPS	TV OPS	POOC COORD
16	Electronic Ground Systems Equipment	EGSE	EGSE	
17	Data Support Replanner	D-REP	*REPLAN	OPS ACTION
24	POCC Support	POCC SUPPORT	POCC SUPPORT	
18	Timeline Engineer-2	TLE	*REPLAN	CREW PROCEDURES
<u>TRAJECTORY MPSR (room 2334)</u>				
IPS 1	IPS			
IPS 2	IPS			
IPS 3	IPS			
IPS 4	IPS			
IPS 5	IPS			
IPS 6	IPS			

Table 1.4-1. Console/call sign/loop (continued)

<u>Workstation number(s)</u>	<u>Console position</u>	<u>Call sign</u>	<u>Call loop</u>	<u>Alternate loop</u>
<u>TRAJECTORY MPSR (room 2334) cont'd</u>				
TRAJ 9, 18	Landing Support Officer	LSO	LANDING SUPPORT	
WMPSR 11, 14	Control (A/E)	CONTROL	*SSR1	GNC MPSR
WMPSR 12	Sensors (A/E)	SENSORS	*SSR1	GNC MPSR
WMPSR 11, 14	GNC Support (orbit)	GNC SUPPORT	*SSR1	GNC MPSR
TRAJ 10, 19	Flight Dynamics Officer-2			
TRAJ 1, 12	Flight Dynamics Officer-1			
TRAJ 2, 13	GSO/Target, Profile-Supt			
TRAJ 3, 14	Onboard Navigation	ONAV	MOCR DYN	
TRAJ 6, 15	Navigation	NAV	NAV SUPPORT	
TRAJ 7, 16	Track	TRACK	TRAJ COORD	
TRAJ 8, 17	Dynamics	DYNAMICS	SDP DYN	
WMPSR 15	OMS/RCS Engineering Officer	OREO	*SSR1	MOCR/GNC PROP
WMPSR 16	Consumables	CONSUMABLES	*SSR1	MOCR/GNC PROP
WMPSR 17, 18	Main Propulsion System Support	MPS	BOOSTER MPSR	
WMPSR 19, 20	Main Engine Support	ME	BOOSTER MPSR	
<u>PAYLOAD MPSR/POCC/SCA (room 3301)</u>				
PAYLOAD 2	Systems	PAYLOAD SYSTEMS	PAYLOAD SYS ENGINEER	PAYLOADS
PAYLOAD 4	Payload Data	PAYLOAD DATA	PAYLOAD SYS ENGINEER	PAYLOADS
PAYLOAD 6				
PAYLOAD 8				

Table 1.4-1. Console/call sign/loop (continued)

<u>Workstation number(s)</u>	<u>Console position</u>	<u>Call sign</u>	<u>Call loop</u>	<u>Alternate loop</u>
<u>PAYLOAD MPSR/POCC/SCA (room 3301) cont'd</u>				
SCA 10	EVA, CDMS	EVA, CDMS MONITOR		
<u>ROBOTICS/EVA MPSR (room 3307)</u>				
EVA 1	EMU Systems	EMU SYSTEMS	EVA MPSR	
EVA 2	EVA Task Support	EVA TASK	EVA MPSR	
ROBOTICS 1	RMS SUPPORT	RMS	*RMS COORD	
ROBOTICS 2	RMS SYSTEMS	RMS	*RMS COORD	
<u>FAO MPSR (room 3308)</u>				
FAO 1, 5	Pointing-1	POINTING	CREW OPS	FAO
FAO 2, 6	Pointing-2	POINTING	CREW OPS	FAO
FAO 4, 8	Timeline	TIMELINE	CREW OPS	FAO
FAO 3, 7	MATS	MATS		FAO
<u>GOSR (room 4328)</u>				
GOSR 15, 16	COMMAND	COMMAND	COMMAND	
GOSR 2, 9	COMMAND	COMMAND	COMMAND	
GOSR 4, 11	DFG	DFE/NIPSUP	DFE	NIP SUP
GOSR 6, 13	COMMAND	COMMAND	COMMAND	
GOSR 5, 12	DFG	DFG/NIPSUP	DFG	NIP SUP
<u>BIOMED MPSR (room 1345A)</u>				
BIOMED 1, 2	AEROMED	BME	*SURGEON	
<u>MOIR (room 1345)</u>				
MOIR 1				
MOIR 2				
MOIR 3				
MOIR 4				

MOIR (room 1345) cont'd

MOIR 5

MOIR 6

MOIR 7
(through
MOIR 45)

30M (room 112)

GOSR 17	COMM Control	COMM CONTROL	COMM CONTROL I/F	GC CALL
GOSR 1	DACON	DACON	DACON COORD	DFE
GOSR 3, 10	COMM Control	COMM CONTROL	OST INT-1	

30M (room 116A)

GOSR 7, 14 NETMAN-1 NETMAN-2	Facility Systems Manager	FSM	FSM	
COM-SUP 1 COM-SUP 2 COM-SUP 3 COM-SUP 4	Computer Supervisor	COMPUTER SUPV-1	SDPC SUPV-1	SDPC CMPTR SUPV-2

30M (room 127)

VOICE 1	COMM TECH	COMMM TECH	VOICE CONTROL	
VOICE 2	COMM TECH	COMM TECH	VOICE CONTROL	
VOICE 3	HOUSTON TV	HOUSTON TV	TELEVISION	

SOP 1.5

TITLE

MISSION CONTROL CENTER RECONFIGURATION REQUESTS

PURPOSE

To define the procedure for requesting expedited changes to the MCC configurations by use of the Mission Control Center Reconfiguration Request (MRR).

PARTICIPANTS

- MRR ORIGINATOR
- * FOM
- FD
- GC
- ORIGINATOR'S NASA DIVISION CHIEF
- MCC FPM
- RESOURCE ALLOCATION MANAGER (RAM)
- HOUSTON VOICE
- MRR COORDINATOR

RELATED MATERIAL

- A. SFOC SOP-FL-EM-26, Implementation and Control of Mission Control Center Reconfiguration Requests (MRRs)
- E. Mission Control Center Operations Handbook (MOH), Volume III, SOP 2.1

GENERAL

- A. The MRR is a method of requesting a change to a required function after normal input cutoff dates have expired, when hardware/software freezes are in effect prior to a flight, or when the change must be expedited (i.e., normal change process flow would be too lengthy).
- B. The MRR change requested must normally be in the mandatory category, but in any case, ample justification must be provided by the requester.
- C. The MRR change request may be submitted during on-console support periods for a change which is required to support the activity in progress or off-console periods when a major operation/mission is imminent.
- D. The MRR may be utilized at any time to request changes to the DVIS database.

PROCEDURES

- A. The change originator will complete the top half of the MRR form (figure 1.5-1) down to but excluding the originator's NASA division chief approval block.
 - 1. The MRR must include a clear and concise description of the required change.

2. The MRR must provide justification for the change, along with a statement of mission impact if not approved.
- B. The MRR approval cycle for changes required during on-console support for simulations, pad tests, and flight operations is as follows:
 1. The originator will submit the MRR to the FOM or GC.
 2. The FOM will obtain the required approvals.
 3. The GC may seek the approval of the FD in lieu of the Flight Controller's Division Chief.
 - C. The MRR approval cycle for off-console periods follows:
 1. The originator will submit the MRR to his/her NASA division chief (via administrative channels) for review/approval.
 2. Approved MRRs are forwarded to the USA MRR Coordinator and MCC FPM for subsequent approval/disapproval.
 - D. After approval, the MRR is assigned a number by the MRR Coordinator and is forwarded to the appropriate SFOC organization(s) for implementation. MRRs disapproved will be returned to the originating organization with rationale for disapproval.
 - E. The MRR Coordinator will provide the MCC FPM (during nonsupport periods) or FOM (during on-console support periods) the following:
 1. The MRR number assigned
 2. An estimate of time required to implement the change
 - F. The MRR originator may contact the MRR Coordinator/FOM for status of approved MRRs.
 - G. Changes made to the DVIS database via the MRR must be entered by the RAM or the Voice controller on duty on the need date.
 - H. Changes made via MRR that are usually accomplished via Support Requirement (SR) require an SR to be submitted within 60 days in order to remain in effect for subsequent missions.

MCC RECONFIGURATION REQUEST

FLIGHT ID/DVIS	<input type="checkbox"/> THIS FLIGHT ONLY <input type="checkbox"/> SUBSEQUENT FLIGHTS ALSO <input type="checkbox"/> PERMANENT	ORIGINATOR	EXTENSION
----------------	---	------------	-----------

DESCRIPTION:

OPERATIONAL NEED DATE

JUSTIFICATION FOR CHANGE AND OPERATIONAL IMPACT:

DIVISION CHIEF APPROVAL

ORIGINATOR	MRR LOG NUMBER	DATE
------------	----------------	------

MSC CONCURRENCE (AS REQUIRED) MCC FPM APPROVAL MCC DPS CENTER DIRECTOR (AS REQUIRED) MCC FPM APPROVAL FOR REMOVAL MCC MRR COORDINATOR <input type="checkbox"/> HOT WORK PERMIT REQUIRED	COMMENTS:
--	-----------

JSC FORM 914 (Rev Sep 96) (PerForm Pro Plus Jul 93)

Figure 1.5-1. MRR form

SOP 1.6

TITLE

OPERATIONS AND MAINTENANCE INSTRUCTION PROCESSING

PURPOSE

To provide a procedure for the receipt of KSC Operations and Maintenance Instruction (OMI) documentation in JSC building 30 and its distribution to the flight control team consoles. This procedure will identify the documentation to be received, the logging procedure, the distribution procedure, and the Flight Director status reporting procedure.

PARTICIPANTS

- KSC OMI STAFF
- * MCC ACTION CENTER STAFF
- SOC COURIER SERVICE
- JSC PRINT SHOP
- JSC MAIL
- MCC FLIGHT CONTROL TEAM
- GC

PROCEDURES

A. Background

1. The OMI document flow from KSC to JSC was set up and managed by the Operations Integration Officer (OIO) at JSC. The system was set up to operate from flight to flight with a minimum of direction.
2. Additions or deletions to the OMI distribution lists were approved by the OIO.
3. KSC interface to status OMI documentation was an OIO responsibility.
4. The OMI documents were delivered to the JSC MCC Action Center (MAC) where reproduction couriers would distribute them to the flight control team consoles.
5. The OIO position has been discontinued and their responsibilities divided up. The MCC Action Center staff has assumed the OMI processing responsibilities.

B. OMI Documents

1. Reference table 1.6-1 for a list of OMI documents received at JSC.
2. OMI distribution lists are updated by MAC Support, ext. 31091, and maintained on the JIN network.

Table 1.6-1. Operations and maintenance instruction list

OMI No.		Copies normally received		Title
		PREL	FINAL	
S0001		2	6	Mila Relay Test
S0002		5	12	MCC Interface Test
S0007	Vol 1	1	2	Launch Countdown
	Vol 2	5	32	
	Vol 3	1	26	
	Vol 4	1	26	
	Vol 5	2	26	
S0014	Vol 1	3	10	Flight Readiness Firing
	Vol 2	4	12	
	Vol 3	3	10	
	Vol 4	3	10	
	Vol 5	3	10	
	Vol 6	3	10	
S0017	Not being used at this time	5	16	
S0026		1	7	Edwards Landing Count
S0027		2	7	Northrup Landing Count
S0028		1	7	KSC Landing Count
S0029		2	7	Post Landing Cnvy Ops-CLS
S0034	Vol 1	2	7	Northrup Landing (ADA)
S0034	Vol 2	2	7	Northrup Landing (CLD)
	S0037	2	2	(APU Hot Fire)
S0046	Vol 1	2	3	Launch Confidence Test
	Vol 2	3	5	
	Vol 3	2	3	
	Vol 4	2	3	
S00739 and E0739			11	P/L IVT E-E Test
V1117		4	12	Comm Launch Config
EOXX		2	8	Cargo End-to-End Test
SOXXX		5	9	Cargo/Orbiter I/F Test
NOXXX		2	2	

C. OMI Document Status

1. KSC points of contact

a. All OMI's (except end-to-end tests)

VITT Team	9-1-407-867-4792
	9-1-407-867-2312

- Carolyn Williams	9-1-407-861-0863
- Fred Cryder-S000's	9-1-407-861-0272

b. End-to-end tests

- Tony Paholovich	9-1-407-861-3113
- Ed Hampton	9-1-407-861-7134
- Tom Koller	9-1-407-861-7855
- Jim Ness or Labroud	9-1-407-861-3061

2. SOC points of contact

a. SOC Courier Service - Mr. Little 283-6863

D. OMI Logging

1. All KSC OMI documentation received at JSC will be logged in on the form provided in figure 1.6-1.
2. Copies of this form and the current OMI distribution lists will be maintained in the Action Center by MAC Support.
3. OMI deviation packs will be logged on this form also.

E. OMI Distribution

1. When OMI's are received by MAC Support by mail or freight, they will be placed outside room 235.
2. MAC Support will log in the OMI and the reproduction staff will make distribution of the documents.
3. When reproduction staff receive an OMI deviation pack-datafax from the JSC message center, it will be logged in the OMI List and Distribution notebook. Then copies will be run and distribution made to the flight control team. The datafax master will be sent to the action center.

F. OMI Coordination

1. MAC Support (ext. 31091) is responsible for keeping the OMI distribution lists current. Coordinating with KSC on OMI shipping questions and then checking with JSC Mail or Freight to find a missing shipment. Coordinating with KSC for increasing or decreasing the number of copies sent to JSC.

SOP 1.7

TITLE

MCC/SMS PROBLEM REPORTING

PURPOSE

To define the procedure for MCC Flight Control (FC) Team reporting hardware and software anomalies with online and offline systems during preflight, flight, and postflight phases.

PARTICIPANTS

WORKSTATION SOFTWARE SUPPORT (WSS)
MCC FLIGHT CONTROL (FC) TEAM
*GROUND CONTROLLER (GC)
COMPUTER SUPERVISOR (COMP SUP)
*FACILITY OPERATIONS MANAGER (FOM)
FACILITY SYSTEMS MANAGER (FSM)
SIM SUPERVISOR
SIM CONTROL TEAM
SIM CONTROL

PROCEDURES

A. Console Operations

1. The F/C reports problem immediately. Reference table 1.7-1 for correct ground operations position and voice loop.
2. The GC will be contacted for any equipment, processing, or procedural problem on the GC CALL loop.
3. Anomaly reports are documented by FCs at the time the problem occurs using the anomaly reporting system.

B. Anomaly Report (AR) Documentation (Anomaly Report)

The MCC AR provides a means of documenting and controlling the disposition of all problems until satisfactory resolution.

Table 1.7-1. Ground operations position and voice loop

Console equipment/ support data flow problems	Contact	Loop	Notes
Emulated DTE	COMPUTER SUP	GC CALL**	Data problems
- TLM data	DFE	DFE	
- TRAJ data	DYNAMICS	SDP DYN	Data problems
- CMD data	COMMAND	COMMAND	
Events	COMPUTER SUP	GC CALL**	
- TLM data	DFE	DFE	
- TRAJ data	DYNAMICS	SDP DYN	Data problems
- CMD data	COMMAND	COMMAND	
Chart recorder data	NIP SUP	NIP SUP	(Alternate loop is DFE)
Computer status	GC	GC CALL	Building 30S
Commanding problems	COMMAND	COMMAND	Station config, CMD rejects CMD load generation and transfer
Longlines	HOUSTON VOICE	VOICE CONTROL	
EMEDs	COMPUTER SUP	GC CALL**	
Projection	GC	GC CALL	
Track data	TRACK	TRAJ COORD	
Track data processing	DYNAMICS	SDP DYN	
	TRACK	TRAJ COORD	
	NAV	NAV SUPPORT	
Attitude & Pointing, Antenna Management, and Navigation data processing	DYNAMICS	SDP DYN	
TLM verification	DFE	NIP SUP	
Workstations	WSS	WSS CALL	
TV monitor	GC	GC CALL	
Clocks	GC	GC CALL	
Biomed display unit	GC	GC CALL	
CMD panel	FSM	FSM-1	
Comm panel	HOUSTON VOICE	VOICE CONTROL	
TV cameras	GC	GC CALL	
Air conditioning	GC	GC CALL	
	FOM		
Lighting/power	GC	GC CALL	
	FOM		
Message Traffic	MESSAGE CENTER	VOICE CONTROL	
Untagged equipment	FOM	FOM-1	

Console voice recorders (portable)	RECORDERS	VOICE CONTROL
Keypad problems	HOUSTON VOICE	VOICE CONTROL
MIDDS/WINDS DATA	FSM	FSM-1

Note (**) indicates the initial calls should be through the GC.

1. Initiation

- a. The FC will initiate and submit an AR as soon as a problem is detected so that configuration conditions, etc., at the time can be reconstructed. A hard copy of the System Status will be taken at the time the problem is noted and submitted with the AR.
- b. If not available in the FCR or MPSRs, MCC AR forms (RSO 8900-A-5) can be obtained at the GC or FSM console. Initiator submits the completed original software AR form to the COMP SUP or the original hardware AR to FSM. ARs without sufficient information will be returned to originator.

2. Opening an AR

- a. An AR is initiated for all failures affecting operational use of SFOC Flight Operations systems. These include Hardware (H/W), Software (S/W), and administrative failures that impact the function of a system.
- b. Originator Responsibilities
 - (1) When a failure occurs, the person who observes the problem initiates an AR.
 - (2) Complete appropriate blocks 1 through 19 and 21 of the AR in accordance with the instructions below.
 - (3) All applicable supporting documentation (i.e., floppy disks, paper hard copies, computer printouts) is properly annotated to indicate the applicable AR number.
 - (4) The AR (and all supporting documentation) is forwarded to the AR Single POC (Facility Operations Manager (FOM) in the MCC) or authorized opening data entry personnel no later than the conclusion of the originator's work shift.
 - (5) Immediately submit critical ARs to the AR Single POC (FOM in the MCC facilities) and the AR originator is available to discuss the identified anomaly before leaving the facility.
 - (6) Critical ARs must be entered into the DRTS within 1 hour of problem occurrence; major ARs within 8 hours of problem occurrence; minor ARs within 24 hours of problem occurrence.

C. Flight Software Problems

1. If a problem arises that could possibly be flight software, the affected flight control discipline will write an AR against the flight software. If the originator is not sure what is required, he should check with the GC.
2. If a problem arises in the ITF that could be flight software, the team lead and the affected instructor discipline will write an AR against the flight software. The Simulation controller, Simulation supervisor, and the affected flight control discipline will be notified, and all required information will be collected. The ITF will use data collection procedures as defined by DT guideline T-25. MCC data required by the ITF flight software Test and Operations (T&O) personnel is to be coordinated by the Simulation controller in conjunction with the FOM or GC.
3. The FOM and Simulation controller will be notified of the flight software AR, the criticality, and the nature of the problem by the Simulation supervisor or the GC prior to the end of the simulation or test. The appropriate flight software T&O personnel should be notified of the AR by the Simulation controller.
4. Critical, major, flight software
 - a. The Flight Director and Simulation supervisor will be provided a copy of the AR by the originating discipline prior to the end of the simulation/test. The on-duty Flight Director will identify for the GC which ARs are critical/major and require special attention.
 - b. Critical, major, and flight software ARs, as identified by the Flight Director, will be hand-carried to their necessary destination. Organizations will make arrangements to accommodate this activity. It is imperative that critical ARs be worked in an expedient manner.
 - c. Copies of any critical, major, and flight software AR, for which the cause has not been determined, will be provided in parallel to MCC and ITF personnel, PASS and BFS T&O personnel, and the Cargo Integration and Operations Branch/DO5.
 - d. If it is uncertain whether a critical or major AR exists, the exact case should be run again as soon as possible/practical, depending upon the launch date (at least within 72 hours or sooner) to confirm the problem. The Simulation supervisor is responsible for scheduling the rerun, establishing support requirements, and notifying the affected disciplines.

D. Obtaining AR Status

1. The AR administrator forwards approved ARs to the affected area(s).
2. The originating flight control discipline is responsible for following up on the AR, making sure that it is being worked in an aggressive manner, and providing status updates to the Flight Director.
3. The FC may obtain status of ARs by contacting the FOM at extension 35743.

E. AR Completion

The AR, form RSO 8900-A-9 (Figure 1.7-1), is completed as follows.

INSTRUCTIONS FOR COMPLETING THE AR FORM

Originator: Name, mail code, and telephone number of the individual experiencing the anomaly (problem).

AR Type (1)

AR Type D = Anomaly Report - Failure(s) identified during the course of normal support activities.

AR Type V = Vendor Anomaly - H/W or S/W failure(s) whose resolution is primarily the responsibility of vendors external to the Space Flight Operations Contract (SFOC) Flight Operations. All services for vendor external support must be chargeable to a H/W or S/W contract/purchase order. Do not use this AR type unless you are certain that a valid purchase order is in existence.

1 Date/Local time of Failure - Enter the date and local time of the failure, using 24-hour clock (i.e., 0300, 1500).

2 Problem Impact - Indicates the impact of this problem on the overall function of the facility involved.

Critical - The failure halts or significantly impacts facility operations or functional objectives. **The problem is to be corrected immediately.**

NOTE

If a CRITICAL AR is initiated, the responsible correcting organization is contacted and required to provide action immediately to identify cause and implement corrective actions. This entails calling in responsible engineers regardless of the time, day or night.

Major - The failure impacts equipment or software performance. **The failure is fixed as soon as possible.**

NOTE

When MAJOR ARs are received by the Facility POC, the responsible correcting organizations and several levels of USA management are notified immediately to ensure corrective action is initiated as quickly as possible.

Minor - The failure may have a slight impact on equipment or software performance. **The problem can be worked around or accepted in the short term. It is fixed as time permits.**

- 3 Impact Level - Operations Center Impact Assessment (Facility POC will complete based upon AR analysis and discussions with the originator if possible)
 - 1 FAILURE - A complete loss of capability for the specified system or subsystem that results in an inoperable condition (e.g., system crash, no response, inoperable).
 - 2 FAULT - Partial loss of capability for the specified system or subsystem that results in a degraded condition where the system or subsystem does not perform according to requirements (e.g., cannot read, wrong information, missing data, incorrect response).
 - 3 PROBLEM - A perception that the specified system or subsystem is not behaving or performing correctly, although the specific cause or effect cannot be readily determined (e.g., looks strange, not supposed to be that way, do not like it, irritant).
 - 4 ERROR - Unintentional mistake caused by misunderstanding, carelessness, or a lack of judgment, knowledge, or experience (e.g., incorrect entry, did not follow procedures, documentation incorrect).
 - 5 DEFECT - Item that is worn out, out of adjustment, jammed, torn, burned out, or requires workmanship action (e.g., paper jam, light bulb, media problem, facility problem).
- 4 Failure Category - Indicate if the failure appears to be hardware, software, or administrative. Administrative failures include procedural and human errors.
- 5 System - Enter the acronym for the system involved. Acceptable system acronyms are listed in the DRTS tables accessible in EDP under REFERENCE/MCC/DRTS REFERENCE TABLE.
- 6 Application/Subsystem ID - Enter the software application or the hardware subsystem acronym where the failure occurred. For administrative ARs, enter the software application or the hardware subsystem acronym that was associated with the administrative failure. Acceptable system acronyms are listed in the DRTS tables accessible in EDP under REFERENCE/MCC/DRTS REFERENCE TABLE.
- 7 Sub-Subsystem - Enter the hardware sub-subsystem acronym where the failure occurred. (Mandatory entry for all hardware anomalies that occur during the anomaly closure cycle.) Acceptable system acronyms are listed in the DRTS tables accessible in EDP under REFERENCE/MCC/DRTS REFERENCE TABLE.
- 8 Building/Room - Indicate the building and room numbers where the anomaly occurred.
- 9 OS Version - Enter the operating system version associated with the failure.
- 10 System Version/Trainning Load - Enter the software system version identification number or training load associated with the failure.
- 11 Host - Enter the acronym that identifies the host computer system associated with the software failure.
- 12 Flight ID - Identify the flight associated with or impacted by the failure. The Flight ID may be a specific flight (i.e., STS087, STS180, etc.), generic flight (all), or non-flight related (non-flight).
- 13 Core Dump Tape No - Enter the full magnetic tape identification number for the tape containing the core dump informaton, if applicable.
- 14 IC Dump Tape No - Enter the full magnetic tape identification number for the tape containing the IC dump information, if applicable.
- 15 Log Tape No - Enter the CCS log tape numbers for the applicable failure. (For MOC/DSC pair, include both numbers and dataset names.)
- 16 Acc/Run No - Enter the user account number or full run ID number for the job that

- incurred the failure/anomaly, if applicable.
- 17 Activity - Enter the activity that was in progress when the anomaly occurred. (*See the ACTIVITY CODE listing below for appropriate Activity codes*)
 - 18 Database Version - Enter software database version.
 - 19 Title and Description - Enter a title and a complete description of the problem. The description should answer the following questions:
 - a. What is the problem and what symptoms were observed?
 - b. Where was the problem observed?
 - c. What functions were affected and to what extent?
 - d. What was the operation and configuration at the time the problem occurred?
 - e. What is the Property/NASA Tag number of the failed item?
 If additional space is necessary, continue the description on the AR Extension Sheet.
 - 20 Date/Local Time Vendor Contacted - Indicate the date and local time that the user granted access to the hardware or software for repair. This date and time are often the same as the time of failure.
 - 21 Number of Attachments - Enter the number of attachments that are to be included with the AR being submitted.

Activity Table (Acceptable Activity Codes for Block 17)

Activity	Activity code description
AUDITS	QUALITY ASSURANCE AUDITS
BUILD	BUILD ACTIVITY
CHECKOUT	SFOC CHECKOUT/TROUBLESHOOTING
CPLC	CREW PARTICIPATION LOAD CHECKOUT
DATA-ENG	ENGINEERING CYCLE ERROR DETECTION
DATA-FLT	FLIGHT CYCLE ERROR DETECTION
DESK CHECK	DESK CHECK
EMF	EMERGENCY MODE FIX
FLT FOLLOW	FLIGHT FOLLOWING
GEN/SUR	QUALITY ASSURANCE GENERAL SURVEILLANCE
IIT	INTEGRATED INTERFACE TESTING
ILC	INTEGRATED LOAD CHECKOUT
INSPECT	QUALITY ASSURANCE INSPECTIONS
IVT	IVT-GENERIC
IVT-CDEOPS	IVT-CDEOPS ENVIRONMENT OPERATIONS
IVT-DSKCHK	IVT DESK CHECK
IVT-LMR	IVT-LOAD MODULE REPLACEMENT
IVT-PBT	IVT-POST BUILD TEST
IVT-REG	IVT-REGRESSION
IVT-REL	IVT-O.S. RELEASE
MAINT	SFOC MAINTENANCE ACTIVITY
MISSION	MISSION/FLT RELATED SUPPORT ACTIVITIES
MSC DEV	MSC DEVELOPMENT ACTIVITY
OPERATIONS	SFOC STANDALONE OPERATIONS
ORT	OPERATIONAL READINESS TESTING
PERF	PERFORMANCE ANALYSIS
PM	PREVENTIVE MAINTENANCE

POST-MISSN	POST-MISSION ACTIVITIES
POST-REL	POST RELEASE RELATED PROBLEMS
PRE-MISSN	PRE-MISSION ACTIVITIES
PWR UP/DN	FACILITY/BUILDING POWER UP/DOWN ACTIVITY
RECONFIG	FLIGHT SOFTWARE RECONFIGURATION ACTIVITY
REWORK	RECONFIGURATION REWORK ACTIVITY
SECURITY	SECURITY AWARENESS ACTIVITIES
SFOC DEV	SFOC DEV ACTIVITY
SIM-A/E	SIM ACTIVITY-ASCENT/ENTRY
SIM-GEN	SIM ACTIVITY-GENERIC
SIM-JIS	SIM ACTIVITY-JOINT INTEGRATED
SIM-LONG	SIM ACTIVITY-LONG DURATON
SIM-ORBIT	SIM ACTIVITY-ON ORBIT
SIOT	SYSTEMS INTEGRATION & OPERATIONS TESTING
SIOT SUP	SIOT SUPPORT
SIT/SOT	SYSTEM INTEGRATED/OPERATIONS TESTING
SRT	SYSTEMS RELEASE TEST
STANDBY	STANDBY/NON-SCHEDULED SUPPORT
SUST	SUSTAINING ACTIVITY
TESTING	NON-SFOC TEST RELATED ACTIVITIES
TRAINING	TRAINING
TSC DEV	TSC DEVELOPMENT ACTIVITY
UAT	USER ACCEPTANCE TESTING
USER OPS	USER STANDALONE OPERATIONS
STA-RECON	IMARS PRODUCTION CYCLE/PASS
AIT	APPLICATION INTEGRATION TESTING

03-18-1998
13:22:21

TIME STAMP (OPEN)

ORIGINATOR: NAME				ANOMALY REPORT				NUMBER D 411325		AR TYPE (Check One)		
MAILCODE		PHONE NUMBER						<input type="checkbox"/> - D <input type="checkbox"/> - O <input type="checkbox"/> - S <input type="checkbox"/> - N <input type="checkbox"/> - T <input type="checkbox"/> - P <input type="checkbox"/> - V				
DATE/LOCAL TIME OF FAILURE 1						PROBLEM IMPACT 2		(OPS. CENTER USE ONLY) 3			FAILURE CATEGORY 4	
MONTH	DAY	YEAR	HOUR	MINUTE	SECOND	<input type="checkbox"/> CRITICAL <input type="checkbox"/> MAJOR <input type="checkbox"/> MINOR	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5			<input type="checkbox"/> HARDWARE <input type="checkbox"/> SOFTWARE <input type="checkbox"/> ADMINISTRATIVE		
SYSTEM 5			APPLICATION/SUBSYSTEM ID 6			SUB-SUBSYSTEM 7			BUILDING/ROOM 8			
OS VERSION 9			SYSTEM VERSION/TRAINING LOAD 10			HOST 11			FLIGHT ID 12			
CORE DUMP TAPE NO. 13		I.C. TAPE DUMP NO. 14		LOG TAPE NO. 15		ACCT/RUN 16		ACTIVITY 17		DATABASE VERSION 18		
TITLE:												
<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold;">DESCRIPTION</div> <div style="flex-grow: 1;"></div> </div>												
PROPERTY/NASA TAG NUMBER						DATE/LOCAL TIME VENDOR CONTACTED 20				# OF ATTACHMENTS 21		
MONTH		DAY		YEAR		HOUR		MINUTE				
<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold;">CORRECTIVE ACTION</div> <div style="flex-grow: 1;"></div> </div>												
DEGRADED SUPPORT? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DOWN						QAR/QAD STAMP				DATE		
TOP ASSEMBLY NAME			MODEL NO.			SERIAL NO.			NEMS NO.			
REPAIR STARTED (Date) (Time)			PROBLEM CORRECTED (Date) (Time)						ACTIVE REPAIR TIME/MANHRS			
CORRECTED BY (Print)			SUPERVISOR (Print)			DATE			PRIMARY/SECONDARY STATUS			

USA 8900-A-9 New 6-96 (Flow) (JSC)

Working copy

Figure 1.7-1. Anomaly report

SOP 1.7.1

TITLE

ANOMALY TRACKING - SHUTTLE, PAYLOAD, AND MCC/STDN/POCC

PURPOSE

To identify the procedures for tracking Shuttle, payload (PL), and MCC/Spaceflight Tracking and Data Network (STDN)/Payload Operations Control Center (POCC) anomalies during flight period.

PARTICIPANTS

- MCC Flight Control Team (FCT)
- * Span Manager/SPAN Systems
- Mission Evaluation Room (MER)
- SOC Action Center Word Processing Operator

PROCEDURES

A. Shuttle System, PL, MCC/STDN/POCC Anomaly Reporting

1. The MOD In-flight Anomaly Log is the only official problem list to be recognized by the space shuttle program during flight operations. The log is maintained from full flight team manning before launch (approximately L - 12 hours) to postlanding operations at the landing site. Anomalies that occur prelaunch, typically are documented by KSC. The FCT may elect to document the same anomaly in the FCT anomaly log to retain a record in the Mission Information System (MIS) database. Additionally, anomalies that occur postlanding that are later discovered by review of flight data or during a crew debrief may also be documented in the MIS database.
2. Any anomalous Shuttle, PL, MCC/STDN/POCC condition is reported on the FD loop by Shuttle Systems FCR F/C's.
3. As soon as possible after the anomaly has occurred, the responsible F/C discipline will initiate an electronic Anomaly Report via the MIS on their workstation, figure 1.7.1-1. The initiating discipline is responsible for ensuring that the anomaly report is complete, including the submission of any revisions, to ensure the FCT understands the impact and resolution of each anomaly. **After the Anomaly Report is complete, the FCR/FC DISCIPLINE position informs SPAN via voice loop of the new Anomaly Report.**
4. The SPAN Systems and SPAN Manager review and edit the anomaly reports and maintains a current hardcopy file in the in-flight anomaly log and cover sheet. SPAN Systems coordinates the incorporation of the anomaly reports in the in-flight anomaly log.
5. SPAN will publish a hardcopy in-flight anomaly log and cover sheet for SOC Action Center staff to submit to "REPRO" for copying and distribution in accordance with the Anomaly Log Cutoff Schedule. This distribution schedule is formulated to ensure receipt of the hardcopy 30 minutes prior to each shift change to disciplines/

organizations who do not have access to the MIS system. The initial in-flight anomaly log will contain a list of anomalies that are known to exist pre-launch and are acceptable for flight.

6. The SPAN Manager coordinates the MOD Anomaly Log and MER Problem Tracking List with the MER Manager. If the MER has an explanation and does not consider it a problem, the MER Manager will write an "Info Only" MER-SPAN chit explaining why the anomaly is not a problem. Subsequent to the flight, the MOD Program Integration Office and STET FCT members will review, compare, and resolve differences between the anomaly log and the problem tracking list.
7. Anomalies discovered during crew debrief will be documented in an anomaly report.

B. Transferring In-flight Anomaly Log Accountability Postflight

1. The anomalies for each flight are presented to the Space Shuttle Program Postflight by each Project Element for program visibility. Each Project Element makes recommendations for selected anomalies to be tracked by and closed by the Space Shuttle Program. The MOD Program Integration Office will coordinate the anomaly reports written by MOD, with the Program Office and the Project Elements. Any FCT anomalies not reported by other Project Elements, including the MCC and STDN elements, will be reported by MOD. Responsibility for closeouts of all anomalies remains with the responsible Program Element/Project.

C. General Guidelines

1. The FCR/F/C reviews, ensures completeness of the anomaly report, and informs SPAN via voice loop that a new/revised anomaly report is ready for SPAN review and processing. The FCR F/C will also identify to SPAN the temporary control number of the new/revised anomaly report.
2. The initial report should be as complete as possible, including the "Impact," "Resolutions" and "In-Flight Status." Revisions are to be submitted, as required, to ensure the accuracy and completeness of the anomaly log. The basic philosophy to be used for revisions is as follows: In general, revisions are to be added to the initial entry, particularly when the revisions are submitted by different authors. Revisions may be made to replace the initial entry or to make corrections; however, a replacement entry is to retain all pertinent information such as crew actions, troubleshooting accomplished, etc. The names of all authors of each report are to be retained in the log.
3. The "In-Flight Status" status is to be shown closed as soon as it is determined that no additional information is to be received during the flight, the resolution is complete for the flight, and no further in-flight action is required relating to this anomaly. Postflight analysis, troubleshooting, or ground testing may be required to explain the anomaly.
4. Anomalies require periodic review to ensure they are current and specify the results of the planned tests, whether workarounds were implemented, etc. The archived anomalies are to reflect the complete status of actions, insight gained, etc., prior to reporting to the Program (preferably by landing time). Each F/C discipline is responsible to ensure anomalies are current no later than landing plus two days.

D. Specific Guidelines

1. Discipline/No/Rev - Is generated automatically by the MIS system unless the originator is a subdiscipline (e.g., CDMS is a subdiscipline of DPS). Change the discipline label to the appropriate subdiscipline.
2. Revision - Select "no" for the initial report. Select "yes" for a revision.
3. In-Flight Status - Select "open" or "closed". Use general guideline in paragraph A.3 above. All anomalies will be closed, by definition, at the time the orbiter is turned over to the KSC ground team.
4. Orbiter Impact - If the anomaly is orbiter related, select "yes" and explain in the "IMPACT" block. Select "no" if not orbiter related.
5. Payload Impact - If the anomaly is related to a payload, select "yes" and explain in the "IMPACT" block. Select "no" if not payload related.
6. MER Problem No. - SPAN enters the anomaly corresponding to the MER problem number. This provides a cross-reference between the MOD Anomaly Log and the MER Problem Tracking List.

If the MER believes the anomaly is not a hardware or software problem, the MER will submit an explanation in a Mission Action Request (a.k.a. chit). SPAN will include the flight chit number in this block.

7. Name - Use initial and last name of author.
8. GMT/MET - This is the time the anomaly occurred to the best of the ability to ascertain.
 - a. Enter either the GMT or MET time, the other time will be provided automatically (both times are in days, hours, and minutes). For simulations, use SGMT or SMET.
 - b. Do not enter GMT or MET for revisions unless they correct the initial GMT and MET; however, the GMT or MET of additional observations or activities are to be included in the text of the description.
9. Title - Specify a short but descriptive title of the problem. Acronyms and abbreviations in common usage are acceptable if required to limit title size; however, the acronyms/abbreviations are to be explained in the text of the description.
10. Description - Describe the anomaly in concise and technically complete terms. If reference is made to instrumentation, include MSID's. For a revision based on additional observations or events which modify the anomaly, include the associated GMT's in the text of the description.
11. Impact - specify the impact to the vehicle/flight/payload including constraints to operations. If there is no impact because of alternatives or redundancy, identify what the alternatives or redundancy are that resulted in a no impact situation.

- Resolution - Specify any actions that are taken or to be taken, configuration changes, workarounds, etc. The resolution is to be consistent with the rationale for the in-flight closure explained in paragraph b.3, above.

MIS Report Processor

File Edit Options Reports SPAN State CHIT Sign Off Help

Date: 11/02/94
Flight: STS-066
Vehicle ID: OV-104

ANOMALY REPORT

Discipline/No./Rev: EGIL
Revision: No
In-Flight Status: Open/Close
Orbiter Impact: No
Payload Impact: No
MER Problem No.:

Name: PRELIMINARY
Title:
Description:
Impact:
Resolution:

NOTE: SIMs use SGMT/SMET. OPS use GMT/MET. (DDD:HH:MM:SS)
If reference is made to instrumentation, please include MSID's.

Edit Mode: ON
Operational Flight: STS-066
Discipline: EGIL
Sub-Discipline: EGIL
New anomaly requested:
graphical attachment(s).

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Figure 1.7.1-1. Anomaly Report

SOP 1.8

TITLE

REPRODUCTION ROOM SUPPORT

PURPOSE

To define the procedure for establishment of reproduction room support and priority assignment.

PARTICIPANTS

FD
MCC F/C's
ACTION CENTER STAFF
REPRO ROOM
GC

GENERAL

- A. The MCC Reproduction Room, building 30S, room 3320, is normally staffed 24 hours/day, 7 days/week during STS flight operations.
- B. Two levels of priority will be recognized: (1) priority and (2) routine. Priority repro jobs require an authorizing signature.
- C. MCC Reproduction Room support is also provided during long duration simulations. This support will be provided upon request of the Flight Director and will be coordinated with the Action Center Staff.

PROCEDURES

- A. The MCC Reproduction Room support will begin at the time of initial console manning by the flight team and will provide continuous support until flight termination.
- B. Requests for repro support which exceed normally planned Repro Room level of effort will be coordinated with the Action Center Staff for approval.
- C. Routine Reproduction Jobs
 - 1. Fill out Reproduction Request form (figure 1.8-1) in duplicate.
 - 2. Submit original plus one copy to Repro Room, building 30S, room 3320 (phone, x35198).
- D. Priority Reproduction Jobs
 - 1. Fill out repro request form in duplicate.
 - 2. Submit original plus one copy to FD for priority approval.
 - 3. After FD approval, submit repro job to Repro Room.

4. Repro Room personnel will complete all priority jobs before routine jobs.
5. Repro Room staff will coordinate with MOIR to resolve any conflicts in accomplishing priority or routine repro jobs. Normally, within each of the two categories (priority and routine), repro jobs will be performed on a first-in, first-out basis.

MCC REPRODUCTION REQUEST						JOB		
DOCUMENT TITLE						PRIORITY-OIG APPROVAL		
NAME		TELEPHONE	ROOM	CONSOLE	DATE	TIME		
NO. OF PAGES _____ X COPIES _____ = PRINTS _____				<input type="checkbox"/> ONE SIDE ONLY	<input type="checkbox"/> COLLATE			
				<input type="checkbox"/> TWO SIDES	<input type="checkbox"/> STAPLE			
DELIVERY INSTRUCTIONS						NEEDED BY		
<input type="checkbox"/> WILL PICK UP: CALL WHEN READY		<input type="checkbox"/> RETURN ORIGINALS AND COPIES TO REQUESTOR		<input type="checkbox"/> MAKE DISTRIBUTION TO DISTRIBUTION LIST		TIME DELIVERED		
<input type="checkbox"/> STANDARD DISTRIBUTION (CIRCLE LETTER)		A	E	I	M	Q	U	Y
		B	F	J	R	R	V	Z
		C	G	K	O	S	W	
		D	H	L	P	T	X	
		<input type="checkbox"/> OTHER DISTRIBUTION (SPECIFY)						
SPECIAL INSTRUCTIONS								

JSC Form 258 (Rev Sep 84)

Figure 1.8-1. Reproduction Request form

SOP 1.8.1

TITLE

MCC EQUIPMENT POWERDOWN FOR EMERGENCIES

PURPOSE

To provide instructions for powering down individual pieces of MCC equipment or all MCC equipment in the case of an emergency. The procedures apply to all personnel performing tasks in the MCC and are to be implemented to protect MCC personnel, equipment, and facilities.

PARTICIPANTS

MCC FC TEAM

GROUND CONTROLLER (GC)

*FACILITY SYSTEMS MANAGER (FSM)

FACILITY FIRE WATCH

MCC MAINTENANCE AND OPERATIONS DEPT PERSONNEL

OPERATIONS SUPPORT TEAM (OST) PERSONNEL

JOHNSON CONTROLS (CENTER OPERATIONS)

BUILDING 48 SUPERVISORS AND OPERATORS

GENERAL

All personnel performing work in the MCC are tasked with the responsibility for ensuring the safety and protection of personnel, equipment, and the facility itself. This may require actions (to be taken in the event of an emergency) to power down equipment immediately. Actions taken in this procedure must take into consideration the activities in progress and the impact on such activities. Personnel safety is paramount to any operation.

The FSM is designated the Facility Emergency Marshal. All emergency situations must be reported to the FSM immediately, or as soon as humanly possible. Actions to be taken in human life threatening situations take priority over reporting of the situation.

PROCEDURES

- A. There are several different scenarios that must be addressed to ensure that this procedure is comprehensive. They are:
- Personnel hung up on hot electrical circuits
 - Equipment fire
 - Electrical shutdown of individual equipment racks
 - Electrical shutdown of an entire facility
 - Water leak

Several built-in safety features have been provided to further ensure the safety of personnel, facilities, and equipment.

1. SAFETY BOARDS

Each floor of the MCC facilities has been provided with several Green Safety Boards." These boards contain safety items as listed below.

- Rope
- Cane
- Flashlight
- CPR paraphernalia
- Floor puller

2. EQUIPMENT LABELING

All equipment in the MCC has been labeled with equipment power tags (figure 1.8.1-1). These equipment power tags indicate which technical power panel or power distribution unit (PDU) provides the power for that equipment. The tag indicates the tech power panel or PDU that supplies the power and its breaker number.

3. POWER PANELS

All power panels in the MCC have been clearly labeled with large signs on the wall above the panels indicating the panel numbers. These signs are clearly visible from anywhere on the floor, making it easy to spot the vicinity of panels providing power to the equipment.

4. EMERGENCY POWER OFF (EPO)

All applicable computer areas in building 30S have been equipped with an EPO system. The EPO push buttons are located at the exits of the affected room. The EPO buttons are clearly labeled. Each EPO button is equipped with a hinged clear plastic cover which is labeled "Warning: pushing this button will power down all computer equipment in this room."

AC POWER SOURCE XSO 8360
NEW 3-87

P/P NO	<input type="text"/>	ITEM NO	<input type="text"/>
BKR	<input type="text"/>	BUS	<input type="text"/>
VOLT	<input type="text"/>	PHASES	<input type="text"/>
OTHER EQUIP AFFECTED	<input type="text"/>		

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Figure 1.8.1-1. Equipment power tag

B. PERSONNEL SAFETY

In the event personnel get hung up on hot electrical circuits, several methods are available to disengage the person from the current.

1. Using the rope or cane from the safety board, loop it around the employee and pull him or her free of the current. (Rope or cane does not conduct electricity.)
2. Remove power to the equipment by
 - a. Throwing the ACPC to the off position
 - b. Throwing the circuit breaker feeding the equipment
 - c. Engaging the EPO for the affected area (if available)

C. EQUIPMENT SAFETY

In the event of smoke and/or fire coming from the equipment, one of the following actions should be accomplished:

1. Remove power to the equipment by
 - a. Unplugging, if stand-alone equipment
 - b. Throwing the ACPC to the off position
 - c. Throwing the circuit breaker feeding the equipment
 - d. Engaging the EPO for the affected area (if available)

D. WATER LEAK

In the event of a water leak causing water to enter electrical equipment

1. Do not attempt to remove power to the rack by the ACPC or other equipment power switches
2. Power down the affected equipment from the circuit breaker in the tech power panel
3. Once the equipment is powered down, cover the equipment with plastic, if it can be done without personal injury

DETAILED PROCEDURES

Building 30 Mission Operations Wing (MOW)

In the event of an occurrence of one of the listed emergencies

- A. Personnel hung up on hot electrical circuits
- B. Equipment fire
- C. Electrical shutdown of individual equipment rack
- D. Water leak

The employee who discovers the incident should

1. If the equipment contains an ACPC or front panel power switches, power the equipment off, if the employee considers this safe to do.
2. If the equipment does not contain an ACPC, front panel power switches, or the employee determines using them is unsafe, the employee should
 - a. Look at the equipment power tag to determine the tech power panel (and breaker number) that supplies power to the affected equipment
 - b. Look up and around the room for the large signs identifying the location of the power panel
 - c. Go to the power panel and turn the affected equipment circuit breaker to the off position

NOTE

Some equipment in this facility is equipped with uninterruptible power systems (UPS's). Look for the UPS signs (figure 1.8.1-2) to identify this equipment. Shutting off the circuit breaker at the power panel will not remove power to this equipment. You must turn off the on/off switch on the UPS to remove power from this equipment.

- d. Notify the FSM of the action you have taken.

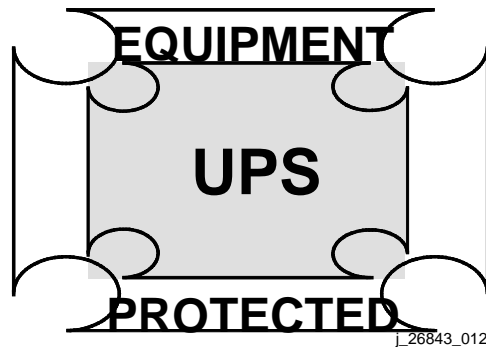


Figure 1.8.1-2. UPS sign

ODRC

In the event of an occurrence of one of the listed emergencies

- Personnel hung up on hot electrical circuits
- Equipment fire
- Electrical shutdown of individual equipment rack
- Water leak

The employee who discovers the incident should

- (1) If the equipment contains an ACPC or front panel power switches, power the equipment off, if the employee considers this safe to do.
- (2) If the equipment does not contain an ACPC or front panel power switches or if the employee determines that using them is unsafe, the employee should
 - (a) Look at the equipment power tag to determine the tech power panel (and breaker number) that supplies power to the affected equipment
 - (b) Look up and around the room for the large signs identifying the location of the power panel
 - (c) Go to the power panel and turn the affected equipment circuit breaker to the off position
 - (d) Notify the FSM of the action you have taken

Building 30S

In the event of an occurrence of one of the listed emergencies

- Personnel hung up on hot electrical circuits
- Equipment fire
- Electrical shutdown of individual equipment rack
- Water leak

The employee who discovers the incident should

- (1) If the equipment contains an ACPC or front panel power switches, power the equipment off, if the employee considers this safe to do.
- (2) If the equipment does not contain an ACPC or front panel power switches or if the employee determines that using them is unsafe, the employee should
 - (a) Look at the equipment power tag to determine the tech power panel (and breaker number) that supplies power to the affected equipment
 - (b) Look up and around the room for the large signs identifying the location of the PDU's
 - (c) Go to the PDU and turn the affected equipment circuit breaker to the off position
 - (d) If necessary, and the room in question is so equipped, use the EPO at the exit of the room to remove power to all equipment in the room

NOTE

Some equipment in this facility is equipped with uninterruptible power systems (UPS's). Look for the UPS signs (figure 1.8.1-2) to identify this equipment. Shutting off the circuit breaker at the power panel will not remove power to this equipment. You must turn off the on/off switch on the UPS to remove power from this equipment.

- e. Notify the FSM of the action you have taken

FACILITY SAFETY

In the event of a cataclysmic problem in the MCC which affects multiple racks of equipment, an entire floor, or more than one floor, the following actions should be taken by the FSM.

The FSM calls building 48 and requests that they immediately remove all power feeding the 30M or 30S. In the event that no one can be reached at building 48 the FSM should call Center Operations and explain the immediacy of the situation and give them the request.

Obviously this portion of the procedure is only for extreme emergencies and the FSM should ensure that there is no other answer to the problem before invoking this action.

NOTE

This action is to be utilized only in extreme emergencies and the FSM must ensure there is no other means to resolve the situation before invoking this action.

SOP 1.9

TITLE

TEMPORARY TECHNICAL POWER AUTHORIZATION

PURPOSE

To minimize the risk of overloading a technical power distribution unit (PDU), maintain the safety margins required by the national electrical code, maintain the documented configuration of the technical power distribution system, and accommodate the users need for temporary equipment power.

PARTICIPANTS

Maintenance Quality Engineer (MQE)
Facility Operations Manager (FOM)
Users

REFERENCES:

- FCOH SFOC-FL2318 Station Operations Mission Control Center Reconfiguration Requests.
- FCOH JSC-26843 Shuttle Operations Mission Control Center Reconfiguration Requests. Flight Rules Vol. A, A3.1.2-8 MCC POWER
- Em-26, Implementation and Control of Mission Control Center Reconfiguration Request (MRR).
- JSC-270049A, Memorandum of Understanding between MOD and COD
- NEC-NFPA-70 National Electrical Code

DEFINITIONS:

TECHNICAL POWER - A configuration controlled power system designed and installed to provide power for computers, display systems, communication systems, power distribution units, technical power outlets, workstations, and other engineering designated support equipment. Included are A1, A2, B1, B2, and C buses in 30M, and the AX, BX, and CX buses in 30S.

NOTE

Three of the four buses in 30M (A1, A2, B1, B2), and one AX and one BX bus in 30S are "Mandatory for Launch". The CX bus in 30S is mandatory if POCC workstations are required. (REF. Flight Rules VOL. A, A3.1.2-8)

UTILITY POWER - A general purpose power system designed and installed to

provide power for items such as overhead lighting, HVAC, elevators, and the common black or white wall outlets where electrical appliances may be connected.

Utility power may be used for electrical appliances at any time without approval or documentation. All safety requirements are applicable. JSC safety requires all electrical appliances be UL rated.

NOTE:

There are no utility power outlets on or in consoles, cabinets, or the black or gray Walker boxes.

CONTROLLED PDU - A PDU that provides technical power to equipment such as consoles, cabinets, keysets, workstations, monitors, Walker boxes, console and cabinet outlets, etc.: These PDUs and their electrical outlets are under configuration control and require an SR or MRR to add or delete equipment to their circuits. Temporary connection is defined in this SOP.

ISOLATED PDU - A PDU that provides technical power for temporary equipment provided by or for customers in the MCC. Configuration management of these PDUs is from the Walker box back to the PDU. No permanent equipment may be assigned to an isolated PDU.

PROHIBITED EQUIPMENT - Equipment in the following category will not be authorized for connection to any technical power source. Coffee pots microwaves hot plates, refrigerators, heaters, vacuum cleaners, floor buffers, electric drills, electric saws, etc. Items of this type can cause EMI, (Electromagnetic Interference) voltage spikes, and power surges that could have an adverse effect on support systems equipment on the same bus.

PROCEDURE

- A. The user must notify the MQE or the FOM (Alternate) by electronic mail (E-mail) of the request for temporary connection to any MCC controlled PDU. (See exclusions.) The request should include the type of equipment, the location (room number, console position, etc.) and the current draw of the equipment in Amps (see the manufacturers plate on the unit). These data will allow the MQE to review the power loading at the requested location, and provide a more timely response to the request. (Every effort will be made to accommodate the user.) The E-mail address can be found on the JSC Global address list as MCCQE. The MQE may be contacted for assistance at 244-5390. The FOM (alternate) can be reached at 483-5615. Only standalone equipment (no external interface cables required) will be authorized for connection to a controlled PDU without the authorization of an approved MRR. (REF. EM-26)
- B. The MQE (FOM alternate) will evaluate the current loading of the breaker at the requested location, and approve or disapprove the connection. Electronic response to the request will be provided. This electronic request and response will be kept by the MQE as the configuration record until the temporary equipment is removed.

- C. Equipment connected to an isolated PDU does not require prior approval for connection; but the MQE must be notified by E-mail of the equipment description, its location, and the expected installation and removal date. This notification will be kept as a temporary configuration record until the equipment is removed.

Isolated PDU outlets are as follows:

BLD.30M

- Room #211 The black Walker boxes and the user interface cabinet
- Room #212 The black Walker boxes.
- Room #214 the black Walker boxes and the nine interface cabinets.
- Room #215 The black Walker boxes.
- Room #217 The black Walker boxes, the console CIP panels and the CIP panel power strips
- Room #231 The black Walker boxes, the console CIP panels and the CIP panel power strips
- Room #229 The black Walker boxes, the console CIP panels and the CIP panel power strips, and the user interface cabinet
- BLD. 30S
- Room #3301 POCC the black Walker boxes, the console CIP panels, the CIP panel power strips, and the user interface cabinets.

CAUTION

All safety requirements must be maintained.

- The total operating load on any breaker shall not exceed 80% of the rated capacity (i.e., 20-AMP breaker cannot exceed 16-AMP total operating load).
- Extension cords are not allowed. UL-rated power strips may be used but shall not be daisy chained (power strip to power strip).
- Power cords and cables may not be routed in a manner that would pose a safety hazard.
- Equipment with power cords that are frayed or have nonstandard splices will not be allowed.

EXCLUSIONS

- A. WFCR and BFCR consoles have an AC outlet on the front of the console. This outlet is accessible without removing any console access panels, and this outlet may be used without prior approval for personal equipment such as laptops. In addition, MPSR consoles have two power strips on top of the console that are provided for this purpose, and the same rule applies. The MQE will monitor the use of these outlets and assist the user in maintaining the safety and power loading maximum. No records will be kept of personal equipment connected to these outlets.

No permanent equipment may be assigned to these outlets.

- B. Configuration management of floor plans and technical power are not required in the Emergency Operation Center (EOC) or the Rapid Lab.

SOP 1.10

TITLE

HEADSET ISSUANCE, MAINTENANCE, AND ACCOUNTABILITY

PURPOSE

To define the procedure for issue/turn-in of a headset or other voice communication device (headset/speaker) and obtaining maintenance on the device, and to define the accountability process for the devices.

PARTICIPANTS

MOD EMPLOYEES
USA EMPLOYEES
OTHER CENTER ELEMENTS

GENERAL

The USA logistics management organization is responsible for issue, receipt, maintenance, and inventory of headsets and other devices used by MOD and the USA organizations.

The Automated Logistics Management System (ALMS) is utilized to maintain inventory management of these devices. This includes ensuring that adequate spares/parts are on hand to meet projected needs. Budgeting is to be included in the USA logistics budget submittals.

Issue, turn-in, and maintenance are at the substore in building 5 (room 1006). Emergency replacement of defective units may be obtained through the Facility Operations Manager (FOM) in the MCC (room 111). The user shall give the defective unit to the FOM at the time of the replacement.

New issues must be approved by the requesters' branch chief (NASA) or department manager (USA). Once issued, these devices will become an accountability item for the receiver, and must be turned in prior to terminating employment. Each device will have an equipment identification number via which they will be tracked.

PROCEDURES

A. New Issue

1. Requester will obtain branch chief's (NASA) or department manager's (USA) concurrence on NASA form 1348 (NASA) or USA form USA 3977-H and submit to the substore.
2. Substore personnel will enter appropriate data into the ALMS.
3. Requester will sign inventory transaction form and be issued headset.

B. Return

1. Submit headset to the substore.
2. Obtain turn-in receipt from substore personnel.
3. Substore personnel will enter appropriate data into ALMS.

C. Maintenance

1. Headsets requiring maintenance will be submitted to the substore.
2. Turn-in for maintenance will result in issuance of another headset (if required). Inventory transaction forms must be completed as in new issue.
3. During support periods, emergency maintenance of a headset device may be obtained through Houston Voice.

SOP 1.11

TITLE

NASA HEADQUARTERS INTERFACE

PURPOSE

To provide a procedure for the flow of data from the MCC Action Center staff to NASA Headquarters during the real-time support timeframe of shuttle flights. This procedure will identify the data to be sent, its frequency, and method.

PARTICIPANTS

MCC ACTION CENTER STAFF
SPAN STAFF
COMMUNICATIONS CENTER STAFF
SSP STAFF

GENERAL

A. Operational Philosophy

The MCC Action Center staff will continue to maintain its current flight status during the real-time environment and copies of selected data will be sent by rapidfax to NASA Headquarters in a timely manner throughout the flight. Sufficient data will be sent to maintain the necessary headquarters visibility of the mission status.

B. Responsibilities


The MCC Action Center staff is responsible for making copies of selected data, sending it by SSP fax machine or filling out a facsimile transmission form (NASA Form 1120, figure 1.11-1) and sending it via P-tube station 01 to the communications center.

The SPAN staff is responsible for preparing the consumable status data to be sent.

The MCC Action Center staff is responsible for sending the selected data by rapidfax to NASA Headquarters.

PROCEDURES

- A. The MCC Action Center staff will send selected data (figure 1.11-2) to NASA Headquarters prior to MMT meetings and at 1 p.m. daily throughout the flight duration.

		Facsimile Transmission <i>(Instructions on Reverse)</i>		
1. TRANSMITTING STATION NO. 713-483-3368 / 2164 / 4963	2. VOICE PHONE CONTACT NO. 713/483-2270	3. MESSAGE NO.	4. TOTAL PAGES (Including lead)	5. DATE
6. FROM (Name, organization and location):				7. OFFICE CODE
				8. OFFICE PHONE NO.
9. TO (Include Office Code and telephone number.) (May also be used for remarks):				
<small>NASA FORM 1120 DEC 78 PREVIOUS EDITION MAY BE USED (MOD Ethernet Sept 84)</small>				<small>NASA/JSC</small>

j_26843_014

Figure 1.11-1. Facsimile Transmission form

- B. The consumable status data is delivered to room 235 from SPAN to the MCC Action Center staff.
- C. The data is sent via SSP fax machine or by the communications center for transmission to NASA Headquarters via P-tube 51.
- D. Maintain a log of the data sent by filling out figure 1.11-2 after each transmission.

SOP 1.12

TITLE

MCC FACILITY SCHEDULING

PURPOSE

To establish procedures for scheduling of Mission Control Center (MCC) resources and associated support.

PARTICIPANTS

*MCC SCHEDULING
FSM
ALL MCC USERS

GENERAL

Scheduling of all MCC equipment must be coordinated through the MCC scheduling office (483-6901, 6902 or 6903). All users must adhere to procedures identified in the MCC Configuration Manual, SOC87-0029.

PROCEDURES

For all procedures and forms, see the MCC Configuration Manual noted in GENERAL.

- A. Scheduling request forms (available in the MCC scheduling office) are submitted at the Joint Evaluation Team (JET) meeting or to the MCC scheduling office by close of business Tuesday prior to the week in which time is required.
- B. The name of the person appearing on the scheduling request form is considered the primary user for that run. Piggyback users must coordinate with the primary user and scheduling.
- C. All scheduled users must contact the FSM 15 minutes prior to run time. If no contact is made, the scheduled equipment will be returned to operations and OST support released. Upon completion of the run, the user must notify the FSM and supporting consoles that the run is finished.
- D. Run cancellation must occur 12 hours in advance of run start time. If the primary user cancels and piggyback users are known to exist by the scheduling office, the scheduling office will cancel all resources not required by the piggyback user(s) of that time. If only the primary user exists, the run will be cancelled.
- E. Additional resources may be coordinated through the scheduling office up to 48 hours in advance.
- F. Users should contact the MCC scheduling office (483-6901 or 6903) or FSM (483-5615) 12 hours prior to check-in time if scheduled time is not to be utilized; otherwise, a no-show letter will be issued.

SOP 1.13

TITLE

STANDARD DISTRIBUTION LISTS

PURPOSE

To establish the rules and responsibilities for the distribution of flight operations information to operations personnel.

PARTICIPANTS

MCC F/Cs

REPRODUCTION

*ACTION CENTER STAFF

GC

PROCEDURES

- A. The Action Center staff, room 1345, bldg. 30S, is responsible for maintaining and publishing current distribution lists.
- B. All materials submitted to Reproduction for subsequent distribution must identify the proper distribution list by letter (A, B, C, etc.) or title.
- C. Changes to the distribution lists should be directed to the Action Center staff, extension 31091.
- D. The Mission Operations Integration Room (MOIR) Manager's staff reviews and approves/disapproves all requests for changes to distribution lists. Disapproved requests are returned to the originator.
- E. Requests for creation of a new lettered distribution list will be submitted to the Action Center and approved by the MOIR Manager.
- F. Distribution will not be made to any organization outside JSC without approval of the FD.
- G. For each mission, the Action Center staff will compile inputs for flight-specific distribution lists which will be provided to Reproduction prior to launch.

**SOP 2
GENERAL OPERATIONS**

SOP 2.1

TITLE

MISSION OPERATIONS INTEGRATION ROOM (MOIR) OPERATIONS

PURPOSE

To define the MOIR operations.

The MOIR facility is the successor to SPAN, Flight Operations Management Room (FOMR) (Skylab), and MER facilities. The MOIR is an MOD-managed facility whose primary purpose is to provide a real-time technical management interface between the Flight Control Team (FCT) and the external program, project/element, CSR/payload customers, contractor, and manufacturer elements participating in a mission. The MOIR provides a formal/documented interface and a focal point for the exchange of information/data between the FCT and these external interfaces, using Mission Action Requests (MAR's).

The MOIR provides a facility for the MOD MOIR Manager and representatives, including astronaut representatives, Space Shuttle Program, and International Space Station (ISS) Program and supports contractors in monitoring and evaluating hardware and software performance during flights, tests, integrated load checkouts (ILC's), simulations, and to plan turnaround/next flight activities.

The MOIR manages dynamic lists of project/element anomalies that are identified, impacted, controlled, and dispositioned by the FCT to ensure the safety of the crew and vehicles(s) and to enhance the accomplishment of the flight objectives.

PARTICIPANTS

Flight Control Team (FCT)
MOIR Manager (MOD)
MOD Representatives (as required)
FCOD Representative
Shuttle Program Representatives
Space Shuttle Vehicle Engineering Office Manager(s)
Space Shuttle Vehicle Engineering Office Contractor Representatives
Space Shuttle Vehicle Engineering Office Subsystem Representatives
EVA Project Office Representatives
SR&QA Representatives
Customer Support Room (CSR)
MSFC Mission Managers/Spacelab Managers
Phase 1 Program Office
ISS Representatives (TBD)

GENERAL

A. MOIR facility

The MOIR facility is an MOD-managed facility that consists of the following:

1. Management area consisting of three consoles with seven workstations
 - a. MOD MOIR Manager
 - b. MOD Representatives, staffed as required, including Flight Dynamics Representative
 - c. FCOD Representative
 - d. Space Shuttle Vehicle Engineering Office Manager(s) and contractor management
 - e. ISS management (TBD)
2. Administrative area with PC's, fax machines, copiers, etc.
3. Thirty-five workstations located in rooms 1358, 1345, and 1345A. Primarily sized for Mission Evaluation Team support during prelaunch, ascent, and entry/landing phases. Reduced requirements during orbit phase allows MOD to use workstations in room 1358 to support MOD activities such as ILC, sim's, training, etc. These workstations will be used by ISS Representatives in the future.
4. Conference room 1344 is reserved for LSEAT prelaunch operations but is available for MOIR Manager scheduling at other times during flight.
5. Conference room 1352 is reserved for Space Shuttle Vehicle Engineering Office for prelaunch, ascent, and entry/landing phases for 7 a.m. conferences with the Space Shuttle Vehicle Engineering Office manager during orbiter flight operations.
6. A document library of limited hardcopy documents is maintained in MOIR- specific locations.

B. MOIR functions

The MOIR Manager is the real-time FCT interface with the Space Shuttle Program and project elements, Customer Support Room/payload customer, and Program Office Phase 1 technical management. In future ISS operations, the MOIR will be the FCT interface with the ISS Program and elements. MAR's, which are commonly referred to as chits, are used for the exchange of data between the FCT and the Space Shuttle Vehicle Engineering Office, EVA Project, Customer Support Room/payload customers, MSFC Spacelab Project, and ISS Program. The chit process is the official method to formally document these data interactions and to ensure operations community visibility to

1. Provide a means of drawing upon expert technical knowledge and the assistance of specialists exterior to the FCT (other JSC and NASA organizations such as Space Shuttle Projects, MSFC Projects, contractors, payload customers, the ISS Program and its project and elements, etc.)

2. Provide inputs relating to the space shuttle orbiter, EVA, Phase 1, Spacelab, and payload (future ISS) hardware/software, operations, and flight requirements during real-time operations.
3. Provide in-depth, near real-time system performance, thermal, software, and loads analyses to the FCT by project elements, including payload customers.
4. Provide an interface and coordination for modification of flight objectives and changing flight priorities.
5. Document requests from customers for flight extensions or changes to flight plans that might affect other flight activities and customers. Documenting requests in a chit reduces confusion and ensures that everyone is operating to the same dataset.
6. Provide assessments and approval of nonstandard operations by program/ project elements.
7. Provide means for the FCT to obtain safety reviews/assessments during flight operations. SR&QA assesses each chit as determined by the MOIR Manager.
8. Provide means for FCT to obtain IFM reviews/assessments and procedures verification.
9. Document agreements and traceability of items, such as Phase 1 transfers between the Mir and the orbiter.

Additionally, the MOIR Manager:

10. Manages FCT anomaly log(s) for the space shuttle and space station (currently in MOD MIS database). The FCT anomaly log includes anomalies from several projects/elements, including: Space Shuttle Vehicle Engineering Office, EVA, SSME, SRB, ET, Spacelab, payloads/experiments, MCC/STDN, and ISS (TBD).
11. Manages the MAR, informally known as chit, process in MOD MIS database. This includes chits to/from the Space Shuttle Vehicle Engineering Office, EVA Project, CSR/payload customers, Phase 1 integration, and ISS (TBD).
12. Calls up technical team and facility support as needed.
13. Provides facility support to the LSEAT during prelaunch periods, including data reproduction.
14. Maintains a daily management report of propulsive and nonpropulsive consumables. The EECOM, EGIL, and PROP Flight Controllers provide consumables data for the daily 3:30 a.m. report.
15. Manages and schedules Action Center support.
16. Provides necessary screening of requests and data flow between the FCT and the Space Shuttle Vehicle Engineering Office, EVA Project, Phase 1 Program, CSR/payload customers, MSFC HOSC, Spacelab Project, etc.

C. Facility protocol and scheduling:

1. The MOIR is a MOD-managed facility that is shared by MOD, Space Shuttle Vehicle Engineering Office, subsystem disciplines, EVA, SR&QA, ISS, LSEAT, etc. Additionally, the MOIR facility will be used by MOD for activities such as ILC, SIM's, training, etc. Therefore, use of the facilities is requested through the MOD Action Center Office, Mary Thomas, telephone number 483-1091.
2. Users of the MOIR facility are responsible for observing all the protocols, security requirements, and procedures. When workstations are not continuously manned, the users are required to sign off, arrange, and secure the workstation ready for the next user.

D. MOIR Manager functions:

The MOIR Manager (MOD) is responsible for the overall management of the MOIR facilities, MOIR administration, MOD word processing, Action Center, reproduction, MAR (chit) processes, the FCT anomaly log, and other MOIR functions. The MOIR Manager shall follow the flight events, systems status, payload status, and keep a log with flight specifics, anomalies, shift briefings, etc. to enable responding to calls for flight progress and status. The MOIR Manager acts as an interface between the FCT and the external interfaces, including the Space Shuttle Vehicle Engineering Office, CSR, and MSFC Spacelab Managers/HOSC. The MOIR Manager is responsible for maintaining regular communications with the Space Shuttle Vehicle Engineering Office, CSR, MSFC HOSC, etc. to ensure efficient MOIR operations.

1. MAR processing:

- a. The MOIR Manager is responsible for management and implementation of the MAR's/chits processing.
- b. Prior to processing the chit, the MOIR Manager reviews each chit to ensure the suitability, clarity, conciseness, and use of the appropriate form. The MOIR Manager ensures that the chit is properly completed and that the response time is reasonable and appropriate. The MOIR Manager coordinates corrections/editorial changes to the chits with the initiator. The MOIR Manager determines if a chit requires multiple responses, verbally advises the responders, and enters the FCT responders in the MIS.
- c. The MOIR Manager ensures that each chit is processed according to the enclosed procedures and flow diagrams.
- d. The MOIR Manager shall designate the FCT responder(s) to chits in the MIS, as well as verbally advising the responder(s), including which discipline is prime and responsible for coordination with other members of the FCT.
- e. The MOIR Manager shall verbally advise the chit recipient (Space Shuttle Vehicle Engineering Office, CSR, MSFC S/L Manager/Mission Manager, etc.) each time the MOIR Manager has opened/initiated a new chit and each time the MOIR Manager has responded to a chit.

- f. The MOIR Manager reviews the chit status periodically to ensure that responses meet the requested time or negotiates a revised "time due" with the initiator and the responder(s) that is consistent with the uses of the available resources.
 - g. Once during each shift (at 4 a.m., 12 noon, and 8 p.m.), the MOIR Manager completes the status review of the chits, "publishes" and prints out a copy of the chit log, and forwards to reproduction for limited hard copy distribution (responder, requester, bulletin board(s), Flight Director, Action Center).
2. FCT anomaly log:
- a. The MOIR Manager is responsible for the management and implementation of the FCT anomaly log, which includes anomalies from the following projects/elements: Space Shuttle Vehicle Engineering Office, Payload, SSME, SRB, ET, Spacelab, MCC/STDN, and ISS (TBD).
 - b. The MOIR Manager is responsible for reviewing each anomaly write-up for suitability, clarity, conciseness, and completeness. Each discipline is responsible for entering the anomaly in the Mission Information System (MIS). The FCR Flight Controller advises the MOIR Manager when the anomaly is ready to process for reviewing in the MIS database. The MOIR Manager coordinates corrections/changes to the anomaly with the initiator/FCR flight controller. Each discipline is responsible for completing the entry of an anomaly in the MIS database prior to shift change.
 - c. The MOIR Manager coordinates orbiter anomalies with the Space Shuttle Vehicle Engineering Office and enters the cross-reference number used by the Space Shuttle Vehicle Engineering Office for the problem.
 - d. The MOIR Manager coordinates EVA anomalies with the EVA project.
 - e. The MOD Manager coordinates the ISS anomalies with the ISS (TBD).
 - f. The MOD Program Integration Office coordinates each FCT anomaly with the Space Shuttle Vehicle Engineering Office, flight crew equipment (FCE), EVA, payload, booster (SSME, SRB, ET, and orbiter MPS), Spacelab, MCC/STDN, and ISS (TBD) with the appropriate projects and offices for postflight presentation of the anomalies to the program.
 - g. The MOIR Manager is responsible for reviewing the anomaly status and for ensuring that the anomalies reflect the most recent activities, including troubleshooting results, probable impacts, workarounds, redundancy use, and safing status (resolution). When the FCT has determined that no further action will be taken related to the anomaly, the anomaly is identified as "closed" for flight status only.
 - h. The MOIR Manager shall review the anomaly log status 2 hours prior to a shift change, request disciplines to complete known anomalies, and then (1 hour before the shift change) "publish" the anomaly log and distribute hard copies to the limited distribution (requester, responder, bulletin board(s), Flight Director, Action Center).

3. MOD and Astronaut Office support:

The MOIR Manager maintains cognizance of chits, flight activities, and events in order to call in support from the Astronaut Office (CB) and MOD, such as Flight Design and Dynamics Support. The CB Representative will be called in to support unscheduled activities such as unscheduled EVA's, IFM reviews, and IFM procedures verifications, as required.

The MOIR Manager shall assist the Flight Director and FCT in callup of facilities and personnel, as requested.

4. CSR support:

The MOIR Manager shall assist the CSR personnel during unmanned CSR periods by answering incoming calls and with callup of CSR Manager support, as required by premission agreements between the MOD Program Integration Office and the Program Office.

5. Consumables Report:

The MOIR Manager shall receive copies of the Consumables data from EGIL, EECOM, and PROP daily at approximately 3:30 a.m. local time and will give the reports to Reproduction for limited distribution.

6. Preapproved G-MEM's

The MOIR Manager shall ensure that the Space Shuttle Vehicle Engineering Office receives a chit for all G-MEM's, preferably with a minimum of 24 hours notice, to enable testing in facilities as required. If the G-MEM is time-critical, the MOIR Manager shall verbally advise the Space Shuttle Vehicle Engineering Office and follow up with a chit.

7. KSC IPR's prelaunch:

The MOIR Manager shall obtain copies of KSC IPR's during prelaunch and will distribute copies to the FCT. (If a scanner is available, the MOIR Manager shall scan the IPR list into a Flight Note.)

8. TMBU updates:

The MOIR Manager shall assist the Space Shuttle Vehicle Engineering Office in obtaining copies of the TMBU messages.

9. Post-wheels stop checklist changes:

The MOIR Manager receives a copy of the FAO post-wheels stop checklist changes from FAO prior to deorbit and sends them to the Space Shuttle Vehicle Engineering Office for transmission to the landing sites.

10. In-flight checkout chit:

The MOIR Manager obtains in-flight checkout times for specific items, prepares a chit, and sends it to the Space Shuttle Vehicle Engineering Office.

11. Postflight prop residuals:

The MOIR Manager obtains the residuals from PROP postlanding and sends a chit to the Space Shuttle Vehicle Engineering Office for transmission to KSC.

12. Landing site coordination:

The MOIR Manager is responsible for calling the KSC LRD on the landing field prime 1 loop at deorbit burn time and providing information about any potential threats or problems that might endanger the ground crew operations. The MOIR Manager shall ascertain any threats, such as prop/thruster leaks, ammonia leaks, etc. from the FCT 2 hours prior to landing and will inform LRD of any threats or of any known problems that exist.

13. MOD word processing, reproduction, and Action Center

The MOD Program Integration Office and the MOIR Manager are responsible for ensuring efficient and effective use of the MOD word processing and reproduction services in support of the FCT. The MOIR Manager shall set the priorities for these facilities/services, which are generally chits, anomalies, reports, and other.

E. FCT functions:

Initiate chits in accordance with this SOP to officially document the exchange of data, such as:

1. Documentation of operations that do not conform to standard operations as specified in flight documentation or operations that violate SODB constraints and limitations
2. Requests for engineering analyses such as thermal, loads, and flight software analyses
3. Requests for hardware and software historical and test data
4. Documentation and visibility of an agreement that affects multiple organizations, perhaps including multiple payload customers and safety representatives
5. Requests for flight day extensions or changes to flight plans that affect multidisciplines or payload customers
6. Notification to projects/elements, payload customers, etc. of significant changes to flight plans
7. Requests for review and agreement of IFM procedures and procedures verification
8. Changes to transfer lists on Phase 1 flights
9. Requests for data related to operations impacted by an anomaly
10. Implementation of preapproved G-MEM's or requests for assessment of proposed G-MEM's

F. Space Shuttle Vehicle Engineering Office, CSR, MSFC Mission Manager/Spacelab Manager, Phase 1 Program, ISS (TBD):

1. Manage project operations related to flight operations

2. Process new chits and chit responses in accordance with this SOP
3. Initiate chits to MOD to request changes to the flight planning that impact crew and flight activities. Include rationale for request
4. Initiate chits to provide new data to the FCT
5. Coordinate requests to the FCT through MOIR Manager
6. Maintain communications with MOIR Manager to ensure efficient MOIR operations

PROCEDURES FOR PROCESSING MARS (CHITS)

A. MAR initiated by FCT requiring one or more of the following to be responder:

1. Space Shuttle Vehicle Engineering Office
2. FCE/EVA
3. CSR/payload customer
4. MSFC S/L management
5. Phase 1 Program
 - a. F/C will document problems, requests for information, or action requests via MIS electronic MAR form on the MCC workstations. Any workstation display needed for supporting information will be electronically captured and attached to the MAR as provided by the MIS system. For ACTION REQD BY (TIME), specify a time in GMT. If required before a flight event, enter the flight event time in GMT. ASAP is not to be used.
 - b. If an F/C other than an FCR operator prepares the MAR, the MAR originator will inform, via voice loop, the appropriate FCR operator that a new MAR is ready for review.
 - c. The FCR operator will review the MAR to ensure that it is clear and concise. After reviewing the MAR, the FCR operator will inform MOIR via voice loop that a new MAR is ready for review and submittal to the required responder(s). (Note that a MAR may require responses from only one or from multiple responders.)

If a MAR is disapproved at any level or review for approval in this procedure, the MOIR will inform the MAR originator (via FCR operator if appropriate) that additional information or a revision needs to be provided.

- d. MOIR Manager reviews the MAR and identifies any elements of the MAR that require clarification or update. Once the MAR is ready for submittal to the responder, the MOIR Manager sets the MAR to open and electronically signs off on the MAR. The MOIR Manager informs the responder via voice loop that a new MAR is available for response. Each new MAR is automatically assigned a MAR control number by the MIS. Each electronic signature is automatically time tagged with GMT by the MIS.

- e. Enclosures to the MAR are scanned or typed into the system, page numbered, and attached to the MAR or must be manually attached and submitted with a hard copy of the MAR.
 - f. MOIR Manager maintains a hard copy of the MAR log.
 - g. The response(s) to the MAR are documented on the bottom of the MIS electronic MAR and saved in the MIS. A data source entry that identifies the source of pertinent data used to generate the response must be clearly indicated in the response. Enclosures that are part of the response to the MAR are scanned or typed into the system, page numbered, and attached to the MAR or must be manually attached and submitted with the MAR. Once a responder has completed the entry of the response, the appropriate management personnel will electronically sign off the MAR in the designated box on the electronic MAR. After electronic signoff is complete, the responder informs the MOIR Manager via voice loop that his response is complete.
 - h. The MOIR Manager coordinates the response(s) with the appropriate requesting discipline to obtain FCR F/C concurrence.
 - i. Following F/C concurrence on all responses, the MOIR Manager electronically signs off and closes the MAR.
 - j. Final closeout hard copies are sent to F/C's and positions that do not have access to MIS (and to strategic management locations).
- B. MAR initiated by external organizations requesting FCT response
- 1. The requester will document problems, requests for information, or action requests via MIS electronic MAR on the MCC workstations. Any workstation display needed for supporting information will be electronically captured and attached to the MAR as provided by the MIS system. For ACTION REQD BY (TIME), specify a time in GMT or specify a flight event: ASAP is not to be used. Enclosures to the MAR are scanned or typed into the system, page numbered, and attached to the MAR or must be manually attached and submitted with a hard copy of the MAR.
 - 2. The appropriate requesting manager reviews and approves (electronically signs) or rejects each MAR. MIS electronic signatures are automatically tagged with GMT.
 - 3. After the requesting manager electronically signs the MAR, he informs the MOIR Manager via voice loop of the new MAR for review and response on the MIS.
 - 4. The MOIR Manager reviews the MAR, coordinates any clarifications of the MAR with the requester, and electronically establishes the MAR as open for review and response, or rejects the MAR. The MIS automatically assigns a MAR control number once the MAR is electronically assigned as open by the MOIR Manager.
 - 5. The MOIR Manager coordinates with FCR F/C's to satisfy the MAR. More than one discipline may be required to respond to the MAR. MOIR Manager will electronically grant access to F/C positions to provide responses to the MAR via the MIS. The MOIR Manager will inform affected F/C positions via voice loop to review and provide a response to the MAR.

6. The FCR F/C's will make every effort to respond to MAR(s) without compromising the real-time operation.
7. The F/C response to MAR(s) will be documented on the bottom of the MIS electronic MAR form. Each required F/C position response will be provided in the appropriate response area of the form. Each F/C position providing a response will identify their discipline as part of the response. Each F/C position, after providing a response, will inform the MOIR Manager via voice loop that a response has been provided. A data source entry must be clearly indicated on the MAR.
8. After the MOIR Manager reviews and concurs with the MAR response, he electronically signs and closes the MAR. The MOIR Manager informs the requester via voice loop that the MAR is closed.
9. Hard copies are made and distributed as in step A.10.

Detailed instructions for use of the MIS for MAR generation and processing are contained in "Mission Information System (MIS) Ops Concept and Training Supplement Manual, Chit Report Processor," latest version.

- C. Procedures for implementation of chits related to Russian hardware/transfer list changes are contained in the following pages.

PROCEDURES FOR IMPLEMENTATION OF CHITS RELATED TO RUSSIAN HARDWARE/TRANSFER LISTS CHANGES

Reference section 16, Transfer Change Coordination, procedure 16.1.

Real-time changes to the transfer list:

Suggest that the chit title be descriptive of the type of transfer and be serially numbered; e.g., "Russian hardware transfer addition no. 1."

- A. To add an item to be returned on the shuttle:

1. Russian hardware: (addition)
See flow diagram 1 and figure 2.1-1
2. U.S. hardware: (addition)
See flow diagram 2.

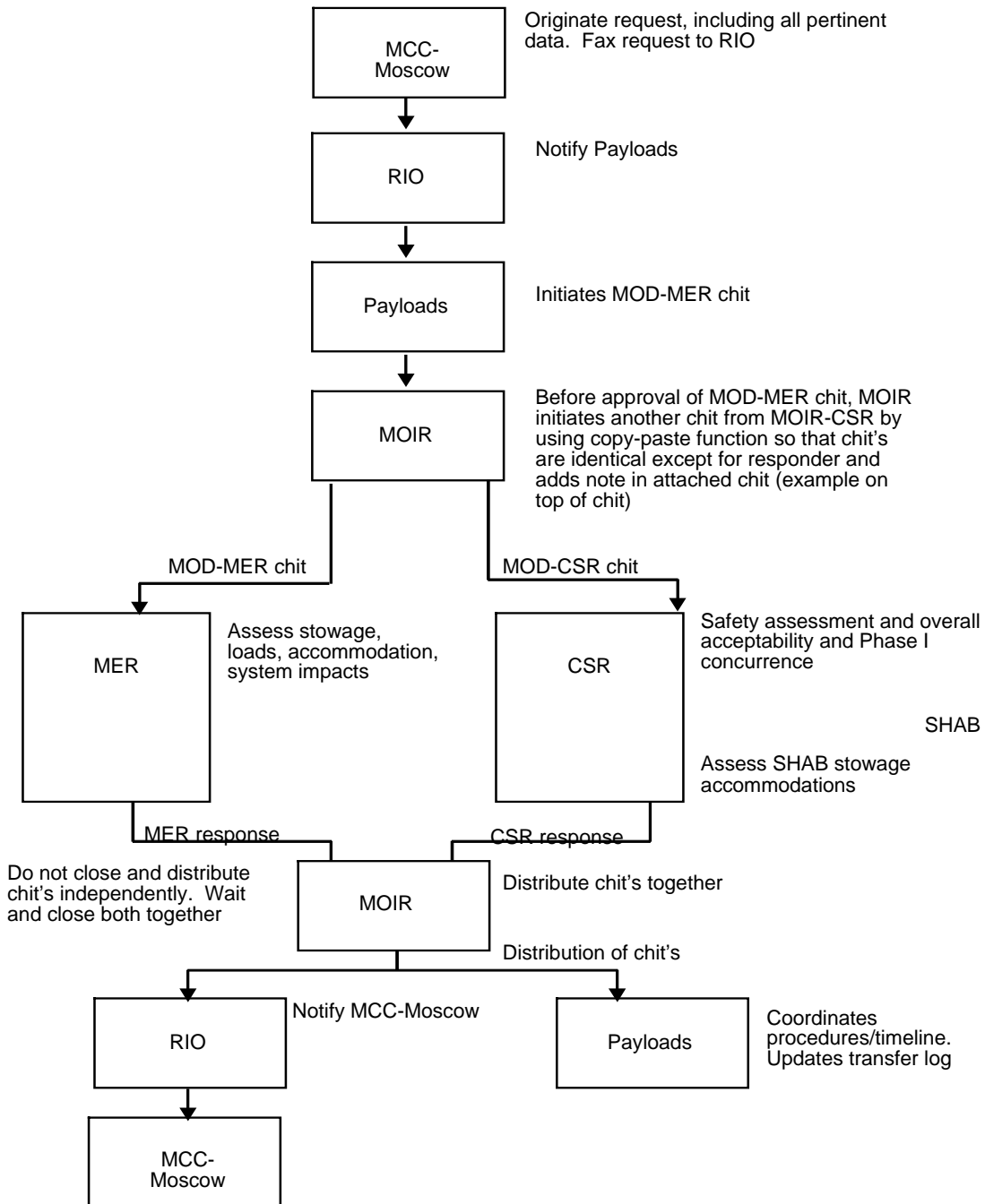
- B. To delete an item from the return list:

1. Russian hardware: (deletion)
See flow diagram 3.
2. U.S. hardware: (deletion)
See flow diagram 4.

Chits with questions/issues to/from RSC-Energia

- A. MER-PI&E on MER-MOD chit
See flow diagram 5.
- B. PI&E-MER on MOD-MER chit
See flow diagram 6.

Flow diagram 1 - To add an item to be returned on shuttle: Russian hardware. Requested by MCC Moscow. See figure 2.1-1.



MOIRSOP6.DOC
6/7/96

Launch Date 11/11/95
Vehicle ID OV-104 (15)

STS-074

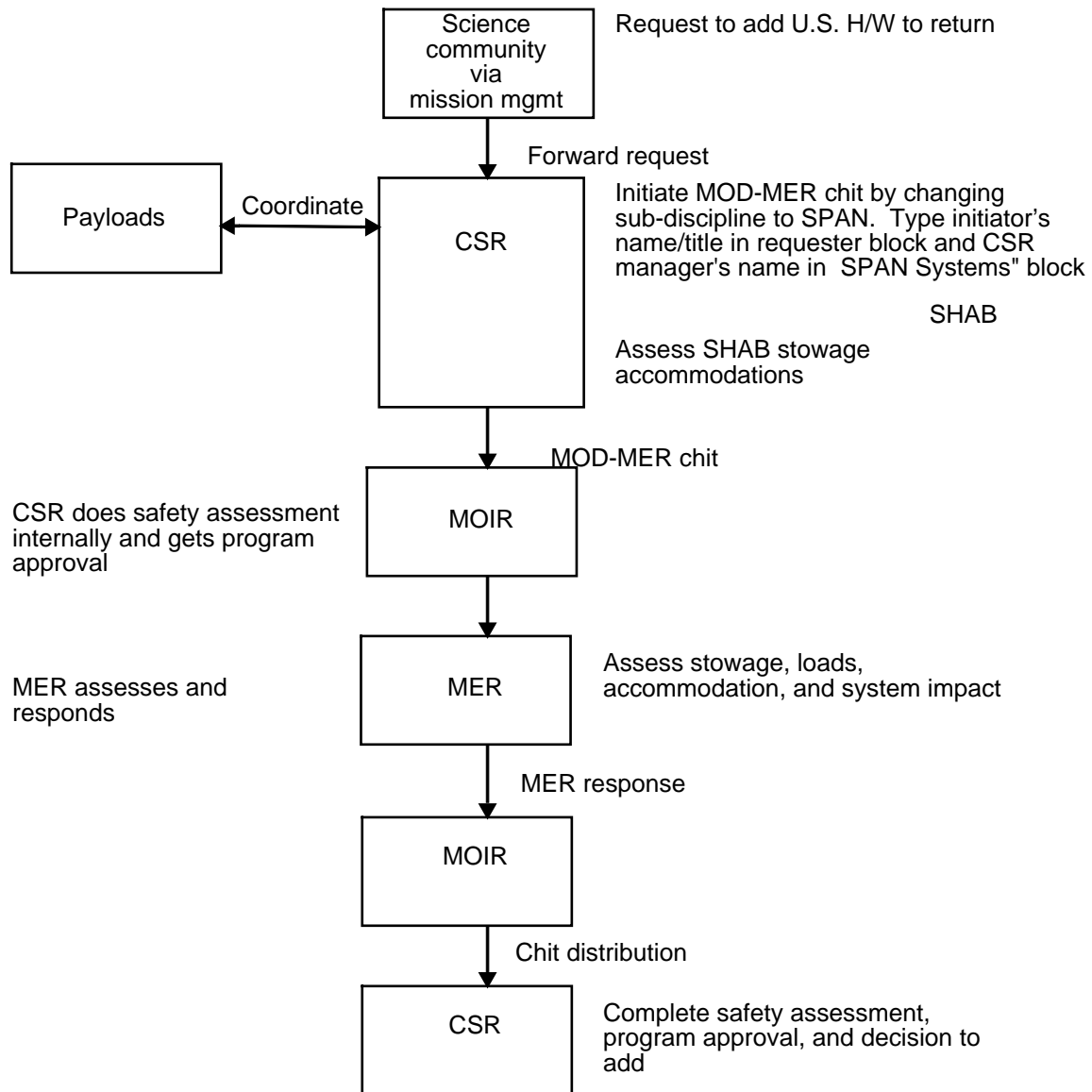
MISSION ACTION REQUEST (CHIT)

GMT TIME	REQUEST ORG	MOD	RESPONSE ORG	MER
ACTION REQUESTED BY (TIME):				
REQUESTER: SPAN				
RESPONDER:				
SUBJECT:				
SPAN SYSTEMS	SPAN MANAGER	TEAM LEADER	VE/VG REP	CONTRACT REP
				MER MANAGER
REQUEST	0 Pages in hardcopy file 0 Graphical Attachments			Page 1
<p>NOTE: THIS IS A COMPANION CHIT WHICH IS BEING DIRECTED TO THE MER AND CSR UNDER TWO DIFFERENT NUMBERS. THE MER RESPONSE TO CHIT NUMBER (XXX) AND THE CSR RESPONSE TO CHIT NUMBER (XXX) ARE REQUIRED FOR A COMPLETE RESPONSE. THE MOIR MANAGER WILL CLOSE AND DISTRIBUTE THESE TWO CHITS SIMULTANEOUSLY.</p> <p style="text-align: center;">***END OF REQUEST***</p> <p style="text-align: center;">***END OF RESPONSE***</p> <p><i>MOIR puts both CHIT numbers here before opening either CHIT.</i></p> <p><i>Do not close either CHIT independently. Wait for both CSR and MER responses, then close both CHITs together and distribute together.</i></p> <p><i>(If MER or CSR asks to see response of the other CHIT before they answer their CHIT, print a copy and note it is not closed and hand carry or fax. This is for a "Heads Up".</i></p>				

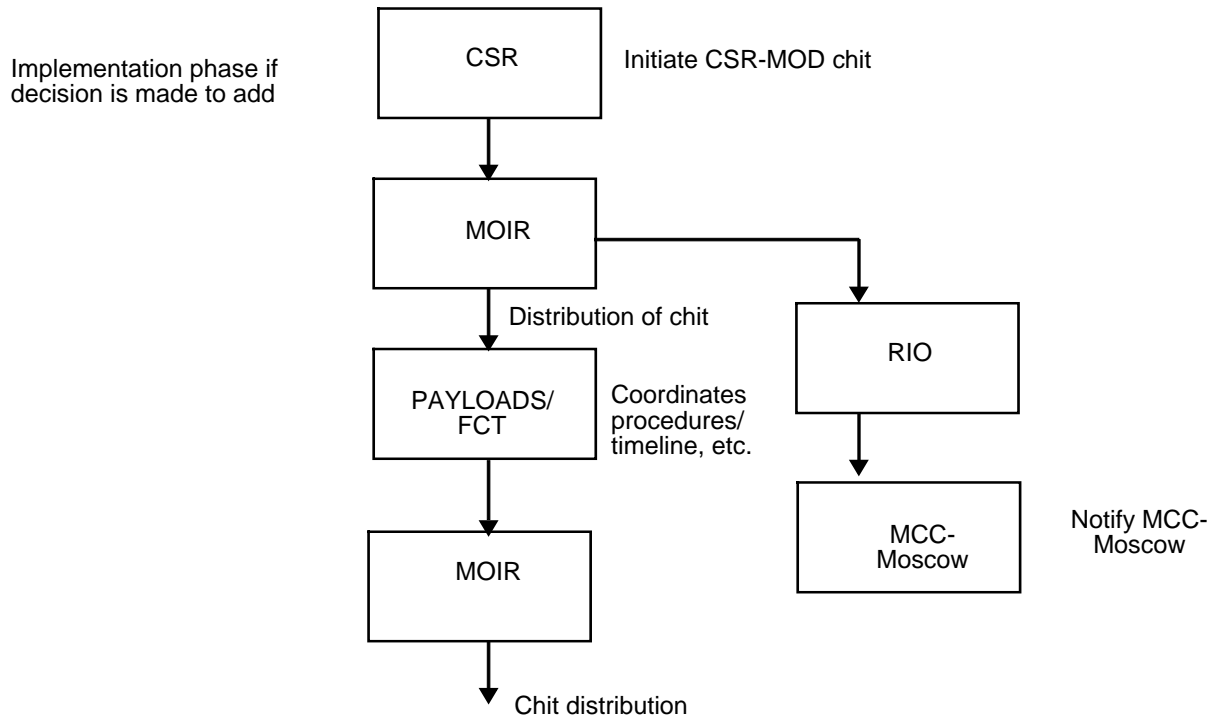
j_26843_0211

Figure 2.1-1. Mission Action Request (Chit)

Flow diagram 2 - To add an item to be returned on shuttle: U.S. hardware. Requested by science community via mission management.



Flow diagram 2 - (cont'd)



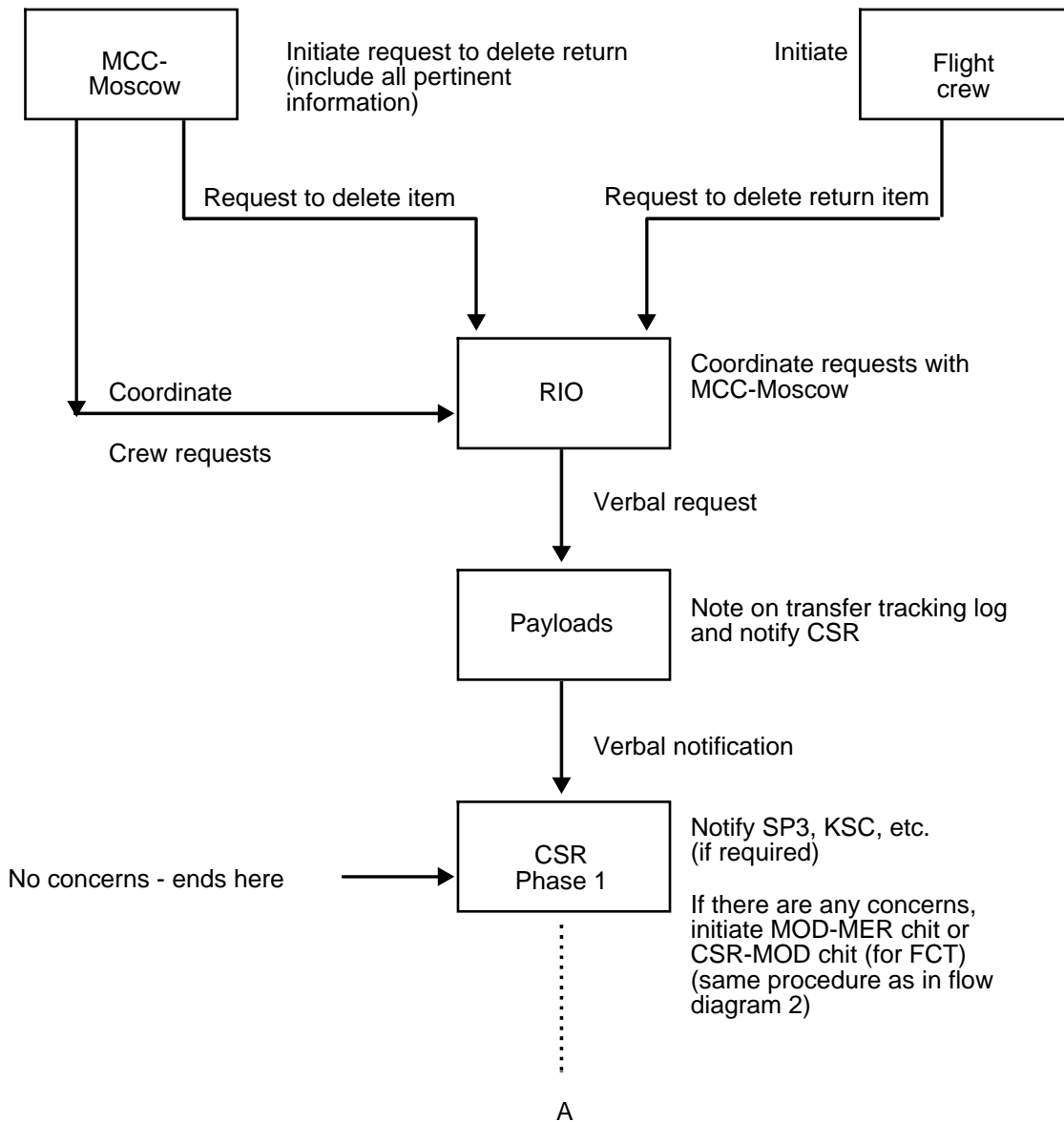
MOIRSOP6.DOC
6/7/96

STS-XX		MOD-MER MISSION ACTION REQUEST		LAUNCH DATE (Date/Vehicle/Times Flown)
TIME (GMT) (GMT of Origination)	REQUEST ORG: (Always) MOD	RESPONSE ORG: (Always) MER	CONTROL NUMBER 001	
ACTION REQD BY (TIME):			REQUESTER: (Name and Title)	
SUBJECT: (Short But Descriptive Title)				
CSR MANAGER'S NAME	CSR MANAGER			
TIME:	TIME:			
Enclosure in SYSTEM		Enclosure in hardcopy file		Page 1 of 1 Pages
RESPONSE:				Page 1 of 1 Pages
RESPONDER				
(Name) TIME: (GMT of Approval)	TIME:			

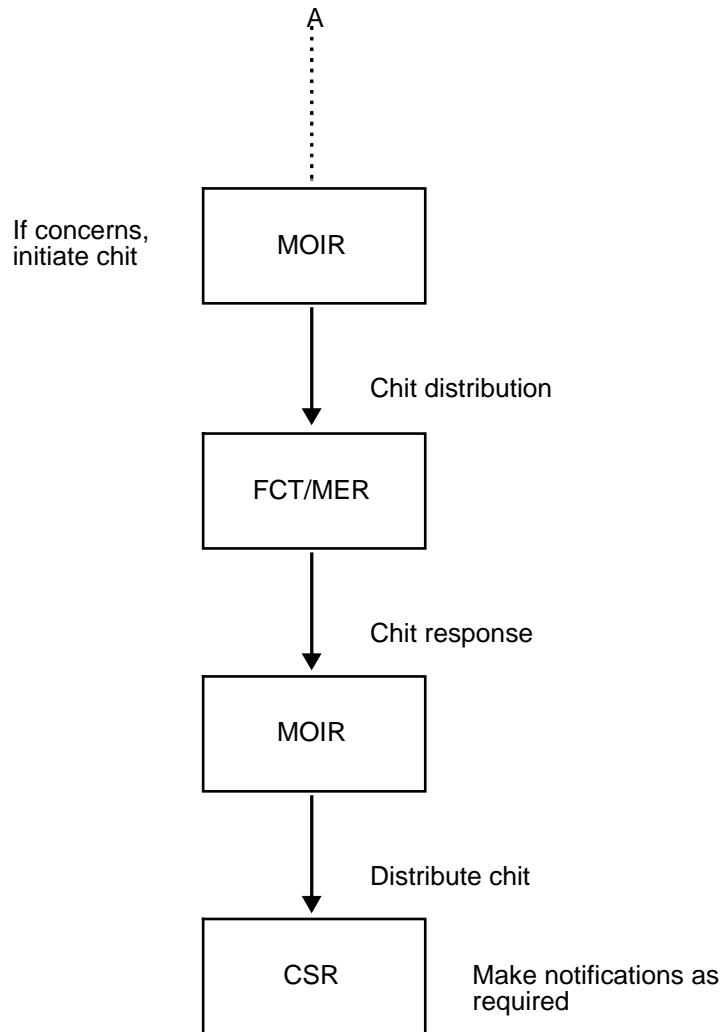
j_26843_0212

Figure 2.1-2. MOD-MER Mission Action Request

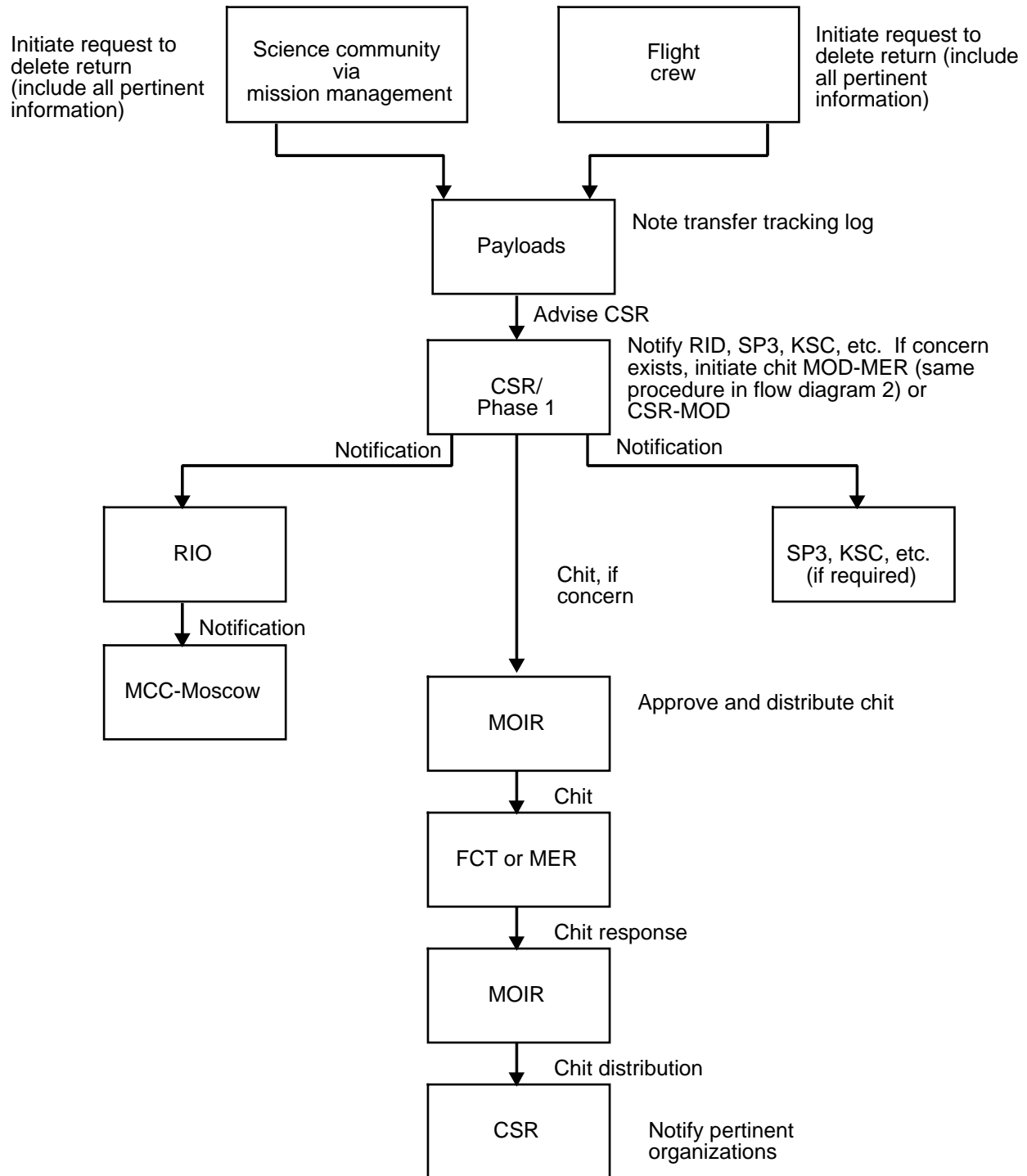
Flow diagram 3 - To delete an item from the return lists: Russian hardware. Requested by MCC Moscow.



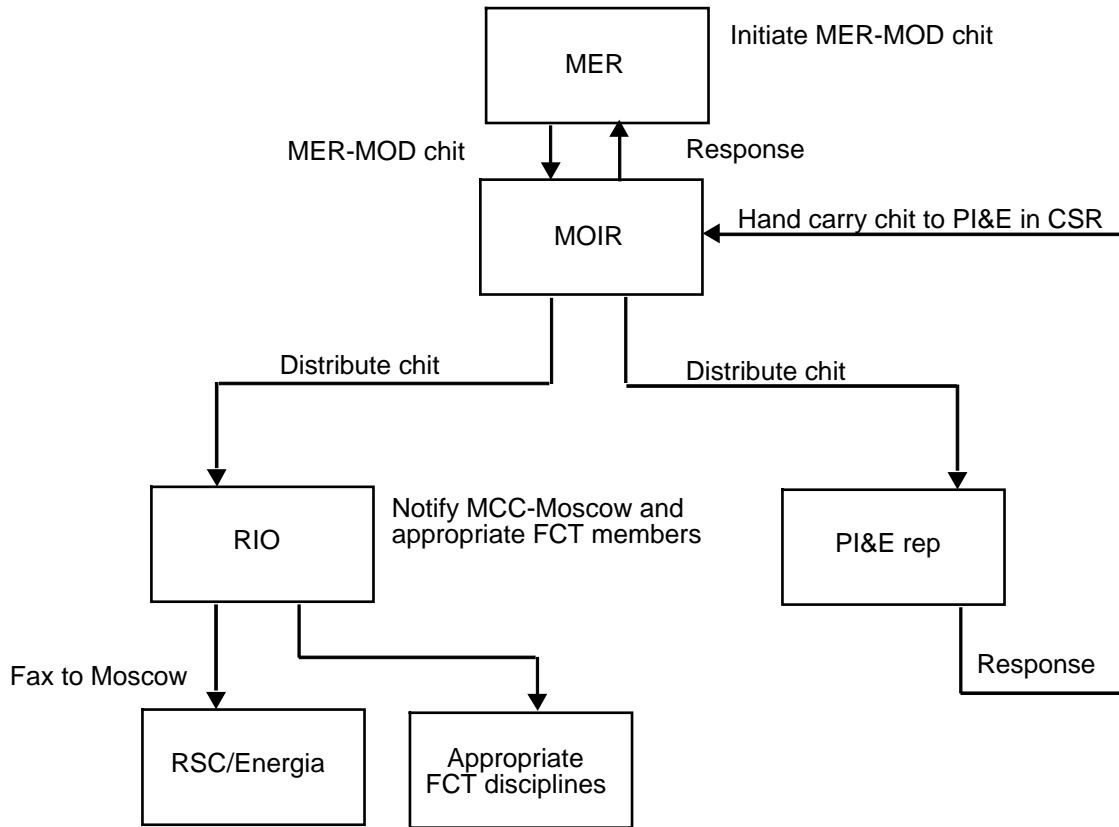
Flow diagram 3 - (cont'd)



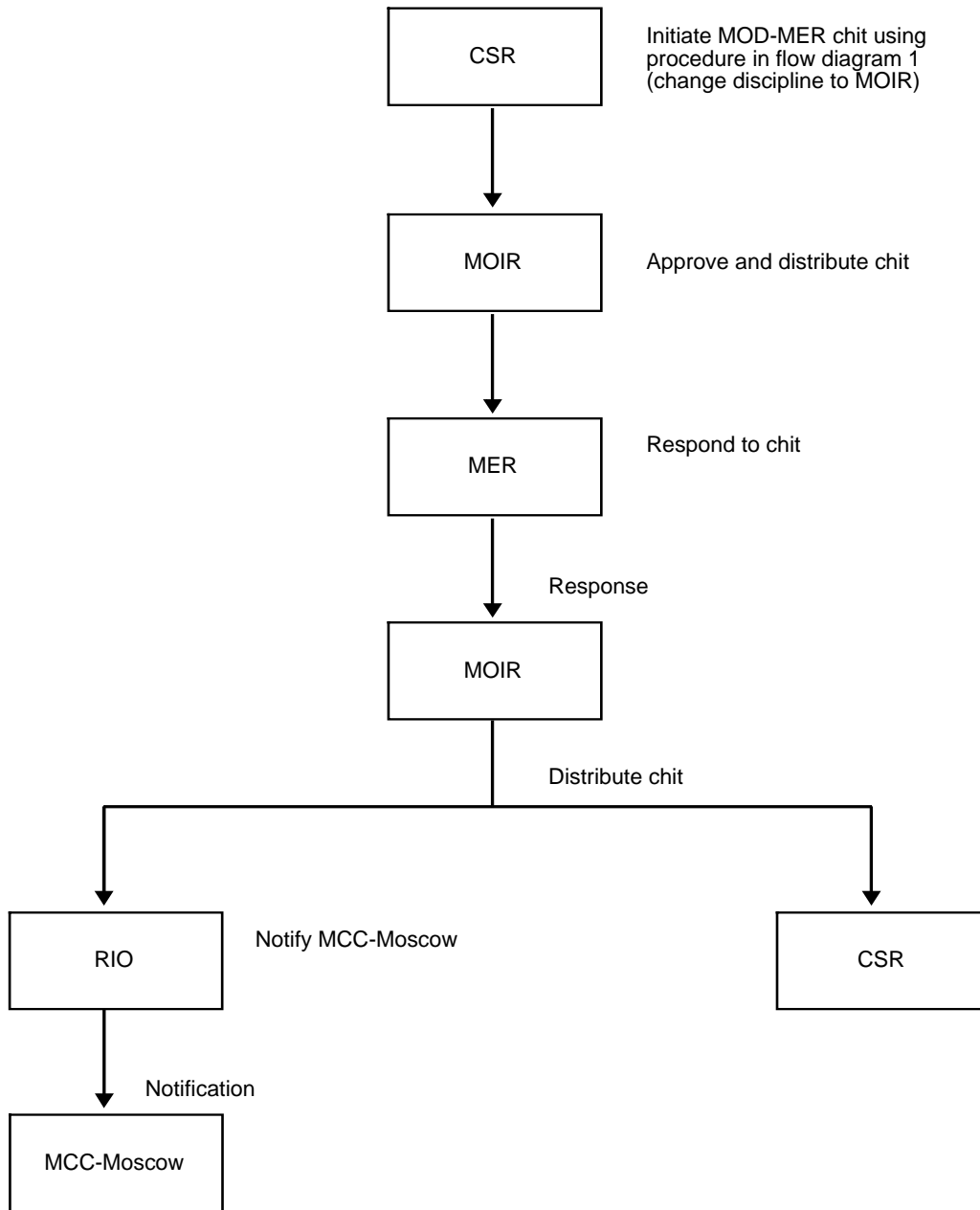
Flow diagram 4 - To delete an item from the return lists: U. S. hardware. Requested by science community via mission management.



Flow diagram 5 - Questions/issues to RSC-Energia from MER.



Flow diagram 6 - Questions/issues to RSC-Energia from PI&E/CSR.



SOP 2.2

TITLE

USER INITIALIZATION OF WORKSTATION APPLICATION SOFTWARE

PURPOSE

To describe the necessary steps for initializing application software on the OSF/1 Alpha client workstation.

PARTICIPANTS

MCC FC TEAM

PROCEDURES

- A. Log on to your workstation using the workstation logon procedures.
- B. After logon, the "DECterm" and "ACTIVITY SELECTION" windows will initialize.
- C. Within the "ACTIVITY SELECTION" window and under the Activity Names section, select the activity being supported.
 - When selected, the activity will black highlight.

NOTE

At this point if you select the "INFO" box you will initialize another window that gives information on the activity selected.

- D. Select "OK" to begin activity initialization.
- E. Select "CONFIRM" in the Confirmation box.
- F. The "CONFIGURATION" window will pop up and display configuration messages. Wait for the message "Configuration Completed Successfully."
- G. After successful configuration, the "DISPLAY NAVIGATION" menu will initialize.

NOTE

Close the "CONFIGURATION MESSAGE" window before selecting a "DISPLAY NAVIGATION" menu item.

- H. At the "DISPLAY NAVIGATION" window, select the menu item needed by moving the cursor, via your mouse, to that menu item, then depress the right mouse button.

DISPLAY NAVIGATION Window Items

- OST . .Toggles to the MASTER DISPLAY" menu
- TELEMETRY
- MOC CCS/C
- DSC CCS/C
- APPLICATIONS

NOTE

EACH DISPLAY NAVIGATION" window item contains a pulldown menu. From the pulldown menu select the application needed.

- I. Initialize applications by depressing the right mouse button.
- J. To toggle to the MASTER DISPLAY" window select OST."

MASTER DISPLAY Window Items

- Master . .Toggles back to the DISPLAY NAVIGATION" menu
- Shuttle
- Station
- Global Apps
- Windows
- Tools
- Prints
- Config
- Help

NOTE

Each MASTER DISPLAY" menu item contains a pulldown menu. From the pulldown menu select the application needed.

- K. Initialize applications by depressing the right mouse button.

SOP 2.3

TITLE

EXECUTE PACKAGE ASSEMBLY AND DISTRIBUTION

PURPOSE

To define the procedure for assembly and distribution of the Execute Package.

PARTICIPANTS

MATS

SUMMARY

The Execute Package is a compilation of messages uplinked at crew wakeup which contains real-time changes to the plan for the applicable flight day. This package will be put on Electronic Document Projects (EDP) for viewing by the Flight Control Team and required external locations.

PROCEDURES

- A. After the morning mail is approved and uplinked, MATS will build a document called FDXX EXECUTE PACKAGE, where XX is the applicable flight day.
- B. MATS will parse the document using the EDP terminal in the FAO MPSR and put the document on the Electronic Document System Server (EDSS) for the Flight Control Team and JSC office viewing via EDP.
- C. MATS will also put the document on the Electronic Document Library Server (EDLS) to transfer the document to external locations (MSFC, GSFC, etc.) as required.

SOP 2.3.1

TITLE

STS FLT PLN REPLANNING FOR FLIGHTS WITHOUT AN INTERACTIVE PLANNING POCC

PURPOSE

To define the method for changing/updating the onboard STS (FLT PLN) for the next crew shift, for operations without an interactive planning POCC.

PARTICIPANTS

- MCC-H FC TEAM
- * FAO
- REPLAN (dual shift only)
- PAYLOADS
- FD
- PAYLOAD CUSTOMER(S)

GENERAL

A POCC that is not an interactive planning POCC is not responsible for timelining payload crew activities or calculating detailed payload attitude timelines.

FLT PLN replanning is the means by which changes can be made to the next shift's FLT PLN during a mission. Changes to the current shift's FLT PLN are submitted per FCOH SOP 2.2.3.

The replanning cycle is referenced to the crew wakeup time for each flight day. For single-shift operations (reference figure 2.3.1-1), a replanning cycle occurs approximately every 24 hours. For dual-shift operations (reference figure 2.3.1-2), a replanning cycle occurs approximately every 12 hours. For dual-shift flights only, REPLAN coordinates the FLT PLN replanning effort (with FAO's cognizance) to allow FAO to monitor the executing crew shift's activities.

- A. The requested FLT PLN changes for the next flight day from both the payload customer (via PAYLOADS) and the FC Team are provided to the FAO by wakeup minus 12 hours. For single shift operations this gives the orbit 2 FAO time to evaluate the requested changes and confer with the current execute FC Team before shift handover to the Planning Team. For dual-shift operations this gives FAO adequate time to coordinate with an FC Team that is both executing and replanning.
- B. By wakeup minus 10 hours, the FAO (REPLAN for dual shift) will provide to the customer (via PAYLOADS) any STS changes that affect payload activities and report on any scheduling conflicts or problems that the STS may have in satisfying the customer requested changes.
- C. The customer (via PAYLOADS) and the FC Team will inform the FAO of any incompatibilities with the STS changes by wakeup minus 8 hours.
- D. The customer will provide the final payload changes to the FAO by wakeup minus 7 hours. All failure/impact/workarounds are also due to FAO and CAPCOM by this time from both the FCT and payload customer.

- E. The time period from wakeup minus 7 hours to wakeup minus 1 hour is used by the FAO to resolve conflicts, finalize the integrated FLT PLN, generate the FLT PLN update message, and review the message with the FC Team. Related procedural update messages are also generated and reviewed during this period.
- F. The FLT PLN update message is completed by wakeup minus 1 hour and is uplinked (per FCOH SOP 2.2.4) during the final hour of sleep so that it is available to the crew at wakeup.
- G. The updated timelines and procedures messages are distributed to the FC Team after they are uplinked as part of the Execute Package.

PROCEDURES

- A. Write the proposed change on a Flight Note and send one copy to FD, and original plus one copy to FAO. Flight Notes should be sent to FAO for both single- and dual-shift operations.
 - 1. Indicate the MET for which the FLT PLN change is valid.
 - 2. Denote the activity name and, if applicable, its associated FDF title and tab reference. The callout should be in the same format as used in the FLT PLN.
 - 3. Fully describe the rationale for the change. To minimize further discussions, include any temporal, attitude, lighting, crewman, or duration constraints. Identify flexibility in the constraints to facilitate scheduling.
- B. Contact the FAO on the FAO loop to review the change. During dual-shift operations, FAO may defer this activity to REPLAN on the Crew Ops loop.

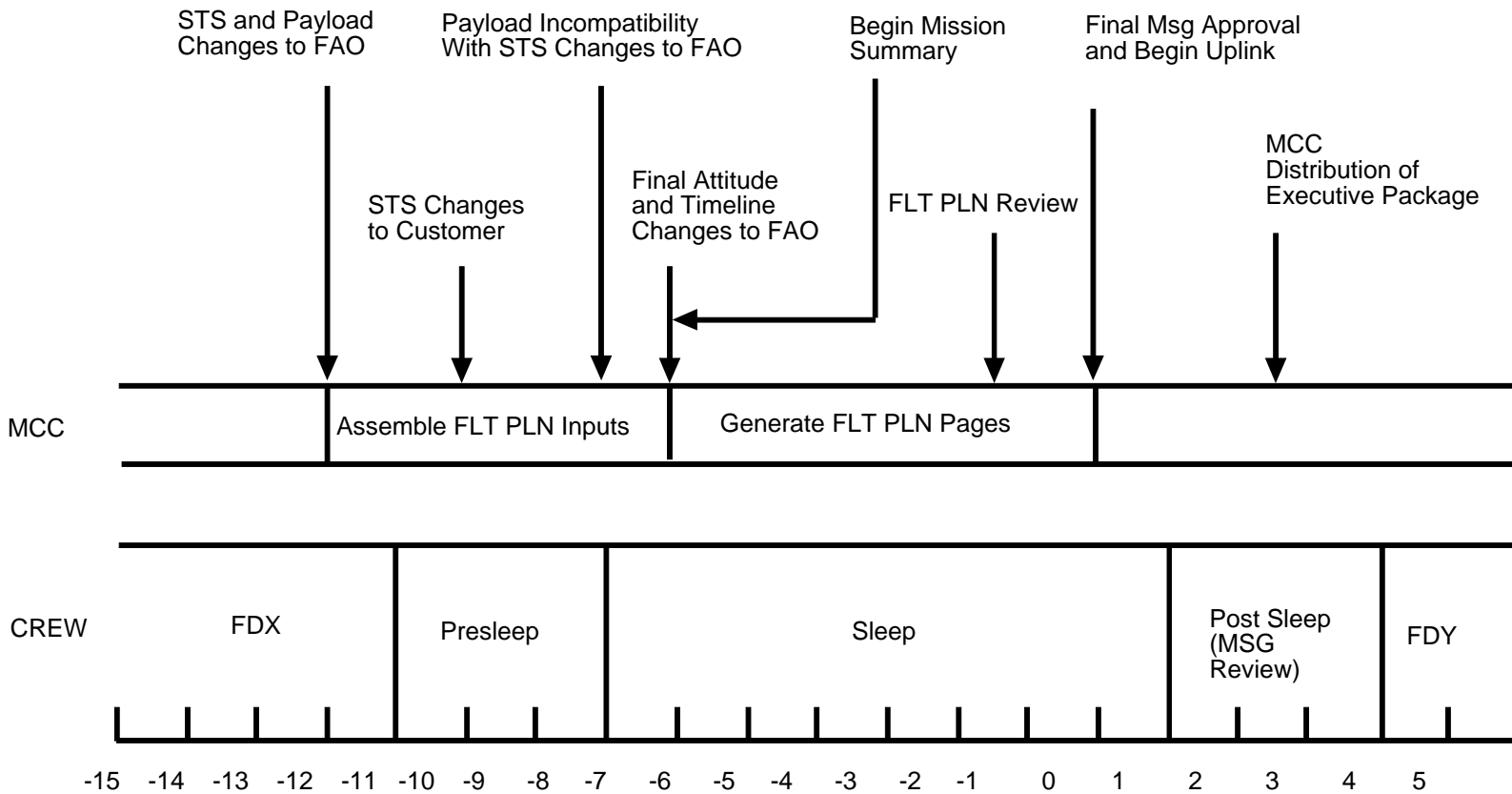


Figure 2.3.1-1. Single-shift replanning without an interactive POCC (POCC does not produce PCAP)

a3348s2

2.3.1-1

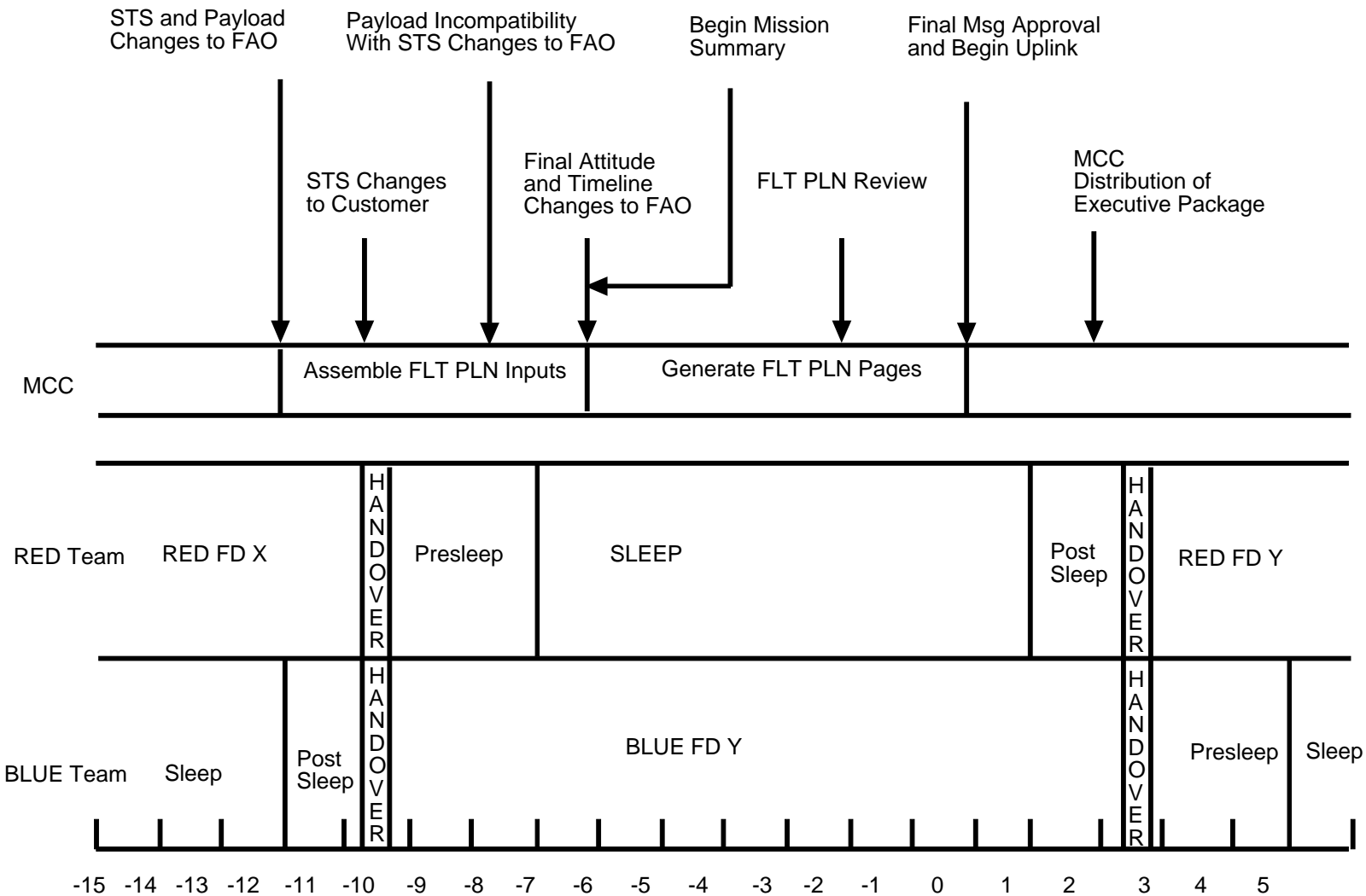


Figure 2.3.1-2. Dual-shift replanning without an interactive POCC (POCC does not produce PCAP)

SOP 2.3.2

TITLE

STS CREW ACTIVITY AND PAYLOAD CREW ACTIVITY REPLANNING FOR FLIGHTS WITH AN INTERACTIVE PLANNING POCC

PURPOSE

To define the method for changing/updating the onboard FLT PLN and define the interface with an interactive planning POCC in changing/updating the onboard payload crew activities for the next crew shift.

PARTICIPANTS

- MCC FC TEAM
- * FAO
- REPLAN (dual shift only)
- FD
- PAYLOADS
- POCC

GENERAL

An interactive planning POCC is defined as a POCC that is responsible for timing payload crew activities and/or calculating detailed payload attitude timelines.

Replanning is the means by which changes can be made to the next shift's FLT PLN and/or the payload crew activity timeline. The payload crew activities will be included as part of the FLT PLN or in a separate document called the Payload Crew Activity Plan (PCAP). Changes to the current shift's STS FLT PLN are submitted per FCOH SOP 2.2.3. The method for changing the current shift's payload timelines will be documented in the appropriate Joint Operations Interface Procedures (JOIP).

The replanning cycle is referenced to the crew wakeup time for each flight day. For single-shift operations (reference figure 2.3.2-1) a replanning cycle occurs approximately every 24 hours. For dual-shift operations (reference figure 2.3.2-2) a replanning cycle occurs approximately every 12 hours. For dual-shift flights only, REPLAN coordinates the FLT PLN replanning effort (with FAO's cognizance) to allow FAO to monitor the executing crew shift's activities.

- A. PAYLOADS collects inputs from the FC Team concerning STS constraints on the payload and the status of consumables. PAYLOADS prepares the SSP Constraints Package, which is then reviewed on the FD loop. The SSP Constraints Package is sent to the POCC by wakeup minus 14 hours.
- B. At wakeup minus 12 1/2 hours, the FAO Conference will begin. This conference is held between the FAO (or REPLAN) and the customer to discuss the Constraints Package and its impact to procedures and the timeline.
- C. A science or payload operations planning meeting at the POCC is usually scheduled from approximately wakeup minus 12 hours to wakeup minus 11 hours. The result of this

meeting will be a tentative plan for the next flight day's payload activities. FAO (or REPLAN) participates in this meeting.

- D. The time period from wakeup minus 11 hours to wakeup minus 7 hours is used for interactive timeline generation between the FAO (REPLAN for dual-shift flights) and the POCC. Initial attitude and timeline changes are provided as early as possible. Final attitude and timeline changes are provided to the FAO by wakeup minus 7 hours. Any procedural updates are submitted during this timeframe, as well as failure/impact/workarounds from both the FCT and POCC to be included in the CAPCOM mission summary.
- E. The time period from wakeup minus 7 hours to wakeup minus 1 hour is used to generate update messages for the FLT PLN, attitude timeline, and PCAP (if applicable) and to review with the FC Team.
- F. The messages are completed by wakeup minus 1 hour and are uplinked (per FCOH SOP 2.2.4) during the final hour of sleep so that they are available to the crew at wakeup.
- G. The updated timelines and procedures messages are distributed to the FC Team after they are uplinked as part of the execute package.

PROCEDURES

- A. Write the proposed change on a Flight Note and send one copy to FD and the original plus one copy to FAO. Flight Notes should be sent to FAO for both single- and dual-shift operations.
 - 1. Indicate the MET for which the FLT PLN change is valid.
 - 2. Denote the activity name and, if applicable, its associated FDF title and tab reference. The callout should be in the same format as used in the FLT PLN.
 - 3. Fully describe the rationale for the change. To minimize further discussions, include any temporal, attitude, lighting, crewman, or duration constraints. Identify flexibility in the constraints to facilitate scheduling.
- B. Contact the FAO on the FAO loop to review the change. During dual-shift operations, FAO may defer this activity to REPLAN on the Crew Ops loop.
- C. FLT PLN and payload crew activity changes from the POCC are usually requested via replanning requests. Attitude timelines are updated using attitude timeline Flight Notes. The specific forms used will be documented in the appropriate JOIP.

a3348s2

2.3.2-3

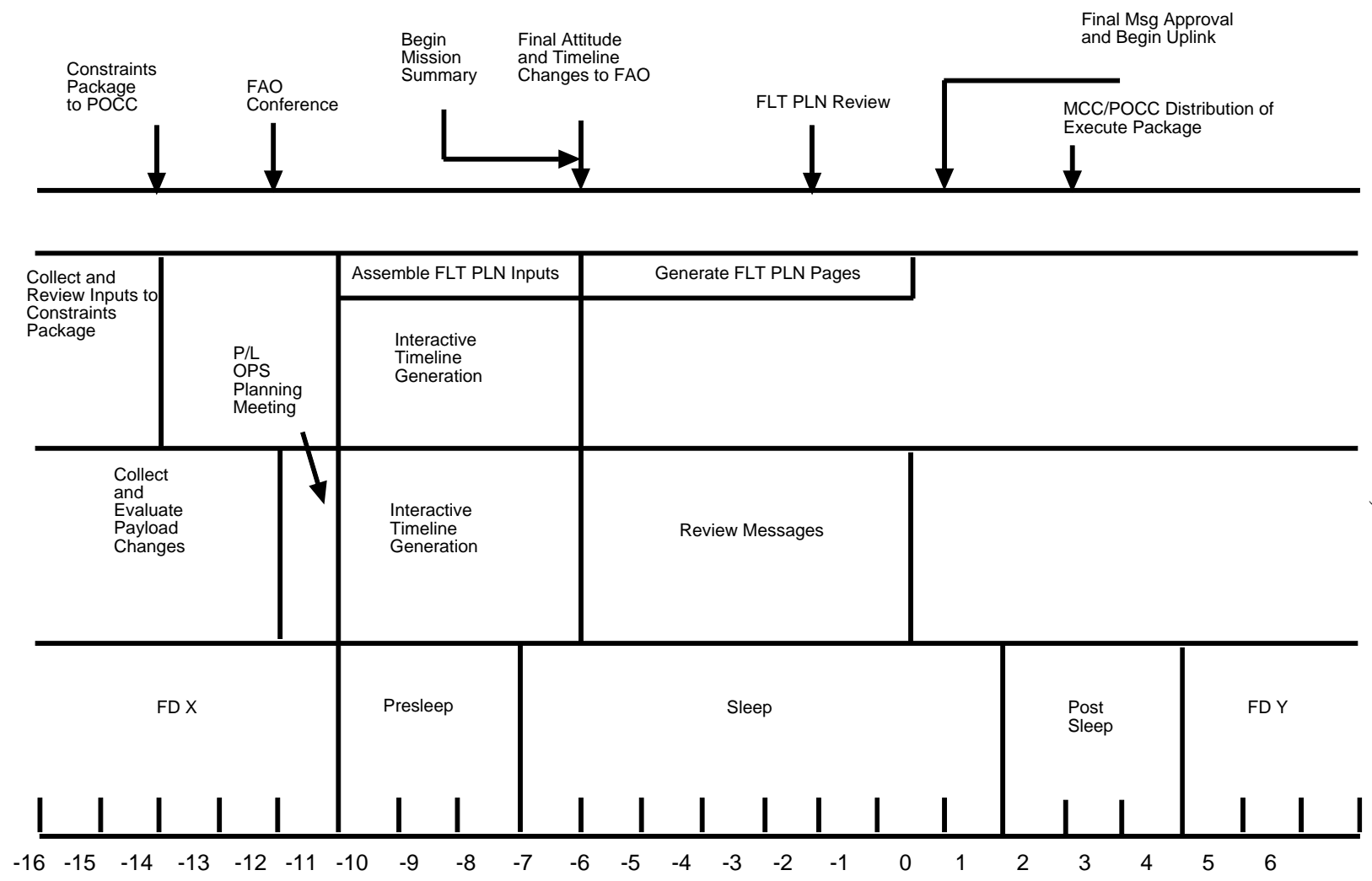


Figure 2.3.2-1. Single-shift replanning with an interactive POCC (POCC produces PCAP)

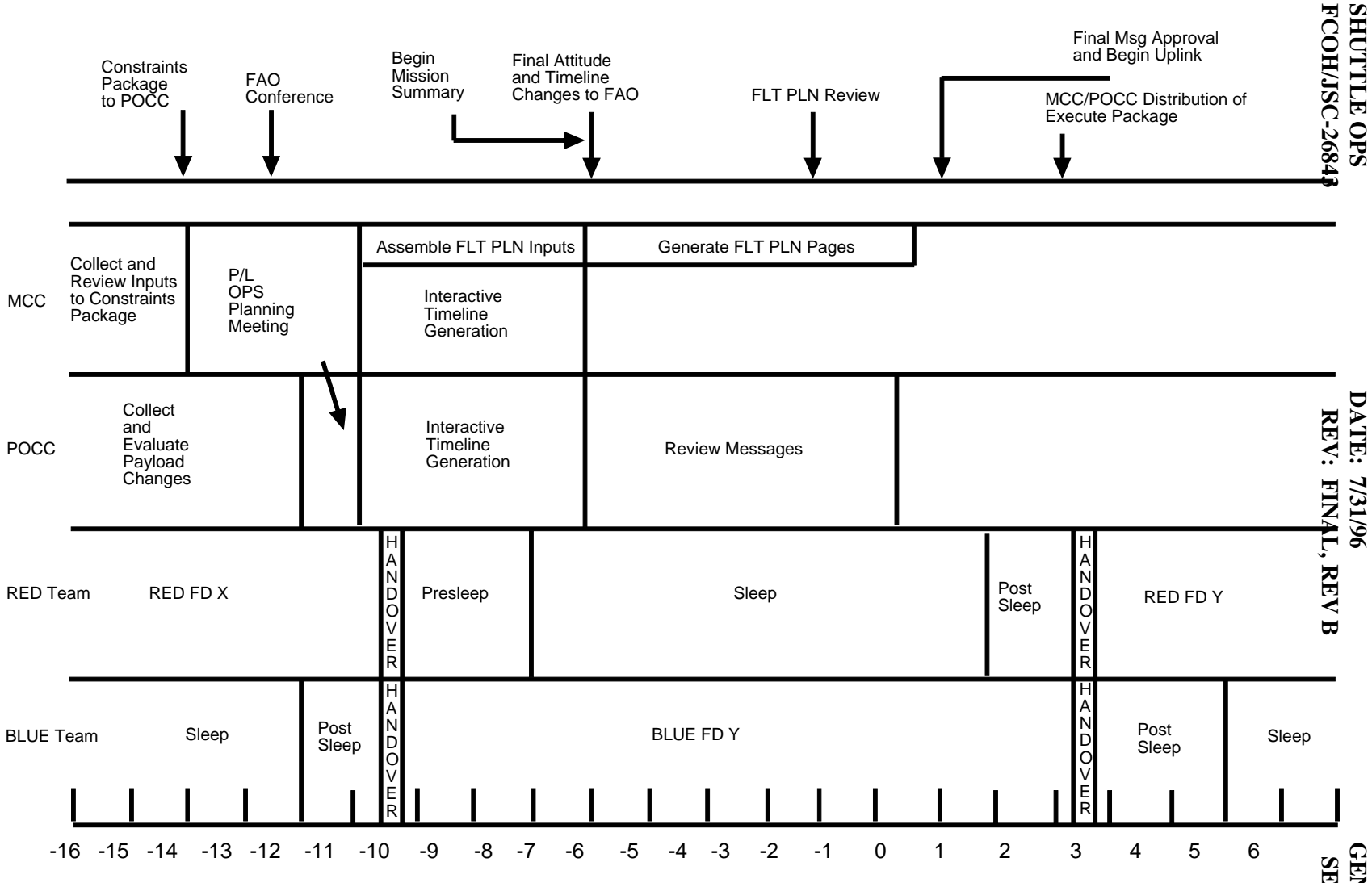


Figure 2.3.2-2. Dual-shift replanning with an interactive POCC (POCC produces PCAP)

SOP 2.3.3

TITLE

REAL-TIME STS FLIGHT DATA FILE CHANGE PROCESS

PURPOSE

To describe the protocol for real-time FDF changes resulting from in-flight anomalies, changes to mission objectives, or errors in crew procedures. This real-time change process will be in effect beginning at launch.

PARTICIPANTS

CAPCOM	MCC FC TEAM
* FAO	MER MANAGER
FD	SPAN MANAGER

GENERAL

Flight controllers can propose real-time changes to existing crew procedures, propose new additions to crew procedures, or alter the current timeline by Flight Note.

NOTE

If the proposed change needs to get onboard quickly, CAPCOM will read it to the crew after FD approval.

If the proposed change can best be implemented as a TIPS message, FAO will coordinate review and uplink.

Any errors in or changes to the Flight Data File that are generic or that will affect future flights should be addressed postflight by the appropriate F/C via the Crew Procedures Change Request form (JSC Form 482).

PROCEDURES

- A. If the message is to be voiced up,
 - 1. A Flight Note with rationale will be routed by the originator to the FAO, FD, CAPCOM and to all FCR operators who are needed for review. All revisions to the message are coordinated by the originator through voice loops within the MCC.
 - 2. After FD approval, CAPCOM will read up the message when appropriate.
- B. If thermal impulse printer system (TIPS) is required,
 - 1. Personnel requesting FDF procedure changes will document them on a Flight Note. The following is performed by the initiator of each Flight Note in order to ensure proper message creation:
 - a. All Vehicle D&C Procedural Nomenclature utilized in addition to FDF document name, section title, procedure title, page number, and, if applicable, time reference specified. (NOTE: A neatly revised FDF page is acceptable for a message input.

Uplink of that page is the FAO's discretion. FAO may determine that a message is required instead of a marked-up FDF page or may have FAO MPSR personnel transfer the inputs to a fresh FDF page in a different manner.)

- b. Associated rationale included.
 - c. All related and/or downstream FDF procedure impacts are considered.
2. FAO will review the Flight Note/message input, obtain any missing data from the initiator, and determine the time that the data is required onboard.
 3. Flight Activities MPSR personnel will generate and distribute the draft message as required.
 4. FAO will coordinate FC Team review on each revision using the EDP message review system. Each new version is identified with a revision letter.
 5. Upon FD approval of the message, FAO will coordinate uplink per FCOH SOP 2.2.4.
- C. FAO maintains a copy of all uplinked Flight Notes and TIPS messages.
- D. FAO coordinates impacts to other FDF documents, especially the Deorbit Prep and Entry Checklists (reference SOP 2.4.6, DEORBIT/ENTRY MESSAGE PREPARATION). A list of updates will be maintained so that entry procedure changes can be sent to the crew prior to entry day. All FCR positions are responsible for making appropriate inputs to these lists and participating in the final review prior to uplink.
- E. The MER manager and SPAN manager, upon receipt of an approved change, determine whether the procedural change impacts KSC postlanding ground operations. Any of these, as well as the Entry Checklist Post-Wheel Stop message, are sent by MER Manager to KSC and to the landing site via PITNEY BOWES (reference FCOH SOP 2.4.1 for address).

SOP 2.3.4

TITLE

MESSAGE REVIEW AND UPLINK

PURPOSE

To define the procedure for review and execution of message uplinks to the flight crew via the TIPS.

PARTICIPANTS

MATS
FAO
FD
COMM TECH
INSTRUMENTATION
MCC FC TEAM

SUMMARY

Message inputs will be incorporated by the MATS console into a message on the Orbiter Text and Information System (OTIS) for eventual uplink. Electronic message inputs will be available to the MATS operator from any console position as well as outside sources. This is possible because OTIS resides on the EDP hub in the MCC-H and can retrieve files sent to either the EDLS or the EDSS of EDP.

The audio link or the Ku-band forward link can be used to uplink messages to TIPS. Text information such as procedure updates and flight plan changes can be uplinked via one of the air-to-ground (A/G) voice channels. Normally the A/G-2 voice channel is used. Graphical information such as pen and inked procedural changes, new timeline pages, schematics, photographs, and text data can be uplinked via Ku-band to the TIPS.

PROCEDURES

A. Message Generation and Review

1. Electronic message inputs from remote users (i.e., those users not on the OPS LAN) will be directed to the EDLS. The EDLS will serve as the central receptacle for all MATS message inputs coming from other NASA sites, the Internet, or the JIN.
2. Electronic message inputs from users on the OPS LAN in the MCC-H will direct their inputs to the EDSS. Hardcopies and nonelectronic inputs should be routed to the FAO or MATS console.
3. MATS will then retrieve the inputs from EDSS, EDLS, or hardcopy and incorporate them into a message for review. Messages will be created in Word.doc or Windows.bmp formats.
4. All message inputs will be assigned a message number and be given a title. All message numbers and titles will be included in the Message Status Display. The approval and transmission status of each message will be noted on the display.

5. When a message is ready for review, MATS will transfer the message file to the EDLS for parsing. Parsing is the process which creates the Hyperman document and sets the Hyperman links for the message. This step can be done only on the EDLS.
6. After parsing, the MATS operator will transfer the file to the EDSS for review by the FC Team. The method of remote POCC review of messages is still TBD.
7. Collaborative review by the FC Team will be done in real time on DEC Alphas via the EDP using SharedX.
8. FAO will coordinate FC Team review on each revision. Each new version is identified with a revision letter.
9. Upon FD approval, the message will be coordinated for uplink.

B. TIPS Uplink Via TIPS Audio

1. MATS coordinates with INSTRUMENTATION on the INST COORD loop on selection of a time for uplink (U/L). MATS will provide data on the type of U/L, number of pages to be uplinked, the time required for transmission, and the approximate time of U/L that is desired. Prior to AOS of the site at which U/L is planned, MATS will notify INSTRUMENTATION if the message will not be ready for U/L at the planned time.
2. INSTRUMENTATION will then give MATS a go to coordinate with COMM TECH.
3. MATS will coordinate the uplink with COMM TECH on the INST COORD loop. COMM TECH will verify that the proper A/G channels are configured and give MATS a GO to turn on the modulator. COMM TECH will monitor AOS and after the signal turnaround is confirmed, will give MATS a clearance to transmit. COMM TECH is responsible for ensuring that sufficient time is available for transmission and that there are no keyholes/TDRS dropouts.
4. At the completion of the transmission, MATS will notify COMM TECH and INSTRUMENTATION on the INST COORD loop that the transmission is complete.
5. COMM TECH will then reconfigure that ground site/TDRS.
6. After reconfiguration, COMM TECH will inform MATS, on the INST COORD loop, to turn the modulator off. COMM TECH will inform MATS of any anomalies in the transmission.
7. FAO will inform the FD that the messages have been transmitted and relate any problems.

C. TIPS Ku-Band U/L

1. MATS coordinates with INSTRUMENTATION on the INST COORD loop on selection of a time for U/L. MATS will provide data on the type of transmission, the time required for transmission, number of pages to be uplinked, and the approximate time of U/L that is desired. If on a specific flight the 128-kb Ku-link is being shared by another customer, INSTRUMENTATION will coordinate with COMMAND to configure the 128-kb link for TIPS uplink at the specified time. INSTRUMENTATION will be responsible for verifying that sufficient Ku-band coverage exists for transmission.

2. INSTRUMENTATION gives MATS a GO for uplink.
 3. MATS notifies INSTRUMENTATION that the transmission has started.
 4. After transmission is complete, MATS will notify INSTRUMENTATION and INSTRUMENTATION will inform MATS of any anomalies during the U/L.
 5. FAO will inform the FD that the messages have been transmitted and relate any problems.
- D. MATS will then transfer the uplinked file to the EDLS for parsing.
- E. The parsed file will then be transferred to the EDSS to make the message available to the FC Team.

INFORMATION

- A. Message U/L via TIPS audio is limited to a 128-ASCII-character set that duplicates most FDF characters. The following list identifies the character set. If a desired character is not available, a word equivalent or a substitute character may be used.

1. All 26 letters (lower and upper case)
2. Numerals 0 through 9
3. Greek letters Δ (delta)
4. The following special symbols:

period	(.)	apostrophe	(')
comma	(,)	colon	(:)
question mark	(?)	cycle	(~)
slant	(/)	up arrow	(↑)
back slant	(\)	down arrow	(↓)
underscore	(_)	left parenthesis	(())
overscore	(-)	right parenthesis	())
ampersand	(&)	left bracket	([])
percent	(%)	right bracket	(])
check	(•)	semicolon	(;)
asterisk	(*)	quote	(")
plus	(+)	block	(H)
minus	(-)	dollar sign	(\$)
equal	(=)	number sign	(#)
less than	(<)	greater than	(>)

- B. Characters available for MATS-produced TIPS Ku-band messages are those available through Microsoft Word.
- C. For TIPS Ku-band uplinks, facsimile transmissions of photographs or schematics should be avoided. The facsimile's low-resolution and black-only transmission will negate the capabilities of TIPS. TIPS provides 200 pixels per inch resolution and 256 gray scale. Pen and ink changes can be transferred from facsimile inputs onto photographs and schematics already at JSC.
- D. The message scanner accepts inputs of up to 8.5 x 11 inches.

- E. Contingency TIPS S-band patch - In the event that A/G-2 has failed, a contingency patch will place the TIPS on A/G-1. COMM TECH can perform this patch if necessary.

SOP 2.3.5

TITLE

MCC MANAGEMENT, REVIEW, AND TRANSMISSION OF PORTABLE AUDIO DATA
MODEM (PADM) FILES

PURPOSE

To define the MCC coordination required for the collection, review, approval, distribution, uplink, and downlink of PADM files.

PARTICIPANTS

MATS
FAO
FD
CAPCOM

MCC FC TEAM
COMM TECH

SUMMARY

Simple text files, program files, and data files can be uplinked and downlinked to and from the flight crew's onboard PC via the PADM, normally using the A/G-2 voice channel. Files to be uplinked are collected from FCR operators and reviewed by the FD. Then, usually once per day, the crew configures the orbiter for PADM U/L/downlink. After coordination with COMM TECH, MATS uplinks the files to the crew's PC and downlinks any files the crew has placed on their PC for downlink. Uplinked and downlinked files are then distributed using the MCC LAN.

PROCEDURES

- A. The ground management of PADM files is based on the capabilities of the MCC LAN. An electronic folder is provided for the collection of files to be uplinked. A separate folder is provided for downlinked files. Access to these two folders is limited to FD, CAPCOM, FAO, and MATS. Two similar folders are provided for the distribution of uplinked and downlinked files. General access is provided for these two folders.
- B. All files provided for PADM uplink are placed in the limited-access uplink folder. FD and CAPCOM should place files they want uplinked directly into this folder. Other operators will submit any PADM uplink files by placing them in a MATS folder on the server. Files requiring uplink can also be accepted on a DOS-formatted 3.5-inch diskette. MATS will then move these files into the limited-access U/L folder.
- C. The FAO will review nonfamily mail and nonconfidential messages, obtain any missing information from the initiator, and determine the time the file is required onboard.
- D. All nonfamily mail PADM files to be uplinked will be given a message number and title. These messages will be tracked on the Message Status Index.
- E. If required, the FAO will coordinate FC Team review of input files, using the MCC LAN.
- F. When all files to be uplinked have been collected and prepared, the FAO will tell the FD the files are ready for review. The FD will then review the files and tell the FAO which files are approved for uplink.

- G. The PADM files are then uplinked and downlinked per paragraph M below.
- H. After the PADM session is complete, MATS places all downlinked files in the limited-access downlink folder.
- I. The FAO then tells the CAPCOM the downlinked family mail files are available for access.
- J. The FAO also tells the FD all uplinked files and downlinked files except family messages and confidential will be distributed unless the FD directs FAO otherwise. These files are then distributed per paragraph N below. After distribution, the limited-access uplink folder and downlink folder are purged.
- K. After CAPCOM removes the downlinked family mail messages, the limited-access downlink folder is then purged.
- L. MATS maintains a log of all files uplinked and downlinked via PADM and keeps an archive copy of these files.
- M. Message Uplink and Downlink
 - 1. The FAO schedules the crew to set up the PADM as required, normally once per day.
 - 2. MATS coordinates with COMM TECH on the INSTR COORD loop for PADM file transmission.
 - 3. When ground configuration is complete, COMM TECH gives MATS a GO for PADM file transmission.
 - 4. MATS performs PADM file uplink and downlink.
 - 5. When PADM transmissions are complete, MATS notifies COMM TECH on the INSTR COORD loop.
 - 6. The FAO informs FD that PADM operations are complete and relates any problems encountered.
- N. Message Distribution
 - 1. Uplinked PADM messages are distributed by placing them in the applicable flight day folder within the general-access uplink folder on the MCC LAN.
 - 2. Similarly, downlinked PADM messages are distributed by placing them in the applicable flight day folder within the general-access downlink folder.

INFORMATION

- A. The PADM is not a high-speed device. Given a good COMM link with the orbiter, current estimates give a transfer speed of approximately 170 cps.
- B. The availability of PADM transfers may be limited because of crew and/or hardware scheduling and MATS work load.
- C. Required PADM file transfers should be coordinated and documented preflight. Guidelines for PADM file transfers are documented in Appendix J of the Crew Procedures Management Plan.
- D. Customer requirements for PADM transfers must be defined in mission specific JOIP's.

SOP 2.3.6

TITLE

POSTLAUNCH SCRUB TRAINING ASSESSMENT

PURPOSE

To define the immediate integrated and/or standalone training requirements following a launch scrub turnaround in which the flight crew will return to JSC.

PARTICIPANTS

DT/SIMULATION SUPERVISOR
DA8/ASCENT FLIGHT DIRECTOR
CB/FLIGHT CREW (or VITT representative)
DT/CREW SCHEDULING COORDINATOR
DT/SMS TEAM LEAD
DT/SECTION HEAD

GENERAL

- A. The name and pager number of each participant will be included as part of the STS-(xx) Launch Scrub Training Assessment memo, distributed by the training division team lead for the flight.
- B. The KSC crew quarters Vehicle Integration Test Team (VITT) representative is the point-of-contact for the flight crew commander availability.
- C. The flight crew will be available in the crew quarters for the telecon approximately 2 hours after orbiter egress.
- D. If the lead simulation supervisor is not on console simulation control area (SCA) for the launch, the ascent/entry simulation supervisor will be delegated responsibility and will contact the lead simulation supervisor if required.

PROCEDURES

- A. The simulation supervisor will contact the VITT representative to coordinate when the flight crew will be available and the phone number for the flight crew to contact the simulation supervisor.
- B. At the request of the flight crew (after returning to the crew quarters) or the ascent FD, the simulation supervisor will coordinate and initiate a telecon to discuss new training requirements.
- C. The simulation supervisor, FD, and flight crew commander will agree on the immediate (approximately 3-4 days) training requirements for both integrated and stand-alone training.
- D. If training is required, the simulation supervisor will inform the crew scheduling coordinator, who will coordinate scheduling the appropriate facilities in support of the new training requirements.

- E. If integrated training is required, the crew scheduling coordinator will also ensure that the integrated simulation recorder is updated to reflect the new integrated training schedule.
- F. The simulation supervisor will inform the SMS team lead and the DT section head of the new training requirements.
- G. The SMS team lead, simulation supervisor, and FD are responsible for contacting their respective team members in order to support a training event that would occur over the weekend or early the following week.
- H. The simulation supervisor office will transmit a PROFS message the following working day to document the amended training schedule.

SOP 2.4

TITLE

PRELAUNCH VEHICLE SYSTEMS BRIEFINGS

PURPOSE

To specify the coordination required to connect the MCC to the prelaunch vehicle systems briefings given by KSC to the flight crew at KSC.

PARTICIPANTS

ASCENT FLIGHT CONTROL TEAM
HOUSTON VOICE
VITT LEADER
KSC VEHICLE ENGINEERING PERSONNEL
FLIGHTCREW

*GC
MESSAGE CENTER
REPRO

GENERAL

KSC provides two vehicle systems briefings to the flightcrew prior to launch, in order to acquaint them with all systems discrepancies noted during prelaunch STS processing. (One at TCDT and one during LCD. The LCD briefing contains only deltas that occurred after TCDT) MCC should keep a copy of TCDT briefings for reference. These briefings are also supported by the Ascent Flight Control Team on console in the MCC, and include all orbiter/cargo systems. Contact VITT for specific times.

PROCEDURES

A. Prebriefing Activities

<u>Time</u>	<u>Event</u>
Briefing - 2 days	GC contacts VITT at KSC (407-867-4792) and confirms that briefing charts will be transmitted to MCC and obtains extension(s) to be used by KSC personnel. Message Center notifies REPRO (35198) to pick up briefing package.
Briefing - 1 day (assumes briefing charts are available)	REPRO copies and distributes the briefing charts, according to the appropriate OMI distribution list.
Briefing - 45 minutes	GC requests that HOUSTON VOICE establish the teleconference on AFD CONF with KSC Crew Quarters, Payload Test Team, and Orbiter Test Team (extensions provided in real time) in talk/monitor mode.
Briefing - 30 minutes	HOUSTON VOICE configures telecon to PRIME OPS. (Prior to configuring, HOUSTON VOICE will make an announcement on PRIME OPS that this conference will be tied to the Crew Status Briefing.)

Briefing - 10 minutes

GC verifies with HOUSTON VOICE that good two-way comm has been established between the MCC, KSC Crew Quarters, and the Test Teams.

- B. KSC vehicle engineering personnel conduct the briefing; the duration is approximately 1 hour.
- C. Immediately after the briefing, the GC establishes the voice/video configuration to support a crew weather briefing.

SOP 2.5

TITLE

LAUNCH COUNTDOWN MANNING

PURPOSE

To identify typical FC Team manning support during a launch countdown, and to define the FC Team callup procedure in the event of a vehicle contingency.

PARTICIPANTS

GC	SPAN MANAGER
LEAD FLIGHT DIRECTOR	MER MANAGER
FC TEAM	ACTION CENTER STAFF

GENERAL

- A. The GC console is manned continuously throughout a launch countdown; GC manning begins at approximately launch minus 36 hours (orbiter communication system activation).
- B. Flight Director and INCO support orbiter communication system activation.
- C. The Ascent FCR team supports launch minus 1 day vehicle/cargo systems briefing, and a portion of this team supports a launch minus 1 day crew weather briefing.
- D. Full team manning begins at launch minus 11 hours and continues through successful launch or launch scrub decision.
- E. All FC Team manning will terminate shortly after a launch scrub decision, and will resume with full team manning as stated in D above.
- F. Span Manager, or the designated representative, mans from L-40 hours; MER Manager, or the designated representative, manning begins at 0800 local the day before launch. Full SPAN/MER manning begins at approximately launch minus 10 hours.

PROCEDURES

- A. The Action Center staff maintains the MCC shift schedule recorded message per FCOH SOP 1.4.
- B. During FC Team unmanned periods, SPAN monitors countdown activity on the NTD (OIS 232) loop and selected telemetry displays for occurrence of vehicle contingencies, if any.
- C. For significant anomalies (refer to Information Section), SPAN contacts Lead Flight Director to determine further action.
- D. If authorized, SPAN contacts some or all on-call FCR flight controllers to request immediate console manning.

NOTE

The on-call team is identified by projecting the launch day shift schedule backwards into the countdown timeline.

- E. When the required flight controllers arrive on station, the Flight Director notifies NTD that a flight control team is on station and available to assist in problem analysis.
- F. If the vehicle anomaly has in-flight impact, the appropriate flight controller submits an anomaly list input to SPAN as specified in FCOH SOP 1.11.

INFORMATION

The following are deemed significant anomalies and may require FC Team manning for problem identification/resolution:

- Launch commit criteria violations
- Equipment/component failures
- Any failure for which KSC requests JSC assistance

SOP 2.6

TITLE

DEORBIT/ENTRY MESSAGE PREPARATION

PURPOSE

To define the method for changing/updating the Deorbit Prep Checklist (C/L) and the Entry C/L, including the Postlanding Switch List at Wheels Stop/Egress in the Entry C/L.

PARTICIPANTS

MCC FC TEAM
* FAO
CAPCOM
FD
SPAN MANAGER

GENERAL

FAO will compile and maintain a current list of all known Deorbit Prep C/L and Entry C/L deltas throughout the mission. Inputs for deltas are required to be submitted by all MCC F/C's to the FAO by the beginning of each crew sleep period. This enables the FC Team to be prepared in the event of early mission termination. Final inputs are due to the FAO by the next to last crew sleep period (XTIG - 40 hours).

The Postlanding Switch List at Wheels Stop/Egress (Post Wheel Stop) message contains Entry C/L, section 5, updates and/or instructions for ground crew use at the landing site. Initial inputs to this message are also required to be submitted by all MCC F/C's to the FAO by the beginning of each crew sleep period. Final inputs are due to the FAO by the next to last crew sleep period (XTIG - 40 hours). The message is handed over to the SPAN MANAGER during the last crew sleep period (XTIG - 15 hours). Inputs to this message which require crew action will be voiced up.

PROCEDURES

A. Procedures for the preparation of the Deorbit C/L deltas and Entry C/L deltas messages are as follows:

1. MCC F/C's will submit deorbit/entry related updates on Flight Note to the FAO by the beginning of each crew sleep period. Final inputs are due by the next to last crew sleep period (XTIG - 40 hours).

Each initiator should ensure that each Flight Note contains the following information:

- a. FDF document name
- b. Section title
- c. Procedure title and page number
- d. If applicable, time reference

- e. Associated rationale
2. FAO will compile and maintain a current copy of all submitted deltas.
3. Nominally, the day before entry, the Entry Team FAO will initiate a review with FD and MCC F/C's via EDP message review system of the Deorbit Prep C/L deltas and Entry C/L deltas TIPS messages.
4. After review and approval by the FD, the messages will be uplinked during the shift prior to the last crew sleep.

NOTE

CAPCOM will produce the Entry Summary (similar to the daily Mission Summary) which is included in the uplink of the deorbit/entry messages.

B. Procedures for preparation of the Post Wheels Stop message is as follows:

1. MCC F/C's will submit inputs to the Post Wheels Stop Message via Flight Note to the FAO by the beginning of each crew sleep period. Final inputs are due by the next to last crew sleep period (XTIG - 40 hours).
2. FAO will compile and maintain a list of Post Wheels Stop inputs.
3. Nominally, the day before entry, the Entry Team FAO will initiate a review with the Entry Team FD and F/C's via EDP of the Post Wheels Stop message. After review and approval by the FD, the message will be attached to a coversheet marked SPAN/MER - PASS TO KSC. FAO MPSR personnel will deliver the message to SPAN MANAGER who will transmit the message to KSC via both voice and facsimile machine.

Ideally, the message will be handed over to SPAN MANAGER during the last crew sleep period (XTIG - 15 hours) but can be voiced and (or) faxed any time prior to landing. However, a late handover of the message does not guarantee that KSC is able to transmit the message to the ground crew during ideal conditions.

SOP 2.7

TITLE

MCC EMERGENCY PROCEDURES

PURPOSE

To provide guidelines for all personnel in the MCC in the event of an emergency condition such as fire, hurricane/severe weather, or bomb threat.

PARTICIPANTS

- ALL MCC OCCUPANTS
- * FOM
- GC
- FD

GENERAL

- A. Emergency procedures have been established to provide guidelines to personnel for safe, timely, and orderly evacuation, shutdown, and MCC recovery in an emergency condition.
- B. The FOM has the prime responsibility for implementation of the emergency procedures, in coordination with the GC and FD during facility support operations.
- C. Evacuation - If the condition warrants some level of evacuation, the following guidelines will be used, based on the condition:
 1. Phase I - Evacuation of all personnel not directly involved in mission or simulation support-related activities; i.e., visitors, development personnel, maintenance workers, installation support, etc.
 2. Phase II - Evacuation of all personnel except those who are designated mission critical
 - a. GC/FOM will determine the ground support team.
 - b. FD will determine the flight support team.
 3. Phase III - Total evacuation of all personnel

Evacuation orders and additional instructions may be issued via console keyset communications, PA system, telephone, or in person. FOM will ensure that transient support personnel (customers, janitors, etc.) receive adequate evacuation instructions if an evacuation is ordered. Evacuation location is south of the MCC in the parking lot, at least 75 feet from the building.
- D. Alarms - The MCC is equipped with both visual (strobe) and audible alarms; some areas have both, but some have only the strobe. These alarms are manually activated by the FOM and require immediate evacuation of the area/areas where they are activated unless revoked by FOM on the PA system as a false alarm. Evacuees are to report to the location noted above and wait for further direction.

- E. Reference documents
 - 1. Disaster Recovery Plan, RSOC86-0092C, contains detailed procedures for use by FOM and facility M&O personnel.
 - 2. JSC Emergency Preparedness Plan, JSC-05900.
- F. Employee responsibilities - Individuals should become familiar with emergency procedures and follow evacuation instructions if ordered.

PROCEDURES

- A. Fire
 - 1. Upon observing fire/smoke in the MCC, observer will immediately notify FOM via voice loop or phone x35615; report location and severity.
 - 2. FOM will notify the JSC Fire Department (x33333) if deemed necessary.
 - 3. FOM will report to GC and provide an assessment and any evacuation instructions necessary and equipment powerdown deemed appropriate.
 - 4. GC will notify FD of assessment.
 - 5. FOM will coordinate action to resolve the emergency situation and give status to GC.
- B. Bomb threat
 - 1. Bomb threat reaction procedures are contained in a controlled distribution document maintained by JSC Security, x34441 (JSC Bomb Threat Reaction Plan); JSC Security is the authority to order actions necessary to deal with a bomb threat.
 - 2. Any person receiving communication regarding a bomb threat should immediately report the information (see attachment for information to collect (figure 2.7-1)) to JSC Security (x34441 - normal duty hours, x34658 - other hours), then notify FOM (x35615).
 - 3. Security personnel, in coordination with FOM, will notify MCC personnel of any evacuation orders.
- C. Hurricane/severe weather
 - 1. Site-wide evacuation orders are ordered by the JSC Director for impending severe weather conditions.
 - 2. During support periods, the FOM will be notified of conditions. The FOM will keep the GC apprised of conditions and procedures to be followed, and the GC will relay the information to the FD.
 - 3. Site shutdown and hurricane information may be obtained at x33351.

BOMB THREAT CHECKLIST

TIME CALL RECEIVED _____ AM/PM DATE _____

EXACT WORDS OF CALLER _____

QUESTIONS TO ASK: EXACT WORDING OF THE THREAT:

1. When is the bomb going to explode? _____
2. Where is it right now? _____
3. What does it look like? _____
4. What kind of bomb is it? _____
5. What will cause it to explode? _____
6. Did you place the bomb? _____
7. Why? _____
8. What is your address? _____
9. What is your name? _____

SEX OF CALLER _____ AGE _____ RACE _____ LENGTH OF CALL _____

CALLER'S VOICE:

- CALM LAUGHING LISP DISGUISED
 ANGRY CRYING RASPY ACCENT
 NORMAL EXCITED DEEP FAMILIAR
 SLOW DISTINCT RAGGED CLEARING THROAT
 RAPID SLURRED SOFT DEEP BREATHING
 LOUD NASAL STUTTER CRACKING VOICE

IF VOICE IS FAMILIAR, WHOM DID IT SOUND LIKE? _____

BACKGROUND SOUNDS:

- STREET NOISES HOUSE NOISES FACTORY MACHINERY
 CROCKERY MOTOR ANIMAL NOISES
 VOICES PA SYSTEM OFFICE MACHINERY
 MUSIC CLEAR STATIC
 LOCAL BOOTH LONG DISTANCE

OTHER _____

THREAT LANGUAGE:

- WELL SPOKEN FOUL INCOHERENT MESSAGE READ
(EDUCATED) TAPES IRRATIONAL BY THREAT MAKER

REMARKS:

Figure 2.7-1. Bomb Threat Checklist

SOP 2.8

TITLE

JSC CONTINGENCY PLAN

PURPOSE

To define the immediate action taken to implement all or any portion of the JSC Contingency Plan.

PARTICIPANTS

MCC F/C'S	MOIR MGR
JSC SECURITY PERSONNEL	GC
* FD	FACILITY OPERATIONS MANAGER (FOM)
	OST

GENERAL

- A. The JSC Contingency Plan, JSC-14273, defines the initial and followup action requirements for an orderly, comprehensive investigation of a contingency, incident, or accident to find the cause and provide recommendations for preventing its recurrence (figure 2.8-1). A copy of JSC-14273 is available at the FD/GC consoles as well as via the Master Documents list on the web.
- B. Definition of Space Shuttle Program contingency: A Space Shuttle Program contingency is defined as any program-related failure, accident, or incident (involving Space Shuttle Program-controlled flight or test hardware, support equipment, or facilities) that significantly delays or jeopardizes the Space Shuttle Program or a flight, prevents accomplishment of a major objective, or terminates a flight prematurely.
- C. This plan is not invoked if an early flight termination occurs at a preplanned flight continuation decision point (i.e., GO/NO-GO milestone). Current decision points are
 1. GO/NO-GO for orbit operations - Decide on launch day whether to continue past CONUS landing opportunity
 2. GO/NO-GO minimum duration flight - Duration as defined in Flight Rules

PROCEDURES

- A. Suspected or declared contingency
 1. FD notifies Mission Operations Director and JSC Director.
 2. FD notifies other key NASA JSC personnel listed in table 2.8-1 of this procedure or ensures that they have been notified.

3. Dependent upon circumstances and time of the shuttle contingency, the director of the Lyndon B. Johnson Space Center (or a designated representative) may implement all or any portion of the JSC Contingency Plan to investigate any event that is related to the building, testing, flying, or landing of the space shuttle.
 4. All MCC personnel, both F/C's and operations support personnel, are forbidden to make any public or private statement concerning a suspected or declared shuttle contingency unless specifically authorized to do so.
 5. All F/C's and MCC support personnel will immediately terminate all unofficial telephone calls in progress when a flight contingency is suspected or declared. No unofficial outside telephone calls will be attempted unless specified in the JSC Contingency Plan or authorized by FD.
- B. Contingency declared
1. FD notifies or ensures notification of all persons or functional positions listed in table 2.8-1 and checklist item 2 in table 2.8-2 of this procedure.
 2. GC notifies or ensures notification of all MCC and external support persons or functional positions listed in table 2.8-2, items 5 and 6, respectively.
 3. All MCC console and workstation positions complete Flight Controller's Log. Provide a complete narrative on data observed and console and workstation actions before, during, and after the incident and include all pertinent voice conversations. Information in the mission log should include console and workstation activities such as commanding, display selection, or strip chart recorder (SCR) configuration, workstation MED entries, and voice communication configuration.
 4. Print displays relevant to the contingency.
 5. FD notifies GC of the workstation positions that are relevant to the contingency. FD will select one of the following:
 - a. All W/S's: Positions required to support the mission (ref. FCOH SOP 17.3)
 - b. Mission phase W/S's: Only those positions with a repair priority of one for a specific mission phase (ref. FCOH SOP 17.3)
 - c. System W/S's: Only those positions associated with the mission contingency (reference FCOH SOP 17.3, MCC pos.)
 6. Relevant workstation positions complete items 1 through 5 of checklist 2.8-7 prior to hands-off policy. (Do not log off.)
 7. Initiate hands-off policy for workstations, switches, PBI's, knobs, recorders, configurable equipment, etc. except as necessary to provide continued support for ongoing flight operation or checklist completion. (Basic hands-off policy requires that all ground support equipment and voice/data networks be preserved in the operational state and configuration existing at the time of the contingency until released by the FD, Mission Director, or, subsequently, by the chairman of the Investigation Board.)
 8. Complete checklists (tables 2.8-2 and 2.8-7).

UU GCEN GNOM
DE HMSC 013
URGENT
18/2152Z
FM HMSC/FLIGHT DIRECTOR
TO GNOM/NETWORK DIRECTOR
U R G E N T
SCP
SUBJECT: SPACE TRANSPORTATION SYSTEM CONTINGENCY PLAN

1. THE SPACE SHUTTLE PROGRAM CONTINGENCY PLAN IS IN EFFECT AS OF (GMT). ALL RECORDINGS OF TELEMETRY DATA, PLOTBOARD CHARTS, TRAJECTORY DATA, VOICE RECORDINGS, WEATHER REPORTS, OPERATOR LOGS, RADAR TAPES, COMMAND RECORDINGS AND HISTORIES, ACQUISITION AID DATA, SIGNAL STRENGTH RECORDINGS, PHOTOGRAPHS, ETC. FROM THE PERIOD _____ GMT TO _____ GMT ARE TO BE CONSIDERED AS OFFICIAL INFORMATION AND HANDLED ACCORDINGLY.
2. SITE PERSONNEL ARE FORBIDDEN TO MAKE NEWS RELEASES, PUBLIC OR PRIVATE STATEMENTS CONCERNING A MISSION CONTINGENCY, OR RELEASE ANY DATA WITHOUT SPECIFIC APPROVAL FROM THE NETWORK DIRECTOR.

OO/OOOOZ XXX 87 HMSC

Figure 2.8-1. Space Transportation System Contingency Plan (SCP) (sample)

Table 2.8-1. Contingency notification list

The following persons are notified in the event of a shuttle contingency.

SUSPECTED OR DECLARED CONTINGENCY

- 1. Director, JSC _____
- 2. Director, Space Shuttle Program _____
- 3. Director, Mission Operations _____
- 4. Director, Flight Crew Operations _____
- 5. Chief, Shuttle Safety and Mission Assurance Division/NS _____

DECLARED CONTINGENCY

- 6. GSFC, Network Director _____

NOTE

The JSC Director or his designated representative will notify all other key personnel listed in the JSC Contingency Plan.

	c.	SPADOC	Send TWX (classified)	
	d.	CSTC	Via shuttle support loop	
	e.	SN (WSGT/NGT)	Via TN coord loop	
	f.	MSFC Ops	Via MCC coord loop	
	g.	Remote POCC's (if applicable)	Via MCC coord loop	
All workstation 7. positions	7.	Print all relevant displays (all operators' prime displays plus others having a bearing on mission contingency).		_____
All workstation 8. positions	8.	Log time of mission contingency (GMT and MET).		_____
All	9.	a.	Terminate all unofficial telephone calls (unless specifically authorized by FD or JSC Contingency Plan).	_____
GC		b.	Put all workstation PABX's on intercept.	_____
All workstation 10. positions	10.	a.	Hands-off policy in effect. For positions ongoing flight operations, critical activities should be continued and routine hands-on activities can be resumed after the configuration is logged (see item 15).	_____
Relevant W/S positions		b.	Hands-off policy in effect. Workstations may be returned to mission support after OS support has released the W/S from data collection. (Ref. table 2.8-7.)	_____
All		c.	Routine data transfers to/from and within MCC should continue.	_____
As applicable (table 2.8-3)	11.	Ensure area security: Personnel manning MCC positions listed in table 2.8-3 will assume responsibility for area security.		_____
GC/FOM	12.	a.	Notify security guards (bldg. 30 desk, ext. 39091).	_____
		b.	Notify JSC Security to implement mission contingency procedures.	_____
GC/FOM	13.	Determine if the following external support should be terminated.		_____
		a.	Terminal interfaces with CIN and SPF file transfer	_____
		b.	FD and A/G comm lines	_____
		c.	All TV	_____
		d.	CAS data to GSFC	_____
		e.	All LAN interfaces	_____
		f.	Trajectory services	_____
		g.	PDIS/POCC I/F	_____
		h.	FEP JSC OD output (external)	_____
PAO		i.	All broadcast to media	_____

- FOM 14. Discontinue routine trash pickup and have discarded mission data collected and held until released by the Flight Director. _____
- All workstation 15. a. Complete Flight Controller's positions log. _____
positions
- GC b. Collect the following data products for identification of MCC data streams and system configurations:
(1) Current completed shuttle mission and simulation systems configurations from FSM _____
(2) Mission and payload interface configurations from Comm Control _____
(3) Print MOC and FEP status displays _____
(4) Print high and low speed track status displays _____
- FAO 16. Securing Flight Data File: Ensure that the backup Flight Data File (FDF) set is impounded for possible use by the Board of Investigation. _____
a. If the backup FDF set is in the MCC, have Timeline retrieve all books and secure in the Flight Activities MPSR. _____
b. Notify the FDF Manager that a contingency requiring impoundment of the backup FDF set, the FDF change control records, and procedure verification records has occurred. _____
c. Make arrangements for the FDF Manager or his representative to enter the MCC for the purpose of delivering materials to be impounded (including the backup FDF set if it was enroute from the launch site) and inventorying the backup FDF set. _____
- All workstation 17. Contingency Narrative/Equipment Status Log (use positions Flight Controller's log). _____
a. Complete narrative of all observations and actions before, during, and immediately following the contingency event(s); include all voice conversations _____
b. Include the following in addition to the narrative:

NOTE

Do not delay critical activities to complete this part of the checklist; however, it is important to document as nearly as possible the actual workstation/equipment configuration at the time this plan is activated.

- (1) Time log started/ended. _____
(2) Equipment PBI indications - List only illuminated PBI's. _____

- (3) Equipment switch positions - For ON/OFF switches, list only those ON. For multiposition switches, indicate selected position. _____
 - (4) Workstation displays by number and application/window identification. _____
 - (5) TV monitors by program and TV channel. Each console position controlling TV(s) is responsible for these data. _____
 - (6) Status indicators (list only those illuminated). _____
 - (7) Communication panel configuration (list only those selected for monitor or talk/listen). _____

<u>Monitor</u>	<u>Talk/Listen</u>
----------------	--------------------
 - (8) List FCR projector displays. _____
 - (9) Stripchart configuration. _____
 - (10) Workstation configuration (applications active, etc.). _____
 - (11) Additional information which may be pertinent. _____
- As applicable and GC 18. List of personnel: Personnel manning positions identified in table 2.8-3 will list all personnel in the room. The GC will perform this task for the FCR. _____
- Computer Sup 19. Computer Supervisor: Request the following status/configuration displays; note GMT each is displayed for subsequent DTE delog request. _____
- All 20. Collect the following, as appropriate, for subsequent turn-in or possible use by the Board of Investigation. _____
- a. Workstation logs _____
 - b. Display printouts _____
 - c. Stripchart recordings _____
 - (1) Analog SCRs _____
 - (2) Event SCRs _____
 - d. MED emulator files sent to OOMOC _____
 - e. TTY type messages _____
 - f. Retain all floppy disks _____
 - g. Workstation dump tapes and floppy disks _____
 - h. Copies of electronic mail messages _____

NOTES

1. All turn-in items will be clearly annotated such that workstation position, time span covered, data source (e.g., SCR, MED hard copy, etc.) and configuration can be easily determined.
2. FOM will obtain data containers for collected data.
 - a. Data containers will be stored in room 1025C of the MCC administration wing.
 - b. Access to the vault will be controlled by the FOM console.
 - c. Additional containers may be obtained from NASA Logistics in building 421.
3. All positions will provide an inventory of items collected for their position. Place one copy of the inventory list inside the container and attach one copy to the outside. Also, provide one copy for FOM. A blank inventory sheet, along with instructions, is provided in table 2.8-4.

Computer SUP COMMAND/ NIP SUP	21. Computer Supv, COMMAND, NIP SUP Collect, identify, and hold for subsequent turn-in or Investigation Board use.	_____
	a. Computer delogs, MOC, and FEPS	_____
	b. MOC operator console printout	_____
	c. MOC line printer output	_____
	d. MOC log tapes	_____
	e. Checkpoint all FEPS	_____
	f. Dump AIPC to tape	_____
NIP SUP	22. Collect or locate and identify for subsequent turn-in or Investigation Board. Use all MCC data recorded on magnetic tapes listed in table 2.8-5.	_____
All	23. Data turn-in: Data turn-in and the impounding of data will be by direction of FD.	_____
	a. MPSR personnel turn data in to lead FCR position. Data will be packaged and identified by individual workstation position. Lead FCR positions assimilate data by discipline for turn-in to FD.	_____
	b. Medical personnel - Turn in data to FD.	_____
	c. PAO personnel - Turn in data to FD.	_____
	d. Weather personnel - Turn in data to FD.	_____
	e. GC - Turn in data to FD.	_____
	f. Facility personnel, first floor of the MCC - Turn in data to FOM.	_____
	g. OST - Turn in data to FOM.	_____
	h. MOIR - Turn in data to MOIR Mgr (room 1345)	_____
	i. WSS and OS support - Turn in data to FOM.	_____

NOTE

All data turned in must be neat, readable, easily identified, and properly signed, when applicable.

- | | | |
|-----------------|--|-------|
| FOM | 24. Storage: FOM will provide safe data storage locations within the MCC. | _____ |
| FOM | Storage of magnetic data tapes | |
| | a. Magnetic data tapes identified by DFE in step 23 and listed in table 2.8-5 will be stored in the SDPC tape library. These tapes will be under the control of the FOM. | _____ |
| | b. Data inventory sheets provided by each workstation position will be filed by DFE. | _____ |
| MOIR MGR | 25. Storage: The MOIR Manager will provide safe storage and control for data products. | _____ |
| | 26. Access/removal of contingency data from the storage areas will require prior NASA management approval. | _____ |
| MOD/FD | a. Access/removal of original data or data copies will require Mission Operations Director or Flight Director approval. | _____ |
| GC | b. Approval authority may be delegated to the Ground Controller to authorize access to data and removal of data copies. | _____ |
| Data requesters | c. The requester of contingency data will take the approved "Impounded Data Access/Removal Authorization Form" to FOM in the MCC. (A blank form is provided in table 2.8-6.) | _____ |
| Telemetry | d. FOM will check the access/removal authorization form for completeness and will provide data product(s) requested. | _____ |
| GC | 27. Special data processing requests will be coordinated with the GC. | _____ |

Table 2.8-3. MCC positions responsible for support area interim security and listing of personnel

For purposes of this procedure, the following MCC positions are assigned responsibility for area security and for providing a list of personnel in assigned support area.

Area	Responsible MCC position
FCR (Room 2306)	Ground Controller
EGIL/EECOM/MMACS MPSR (room 2334)	EPS
INCO/DPS/CDMS MPSR (room 2300)	Communications Support
GNC/PROP/BOOSTER MPSR (room 2334)	OMS/RCS Engineering Officer (OREO)
Flight Activities MPSR (room 2334)	Timeline
FDO MPSR (room 2334)	Landing Support Officer
Medical MPSR (room 1345A)	Biomedical Engineer
MIDDS	S/C Meteorologist
CSR (room 236)	MOD CSR Representative
Payload Support Room	Payload Data
Computer Room (room 116A)	FOM
Communications (Voice and GOSR TV) (rooms 127A and 127)	Houston Voice
MCC Message Center (room 324)	Message Center Supv
Communications Control (room 112)	Comm Controller
CCRF (room 112)	Recorders
Tape Library (room 112A)	FOM
Building 48	FOM
ODRC	ODRC Database Administrator (DBA)
MOIR	MOIR MGR
All MCC maintenance and equipment areas not listed above	FOM

Table 2.8-4. Inventory of contingency data for space shuttle

Workstation Position _____ Workstation No. _____

Data medium	Data identification	Description of data	No. copies	Time period covered	
				First start time	Last stop time

Table 2.8-4. Inventory of contingency data for space shuttle (continued)

INVENTORY SHEET FOR CONTINGENCY DATA

When contingency data are collected, each controller must inventory the data and list the contents prior to delivering the data to its storage area. The attached form should be used. Instructions for filling in each column are give below:

Data medium - The physical form of the data should be entered; e.g., console log sheets, printouts, hard copies, strip charts, analog tapes, digital tapes, videocassettes, voice cassettes, floppy disks, film, microfiche, etc.

Data identification - The data should be identified by the means normally used. For example, printouts, hard copies, and microfiche have titles. Delogs might refer to formats, track assignments, etc. Voice cassettes might refer to voice loops.

Description of data - A brief description of the data should indicate how the data are normally used, area of concern, how it could be used for analysis, or any other useful information.

Number of copies - The number of copies should be given of each type of data identified in the second column. For example, if two kinds of printouts are identified, the number of copies should be given for each title. Redundant copies should not be counted or submitted.

Time period covered - The time period applies to each type of data identified. If several copies of that kind of data exist, the earliest start time and the latest stop time should be given in GMT to cover the period.

Table 2.8-5. Magnetic tape list

Metrum recorder (configuration file name: MISSION)

Source	Record channel	Description
LLTD1	1	Prime LLTD (7.2k)
OTU-10-A1/A2	2	GSFC RX (1.544M)
GG_P1_1	3	G/G FEP output port no. 1 (58k) (configured by COMMAND)
GG_P2_1	4	G/G FEP output port no. 2 (58k) (configured by COMMAND)
LLTD2	5	Alternate LLTD (7.2k)
OTU-08-B1/B2	6	WSC TDE S-band (192k)
OTU-09-B1/B2	7	WSC TDE K-band ch. 1 (192k)
OTU-10-B1/B2	8	WSC TDE K-band ch. 2 (2M)
ULF_-SB	9	Uplink FEP S-band output 32/72K (configured by TELCOM)
OTU-16-B1/B2	10	WSC TDW S-band (192k)
OTU-17-B1/B2	11	WSC TDW K-band ch. 1 (192k)
OTU-18-B1/B2	12	WSC TDW K-band ch. 2 (2M)
K58-CH-4	13	Space shuttle main engine 1 (60k) (launch only)
ULF_KB	14	Uplink FEP K-band output 72/216k (configured by COMMAND)
OTU-11-C	15	RTS real-time OD (192k)
OTU-12-C	16	RTS dump (2M)
K58-CH-6	17	Space shuttle main engine 2 (60K) (launch only)
	18	
Autosource grp	19	JSC R/T OD (192k)
OTU-20-B1/B2	20	WSC tracking data (58k)
K58-CH-8	21	Space shuttle main engine 3 (60k) (launch only)

Recorder type	Data type(s)	Location
Voice recorder	Voice recording	Voice Control Rm 127
Videotapes	PAO video, launch video, flight downlink video	PAO TV Bldg 8
SDP input log CCT	Input log of TLM, TRK, etc.	Rm 116
SDP system log CCT	Operator actions, MED I/O, device I/O, etc.	Rm 116
SDP checkpoint CCT	Checkpoint tape	Rm 116
W/S data cartridge tape	Workstation dump data	Rm 116

Table 2.8-6. Impounded data access/removal authorization

(Check one major block and one subblock under the major block)

The undersigned, as authorized by

- the Mission Director or Flight Director to
- examine original data,
- copy original data and remove the copy from the contingency storage area,
- remove the original data identified below from the contingency storage area,
- the GC to
- examine original data,
- copy original data and remove the copy from the contingency storage area,

in pursuit of his investigation as a member of the _____ Team,

takes responsibility for any original or copied data which is removed from the contingency storage area, with full understanding that the data is sensitive and will be used only to support the space shuttle _____ contingency investigation.

Impounded data to be accessed or removed:

Workstation position _____

Description of Data _____

Requestor's Name: _____

Organization: _____ Date: _____

Authorized By: _____ Title: _____ Date: _____
(Signature)

SOP 2.9

TITLE

SHUTTLE CONFIGURATION AND ANALYSIS PROGRAM OPERATIONS (DELETED)

SOP 2.10

TITLE

TEMPORARY MISSION CONTROL CENTER

PURPOSE

To define the procedures to be followed by the FC Team in the event of a situation which renders the MCC facility temporarily unavailable for a period of 10 hours or less.

PARTICIPANTS

JSC FC TEAM	KSC NTD
JSC SECURITY	GSFC ND
* JSC FD	GSFC NOM

RELATED MATERIAL

534-CAP-EMCC, Space Shuttle Program Emergency Control Center Activation and Operations Procedures.

534-CAP-EMCC/Supplement, Space Shuttle Program Emergency Control Center Telephone Reference List.

JSC-26843, FCOH, procedure 2.7, "MCC Emergency Procedures"; procedure 2.8, "JSC Contingency Plan"; procedure 6.2.3, "DVIS Contingency Management."

GENERAL

A. Overview

1. The Temporary Mission Control Center (TMCC) is required to provide an unclassified temporary backup to the MCC for orbiter orbit/deorbit support for a period of up to 10 hours. The operational requirements are based on the philosophy of continuing on-orbit support while maintaining a primary or secondary landing site safe flight termination capability. Onboard **autonomous** (requiring no ground interaction) payload operations will be considered during the period in which the TMCC is active.
2. The TMCC will be a voice only operation. Deorbit targeting, if required, will be computed by the Trajectory Emergency Mission Operations Computer System (TEMOC) equipment, which is managed by the Flight Dynamics Officer (FDO). Vehicle systems monitoring will be the responsibility of the spacecraft crew, who will relay necessary indications to the TMCC ground support personnel. Provisions for a TMCC capability will continue as an operational requirement until the MCC has been restored to an operational state or the Emergency Mission Control Center (EMCC), currently located at KSC, has been activated.
3. The amount of documentation and electronic equipment transported to the TMCC by each discipline should be based on the probability of subsequently returning to the MCC. The potential exists that the condition could worsen, thus requiring activation of the EMCC.

4. In the event the TMCC is required to support deorbit and landing, end-of-flight handover from JSC to KSC will be at wheels stop (via crew egress) because of support limitations common to a TMCC environment (i.e., limited data insight).

B. TMCC Activation Criteria

1. In general, the MCC will be evacuated because of any condition deemed hazardous to mission operations personnel or that severely reduces or completely prohibits operational activities during a space shuttle flight. This includes, but is not limited to, threat of sabotage, toxic hazards, structural hazards, or a high probability of severe weather such as a direct hurricane strike. Reference FCOH, procedure 2.7, MCC Emergency Procedures."

The TMCC is designated a temporary backup facility for the JSC MCC when any of the following occur:

- a. MCC deemed unsafe
 - b. Building failure(s) resulting in loss of **both** DVIS and telemetry processing capabilities
 - c. By the direction of the JSC MOD
2. The TMCC will be activated if the condition is estimated to be rectified within the specified time limit outlined in section A. If the condition is expected to persist longer, a decision must be made either to extend the TMCC operation control or to activate the EMCC. Based on the events at hand and the estimated time to return the MCC to operational status, consideration should be given to an initial or partial activation of the EMCC. Reference 534-CAP-EMCC, Space Shuttle Program Emergency Control Center Activation and Operations Procedures, section 1.4, EMCC Operational Philosophy."

C. Management Responsibilities

The Director of Mission Operations, or a designated representative, will make the decision to activate the TMCC. The Flight Director will decide the FC Team manning for TMCC operations. All subsequent action will be under the direction of the Flight Director.

D. Documentation

Each discipline is responsible for collecting and preparing the necessary documentation and electronic equipment for transport to the TMCC. If the potential exists to further downgrade the MCC and activate the EMCC, consideration should be given to collecting the appropriate documentation necessary to support the EMCC. Reference 534-CAP-EMCC, Space Shuttle Program Emergency Control Center Activation and Operations Procedures, section A4, Specific Documentation Requirements."

E. Emergency MCC Evacuation

Some conditions may warrant immediate evacuation of the MCC. If the decision has not yet been made to activate the TMCC, per FCOH, procedure 2.7, "MCC Emergency Procedures," emergency evacuation will be to the parking lot on the southwest side of the MCC, near the building 12 loading dock. The team will await further instructions from the Flight Director either to begin activation of the TMCC or to return to the MCC.

F. TMCC Location

The TMCC will be located on the third floor of building 4N. A combination of conference rooms and offices will be made available to support each of the functional areas in the MCC. The room assignments and voice loop patching configuration are defined in table 2.10-1. The TMCC layout is shown in figure 2.10-1.

Table 2.10-1. TMCC relocation configuration

Support Team	Room	Seating Capacity	Phone #	Style/ Model	Patch to:	Activity
FCR Team (FCR/MPSR)	3025	50	244-6156	Shure ¹	281/483-2842	FD conference loop
			244-5527	240 ²	301/286-5471	A/G-1 (talk/monitor)
			483-4286	120 ³	N/A ⁵	Internal/external coord
LSO	3028	3 desks	483-2575	120	Conf from rm 3073	A/G-1 (monitor only)
			483-5943	240	281/483-2842	FD conference loop
			483-4430	240	301/286-9859	Landing field prime
			483-0031	120	N/A	Internal/external coord
GC 2, OST	3073	25	TBD-1	120	301/286-5472	A/G-1 (monitor only)
			TBD-2	240	301/286-5473	SHO time
			244-1030	240	301/286-5473	Site Coord/TN Coord
CSR, POCC	3065	25	483-6913	240	Conf from rm 3073	A/G-1 (monitor only)
			244-6237	Shure	301/286-9860	Prime Ops
MER	3002	25	TBD-3	120	Conf from rm 3073	A/G-1 (monitor only)
			244-1130	240	281/483-2842	FD conference loop
MER Support	300	1 desk	483-4930	240	N/A	Internal/external coord
MOD	309A	5	483-5435	400 ⁴	Conf from rm 3073	A/G-1 (monitor only)
			483-5431	240	281/483-2842	FD conference loop
Houston Voice	301	1 desk	244-8022	240	N/A	Voice patch coord
Weather	302	1 desk	483-0512	240	N/A	Weather coordination
Reproduction	309	2 desks	483-5435	400	N/A	Reproduction
Secretarial	309	2 desks	483-5426	400	N/A	Word processing
(Overflow)	303	1 desk	483-5416	240	N/A	Internal/external coord
¹ Shure teleconferencing system ² Rolm phone with transmit/receive speaker ³ Rolm phone with receive only speaker				⁴ Rolm secretarial-style phone with transmit/receive speaker ⁵ Hall phone outside conference room		

G. Communications

Six dial-in phone lines are available at GSFC to allow the TMCC to patch into designated voice loops. One of the A/G-1 patches will be dedicated to the FCR team (room 3025). The other A/G-1 patch will be monitor only and will be teleconferenced to allow multiple phone line access. The FD conference loop will use a party line dial-in telecon (i.e., MOD telecon system). The GSFC phone line patch assignment is defined in table 2.10-2.

Table 2.10-2. GSFC phone line patch assignment

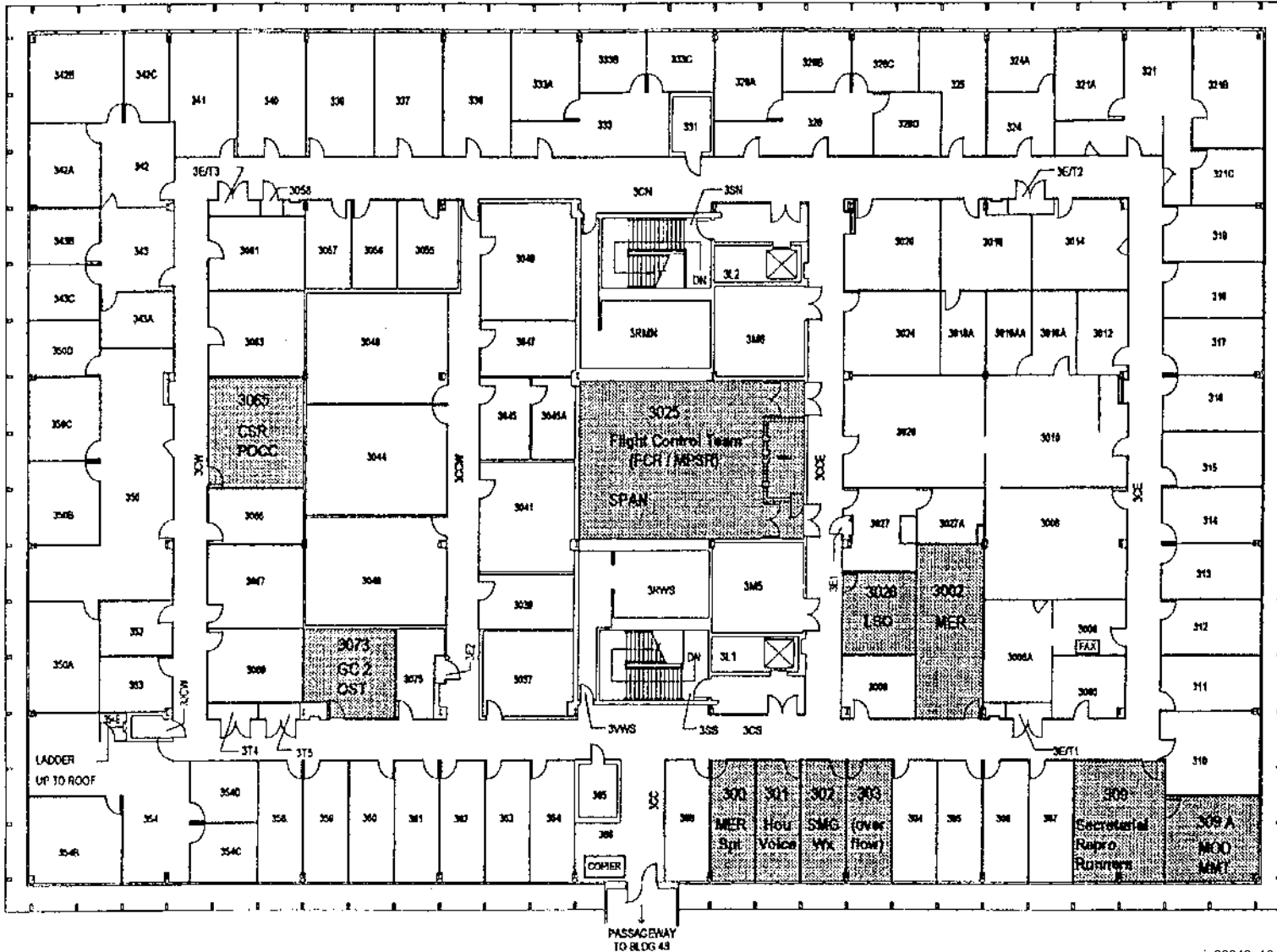
GSFC		JSC	
Dial-In Line (ac: 301)	NASCOM Voice Loop Patch	Call Origination (ac: 713)	Room no. (Bldg. 4N)
286-5471	A/G-1	244-5527	3025
286-5472	A/G-1 (Monitor Only)	tbd-1	3073
286-5473	Site Coord/TN Coord	244-1030	3073
286-8737	SHO Time	tbd-2	3073
286-9859	Landing Field Prime 1	483-4430	3028
286-9860	Prime Ops	244-6237	3065

H. TMCC Deactivation

Once the MCC has been declared ready to return to operation by the FSM, a GC and a subset of the OST will return to the MCC and begin the reconfiguration process. When the MCC is again operational, the TMCC will be deactivated and support will return to the MCC.

I. Status Recorder

The MCC flight recorder (483-1077) will be updated by the GC to reflect the current TMCC activities and status.



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Figure 2.10-1. TMCC layout

PROCEDURES

A. TMCC Preparations and Activation

**IF EMERGENCY EVACUATION:
Time permitting, collect necessary
EMCC documentation**

Step	Responsible Position	Action Taken
1	MOD (FD)	Authorize activation of the TMCC.
2	MOD	Notify Mission Management Team (MMT) of TMCC activation.
3	FD	Notify GSFC Network Director (ND) and KSC NASA Test Director (NTD) of TMCC activation.
4	FD	Inform FC Team that TMCC is being activated and define required support.
5	GC	Notify GSFC Network Operations Manager (NOM) of TMCC activation.
6	FD	Review FCOH procedure for TMCC activation and operations plan with FC Team.
7	MOD	Decide management manning support.
8	Payload	Notify/brief customers of the TMCC activation plans. Coordinate with customer and MCC personnel which payload activities are to be continued or terminated.
9	CAPCOM	Brief flightcrew on TMCC activation and operational capabilities (if possible).
10	FDO	Uplink best current vector (from MCC if possible). Generate orbiter state vector update loads for next 4 orbits and fax to GSFC. Coordinate GSFC state vector uplink if MCC unable to support.
11	FAO/FDO	Verify console SPOC state vector and MET/GMT clocks are updated.
12	FDO	Notify EMCC FDO/TRAJ personnel to support TEMOCS initialization.
13	LOS/TRAJ	Obtain current status of ELS and PLS support.
14	LSO/TRAJ	Obtain latest 24-hour weather forecast.
15	LSO/TRAJ	Notify LRD (KSC), GOM (EAFB), and WGM (NOR) airfield support coordinators of the current plan and obtain their status.
16	GC	Hardcopy current PSAT (AOS/LOS) table for use in TMCC.
17	FAO	Prepare two complete sets of FDF for transport to TMCC.
18	FC Team	Prepare necessary equipment, logs, and documentation for transport to TMCC.
19	GC	Notify JSC Security to provide limited access to building 4N.
20	GC	Instruct Houston Voice Controller to proceed to building 4N and set up the TMCC voice circuits per table 2.10-1 for conference rooms 3025 and 3073 only. Note: After FC Team arrival, conference in locally the extensions for A/G-1 (monitor only).

21	Houston Voice	Inform GC that building 4N voice circuits are configured and ready to support the TMCC.
22	GC	Inform Flight Director that TMCC is ready to support.
23	FD	Direct FC Team and designated support personnel to proceed to TMCC.
24	TMCC Members	Once members from each room arrive at TMCC, dial in to FD telecon circuit and report in.
25	CAPCOM	Inform the flightcrew the TMCC is activated.

B. TMCC Operations

1. General overview

Current orbiter operations should be able to continue as scheduled while the TMCC is active. However, any activities that could be delayed until the MCC is activated again should be given consideration.

2. Payload operations

In general, payload operations will be terminated during the time period the TMCC is activated. However, only **autonomous** (requiring no ground interaction) payload operations will be considered by the Flight Director to be conducted.

3. Telemetry parameter readout

Serialized Space Shuttle OD data will be transmitted to the KSC LCC via the Nascom-MIL interface to accommodate monitoring of telemetry parameters in real time. Telemetry data will be made available through the KSC LPS. Reference 534-CAP-EMCC, Space Shuttle Program Emergency Control Center Activation and Operations Procedures, section 3.5, "Telemetry Monitoring." The GC will coordinate parameter or display requests with the NTD in the LCC.

4. Tracking data

- a. **Best current vector** - The GSFC FDF will process the C-band and S-band low speed tracking data and provide a best current vector in Earth- fixed, true-of-date rotating (TDR) coordinates. The tracking data will be integrated over the period of site acquisition, and a best current vector will be transmitted via facsimile to the FDO in the TMCC.
- b. **Site acquisition data** - GSFC, vice JSC, will provide the orbiter state vector for generating the site acquisition data.
- c. **Site configuration** - GC and INCO will generate the new flight support requirements to support the flight from the TMCC and will voice the information to the GSFC NCC OPS via the SITE Coord/TN Coord voice loop.

5. Command uplink

Command requests will be voiced up to the crew and manually executed onboard. The capability also exists for the KSC LCC to format and transmit command to the orbiter. Reference 534-CAP-EMCC, Space Shuttle Program Emergency Control Center Activation and Operations Procedures, section 4.15, Real-Time Uplink Commanding."

6. TEMOCS

The TEMOCS will be located with the Flight Control Room (FCR) team. It will be initialized with the latest best current vector from the MCC (if available) or via facsimile from GSFC.

7. Ground track display and clocks

Once the TEMOCS is initialized, it will provide orbiter groundtrack and clock display. The clocks will include AOS/LOS as well as MET and GMT. The SPOC is also available to provide a similar groundtrack and clock display.

8. AOS/LOS

The copy of the PSAT brought over by the GC will be the primary AOS and LOS schedule for TDRS coverage until the TEMOCS is initialized. In addition, the SPOC will also be available to provide approximate AOS and LOS times.

9. Orbiter state vector update

Once the TEMOCS is initialized, it will be used as required to generate a navigation state vector update. Since no command capability exists in the TMCC, an Ops 3 Voice Delta State Update will be performed. If a whole state vector update is necessary, the LCC will be used as the command uplink source. The FDO will transmit the state vector to the LCC via facsimile. Reference 534-CAP-EMCC, Space Shuttle Program Emergency Control Center Activation and Operations Procedures, section 4.12, Orbiter State Vector Updates."

10. Onboard navigation state vector read

If the LCC is unable to provide a copy of the Ops 2 State Vector display (reference 534-CAP-EMCC, Space Shuttle Program Emergency Control Center Activation and Operations Procedures, figure 3-8), the flightcrew can voice

Step	Responsible Position	Action Taken
1	FSM	Inform the GC when power has been restored to the MCC.
2	GC	Inform the Flight Director that power has been restored to the MCC and request permission for GC2 and the OST to go back to building 30 and begin restoring the MCC for mission support.
3	FSM/M&O	Perform power on portion of the (Power on/Power off Procedure), with DVIS power as the first priority, which includes FCR 1 Consoles (DVIS keysets).
4	HVC	Perform VAL 2A11 (DVIS Cold Start) and when completed, inform the GC that DVIS is ready for mission support.
5	GC	Advise the FD that voice communications have been restored and that relocation to building 30 can begin.
6	GC, OST and Computer Sup	Perform abbreviated RIEF test to reestablish MCC for mission support.
7	FD	Determine appropriate point to terminate TMCC support. Direct all support operations to relocate back to the MCC.
8	Capcom	Inform crew of TMCC termination and expected MCC return.

SOP 2.11

TITLE

REAL-TIME OBSERVATION REQUEST FOR TARGETS OF OPPORTUNITY

PURPOSE

To define the procedures and interfaces for requesting real-time observations for targets of opportunities (hurricanes, volcanic activity, solar activity, etc.) and the support provided by the FC Team.

PARTICIPANTS

EXTERNAL ORGANIZATIONS (REQUESTORS)

FD

* FAO

SPAN

ORBITER CREW

SMG

PROCEDURES

- A. Request for targets of opportunity observations will be directed to the FD for evaluation.
- B. If approved, FD will forward the request to FAO for assessment on crew activity timeline and impacts.
- C. The impacts and plans will be discussed on FD loop with the FC team. If the FD disapproves the observation request because of major impacts to the FLT PLN, then the information is submitted to SPAN to resolve the conflicts.
- D. The requestor must provide the following inputs.
 1. Objective for viewing the target.
 2. Description of target and nearby landmarks.
 3. Location of target; LAT/LONG or right ascension - declination.
 4. Type of viewing requested: photography, TV camera, or other payload instruments viewing.
 5. Maximum crossrange or elevation angle.
 6. Special attitude requirements on tracking.
 7. Projected weather. The SMB may be requested by FD to provide weather conditions, if available.
 8. Real-time voice observation reports by the orbiter crew.
 9. Disposition of postflight data.

- E. FAO will provide the following:
 - 1. AOS, LOS, Time of Closest Approach (TCA), crossrange, elevation angle
 - 2. Optimum orbiter windows for viewing
 - 3. Attitude (computed if special window is required)
- F. The completed data acquisition and data-take plan will be given to the orbiter crew.

SOP 2.12

TITLE

TEAM 4 CONTINGENCY OPS PROCEDURES

PURPOSE

To identify the plan, participants, and actions to be taken should an orbiter contingency occur requiring offline, integrated evaluations of the effects of the contingency on subsequent missions operations.

PARTICIPANTS

MOD MANAGER
* TEAM 4 FLIGHT DIRECTOR
TEAM 4 FC TEAM
EXTERNAL SUPPORT
SPAN/MER/CONTRACTOR
ENTRY FLIGHT DIRECTOR

GENERAL

The Team 4 group will perform an evaluation for any major anomaly and, if required, develop a contingency OPS plan which can be implemented by the real-time mission controllers and the onboard crew. This evaluation and plan will be coordinated with external elements such as MER/Contractors, Thermal and Wiring Identification support.

RESPONSIBILITIES

A. MOD Manager

Initiates the Team 4 contingency operation and assesses planning requirements.

B. Team 4 Flight Director

The controlling authority responsible for directing the contingency planning team effort and for developing the contingency operations plan.

C. Contingency Team Elements

The following MOD team elements will be responsible for providing expertise in their defined areas including evaluation and/or procedures for the affected orbiter areas. Team 4 members may be assigned preflight:

1. DPS

Responsible for the onboard systems monitoring and reconfiguration for the GPC's, flight critical MDM's, CRT display system, mass memories, and system level software.

2. EECOM

Responsible for ECLSS, thermal, onboard EPDC and fuel cell sub-systems, caution/warning systems, and nonpropulsive consumables management.

3. MMACS

Responsible for APU, hydraulic and mechanical systems, the remote manipulator systems, inflight maintenance, EVA support, and crew systems.

4. GNC

Responsible for the guidance, navigation, and control systems and contingency aerodynamic and flight control planning.

5. BOOSTER

Responsible for main propulsion systems.

6. PROP

Responsible for OMS and RCS systems.

7. PAYLOADS

Responsible for payload installed equipment.

8. FAO

Responsible for crew activity timeline planning, attitude and pointing, Flight Data File, and phase support.

9. CAPCOM

Responsible for crew inputs and crew capabilities.

10. INCO

Responsible for communications and data systems.

11. Surgeon

Responsible for crew health and safety, EMSS coordinator, and EVA support.

12. LRU Support (mechanical)

Responsible for providing preliminary LRU impact listing for documentation/data drawing file support, and coordination impact areas with the external support. Responsible for maintaining/updating the status board; tracking of anomalies and interfacing ongoing flight activities with Team 4.

a. Thermal Support

b. Vehicle wiring

c. Vehicle DFI wiring

- d. MER/Contractor
- D. External Support
 - 1. MER/Contractor
Provide support for all major contingency and subsystem failure conditions.
 - 2. Thermal Support
Evaluate launch video documentation and assess thermal effects.
 - 3. Wiring Identification support
 - 4. Identify vehicle wiring and/or functions of wiring in the affected area.

OPERATIONS PLAN

- A. The Team 4 activation and development of the contingency OPS plan will begin with the approval from the on-console MOD Manager.
- B. Notification of the Team 4 personnel will be coordinated through the on-console FCR operators. The Team 4 manning has been designated preflight.
- C. The contingency support room, located in building 30, room 2029, is the designated meeting area for the Team 4 operators and LRU support group (figure 2.12-1).
- D. The Team 4 briefing will be conducted as soon as practical by the Team 4 Flight Director, at which time the initial problems are to be identified and evaluation schedule milestones established. This schedule will be distributed to all required support elements.
- E. The LRU support team will provide a preliminary identification of the equipment in the affected area. If several areas are being investigated, the areas will be prioritized according to the level of impact.
- F. The status of the LRU's affected in various areas will be listed on the LRU status board in room 2029. The status will be updated every 3 hours.
- G. A data package consisting of equipment identification and photographs will be submitted to the SPAN/MER. The MER will interface with both the contractor and the Team 4 disciplines in investigating equipment impact evaluation, workaround and system procedural changes in development of the contingency OPS plan.
- H. The contractor (RI/Downey) contingency evaluation will support as required. This support interface will normally be conducted through the SPAN/MER.
- I. Periodic status meetings between the support disciplines and the Team 4 Flight Director will be held on the Team 4" communication loop. Periodic status telecons with the thermal support and the wiring support areas will be conducted.
- J. After final evaluation of the vehicle system procedural changes, the contingency OPS plan will be coordinated between the Team 4 Flight Director and the Entry Flight Director.

DATA/DOCUMENTATION

The following documentation will be available in the contingency support room for review if required:

<u>Source</u>	<u>Data/documentation</u>
MECH	Closeout photos LRU mapping computer program LRU identification books Orbiter overlay drawings FOD handbook drawings Shuttle mass properties Subsystems installation drawings
RMS/FAO	RMS video photography plan

MCC/TV PLAYBACK

TV playback capability for the purpose of assessing contingency areas can be made by submitting an MDRF request to the Data Integrator. Reference FCOH procedures: TV Playback, SOP 7.2, and Mission Data Request Form (MDRF), SOP 10.1.

CONTINGENCY SUPPORT ROOM

The Contingency Support Room (CSR) is located in room TBD of the building 30 MOW. The support room is configured with the following facilities: TBD.

SOP 2.13

TITLE

YEAR-END ROLLOVER PROCEDURES

PURPOSE

To define the procedural changes required when simulation or mission operations occur during the rollover from one calendar year to another.

PARTICIPANTS

*GC	FD
TRACK	INCO
FSM	NAV
FDO	DPS
COMMAND	DFE

GENERAL

Tests to verify orbiter onboard and MCC/network operational impacts of running across the year-end rollover were performed with the SMS and SAIL facilities in November/ December 1989. Summaries of the test accomplishments, operational impacts, and procedural workarounds are described here. For MCC procedural workarounds, see "Procedures" below. None of the impacts discovered are considered show stoppers.

- A. Onboard - The onboard GPC's continue to count up to day 366, 367, etc., whereas the master timing unit (MTU) resets to day 001. The MTU also resets at the end of days 366, 375, and 376. When the MTU resets to day 001, the GPCs default to internal time and continue running. The flight crew performs procedure "DPS SSR 17" to reset the MTU to GPC time. This procedure requires the TIME Spec, which is not available in OPS 1 or 3, thus the onboard should be in OPS 2 during rollover. Timewords within the downlinked telemetry continue to count sequential days; i.e., 366, 367, etc.
- B. Mission Operations Computer (MOC) - The MCC MOC continues to count to 366, etc., but displays the time as 001 on the DTE. Stepping the MOC ahead from one year into the next year does not present any problems. Recommended action is to take MOC checkpoints both prior to and after the rollover, as close to the event as practical.
- C. MCC Timing - Initial tests had the MCC MTU set for day 365 to provide pseudoreal GMT to the MOC, FEPs, and peripherals. Subsequent testing proved this to be unnecessary. The MTU resets to day 001 at rollover, but is no impact to MOC/FEPs/peripheral operations.
- D. Telemetry, Real-Time/Dumps - Downlinked telemetry, following rollover, contains timetags of day 366, etc. The FEP and MOC processing is not affected, but the data is displayed as day 001, etc., on the EDTE. GPC dump tapes were generated

and processed successfully during testing. All testing was performed with downlink encryption disabled.

- E. Command - Command testing was performed with uplink encryption and time authentication enabled. Delogs of the timetags within the uplinked time authentication words showed the MOC outputs consecutive days, 366, 367, etc. The time authentication process performs nominally with no workaround procedure required. The stored program command (SPC) build process requires careful attention. Refer to procedure A.1 below.
- F. Trajectory - At rollover, the NSS must resynchronize its timing system with the SMS by going nonintegrated, then back to integrated. This changes the network timetags to day 001. Following resynch, high- and low-speed tracking data are processed normally. The following list of functions all tested successfully: vector uplinks in both OPS 2 and 3, propagating ephemerides across the year boundary, targeting, vector compare, delta T, and delta state processing and uplink. Problems found were with TDRS vector timetags, vector move operations, and return of state vectors from the SMS to the MCC. Refer to procedures A.3 and B.3.

PROCEDURES

A. Mission Procedures

1. SPCs must be built using either the continuous day time base (366, 367, etc.) or MET. SPCs built with day 001, 002, etc., are executed immediately by the orbiter. An SPC build with day 366 is stored and handled by the MOC as 366, but displayed as 001. Thus, an SPC could be built incorrectly and not be detected on the load verification displays.

Workaround: Set the PET reference time in the SPC build menu to the launch time and build all SPCs using MET rather than GMT.

2. TDRS vectors transmitted electronically from GSFC are interpreted by the MOC as previous year vectors, making them unusable. The electronic method will not be used.

Workaround: After rollover, GSFC must transmit all vectors via facsimile, using true-of-date rotating (TDR) coordinate system. The NAV controller manually inputs these vectors to the MOC, using the S84 MED.

3. The S85 MED move option, used to change timetags of vectors, adds an additional 365 days to the timetags of any vector manipulated with the MED. This MED option is unusable.

Workaround: The NAV controller inputs the vector elements and correct timetag to the MOC via the S84 MED.

B. Simulation-Unique Procedures

1. Procedures A.1 and A.2 apply.

2. The SMS cannot perform a step/jump ahead across year-end boundary.

Workaround: Step/jump ahead to the end of the year, run real time across the year-end rollover, then step/jump ahead to the final data store point.

3. State vectors are improperly returned to the MCC for vector compare after year-end rollover.

Workaround: Manual comparison of the vectors at the SMS.

4. The ASID page does not allow data inputs past 365 days.

Workaround: Enter the time through the SID panel. Anticipated fix for this problem is a software patch to allow greater than 365 days.

5. After year-end rollover, the SMS environment is in day 001 and the GPC's are in day 366. Any state vector uplinked from the environment to the GPC's is invalid.

Sim workaround: Have the MCC uplink the vector.

Mission workaround: Add a software patch to the SMS uplink program to add 365 days to the vector timetag after year-end rollover.

SOP 2.15

TITLE

ATTITUDE TIMELINE THERMAL VALIDATION

PURPOSE

Define the process by which changes to the Attitude Timeline (ATL) are verified to be thermally acceptable for orbiter passive thermal control. Describe operations particular to next shift planning, real-time changes, and end-of-mission (EOM) planning.

PARTICIPANTS

* EECOM	MER THERMAL
THERMAL	FD
FAO	MCC FCT
POINTING	

GENERAL

FAO and Pointing are responsible for generating the ATL, which satisfies orbiter and payload attitude constraints. EECOM and Thermal have overall responsibility for thermal control of orbiter systems. Because of the complexity of the thermal interactions of the orbiter, generic thermal attitude constraints cannot be defined for all situations, and an iterative planning process must be used to give thermal approval for attitude changes.

EECOM's primary tool for analyzing attitudes is the Simplified Thermal Evaluation Program (STEP). STEP predicts temperatures for orbiter locations which have defined thermal limits using an attitude timeline which is created from the Pointing ALT. Because STEP is a simplified thermal model, worst-case uncertainties, based on past flight data, must be added to the predicted temperatures. The results are then compared with Flight Rule limits.

Thermal runs STEP (usually on the planning shift) for all known attitude changes, past and future. STEP is used as a screening tool for thermal concerns. If the results predict possible violations, EECOM coordinates with the FCT and/or MER Thermal as required and recommends how to correct the violations. For proposed attitude changes which require quicker approval, the FD, EECOM, and the FCT can approve changes based on engineering judgement, with the understanding that recovery attitudes may have to be added later.

It should be noted that a STEP thermal analysis is only valid for the timeframes where the attitude timeline is considered valid. For example, if the deorbit prep attitudes in the ALT are the preflight attitudes and they are inappropriate for the actual launch and must be replanned by Pointing, then bondline temperature predictions at EL would be invalid.

PROCEDURES

Next Shift Planning

NOTE

Times in this SOP are based on the replanning milestones in SOP 2.2.1. They are target times and may be affected by other replanning considerations.

1. Pointing will generate an ATL approximately once every planning shift (whether single or dual crew shift - see note below). This ATL will include the already-flown attitudes, plus the attitudes planned for the next 24 hours. It is desirable that the ATL include updated entry day attitudes, as well as any other known attitude changes beyond the next 24 hours. The ATL file will be in Pointing's MOC ATL format. This format replaces attitudes which STEP does not model correctly, such as spacecraft track, with appropriate LVLH or inertial snapshot attitudes. If possible, this ATL will be completed by wakeup minus 3 hours.

NOTE

On dual-shift missions, attitudes are generally replanned for only the next 12 hours. EECOM and FAO will decide preflight whether STEP analysis will be planned for every planning shift or only every 24 hours. This decision will be based on the expected thermal profile; i.e., beta angle, whether or not expected attitudes are generally thermally benign, etc. In the latter case, EECOM would use engineering judgement to approve 12 hours of attitudes; i.e., without a STEP run. EECOM may still require a STEP analysis if the proposed changes appear thermally significant.

2. Pointing will inform Thermal on SSR-1 of the workstation directory and title of the ATL file, as well as the associated state vector file. Pointing will also tell Thermal how far in the future the attitudes are valid; i.e., through the next 24 hours only, through EOM; and whether or not the MOC ATL (MSK 2330) is in sync with the workstation ATL.
3. Thermal will transfer the ATL file to the Thermal workstation and convert it to STEP format.
4. Thermal will run STEP. The STEP run and the subsequent data analysis can be expected to take about 1.5 to 2 hours. (This duration is dependent on mission duration and not on the number of attitudes.) For special constraints which STEP does not model, such as RCS thrusters at high beta or EDO pallet, Thermal will consult other documentation and/or MER Thermal as required.
5. Thermal will notify EECOM of any possible violations predicted by STEP, as well as any recommendations or other concerns. Thermal will also inform EECOM if any of the predicted violations occur during a timeframe which includes invalid attitudes.
6. If STEP predicts no violations, EECOM will give FD and FAO a GO on the planned ATL, by approximately wakeup minus 1.5 hours if possible.

7. If STEP predicts possible violations, EECOM will recommend whether or not to take action. FD, FAO EECOM, and other affected disciplines will decide whether or not to change the planned attitudes to satisfy the orbiter thermal requirements. MER Thermal will be consulted if necessary to assist in recommending corrective action and/or relaxing the STEP limit biases. If a formal response is required, EECOM will generate a SPAN/MER chit.
8. If the STEP analysis cannot be completed by wakeup minus 1.5 hours or agreement has not been reached on resolving violations, the FD may elect to either delay approval of the Execute Package attitudes or give an interim approval to allow uplink of the Execute Package. In the latter case, any attitude changes to correct violations may be worked as real-time changes; i.e., flight note.
9. If MMACS/Mechanical has requested STEP brake line temperature and BET predictions, Thermal will copy the files to Mechanical's diskette after the STEP analysis is complete.
10. If MER Thermal has requested a copy of the STEP ATL file, Thermal will notify MER Thermal that the STEP ATL is available. After STEP analysis processing is complete, Thermal will copy the file to the MER Thermal diskette.

Real-Time Changes

For changes to attitudes during execute shifts, if time permits, EECOM and Thermal will approve the changes based on engineering judgement. EECOM will inform FD of any thermal concerns associated with the attitude change. EECOM may also recommend further analysis (STEP run or MER support) and/or a recovery attitude. If a thermal constraint allows it, FD may elect to implement an attitude change with the understanding that a limit may be violated and/or a recovery attitude may be required later.

End of Mission Planning

STEP is also used to analyze EOM contingency scenarios, such as one-orbit waveoff and one-day waveoff. Because of the additional work required to generate alternate ATL's and STEP runs, these additional scenarios will be kept to the minimum required. To allow adequate time for EOM thermal analysis and water planning, EOM STEP analysis will be started the day before entry.

The constraints which are of most concern at EOM are bondline temperatures at entry interface, bending effect temperature (BET), and tire temperatures/pressures. These parameters are significantly affected by the deorbit prep attitudes, especially the comm attitude. If a nominal ATL shows predicted temperature trends to be acceptable during deorbit prep, then thermal concerns can be alleviated, and the number of cases to be analyzed may be reduced.

1. Preflight, the EECOM, FAO, and Entry FD will agree on the cases which will be analyzed and their relative priority. The cases will depend on the thermal behavior predicted (by STEP) in the nominal EOM ATL, as well as EOM trajectory and timeline constraints. The cases selected will represent only the most likely attitude options; e.g., nominal EOM, 2 orbit late to SLS (waveoffs in comm attitude).
2. Pointing will generate the ATL's for these cases during the second-to-last sleep period before Entry (approximately TIG - 36 hours). These ATL's will include the planned day-

before-entry attitudes; this is consistent with next shift planning above. Thermal will analyze the ATL's in the agreed-to priority order.

3. One-day waveoff cases will be analyzed after the waveoff and backout has occurred. (These analyses may have to extend to the subsequent team's shift.) This assumes that the waveoff attitude is -ZLV, which is thermally benign. One-day waveoff cases will not be analyzed before the actual waveoff unless orbiter or payload conditions require a waveoff attitude timeline which is not thermally benign.

SOP 2.16

TITLE

IMU ALIGNMENT PLANNING AND STAR TABLE UPDATE

PURPOSE

To define the procedure for planning IMU alignments and for updating the IMU star table utilizing the uplinkable star capability.

PARTICIPANTS

FAO
*POINTING
GNC

GENERAL

For each mission the Flight Activities Officer (FAO) develops the mission Flight Plan which includes periods where an IMU alignment may be performed per Flight Rule requirements. The IMU alignment is scheduled and the star pairs are selected by the FAO and Pointer to maintain mission requirements such as thermal constraints, communications links, payload requirements and constraints, crew availability, and minimization of fuel consumption. POINTING develops an ATL which satisfy the IMU alignment requirements listed in MOU #TBD. Any changes to the criteria to be used for star selection will come from the Guidance, Navigation, and Control Officer (GNC). They will inform POINTING as soon as possible so the appropriate stars can be selected in the planning process.

The decision to plan IMU alignments as maneuver or SOPA (star of probability align) is made by POINTING. SOPAs are preferred over maneuver aligns except for highly critical alignments. Therefore, POINTING attempts to ensure adequate star availability by selecting the best SOPA attitude at the required times, putting biases into baselined attitudes, selecting the best maneuver time/path, selecting SOPA friendly attitudes for orbiter required attitudes, or modifying the Flight Plan to put a SOPA friendly attitude in at the right time. As a final resort, a maneuver align is scheduled. This can be off the star pairs pad or as a minimum maneuver from a payload required attitude. In some cases, SOPAs are scheduled with a backup maneuver align. If the SOPA does not provide adequate stars, a maneuver may be required. POINTING will compute this maneuver considering all other mission constraints and requirements. POINTING also generates the IMU align star pairs cue-card and pad. This is used to provide an anytime, maneuver alignment capability during the mission. It also provides COAS/HUD alignment data to the crew. IN addition, POINTING generates the D/O IMU Align/Verif pad.

The uplinkable star capability enhances this process by allowing a larger selection of stars for IMU alignment planning, as well as for real-time IMU performance monitoring and real-time drift monitoring. Proper use of the uplinkable star capability will reduce undesired attitude maneuvers for IMU alignments. Uplinkable star capability is available in Primary Avionics Software System (PASS) Ops 2 only.

Ten slots are available in the star table for uplinked data. If it is desired to use a star that is not in the on-orbit table. POINTING will send star information to the GNC, who prepares uplink commands to update the star table. The IMU alignment or monitoring can then proceed. GNC will coordinate any changes to the on-orbit star table with FAO and POINTING so that the table configuration is known for planning purposes.

Actual star acquisitions rarely match predictions due to uncertainty in attitude deadband, maneuver init. times, horizon occultation constraints, star magnitude variability, etc. During realtime operations, the GNC evaluates the pair for good torquing angles, delta angle, age, etc. If acceptable, the crew is told to proceed with the IMU alignment per the plan. If not, the GNC will opt for a smaller separation pair with better data or a later alignment will be planned. If the alignment is not required, the GNC will call it off.

PROCEDURE

- A. GNC defines any realtime or planning deltas to the IMU align or monitoring requirements based on IMU configuration, performance, accuracy requirements, and expected star separation angles. This data is provided to FAO and POINTING.
- B. FAO coordinates IMU alignment scheduling based on the preflight planned activity and attitude requirements and on star availability associated with that plan.
- C. When an update to the onboard star catalog is desired, GNC and POINTING will discuss the update plan. POINTING will provide the star table uplink data in the format of Figure 2.16-1 to provide star data to the GNC's for uplink.
- D. GNC will build and uplink the STAR TABLE COMMAND per GNC SCP 3.5 and FCOH SOP 3.2.1.
- E. GNC will write a flight note to status FAO/POINTING on the configuration of the onboard star table.
- F. GNC evaluates the pair for good torquing angles, delta angle, age, etc. If acceptable, the crew is told to proceed with the IMU alignment per the plan. If not, the GNC will opt for a pair with better data or a later alignment will be planned. If the align is not required, GNC will call it off.
- G. During non-alignment periods, GNC may elect to uplink stars in support of IMU performance monitoring or drift measurement POINTING will be kept informed of the configuration of the onboard star table. Generally no data from POINTING is required to support performance monitoring.

SLOT	Star ID	Notes
101	xxx	<i>The notes section of the table can be used to identify special restriction or constraints such as the use of an uplink slot on the star pairs cue card, the presence of a star in an uplink slot also in the table, or use of an uplink slot for a planned upcoming IMU alignment</i>
110	xxx	

Requested uplink window: MET ddd/hh:mm - ddd/hh:mm

Star Acquisition Data

This section of the note will contain the star data for the expected IMU alignment opportunity and the time it will be scheduled in the Flight Plan. An additional list of other likely star pairs that may be acceptable for IMU alignment will also be provided. The general format will be:

- Candidate star ID's (with associated uplink slot, if applicable)
- MET of acquisition
- Associated Star Tracker
- Angular separation between the candidate stars
- Recommendation on best stars for the uplink to support the planned align period. Stars that are less likely to be acquired due to attitude deadband, maneuver path uncertainty, or acquisition near the bright earth will be identified.

Figure 2.16-1. Star Table Uplink Data

SOP 2.17

TITLE

SMS REAL-TIME SUPPORT

PURPOSE

To define SMS support team interface with the FC team.

PARTICIPANTS

DA8 REPRESENTATIVE
DT MANAGEMENT LEAD
SMS TEAM
FC TEAM
CB MOIR REPRESENTATIVE

GENERAL

- A. The SMS may be used, from L-3 days through the end of mission deorbit burn, to support the development of workaround procedures, duplication of problems, simulation of future events with known conditions present, or entry trajectory/wind analysis. The FC team is responsible for determining the configuration of the vehicle, the flight software, and onboard FDF. The SMS team and the assigned crewmembers will execute the test plan in the simulator. A representative of the prime FCR position(s) involved is encouraged to attend the runs and the summation of results meeting.
- B. The SMS team will be on call and will consist of the following positions.
 - 1. Team Lead - DT representative who is responsible for setting up the SMS, ensuring that test plan is compatible with the SMS, determining reset point information, and running the simulation
 - 2. NAV - Responsible for the SMS navigation and DPS areas
 - 3. CONTROL - Responsible for the GNC and PROP areas
 - 4. SYSTEM - Responsible for the EECOM, MMACS, and EGIL areas
 - 5. COMM - Responsible for the INSTRUMENTATION and COMMUNICATIONS areas
 - 6. Specialists as needed (e.g., PDRS, RNDZ, PL)
- C. The CB MOIR representative will make crew inputs to the test plan and ensure that crewmembers are present (if required) when the test is being performed.
- D. DO4 is responsible for correct FDF content and configuration at the SMS. DO4 shall inform DT prior to L-3 days of the name and phone number of their designated FDF representative(s) for prelaunch support.
- E. By L-10 days, the prime SMS Team Lead will initiate the Training Division real-time support memorandum to the Lead Flight Director. It will list the duty rotation of the DT Management

Leads and the SMS Team Leads, their home and office phone numbers, and their assigned pager numbers.

- F. After the flight, the prime SMS Team Lead will document the runs made as a result of each callup in a postflight report memorandum to the DT Management Lead responsible for the flight. The memo shall include each run for each real-time support session and actions taken during the flight as a result of the SMS runs.

PROCEDURES

The SMS real-time support procedure is broken down into four different sections:

- ζ Prelaunch Support
- ζ On-Orbit Callup of Real-Time Mission Support
- ζ Deorbit and/or Entry Callup of Real-Time Mission Support
- ζ Quick-Response SMS Real-Time Mission Support

The first, second, and third procedural sections are standalone procedures applicable to the flight phase of SMS real-time support required. The fourth section is designed to provide the quickest possible support during the on-orbit and deorbit/entry time periods.

A. Prelaunch Support

1. The DA8/Flight Director Office decides if an SMS run is desired, then designates a DA8 Representative who will initiate the request for the SMS Mission Support form (figure 2.17-1). The on-duty DT Management Lead shall be called and briefed on the purpose of the SMS callup; i.e., the objectives of the run(s), the intended results, the time criticality of the data, and the projected support requirements.
2. When the DT Management Lead and the DA8 Representative reach agreement for SMS support (see questions in table 2.17-1) after coordination with the on-duty SMS Team Lead, SIM CONTROL, CB/Deputy Chief, and other required support elements, the DT Management Lead will inform all parties of the SMS support starting time. The DT Management will obtain the completed and signed Request for SMS Mission Support form and deliver it to SIM CONTROL (copies to the SMS Team Lead and the DA8 Representatives).
3. The SMS Team Lead will coordinate the flight control team support data requirements with the DA8 representative. The DA8 Representative will assemble the support data and brief the SMS Team Lead on all final prerun details 1 hour prior to the SMS start time. The SMS Team Lead and DA8 Representative will brief all applicable support personnel in the building 5 conference room 30 minutes prior to run start.
4. Unless superseding data is requested and supplied by the DA8 Representative, the SMS will use existing reset point/data store initialization on the most recent training load available for the specific flight. The FDF used will be the existing books for that training load as supplied and configured by DO4 personnel. The SMS Team Lead will call the FDF representative for crew station configuration support if required.

5. When the prelaunch support run is completed, the result will be documented by the SMS Team Lead and the DA8 Representative on the SMS Support Status form (figure 2.17-2) and delivered to the Flight Director Office by the DA8 Representative (copy to SMS Team Lead).

B. On-Orbit Callup of Real-Time Mission Support

1. The FD decides if an SMS run is required and requests the DA8 Representative to initiate the procedure. After consultation with the prime FCR position(s) involved on the projected SMS support required and the time criticality of the data results, the Request for SMS Mission Support (figure 2.17-1) is filled out and the on-duty DT Management Lead is called.
2. When the DT Management Lead and the DA8 Representative reach agreement (see questions in table 2.17-1) that the SMS facility is appropriate for the proposed support, the DT Management Lead will determine whether the SMS is needed within the next 4 hours or if the real-time support will be needed after 4 hours. If the real-time support is required within a period of 2 to 4 hours, the DT Management Lead must work the quick response portion of this SMS real-time support procedure.

If the SMS real-time support is not needed within 4 hours, the DT Management Lead should call the SMS Team Lead, who will coordinate with the DA8 Representative and the affected FCR position(s) the feasibility and limitations of obtaining the intended results and the initialization data pack that will be required. In general, that data will include the following:

- a. Number of crewmembers required (see GENERAL, paragraph C)
 - b. Vectors for all bodies (cut on whole GMT minute)
 - c. Weight and c.g.
 - d. Fuel loading and consumables
 - e. Flight software deltas from nominal configuration
 - f. Systems deltas from nominal configuration
 - g. Current FDF (see paragraph 5)
 - h. Specific run objectives(s) and resulting data
3. The SMS Team Lead and DA8 Representative will then inform the DT Management Lead of specific simulator requirements as known at this time. The DT Management Lead will deliver the signed Request for SMS Support form (copies to the DA8 Representative and SMS Team Lead). The DT Management Lead will also inform SIM CONTROL of the following:
 - a. Start time and duration
 - b. Base required, including reset point/data store, step-ahead time, visuals, and payloads
 - c. Stowage required

- d. Data logging required
 - e. Support personnel required
 4. The DA8 Representative shall contact the CB MOIR Representative to provide required crew support in the building 5 conference room 2 hours prior to run start.
 5. The DA8 Representative shall contact the FAO to provide the "as launched" FDF plus a copy of all actual uplink (voice or RF) changes. The FDF should be available to the crew in the building 5 conference room 2 hours prior to run start for pencil updating all uplinking changes. The crew will return the FDF to the FDF Representative for stowage in the crew station prior to run start.
 6. Two hours prior to the scheduled start time, while the support crew is readying their FDF in the building 5 conference room, the SMS Team Lead will pick up the final initialization data pack and be briefed by the DA8 Representative in the MCC.
 7. One hour prior to the scheduled start time, the SMS Team Lead will deliver final initialization data to SIM CONTROL and conduct a briefing in the building 5 conference room for all personnel involved in the upcoming run(s).
 8. When the mission support run is completed, the results will be documented by the SMS Team Lead and the DA8 Representative on the SMS Support Status form (figure 2.17-2) and delivered to the FD by the DA8 Representative. Copies of this form should go to the SMS Team Lead, FAO, and appropriate FCR disciplines.
- C. Deorbit and/or Entry Callup of Real-Time Mission Support
1. The FD decides whether an SMS run is desired for trajectory/wind analysis and requests the DA8 Representative to initiate the procedure. After consultation with FDO on the recommended time to start the run, the Request for SMS Mission Support (figure 2.17-1) is filled out and the on-duty DT Management Lead is called.
 2. When the DT Management Lead and the DA8 Representative reach an agreement for SMS support (see questions in table 2.17-1), the DT Management Lead must determine whether the SMS is needed within the next 4 hours or if the real-time support will be needed after 4 hours. If the real-time support is required within a period of 2 to 4 hours, the DT Management Lead must work the quick response portion of this SMS real-time support procedure.

If the SMS real-time support is not needed within 4 hours, the DT Management Lead will advise the on-duty SMS Team Lead and SIM CONTROL (x32720) that the SMS is being called up for real-time support. The DT Management Lead will obtain the completed and signed Request for SMS Mission Support form (figure 2.17-1) and give it to SIM CONTROL (copies to the DA8 Representative and the SMS Team Lead). The DT Management Lead will also inform SIM CONTROL of the following:
 - a. Run purpose - trajectory, wind, or both.
 - b. Motion base preferred with forward visuals.
 - c. Reset point is EI-10 minutes.

- d. Proposed run start time.
3. The DA8 Representative shall contact the CB MOIR Representative to provide a crew at the SMS 15 minutes prior to run start.
4. The DA8 Representative shall contact the FAO to provide the entry FDF configuration at the SMS 15 minutes prior to start.
5. The DA8 Representative/FDO shall have the end of mission data pack ready for pickup by the SMS Team Lead 30 minutes prior to run start. They shall inform the SMS Team Lead of any deltas to the desired data results. The end of mission data pack shall contain the following information:
 - a. TDRS vector at the first whole minute of GMT past EI-10.
 - b. Designated runway.
 - c. Altimeter setting and surface temperature.
 - d. Weight and c.g.
 - e. Consumables.
 - f. Fuel loading.
 - g. PASS/BFS deltas from nominal configuration.
 - h. Systems deltas from nominal configuration.
 - i. Wind (forecast or mean monthly) - For forecast wind cases, the SMS needs altitude (FLT), velocity (FPS), and direction (TRUE).
 - j. Special crew procedures (if required)
6. The desired data results from the SMS are
 - a. First bank command and direction
 - b. MET at closed loop guidance initiate
 - c. M at each roll reversal
 - d. HAC intercept
 - (1) Altitude
 - (2) Heading (derive turn angle to runway)
 - e. Speedbrake modulations (provided on winds analysis only)
 - f. Procedure feedback
 - g. Altitude at MM305 transition
 - h. Maximum bank angle and G's on the HAC

7. When the end-of-mission session is completed, the results will be documented by the SMS Team Lead and the DA8 Representative on the SMS Support Status form (figure 2.17-2) and delivered by the DA8 Representative to the FD (copies to the FDO and the SMS Team Lead).

D. Quick Response SMS Real-Time Support

Purpose: This part of the procedure is designed to provide SMS real-time support within a period not less than 2 hours but not more than 4 hours. DT believes that providing real-time support in less than 2 hours is not realistic. If support is not needed within 4 hours, the basic procedure should be used.

Philosophy change: The quick response portion of this procedure has two significant changes from the basic document.

1. The DT Management Lead is given more responsibility.
2. All support personnel are asked to come to the test even though they may not actually be needed.

The DT Management Lead will attempt to involve the SMS Team Lead in the data collection process as soon as possible, but the DT Management Lead will not wait to hear from the SMS Team Lead to start the data collection process. In this procedure, the SMS Team Lead is not consulted about the need for SMS real-time support.

If the on-console FD requests SMS real-time support and needs it ASAP, the intent of this procedure is to provide that support as quickly as possible. Therefore, it is left to the DA8 Representative and the DT Management Lead to collect the data.

Procedure:

1. The on-console FD decides whether an SMS run is required and requests the DA8 Representative to initiate the procedure. After consultation with the prime Flight Control positions involved on the projected SMS support required and the time criticality of the data results, the request for SMS mission support (figure 2.17-1) is filled out and the on-duty DT Management Lead is called.
2. When the DT Management Lead and the DA8 Representatives reach an agreement for SMS support (see questions in table 2.17-1), the DT Management Lead must determine whether the SMS is needed within the next 4 hours or if the real-time support will be needed after 4 hours. If the real-time support is required within a period of 2 to 4 hours the DT Management Lead will perform this procedure (quick response SMS real-time support).
3. The DT Management Lead calls SIM CONTROL and tells them that MOD wants to exercise the quick response SMS real-time support procedure. SIM CONTROL is asked to perform the duties listed in the SIM CONTROL duties portion of the quick response SMS real-time support procedure.

NOTE

SIM CONTROL should be on the preflight distribution of this procedure.

The DT Management Lead must also give SIM CONTROL the specific simulator requirements. (The DT Management Lead will deliver the signed Request for SMS Support form (copies to the DA8 Representative and SMS Team Lead) to SIM CONTROL.)

- a. Start time and duration
- b. Base required, including reset point/data store, step-ahead time, visuals, and payloads
- c. Stowage required
- d. Data logging required
- e. Support personnel required - SMS Team, crew positions needed, and what time everyone is required at the SMS for the pretest briefing

NOTE

For quick response SMS real-time support, all positions will be required.

4. The DT Management Lead calls the MOIR and tells them to inform the CB MOIR REP that CB support is needed for SMS real-time support. Tell the MOIR Manager to give the CB MOIR REP the following information:
 - a. CB support is needed for a quick response SMS real-time support.
 - b. The crew positions and skills needed.
 - c. The time the crew is needed at the SMS for the pretest briefing.
 - d. Supporting crewmembers are to call SIM CONTROL at (281) 483-2720 if they need more information.
5. The DT Management Lead pages the entire SMS Team and inputs the SIM CONTROL phone number, (281) 483-2720. SIM CONTROL will perform actions given in part 2 of this procedure.
6. The DT Management Lead, along with the DA8 Representative, will obtain all the final initialization data needed to support this test. In general, that data will include the following:

NOTE

If this test is called for end-of-mission support, the data will be the same as that given in section C, page 2.17-4 of this procedure.

- a. Number of crewmembers required (see GENERAL, paragraph C)
- b. Vectors for all bodies (cut on whole GMT minute)
- c. Weight and c.g.
- d. Fuel loading and consumables
- e. Flight software deltas from nominal configuration
- f. Systems deltas from nominal configuration
- g. Current FDF (see paragraph 6)
- h. Specific run objective(s) and resulting data

The DT Management Lead will pick up this data pack from the MCC and deliver it to the SMS no later than 30 minutes prior to the start of the simulation.

7. The DT Management Lead will remind the DA8 Representative to obtain from FAO the "as launched" FDF plus a copy of all actual uplink (voice or RF) changes. The FDF should be available to the crew in the building 5 conference room ASAP for pencil updating of all uplinked changes. The crew will return the FDF to the FDF Representative for stowage in the crew station prior to run start.
8. The DT Management Lead will work with the DA8 Representative to make sure that the final initialization data is delivered to SIM CONTROL as soon as possible. The initialization data pack needs to be given to SIM CONTROL 1 hour after the call for a quick response SMS real-time support in order to give SIM CONTROL the time needed to get the SMS configured properly.
9. The DT Management Lead, along with the SMS Team Lead, will conduct a briefing in the building 5 conference room for all personnel involved in the upcoming run(s). This briefing could occur as soon as 2 hours after the call for a quick response SMS real-time support. The exact time for the prebrief will be designated by the DT Management Lead. SIM CONTROL will be given this time, and all test participants can call SIM CONTROL to get the prebrief time.
10. When the mission support run is completed, the results will be documented by the SMS Team Lead and the DA8 Representative on the SMS Support Status form (figure 2.17-2) and delivered to the FD by the DA8 Representative. Copies of this form should go to the SMS Team Lead, FAO, and appropriate FCR disciplines.

E. SIM CONTROL Duties

1. Serve as the main point of contact for all personnel who will be supporting the test. SIM CONTROL will have the SMS real-time support procedure on console and be

familiar with its contents. SIM CONTROL will be prepared to collect information and provide that information to anyone associated with the test.

2. Upon callup of the SMS for real-time support, SIM CONTROL will obtain the following information from the DT Management Lead.
 - a. Start time and duration
 - b. Base required, including reset point/data store, step-ahead time, visuals, and payloads
 - c. Stowage required
 - d. Data logging required
 - e. Support personnel required - SMS Team, crew positions needed, and what time everyone is required at the SMS for the pretest briefing

NOTE

For quick response SMS real-time support, all positions will be required.

3. Schedule the conference room for the pretest briefing and make sure the room is available for the entire test.
4. In order to ensure that the proper support is available for the start of the test, SIM CONTROL will have a copy of the DT Team Lead version of the SMS real-time mission support. This memo contains the list of all DT personnel who are required to support SMS real-time support sessions.

SIM CONTROL will keep track of which operators have called in to support the test and will tell each operator and crewmember the time that they are required at the SMS for the pretest briefing.

NOTE

SIM CONTROL will not have the names of the crewmembers who are expected to support the test, but when they call in, he should log their names.

Periodically, SIM CONTROL should expect a call for the DT Management Lead with a status on who has called in to support the test. The DT Management Lead will use this information to determine if he needs to call backup personnel to support the test.

Table 2.17-1. SMS callup request questions

QUESTIONS TO BE ANSWERED ON SMS CALLUP REQUEST BY DT MANAGEMENT
LEAD AND DA8 REPRESENTATIVE

1. What is the purpose-
2. Can the SMS, as modeled, contribute to the solution of this problem-
3. How much time is projected-
4. How many runs are projected-
5. Is this test better performed on/in conjunction with another facility-
6. Can this callup wait until normal work hours-

REQUEST FOR SMS MISSION SUPPORT

TITLE: _____

Mission

Request
Number

OBJECTIVES(S):

SUMMARY DESCRIPTION OF OFF-NOMINAL VEHICLE CONFIGURATION(S) TO
BE SIMULATED:

FACILITY REQUIREMENTS:

BASE: EITHER FIXED MOTION

VISUAL: FORWARD AFT/OVHD/CCTV

RESET POINT: _____ OR DATA STORE POINT: _____
STEP AHEAD TO: ____/____:____:____ SGMT
day/ hr: min:sec

MOD INITIATOR:

Flight Director

Date/Time

CONCURRENCE:

DT Management Lead

Received By:

SIM CONTROL Date/Time

Copy to: MER via MOIR

Flight Director

SMS Team Lead

Figure 2.17-1. Request for SMS Mission Support

SMS SUPPORT STATUS FORM

1. OBJECTIVE
2. TEST PLAN
3. DATA REQUIREMENTS
4. RESULTS/RECOMMENDATIONS

Signature

MET:

DA8 Representative

Figure 2.17-2. SMS Support Status Form

SOP 2.18

TITLE

COORDINATION OF POWER CONFIGURATION FOR SEVERE WEATHER

PURPOSE

The purpose of this procedure is to establish guidelines for coordinating implementation of the severe weather power configuration for the MCC. This involves starting the diesel generators, paralleling them with the JSC site fed power source, then divorcing the facility from the Houston Lighting and Power Co. (HL&P) commercial power. Because of technical limitations, these steps cannot be separated by time delays and must be considered a single procedural entity.

PARTICIPANTS

FLIGHT DIRECTOR (FD)
GROUND CONTROLLER (GC)
FACILITY OPERATIONS MANAGER (FOM)
BUILDING 48 DUTY OFFICER
JSC NOAA WEATHER

REFERENCE

Plant Engineering Division Management Issuance No. 8460.01A

GENERAL

Using established criteria, this procedure will be followed during periods of inclement weather that have the possibility of causing an interruption to or disturbance of HL&P-provided power service to JSC. The JSC NOAA Weather Office, when manned, will notify the Facility Operations Manager (FOM) of impending severe weather that could meet established criteria for implementing the severe weather power configuration. The information will be relayed by the FOM to the Ground Controller on duty and to the building 48 Duty Officer. In accordance with the detailed procedures in this SOP, a decision will be made relating to whether the severe weather power configuration will be implemented.

NOTE

The procedures involved in switching from HL&P to diesel power and back entail inherent risk. Therefore, coordination of the implementation time may be required to avoid critical events.

The NOAA Weather forecasters normally man the facility during nonmission periods from 0630L until 1800L, Monday through Friday. During mission periods, the weather office is normally manned from 0100L until 1800L, Monday through Friday, and from 0300L until 1200L during weekends. Twenty-four hour staffing occurs from launch minus 36 hours through launch plus 6 hours, and from landing minus 30 hours through landing plus 4 hours. During hurricane support, the weather office is staffed 24 hours a day.

When there is a possibility of severe weather approaching the JSC area, the weather forecaster will contact the FOM before leaving the facility and provide the available information about the

weather system severity, projected track, and timing. The NOAA Weather forecaster will then configure the weather channel on the MCC RF video system to display radar for south Texas coast so that it can be monitored in the facility.

PRO CEDURES

1. NOAA Weather will call the FOM and provide information about severe weather that could meet the criteria for severe weather power configuration and that is either currently in the vicinity or approaching the vicinity of JSC.
2. The FOM will provide the information to the on-duty GC, who will relay the information to the on-duty Flight Director.
3. The FOM will also provide the information to the Duty Officer in the building 48 power facility.
4. Based on the information provided to the building 48 Duty Officer, he/she will decide whether the diesel generators will be brought on line and whether the facility will be divorced from HL&P-provided power service.
5. In the decision to implement or not to implement the severe weather power configuration, the on-duty FD has the option to overrule if, after considering all ramifications, FD considers it to be in the best interest of the MCC and/or the Space Shuttle Program either to protect or to risk its equipment and support capability.
6. The building 48 Duty Officer will coordinate with the FOM and the on-duty GC to determine and establish the appropriate time to bring up the diesel generators and isolate the facility from commercial power. At the agreed-upon time, the building 48 Duty Officer will implement the procedure and notify the FOM when the MCC is on generator power and divorced from HL&P-provided service.
7. The JSC NOAA Weather forecasters will notify the FOM when the weather situation has improved or is no longer in the vicinity of JSC.
8. The FOM will relay the information provided by the JSC NOAA Weather forecaster to the on-duty GC and the building 48 Duty Officer. The duty officer will decide when the severe weather configuration should be terminated. The return to HL&P-provided power service will be implemented at a time agreed upon with the GC and FD, based on the operations in progress relating to flight or simulation support.
9. The decision to return to HL&P-provided power service can also be overruled by the on-duty FD, who after considering all ramifications deems it to be in the best interest of the facility or the Space Shuttle Program to remain in the severe weather power configuration.

SOP 2.19

TITLE

MISSION CONTROL CENTER VIRUS PREVENTION/RESPONSE PROCEDURE

PURPOSE

To define the procedure for the MCC Flight Control Team (FCT) to accomplish virus scanning, detection, and reporting for newly acquired data and computer hardware. These procedures apply to both online and offline office automation and flight note systems during preflight, flight, and postflight phases.

PARTICIPANTS

FCT
JSCMODM FST (Flight Support Team)

GENERAL

A. Flight Controllers

The FCT console operators are the first line of virus prevention in the MCC and are responsible for ensuring all data brought into the control center are properly scanned before being used on the JSCMODM Flight Note server and associated workstations. These data include floppy disks, laptop/PC workstations brought into the control center to support a specific flight, E-Mail attachments, and data transferred over the JSC Information Network (JIN).

Each MOD division file server and workstation has the latest virus protection software and must be used to ensure all data transferred electronically to the MCC are clean. If a virus is encountered outside the MCC, the Information System Directorate (ISD) Help Desk (483-4800) should be contacted. If a virus is encountered in the MCC, refer to "Virus Infection Response" in this SOP for the proper procedure. E-mail attachments cannot be scanned and cleaned until an action is performed on them (e.g., opened, copied, save as). All E-Mail attachments must be scanned before sending them to the control center whether a flight is in progress or not.

NOTE

In many cases, a virus infected E-Mail attached file is "Copied" or "Saved As" and the virus is detected and cleaned. When this happens, only the copy is cleaned. The actual attachment is still infected. The attachment cannot be cleaned unless it is opened, cleaned, and resaved back into the E-Mail message.

Virus scanning workstations are provided through the MOD (one per building). They are not connected to the network and are always turned on. Current locations are as follows:

B4N-3006A - In the back room, to the right, near the scanner and PC.

B4S-2809 - To the back on the left.

B17/229 - In the hall near the HP5M printer.

B30A/2068 - In the entrance, to the right, near the printer.

B30S/2334 - Outside the White FCR left door, behind the gray partition.

The JSCMODM FST is responsible for keeping these virus workstations updated with the latest virus software and signature files.

B. JSCMODM FST

The JSCMODM FST is responsible for responding to and reporting all virus incidents in the MCC with regard to the JSCMODM server and associated workstations. They are also responsible for ensuring that all MOD office automation division file servers, including the JSCMODM flight note server, are updated with the latest virus scanning software and virus signatures and are scanned for viruses by close of business (COB) on launch - 2 days (L - 2).

C. MOD Division Server Administration Support

This procedure is intended to prevent or limit infection by viruses coming from division servers through E-Mail attachments, file transfers, and other forms of data transfers.

At launch - 3 days (L - 3), the MOD server administrator performs a scan on all division office automation servers to ensure that any infected files are detected and cleaned. System administrators for division-specific servers that may contain flight support data are responsible for scanning the servers with the latest virus software and virus signatures. These administrators are required to submit a virus plan to the MOD Computer Security Officer (CSO) certifying that the server has been scanned and is clean. The JSCMODM server administrator performs the same cleanup task on the JSCMODM server and all associated workstations. This ensures that all MOD servers are as clean as possible before each flight. The only contaminated files not cleaned are attachments to E-Mail messages, that must be opened before they can be scanned and cleaned.

PROCEDURES

A. This section covers virus scanning procedures performed by flight controllers.

1. Scanning Floppy Disks

Virus scanning workstations are not connected to the network and are strictly for scanning floppy disks.

- a. If the workstation is not turned on, turn it on and leave it on. Norton AntiVirus automatically opens. If it does not, double click the Navw32.exe icon.
- b. A Norton AntiVirus window appears; insert floppy disk, click the Drive A: icon, and select Scan Now.
- c. If a virus is found, it is repaired automatically.
- d. The virus must be reported. To report a virus or any other virus scanning problems anytime, call pager (713) 891-9099 (24-hour flight pager).

The JSCMODM FST will check out the virus and take the appropriate actions.

- e. When scanning is complete, close the scan window. Leave the Norton AntiVirus window open for the next user.

2. Scanning Laptops/PC Workstations

Virus scanning floppy disks are provided for scanning and cleaning Laptop/PC workstations. These are used for scanning any equipment brought into the control center. There are three disk configurations: DOS 6.2.2., Windows 95, and Macintosh. The disks can be checked out from the GC console. If additional virus scanning disks are required, contact the JSCMODM FST at pager (713) 891-9099 (24-hour flight pager). The JSCMODM FST is responsible for maintaining and updating these disks.

- a. Boot with diskette supplied by the GC console. The Scan window appears.
- b. Click the drive(s) to be scanned (C:, D:, A:) and select scan now.
- c. If a virus is found, it is repaired automatically.
- d. The virus must be reported. To report a virus or any other virus scanning problems anytime, call pager (713) 891-9099 (24-hour flight pager).

The JSCMODM FST will check out the virus and take the appropriate actions.

- e. Exit, reboot, and return the diskette to the GC console. The laptop/PC workstation is ready to connect to the network.

B. This section covers virus scanning procedures performed by the JSCMODM FST.

1. Virus Infection Response

This procedure details how virus incidents are handled in the control center if the MODM server or associated workstations get infected.

- a. If a virus is reported in the control center during a flight, in regard to the JSCMODM server or associated workstations, the JSCMODM FST virus response team must immediately be notified by calling the 24-hour flight support pager (713) 891-9099.
- b. After receiving a virus call and verifying the validity, the response team immediately contacts the ISD Help Desk to report that a virus has been discovered in the MCC and that the response team is responding.
- c. The first workstation or server inspected is reported to the Help Desk so that official notification of a virus incident can be recorded.
- d. The response team proceeds to all suspected workstations or console positions cleaning and documenting the infected workstations. Access to all hardware or software at each position is given to the response team for scanning and cleaning.
- e. When all viruses have been eradicated, the response team notifies the GC and Flight Director console positions that all viruses have been found and removed.
- f. A complete report is compiled and submitted to the MOD CSO and Flight Directors Office by COB the following day.

2. JSCMODM Workstation Preflight Updates

This procedure involves doing a Launch - 3 days check for the latest virus update. If a more current version is available, then it will be deployed as described below.

- a. The JSCMODM server administrator for the upcoming flight goes to the ISD home page and checks for the latest virus update. If the workstations are current with the latest update, no further action is performed. This action is performed on L - 3.
- b. If the update is more current, it is downloaded to a single workstation and tested before being deployed. Testing is conducted on the same day that it is downloaded in this case L - 3.
- c. If the update presents no problems, it is deployed on L - 3 and L - 2. Any deployment problems are corrected before L - 1. From L - 1 through the end of mission there is no deploying of virus software updates or signature files.

NOTE

During a flight, JSCMODM support personnel will continuously monitor the ISD home page for new virus updates. If a new update is available, it is downloaded to a standalone workstation and tested in case an emergency update in the MCC is required. This ensures deployment time is kept to a minimum. In addition, all standalone virus workstations (refer to Flight Controllers for locations) and diskettes used for scanning laptops and PC workstations (refer to Scanning Laptops/PC Workstations for details) are updated to the latest virus signature level.

SOP 2.19.1

TITLE

OFFICE AUTOMATION SYSTEMS AND FLIGHT SUPPORT

PURPOSE

This procedure gives guidelines for using files hosted on Office Automation Systems (OAS) in support of flights. OAS include servers and desktop computers outside of the MCC in the office environment and the JSCMODM flight support server inside the MCC.

PARTICIPANTS

All MCC Occupants
* MOD Office Automation Systems Projects Lead

REFERENCES

JSC 2410.11 JSC Automated Information Systems Security Manual

GENERAL

While MOD strives to offer the highest practical reliability measures for its OAS servers and desktop computers, they are not to be considered mission critical or flight certified. JSCMODM, the MCC OAS server, offers the highest level of data integrity and reliability because it is dedicated to mission support and has the fewest network backbone dependencies.

It is the responsibility of each flight control console lead to ensure that OAS files are placed on the appropriate host system for flight support prior to and for the duration of a mission. All files placed on the MCC Flight Support Server JSCMODM shall be deleted after mission completion.

JSC 2410.11 JSC Automated Information Systems Security Manual defines four sensitivity/criticality levels for security purposes for all automated information systems. The following table defines the levels along with the appropriate host system for Office Automation Systems flight support files.

PROCEDURES

AUTOMATED INFORMATION SENSITIVITY/ CRITICALITY LEVEL	<u>EXPLANATION</u> Automated information, automated applications, or computer systems, the inaccuracy, alteration, disclosure, or unavailability of which:	RECOMMENDED LOCATION OF OAS FLIGHT SUPPORT FILES
3	<ul style="list-style-type: none"> • Would have an IRREPARABLE impact, permanently violating the integrity of NASA's missions, functions, image, and reputation. The catastrophic result would not be able to be repaired or set right again; or • Would result in the loss of MAJOR tangible asset(s) or resource(s), including posing a threat to human life. 	Do <u>not</u> use office servers
2	<ul style="list-style-type: none"> • Would have an ADVERSE impact actively opposed to NASA's missions, functions, image, and reputation. The impact would place NASA at a significant disadvantage; or • Would result in the loss of SIGNIFICANT tangible asset(s) or resource(s). 	JSCMODM - MCC Flight Support Server
1	<ul style="list-style-type: none"> • Would have a MINIMAL impact on NASA's missions, functions, image, or reputation. A breach of this sensitivity/criticality level would result in the least possible significant unfavorable condition with a negative outcome; or • Could result in the loss of SOME tangible asset or resource. 	<ul style="list-style-type: none"> - JSC-MOD-FS3-MOD shared resources server (<i>redundant</i>) - Desktop computers
0	<ul style="list-style-type: none"> • Would have a NEGLIGIBLE impact on SA's missions, functions, image, or reputation. The impact, while unfortunate, would be insignificant and almost unworthy of consideration; or • Probably would NOT result in the loss of a tangible asset or resource. 	<ul style="list-style-type: none"> - User Home directory (N:) servers (<i>not redundant</i>) - Desktop computers

**SOP 3
COMMAND**

SOP 3.1

TITLE

COMMAND POLICY FOR THE MISSION OPERATIONS DIRECTORATE

PURPOSE

This procedure defines the command policy for the Mission Operations Directorate (MOD) which applies to Space Shuttle Program (SSP) operations.

PARTICIPANTS

- FD
- * INCO
 - MCC Command Initiation/Execution Positions
 - MCC Command Generation Positions
 - COMMAND

GENERAL

MOD command policy is contained in the FCOH, section 3, the Space Shuttle Operational Flight Rules (ref. Flight Rule 1-14), and the applicable Flight Rules Annex. Additional SSP payload command policy is contained in NSTS-19943, Command Requirements and Guidelines for NSTS Customers, NSTS-21000-SIP, Shuttle/Payload Standard Integration Plan, and NSTS-21000-A03, Data Requirements for the Flight Operations Support Annex.

If discrepancies exist, Flight Rules take precedence over FCOH procedures. All console handbook procedures shall be written to conform to the Flight Rules and FCOH procedures. Exceptions to this SOP will only be made with FD approval. The following are definitions of terms used in the command policy for MOD:

A. Command Operation

The initiation or execution of command data to an actual orbiter or payload vehicle. This includes prelaunch test commanding to KSC Cargo Integration Test Equipment (CITE), but not simulations.

B. Command Panel

Refers to the command capabilities of a position. Command panels, any combination of hardware devices and software functions used expressly for the uplink of commands.

C. Command Plan

The set of documents that identifies the command operations concept for a specific flight, via policy and procedures (including timelines, if used) that specify the use of NASA and payload customer resources (i.e., command systems and personnel).

D. Payload Hazardous Command

A command that can remove an inhibit to a hazardous function or activate an unpowered hazardous payload system (ref. NSTS 21000-A03). The term "hazardous command" is used for definition only, since commands defined as hazardous are never initiated while the hazard potential exists.

E. Preflight-approved command operation

A command operation using command systems, data, and procedures that are approved by SSP and/or the Lead Flight Director prior to launch. Changes to command data which do not affect overall command function (e.g., time tags, instrument adjustments) retain preflight-approved status, as long as the change has no adverse impact to the safety or mission objectives of the SSP or payloads. Reference Flight Rule 1-14K.2.

F. Non-standard procedure

A procedure not approved and published, or *not* routinely used.

G. Command certified operator

An MCC Flight Controller who has completed the command certification requirements in their applicable Training Guide.

H. Buildable command

A prestored "command shell" in one of the MOC command storage arrays (CSAs) designated for real-time command generation.

PROCEDURES

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

A. Command Training and Certification

MCC Flight controllers who generate, store, verify, initiate, or execute command data for SSP command operations are required to be command certified, per the requirements in their applicable Training Guide. If the training for certification is part of a larger (e.g., flight controller) certification, the specific lessons required for command certification will be identified (e.g., highlighted with asterisks).

Positions that are required to be command certified are referenced in SOP 3.2.1.

B. Command Procedures

All command operations will be supported by FOIG-approved procedures. Real-time changes to procedures must be authorized by the FD. All procedures requiring FOIG/FD approval for changes shall be clearly identified.

A Command Procedures Handbook (CPH) has been developed and consists of a collection of all FOIG-controlled orbiter command procedures. All FOIG-controlled payload command procedures are contained in the Payload Support Console Handbook Command Procedures Annex (PSCH CPA).

All command operations that require coordination with other disciplines must be documented in the FCOH, CPH, and CPA, as applicable.

Procedures for each command must contain all restrictions applicable for the command, and safety critical steps will be marked by a box. For example: OI load, OPS mode, Ops note/ waivers, vehicle, and crew coordination.

Command procedures must contain steps to verify that the buildable command data base has been correctly received and stored in the MOC, as well as steps for deletion and safing of loads after command actions are complete.

Command operations using nonstandard command procedures will be submitted to the FD in written form for flight control team (FCT) review and FD approval.

C. Command Operations

1. Command plan

The integrated orbiter and payload command plan (reference definitions in the GENERAL) will be developed by INCO and PAYLOADS personnel, reviewed at the Flight Operations Review (FOR), and documented in SSP-approved operations documentation (e.g., Flight Rules, INCO Communications Memorandum, Operations Support Timeline, and Joint Operations Interface Procedures). Payload command operations which have no adverse effect on the safety or mission objectives of the SSP or other payloads may be documented in Payload Operations Branch documentation (e.g., Payload Support Console Handbook Flight Supplement), or payload customer-approved documentation (e.g., the Spacelab POCC Command Timeline).

2. Command data generation, storage, and verification

Command data generated and stored by MCC flight controllers, for SSP command operations, will be verified by two command-certified flight controllers, prior to the request for uplink. The data verification will be

performed upon the data resident in the storage device (e.g., MOC) from which the data will be initiated.

The command storage arrays (CSA's) in the MOC shall not be used as a historical repository for commands. The CSA shall contain only commands which are intended for future uplink. Hazardous command or commands which are of such a critical nature that they must be previewed by the operations community prior to use shall be safed.

3. Command initiation and execution

a. General

Critical orbiter command operations normally take precedence over all payload command operations. Critical payload commanding may take precedence over noncritical orbiter commanding, based upon the Flight Rules or the decision of the FD. Command precedence between payloads will normally be established by the Flight Rules.

All command operations will be approved by the FD. Routine and continuous operations shall require only initial approval. When command sequences of a hazardous nature are being executed, the FD will exercise positive control of the major procedural steps by obtaining status and providing approval.

The INCO is the prime uplink operator. All command uplink activities will be coordinated through the INCO or the INCO MPSR. Exception will be the abort command for ascent, since the MOC automatically prioritizes the abort command above all other commands.

During any command operations, the command initiator will have talk and monitor voice loop capability with the command requester, COMMAND, and any appropriate coordination loops. For prelaunch testing, this includes loops to remote sites (e.g., KSC).

Command Panels will only be enabled when attended by a command certified operator. If the command initiator/executor will be absent from the position for an extended period of time or the position is under maintenance, the operator will notify COMMAND to disable the command position.

FD approval for uplink implies a go for unsafing the command. If a hazardous or critical command is to be unsafed because it may be needed rapidly but not immediately uplinked, a separate go from the FD is required.

Auto execute mode (MOC automatic comparison and issuance of buffer execute command) is the normal mode for two-stage commands. Manual execute mode shall primarily be used for limited, predefined cases such as day of launch I-load updates and midpass TDRS handovers, which have special timing constraints.

Commands, both orbiter and payloads, will be sent during crew sleep only if previously coordinated with the crew, or to prevent nuisance alarms, or if a part of routine/continuous operations. No state vector uplinks will be initiated within 10 minutes of predicted LOS, and no state vector uplinks will be initiated during periods of communications interference or poor communications.

Commands shall not be uplinked during onboard software operational sequence (OPS) transitions. DPS shall inform the FCT of OPS transitions on the Flight loop.

When practical, the crew should be informed when a DEU equivalent will be performed prior to uplink, because crew interaction with the display system can affect implementation of commands. Also, a DEU equivalent will not be chained because successful execution of a command may not be verified before subsequent commands are executed.

If loss of one RTC in an MRTC would cause a hazardous condition, the MRTC will be sent in the two-stage mode.

b. Command uplink request

- (1) Each request to the INCO or INCO MPSR personnel for a command uplink must include a confirmation of FD approval for uplink, the GPC major function (MF) destination, and the DSM (including sequence number) number of the command. For commanding to the BFS GPC, there must be a confirmation (instead of the GPC MF) that the destination is BFS. For DEU equivalents, there must be a confirmation (in addition to the GPC MF) of the DEU number to which the load will be uplinked. For payload commanding, PAYLOADS MPSR personnel will verify the GPC MF and DSM number, and obtain FD approval via the Payload Officer. For payload commanding from a Payload Operations Control Center (POCC), including the Multipurpose Control Center (MPCC), the DSM number is not applicable.
- (2) The GPC MF/BFS destination, DEU number (if applicable), and DSM number shall be repeated back to the command requester on the command

initiator loop, prior to execution, to ensure that the information has been received correctly. INCO will confirm the command initiator has a GO from the FD. For payload commanding from the MCC/MPCC, PAYLOADS MPSR personnel will verify the selected command via the command plan or payload customer coordination.

- (3) The requester will monitor the command initiator loop until all requested command actions are completed.
- (4) The command initiator will notify the command requester when the requested command initiation/execution is completed.
- (5) MCC command requesters will monitor the Command Summary Display to verify that the correct commands and sequence have been executed. For payload commanding, PAYLOADS MPSR personnel will monitor command tracking displays.
- (6) The command requester is responsible for verifying the success of the command via end item telemetry when available, and notifying the FD of the command results on the loop, except for routine or preflight approved commands.

4. Sequence-critical commands

When the order of execution of the commands is critical to their success, the requester and command initiator will coordinate after each command. Subsequent commands will not be sent until authorized by the FD and the requester. If the sequence of commands is hazardous, consideration should be given to coordinating the commands on the FD loop. If the proper sequence of commands is critical to their success, a flight note describing the required sequence will be provided to the command initiator and the FD for FCT review and FD approval.

NOTE

For nonhazardous payload commanding, this policy applies to operations that:

- a. Are not part of the command plan, or
- b. Use nonstandard command procedures, or
- c. Could have an adverse effect upon SSP or payload safety or mission objectives, with the exception of those effects agreed to in the preflight-approved command plan (e.g., mission priorities).

5. Payload command operations

a. General

Designated MCC command-certified flight controllers (e.g., PAYLOADS and INCO personnel) are responsible for the support of payload command operations through configuring, monitoring, and resolving anomalies associated with the MCC and orbiter command systems, and, if required, initiating/executing commands to payload and payload support systems. These flight controllers are also responsible for ensuring the safe and efficient use of SSP resources (e.g., the orbiter), and, toward this end, will provide guidance to SSP payload customers on the conduct of payload command operations. For payloads that have hazardous commands, MCC flight controllers have additional responsibilities, as specified in the command plan. For payloads that do not have hazardous commands, the payload customer is responsible for the success of their payload command operations, since MCC personnel typically have little or no insight into the function of customer-initiated payload commands (e.g., during POCC commanding).

Payload commanding that does not deviate from the command plan will be considered routine for the purposes of command approval and coordination (ref. C.1.).

b. Payload command data generation, storage, and verification

Payload command data which is not approved via a Payload Integration Plan Annex 4 Change Request requires Flight Director and INCO approval, prior to the data being stored in the MOC/MPCC/PHE.

c. Payload command operations constraints

All payload commanding after payload bay door closure will be via T-0 umbilical or standard switch panel and will nominally be completed no later than the start of ET cryogenic propellant loading at approximately 11 hours before launch (L-11 hours). Only mandatory commands specifically approved by the SSP and documented in the Flight Operations Support Annex (Annex 3) will be allowed after this time. In no case will payload commands be sent after L-9 minutes.

Payload command panels shall normally remain disabled by COMMAND from L-9 minutes until the "Go for orbit ops" call, and from deorbit burn TIG-4 hours until wheels stop after landing. However, if authorized by the preflight-approved command plan, PAYLOADS personnel may uplink payload commands, anytime an SM GPC is available.

Prior to uplink, the Payload Officer will indicate on the FD loop when payload commands defined as "hazardous" (ref. Definitions, 4.) are about to be uplinked, and receive approval for uplink from the FD.

Payload commands shall not be uplinked from the start of the L-9 minute hold until completion of the OMS-2 burn. Payload SPC/MSPC's may be uplinked by INCO prior to L-9 minutes and executed after L-9 minutes. From completion of the OMS-2 burn until the "Go for orbit ops", only INCO may uplink payload commands. Payload SPC/MSPC's may be uplinked by INCO prior to deorbit burn TIG-4 hours and executed between TIG-4 hours and wheels stop.

d. Orbiter command system coordination

Use of the orbiter command system for payload commanding should be specified in the flight-applicable JOIP. If not, 4 minutes before TDRS-EAST LOS, 2 minutes after TDRS-WEST AOS, and 2 minutes prior to and 2 minutes after a TDRS handover (1 minute for GSTDN/RTS), as applicable, is reserved for orbiter commanding. The orbiter command system may be used for payload commanding during these reserved times with the approval of the INCO. Noncritical payload commanding that requires continuous communication (e.g., sequence-critical command chains) should be avoided within 5 minutes of acquiring/losing TDRS LOS, due to earth limb interference.

All payload commanding that requires the use of the SM two-stage buffer will be coordinated with the INCO or the INCO MPSR. Payload consoles do not have the capability to command to the BFS or GNC computers. If the need arises on a flight-specific basis, INCO will uplink the commands. Uplink of payload single-stage RTC's does not require approval from INCO unless there is a deviation from the command plan. Payload SPC's/MSPC's will be uplinked by INCO or INCO MPSR personnel.

If coordination of the SM two-stage buffer or coordinating between two payload command sources would prevent meeting payload mission objectives, simultaneous command operations (simo ops) may be conducted between two command sources (i.e., MCC, MPCC, or POCC). Normally, this should be part of the command plan. If not, the applicable payload customer(s), INCO, and PAYLOADS will recommend simo ops to the FD, who must give a one-time approval to begin simo ops. If the command sources are changed, another FD approval must be obtained. PAYLOADS and/or INCO should advise each oncoming FD in the shift handover briefing that simo ops are in progress, and which command sources are being used for simo ops.

D. Command Anomalies and General FD Notification

If any anomalies *or* off-nominal conditions are detected during command operations, the command requester and/or the command initiator will notify the FD immediately. In addition, command requesters and/or initiators will obtain the approval of the FD before initiating command operations that:

1. Are not routine, preflight-approved, or part of the command plan, or
2. Use nonstandard command procedures, or
3. Could have an adverse effect upon SSP or payload safety or mission objectives, with the exception of those effects agreed to in the preflight-approved command plan (e.g., mission priorities).

A word-by-word compare shall not be initiated to the BFS MF (for OI-23 and subsequent releases, word-by-word has been eliminated from the BFS).

In cases where command system anomalies occur during critical command sequences, the MPSR and FCR shall coordinate the subsequent actions required for the resolution of the anomaly.

No Two-Stage Buffer (TSB) Execute commands shall be uplinked for a DATA REJECT miscompare of the two-stage buffer content, except for a miscompare of the TSB Execute command itself.

No TSB Execute command shall be uplinked to the guidance, navigation, and control (GNC) major function (MF) for a TELEMETRY REJECT (TMRJ) miscompare of the TSB (no exceptions).

No TSB Execute command shall be uplinked to the systems management (SM) MF for a TMRJ miscompare of the two-stage buffer, except upon approval of the FD. An example of when a TSB Execute of a TMRJ might be uplinked is an uplink of a telemetry format load (TFL) in format 129, which has no SM downlist.

SOP 3.1.1

TITLE

MCC/LAUNCH COMPLEX COMMAND SYSTEM ACTIVATION, DEACTIVATION, AND SAFING

PURPOSE

This procedure identifies the sequences necessary to activate, deactivate, and safe the Merritt Island Launch Area (MILA) command system when conducting launch complex/MCC/STS testing or launch operations. The sequence ordering provides a means of activating/deactivating the command system in a logical and consistent manner to maintain command system configuration control.

PARTICIPANTS

FLIGHT	NASA Test Director (NTD)
GC	INCO
* COMMAND	MILA

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

PROCEDURES

A. Command ACTIVATION/ARMING Sequence (throughput mode)

- **1. NTD - Request FLIGHT to verify MCC ready to support command checks.
2. FLIGHT - Request GC to verify the command system is ready for activation.
3. GC - Request COMMAND perform checklist (step 5).
- **4. NTD - Conduct MILA uplink activation sequence:
 - a. Verify radiation clearance for MILA uplink (specify frequency).
 - b. Verify vehicle ready for MILA uplink.

**Indicates OMI callouts

NOTE

Steps 4 and 8 not required if MILA uplink has already been activated by LCC.

- c. MILA place SFL in SAFE mode.
- d. Activate MILA uplink carrier (no modulation) and verify phase lock.
- e. Apply uplink modulation (SFL to OPERATE) and verify network signal processor (NSP) frame sync lock.

- 5. COMMAND - Conduct command checklist
 - a. Verify that MCC SAFE/OPERATE status is in SAFE.
 - b. Site select appropriate TDRSS VEH.
 - c. Verify that CEF configured to match orbiter COMSEC configuration via telemetry.
 - d. Select Time Authentication (T/A) Enable/Disable to match COMSEC configuration determined in step C. If T/A is enabled, verify MOC timer 1 is in sync with orbiter time.
 - e. Verify that only INCO and COMMAND positions are FLIGHT SELECTED on the Flight Select Matrix (FSM).
 - f. Verify that INCO's command panel configuration is in the disabled mode.

- 6. COMMAND - Notify GC that the command system is ready to be armed.
GC - Notify FD that the command system is ready to be armed.
FLIGHT - Request GC to arm the command system.
COMMAND - Set the MCC command system to OPERATE and advise FLIGHT "MCC command system is armed."
- 7. FLIGHT - Notify NTD that the command system is armed, and MCC is ready to proceed with OMI command sequences.
- **8. NTD - Notify FLIGHT to initiate commands and uplink per OMI steps.

**Indicates OMI callouts

- **9. INCO - Enable the command panel, load the command per OMI, and execute the command on a mark as required by OMI step.
 - **10. INCO - Notify NTD when the uplink is complete and stand by for the next sequence.
 - **11. COMMAND - For OMI ABORT advisory checks, refer to FCOH procedure 3.1.3.
- B. Command SAFING/DEACTIVATION sequence (throughput mode).

NOTE

Perform steps 1 to 3 for safing. Perform steps 1 to 6 for safing and deactivation.

- 1. FLIGHT - Request GC to SAFE the MCC command system.
- 2. COMMAND - Set the MCC command system to SAFE and advise GC "MCC command system is safed."
- 3. GC - Notify Flight "MCC command system is safed."
- **4. FLIGHT - Notify NTD that MCC has completed command checks and the command system is safed.
- **5. NTD - Verify ready for MILA uplink deactivation.
- **6. NTD - MILA deactivate uplink.
- 7. COMMAND - Deselect appropriate TDRSS VEH.

**Indicates OMI callouts

SOP 3.1.2

TITLE

MCC COMMAND SYSTEM INITIALIZATION/SAFING

PURPOSE

To define the operational procedure for placing the MOC command software in the OPERATE or SAFE mode for launch support.

PARTICIPANTS

FD	PAYCOM
INCO	GC
COMM SUPPORT	COMMAND
PAYLOAD	INSTRUMENTATION

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

INITIALIZATION

- A. At MOC initialization, the command software is initialized in the SAFE mode (all MOC command uplink capability inhibited).
- B. At MOC initialization, all F/C command panels are in DISABLE mode.
- C. After the MOC is initialized, COMMAND will place the MOC command software in the OPERATE mode and perform a command system test(s).
- D. When the command system test(s) is completed, COMMAND will advise GC that the system is ready to support.
- E. GC will advise FD and INCO that the command system is ready to support.
- F. COMMAND will ENABLE each position for command when requested by that position (INCO, PAYLOADS, PAYCOM, COMM SUPPORT).

CAUTION

After MOC is in operate and positions are enabled, the only remaining inhibits are command operator controlled.

NOTE

COMMAND/INCO - Verify from times L - 5 minutes to BDA LOS +2 minutes, the only positions which are to be "command enabled" are: FD, FDO, INCO, INST, and COM. Any directions to deviate from this procedure must come from FLIGHT or INCO.

SAFING

- A. COMMAND will DISABLE each position for command when requested by that position or by INCO.
- B. The MOC command software will remain in OPERATE until COMMAND is directed to switch to SAFE mode by GC or FD.

CAUTION

For prelaunch activities, the MOC should be safed when not needed for command checkouts.

SOP 3.1.3

TITLE

ABORT COMMAND ENABLE/DISABLE

PURPOSE

To define the procedure for abort advisory command enable/disable function.

PARTICIPANTS

FD
FDO

COMMAND
GC

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

GENERAL

- A. The command position FLT ENABLE/DISABLE capability is controlled by the COMMAND controller.
- B. The abort command software ENABLE/DISABLE function is controlled by the FD position and the FDO position.
- C. The abort command will be transmitted by FD or FDO to indicate that one of the following modes is required: FAST SEP, RTLS, AOA, ATO, TAL, or Contingency Abort.
- D. If an aborted flight will result in a night landing, FD will transmit the "abort off" command after the abort has begun.

PROCEDURES

- A. Terminal Count Abort Advisory Check
 - 1. MCC enable
 - a. At 5 minutes before "Abort Advisory Command check," COMMAND sequentially "FLT ENABLES" the FD and FDO positions.

NOTE

Enable both FD and FDO positions sequentially on COMMAND position Flight Select Matrix (FSM) to avoid software lockout.

- b. At 4 minutes before Abort Advisory Command check, "FD ENABLES" the abort command software.

NOTE

In terminal count, Abort Advisory Command checks are performed by the MCC per OMI timeline.

- 2. MCC disable
 - a. After completion of ABORT ADVISORY C/O, "FD performs a LOGIC CLEAR", and then "DISABLES" the abort command software.
 - b. At 5 minutes after completion of ABORT ADVISORY C/O, "COMMAND DISABLES" the FD and FDO positions.

B. Abort Command Configuration for Launch

- 1. MCC enable
 - a. At L-5, "COMMAND ENABLES" the FD and FDO positions.

NOTE

Enable both FD and FDO positions sequentially on COMMAND console flight select module (FSM) to avoid software lockout.

- | |
|---|
| <ul style="list-style-type: none">b. At L-2M, "FD ENABLES" the abort command software.2. MCC disable<ul style="list-style-type: none">a. "FD DISABLES" the abort command software after orbital insertion.b. "COMMAND FLT DISABLES" the FD and FDO positions unless directed otherwise by GC or FD. |
|---|

SOP 3.1.4

TITLE

INDIVIDUAL COMMAND SAFING/ENABLING

PURPOSE

To define the procedure for safing/enabling an individual command.

PARTICIPANTS

MCC Command Positions
* COMMAND

GENERAL

- A. Permission, certain commands are identified as individual safed commands; i.e., inhibited from being uplinked. Such commands are initialized in the "safed" state at OOMOC initialization.
- B. Commands which are not safed are considered enabled for uplink.

PROCEDURES

- A. Individual commands are safed/enabled by COMMAND. Verification of safed command inputs is the responsibility of the requesting F/C position and COMMAND via EDTE 2665.
- B. If a safed command is required to be uplinked, the appropriate F/C (command requester or command operator) advises COMMAND, after Flight Director approval, to enable the command for uplink by providing the individual safed command's DSM number. Flight Director approval for uplink implies a go for unsafing. If a command is to be unsafed but not immediately uplinked, a separate go from the Flight Director is required.
- C. When uplink requirements of the command(s) are completed, it is the responsibility of the requesting F/C position to advise COMMAND to safe the command and to provide COMMAND with the information in paragraph B.
- D. If a command (RTC, Stored Program Command (SPC), or Load) which has not been previously identified as an individual safed command is to be safed, COMMAND is provided with the information in paragraph B which is needed to safe the command.

E. Safed Command Notes

1. A command can be group or individually safed.
2. Commands in safed groups appear on EDTE 2665, even though they are not individually safed.
3. When a group is enabled, the commands in that group disappear from EDTE 2665.
4. If a command is individually safed and then added to a group, it is group safed, not individually safed, although it will appear on both displays EDTE 2665 and 2666.
5. If a command is deleted from a group, it retains the status of the group at the time it is deleted; i.e., if a command is deleted from a group that is disabled (safe), that command becomes individually safed. If a command is deleted from a group that is enabled (unsafe), that command is unsafe (see no. 4).
6. To uplink an individually safed command, you must individually unsafe it.
7. To uplink a group safed command, all you have to do is enable that group.

SOP 3.1.5

TITLE

SAFED COMMAND GROUPS

PURPOSE

To define the procedure for safing/enabling safed command groups.

PARTICIPANTS

MCC Command Positions

*COMMAND

GENERAL

Permission, certain commands are identified and assigned by group ID (1, 2, 3, or 4) (maximum of 10 CMD's/group) as safed command groups; i.e., inhibited from being uplinked. Such command groups are initialized in the safed state at MOC initialization. When these command groups are not safed, they are said to be enabled for uplink.

PROCEDURES

- A. Safed command groups are safed/enabled by COMMAND. Verification of safed command inputs is the responsibility of the requesting F/C position and COMMAND via EDTE 2666.
- B. If a specific command of a safed command group is required to be uplinked, the appropriate F/C contacts INCO to have the safed command group enabled.
- C. INCO then advises COMMAND to enable the safed command group for uplink by providing COMMAND the group number (1, 2, 3, or 4).
- D. When uplink requirements of the safed command group(s) are completed, INCO advises COMMAND to safe the command group by providing the group number.
- E. If a command (RTC or MRTC) which has not been previously identified as a safed command is to be added to a safed command group, the F/C position responsible provides COMMAND with the vehicle ID, digital select matrix (DSM) number to be safed, and safed group number.

F. Safed Command Notes

1. A command can be group or individually safed.
2. Commands in safed groups appear on EDTE 2665, even though they are not individually safed.
3. When a group is enabled, the commands in that group disappear from EDTE 2665.
4. If a command is individually safed, then added to a group, it is group safed, not individually safed, although it will appear on both displays EDTE 2665 and 2666.
5. If a command is deleted from a group, it retains the status of the group at the time it is deleted; i.e., if a command is deleted from a group that is disabled (safe), that command becomes individually safed. If a command is deleted from a group that is enabled (unsafed), that command is unsafed (see no. 4).
6. To uplink an individually safed command, you must individually unsafe it.
7. To uplink a group safed command, all you have to do is to enable that group.

SOP 3.1.6

TITLE

MPS SAFING COMMAND PROCEDURES FOR LOSS OF LAUNCH PROCESSING SYSTEM/LAUNCH DATA BUS CAPABILITY

PURPOSE

To provide the procedures necessary to safe the orbiter by opening the LO2 overboard bleed, MPS POGO valves, and closing the LO2 prevalues when these valves cannot be positioned because of the loss of launch processing system/launch data bus (LPS/LDB) capability, and when crew actions are unsuccessful in properly configuring MPS LO2 valves for safing the vehicle. This command procedure was last verified during the STS-55 Terminal Countdown Demonstration Test.

PARTICIPANTS

FLIGHT DIRECTOR
INCO
COMMAND
DPS
* BOOSTER
NASA TEST DIRECTOR (NTD)

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

GENERAL

Restrictions:

OI Load:	All
OPS mode:	PASS - OPS 9
Major function:	GNC
Vehicles:	All
Crew/MCC coordination:	None
Hazardous:	Yes
Require MOC safing:	Yes

TIME CONSTRAINTS

These commands must be sent within two (2) minutes after their request; otherwise, catastrophic damage to the vehicle and the launch facility will result.

PROCEDURES

- A. In the event of a hold or an abort after T-31 seconds and counting, BOOSTER will immediately request from the FLIGHT DIRECTOR a "go" to unsafe the MPS safing commands. This "go" includes a "go" to unsafe the DPS DEU equivalent (DSM 20101) that performs the GNC OPS 1 to OPS 9 transition. After the FLIGHT DIRECTOR gives a "go," BOOSTER will request that COMMAND unsafe the commands and will state that BOOSTER has a "go" from the FLIGHT DIRECTOR. BOOSTER will verify that the MPS safing commands are unsafed via EDTE 0918 and 0919, and will inform the FLIGHT DIRECTOR and INCO if any commands are not unsafed within 1 minute. BOOSTER will continue to work with COMMAND until unsafing is complete and will inform the FLIGHT DIRECTOR and INCO when unsafing is accomplished.

DPS will verify that DSM 20101 is unsafed, via EDTE 2664 or EDTE 2665, and will inform the FLIGHT DIRECTOR and INCO if it is not unsafed within 1 minute, DPS will continue to work with COMMAND until unsafing is complete and will inform the FLIGHT DIRECTOR and INCO when unsafing is accomplished.

- B. Once the vehicle is determined by the BOOSTER and KSC to be in a safe configuration, the BOOSTER will inform the FLIGHT DIRECTOR, INCO, and COMMAND that the vehicle is in a safe configuration and that DSM 20101 and the MPS safing commands are not to be sent. BOOSTER will then request from the FLIGHT DIRECTOR a "go" to safe the MPS safing commands. This "go" includes a "go" to safe DSM 20101. After the FLIGHT DIRECTOR gives a "go," BOOSTER will request that COMMAND safe the commands and will state that BOOSTER has a "go" from the FLIGHT DIRECTOR. BOOSTER and DPS will verify that the commands are resafed and will inform the FLIGHT DIRECTOR and INCO of the command safe status.

WARNING

THE REMAINDER OF THIS PROCEDURE WILL BE PERFORMED ONLY IF VEHICLE SAFING VIA MCC COMMAND CAPABILITY IS REQUIRED.

- C. KSC (NTD) will determine if they have lost LPS/LDB capability and if MPS safing must be performed via MCC command capability.
- D. Upon recognition of this case, a call will be made from KSC NTD to Houston FLIGHT DIRECTOR to transition to OPS 9. The transition will be accomplished through the uplink of a DEU equivalent (digital select matrix (DSM) 20101) to the GNC major function and a DEU specified by the DPS officer. The INCO will send the DEU equivalent on a call from the DPS officer. The DEU equivalent contains the "GNC OPS 901 PRO" command, which is interpreted by the GPC's. Upon receiving the command, the GPC's will transition to OPS

9. The DPS officer will verify that a successful OPS 9 transition has been made and will report this to the FLIGHT DIRECTOR before the safing commands are sent.
- E. The call from the KSC NTD to the Houston FLIGHT DIRECTOR will include the vehicle safing (close the LO2 prevalves and open the overboard bleed and POGO valves) multiple real-time commands (MRTC's) (DSM's 5650, 5654, 5651, 5652, 5653). After a "go" from the FLIGHT DIRECTOR, BOOSTER will inform INCO of the commands required and the GNC major function destination and will state that BOOSTER has a "go" from the FLIGHT DIRECTOR. BOOSTER will request automatic two-stage transmission of the MRTC's. The INCO will then send the MRTC's. Booster will verify that these valves are positioned correctly and that the MPS LO2 manifold disconnect temperatures are dropping.
- BOOSTER will then inform the FLIGHT DIRECTOR of the status of the configuration. If the valves are in the proper configuration and the MPS LO2 manifold disconnect temperatures are dropping, the orbiter is in a safe configuration until LPS/LDE capability can be restored.
- F. The FLIGHT DIRECTOR will inform the NTD of the completion of the procedure.
- G. BOOSTER will then request from the FLIGHT DIRECTOR a "go" to safe the MPS safing commands. This "go" includes a "go" to safe DSM 20101. After the FLIGHT DIRECTOR gives a "go," BOOSTER will request that COMMAND safe the commands and will state that BOOSTER has a "go" from the FLIGHT DIRECTOR. BOOSTER and DPS will verify that the commands are resafed and will inform the FLIGHT DIRECTOR and INCO of the command safe status.
- H. Tables 3.1.6-1, 3.1.6-2, and 3.1.6-3A, B, and C. List the RTC's that combine to form the MRTC's used to configure the LO2 overboard bleed valve, the LO2 POGO recirculation valves, and the LO2 prevalves. Table 3.1.6-4 lists the DSM 20101 DEU equivalent used to transition from GNC OPS 1 to GNC OPS 9.

CAUTION

A LAUNCH SCRUB MAY OCCUR IF THESE COMMANDS ARE SENT DURING PRELAUNCH.

Table 3.1.6-1 Overboard bleed command library

DSM	RTC TITLE	MDM	RESET	SET	MSID
5600	TERM OVB CL COM A	FA 3	BIT 2 - 1	BIT 2 - 0	V41K1575U
5601	TERM OVB CL COM B	FA 4	BIT 2 - 1	BIT 2 - 0	V41K1576U
5602	TERM OVB CL COM C	FA 2	BIT 2 - 1	BIT 2 - 0	V41K1577U

DSM	MRTC COMMAND TITLE
5650	TERM OVB CL COM

NOTE

MRTC 5650 contains RTC's 5600, 5601, 5602.

Table 3.1.6-2 POGO command library

DSM	RTC TITLE	MDM	RESET	SET	MSID
5627	TERM POGO1 CL CMD A	FA 1	BIT 1 - 1	BIT 1 - 0	V41K1830U
5628	TERM POGO1 CL CMD B	FA 3	BIT 1 - 1	BIT 1 - 0	V41K1831U
5629	TERM POGO2 CL CMD A	FA 2	BIT 1 - 1	BIT 1 - 0	V41K1832U
5630	TERM POGO2 CL CMD B	FA 4	BIT 1 - 1	BIT 1 - 0	V41K1833U

DSM	MRTC COMMAND TITLE
5654	TERM POGO COMMANDS

NOTE

MRTC 5654 contains RTC's 5627 through 5630.

Table 3.1.6-3A. E1 LO2 prevalve command library

DSM	RTC TITLE	MDM	RESET	SET	MSID
5603	ISSUE P/V CL A - ME1	FA 3	BIT 9 - 0	BIT 9 - 1	V41K1139U
5604	ISSUE P/V CL B - ME1	FA 1	BIT 9 - 0	BIT 9 - 1	V41K1140U
5605	ISSUE P/V CL C - ME1	FA 2	BIT 9 - 0	BIT 9 - 1	V41K1141U
5606	ISSUE P/V CL D - ME1	FA 4	BIT 10 - 0	BIT 10 - 1	V41K1142U
5607	TERM P/V OP A - ME1	FA 3	BIT 8 - 1	BIT 8 - 0	V41K1196U
5608	TERM P/V OP B - ME1	FA 1	BIT 8 - 1	BIT 8 - 0	V41K1197U
5609	TERM P/V OP C - ME1	FA 2	BIT 8 - 1	BIT 8 - 0	V41K1198U
5610	TERM P/V OP D - ME1	FA 4	BIT 9 - 1	BIT 9 - 0	V41K1199U

DSM	MRTC COMMAND TITLE
5651	CLOSE ENG1 P/V

NOTE

MRTC 5651 contains RTC's 5603 through 5610.

Table 3.1.6-3B. ME2 LO2 prevalve command library

DSM	RTC TITLE	MDM	RESET	SET	MSID
5611	ISSUE P/V CL A - ME2	FA 1	BIT 9 - 0	BIT 9 - 1	V41K1239U
5612	ISSUE P/V CL B - ME2	FA 2	BIT 9 - 0	BIT 9 - 1	V41K1240U
5613	ISSUE P/V CL C - ME2	FA 3	BIT 9 - 0	BIT 9 - 1	V41K1241U
5614	ISSUE P/V CL D - ME2	FA 4	BIT 13 - 0	BIT 13 - 1	V41K1242U
5615	TERM P/V OP A - ME2	FA 1	BIT 8 - 1	BIT 8 - 0	V41K1296U
5616	TERM P/V OP B - ME2	FA 2	BIT 8 - 1	BIT 8 - 0	V41K1297U
5617	TERM P/V OP C - ME2	FA 3	BIT 8 - 1	BIT 8 - 0	V41K1298U
5618	TERM P/V OP D - ME2	FA 4	BIT 12 - 1	BIT 12 - 0	V41K1299U

DSM	MRTC COMMAND TITLE
5652	CLOSE ENG2 P/V

NOTE

MRTC 5652 contains RTC's 5611 through 5618.

Table 3.1.6-3C. ME3 LO2 prevalve command library

DSM	RTC TITLE	MDM	RESET	SET	MSID
5619	ISSUE P/V CL A - ME3	FA 2	BIT 9 - 0	BIT 9 - 1	V41K1339U
5620	ISSUE P/V CL B - ME3	FA 4	BIT 9 - 0	BIT 9 - 1	V41K1340U
5621	ISSUE P/V CL C - ME3	FA 1	BIT 9 - 0	BIT 9 - 1	V41K1341U
5622	ISSUE P/V CL D - ME3	FA 3	BIT 10 - 0	BIT 10 - 1	V41K1342U
5623	TERM P/V OP A - ME3	FA 2	BIT 8 - 1	BIT 8 - 0	V41K1396U
5624	TERM P/V OP B - ME3	FA 4	BIT 8 - 1	BIT 8 - 0	V41K1397U
5625	TERM P/V OP C - ME3	FA 1	BIT 8 - 1	BIT 8 - 0	V41K1398U
5626	TERM P/V OP D - ME3	FA 3	BIT 9 - 1	BIT 9 - 0	V41K1399U

DSM	MRTC COMMAND TITLE
5653	CLOSE ENG3 P/V

NOTE

MRTC 5653 contains RTC's 5619 through 5626.

Table 3.1.6-4 GNC OPS 901 PRO DEU equivalent

DSM	DSM TITLE	MAJOR FUNCTION	# OF WORDS	DEU EQUIVALENT KEYSTROKES
20101	OPS 901 PRO	GNC	5	OPS 901 PRO

NOTE

The DSM numbers may change when the new CCC Command Processing System comes on line.

REFERENCES

1. Operational and Maintenance Instructions, S0007, Volume 5, Sequence number 132.
2. Operational and Maintenance Instructions, S10003, Sequence number 99.
3. Orbiter MPS FMEA/CIL, Volume 2, 1977.
4. Orbiter Maintenance and Requirements Specifications Document, Volume I, File 2.

SOP 3.1.7

TITLE

CONTINGENCY COMMAND AND CONTROL HANDOVER (CCH) TO 30 MOW DURING
WHITE FCR OPERATIONS (DELETED)

SOP 3.1.8

TITLE

COMMAND REGISTRATION/DEREGISTRATION

PURPOSE

To identify the steps necessary for a user, after signing on to a workstation, to register or deregister as a command user.

PARTICIPANTS

MCC F/C's
*COMMAND

PROCEDURES

A. Registration

1. Sign on to workstation.
2. Call up EMED window.
3. Type 'C50-' and click on the 'Submit' button or press the PF2 key.
4. The C50 menu (see reference below) will appear.
5. Enter an ACRONYM CONTROL OPTION of 'R'.
6. Enter the CCC W/S CMD POSITION ACRONYM.
7. Enter the CCC W/S CMD POSITION ACRONYM TYPE.
8. Click on the 'Submit' button or press the PF2 key.
9. Verify on command display 2667 the message 'xxx REGISTRATION SUCCESSFUL', where 'xxx' is the position acronym entered in step 7.
10. Verify on command display 2679 that an entry has been created for the correct 'POSITION ACRONYM TYPE' and it contains the correct 'POSITION ACRONYM'
11. Notify COMMAND that registration is successful and of the POSITION ACRONYM to be added to the Flight Select Matrix (FSM).

B. Deregistration

1. Call up EMED window.
2. Type 'C50-' and click on the 'Submit' button or press the PF2 key.
3. The C50 menu (see reference below) will appear.
4. Enter an ACRONYM CONTROL OPTION of 'D'.
5. Click on the 'Submit' button or press the PF2 key.
6. Verify on command display 2667 the message 'xxx DEREGISTRATION SUCCESSFUL'.
7. Verify on command display 2679 that the corresponding entry has been deleted.
8. Notify COMMAND that deregistration is successful and of the POSITION ACRONYM to be deleted from the Flight Select Matrix (FSM).

REFERENCES

This is the C50 menu as it appears in the EMED window.

C50#	xxx/RR	CCC W/S CMD POSITION ACRONYM CONTROL	MSK 2679
	ACRONYM CONTROL OPTION	___	R = REGISTER D = DE-REGISTER
			CCC W/S CMD ACRONYM CCC W/S CMD ACRONYM
	CCC W/S CMD POSITION ACRONYM	_____	3 ALPHANUMERIC CHARACTERS 1ST CHARACTER MUST BE ALPHABETIC
	CCC W/S CMD POSITION ACRONYM TYPE	___ S	RANGES FROM 1 TO 8: 1 = INSTRUMENT / COMM OFFICER (INCO) 2 = REGULAR CMD CONTROLLER (FD) 3 = POCC INTERFACE CONTROLLER (GPO) 4 = FLIGHT DIRECTOR (FDO) 5 = GUIDANCE / PROCEDURES OFFICER 6 = COMMAND CONTROLLER 7 = FLIGHT DYNAMICS OFFICER 8 = POCC REAL-TIME CONTROLLER
<ol style="list-style-type: none"> 1. ALL FIELDS ARE REQUIRED WHEN REGISTERING CCC W/S. 2. 'D' IS THE ONLY INPUT PERMITTED WHEN DE-REGISTERING CCC W/S. 3. 'ALL' IS NOT A VALID CCC W/S CMD POSITION ACRONYM. 			

The following lists contain the suggested console acronyms for each command section. The acronyms followed by a console number cannot be used because the MOC software at this time still considers these as valid command consoles (even though they may not physically exist).

Type 1 command positions - INSTRUMENT/COMM OFFICER (Maximum 2)

<u>INCO</u>	IC2 - 429	IC6
	IC3	IC7
INC - 390	IC4	IC8
IC1	IC5	IC9

Type 2 command positions - REGULAR CMD CONTROLLER (Maximum 4)

<u>Comm Support</u>	<u>Payload MPSR</u>	<u>Instrumentation</u>
COM - 356	RL1 - 377	IN1 - 358
CO1 - 357	RL2 - 370	IN2 - 474
CO2 - 473	RL3 - 375	IN3 - 359
CO3	RL4 - 376	IN4
CO4		IN5
CO5		IN6
CO6		IN7
CO7		IN8
CO8		IN9
CO9		

Type 3 command positions - POCC INTERFACE CONTROLLER (Maximum 4)

PO1 - 377	PO4 - 376	PO7
PO2 - 370	PO5	PO8
PO3 - 375	PO6	

Type 4 command positions - FLIGHT DIRECTOR (Maximum 2)

FD - 389	FD4	FD8
FD1	FD5	FD9
FD2 - 427	FD6	
FD3	FD7	

Type 5 command positions - GUIDANCE/PROCEDURES OFFICER (Maximum 2)

GDO - 386	GP2	GP6
GD2 - 434	GP3	GP7
GPO	GP4	GP8
GP1	GP5	GP9

Type 6 command positions - COMMAND CONTROLLER (Maximum 1)

RTC - 318	RT3 - 319
RT2 - 425	CMD

Type 7 command positions - FLIGHT DYNAMICS OFFICER (Maximum 2)

FDO - 385
FO1
FO2 - 428
FO3

FO4
FO5
FO6
FO7

FO8
FO9

SOP 3.1.9

TITLE

COMMAND SERVER CRASH RECOVERY

PURPOSE

This procedure advises Flight Control Team command server users how to recover from a command server failure.

PARTICIPANTS

FCT
GC
*Command

GENERAL

This procedure cannot anticipate all failures, but it addresses the standard procedures for recovery from command server crashes.

PROCEDURES

Following a Command server crash:

1. The FCT has been notified a new server was brought up COLD or a HOT BACKUP was brought on line.
 - a. FCT users must bring down all old command server displays and managers, then wait for GC to report the new server is available for login.

NOTE

A TYPE 6 Command (OST) workstation must be the first workstation to logon a new server for reference year registration. Therefore the FCT must wait for GC's GO to login.

2. The FCT is informed that a select over to a backup server was performed.
 - a. FCT members should check their displays to verify connectivity to the new prime command server and make a few inputs to the server to verify command manager I/O.
 - b. FCT should also clean up their workstation if they find that the new server is sluggish by dropping all command server displays and the command manager and restarting their managers anew.

SOP 3.2

TITLE

ACQUISITION AND HANDOVER REPORTING

PURPOSE

To document the MCC/STDN/TDRSS acquisition and handover status reporting procedures.

PARTICIPANTS

FD	INCO
* COMMAND	STATION OPSR
COMM TECH	CAPCOM
GC	

PROCEDURES

A. Acquisition Reporting

1. GC announces initial orbiter AOS on FD loop as follows: (site) has AOS."
2. As soon as MCC processing of that site's data has commenced, GC announces on FD loop "MCC is processing data from (site)." If any part of the downlink is not being processed, GC will note this. For continuous, uninterrupted AOS periods, no further GC announcements are required.
3. COMM TECH announces on COMM TECH loop "Go for voice." One of the following conditions is required for the "Go for voice" call.
 - a. S-band station is "Go for command uplink."
 - b. UHF station - Predicted AOS time has occurred.
4. MCC COMM TECH makes the following keyhole announcements on COMM TECH loop.
 - a. "Fifteen seconds to keyhole"
 - b. "Orbiter entering keyhole"
 - c. "Orbiter out of keyhole"
5. GC is responsible for reporting all identified MCC/STDN problems to FLIGHT. FC'ers report to FLIGHT all identified problems that involve the orbiter. They troubleshoot their respective systems for the possible cause(s).

B. Handover Reporting

1. Nominal handover - Nominal station uplink handovers are conducted at the time specified by COMMAND .

Ascent - Handover is accomplished according to planned timeline.

- a. COMM TECH announces to CAPCOM on COMM TECH loop 30 seconds to handover."
- b. After handover, COMM TECH announces on COMM TECH loop "Go for voice."
- c. GC announces "Handover complete" on FD loop after handover completion.

NOTE

During station uplink handovers, uplink and downlink A/G voice, command, and telemetry may be lost for several seconds.

2. Non-nominal handover - Non-nominal station uplink handovers are conducted by COMMAND.
 - a. Requests for early or delayed station uplink handovers are discussed with INCO. If a handover is necessary, INCO advises COMMAND.

COMMAND alerts GC, NIP SUP, and COMM TECH on GC loop as to the type of handover (early or delayed).
 - b. For time-critical situations, INCO may request COMMAND to handover immediately. (Time-critical is defined as an unplanned situation in which handover must be accomplished immediately to avoid excessive loss of uplink/downlink capability.)
 - (1) COMMAND alerts GC, NIP SUP, and COMM TECH on the GC loop and any user(s) of the command system on the command loop as to the imminent handover.
 - (2) If required, INCO provides FD the rationale for the immediate handover.
 - c. If STDN failure results in total loss of the active station or loss of critical support capability, GC instructs COMMAND and NIP SUP to proceed with the handover and notifies FLIGHT.
 - d. If STDN failure results in partial loss of support capability at the active station and does not require an immediate handover, COMMAND coordinates with INCO and other affected data users to determine if a handover is advisable. If the handover is deemed necessary, INCO directs COMMAND to proceed with the handover and notifies FLIGHT.

- e. Whenever a command handover is performed, an S-band A/G voice handover must also be performed. A TLM handover normally is also performed unless F/Cs request otherwise.

DEFINITIONS

- A. GO FOR COMMAND indicates valid command uplink mode, modulated command carrier on and that station command system equipment is operational and configured for shuttle uplink mode.
- B. UNABLE TO UPLINK indicates the station is configured for uplink as instructed but unable to uplink due to equipment problem or loss of lock.
- C. AOS indicates rf from the space vehicle is present.
- D. LOS indicates all rf from the space vehicle has been lost.
- E. LDR contains A/G 1 only.

SOP 3.2.1

TITLE

COMMAND LOAD GENERATION, EXECUTION, AND CLEARING

PURPOSE

To describe the techniques and coordination to be followed by FCR/MPSR positions in generation, uplink, and clearing of command loads.

PARTICIPANTS

F/C Team	COMMAND
DPS	DYNAMICS
* INCO	FD

GENERAL

- A. All command loads available for uplink to the orbiter are listed in table 3.2.1-1. Each load is matched with the position responsible for its initiation, the menu to generate the load, its unique DSM number, the display that allows the F/C to verify the generated load, and the F/C position responsible for generating (as opposed to uplinking) the load. Generation is defined as building the command load and inputting it to the MOC/DSC.
- B. Uplinking a load requires coordination between at least three MCC positions: the position requiring the uplink, the Flight Director for approval of the uplink, and the position responsible for uplinking the load. Several displays are provided to the F/C's to aid them in the load generation process. Loads can be built by DYNAMICS when necessary. See the SOP which details the specific coordination involved for each command.
 1. Load displays (see table 3.2.1-1 for DISPLAY numbers) - These displays provide each command load with a dedicated DISPLAY to allow the F/C to examine the generated load. DISPLAY's feature load title, DSM number, GMT of generation, data in engineering units (EU's), and the HEX equivalent of the EU data.
 2. Load inventory (DISPLAY 2664) - This display provides F/C's with all the loads that have been built and stored in the MOC/DSC. This display provides all the prestored command loads and all the real-time buildable loads stored in the load storage array (LSA) buffer. The load capacity of the MOC/DSC varies according to requirements of each flight.
 3. Load chaining (DISPLAY 2671) - This display shows all the loads that have been configured for a chained uplink. This technique allows 10 general loads to be uplinked in a series with the onboard two-stage buffer executed automatically after a compare on each load. Only loads in the same class (DSM numbers identical on the first three digits) are valid for chaining.
 4. Load safing - Loads existing in the MOC/DSC can be safed to avoid an unauthorized or an erroneous uplink (ref. FCOH SOP's 3.1.4 and 3.1.5). COMMAND performs all safing and unsafing.

- C. Command loads should be cleared from the MOC/DSC when they are no longer required for uplink. Obsolete commands stored in the MOC/DSC can cause confusion, they could be uplinked erroneously, and they take up valuable limited space in the LSA.
1. It is the responsibility of the F/C position that generates a load to clear the load from the MOC/DSC when it becomes obsolete or unnecessary. Failure to clear obsolete loads can result in eventually exceeding the limited capacity of the LSA buffer. When the LSA buffer becomes full, all subsequent loads to the MOC/DSC will be rejected until one or more loads are cleared from the MOC. Loads should not be left uncleared purely for historical purposes since there are other methods to maintain this history, such as hard copy and MOC Display Delogs.
 2. INCO and COMMAND will monitor the number of bytes available in the LSA via DISPLAY 2664, LOAD INVENTORY. DISPLAY 2664 contains a counter labeled "storage available xxx" that shows the number of bytes available for buildable command loads. There is nominally about 340 bytes initially available before any buildable loads are put in the MOC/DSC. The average load contains approximately four bytes, but some are much larger. When an attempt is made to input a load that will fill the LSA buffer, the message "LSA BUFFER FULL" will be displayed on DISPLAY 2669, CMD APPLICATION ADVISORY DISPLAY and on DISPLAY 2667, COMMAND SYSTEM MONITOR.
 3. INCO will advise the FD/FCT on the FD Loop when the MOC/DSC LSA BUFFER space could become a problem. INCO or FD will advise the F/C TEAM of the situation and request F/C's to clear all command loads not required.
 4. In a dual MOC/DSC environment, both MOC and DSC "storage available" counters should be verified by COMMAND to be in sync. COMMAND will notify INCO if an "out of sync" condition is observed. "Out of sync" conditions are resolved by performing MOH Volume III, SOP 3.32 procedure.

PROCEDURES

- A. The following positions are authorized and certified by discipline training plan to accomplish command load generation:

INCO	COMMAND	GNC SUPPORT
COMM SUPPORT	GPO	SENSORS
INSTRUMENTATION	EPS	MMACS
DPS	MECH 1	EGIL
DPS SUPPORT	DYNAMICS	EECOM
CDMS	PAYLOAD DATA	LIFE SUPPORT
FDO	PAYLOAD SYSTEMS	THERMAL
GNC	PAYCOM	PROP
OREO	PDRS	CONSUMABLES
IPS SUPPORT	S/L EPS	BOOSTER
IPS	RMS SYSTEMS	

- B. Dynamics Manual Load Generation

1. The F/C (command load initiator) requiring an uplink load to be generated by DYNAMICS provides command load generation information to DYNAMICS via the Load Generation Request form. All information necessary for manual load generation must be provided. (Load Generation Request forms are the responsibility of command load initiators.)
2. Command load initiator sends completed Load Generation Request form to DYNAMICS. Sufficient lead time must be allowed for command generation and verification prior to planned time for uplink.

- C. Automated Load Generation

1. To initiate command loads that are generated automatically, the command load initiator has two options.
 - a. The F/C can build the load.
 - b. The F/C can have DYNAMICS build the load by the following procedure:
 - (1) Provide DYNAMICS with load generation information via MPSR DYN B VOICE COMM loop.
 - (2) Provide a premission memo requesting command generation and providing load generation information. (This option may be desirable when a large number of commands are to be generated automatically.)

NOTE

Details of information necessary for command load generation are provided in the F/C command load initiator's console handbook(s).

2. After a command load has been generated and verified by DYNAMICS, DYNAMICS notifies the F/C requesting the command load (command load initiator).
3. Command load initiator verifies results of the command load generation and coordinates request for command load uplink with appropriate uplink position.
4. After the load has been uplinked, verified, and is no longer required in storage, the position requiring the uplink requests DYNAMICS to clear the load from storage, or the F/C can clear the load.

D. Guidelines and Constraints

1. Uplink DEU Equivalent Loads (reference FCOH SOP 3.3)
 - a. DEU equivalent uplinks that require calling a specialist function display (SPEC) are coordinated with the crew. If, during crew sleep, the SPEC will not be called up until required and then resumed as soon as possible.
 - b. DEU equivalent loads should avoid containing item entries which must be uplinked at a specific time, or within a specific time interval.
 - c. The ground is prohibited from doing DEU equivalents which would cause OPS/major mode changes, except for G1 - G9 transitions.
 - d. DPS will notify INCO as to which DEU will be the target for uplink.
 - e. DEU equivalents will not be chained, because the successful execution of a load may not be verified prior to the subsequent command loads being executed.
 - f. When practical, the crew should be informed when a DEU equivalent will be performed prior to uplink, because crew interaction with the display can affect the implementation of the commands.
 - g. Due to ground limitations; FAULT SUMM, SYS SUMM, GPC/CRT, MSG RESET, CLEAR, and ACK keystrokes cannot be used in any DEU Equivalent load.
 - h. DEU Equivalent commanding during crew sleep will not be performed until all of the following requirements have been met:
 - (1) Confirmed period of AOS and good comm both before and after scheduled completion of the load.

- (2) The MCC must be able to verify all DEU Equivalent loads via methods other than scratchpad line response.
- (3) If a series of loads are planned, the impact of not completing all uplinks must be evaluated and considered to be an acceptable risk.
- (4) Need for crew alert SPC's has been evaluated by the MCC.

2. Two-Stage Uplink Loads

- a. In general, two-stage uplink loads which are primarily used for maintenance and general operations do not require crew coordination.
- b. Two-stage loads that require specific conditioning to vehicle control or systems monitoring applications software are coordinated with the crew. Some specific exceptions may exist for loads in this category, due to their repetitive nature.

NOTE

Command loads are normally built by the F/C but can be built by DYNAMICS when necessary.

Table 3.2.1-1 Command loads

UPLINK load	Load initiator loop	Menu	DSM	DISPLAY	Load gen. position loop
IMU REFSMMAT	<u>GNC</u> MOCR GNC/ PROP	C06	430YY	1680	<u>GNC</u> MOCR GNC1 PROP
IMU GYRO BIAS	<u>GNC</u> MOCR GNC/ PROP	C17	431YY	1681	<u>GNC</u> MOCR GNC1 PROP
IMU ACCEL BIAS	<u>GNC</u> MOCR GNC/ PROP	C17	432YY	1681	<u>GNC</u> MOCR GNC1 PROP
IMU ACC SCALEFACTOR	<u>GNC</u> MOCR GNC/ PROP	C53	434YY	1682	<u>GNC</u> MOCR GNC1 PROP
ORBITER GYRO BIAS	<u>GNC</u> MOCR GNC/ PROP	C54	435YY	1683	<u>GNC</u> MOCR GNC1 PROP

Table 3.2.1-1. Command Loads

UPLINK load	Load initiator loop	Menu	DSM	DISPLAY	Load gen. position loop
ACCELRM ASSEMBLY BIAS UPDATE	<u>GNC</u> MOCR GNC/ PROP	C55	436YY	1683	<u>GNC</u> MOCR GNC1 PROP
<u>DOLILU:</u> PITCH YAW WINDS THROTTLE VEL AND TREF ADJ THROTTLE LEVELS	<u>GPO</u> MOCR DYN MOCR DYN MOCR DYN MOCR DYN MOCR DYN	C02 C02 C93 C94 C95	416YY 420YY 393YY 394YY 395YY	0416 0420 0393 0394 0395	<u>GPO</u> MOCR DYN MOCR DYN MOCR DYN MOCR DYN MOCR DYN
LAUNCH TARGETING	<u>GPO</u> MOCR DYN	C05	425YY	0425	<u>GPO</u> MOCR DYN
OMS TARGETING	<u>GPO</u> MOCR DYN	C03	427YY	0427	<u>GPO</u> MOCR DYN
ORBIT TGT PEG 7	<u>FDO/GPO</u> MOCR DYN	C11	406YY	0406	<u>FDO</u> MOCR DYN
DEORBIT TGT PEG 7	<u>GPO/FDO</u> MOCR DYN	C12	410YY	0410	<u>GPO</u> MOCR DYN
OMS ASSIST	<u>GPO</u> MOCR DYN	C96	396YY	0396	<u>GPO</u> MOCR DYN
INSERTION TGT PEG 4	<u>GPO/FDO</u> MOCR DYN	C14	405YY	0405	<u>GPO</u> MOCR DYN
DEORBIT TGT PEG 4	<u>GPO/FDO</u> MOCR DYN	C13	411YY	0411	<u>GPO</u> MOCR DYN
DEORBIT LANDING SITE	<u>GPO/FDO</u> MOCR DYN	C19	412YY	0412	<u>GPO/DNAV</u> MOCR DYN
DEORBIT TACAN SITE	<u>GPO/FDO</u> MOCR DYN	C18	413YY	0413	<u>GPO/DNAV</u> MOCR DYN
ORBIT STATE VECTOR	<u>FDO/GPO</u> MOCR DYN	C08	401YY	0401	<u>FDO/DNAV</u> MOCR DYN
DELTA NAV STATE VECTOR	<u>GPO</u> MOCR DYN	C04	40401	0404	<u>GPO/DNAV</u> MOCR DYN
TARGET STATE VECTOR	<u>FDO/GPO</u> MOCR DYN	C08	402YY	0402	<u>FDO</u> MOCR DYN
DRAG FACTOR	<u>FDO</u> MOCR DYN	C27	400YY	0400	<u>NAV</u> MOCR DYN

Table 3.2.1-1. Command Loads (continued)

UPLINK load	Load initiator loop	Menu	DSM	DISPLAY	Load gen. position loop
COVARIANCE UPDATE	<u>RENDEZVOU</u> <u>S</u> MOCR DYN	C28	421YY	0421	<u>NAV</u> MOCR DYN
VENT/RSC BODY FORCE VECTOR	<u>FDO</u> MOCR DYN	C26	426YY	0426	<u>NAV</u> MOCR DYN
TDRSS STATE VECTOR	<u>FDO/GPO</u> MOCR DYN	C10	403YY	0403	<u>FDO/GPO</u> MOCR DYN
KU-BAND ANT. CONTROL	<u>INCO</u> INCO	TBD	104YY	N/A	<u>F/C</u>
KU-BAND ANT. BIAS	<u>INCO</u> INCO	C15	130YY	0914	<u>F/C</u>
INSERTION STATE VECTOR	<u>GPO</u> MOCR DYN	C09	42901	0429	<u>GPO/DNAV</u> MOCR DYN
PDRS PLID	<u>PDRS</u> MOCR SPEC	N/A	199YY	0904	<u>F/C</u>
PDRS EEID	<u>PDRS</u> MOCR SPEC	N/A	199YY	0904	<u>F/C</u>
PDRS AUTOSEQ HDR	<u>PDRS</u> MOCR SPEC	N/A	199YY	0904	<u>F/C</u>
PDRS AUTOSEQ POINTS	<u>PDRS</u> MOCR SPEC	N/A	199YY	0904	<u>F/C</u>
TABLE MAINT. BLOCK UPDATE					
BFS PRE-LAUNCH, MECO +5, ENTRY INIT, OR WORKSTATION FAILURE	<u>DPS</u> MOCR DPS/ CDMS	C24	123YY	1400	<u>F/C</u>
OTHER TMBUs PASS/BFS	<u>INCO</u> INCO	C24	12301- 12310	1400	<u>EECOM</u> MOCR SYS
	<u>INCO</u> INCO	C24	12311- 12320	1400	<u>EGIL</u> MOCR SYS
	<u>INCO</u> INCO	C24	12321- 12330	1400	<u>MMACS</u> MOCR SYS
	<u>INCO</u> INCO	C24	12331- 12335	1400	<u>PDRS</u> MOCR SPEC
	<u>INCO</u> INCO	C24	12336- 12340	1400	<u>PROP</u> MOCR GNC/ PROP

Table 3.2.1-1. Command Loads (continued)

UPLINK load	Load initiator loop	Menu	DSM	DISPLAY	Load gen. position loop
	<u>INCO</u> INCO	C24	12341- 12345	1400	<u>PAYLOADS</u> PAYLOADS
	<u>INCO</u> INCO	C24	12341- 12345	1400	<u>F/C</u>
	<u>INCO</u> INCO	C24	12346- 12350	1400	<u>INCO</u> INCO
ANT MGMT	<u>INCO</u> INCO	N/A	122YY 124YY	N/A	PREMISSION
SPACELAB TMAs	<u>DPS</u> MOCR DPS/ CDMS	E03 E13 E14	615YY 622YY 623YY	3565 3572 3573	<u>CDMS</u> MOCR DPS/ CDMS
PAYLOAD DATA LOAD	<u>PL DATA</u> PL SYS	C33	71201- 71250 61101- 61150 (for Spacelab)	3300	<u>PL DATA</u> PL SYS or POCC CMD
PSP CONFIG	<u>INCO</u> INCO	C23	132YY	0913	<u>F/C</u>
PRIM RCS PVT UNIT	<u>PROP</u> MOCR GNC/ PROP	C25	317YY	1146	<u>F/C</u>
DEU EQUIVALENT	<u>DPS/</u> MOCR DPS/ CDMS	C21	201YY	1331	<u>DPS</u> MOCR DPS/ CDMS
	<u>DPS/</u> MOCR DPS/ CDMS	C21	202YY	1332	<u>DPS</u> MOCR DPS/ CDMS
	<u>DPS/</u> MOCR DPS/ CDMS	C21	203YY	1333	<u>DPS</u> MOCR DPS/ CDMS
	<u>DPS/</u> MOCR DPS/ CDMS	C21	204YY	1334	<u>DPS</u> MOCR DPS/ CDMS
GPC MMU READ	<u>DPS</u> MOCR DPS/ CDMS	C22	309YY	1335	<u>DPS</u> MOCR DPS/ CDMS
	<u>DPS</u> MOCR DPS/ CDMS	C22	310YY	1336	<u>DPS</u> MOCR DPS/ CDMS

Table 3.2.1-1. Command Loads (continued)

GPC MMU MERGE	1	<u>DPS</u> MOCR DPS/ CDMS	C322	311YY	1339	<u>DPS</u> MOCR DPS/ CDMS
	2	<u>DPS</u> MOCR DPS/ CDMS	C22	312YY	1340	<u>DPS</u> MOCR DPS/ CDMS
	3	<u>DPS</u> MOCR DPS/ CDMS	C22	313YY	1341	<u>DPS</u> MOCR DPS/ CDMS
	4	<u>DPS</u> MOCR DPS/ CDMS	C22	314YY	1342	<u>DPS</u> MOCR DPS/ CDMS
GPC MMU WRITE	1	<u>DPS</u> MOCR DPS/ CDMS	C22	315YY	1337	<u>DPS</u> MOCR DPS/ CDMS
	2	<u>DPS</u> MOCR DPS/ CDMS	C22	316YY	1338	<u>DPS</u> MOCR DPS/ CDMS
GMEM CONTIGUOUS	1	<u>DPS</u> MOCR DPS/ CDMS	C20	301YY	1323	<u>DPS</u> MOCR DPS/ CDMS
	2	<u>DPS</u> MOCR DPS/ CDMS	C20	302YY	1324	<u>DPS</u> MOCR DPS/ CDMS
	3	<u>DPS</u> MOCR DPS/ CDMS	C20	303YY	1325	<u>DPS</u> MOCR DPS/ CDMS
	4	<u>DPS</u> MOCR DPS/ CDMS	C20	304YY	1326	<u>DPS</u> MOCR DPS/ CDMS
GMEM SCATTER	1	<u>DPS</u> MOCR DPS/ CDMS	C20	305YY	1327	<u>DPS</u> MOCR DPS/ CDMS
	2	<u>DPS</u> MOCR DPS/ CDMS	C20	306YY	1328	<u>DPS</u> MOCR DPS/ CDMS
	3	<u>DPS</u> MOCR DPS/ CDMS	C20	307YY	1329	<u>DPS</u> MOCR DPS/ CDMS

Table 3.2.1-1. Command Loads (continued)

4	<u>DPS</u> MOCR DPS/ CDMS	C20	308YY	1330	<u>DPS</u> MOCR DPS/ CDMS
PASS VARIABLE DOWNLIST	<u>DPS</u> MOCR DPS/ CDMS	C23	230YY	1345	<u>DPS</u> MOCR DPS/ CDMS
BFS VARIABLE DOWNLIST	<u>DPS</u> MOCR DPS/ CDMS	C99 WRK. STAT.	19901- 19915	0904	<u>DPS</u> MOCR DPS/ CDMS
MDM BITE READ (BITE 4 READ OR BITE STATUS REGISTER READ)	<u>DPS</u> MOCR DPS/ CDMS	C99 WRK. STAT.	19901- 19915	0904	<u>DPS</u> MOCR DPS/ CDMS
NOTCH FILTER/MASS PROPERTIES UPDATE	<u>GNC</u> MOCR GNC/ PROP	C99 WRK. STAT.	19921- 19925	0904	<u>GNC</u> MOCR GNC/ PROP
STAR CATALOG UPDATE LOAD	<u>GNC</u> MOCR GNC/PROP	C99 WRK. STAT.	19921- 19925	0904	<u>GNC</u> MOCR GNC/PROP

NOTES

1. The DSM ranges shown are for buildable commands only.
2. If an attempt is made to load a command into the MOC with a DSM that is already in use or outside the ranges specified, the command will be rejected.
3. If the allocations listed here are insufficient to meet a console operator's command requirements, that operator should coordinate with the other disciplines to "borrow" additional slots.

SOP 3.2.1.1

TITLE

GENERIC COMMAND (C99) LOAD GENERATION, EXECUTION, AND CLEARING

PURPOSE

To define the MCC coordination and operational procedures for generating and uplinking a generic command load.

PARTICIPANTS

MCC F/C positions
FD
COMMAND
*INCO

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

POLICY

Since C99 MENU usage bypasses normal MOC command verification, only users with certified workstation application interfaces that support generic command capability are authorized for C99 MENU usage.

Uplinking a generic command load requires coordination between at least four MCC positions: the position requiring the uplink, the FD for approval of the uplink, the COMMAND position responsible for enabling user access to C99 MENU for generic command load generation, and the INCO position responsible for uplinking the load.

- A. To initiate a generic command, the command load initiator (operator requesting the uplink) must first request approval to enable C99 MENU from the FD.

Only those users with already developed workstation application interfaces to support generic command shall be approved for C99 MENU usage.

- B. After FD approval, the command load initiator (operator requesting the uplink) must then request COMMAND, on the COMMAND loop, to enable C99 MENU for their use and must provide COMMAND with the following information:
1. Op code for associated command
 2. Terminal/position authorization ID
 3. Destination node name

C. Once MENU C99 has been enabled for use for the command load initiator, he may proceed to generate and store the generic command load in the MOC. The generic command load is stored in the MOC in the SAFE mode as the default status.

D. The command load initiator verifies the results of the command load generated before requesting an uplink approval from the FD. Once FD approval for uplink has been granted, the command load initiator unsafes the load and coordinates with INCO for uplink per FCOH SOP's 3.1 and 3.2.2.

E. COMMAND will disable the Op Code and MENU C99 for usage once the command load generator has informed COMMAND that he is done with the generic command build.

F. After the load has been uplinked, verified, and is no longer required in storage, the position requiring the uplink should clear the load from storage. If the load is to be used again in the future, the command load initiator is to request that the load be safed between uplinks.

SOP 3.2.2

TITLE

COMMAND EXECUTION

PURPOSE

To define the necessary coordination and techniques to be followed in command execution for normal and contingency operations.

PARTICIPANTS

MCC Command Positions
GC

COMMAND
INCO

PROCEDURES

A. General

All F/C's having command capability will monitor the COMMAND loop during periods of time when they have command responsibilities. For commanding activities, the COMMAND loop and the FD loop will be used for the following purposes.

1. COMMAND Loop

- a. All commanding coordination among F/C's and with COMMAND.
- b. Coordination of ground system commanding problems with COMMAND.

2. FD Loop

- a. Announcement and discussion of commanding problems and abnormal equipment status indications with FD.
- b. Approval of load uplinks.

B. Nominal Command Sequence

NOTE

This procedure assumes that COMMAND has already placed the command system in the OPERATE mode and has flight-enabled applicable positions; i.e., INCO, INST, COMM SUPPORT, PAYLOAD DATA, PAYLOAD SYSTEMS, PAYCOM, and FD (FD/FDO for abort command only).

1. After FD approval, command requesters identify all command uplink requirements to INCO, INSTRUMENTATION, or COMM SPT.
2. INCO resolves conflicts of command activity with other F/C's and identifies times during the pass when additional coordination may be required.

3. INCO, INSTRUMENTATION, PAYLOADS, PAYCOM, and COMM SUPPORT individually enable command panels for uplink (as applicable), and verify correct command panel configuration.
4. COMMAND announces go for command on COMMAND loop.
5. All F/C's can initiate commanding after COMMAND announces go for command.
6. Each F/C disables command panels when commanding is completed.

C. Contingency Commanding

1. If a situation arises that requires an F/C to send nonnominal commands, notify FD for command approval. All approved commands may be sent without further coordination. When the F/C has completed the nonnominal commanding sequence, FLIGHT should be notified of the commanding results and of any further recommendations.
2. If a problem is encountered in executing a command, an F/C may choose to reinitiate the command. If the problem persists, the discrepancy will be reported to COMMAND/INCO. COMMAND will report to the F/C and GC with an estimated time until return to operation (ETRO) for both internal and external execution problems. INCO will address orbiter command system problems and ETRO's. If the command is time critical, the F/C may exercise one of the following alternatives.
 - a. Use alternate system (EPBI on workstation).
 - b. Request another command position to uplink the command.
 - c. Physically move to another position.
 - d. Instruct CAPCOM to voice the information to the flight crew for execution of commands (preferably during nonresting, low-activity periods).
3. Any problems in configuring a command panel will be addressed to COMMAND.

D. Flight Enabled

The only positions which are command enabled during powered flight are as follows:

FD, FDO, INCO, COMM, INST

Postmain engine cutoff (MECO):

INCO, INST, COMM, PAYLOADS, FD, and FDO (aborts only)

- E.** The following positions are authorized and certified to execute uplink commands to the STS and/or PAYLOAD:

INCO	INSTRUMENTATION
PAYLOAD SYSTEMS	PAYLOAD DATA
RF COMM SUPT	COMMAND
DATA COMM SUPT	PAYCOM

The FD and the FDO are authorized and certified to execute the abort command uplink to the STS.

SOP 3.2.3

TITLE

MCC/GN/TDRSS COMMAND HISTORY REQUESTS

PURPOSE

To identify the command history request procedure for MCC and station personnel.

PARTICIPANTS

- MCC F/C's
- Station Operations Supervisor (OPSR)
- * COMMAND
- HOUSTON VOICE

PROCEDURES

Any MCC F/C requiring a command history must complete and route a Mission Data Request Form (MDRF) according to FCOH SOP 10.1. The different forms of command history data are as follows:

NOTE

Only MCC-H command history delogs available for TDRSS.

A. Throughput Operations

Type III command history will be generated or transmitted to MCC only when requested.

1. MCC-H command history. This delog contains command data, CAP and COMP results, DSM number and command title, execution time, and console initiating the command. In the event of a two-stage command, it also contains the contents of the two-stage buffer. MCC-H delogs should satisfy most history requests and are available for all types of uplink stations/modes. Output sort options are as follows:
 - a. ALL OP CODES - Outputs all executed commands.
 - b. OP CODE 1,2,...,8 - Outputs only those executed commands of the specified OP CODES (up to eight OP CODES).
 - c. VEH ID - Outputs only those executed commands addressed to the specified vehicle ID (e.g., VEH 102).
 - d. Stream ID - Outputs only those executed commands of the specified stream ID (1,2,...,8). Stream ID is an internal MOC command system number which uniquely identifies a vehicle ID. This output is identical to that obtained by requesting the corresponding vehicle ID.

- e. Flight ID - Outputs only those executed commands of the specified Flight ID (001, 002, etc.). Commands to all vehicle ID's carried under a flight ID would be included in the output.
 - f. Site ID - Outputs only those executed commands addressed to the specified STDN/SGLS station (e.g., MIL or IOS) or VEH 1 or VEH 2 for TDRSS.
 - g. Type - Outputs only those commands executed under the command data type real time (Type RR) or simulation (Type SR).
 - h. Console ID - Outputs all commands that were initiated from the specified console (e.g., 429-INCO).
2. Type III command history. The source of a type III command history is the analog recording of the verification receiver. The 72-kb uplink data from the tape is played back to the SFL. The SFL packs the data into NASCOM 4800-bit blocks for transmission to JSC. A destination code of 214 (octal) is used. Type III is available only when using SFL throughput uplink and will be transmitted to the MCC only on request.
3. MCC Command Tracking Display (910) Delog (SOP 10.2).
4. GN Command History Playbacks.
- a. COMMAND obtains a command history from station/orbit and identifies its priority (before or after TLM playback).

NOTE

Type III command history generation and transmission will nominally be completed after station LOS.

- b. All command histories that cannot be completed prior to AOS will be generated and transmitted to MCC by the end of that station's support period.
- c. All GN command histories are transmitted to MCC by high speed data lines. Histories are delogged by COMMAND when requested via MDRF. HOUSTON VOICE coordinates the delivery of the command history to the specified recipient and closes MDRF.

SOP 3.2.4

TITLE

PRELAUNCH GUIDANCE UPLINKS

PURPOSE

To define the procedures for uplinking prelaunch guidance I-loads. The three categories are Day of Launch I-Load Updates II (DOLILU II), SOP 3.2.4.1, Launch Targeting, SOP 3.2.4.2, and OMS Assist, SOP 3.2.4.3. DOLILU generates first-stage I-loads from launch day balloon data. Launch Targeting uplink commands are used for ground-up rendezvous flights. The OMS Assist command load is used to change I-loads associated with the planned OMS dump in second stage for specific heavy-weight flights.

PARTICIPANTS

FLIGHT DIRECTOR	*DYN	ASC Support
LDO	FDO	COMMAND
GPO	GNC	NTD
GSO	MOD	DPS
INCO	MOIR	DPS Support

BACKGROUND

DOLILU II, which uses the Day of Launch Ascent Design System (DADS) processor to build the pitch and yaw coefficients, also generates winds data and SSME throttle data for uplink.

GENERAL

Restrictions:

OI Load:	All
OPS Mode:	OPS 9 (PASS), OPS 1
Major function:	GNC
Vehicles:	All
Crew/MCC coordination:	None
Time constraints:	Before launch

Hazardous:	Critical for first-stage trajectory
	Critical for first-stage through OMS 2 if Launch Targeting or OMS Assist is uplinked

Require MOD safing:	No
---------------------	----

SOP 3.2.4.1

TITLE

DAY-OF-LAUNCH I-LOAD UPDATES II (DOLILU II)

PURPOSE

To define the procedure for requesting uplink of first stage guidance DOLILU II commands and the information required to satisfy the request.

PARTICIPANTS

FLIGHT DIRECTOR	GNC
LDO	MOD
GPO	MOIR
GSO	ASC SUPPORT
INCO	COMMAND
	NTD
*DYN	DPS
FDO	DPS SPT

GENERAL

- A. The ASC Support team will evaluate the L - 24 hour measured winds to establish confidence in the DOLILU II system for creating first stage I-loads. The GPO will test the DOLILU data transfer system on L - 1 day. On launch day, the ASC Support team will generate DOLILU II I-load values for pitch and yaw coefficients data, wind velocity data, and SSME throttle data using the L - 4:15 winds (or the L - 4:30 winds if a 51.6° inclination flight). The LDO will give a GO or NO-GO for launch based on the L - 4:15 (or L - 4:30) winds. The DOLILU uplink commands will be performed at the time shown in the OMI.
- B. Uplink coordination and execution is described in FCOH SOP 3.2.1.
- C. After the I-loads have been uplinked per the OMI, a partial GPC memory dump will be performed to provide verification of the uplinked I-loads.
- D. After completion of the dump, the GPO will use the GPC DUMP display from the DNAV/DPS menu for a visual verification of the uplinked I-loads.
- E. The uplink and verification dump is normally started at the L - 1:20 (or L - 1:50) point in the countdown, but a contingency procedure is available to perform the uplink in GNC OPS 9 and the dump before or after transition to GNC OPS 1, usually at the T - 9 minute hold point.

PROCEDURES

- A. The MCC trajectory data tables are initially configured with data for throttling data, winds data, and pitch and yaw coefficients data. These baseline I-load values are "canned" data that cannot be used for flight. The following three trajectory tables are used as the source of the uplink command loads:

- MSK 391 THROTTLE DATA TABLE that contains the SSME throttle levels in percent, the throttle velocities in fps, and T REF ADJUST in sec.
- MSK 392 DOLILU WINDS TABLE that contains the wind velocities in fps corresponding to eight I-loaded altitudes.
- MSK 2440 LAUNCH TARGETS CONSTRAINTS TABLE (NOMINAL LTCT) that contains the first-stage pitch and yaw guidance coefficients.

From these trajectory tables the GPO can generate the following command loads:

- MSK 416 GUID POLY - THETA (PITCH)
- MSK 420 GUID POLY - PSI (YAW)
- MSK 393 DOLILU WINDS UPLINK (Wind Velocities at fixed I-loaded altitudes)
- MSK 394 THROTTLE VEL/TRF U/L (SSME throttle velocities and T REF ADJUST)
- MSK 395 THROTTLE LEVELS U/L (SSME throttle levels in percent, typically not uplinked)

- B. On launch day the trajectory tables will be reconfigured with the DOLILU II-generated values based on the L - 4:15 (or L - 4:30) wind data that are electronically transferred to the MCC Flight Support Host at about L - 2:30 (or L - 2:45). DYN will construct D64 data members from the transferred data, and then load the trajectory tables at the request of the GPO. The command loads are built from these data using "DOLILU" in the label for each of the four (or five) commands as required:

- 41601 DOLILU PITCH
- 42001 DOLILU YAW
- 39301 DOLILU WINDS UPLINK
- 39401 DOLILU THROTTLE VEL
- 39501 DOLILU THROT LEVELS

At about L - 2 hours on launch day, the verification of the DOLILU I-load values is accomplished by comparing the MOC-generated command load values with the DOLILU I-LOAD SUMMARY package that is generated and delivered by ASC Support.

- C. At the L - 1:30 (or L - 1:50) point in the countdown, the LDO notifies the FD of the decision to launch with the DOLILU II I-loads. The FD then gives a GO to the GPO, INCO, and DPS for an uplink of the DOLILU data.
- D. The GPO will select the associated DSM numbers for the command loads containing the desired target I-load values.
- E. The GPO and INCO will coordinate and satisfy the I-load uplink of the GNC data per FCOH SOP 3.2.1.
- F. The GPO will monitor the MASTER DNAV/INCO/CMD/BFS/GNC UPLINK VERIFY display via the uplink verify button on the DOLMOC display to provide the FD with I-load uplink verification prior to INCO sending the TWO-STAGE-BUFFER executes.

- G. The DPS will provide the necessary coordination and MCC configuration to obtain the partial GPC memory dump. The GPO will provide the FD and DPS with the desired HEX starting address for the dump.
- H. The DPS Officer will provide the necessary coordination and action to obtain results of any memory verification activity performed at KSC. NTD will report results from the KSC verification to the FD.
- I. To verify the DOLILU II uplinked values, the GPO and the GSO will obtain a GPC hex dump file for the DOLMOC display by configuring a dynamic report from the GPC memory DUMP display (via the GPC DUMP APP button on the DOLMOC display). The uplinked hex values will be compared to the onboard hex values electronically on the DOLMOC display. The GPO will report the results of the dump comparisons to the FD.
- J. If a late change of the onboard I-loads is required after the initial notification in step C, or in any event, after the uplink of the DOLILU II data, the LDO chairman shall inform the FD of the I-load changes and the same procedures of steps D through I will be performed, except that if the I-load change is requested after the OPS 9 to OPS 1 transition, the contingency procedure in the OMI which incorporates the GNC OPS 1 to 9 to 1 procedures will be used because the DOLILU uplinks are legal in OPS 9 only.
- K. If a launch is scrubbed, the onboard I-loads will remain unchanged until the next launch attempt unless a re-IPL of the GPCs is conducted, which will restore the baseline first stage I-load values.

SOP 3.2.4.2

TITLE

LAUNCH TARGETING

PURPOSE

To define the procedure for building and uplinking I-loads for Launch Targeting Loads and Launch Targeting Load OMS Targets.

PARTICIPATION

Flight Director	MOD
*GPO	NTD
*FDO	INCO
DYN	DPS
GSO	
COMMAND	

GENERAL

The launch targeting load updates the launch targets to provide variable launch windows for ground-up rendezvous flights. The OMS targeting load provides OMS 1 and OMS 2 target sets that match the launch targeting load.

- A. The FDO generates and transfers the launch targeting vectors and OMS targets to trajectory tables. The GPO builds Launch Targeting and OMS Targeting command loads from these trajectory tables.
- B. The command loads are uplinked to the PASS in OPS 9 and/or OPS 1, and uplinked to the BFS in OPS 1 only. The manual two-stage buffer execute is used only for uplinked commands in OPS 9; the auto execute is used in OPS 1.
- C. The PASS launch targeting loads are visually verified with a partial GPC dump in OPS 9 (in the same dump as the DOLILU data).

PROCEDURES

- A. On launch day the FDO will generate the launch targeting vectors and OMS targets and transfer this data to trajectory tables as follows:

Launch targeting vectors	IY Vector Display (MSK 2442)
OMS targets	OMS 1 (MSK 2443) OMS 2 (MSK 2444)

- B. The GPO will then perform checks on the trajectory tables and request DYN to build command loads for the opening of the window launch time.

LAUNCH TARGETING	4250 <u>2</u>
OMS TARGETING	4270 <u>2</u>

The FDO will then configure the trajectory tables and the GPO will then request that DYN build the command loads for the preferred launch time.

LAUNCH TARGETING	4250 <u>1</u>
OMS TARGETING	4270 <u>1</u>

- C. At the L - 1:30 (or L - 1:50) point in the countdown (in OPS 9), the two preferred launch time targeting commands will be uplinked to the PASS along with the DOLILU command loads.
- D. The GPO will select the associated DSM numbers for the command loads containing the desired target I-load values.
- E. The GPO and INCO will coordinate and satisfy the I-load uplink of the GNC data per FCOH SOP 3.2.1.
- F. The GPO will monitor the MASTER DNAV/INCO/COMMAND/BFS/GNC/UPLINK display via the uplink verify button on the DOLMOC to provide the FD with I-load uplink verification prior to INCO sending the manual TWO-STAGE-BUFFER executes.
- G. The DPS will provide the necessary coordination and MCC configuration to obtain the partial GPC memory dumps. The GPO will provide the FD and DPS with the desired hex starting address for the DOLILU dump which will include the Launch Targeting/OMS Targeting data.
- H. The DPS Officer will provide the necessary coordination and action to obtain results of any memory verification activity performed at KSC. NTD will report results from the KSC verification to the FD.
- I. To verify the uplinked targeting values, the GPO and GSO will visually compare the hex values of the partial GPC dump on the GPC memory DUMP display (via the GPC DUMP APP button on the DOLMOC display) with the hex values contained on the Launch Targets (MSK 425xx) and OMS Targets (MSK 427xx) command loads.
- J. After the transition from OPS 9 to OPS 1, the Launch Targeting and OMS Targeting command loads will be uplinked (AUTO execute) to the BFS (cannot be uplinked in OPS 9). The GPO will request a go from the FD to uplink to the BFS. The GPO will give INCO the DSM's of the two loads and a go to uplink to the BFS. The GPO and the GSO will monitor the BFS/GNC UPLINK display to verify the correct command loads.

If a change in the Launch Targeting loads is required to change from the preferred launch time to the opening of the window launch time while in OPS 1, the Launch Targeting and OMS Targeting loads (42502 and 42702, respectively) reflecting this launch time will be uplinked to the PASS and the BFS. A GPC verification dump is not required for the uplink to the BFS or the late uplink to the PASS in OPS 1.

- K. If a launch is scrubbed, the onboard launch target I-loads will remain unchanged until the next launch attempt unless a re-IPL of the GPCs is conducted, which will restore the original launch targeting I-load values.

SOP 3.3

TITLE

DEU EQUIVALENT COMMANDS

PURPOSE

To define the procedure for requesting uplink of DEU equivalent loads/keystrokes and the information required to satisfy the request. A DEU equivalent allows the MCC to uplink keystrokes to the orbiter, emulating the onboard keyboard.

PARTICIPANTS

MCC F/Cs	FAO	Flight Director
INCO	PTG	DPS
*DPS SUPPORT	GNC	CAPCOM

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

GENERAL

- A. DEU equivalent loads/keystrokes are input to the Generic Command Server (GCS) by DPS SUPPORT. Uplink is initiated by INCO.
- B. Uplink coordination and execution are described in FCOH SOP 3.1, 3.2.1, and 3.2.2.
- C. This capability is valid in all Primary Avionics Software System (PASS) OPS modes and sequences. However, DEU equivalents are not supported by the BFS software.

PROCEDURES - NON-MANEUVERS

- A. F/C requiring an unplanned DEU equivalent load(s)/keystrokes fills out DEU Equivalent Worksheet form (figure 3.3-1).
- B. F/C forwards one copy of the completed form to DPS. Voice coordination will take place on GCSR DPS/CDMS loop.
- C. DPS/DPS SPT reviews the form for adequacy of the information provided and completes the form accordingly. DPS/DPS SPT builds the command load(s) and transmits it to the GCS.
- D. DPS/DPS SPT returns one copy of the completed form to the requesting discipline.
- E. DPS, DPS SPT, and the requesting discipline verify the load(s) in the GCS.

- F. Upon load verification, DPS/DPS SPT will submit a flight rate to the FD, CAPCOM, INCO, and FAO.
- G. After FD authorization, CAPCOM, if necessary, informs the crew of the pending uplink and instructs them to avoid all keyboard entries until the uplink is complete. DPS and INCO provide necessary coordination and action to satisfy the DEU equivalent uplink request per FCOH SOPs 3.1, 3.2.1, and 3.2.2.

PROCEDURES - UNPLANNED MANEUVERS

- A. FAO/PTG develops the planned timeline and desired attitudes well enough in advance to allow ample time for load build and verification (24 hours is desired, but depending on the specific case, could be less.)
- B. FAO/PTG fills out the DEU Equivalent Worksheet form (figure 3.3-1) and forwards a copy to DPS, DPS SPT, GNC, and INCO.
- C. GNC and INCO evaluate the planned timeline and attitudes for correctness and proper comm coverage.
- D. DPS/DPS SPT reviews the form for adequacy of information provided and completes the form accordingly. DPS/DPS SPT then builds the required command loads.
- E. DPS prepares a flight note containing the sequence of loads, DSM numbers, load titles, load contents, desired MET or uplinks, GNC major function, and targeted DEU.
- F. After GNC and INCO are go with the proposed plan, DPS/DPS SPT transmits all required loads to the GCS (safed) and forwards a copy of the flight note to PTG, and GNC.
- G. DPS, DPS SPT, PTG, and GNC verify all loads in the GCS with coordination on the MOCR DPS/CDMS loop.
- H. Upon load verification, DPS/DPS SPT forwards a copy of the flight note created in step E to FD, CAPCOM, INCO, and FAO.

- | |
|--|
| <ul style="list-style-type: none">I. After FD authorization, CAPCOM, if necessary, informs the crew of the pending uplink and instructs them to avoid all keyboard entries until the uplink is complete. DPS coordinates each step of the planned sequence with INCO on the FD loop. (See FCOH SOPs 3.1, 3.2.1, and 3.2.2.)J. For each stop in the sequence, GNC, FAO, and DPS give a go on the FD loop after having verified the success of the previous load using methods other than scratch pad line response. Additionally, FD will give a separate GO prior to initiating any actual maneuver (i.e., ITEM 18, 19, or 20 on UNIV PTG). |
|--|

PROCEDURES - PREFLIGHT APPROVED MANEUVERS

- A. FAO/PTG develops a baseline DEU Maneuver plan preflight. The plan will be reviewed by DPS, INCO, GNC, PAYLOAD, and FD preflight.
- B. FAO/PTG develops the specific planned timeline, attitudes, and bailout attitude for flight night (FN) X during the planning shift for FN X-1 (the night prior to the FN that requires the

maneuvers). The specific timeline and attitudes for maneuvers planned for FN 1 will be developed during prelaunch.

- C. FAO/PTG completes the MET, DSM TITLE, LOAD CONTENTS, and COMMENTS sections of the STS-XX FN[X] DEU EQUIVALENT PROCEDURE form (figure 3.3-3) and forwards a copy to DPS, DPS SPT, INCO, GNC, and PAYLOAD. Once FAO/PTG forwards the plan, DPS will be responsible for any required updates and redistribution of the plan.
- D. DPS/DPS SPT evaluates the plan for the adequacy of the information provided in the form and updates the form to include the DSM numbers.
- E. DPS/DPS SPT builds the required command loads and saves them in the workstation.
- F. GNC evaluates the plan for correctness of SPEC/ITEM entries. Any changes will be coordinated with FAO/PTG. If required, DPS will update the plan and the command load(s).
- G. INCO evaluates the plan for proper comm coverage. Any changes will be coordinated with FAO/PTG. If required, DPS will update the plan and the command load(s).
- H. When GNC and INCO are GO with the proposed plan, DPS/DPS SPT transmits the loads to the GCS and has them safed.
- I. DPS forwards the updated plan to PTG and GNC and informs them that the loads are in the GCS and ready for verification.
- J. DPS, DPS SPT, PTG, and GNC verify the loads in the GCS.
- K. PTG and GNC notify DPS when they have completed the load verification.
- L. PTG, INCO, and PAYLOAD determine whether a crew alert SPC will be required. Crew alert SPCs will be considered for any attitude that cannot sustain loss of forward link comm/command. Specific SPC requirements will be documented in the mission specific flight rule annex. If required, INCO will generate the SPC command.
- M. INCO coordinates with DPS for integration of the SPC(s) (and SPC clears), including the crew alert SPC required approximately halfway through the sleep period, into the FN specific plan.
- N. When PTG, GNC, DPS, and DPS SPT have completed the load verification and INCO has completed SPC evaluation, DPS generates a flight note with the final FN specific plan inserted as the body of the text and forwards a copy to PTG, GNC, INCO, PAYLOAD, FAO, CAPCOM, and FD.

- O. The Orbit 2 shift will approve the FN X DEU maneuver plan and uplink it, along with the bailout attitude, to the crew prior to crew sleep on the night the plan is to be executed. P. Prior to the MET of the next required maneuver, DPS gets a GO from FD to proceed with the maneuver uplink sequence. Then, DPS coordinates each step with INCO on the FD loop.

- P. Prior to the MET of the next required maneuver, DPS gets a GO from FD to proceed with the maneuver uplink sequence. Then, DPS coordinates each step with INCO on the FD loop.
- Q. After each command load is uplinked, GNC, PTG, FAO, or DPS as appropriate will verify the success on the FD loop using methods other than scratch pad line response. A separate GO from the FD prior to initiating any actual maneuvers is also required (i.e. ITEM 18, 19, or 20 on SPEC 201 UNIV PTG).

INFORMATION

The following information is provided to assist F/C in filling out the DEU Equivalent Form worksheet. (For an example of a completed DEU Equivalent Worksheet form, refer to figure 3.3-2).

CAUTION

If the following parameters are improperly specified, the DEU uplink can have hazardous results.

- A. Originator - The signature of the requester and the FCOH acronym for the console position represented.
- B. GPC ID/Major function - Specify which major function will be affected by the DEU equivalents (i.e., is the command addressed to the GNC-type machine or the Systems Management (SM)). The GPC ID number should be given if a specific GPC is targeted for the DEU equivalent uplink. It should be noted that there is no DEU equivalent command capability to the backup flight control system (BFS).
- C. Major mode - The major mode which is to be present (e.g., GNC-101; if the major function is Guidance, Navigation, and Control (GNC), the next line should contain 101).
- D. Major mode page/SPEC number - The three- or four-digit number which appears in the upper left-hand corner of the display which is being addressed.
- E. Requested time of uplink - The uplink time in GMT for which the user wants the DEU equivalent uplinked to the orbiter.
- F. Purpose - Explain what the DEU equivalent is intended to do (e.g., update Master Timing Unit (MTU) MET; perform a dump which will be used in troubleshooting, etc.).
- G. Lines 1 through 10 - Lines 1 through 10 should be filled out in logical keystroke groups in the manner they would be performed by a crew member. The maximum number of

keystrokes is 30 (e.g., ITEM is a single keystroke) and the request must have a "complete" and syntactically correct" keyboard statement (one per line). Leave the "DSM #" column blank.

- H. H.DEU number - Leave blank (this information to be filled in by DPS).
- I. Time/date/DPS signature - Leave blank; to be filled in by DPS.

CAUTION

The crew will be informed of DEU equivalents prior to uplink, because crew interaction with the display system can affect the implementation of the commands. Also, the DEU equivalents should not be chained because successful execution of a command may not be verified before subsequent commands are executed.

DEU EQUIVALENT WORKSHEET

Originator _____
 GPC ID/Major Function (GNC, SM, PL/OP0) _____
 Major Mode _____
 Major Mode Page/SPEC Number _____
 Requested Time of Uplink (GMT) _____
 Purpose _____

Keystrokes* (max 30)	DSM # (DPS)	Title (DPS)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

* Each line represents keystrokes required to perform a single function.
 Invalid keystrokes are FAULT SUMM, SYS SUMM, MSG RESET, ACK, GPC/CRT, CLEAR

DEU Number (DPS) _____ Date (DPS) _____
 Time Received (DPS) _____ DPS Signature _____

Figure 3.3-1. DEU Equivalent Worksheet form

DEU EQUIVALENT FORM

Originator _____
 GPC ID/Major Function (GNC, SM, PL/OP0) GNC
 Major Mode 201
 Major Mode Page/SPEC Number 0000
 Requested Time of Uplink (GMT) 0930 GMT
 Purpose To dump the entire main memory contents of the GNC OPS 2 GPC

Keystrokes* (max 30)	DSM # (DPS)	Title (DPS)
1. SPEC, 0, PRO	20401	SPEC 0
2. ITEM, 4, 0, +, 0, 0, 0, 0, 0, EXEC	20402	START ADDRESS
3. ITEM, 4, 1, +, 2, 6, 2, 1, 4, 4, EXEC	20403	END ADDRESS
4. ITEM, 4, 2, +, 1, 1, 2, EXEC	20404	WORDS/FRAME
5. ITEM, 4, 3, EXEC	20405	EXEC DUMP
6. RESUME	20406	RESUME
7.		
8.		
9.		
10.		

* Each line represents keystrokes required to perform a single function.
 Invalid keystrokes are FAULT SUMM, SYS SUMM, MSG RESET, ACK, GPC/CRT, CLEAR

DEU Number (DPS) 4 Date (DPS) 7/12/94
 Time Received (DPS) 0900 GMT DPS Signature _____

Figure 3.3-2. Example of completed DEU Equivalent Worksheet form

STS-XX FN[X] DEU EQUIVALENT PROCEDURE

	MET	DSM#	DSM TITLE	LOAD CONTENTS	COMMENTS
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					

Figure 3.3-3. STS-XX DEU Equivalent Procedure form

PRIMARY PROCEDURE

- A. For a hardware C&W change, a mission note is passed from the requesting FCR F/C to FD, CAPCOM, and EGIL via a Flight Note (see FCOH SOP 1.1).
 1. CAPCOM relays the change to the flight crew.
 2. EGIL monitors the conversation and makes a corresponding entry to the Hardware C&W limit record, which is maintained throughout the flight.
- B. All TMBU requests for orbiter S/W (PASS, BFS) are made on the standard TMBU request. Orbiter S/W TMBU request forms are generated by the TMBU program. Instructions for completing the TMBU request form are in table 3.3.1-1. TMA requests are generated manually using the TMBU request form, figure 3.3.1-1. Only BFS prelaunch, MECO + 5, and entry initialization TMBU's will be forwarded to the DPS/DPS SPT position. The individual disciplines will be responsible for all PASS SM TMBU's and other BFS TMBU's. If the TMBU cannot be built via the workstation because of a malfunction, the TMBU's are built by DPS SPT via the MED emulator per the backup procedure.
- C. Orbiter TMBU Requests
 1. To request orbiter software constant changes, limit changes, inhibit/enables, noise filter changes, selected GECOM calibration coefficient changes, or discrete state changes, the requesting F/C completes the TMBU form generated on the workstation (W/S) by the TMBU program. The procedure that documents the proper utilization of the TMBU program can be found in the requesting discipline's console handbook. The load will be transmitted to the Generic Command Server (GCS) and the F/C FCR operator will properly verify the load. If the TMBU is required to have DPS coordination in B above, DPS/DPS SPT acknowledges receipt of the form to the requester and enters the receipt time (in GMT) on the forms.
 2. The requesting discipline then distributes the copies of the completed forms as follows:

For SM and real-time BFS TMBU's:

 - One copy to the MOIR (after uplink)
 - Two copies to self (FCR and MPSR)

For DPS-coordinated BFS TMBU's:

 - Two copies to self (FCR and MPSR)
 - Three copies to DPS/DPS SPT, then DPS provides:
 - One copy to the MOIR (after uplink)
 - One copy to DPS
 - One copy to DPS SPT

NOTE

For DPS-coordinated BFS TMBU's, all necessary coordination will be performed over SSR CONF with DPS SPT.

3. The requesting discipline will obtain a GO" from the FD. Upon FD approval, the F/C FCR operator will coordinate the TMBU uplink with INCO/INST per FCOH SOP 3.1. For DPS-coordinated BFS TMBU'S, DPS/DPS SPT will coordinate with INCO/INST. After successful uplink, INCO/INST will inform the requester (DPS/DPS SPT for DPS-coordinated BFS TMBU's) that the TMBU is onboard.
4. The requesting discipline (or DPS/DPS SPT for the above BFS TMBU's) records the uplink time of the load on the TMBU request form. This is done by monitoring the Command Tracking application for the BUFFER EXECUTE.
5. As soon as the TMBU is successfully uplinked to the orbiter, the requesting discipline will forward one copy of the TMBU to the MOIR, and the MOIR will forward a copy to the MER. This will enable MER personnel to track parameter limits for possible use during later problem analysis. DPS/DPS SPT will forward a copy of the appropriate BFS TMBU's.
6. The individual disciplines will maintain the TMBU loads on their W/S according to the procedure in the discipline's console handbook. Nominally, the loads built for sim purposes only should be deleted from the W/S at the end of the sim.

BACKUP PROCEDURE

NOTE

This procedure is to be used only if the F/C workstation or LAN interface has problems such that repairs cannot be performed before the TMBU uplink is required. All efforts for W/S or LAN interface recovery should be attempted before executing this backup procedure.

- A. All TMBU requests for orbiter software (PASS, BFS) are made on the Standard TMBU Request form and submitted to DPS SPT.
- B. Orbiter TMBU requests
 1. To request orbiter software constant changes, analog limit changes, inhibit/enables, noise filter changes, or discrete state changes, the requesting F/C completes a TMBU Request form (figure 3.3.1-1) in five copies. If the changed parameter resides in both PASS and BFS software, two sets of TMBU Request forms (in three copies each) must be submitted. Form completion instructions are contained in the information section of this SOP. The requester sends the copies to DPS SUPPORT, coordinating over SSR CONF.

NOTE

The F/C must be certain that parameter values in SM and BFS are consistent when applicable.

2. DPS SPT acknowledges the receipt of the TMBU request form and informs DPS. DPS SPT validates the request against the SM/PM Database Information Listing (DBIL).

NOTE

For time-critical inputs, DPS informs FD that a TMBUchange is in work and provides an uplink time estimate. If the FD decides that the change should be done earlier than at the estimated time, the CAPCOM relays the change to the flight crew.

3. DPS SUPPORT fills out the remaining portion of the TMBU Request form and builds the load via the MED emulator (or TMBU workstation application) and stores it on the workstation hard disk.
4. DPS SUPPORT distributes two copies of the completed TMBU Request form to DPS and returns two copies to the requester.
5. DPS, DPS SUPPORT, and requesting discipline review and verify the TMBU load in the GCS.
6. DPS obtains permission from the FD for the TMBU load uplink. DPS/DPS SUPPORT will coordinate with INCO/INST on the load uplink per FCOH SOP 3.1. DPS/DPS SUPPORT will verify using the Command Tracking application that the load successfully uplinked. DPS/DPS SUPPORT will inform the requesting discipline when the TMBU load is onboard. DPS/DPS SUPPORT will record the uplink time on the TMBU Request forms.
7. As soon as the TMBU is successfully uplinked to the orbiter, DPS SUPPORT will forward a completed copy of the TMBU Request form to the MOIR. The MOIR will forward a copy of the TMBU Request to the MER. This will enable MER personnel to track parameter limits for possible use during later problem analysis.

Table 3.3.1-1 TMBU Request form

1	REQUESTED BY	Requester's name
2	POS	Requester's console position
3	GMT	GMT of request
4	REQUIRED BY	GMT time for uplink. Allow 20 to 30 minutes for TMBU processing
5	RETENTION	Specify usefulness of this TMBU (ex. This sim only")
6	SM/BFS/SL SSC/SL EXC/SL ASCII	Destination of load. Select only one. Vehicle parameters select SM or BFS. Three selections are available for Spacelab computer resident parameters
7	MSID/SID	MML ID number/Spacelab ID
8	CLASS	Annunciation class number
9	SET	For multiple limit set parameters, specify set 1, 2, or 3. Orbiter-applicable only
10	LIM/CONST	Type of change: UL = upper limit LL = lower limit NF = noise filter DISC = discrete INH = inhibit ENA = enable CONST = constant STATE = Spacelab state chng
11	OLD VALUE	Values in use at present time
12	NEW VALUE	<ul style="list-style-type: none"> • Value to which the referenced parameter is to be changed • Enter `OSH' or `OSL' to set parameter off-scale high or off-scale low • NH/ENA-set new value = 1,0 • Noise filter values range from 1 to 15
13	FDF REF DATA NAME	BFS/SM parameter name as shown in REF DATA BOOK, section 4, C/W and FDA table, "PARAMETER NAME" (or appropriate FDF book for payloads or Spacelab parameters). Indicate which book
14	PAGE NO.	Page number in the FDF REF DATA BOOK where parameter name may be found (or other appropriate FDF book)
15	RATIONALE	Reasons for requested changes and subtitles associated with the request
16	SL DSM/DPS DSM	DSM number of load. Vehicle TMBU DSM numbers are assigned by DPS SUPPORT.
17	TITLE	21 characters descriptive of the contents of the load. The title is completed by DPS SPT
18	TYPE/SL MODE	These fields are not valid since Spacelab will no longer be manifested.
19	PARAMETER ID/SID	
20	NEW VALUE	
21	DPS/CDMS	Signature of DPS SUPPORT and GMT of completion

T M B U R E Q U E S T

<input type="checkbox"/> SM2 <input type="checkbox"/> BFS <input type="checkbox"/> SL SSC <input type="checkbox"/> SL EXC <input type="checkbox"/> SL ASC II (RI 33) (RI 4E)					REQUESTED BY ①		POS MOCR/SSR ②		(S) GMT ③ : :														
NO.	MSID/SID	CLASS	SET	LIM/CONST	OLD VALUE	NEW VALUE	REF	REFERENCE DATA NAME	PAGE NO.														
1	⑦	⑧	⑨	⑩	⑪	⑫		⑬	⑭														
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
RETENTION:		⑤		REQ'D BY:		④																	
RATIONALE:		⑮		DATA SET		TYPE/SL MODE		PARAMETER ID/SID		NEW VALUE		SL DSM											
				01		⑱		⑲		⑳		⑰											
				02																			
				03																			
				04																			
				05																			
				06																			
				07																			
				08																			
				09																			
		10																					
TITLE (Completed by DPS/COMS):				⑰				DPS/COMS				⑲				DPS DSM				⑰			
T M B U																							

JSC Form 457 (Rev Oct 83)

1_12805_042

Figure 3.3.1-1. TMBU Request form

SOP 3.3.2

TITLE

MMU PATCH GENERATION AND EXECUTION

PURPOSE

To identify the sequence of events required to reliably uplink the contents of a Shuttle Avionics Integration Laboratory (SAIL)/Software Production Facility (SPF) formatted patch memorandum to the orbiter MMU via the MCC command system.

PARTICIPANTS

FD	DPS SUPPORT
*DPS	COMMAND
SPAN	COMPUTER SUP
MER	INCO
SAIL	FSM

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

GENERAL

- A. While such an FCOH procedure exists, it should be noted that the MMU patch uplink capability will rarely, if ever, be utilized in flight. Instead, when the flight software requires modification, a GPC memory write procedure (see FCOH SOP 3.3.3) will be utilized. Indeed, STS Operational Flight Rules (section 7) currently prohibit the utilization of this feature.
- B. The necessity for an MMU software patch is determined by DPS/SPAN/MER based on problems discovered in flight by the FCR F/C's.
- C. MMU patches can be developed in flight for either the PASS or the BFS.

PROCEDURES

- A. SPAN, MER, or an FCR F/C initiates a MAR (see FCOH SOP 2.5) identifying a PASS or BFS software anomaly.
1. The requesting personnel completes a MAR, saves the MAR, and verbally notifies DPS of the MAR number and that a MMU patch is desired.
- B. DPS verifies the occurrence of the anomaly and recommends to FD that a software MMU patch be developed. If FD concurs, DPS sends the MAR to SPAN for action.

- C. DPS, SPAN, and the MER jointly develop software MMU patch requirements, and the MER coordinates patch generation with the SAIL or SPF.
1. Patch details can be provided to DPS in a memorandum that utilized the universal patch format (UPF) listing.
 2. The MER notifies SPAN and DPS as soon as the patch details are available. For PASS or BFS patches, SPAN informs DPS that the memorandum with patch details in the universal patch format listing is ready for pickup.
 3. DPS/DPS SUPPORT contacts COMMAND to request delivery of all listings to DPS, including the UPF paperwork
- D. DPS/DPS SUPPORT builds the command load via the MMU Ops application as detailed in SCP 7.5 in the DPS Console Handbook (JSC-18819).
1. Once built, DPS/DPS SUPPORT safes the command load unless immediate uplink is required.
 2. DPS/DPS SUPPORT verifies command server MMU patch load contents (example shown on figure 3.3.2-1), and INCO uplinks the resultant command loads per FCOH 3.1 and 3.2.2 after MER and FD approval.
 3. Only a single MMU should be patched until verification of the success of the first patch. Once the patch is verified as correct, the patch will then be implemented to the second MMU, if required.

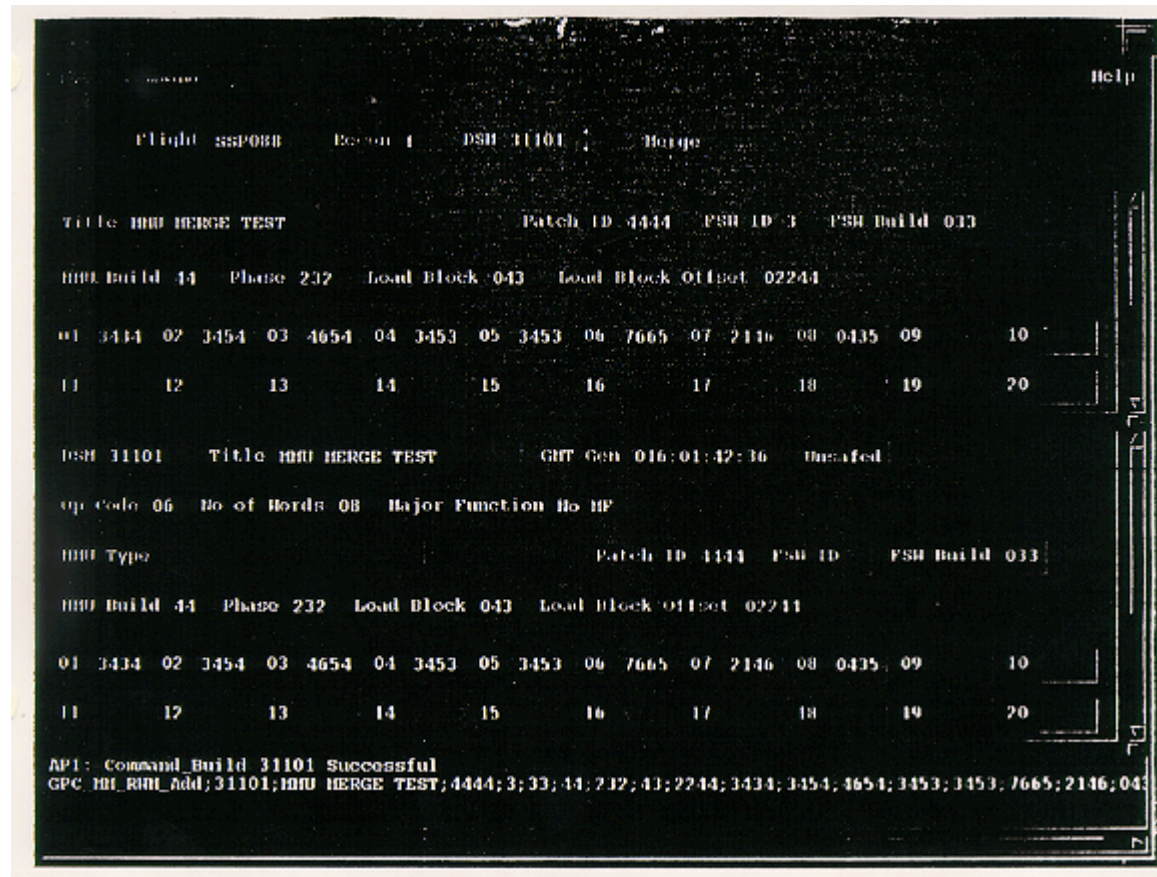


Figure 3.3.2-1. MMU OPS Application

SOP 3.3.3

TITLE

GPC MEMORY READ/WRITE

PURPOSE

To define the method for either reading or changing the contents of the onboard PASS or BFS GPC memory locations in real time.

PARTICIPANTS

MCC FC's
*DPS/DPS SPT
FD
MOIR
FAO
INCO
MER

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

BACKGROUND

- A. A read operation is defined as the task of determining the present contents of any memory location in either a PASS or BFS computer. A single operation will be limited to the reading of six memory locations or less from a specific computer. If more than six locations are required to be read out, a partial or complete GPC memory dump should be considered.

NOTE

A read operation should be limited to determining contents on a one-time basis. If repetitive readouts of a memory location are required and the location address is between 0000 and FFFF in PASS or BFS GPC's, it is recommended that the variable parameter downlist capability be used. (See FCOH SOP 4.8, VARIABLE PARAMETER DOWNLIST USAGE.)

- B. A write operation is defined as the task of changing the contents of any memory location in either a PASS or BFS computer. Two options are available to change the contents of a memory location.

1. Change the contents before the program containing the desired memory location is loaded into the GPC. This option would modify the location while it is resident on the MMU.
2. Change the contents after the program containing the location is loaded into the GPC. This option modifies the location while it is resident in main memory.

NOTE

Flight rules dictate that option 2 is the preferred method. But option 1 is used if the restrictions concerning the write operations preclude updating the location while resident in active GPC memory.

- C. DPS maintains a log of all real-time read or write operations performed. DPS SPT supplies the FC team with R/T Memory Read/Write Worksheets on request. The RT Memory Write Worksheet is available electronically as a default template on the MCC PC's (see examples of each worksheet at the end of this SOP).
- D. PASS or BFS real-time GMEM write procedures must have completed a software development level verification and a crew procedural verification before the write procedure can be implemented. Verification may be performed preflight or real-time depending on the status of the memory write procedure.

PROCEDURES

A. To Perform a Read Operation

1. FC fills out the R/T Memory Read Worksheet in triplicate as outlined in the information section of this procedure (JSC form 781E, figure 3.3.3-1).
2. FC sends original and one copy to DPS SPT and retains one copy. DPS SPT verifies that form is filled out properly and coordinates any change with the initiator as necessary.
3. DPS/DPS SPT prepares a Flight Note (six copies) if less than seven locations are to be read out. If more than six locations are requested to be read out, DPS SPT recommends that a partial or complete GPC memory dump be performed to determine the contents of the requested locations.
4. After completing the Flight Note, DPS SUPPORT will send all paperwork to DPS for review.
5. DPS and originating FC coordinate with FD to determine an appropriate time to perform the requested read operation. DPS provides a copy of the Flight Note to CAPCOM, FD, FAO, and the originator. Included in the Flight Note should be an explanation of the procedure and the desired results.

B. To Perform a Write Operation With a Preflight-Approved GMEM

The FC determines the present conditions for which the GMEM is being considered. The FC and DPS compare the present conditions against those conditions published in the

GMEM Maintenance Release Authorization Signature Sheet (MRAS) for PASS or the engineering order (EO) for BFS. DPS maintains a copy of all preflight-approved GMEM MRAS's and EO's.

1. If present conditions are the same as the GMEM write MRAS or EO conditions
 - a. Perform one of the following:
 - (1) In emergency, time-critical situations, the FC, DPS, FD, CAPCOM, and INCO will coordinate the preauthorized GMEM writes usage and implementation via loops without further verification. Following such emergency, FC should initiate a flight note to FD, FAO, CAPCOM, DPS, and INCO and initiate an informational MAR to SPAN to document why, when, and how. The FC should include as part of the MAR to SPAN a reference by number to the appropriate MRAS (PASS) or EO (BFS).
 - (2) In nonemergency situations, the FC initiates a MAR to SPAN requesting that the preauthorized GMEM write procedure be reverified, time permitting, prior to its use. The FC should include in this MAR a reference by number to the appropriate MRAS (PASS) or EO (BFS). After GMEM write is reverified or time for the GMEM write need has been reached, continue with b. If reverification cannot be completed prior to the need for the procedure, the procedure will be implemented without further verification.
 - b. FC and DPS coordinate with FD to determine an appropriate time to perform the write operation. If implementation of GMEM write is to be performed via uplink capability, DPS/DPS SPT will generate the appropriate uplink load.
 - c. DPS and FC will verify the GMEM load in the Command Server.
 - d. FC provides a flight note to CAPCOM, FD, DPS, INCO, and FAO explaining that a GMEM write is to be accomplished. The note should explain intent, rationale, and method of implementation (i.e., use of onboard crew procedure or command uplink, as well as DSM number and GPC/MF).
 - e. On FD GO, DPS will coordinate uplink with INCO as per FCOH SOP 3.1.
 - f. DPS informs FD and FC when the GMEM is onboard. The FC is responsible for verifying that the GMEM is successful and will notify FD accordingly.
 - g. As soon as practical after uplink, DPS requests SPAN to inform the MER that the G-MEM has been implemented.
2. If present conditions are not the same as MRAS or EO conditions
 - a. After coordinating proposed MAR with DPS, FC initiates a MAR to SPAN. The MAR must define the condition(s) which requires the GMEM write recertification and request that the GMEM write be reverified for use under these conditions. Any one of the following conditions requires recertification:
 - (1) The GMEM write is to be used in any GPC memory configuration to which a previous GMEM has already been invoked and is still active.

- (2) Any hardware failure that interfaces with the software or configuration (hardware or software) presently exists, other than the conditions explicitly defined in the original GMEM write request.
 - (3) The same GMEM write has been entered once and has not been nullified by an approved backout technique. Examples of approved backout techniques are OPS transitions, changing MF's, re-IPLing the GPC, implementing an approved and verified GMEM write that cancels the initial GMEM, etc.
 - (4) The original GMEM write request contained specific numerical values as data entries, and a change in the data values is necessary, or if numerical values are necessary data entries and none were specified in the original write request.
- b. After recertification, FC and DPS coordinate with FD to determine an appropriate time to perform the write operation. If implementation of the GMEM write is to be performed via uplink capability, DPS/DPS SUPPORT will generate the appropriate uplink load.
 - c. DPS and FC will verify the GMEM load in the Command Server.
 - d. FC provides a flight note to CAPCOM, FD, DPS, INCO, and FAO explaining that a GMEM write is to be accomplished under present conditions. The note should explain intent, rationale, method of implementation, existence of changed conditions (implementation; i.e., crew procedure or command uplink, as well as DSM number and GPC/MF).
 - e. On FD GO, DPS will coordinate uplink with INCO as per FCOH SOP 3.1.
 - f. DPS informs FD and FC when the GMEM is onboard. The FC is responsible for verifying that the GMEM is successful and will notify FD accordingly.
 - g. As soon as practical after uplink, DPS requests SPAN to inform the MER that the G-MEM has been implemented.
3. If implementing a subsequent preflight-approved and verified GMEM write procedure
 - a. If the MRAS or EO for a subsequent GMEM authorizes concurrent use with a previously implemented GMEM, the FC coordinates a MAR with DPS as outlined in section B.1.
 - b. If the MRAS or EO for a subsequent GMEM does not authorize concurrent use with a previously implemented GMEM, the FC coordinates a MAR with DPS as outlined in section B.2.
 4. If 482 FDF changes are requested affecting approved and verified GMEM write procedures
 - a. Changes to approved and verified FDF GMEM write procedures are permitted only after the submission and approval of a subsequent CR, asking the software developer to verify the change. The change must be verified by the software developer before its incorporation into the FDF.

- b. To initiate a change to an approved and verified FDF GMEM write procedure, the initiator must write the CR and take it before the SASCB for approval. After approval, the initiator must submit a 482 FDF CR to incorporate the change into the FDF.

- c. Real-time changes to approved and verified GMEM write procedures transform the approved and verified procedure into an unapproved real-time GMEM write procedure. The Real-Time STS Crew Procedure Change Request, SOP 2.3.3 in the FCOH, is not to be used in cases of GMEM write procedure changes, since that process does not require software developer verification.

C. To perform a non-preflight-approved GMEM write procedure

1. FC fills out one set of R/T Memory Write Worksheets, as outlined in the information section of this procedure and initiate a MAR.

NOTE

To provide quick software development and verification, it is important to provide as much detail as possible on the intended write operation and on associated system procedures to be used.

2. FC sends worksheets and proposed MAR to DPS. DPS verifies that all the paperwork is filled out properly and coordinates any change with initiator as necessary.
3. DPS assesses the intended write operation, using the known write operation restrictions, to determine if a special DPS configuration is required to implement the write operation. If the use of a special memory configuration is required, DPS, with initiator assistance, generates a procedure involving the necessary DPS transitions, the write operation, and any required necessary subsystem actions. DPS fills out the DPS configuration matrix on the worksheet as required.
4. DPS returns the worksheets to the initiator.
5. FC sends proposed MAR, with worksheets, to SPAN (see FCOH SOP 2.1) requesting development and verification of the write operation.
6. After the development and verification of the write operation is complete, SPAN returns the MAR to the initiator and one copy to each DPS and DPS SPT.
7. DPS and originator, with the assistance of FAO, generate the integrated crew procedures necessary to make the write operation execute properly. DPS is responsible for generating the required crew read/write pads or uplink loads. If the write operation requires MMU patching, DPS uses FCOH SOP 3.3.2 to accomplish this task. The originator is responsible for providing the detailed subsystem procedures.
8. DPS and FC will verify the GMEM load in the Command Server.
9. FC provides a Flight Note to CAPCOM, FD, DPS, INCO and FAO explaining that a GMEM write is to be accomplished under present conditions. The note should explain

intent, rationale, and method of implementation (implementation; i.e., crew procedure or command uplink, as well as DSM number and GPC/MF).

10. On FD GO, DPS will coordinate uplink with INCO as per FCOH SOP 3.1.
11. DPS informs FD and FC when the GMEM is onboard. The FC is responsible for verifying that GMEM is successful and will notify FD accordingly.
12. As soon as practical after uplink, DPS requests SPAN to inform the MER that the GMEM has been implemented.

INFORMATION

The following information is provided to assist FC in filling out the appropriate worksheet:

A. R/T Memory Read Worksheet (JSC form 781E, figure 3.3.3-1)

1. Date and GMT terms self-explanatory. Initiator/Loop: Operator call sign and FCR loop on which initiator is available.

2. PASS and BFS terms self-explanatory; however, only one box can be marked. If similar GMEM write is being implemented in PASS and BFS, separate worksheets must be developed by initiating FC. One MAR is sufficient for both GMEM reads.
3. Major Function and OPS: If the requested read operation is dependent upon which major function (GNC, SM, or PL) is resident in the GPC, a single box should be marked. (Unnecessary for a BFS operation.) If the read is dependent upon which OPS overlay (OPS 0, 201, 301, 801, or 901) is resident or active in the GPC, the correct OPS must be defined. If implementation is desired for all major modes of an OPS configuration, this area should be filled in with #XX" where # is 2, 3, 8, or 9 for the desired OPS.

4. Objective - A short statement defining what the read operation will accomplish. Use generic terms to describe this purpose.

5. Display Format - Two options exist on a crew readout of an address; i.e., HEX or Engineering Units. Only one can be selected. For engineering units display, the Scaling and Conversion blocks must be filled out. Only one scaling option and one conversion option can be selected for the read operation. Additionally, if multiple addresses are being read out simultaneously, only one scaling and one conversion option can be selected.

6. Software Address (Add) ID, Add Name, and Expected Contents.

Add ID: A five-digit hexadecimal number is required.

Add Name: HAL-S or assembly name as defined in program listings.

Expected Contents: The addressed memory location should contain the defined value in HEX or in the appropriate engineering units. If unknown, define the contents to be N/A.

B. R/T Memory Write Worksheet (DPS (DF22) form 781, figures 3.3.3-2 through 3.3.3-3)

1. The R/T Memory Write Worksheet is available electronically as a default template on the MCC PC's.
2. Date and GMT terms self-explanatory. Initiator/Loop: Operator call sign and FCR loop on which initiator is available.

3. Block I - PASS and BFS terms are self-explanatory; however, only one may be checked. Separate forms should be submitted if similar GMEM writes are desired to both PASS and BFS.

GMEM write operations. Code load and data load are 16-bit (halfword) write operations. Code Load is the only operation which can be done to code areas of memory. Data Load, Bit Set, and Bit Reset Write operations can be performed only to data areas of memory. The bit set operation will set to 1" bits defined in the mask word (reference Information Section B.6). The bit-reset operation will set to 0" bits defined in the mask word.

The location of the GMEM write in memory will determine what actions will terminate its effects. Major function base GMEM writes will remain in effect until a new major function base is loaded or the GPC is IPL'd. OPS overlay GMEM writes will be overwritten for OPS transitions, major function base changes, and GPC IPL's. System software GMEM writes will remain in effect for OPS transitions and major function base changes. Moreover, system software GMEM writes will only be overwritten when the GPC is IPL'd.

All GMEM writes will be implemented by either crew keyboard input or MCC uplink. The uplink options for PASS and BFS are contiguous and scatter loads. The PASS also has the capability to receive DEU equivalent loads. On this form, it is only necessary to check uplink or crew input. Uplink is the preferred method of implementation (reference Flight Rule 7.1.3.6). DPS will determine the best uplink method.

4. Block II - Checking the memory sector of the GMEM write will help to easily determine what type of read operation will be required to verify initial and final write memory location values. Exact memory address will be entered on form 781B.
5. Block III - If a GMEM write must be implemented in a particular OPS overlay, check the appropriate OPS in which the write must be accomplished.

6. Block IV - Objective - Explain what problem has occurred that requires this write operation and how this write will correct the problem (e.g., if discrettes are being modified, identify the discrettes' functions and how this modification solves the problem). Consideration should be given to defining how each parameter value used in the write operation was determined; i.e., analysis of TLM data, test data, off-line computer program results, listings, or any combination of these sources. Specify the type of source and the source used.
7. Block V - Operational Constraints/Requirements: The originator should define the necessary actions to set up the appropriate subsystem configuration and software steps to accept the effects of the write operation. The originator should define any limitation, restriction, or peculiarity in either the hardware or software configuration that can constrain the results of the write operation. The following list of possible

constraints should be considered to determine if any are applicable and thus necessitate inclusion into this area of the worksheet.

- a. Define the mission interval that the results of this write operation are to be in effect within the GPC(s). Identify by major modes, flight events, duration in time, or by other significant software activities (burns, sequences, etc.).
- b. What software configuration (major mode, FC mode, guidance mode, deselections, etc.) is required at the time this write operation is performed-
- c. Is there any special flight environment (zero g, thrusting, etc.) required for the results of this operation to be observed-
- d. Are there any software configurations which must be avoided while the effects of this write operation are active in the GPC(s) (FC modes, guidance modes, OPS and major mode transitions, failures, deselections, SPEC entries, etc.)-
- e. Are there any crew procedure/activities (OPS Trans, switch settings, etc.) which must be performed in order for this write operation to be effective-
- f. Are there any future crew procedures/activities which could interfere with the intent of this write operation-
- g. Specifically define the point in the mission for which the effects of this write operation become incompatible/undesirable and thus must not be present; i.e., when this write operation must be backed out.
- h. What is the recommended method of application for this memory write- (Either crew manually inputting via keyboard or ground uplinking to the two-stage buffer.) Provide the rationale for this recommendation.

8. Block VI - SW Name, Parameter, Address, Mask Word or Desired, Initial Actual, Final Actual.

SW Name: HAL-S or assembly name as defined in program listings.

Parameter: Generic or engineering name commonly used; i.e., RGA 4 BIAS or IMU 2 X AXIS SCALE FACTOR.

Address: A five-digit hexadecimal number is required.

Mask Word/
Desired The addressed location will be changed to this value in HEX (up to four digits) after the write operation is performed. If bit-set or bit-reset mode has been chosen, this column will contain the mask word. The mask word is defined to be the bit location within a 16-bit memory word that is to be manipulated. The mask word must be a four-digit HEX word.

EXAMPLE 1

Address location 017C0 is presently reading 1000 (HEX) and is desired to be 3000 (HEX). The mask word would be generated to set the second bit of first HEX character to a 1; i.e.,

Maskword = 2000.

Thus, mask word bits have a one-to-one correspondence with the bits of the memory word. For multiple bits being set or reset, mask word would be generated to set/reset the appropriate bits.

EXAMPLE 2

Address location 017C1 is presently reading 1000 and is desired to be DC00.

PRESENT WD	0 0 0 1	0 0 0 0	0 0 0 0	0 0 0 0
BIT	0 1 2 3	4 5 6 7	8 9 10 11	12 13 14 15
DESIRED WD	1 1 0 1	1 1 0 0	0 0 0 0	0 0 0 0
BIT	0 1 2 3	4 5 6 7	8 9 10 11	12 13 14 15

The mask would be generated to set bits 0, 1, 4, and 5 to a 1, and, therefore, the mask word would be CC00. If the desired contents had been C000, a bit reset operation would be required to reset bit 3 to a zero. Alternatively, a HEX write, where all bits are specified, could set the contents directly to C000 in a single operation. Generally, a bit set/bit reset operation allows single bit manipulation where the state of adjacent bits is not known; whereas, with a HEX write, the total contents of the word changed must be known.

Initial Actual: The addressed location should contain this defined value in HEX (up to four digits) before the write is accomplished. If bit set or bit reset mode of write is required, it is only necessary to define the state (1 or 0) of the bit to be manipulated by using the following format.

BIT 0 = 1 or BIT 15 = 0. Multiple bits can be manipulated within the addressed word with a single bit set or bit reset operation. In this case, definition of the entire word in HEX should be entered in the "Initial Actual" column.

Final Actual: The addressed location will be changed to this value (up to four digits) after the write operation has been performed. For a code load or data load, the contents of the "Desired" column should equal the contents of the "Final Actual" column. For a bit set/reset operation, the "Final Actual" column will contain the final desired contents, whereas the "Desired" column contains the mask word.

9. Block VII Applicable Configurations: DPS will define the contents of these blocks such that verification of the write operation will be performed against the applicable configurations.

R/T MEMORY READ WORKSHEET																													
INITIATOR/LOOP	TIME	DATE																											
<p>I <input type="checkbox"/> PASS <input type="checkbox"/> OPS</p>																													
<p>II Major Function <input type="checkbox"/> GRC <input type="checkbox"/> SM <input type="checkbox"/> PL</p> <p>OPS _____</p>																													
III Objective:																													
<p>IV Display format: <input type="checkbox"/> ENGINEERING UNITS <input type="checkbox"/> HEX</p>																													
<p>SCALING: CONVERSION:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> 1 16 Bit/Fixed <input type="checkbox"/> 2 32 Bit/Floating </td> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%;"> <tr> <td><input type="checkbox"/> 00 Units in Memory</td> <td><input type="checkbox"/> 06 °/SEC from Mill. RAD/SEC</td> </tr> <tr> <td><input type="checkbox"/> 01 MM from FT</td> <td><input type="checkbox"/> 07 DEG from ARC SEC</td> </tr> <tr> <td><input type="checkbox"/> 02 MM from KFT</td> <td><input type="checkbox"/> 08 FT/SEC² from μG</td> </tr> <tr> <td><input type="checkbox"/> 03 FT from MM</td> <td><input type="checkbox"/> 09 DEG from RAD</td> </tr> <tr> <td><input type="checkbox"/> 04 KFT from MM</td> <td><input type="checkbox"/> 10 KFT from FT</td> </tr> <tr> <td><input type="checkbox"/> 05 FT/SEC² from GS</td> <td></td> </tr> </table> </td> </tr> </table>			<input type="checkbox"/> 1 16 Bit/Fixed <input type="checkbox"/> 2 32 Bit/Floating	<table style="width: 100%;"> <tr> <td><input type="checkbox"/> 00 Units in Memory</td> <td><input type="checkbox"/> 06 °/SEC from Mill. RAD/SEC</td> </tr> <tr> <td><input type="checkbox"/> 01 MM from FT</td> <td><input type="checkbox"/> 07 DEG from ARC SEC</td> </tr> <tr> <td><input type="checkbox"/> 02 MM from KFT</td> <td><input type="checkbox"/> 08 FT/SEC² from μG</td> </tr> <tr> <td><input type="checkbox"/> 03 FT from MM</td> <td><input type="checkbox"/> 09 DEG from RAD</td> </tr> <tr> <td><input type="checkbox"/> 04 KFT from MM</td> <td><input type="checkbox"/> 10 KFT from FT</td> </tr> <tr> <td><input type="checkbox"/> 05 FT/SEC² from GS</td> <td></td> </tr> </table>	<input type="checkbox"/> 00 Units in Memory	<input type="checkbox"/> 06 °/SEC from Mill. RAD/SEC	<input type="checkbox"/> 01 MM from FT	<input type="checkbox"/> 07 DEG from ARC SEC	<input type="checkbox"/> 02 MM from KFT	<input type="checkbox"/> 08 FT/SEC ² from μ G	<input type="checkbox"/> 03 FT from MM	<input type="checkbox"/> 09 DEG from RAD	<input type="checkbox"/> 04 KFT from MM	<input type="checkbox"/> 10 KFT from FT	<input type="checkbox"/> 05 FT/SEC ² from GS														
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ADD 10 (HEX)	ADD NAME	EXPECTED CONTENTS																											
<p><small>JSC Form 3018 (500 80)</small> <small>0450-22C</small></p>																													

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Figure 3.3.3-1. R/T Memory Read Worksheet

REAL TIME MEMORY WRITE WORKSHEET		PAGE 1 OF 2																				
INITIATOR/LOOP:	GMT: / : :	DATE:																				
<p>I. For each WRITE desired, select one item in each of the following columns:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>PASS/BFS:</u></th> <th style="text-align: left;"><u>GMEM TYPE:</u></th> <th style="text-align: left;"><u>PASS ONLY - GMEM done to</u></th> <th style="text-align: left;"><u>IMPLEMENTATION:</u></th> </tr> </thead> <tbody> <tr> <td>PASS</td> <td></td> <td></td> <td>UPLINK</td> </tr> <tr> <td>PASS</td> <td></td> <td></td> <td>UPLINK</td> </tr> <tr> <td>PASS</td> <td></td> <td></td> <td>UPLINK</td> </tr> <tr> <td>PASS</td> <td></td> <td></td> <td>UPLINK</td> </tr> </tbody> </table>			<u>PASS/BFS:</u>	<u>GMEM TYPE:</u>	<u>PASS ONLY - GMEM done to</u>	<u>IMPLEMENTATION:</u>	PASS			UPLINK	PASS			UPLINK	PASS			UPLINK	PASS			UPLINK
<u>PASS/BFS:</u>	<u>GMEM TYPE:</u>	<u>PASS ONLY - GMEM done to</u>	<u>IMPLEMENTATION:</u>																			
PASS			UPLINK																			
PASS			UPLINK																			
PASS			UPLINK																			
PASS			UPLINK																			
<p>II. Select appropriate memory sector for GMEM implementation:</p> <p style="text-align: center;"><u>LOWER MEMORY</u> <u>UPPER MEMORY</u></p>																						
<p>III. For PASS only, select the OPS(s) in which the desired GMEM must be implemented:</p>																						
<p>IV. Objective:</p>																						
<p>V. Operational Constraints / Requirements (<i>Initiator - See Suggested Topics in FCOH 3.3.3</i>)</p>																						

Figure 3.3.3-2. Real-Time Memory Write Worksheet (GMEM) (1 of 2)

SOP 3.4

TITLE

COMMAND UPLINK TAPE GENERATION CHECKLIST

PURPOSE

This procedure is designed to provide a user who has little command system experience with a checklist to define the uplink characteristics required to build a command uplink tape.

PARTICIPANTS

- * COMMAND
FCT member/user

GENERAL

Command uplink tapes are normally built for the SAIL to verify orbiter response to MCC command data. However, tapes may also be built for other facilities/centers.

The underlined parameters on the Command Data Checklist are used as defaults for building all tapes.

PROCEDURES

- A. If the tape is to be built for the SAIL, the user only needs to complete items 1 and 8 on the Command Data Checklist. (Items are listed below.)
- B. If the tape is to be built for another facility/center (SMS, MIL, Sunnyvale, etc.), the user should verify the parameters listed on the Command Data Checklist with the requestor to ensure that the configuration is correct.
- C. When complete, the Command Data Checklist should be returned to COMMAND. COMMAND can be reached on the COMMAND loop or through the INCO or GC.

The following is a description of the available options for each parameter.

1. If the tape is to be built during a mission or a simulation, these parameters are not required. However, these items are required if the user plans to schedule an offline MOC to build a tape. The FLIGHT, CYCLE, and VEHICLE parameters are used by COMMAND to ensure that the correct MOC software has been brought up for the run. When the user schedules the run, the uplink FEP must be scheduled by adding uplink FEP in the configuration block of the scheduling form. Also in the test objective block, state your intention to build a SAIL tape so that the COMMAND controller will be ready.
2. UPLINK RATE: The MCC command system outputs 32 kb/s, 72 kb/s, and 216 kb/s; 72 kb/s is used as the default.

NOTE

The following lists the orbiter command rates and the rate normally used.

TDRS S-band	32 kb/s or 72 kb/s	:	72 kbs
TDRS K-band	72 kb/s or 21 6kb/s	:	216 kb/s
STDN S-band	32 kb/s or 72 kb/s	:	72 kb/s
SGLS S-band	32 kb/s or 72 kb/s	:	72 kb/s

3. UPLINK TYPE: RTC's and payload command loads can be uplinked in two-stage or single-stage mode. Orbiter loads will be uplinked only in two-stage mode regardless of selection. Single-stage means the command is sent to the orbiter and executed immediately. Two-stage means the command is first stored in a GPC buffer while the contents of the buffer are downlinked for comparison in the MOC. If the uplinked and downlinked data compare, a Buffer Execute command is sent for the command in the GPC two-stage buffer. Single-stage is used as the default.
4. MAJOR FUNCTION: Commands can be uplinked to SM, GNC, BFS, PL, GPC1, GPC2, GPC3, GPC4, GPC5, for GPCA (all). SM, GNC, and BFS are normally the only major functions used. SM is used as the default.
5. TIME AUTHENTICATION (T/A): T/A is the process of protecting command data by encoding the commands with a time code at the time of execution. Normally, T/A and encryption are configured together; however, the ground command system has independent control over these two functions. If T/A is required to be ON, then the user will have to supply a GMT to which the MOC must be stepped ahead.

T/A should be ON only if absolutely necessary! Special user facility capabilities must exist to be able to use T/A.

OFF is used as a default.
6. ENCRYPTION: The default for encryption is OFF. If encryption is to be on, COMMAND will need to know whether Test keys or Mission keys will be needed. If Mission keys are needed, COMMAND will also need to know for what flight.
7. TIMING REQUIREMENTS: This parameter refers to the time delay between the commands listed in the following step. A 2-minute delay between commands will be used as a default. Unless otherwise specified, a two-stage buffer execute will be transmitted 20 seconds after each command load.
8. COMMANDS REQUIRED: List the DSM numbers of all commands to be uplinked, including the buffer execute, in the order they are to be uplinked. If T/A is to be ON, then the GMT time of uplink should also be supplied for each DSM number.
9. DELOGS: COMMAND has the capability to provide the user with a delog of the command data sent to the tape and the command data played back into the MOC (for tape build verification). COMMAND uses these delogs to confirm a good tape build. The entire command content is not compared.

10. TRACK ASSIGNMENTS FOR TAPE: The track assignments listed on the checklist are defaults for the SAIL. If an external user would like different assignments, they should be listed here. Also note this is for a seven track 1/2-inch tape.
11. TAPE FORMAT: The standard tape format is seven track 1/2-inch wideband tape. The MCC does have the capability to use 28-track 1-inch wideband tape.
12. DELIVERY INSTRUCTIONS: The FCT member/user should provide their name, telephone number, and console position (if applicable) in the event COMMAND has any questions and as a contact when the tape build is complete and ready for delivery.

Please feel free to contact COMMAND if you have any questions about any item on this checklist or about the tape build process.

The COMMAND workstation is located in room 4328 of building 30S. COMMAND can be reached on the COMMAND loop or by contacting GC or INCO. The offsite telephone number is 282-3341 and the w/s telephone number is 483-8723.

COMMAND DATA CHECKLIST

1. FLIGHT STS-_____ VEHICLE ID 10
CYCLE: Engineering Flight
2. UPLINK RATE: 32kb/s 72kb/s 216kb/s
3. UPLINK TYPE: Single Stage Two Stage
4. MAJOR FUNCTION: SM GNC BFS
5. TIME-AUTHENTICATION: On Off
6. ENCRYPTION: On Off
WHAT KEYS IF ON": Test Mission STS-
7. TIME REQUIREMENTS:
2 Minutes between commands
20 Seconds between command and buffer execute
8. COMMANDS REQUIRED (List DSM numbers in order of uplink):
9. DELOGS: Outgoing commands: Yes No
Tape playback: Yes No
10. TRACK ASSIGNMENTS FOR TAPE:
 - 1.
 2. 25 Kc Reference
 3. Uplink Signal
 - 4.
 - 5.
 6. Uplink Signal
 7. IRIG B Timing
11. TAPE FORMAT: 7 TRK 1/2" 28 TRK 1"
12. DELIVERY INSTRUCTIONS:

SOP 3.4.1

TITLE

CONTINGENCY TELCOM UPLINK TAPE GENERATION

PURPOSE

To describe the procedures for contingency verification of commands during a mission period via a command uplink tape in the SAIL.

PARTICIPANTS

* TELCOM	CCRF
GC	COMM CONTROL
INCO	CEF
FCT member/user	SAIL
FLIGHT DIRECTOR	

GENERAL

TELCOM uplink tapes are used by the SAIL to verify the orbiter response to MCC command data. MOC commands are output to the FEP via the multiple host interface (MHI). The FEP output is routed to the CCRF for recording and subsequent tape delivery to the SAIL. Since the normal command uplink path is in use for the mission, the uplink FEP must be configured to build the tape.

PROCEDURES

- A. FCT member/user will clear required command build activity with the FD and then complete a Command Data Checklist and deliver it to INCO and TELCOM. (Reference FCOH SOP 3.4.1, Command Uplink Tape Generation Checklist, for the items referenced below.) TELCOM will notify GC of the request.
- B. TELCOM coordinates with COMM CONTROL to allocate/connect output port and rate (item 2) to CCRF. TELCOM will ensure that all FEP ports are not configured external to the MCC.
- C. TELCOM notifies CCRF of intent to build a tape with track assignments as defined on the Command Data Checklist, FCOH SOP 3.4.1-4, items 10 and 11.

NOTE

Two tapes should be made if another recorder is available.

- D. GC advises CEF the uplink FEP will be going to unencrypted mode.
- E. TELCOM notifies FLIGHT DIRECTOR and INCO when CCRF, COMM CONTROL, and NIP CONTROL are configured and ready for tape build.
- F. FCT member/user notifies INCO when the command loads have been built and are ready for tape build (Command Data Checklist, item 8).

- G. INCO notifies TELCOM when ready to build tape. A time must be selected and coordinated when no mission command uplinks are required.
- H. TELCOM obtains a GO from FLIGHT DIRECTOR to unsafe the commands listed in the Command Data Checklist, item 8.
- I. COMMAND instructs CCRF to roll tape.

NOTE

A/G voice is unaffected by this step.

NOTE

If an unforeseen command uplink is required for the mission, TELCOM can quickly restore command with the orbiter by configuring the uplink FEP to encrypted mode and reconnecting all parts.

- J. TELCOM announces on FD, GC, and CMD loops that COMMAND SYSTEM IS NO-GO FOR COMMAND AND IS CONFIGURED FOR TAPE BUILD.
- K. TELCOM calls up an I94 MED menu to enable Buffer Execute in the event of a DATA REJECT.
- L. After approximately 2 minutes (for tape leader), INCO begins transmitting commands as defined on Command Data Checklist, item 8.
- M. INCO notifies FD and TELCOM when commanding is complete.
- N. TELCOM safes the commands listed on Command Data Checklist, item 8, and notifies FD and INCO.
- O. TELCOM will re-enable the uplink FEP for flight support.
- P. TELCOM announces on FD, GC, and CMD loops that COMMAND SYSTEM IS GO FOR COMMAND.
- Q. Approximately 2 minutes after last command is sent, TELCOM instructs CCRF to stop the tape and rewind it to the beginning.
- R. GC directs CEF to place VH2 formatter in encrypt mode.
- S. NIP CONTROL configures NOM for SDPC DATA LOOPBACK. (This sends loopback data to the MOC).
- T. When ready, CCRF begins PB of tape to the NOM.
- U. After tape playback is complete, CCRF rewinds tape and prepares it for pickup by TELCOM.
- V. TELCOM performs MCCH and NOMLP delogs to verify data on the tape.
- W. TELCOM notifies FCT member/user (Command Data Checklist, item 12) that tape and delogs are ready for delivery.

COMMAND DATA CHECKLIST

1. FLIGHT STS-_____ VEHICLE ID 10
CYCLE: Engineering Flight
2. UPLINK RATE: (SBD) 32kb/s 72kb/s (Ku) 216kb/s
3. UPLINK TYPE: Single Stage Two Stage
4. MAJOR FUNCTION: SM GNC BFS
5. TIME-AUTHENTICATION: On Off
6. ENCRYPTION: On Off
WHAT KEYS IF ON": Test Mission STS-
7. TIME REQUIREMENTS:
2 Minutes between commands
20 Seconds between command and buffer execute
8. COMMANDS REQUIRED (List DSM numbers in order of uplink):
9. DELOGS: Outgoing commands: Yes No
Tape playback: Yes No
10. TRACK ASSIGNMENTS FOR TAPE: (Items 2, 3, 6, & 7 on SAIL defaults)
 - 1.
 2. 25 Kc Reference
 3. Uplink Signal
 - 4.
 6. Uplink Signal
 7. IRIG B Timing
11. TAPE FORMAT: 7 TRK 1/2" 28 TRK 1"
12. DELIVERY INSTRUCTIONS:
Name: Phone:

SOP 3.5

TITLE

SPACELAB MAIN MEMORY AND MASS MEMORY IN-FLIGHT SOFTWARE MAINTENANCE
(SPACELAB PATCHING)

PURPOSE

To identify the sequence of events required to develop and implement patches to Spacelab main or mass memory locations in real time.

PARTICIPANTS

* FD	HOSC
DPS	PAYLOADS
SPAN	FCR Flight Controllers
INCO	CDMS

CAUTION

This procedure contains safety-critical steps. Improper implementation of these steps can be hazardous to equipment or personnel. Safety-critical steps are annotated by a surrounding box.

GENERAL

- A. All software patching using Spacelab RI codes 2C, 2D, 3F, 17, or 18 (write core memory contiguous, write core memory scatter, write mass memory, extended write core memory contiguous, and extended write core memory scatter, respectively) will be performed under supervision of the DPS console position.
- B. All software patches will be verified by the HOSC reporting through the SPAN.

PROCEDURES

- A. An FCR FC identifies the need for a Spacelab computer or mass memory patch by initiating a Mission Action Request (MAR).
 - 1. The MAR will first be submitted to DPS for screening. If DPS concurs, the MAR will be submitted to the SPAN for HOSC verification.
 - 2. DPS will notify FD that a software patch development has been initiated.
 - 3. The HOSC will verify the patch and complete any further development, including any required checksum patching and will return the MAR to the MCC via the SPAN, stating that the patch is verified and will identify any additional constraints.
- B. The HOSC identifies the need for a Spacelab computer or mass memory patch by initiating a MAR.

1. The HOSC will perform this development, including required checksums, for any patching (using RI codes 2C, 2D, 3F, 17, or 18) required by the POCC.
 2. The MAR will include copies of the Spacelab Inflight Software Maintenance Forms.
 3. The HOSC will perform all verification of the patch and submit to the SPAN for MCC implementation.
- C. The SPAN will provide copies of the MAR documenting the patch and its verification to DPS and the originator.
- D. DPS/CDMS will prepare all uplink loads required to implement and verify implementation of the patch. DPS will notify FD that the loads are ready for uplink.

NOTE

Spacelab patching consists of several commands that must be uplinked in a specific sequence with verification between each step, per FCOH SOP 3.1. DPS will provide INCO a separate GO for each load in the sequence.

- E. When FD approves the uplink, DPS will coordinate the uplink with INCO per FCOH SOP 3.1.
- F. If the patch is to computer main memory, the following is the sequence of events.
1. DPS will coordinate with INCO to uplink a load to dump the locations which will be patched.
 2. DPS will verify that the current values are the same as the predicted values.
 3. DPS will coordinate with INCO to uplink the load(s) to patch memory.
 4. DPS will coordinate with INCO to re-uplink the load in step 1 to dump the patched locations.
 5. DPS/CDMS will verify that the patch is correct from the dump.

- G. If the patch is to Spacelab mass memory, the following is the sequence of events.
1. DPS will coordinate with INCO to uplink a load to read the load block to be patched into the modification buffer and dump it to the ground.
 2. DPS/CDMS will verify that the current values in memory match the predicted values.
 3. DPS will coordinate with INCO to uplink loads to patch the MOD buffer location.
 4. DPS will coordinate with INCO to dump the MOD buffer patched locations.
 5. DPS/CDMS will verify that the patch is correctly implemented by analysis of the dump.
 6. DPS will coordinate with INCO to uplink the patch to the MMU prime image.
 7. DPS will coordinate with INCO to dump the MMU prime image, and DPS/CDMS will verify.
 8. Once verification is complete, DPS will coordinate with INCO to write the patch to the MMU redundant image.
- H. DPS will notify FD when the patch is successfully completed.
- I. Special cases
1. A specified set of patches that have been identified, verified, and documented prelaunch will not require real-time verification by the HOSC unless prior patches have been implemented to the affected configuration.
 2. If the patch requirement originated in the POCC, payloads will represent the originator to FD and provide any real-time experiment configuration coordination required for patch implementation.
 3. If the spare Spacelab MMU must be used, the MCC will implement all patches required for continuation of the mission. This list of patches will be identified prelaunch by ECR, and the complete patched configuration will be verified by MSFC prelaunch.
 4. If circumstances dictate use of ECOS modification buffer for MMU patching, PAYLOADS will identify a time when the modification buffer is available for MCC use.

SOP 3.6

TITLE

MCC KERBEROS PASSWORDS

PURPOSE

This procedure provides the Flight Control Team with information for obtaining Command Server Subsystem Kerberos passwords.

PARTICIPANTS

- KERBEROS GROUP ADMINISTRATORS (GA)
- ACCESS CONTROL AND AUDIT GROUP (ACA)
- * OS SUPPORT GROUP (OS)

REFERENCES

SFOC AIS Security Engineering Desktop Procedures #4312-AC0001

GENERAL

Kerberos (a DEC CySecure COTS product) is an authentication service that validates a user's access and allows them to validate their identity to the network once for all the services. It is currently used on a positional rather than individual basis, and is an enhancement to ensure a more secure MCC environment. Kerberos is required only for users with Shuttle or Station uplink capability. The type of password used will be determined by the type of Command Server being used.

PROCEDURES

- A. Each flight controller must contact his/her authorized Kerberos point of contact (POC) to gain Kerberos access to that particular group/discipline. Each POC is responsible for obtaining passwords and entering the controller's name into the group's Kerberos database. If a GA is unavailable or has not yet been assigned, the controller may call one of the general points of contact from the list located in the ACA office.
- B. Should a controller require password access during mission support after normal working hours, an OS support person is on duty 24 hours a day. This service is not available, however, during non-mission support and the controller will have to wait until the next working day for password access. The ACA group maintains an up-to-date contact list in their office in 30S, room 3306 but maintain instructions outside the door on how to contact after-hours OS or ACA personnel.
- C. Kerberos passwords are separated into Shuttle and Station activities which are not interchangeable. These activities are then separated into MIS, SIM, TEST, and GND modes. The SIM, TEST, and GND modes use the same Kerberos password and only the MIS password is unique. Mission passwords will be in effect at L-30 for mission specific sims plus the flight days and will automatically terminate at the end of that mission or after a maximum of 90 days in the event of long duration flights or slips in the mission manifest.

Mission passwords correspond to specific tail number/vehicle ID, with a different password for each vehicle. The SIM, TST, CDE and GND passwords will all be the same.

- D. Each controller will have three chances to correctly enter the password before the application shuts down. If the password log-on fails, re-select 'Start Command Server' from Global Applications to proceed. At some point, the system will permanently log off and the password will have to be reset for the entire group.
- E. Kerberos passwords must be re-entered every 8 hours, but will survive through shift hand-over without being re-entered.
- F. All passwords are reset approximately every 90 days and the GA will be notified 7 days in advance.

NOTE

A workstation reboot kills Kerberos and the password must be re-entered.

**SOP 4
TELEMETRY**

SOP 4.1

TITLE

TELEMETRY PROCESSING

PURPOSE

To establish telemetry processing procedures for coordination of Telemetry (TLM) and/or Payload Interleaved Data anomalies or data enhancement techniques.

PARTICIPANTS

FC TEAM	GC
FD	PAYLOAD DATA
INSTRUMENTATION	COMM CONTROL
DPS	COMM SUPPORT
* INCO	
* DFE	

GENERAL

The TELCOM is the central point of contact for downlinked TLM and PDIS anomalies and has primary responsibility for troubleshooting in response to inputs from GC or FC team.

PROCEDURES

A. TLM Format Changes

1. DFE will notify INSTRUMENTATION of any anomalies in the TLM downlist format on the DFE loop.
2. INSTRUMENTATION will notify DFE of impending format changes.

B. Loss of TLM Data in the MCC

1. If part or all of the data expected to be available is static, GC advises the FC team on the FD loop, specifying what data are static or missing (e.g., OI, GN, SM, BF, or all).
2. If the cause of and corrective action for the anomaly are known, one of the following informs FD: INCO, DPS, or GC.

NOTES

- a. The GC is the point of contact concerning the data loss until the anomaly is identified.
- b. When DFE determines what telemetry is available, DFE and INSTRUMENTATION cooperatively select a combination to be forced to recover a part of the data. If telemetry data are determined by DFE to be NSP fill data, this will be reported to COMM SUPPORT for appropriate action. Where there is a choice of combinations, the TLM formats have the following priorities:
 - (1) OI data (required for any data to be processed)
 - (2) GNC downlist
 - (3) SM2 or BFS downlist
- c. INCO informs the FC team on FD loop which combination is being processed.
- d. Following a pass in which a significant amount of data are lost, GC informs FD of the data resource availability for a playback.

C. PDI Window Change

1. If the onboard payload is configured to read into another PDI window and the onboard PDI is reconfigured to reflect the change, INSTRUMENTATION informs the DFE of the change. No DFE intervention is necessary.
2. If the onboard payload is configured to read into another PDI window and the onboard PDI is not reconfigured to reflect the change, INSTRUMENTATION will inform the DFE of the change and in which new window the payload is expected. DFE will make the change and inform INSTRUMENTATION that the change has been completed.
3. Notify GC of expected or unexpected changes.

D. Duplicate Format in Downlink

1. If the downlink should contain two like formats, the front end processor subsystem (FEPS) will default to and process the first occurrence only, and no DFE intervention is necessary.
2. Should the second like format be the format of choice, INSTRUMENTATION will instruct the DFE to process the second occurrence. The DFE will implement the change via FEP override entry. The DFE will, in turn, advise INSTRUMENTATION that the change has been effected. The change will remain in effect until the format changes or is manually overridden.
3. This change will remain in effect until the format changes or is overridden.
4. Notify GC of INSTRUMENTATION's request to delete other formats.

E. B/U OI Format Procedure

1. INSTRUMENTATION will instruct the DFE which format is to be loaded into the B/U OI format.
2. DFE will load the B/U OI MF in the FEPS.

F. Change or Cancel PDIS Routing

1. Should PAYLOAD DATA require a change of PDIS routing or configuration, he/she will advise the DFE of the "from" and "to" overrides to be entered.
2. DFE will do the configuration and advise PAYLOAD DATA when the change is completed.
3. DFE notifies GC.

SOP 4.2

RESERVED

SOP 4.3

TITLE

TELEMETRY PARAMETER READOUT FROM THE FEP

PURPOSE

Describe the steps required to acquire parameter readouts from the Front End Processor (FEP).

PARTICIPANTS

*DFE
FC

GENERAL

Flight controllers requiring telemetry parameter readouts can access Telemetry Services and complete the task as noted below. If a controller needs help, they can contact the DFE on the DFE or NIP SUPV Loop. The DFE is a Super User.

Parameter Readout Manager provides all processing of parameter readouts. To accomplish a telemetry parameter readout, one accesses Common Telemetry Services. Parameter readouts are accomplished via the Parameter Readout Manager function, which is a part of the Common Telemetry Services application, residing in the CCF FEP's architecture. Parameter Readout Manager receives its requests from flight controller or DFE workstations and then executes the readout requests.

PROCEDURES

A. Bring up Parameter Readout Menu:

1. From DNAV Menu **Master, Global Apps**. Select **Telemetry Services**, for **DLRT FEP**.
2. To start parameter Readout Manager click on the appropriate vehicle (i.e., OI/GPC, Payload, etc.) from the Telemetry Services display. Select the **Parameter Readout** Option. Hold down the menu button, move the menu cursor down to the desired parameter readout task option, and release the menu button.
3. The Parameter Readout Menu has the following options:

Define Parameter Readout: To define a parameter readout entry.

Define Word/Frame Readout: To define a word/frame readout entry.

Enable/Disable RT Retrieval: To enable or disable parameter readout for dynamic retrieval.

Delete Parameter Readout: To remove a requested parameter readout entry from the readout configuration

View Parameter Readouts: To generate a snapshot report of a specified parameter readout entry.

View Defined Parameter Readouts: To generate a formatted ASCII report of all parameter readout entries to a screen.

View Dynamic Readouts: To display a screen showing telemetry changing in realtime.

B. Define Parameter Readout:

1. Move the menu cursor down to the **Define Parameter Readout** option, and release the menu button. The Parameter Pick List appears.
2. Select a parameter by clicking on the appropriate parameter or by using the Filter capability. To use the Filter option:

Input several key characters of the requested parameter in the Filter field and click on **Filter**. Click on the appropriate parameter to select. Click **OK**.

To recover the entire parameter list. Enter a period (.) in the Filter field. Click on **Filter**.

3. The Define Parameter Readout display appears.
4. Click on the **Parameter** box, and enter the parameter in the Parameter field.
5. Click on the **Sample Number** box, and enter the sample number. The last sample in the data cycle is zero (0), the first sample is one (1), the second sample is two (2), etc.
6. Click on the appropriate Data Type (**Raw** or **Processed**). The selected button will appear filled in.
7. Click on the appropriate Display Format (**Hex** or **Predefined**).
8. Click **OK** to accept the parameter readout. Otherwise, click on **Cancel** to cancel the request.

C. Define Word/Frame Readout:

1. Move the menu cursor down to the **Define Word/Frame Readout** option, and release the menu button. The Define Word/Frame Readout display appears.
2. Click on either the main frame **OI** or the appropriate **Subcom**.

3. Click on the appropriate **Display Format** type (Hex or Decimal).
Hex = Hexadecimal.
Decimal = The first 32 bits of the value as an unsigned integer.
 4. Enter the **Word** location, where the first word in the frame is one (1).
 5. Enter the **Frame** location, where the first frame is frame zero (0).
 6. Enter the **Start Bit**, where the first bit in the word is zero (0).
 7. Enter the **Length** of the readout required.
 8. Click **OK** to add the readout entry to the table. Click **OK** in the verification dialog box, otherwise click **Cancel**.
- D. Enable/Disable RT Retrieval:
1. Move the menu cursor down to the **Enable/Disable RT Retrieval** option and release the menu button. The Enable/Disable RT display appears.
 2. If entries exist to be enabled or disabled, a list of readout definitions appear for the selection. Move the cursor to the desired entry and click on the entry to select it. A reverse image highlights the selected entry and it appears inside the Selections portion of the Enable/Disable RT Retrieval window. Repeat to select up to five (5) entries at a time.
 3. Click **Enable** to enable the RT readout. Click **Disable** to disable the RT readout, otherwise click **Cancel** to cancel the request.
- E. Delete Parameter Readout:
1. Move the menu cursor down to the Enable/Disable RT Retrieval option, and release the menu button. The Enable/Disable RT display appears.
 2. If entries exist to be deleted, a list of parameter readout definitions appears for selection. Move the cursor to the desired entry and click on the entry to select it. A reverse image highlights the selected entry. Only one entry can be deleted at a time.
 3. Click **OK** to delete the readout entry. Click **OK** in the verification dialog box, otherwise click **Cancel**.
- F. View Parameter Readout Report:
1. Move the menu cursor down to the **View Parameter Readout Report** option, and release the menu button.
 2. If entries exist to be viewed, a list of parameter readouts appears for selection. Move the cursor to the desired entry and click on the entry to select it. A reverse image highlights the selected entry. Only one entry can be selected at a time.
 3. Click **OK** to view the readout entry. Otherwise click **Cancel** to cancel the request.

4. A report appears which contains information such as the raw and processed value, calibration, and override information for that parameter.

deleted

G. View Defined Parameter Readout Report:

1. Move the menu cursor down to the **View Defined Parameter Readout Report** option, and release the menu button. The inquiry box to view defined parameter readouts display appears.
2. Click **OK** to view the defined parameter readouts. Otherwise, click **Cancel** to cancel the request.
3. A report of defined readouts appears.
4. To view the entire report, move the vertical or horizontal scroll bar. The report contains the following information:

Heading

Time (GMT) of report

Discipline: TELCOM, INCO, etc...

Parameter or W/F: Parameter Name or Word/Frame

Raw/Proc or W/F: Raw or processed, or Word/Frame

Same # or Len/Start: The sample number (L = Last), or the work/frame word length and start bit

Display: Display formats are:

HEX	= Hexadecimal
PRE	= Predefined scientific notation for types D and E, decimal for types F and L (less than 32 bits), and ASCII for type A
CON	= For types D, F, and E
DEC	= The first 32 bits of the value is being displayed as an unsigned integer (OI/GPC and Word/Frame only)

Enable: An "ON" flag is printed if the readout entry is enabled.

5. To save the report to a file, select **File** and **Save**. Specify a file name for the file to be saved as.
6. To print the reports, select **File** and **Print**. Specify the output destination.

H. View Dynamic Readouts:

1. Move the menu cursor down to the **View Dynamic Readouts** option, and drag the mouse until a sub-menu of View Dynamic readouts appears. Select **OI/GPC** and release the menu button. The View Dynamic Readouts for OI/GPC display appears.
2. If Dynamic parameter readout entries exist, then a window appears displaying the dynamic information on those enabled entries. Otherwise, the window is empty.
3. The **OI/GPC Dynamic Readout Display** window is organized into three areas:
 - a. **Parameter Description** for parameter displays is as follows:

<Parameter name + Sample number (L = Last)>

<Source (OI/GPC/PLD)>

<Data type (R = Raw, P = Processed)>

<Data type (R = Raw, P = Processed)>

<Display Format (see below)>

<Entity's descriptive name>

As for **OI/GPC Word/Frame** displays, the description is as follows:

<Word/Frame + length in bits>/<start bit>

<Display Format + description>

Display formats are:

HEX	=	Hexadecimal
PRE	=	Predefined Scientific notation for types D and E, decimal for types F and L (less than 32 bits), and ASCII for type A
CON	=	For types D, F, and E
DEC	=	The first 32 bits of value is being displayed as an unsigned integer (OI/GPC and Word/Frame only)

- b. **Status:** Contains the status conditions of each parameter during real-time retrieval. The following statuses may appear in the Status area:

D = Dead

L = Offscale Low

H = Offscale High

I,S = Invalid (Raw Data), Stale (Processed Data)

N = No sample this PPM (Payload Only)

C = Calibration change in effect that is different from the original

- c. **Value:** Contains the parameter value during dynamic retrieval. All parameter readouts that show a hexadecimal value are padded with leading zeros. All hex displays are on byte bounds. If a parameter in the display is not currently active the downlink, the phrase "no data flow" appears under value. ASCII values or word/frame values greater than sixteen characters are truncated.

4. Click **OK** to view the defined parameter readouts. Otherwise, click **Cancel** to cancel the request.
5. A report of defined readouts appears.
6. To view the entire report, move the vertical or horizontal scroll bar. The report contains the following information:

Heading

Time (GMT) of report

Discipline: This only applies to Station. A "N/A" is printed for Shuttle

Parameter or W/F: Parameter Name or Word/Frame

Raw/Proc or W/F: Raw or processed, or Word/Frame

Sample # or Len/Start: The sample number (L=Last), or the work/frame word length and start bit.

Display: Display formats are:

HEX	=	Hexadecimal
PRE	=	Predefined Scientific notation for types D and E, decimal for types F and L (less than 32 bits), and ASCII for type A
CON	=	For types D, F, and E
DEC	=	The first 32 bits of value is being displayed as an unsigned integer (OI/GPC and Word/Frame only)

Enable: An "ON" flag is printed if the readout entry is enabled.

7. To save the report to a file, select **File** and **Save**. Specify a file name for the file to be saved as.
 8. To print the report, select **File** and **Print**. Specify the output destination.
- I. View Payload Dynamic Readouts:

Move the menu cursor down to the **View Dynamic Readout** option and drag the mouse until a sub-menu of View Dynamic Readouts appears. Select Payload and release the menu button. The View Dynamic Readouts display appears.

SOP 4.3.1

TITLE

TELEMETRY PARAMETER READOUT FROM MOC

PURPOSE

To define the mechanism for obtaining DTE display (snapshot or once/second update rate) of specified telemetry parameters from the MOC.

PARTICIPANTS

FC TEAM

GENERAL

- A. Only those telemetry parameters processed by the MOC are available for display; telemetry input sample rate to the MOC is normally 1 S/S maximum. Refer to FCOH SOP 4.4.1 for readout of telemetry parameters not processed by the MOC or to verify parameter values read out from or processed by the MOC.
- B. All inputs to the MOC must be made via a workstation and all viewing of a display must be done via the workstation DTE emulator (EDTE).

PROCEDURE

- A. Display of selected orbiter PCM telemetry parameters is possible via EDTE 2020 using the V51 MED. Select the display and determine a spare line number.
- B. Input to the MOC a V51 MED with the following information:
 - 1. Measurement number
 - 2. MSK 2020 line number
 - 3. Flight ID and data type
 - 4. Display control mode (snapshot or cyclic)
- C. The requested data is displayed on MSK 2020 in as many of the following formats as are valid (predefined) for the parameters.

Percent full-scale, octal, decimal, hexadecimal, or engineering units.
- D. Because this limited display is shared by all F/C's, it is important that parameters be deleted from the display when they are no longer required. The F/C's are responsible for deleting their own parameters from EDTE 2020 using a V51 MED.

SOP 4.4

TITLE

GPC/MMU MEMORY DUMP (DELETED)

SOP 4.5

TITLE

TLM PLAYBACK

PURPOSE

To define the method for obtaining a playback of real-time or dump TLM data.

PARTICIPANTS

FC TEAM
STATION OPSR/DICE/NCC OPS
INSTRUMENTATION
COMM SUPPORT
COMM TECH

*DFE

GENERAL

The nominal plan is for the MCC to retrieve all dump TLM data/voice from the STDN as soon as possible after each station pass.

PROCEDURES

Nominal GSTDN TLM Playbacks

- A. If real-time data are not received because of LOS, INCO may wish to dump data at a GSTDN site. COMM SUPPORT will notify DFE of any pending STDN dump activities. DFE will notify the STDN site to configure for an OPS RECORDER dump. DFE will verify data content and quality and pass the information to COMM SUPPORT.

NOTE

If a dump was not conducted at a site and no backlog exists, DFE advises the site to reconfigure for AOS.

- B. DFE will retrieve current dump data first unless an older dump has priority.
- C. DFE directs STATION OPSR on SITE COORD loop to configure for dump TLM playback. Note that all TLM playbacks are in the forward direction at the original data rate.
- D. If an anomaly is known to exist in the dump data, COMM SUPPORT advises DFE on the DFE loop prior to playback from site. If an unexpected invalid or anomalous format occurs during the playback, DFE contacts COMM SUPPORT on the DFE loop to determine which option to exercise.

1. Continue the playback.
 2. Stop the playback, recue the tape, and perform corrective measures.
- E. DFE directs STATION OPSR to begin the playback. The nominal plan calls for in-flight retrieval of all real-time and dump data.
- F. If DFE determines that the MCC ground system is receiving poor quality data, DFE informs COMM SUPPORT of the situation. If the ground system is at fault, then a replay is scheduled by DFE after problem resolution.
- G. DFE directs the station to reconfigure for AOS and advises GC, who releases the station as defined in FCOH SOP 9.1.

Nominal TDRSS/RTS TLM Dumps

- A. If real-time data was not received because of LOS, INCO may wish to dump data using the TDRSS or RTS network. COMM SUPPORT will notify DFE of any pending dump activities. If TDRSS, DFE will check with NCC OPS to see that the network is configured to support dump activities. If RTS, DFE will check with DICE to see that the site is configured to support dump activities. DFE will configure to record the dump. DFE will inform COMM SUPPORT of good dump modulation. After the dump is played into ODRC, DFE will verify data content and quality and pass the information to COMM SUPPORT.
- B. If DFE confirms that JSC has received poor quality data, he/she informs COMM SUPPORT. A redump may be scheduled by COMM SUPPORT.

NOTE

During CCRF playbacks of TDRS or RTS OD telemetry, the RSGMT will be static or erroneous. RSGMT is valid only for GSTDN playbacks.

SOP 4.6

TITLE

LIMIT TABLE UPDATE

PURPOSE

To provide a procedure for updating critical and operational limits in the MOC job.

PARTICIPANTS

MCC F/C's

GENERAL

- A. Operational and critical limits can be viewed on the displays listed in table 4.6-1.
- B. All F/C's should periodically review these limits displays, especially after a limit is changed.
- C. If changes to onboard limits also are required, refer to FCOH SOP 3.3.2.
- D. All inputs to the MOC must be made from a workstation and all viewing of a display must be done via the workstation DTE emulator (EDTE).

PROCEDURES

A. Operational Limits (MOC)

Changes are made via F/C workstations. Call up the TLM operational limit change menu using MED V30 (MOC) (figure 4.6-1). The limits can then be changed to new values. If the changes are permanent MED candidates, enter "PM" in position 5 on line 1 on the menu.

B. Critical Limits (MOC)

Critical limits can be changed or the parameter's limit sensing enabled or disabled:

Changes are made via F/C workstations. Call up the TLM critical limits change menu using MED code V33 using EDTE. The limits can then be changed and enabled or disabled. If the changes are permanent MED candidates, enter "PM" in position 5 on line 1 on the menu.

- C. Addition of new parameters to operational or critical sense tables must be submitted through RDCS.

INFORMATION

For additional details on the subject MED entries, refer to MED User's Guide in Part 1 and Part 3 of the Ground Based Space Systems CCS/CONTROL User's Guide, JSC-13908 (1) and (3).

Table 4.6-1. Operational and critical limit displays

A. Operational limits (MOC)

<u>EDTE</u>	<u>Discipline</u>
2100-2102	BOOSTER
2124-2127	DPS
2146-2151	AVIONICS (GNC)
2168-2176	EECOM
2190-2195	MMACS
2212-2216	PROP
2234-2239	PAYLOADS

B. Critical limits

<u>EDTE</u>	<u>Discipline</u>
2119	BOOSTER (SPARE)
2141	DPS
2163	AVIONICS (GNC)
2185, 2186	EECOM
2207	MMACS
2229	PROP
2251	PAYLOADS

V30#
FLT/DT____/

		TLM OPERATIONAL LIMIT CHANGE MENU	
PARAMETER NUMBER	LOW VALUE	HIGH VALUE	
/ _____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____,	
_____,	_____,	_____ / \$	

V31#
FLT/DT____/

		TLM OPERATIONAL LIMIT SENSE CHANGE MENU		NOTE:
PARAMETER NUMBER	NO			CONTROL CODE DEFINITIONS
/ _____,	_____,			H=OFFSCALE HIGH
_____,	_____,			L=OFFSCALE LOW
_____,	_____,			R=OFFSCALE RESET
_____,	_____,			
_____,	_____,			
_____,	_____,			
_____,	_____,			
_____,	_____,			
_____,	_____,			
_____,	_____ / \$			

V33#
FLT/DT____/

		TLM CRITICAL LIMITS CHANGE MENU		NOTE:
PARAMETER NUMBER	LOW LIMIT	HIGH LIMIT		CONTROL CODE CODE (E/D)
/ _____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____,
_____,	_____,	_____,		_____ / \$

Figure 4.6-1. TLM limit table change MED's

SOP 4.7

TITLE

DATA DRIVER ALTER/RESTORE MSID CALIBRATION COEFFICIENT AND VALUE
COMMAND (DELETED)

SOP 4.7.1

TITLE

DATA DRIVER PARAMETER OVERRIDE (DELETED)

SOP 4.7.2

TITLE

UNIVERSAL DIGITAL/PLOT DISPLAYS

PURPOSE

To define the methods of configuring and viewing universal digital and universal plot displays.

PARTICIPANTS

CCC FC TEAM
MCC FC TEAM

GENERAL

- A. The 80 Universal Plots are initialized in a skeletal structure and must be filled in via MED inputs made by F/C's. Once filled in, the Universal Plots and the Universal Digital Displays are reconfigurable during flight.
- B. Table 4.7.2-1 identifies the UP's and UDD's and their allocation by flight phase.
- C. All inputs to the MOC must be made via a workstation and all viewing of a display must be done via the workstation DTE emulator (EDTE).

PROCEDURES

- A. F/C reconfiguration of UDD's and UP's via MED.
 - 1. For UDD's, call up menu V43 (Universal Digital Display) (figure 4.7.2-1). Specify MSK number from table 4.7.2-1, fill in parameters to be added/cleared and their display format, then execute. Verify correct operation by MSK display requesting the UDD.
 - 2. For UP's, call up menu V40 (TLM UP (Control Data)) (figure 4.7.2-2). Specify MSK number from table 4.7.2-1, update rate, X and Y parameters and scale values, and number of interim Y values; then execute. The plot is started via D61 PBI MED or Summary Message Enable Keyboard (SMEK) PBI, and SMEK data type (RR, R1, R2) determines the data source. Verify correct operation by MSK display requesting the UP.
 - 3. For nominal lines on a UP, call up menu V41 (UP (Nominal Data)). Specify MSK number from table 4.7.2-1 and either X, Y pairs or polynomial coefficients; then execute. Verify the nominal line appears on the UP.

Table 4.7.2-1 Universal digital and plot allocation

F/C position	MSK/EDTE type	Ascent	Orbit	Entry
BOOSTER	UP	2759-2775	N/A	N/A
	UDD	2023-2024	N/A	N/A
MMACS	UP	2701-2707 (all)		
	UDD	2025, 2027	2025, 2027	2025, 2027
EECOM	UP	2708-2726 (all)		
	UDD	2026	2026	2026
GNC	UP	2742-2758 (all)	2741-2750	2724-2729 2741-2750
	UDD	2023-2024	2023	2023-2024
INCO	UP		2759-2760 (ORB/ENT)	
	UDD	2022	2022	2022
PAYLOADS	UP	2741(ascent)	2776-2780 (all)	
	UDD	N/A	2024	N/A
PROP	UP	2727-2741 (all)	2741 (ORB/ENT)	
	UDD	2023	2023	2023
CDMS (S/L)			2761-2766 (orbit S/L)	

V40#

FLT/DT ___/

TLM UNIVERSAL PLOT (CONTROL DATA) MENU

MSK 18 __,

PLOT RATE ____,

	Y1	Y2	Y3	Y4
COMMENTS	/ _____,	_____,	_____,	_____,
PARAMETER NUM.	/ _____,	_____,	_____,	_____,
SCALE POS. (L/R)	/ ____,	____,	____,	____,

SCALE VALUES: Y LEFT Y RIGHT

MAXIMUM / _____, _____,

MINIMUM / _____, _____,

NOTE: TO DELETE A PARAMETER PLACE
THE WORD DELETE IN THE
PARAMETER SLOT.

CALCULATE (2/3)

INTERIM VALUES: / ____,

X SCALE INPUTS:

NOTES

PARAMETER NUM. _____,
MIN SCALE VALUE _____,
MAX SCALE VALUE _____,

- :
1. INPUT ONLY IF X PARM IS A TIME VALUE.
 2. APPLICABLE ONLY IF T NOT ENTERED
 3. APPLICABLE ONLY IF T NOT ENTERED

V41#

FLT/DT ___/

TLM UNIVERSAL PLOT (NOMINAL DATA) MENU

MSK 18 __,

SCALE (L/R/D/C) , L/R = ADD NOMINALS; D = DEL NOMINALS; C = CHG NOMINALS

NOTE: IF X PARAMETER IS A TIME, INPUT X POINTS IN MINUTES

DATA POINT PAIRS

NO	X VALUE	Y VALUE	NO	X VALUE	Y VALUE
01/	_____,	_____,	02	_____,	_____,
03	_____,	_____,	04	_____,	_____,
05	_____,	_____,	06	_____,	_____,
07	_____,	_____,	08	_____,	_____,
09	_____,	_____,	10	_____,	_____,
11	_____,	_____,	12	_____,	_____,
13	_____,	_____,	14	_____,	_____,
15	_____,	_____,			

OR: UP TO 6 COEFFICIENTS FOR 1ST TO 5TH DEGREE POLYNOMIAL.

COEFFICIENT A(0) / _____, COEFFICIENT A(1) _____,
COEFFICIENT A(2) _____, COEFFICIENT A(3) _____,
COEFFICIENT A(4) _____, COEFFICIENT A(5) _____/

Figure 4.7.2-2. Universal plot and nominal line change MED's

SOP 4.7.3

TITLE

SPECIAL COMPUTATION CONSTANT CHANGE

PURPOSE

To define the methods of changing special computation constants.

PARTICIPANTS

MCC FC TEAM

GENERAL

- A. Certain special computation constants can be changed via F/C MED input. Engineering units, time, and remote text are the only categories of computation constants which can be changed.
 - 1. Engineering units - use menu V20, TLM SPECIAL COMP CONSTANT CHANGE (EU) MENU (figure 4.7.3-1).
 - 2. Time - use menu V21, TLM SPECIAL COMP CONSTANT CHANGE (TIME) MENU.
 - 3. Remote text - use menu V23 - TLM SPECIAL COMP RTXT INPUT MENU.
- B. If desired, any special computation constant change can be designated as permanent via the PM MED option (see FCOH SOP 11.6).
- C. Changes can be made from a workstation using the MED emulator and displays can be viewed using EDTE.

PROCEDURES

- A. Constant change via F/C MED
 - 1. F/C use of MED terminals is governed by FCOH SOP 11.5.
 - 2. Call up the appropriate menu (V20, V21, or V23), fill in parameter numbers and corresponding new values (engineering units, time, or text), then execute.
- B. Constant Change Verification
 - 1. In some cases, the changed parameter value is directly shown on one of the F/C's MSK displays.
 - 2. MSK displays 2061-2067 contain the current value of all constants which can be changed via MED.
 - 3. The F/C may configure a UDD to display the changed parameter value (see FCOH SOP 4.7.2).

SOP 4.7.4

TITLE

PARAMETER OVERRIDE FORMS (DELETED)

SOP 4.7.5

TITLE

FEP TEMPORARY/PERMANENT CALIBRATION CHANGES

PURPOSE

To define the procedures for the MCC FCT using the Telemetry Services application for FEP calibration changes.

PARTICIPANTS

*DFE
MCC F/Cs
WSS

GENERAL

The Telemetry Services application is used to perform FEP parameter calibration updates to the engineering cycle or flight cycle. Information on Telemetry Services is available on the workstation through Master, Global Apps, EDP, and CCF. See Consolidated Communications Facility (CCF) Software User's Handbook (LOR-TR1742, July 1995), Volume III, TELCOM Position, section 3.6. The DFE is a super user and should be contacted on the DFE/NIP SUP loop should there be operational questions about Telemetry Services. As a super user, the DFE has the capability to modify any parameter. This can be done upon request if a problem is preventing a Flight Controller from accomplishing it (accompanying anomaly report (AR) required).

NOTE

A D/L R/T FEP must be allocated to the selected activity prior to using the telemetry services. For mission countdown the FEPS will be allocated from L-24 hours through launch.

PROCEDURES

- A. The F/C will determine which MSID(s) calibration(s) are to be changed and if the changes are to be temporary or permanent.
- B. To make a calibration change to an FEP parameter, perform the following steps:
 1. Select Master ! Global Apps ! Telemetry Services.
 2. Verify that DLRT Telemetry Services popup window appears.
 3. Click on appropriate icon (shuttle for OI/GPC and payload MDM parameters, shuttle with payload bay doors open for payload PDI parameters, station or independent vehicle for future use).
 4. Click on calibration change, then select alter parameter CAL coefficients or alter parameter CAL data points. The parameter pick list will pop up.

5. Enter MSID to be altered in selection box or scroll through the parameter pick list, then click on OK.
6. The Alter Parameter Calibration Coefficients window will appear. Click on the coefficient box you wish to change and enter the new coefficient in scientific notation (like the shuttle data tape (SDT) or in decimal. The coefficients are not case-sensitive. Example: 1.0000e+01 or 1.0000E+1 or 10.000 are all acceptable inputs. Repeat step 6 until all updates are completed.

OR

The Alter Parameter Calibration Data Points window will appear. Click on the respective raw value box and engineering unit box you wish to change and enter the new raw values and engineering units. Click on the horizontal or vertical scroll bars for additional data point raw value and engineering unit input boxes. Repeat step 6 until all updates are completed.

7. Select temporary or permanent for the type of change and click on OK.
8. To verify successful CAL update, check the advisory messages or go back to the DLRT Telemetry Services window and click on Calibration Change.
9. Select Parameter Calibration Report.
10. Select View Discipline CAL Report.
11. Select desired discipline from pick list and click on OK.
12. View report on screen or select print for a hard copy.
13. If changes are to be permanent, you must notify WSS at the end of the activity on the WSS loop so that they can incorporate the updates into the CM (AUSPEX) server so that future FEP downloads will contain the changes. WSS will need the flight number, activity, and the parameter type.
 - a. OI/GPC/Payload MDM
 - b. OI/GPC Data Point (GNC only)
 - c. Payload PDI
14. To exit Telemetry Services, click on the "-" in the upper left-hand corner of the DRLT Telemetry Services window.

SOP 4.8

TITLE

VARIABLE PARAMETER DOWNLIST USAGE

PURPOSE

To define the procedure for requesting usage of or change to the variable parameter downlist.

PARTICIPANTS

MCC FC TEAM

FD

* DPS

DPS SPT

GENERAL

- A. The capability exists to downlist up to 10 variable parameters (VP's) out of each of the PASS GNC, SM, or OPS 0/PL9 downlists. The capability also exists to downlist up to three variable parameters out of the BFS downlist. The contents of each of the 10 pass VP "slots," which are controlled by specifying the GPC memory address for the desired major function, are normally changed by DPS via uplink but may also be modified via inputs to the DPS UTILITY SPEC (major function dependent). Only parameters which reside in GPC memory sectors 0 and 1 (addresses 0000 through FFFF) may be downlisted via variable parameters capability. The contents of each BFS VP slot may be modified by ground uplink only (no crew update capability exists).
- B. It should be noted that multiple disciplines utilize the VP downlist capability to view GPC parameters. For these reasons, an MCC discipline should use discretion when requesting VP slots, particularly if an extended viewing period is required (generally, on-orbit "snapshots" of multiple parameters are readily accommodated).
- C. Although the downlisted VP's may be viewed via any ISP application - the prime application for viewing VP's by non-DPS disciplines is "VP scaling". This application permits GNC/SM/OPS 0/BFS variable parameters to be displayed in raw hexadecimal and in engineering units (EU's) (provided the requester provides DPS with sufficient scaling values to drive the special comp).
- D. Disciplines which request VP's real time during mission operations are responsible for properly filling out the Variable Parameter Display Request (VPDR) form and submitting that form to DPS for implementation. DPS will have optical disks and, if needed, can assist other disciplines needing to find the desired parameter information.

PROCEDURES

- A. F/C requiring use of a specific variable parameter in the downlist during a flight or simulation, fills out a VPDR (figure 4.8-1) electronically and submits it to DPS/DPS SPT via E-mail.

If a discipline is submitting a request for a future flight, the VPDR form is completed electronically and forwarded via E-mail to the DPS VP coordinator and also to the DPS Lead for that particular flight. If the electronic forms are not available, paper forms will be used as the backup. The form is available as a default template on the MCC PC's and should be filled out as follows:

1. ORIGINATOR/PHONE: Name and phone number of the person originating the request.
 2. DISCIPLINE: Console position requesting the variable parameter.
 3. GMT: The current GMT.
 4. DATE: Date of the request.
 5. MAJOR FUNCTION: Major function for the variable parameter.
 6. OPS: OPS for the VP (i.e., 011 2)
 7. COVERAGE: "Snapshot" if data required only long enough to see its value; "monitor" if data required for a length of time.
 8. RETENTION: How long the variable parameter request applies.
 9. SPECIFY COVERAGE: Specify the window of time during which the parameter is required. Reference specific events or GMT's.
 10. HAL NAME: The flight software variable name for the requested parameter(s).
 11. ADDRESS: The four-digit hexadecimal address for the requested parameter(s). Note that only addresses from 0000 - FFFF can be requested.
 12. VP SCALING: Scaling can be done but requires the following information:
 - a. K: The scaling constant, to be multiplied by the parameter value
 - b. BIAS: The scaling offset, to be added to the parameter value
 - c. TYPE: FXS for fixed-point values (integers), FLS for floating-point values
 13. RATIONALE: Reasons for requesting the variable parameter and/or special notes for the DPS/DPS SPT officer.
- B. If a conflict exists for use of variable parameter downlist between users, DPS will resolve the conflict.
- C. DPS/DPS SPT completes the VPDR form, including
1. SLOT: The slot number (1-10) assigned to the variable parameter
 2. TITLE: A title for the command load
 3. DSM: The next DSM number for uplink
 4. DPS APPROVAL: Name of the DPC personnel officer on the request.

DPS SPT returns one copy of the completed form to the originator of the request and sends one copy of the form to DPS.

VARIABLE PARAMETER DISPLAY REQUEST (Submit 3 copies to DPS SPT)					
REQUESTING DISCIPLINE:		NAME:		GMT:	
MAJOR FUNCTION/OPS: <input type="checkbox"/> GNC 1 <input type="checkbox"/> GNC 8 <input type="checkbox"/> SM 2 <input type="checkbox"/> BFS <input type="checkbox"/> GNC 2 <input type="checkbox"/> GNC 9 <input type="checkbox"/> SM 4 <input type="checkbox"/> GNC 3		COVERAGE: <input type="checkbox"/> SNAPSHOT(s) OF DATA <input type="checkbox"/> MONITOR FOR A SPAN OF TIME		RETENTION: <input type="checkbox"/> CURRENT FLIGHT/SIM ONLY <input type="checkbox"/> ALL FLIGHT/SIMS	
SPECIFY COVERAGE: (Reference specific events or GMT's)					
FROM:			TO:		
HAL NAME	ADDRESS	MSK 1352 (1)			SLOT (3)
		K	BIAS	TYPE (2)	
RATIONALE:					
TITLE: (3)				DSM: (3)	
				230 — —	
NOTES: (1) Optional Fields - required for viewing on MSK 1352. (2) Type is FXS (fixed-point) or FLS (floating-point) (3) DPS usage only			DPS SIGNATURE: (3)		

Figure 4.8-1. VPDR form

VARIABLE PARAMETER DISPLAY							
File	View						Help
OGMT	105/20:11:58	OMET 007/14:42:58	GN 22	SM 24	OI 184		
Raw VP's		Conversion	VP Slot			Engineering	
SM	Nomenclature	Type	Inputs	K(A1)	BIAS(A0)	Units	
1 8F2D	test1	signed	0:0:8:1	-1.0000E+00	-2.0000E+00	-8.0115E+08	
2 2000	test1 sm1	signed	0:0:8:0	-2.0000E+00	0.0000E+00	-1.6022E+09	
3 1000	test for sm 3	signed	0:0:1:5	-1.0000E+00	0.0000E+00	2.5461E+08	
4 8000	test for sm4	unsigned	0:0:2:1	1.0000E+00	2.0000E+00	5.3691E+08	
5 0898	test1 for sm5	signed	0:0:1:5	-1.0000E+00	0.0000E+00	2.5461E+08	
6 0000	test1 for sm6	32 bit f	5:1:0:0	-1.0000E+00	0.0000E+00	-2.2104E-68	
7 0009	test1 fo sm7	32 bit f	8:5:0:0	-1.1000E+01	0.0000E+00	-2.7957E-20	
8 2FC0	test1 for sm8	64 bit f	8:1:5:2	-1.0000E+01	0.0000E+00	-2.5485E-20	
9 0000	test2 for sm9	64 bit f	8:1:5:2	-1.1000E+01	0.0000E+00	-2.8034E-20	
10 7C00	test2 for sm10	32 bit f	8:1:0:0	-1.2000E+01	0.0000E+00	-3.0582E-20	

j.12805.068

Figure 4.8-2. Variable parameters

- D. DPS SPT builds the command load for uplink and makes necessary inputs for the variable parameters application.
- E. DPS, DPS SPT, and Requester verify the load in the generic Command Server.
- F. DPS, FD, and INCO provide necessary coordination to uplink.

INFORMATION

The variable parameters application (VP Scaling) displays the variable parameters for each GPC downlist (GNC, SM, OPS 0, and BFS. The application displays the VP's for only a single downlist at a time based on user input to the View menu. The application also displays engineering units (EU) for VP's based on inputs to various other fields displayed. Input to the fields which control the EU calculations is controlled exclusively by DPS. Each field is described below.

- A. Nomenclature: Some descriptive text indicating the parameter in this slot. This is often set to an address or requesting discipline name.
- B. Conversion Type: Indicates the type of conversion being done on the VP slots to arrive at an EU. Valid conversion types are, "signed" (signed integer), "unsigned" (unsigned integer), "32 bit f" (32-bit IBM floating point) and "64 bit f" (64-bit IBM floating point).
- C. Inputs: Lists, in order from most significant bit to least significant bit, the VP slots being used as inputs for the EU calculation.
- D. K(A₁): The A₁ value for the EU calculation.
- E. BIAS(A₀): The A₀ value for the EU calculation.
- F. Engineering Units: The calculated EU, $EU = K * VP + BIAS$.

SOP 4.9

TITLE

DUMP DATA HANDLING DUAL FLIGHT LIMITATIONS (DELETED)

SOP 4.10

TITLE

SPACELAB MEMORY DUMP

PURPOSE

To define the coordination necessary to generate and process Spacelab ECOS, SCOS, and Mass Memory Dumps.

PARTICIPANTS

FD	HOSC
*DPS	PAYLOADS
CDMS SUPPORT	MCC Flight Controllers
INCO	

GENERAL

Memory dumps are initiated in order to diagnose or correct an anomaly in the experiment or subsystem data processing operation. Dumps may be initiated by the flight crew through SCOS or by the MCC by uplink to SCOS or ECOS. The POCC initiates and processes Experiment Computer Memory dumps as required independent of this procedure. The HOSC can retrieve dumps from telemetry and will analyze some dumps.

PROCEDURES

- A. If an MCC F/C requires an ECOS, SCOS or MMU dump, that operator will request, via flight note, that DPS coordinate the dump. The flight note will include start address in hexadecimal, number of words in decimal, and a brief statement of the need for the dump.
- B. CDMS SUPPORT will generate the load to initiate the dump.
- C. If the dump is from ECOS, DPS will request that PAYLOADS identify a time when the ECOS variable buffer is available.
- D. When FD approves, INCO will uplink the load.
- E. CDMS SUPPORT will retrieve the dumped information either real time, via the MOC (up to 512 addresses), or via ODRC (longer dumps) and provide this information to the requester.
- F. If a dump requires analysis by the HOSC, as would be the case of a computer failure or anomalous function, the requester (usually CDMS) will submit a MAR requesting that HOSC analyze the dump.

- G. The order of priority for HOSC acquisition of the dumped data is as follows:
1. HOSC acquisition of real-time dump.
 2. HOSC acquisition of a second dump initiated by MCC if crew-requested dump occurred during LOS.
 3. HOSC acquisition of dump from HDRR dump if crew-requested dump occurred during LOS and a second dump of the data is impossible (data is overwritten or dump is prevented by system failures).
 4. MCC acquisition of dump from orbiter ops recorder dump if crew-requested dump occurred during LOS and a second dump of data is impossible. MCC will transmit the dumped data to HOSC by Rapifax.
- H. If the HOSC requires that a dump be made for analysis of an STS system anomaly, the request shall be submitted to the MCC as a MAR. For experiment computer dumps required for analysis of experiment anomalies, the HOSC will normally request that the POCC initiate the dump.

SOP 4.11

TITLE

DATA DRIVER LOGGING AND DELOGGING (DELETED)

SOP 4.12

TITLE

PDI PRIME OCCURRENCE COMMAND (DELETED)

SOP 4.13

TITLE

SUBCOM FORMAT COMMAND (DELETED)

**SOP 5
TRACKING/TRAJECTORY**

SOP 5.1

TITLE

EPHEMERIS COORDINATION

PURPOSE

To define the coordination required for ephemeris status, maneuver vectors, and intercenter vectors.

PARTICIPANTS

* FDO
* TRACK
GC
GSFC/FLIGHT DYNAMICS FACILITY (FDF)
DYNAMICS
NAV

PROCEDURES

A. Ephemeris Status

1. FDF/COMM personnel will coordinate ephemeris status with TRACK on the ODF loop. This coordination is accomplished by GODDARD FDF or NETWORK ANALYST using the call sign FDF COMM.
2. If TRACK cannot provide the required information without further coordination with FDO on the TRAJ COORD loop, he may ask FDO NAV to contact FDF COMM directly on the ODF loop.

B. Maneuver Vectors

1. Maneuver vectors may be transmitted to the FDF COMM or other external organizations either automatically or upon request when a valid maneuver has been inserted into the Mission Plan Table (MPT). In the automated mode, intercenter vectors are transmitted automatically on an hourly basis. If a maneuver in the MPT is scheduled to begin within 0 to 120 minutes into the future of the current hourly automatic intercenter vector queue, both maneuver initiate (MVI) and maneuver end (MVE) vectors, plus intermediate vectors, are transmitted automatically with the intercenter vector. In the user request mode, maneuver vectors may be transmitted at FDO's direction anytime a maneuver has been inserted into the MPT. FDO contacts TRACK on the TRAJ COORD loop to indicate the desired mode for MVI and MVE transmission.
2. GODDARD FDF or other recipients may direct questions regarding the maneuver vectors to TRACK on the ODF loop.

3. TRACK advises FDF COMM of unscheduled maneuvers as soon as possible on the GSFC/OSCF loop. FDO coordinates with TRACK on the TRAJ COORD loop for transmission of the unscheduled MVI and MVE vectors.

C. Intercenter Vectors

1. Organizations external to JSC requiring intercenter vectors may contact GODDARD FDF directly, or they may contact the TRACK position at JSC. The following loops may be used for such requests.

Call sign

Loop

FDF COMM

ODF

TRACK

ODF/MCC COORD/TRACK COORD or
LLTDS COORD

2. TRACK notifies FDO of intercenter vector request on the TRAJ COORD loop. FDO specifies to TRACK the appropriate ephemeris for the vector fetch.

NOTE

TRACK is responsible for assigning the destination code and transmitting intercenter vectors.

D. Entry Ephemeris Vectors

1. At deorbit burn minus 1 hour, FDO confirms to TRACK that entry ephemeris is good.
2. TRACK advises FDF COMM on the ODF loop that entry ephemeris transmission is about to begin and FDF COMM confirms the number of vectors received. TRACK compares this number with the number of transmitted vectors to ensure none are lost in transmission.

SOP 5.2

TITLE

POSTPASS PLAYBACK OF TRACKING DATA

PURPOSE

To define a procedure for accomplishing postpass playback of tracking data from a remote site or TDRS.

PARTICIPANTS

* NAV
* TRACK
DOD TRACK
REMOTE SITE
WSC
GC

GENERAL

Postpass playback of C-band or S-band tracking data from GSTDN or DOD sites or WSC can be provided on request. This support will not be a planned function, but may be requested for the following reasons.

- A. Site or WSC unable to send tracking data to MCC in real time due to line failure, etc.
- B. Postpass tracking data playback required for network certification purpose or real-time data hits.

PROCEDURES

- A. When required, NAV requests TRACK (on TRAJ COORD loop) to coordinate postpass tracking data playback from the appropriate remote site(s) or WSC. If a site has been released, GC coordinates site recall (reference FCOH SOP 9.1). TDRS playbacks from WSC will be scheduled with GSFC for periods of TDRS LOS.
- B. TRACK coordinates the playback with the remote site or WSC.
- C. TRACK informs NAV at beginning of playback and at playback termination.
- D. When NAV and TRACK are satisfied with the playback or need additional playback, TRACK notifies the remote site, DOD TRACK, or WSC.
- E. TRACK advises GC when the playback is complete.

SOP 5.3

TITLE

MANEUVER PAD POLICY

PURPOSE

To provide consistent translational maneuver PAD procedures.

PARTICIPANTS

FD
CAPCOM
* FDO
GUIDANCE
RENDEZVOUS
PROP
GNC
PAYLOADS
FAO
MCC FC TEAM

PROCEDURE

A. Noncritical translational maneuvers

1. Based on mission-specific requirements, FDO will prepare a maneuver PAD. The PAD itself can be either handwritten or electronically distributed. If handwritten, copies will be made available to FD, CAPCOM, PROP, GNC, FAO, RENDEZVOUS, and PAYLOADS. The format of the PAD will be as illustrated in figure 5.3-1. All data must be completed. If an area of the PAD is not applicable, "N/A" will be written over that part. Information for the "notes" section requires inputs from other disciplines including PROP, GNC, and POINTING.
2. FDO will prepare a PEG7 command load to supplement the maneuver PAD and will have this command available at the time the PAD's are distributed.
3. At approximately TIG - 20 minutes, CAPCOM will relay information from the PAD to the crew. This readup will primarily consist of data that are not uplinked or electronically verifiable from the ground. Items to read to the crew consist of maneuver thruster selection, orbiter weight, TIG, and any notes (standard or free-form text). All other data (OMS engine trims, targets, burn attitude, TGO, VGO's, Ha, and Hp) are not required unless communication with the crew is anticipated to be unavailable or suspect at or near the time of the burn. In that case, the entire PAD should be read to the crew.
4. When the burn targets are loaded, FDO will verify that a good solution has been obtained by onboard guidance and will inform FD of its acceptability. CAPCOM will then inform the crew that the burn solution has been verified correct.

B. Maneuvers requiring preliminary PAD's.

1. For missions requiring a rendezvous or other such complex sequence of translational maneuvers, complete maneuver PAD's) will be made available to the crew in that day's execute package. These PAD's will henceforth be called "preliminary" PAD's and labeled as such. Their purpose is to allow the crew to execute the maneuver in the event that communication is lost prior to the burn and the final PAD cannot be uplinked. This protection is required to assure mission success. There are many instances for which a missed rendezvous burn will destroy any chance of a rendezvous for that day. For a no comm case, performing a burn based on the preliminary PAD with a trajectory recovery on subsequent burns is preferred to no burn at all.
2. At approximately TIG-20 minutes, updates to the preliminary PAD will be provided by FDO to FD, CAPCOM, PROP, GNC, FAO, RENDEZVOUS, and PAYLOADS. These updates can be in the form of a complete PAD or deltas to the preliminary PAD.
3. A PEG7 command load will be made available at the time the PAD's are distributed. All updates to the preliminary PAD will be read to the crew.
4. For the rendezvous Ti-Delay maneuver, only the left side (engine selection, OMS engine trims, orbiter weight, TIG, and targets) of the PAD in figure 5.3-1 is completed. All other data are N/A. All data are then read to the crew, since these targets are not included in the preliminary PAD's, and communication in that timeframe has proven to be unstable.

C. Deorbit burns

1. At approximately TIG - 2 hours and 20 minutes, FDO will make available a deorbit maneuver PAD. The PAD itself can be either handwritten or electronically distributed. If handwritten, copies will be made available to FD, CAPCOM, GUIDANCE, PROP, GNC, and FAO. The format of the PAD will be as illustrated in figure 5.3-2. All data must be completed. If an area of the PAD is not applicable, "N/A" will be written over that part.
2. GUIDANCE will prepare a PEG4 command load to supplement the maneuver PAD and will have this command available at the time the PAD's are distributed.
3. CAPCOM will read information from the PAD to the crew. This readup will consist only of data that are not uplinked or electronically verifiable from the ground. Items to read to the crew consist of TIG (if different than previously read to the crew), TGO, and any notes (standard or free-form text). All other data are not required unless communication with the crew is anticipated to be unavailable at or near the time of the burn. In that case, the entire PAD should be read to the crew.
4. When the burn targets are loaded, FDO/GUIDANCE will verify that a good solution has been obtained by onboard guidance and will inform FD of its acceptability. CAPCOM will inform the crew that the solution has been verified correct.

ORBITAL MNVR PAD FOR _____

OMS BOTH 1

L 2

R 3

RCS SEL 4 +X

-X

MULTI-AXIS

TV ROLL 5

TRIM LOAD

P 6

LY 7

RY 8

WT 9

TIG 10 /

TGT PEG 7

$\Delta\zeta E$ 19

$\Delta\zeta \Psi$ 20

$\Delta\zeta Z$ 21

BURN ATT

R 24

P 25

Y 26

DVTOT

TGO

VGO X ()

VGO Y ()

VGO Z ()

TGT HA

() HP

OMS GMBLE CK:

	PRE	POST-BURN
L PRI	<input type="checkbox"/>	<input type="checkbox"/>
L SEC	<input type="checkbox"/>	<input type="checkbox"/>
R PRI	<input type="checkbox"/>	<input type="checkbox"/>
R SEC	<input type="checkbox"/>	<input type="checkbox"/>

NOTES

RCS I'CONNECT:

LOMS!RCS

ROMS!RCS

NONE

DOWNMODE OPTIONS:

2 OMS!1 OMS!RCS

2 OMS!1 OMS

1 OMS!RCS

NONE

OMS HE REG TEST:

L, R OMS HE P/VAP ISOL

GPC OP CL

A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

-X RCS BURNS

	BURN ATT	LVLH ATT
P 15	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	R <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Y 16	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	P <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
OM 17	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Y <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Figure 5.3-1. Orbital maneuver pad

DEORBIT MNVR PAD

<p>OMS BOTH 1 <input type="checkbox"/></p> <p style="padding-left: 20px;">L 2 <input type="checkbox"/></p> <p style="padding-left: 20px;">R 3 <input type="checkbox"/></p> <p>RCS SEL 4 <input type="checkbox"/></p> <p>TV ROLL 5 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>TRIM LOAD</p> <p>P 6 <input type="checkbox"/> () <input type="checkbox"/> ● <input type="checkbox"/></p> <p>LY 7 <input type="checkbox"/> () <input type="checkbox"/> ● <input type="checkbox"/></p> <p>RY 8 <input type="checkbox"/> () <input type="checkbox"/> ● <input type="checkbox"/></p> <p>WT 9 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>TIG 10 <input type="checkbox"/><input type="checkbox"/> / <input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/></p> <p>TGT PEG 4</p> <p>C1 14 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>C2 15 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>HT 16 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>FT 17 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>PRPLT 18 <input type="checkbox"/> () <input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p style="padding-left: 20px;"><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p style="padding-left: 20px;"><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p style="padding-left: 20px;"><input type="checkbox"/> () <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p>	<p>BURN ATT</p> <p>R 24 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>P 25 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>Y 26 <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>REI <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p> <p>TXX <input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></p>	<p>DVTOT <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/></p> <p>TGO <input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/></p> <p>VGO X () <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/></p> <p>VGO Y () <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/></p> <p>VGO Z () <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> ● <input type="checkbox"/><input type="checkbox"/></p> <p>TGT <input type="checkbox"/><input type="checkbox"/> HA <input type="checkbox"/><input type="checkbox"/> HP <input type="checkbox"/><input type="checkbox"/></p>
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NOTES

RCS I'NECT:

LOMS!RCS

LOMS!RCS

NONE

Figure 5.3-2. Deorbit maneuver pad

**SOP 6
COMMUNICATIONS**

SOP 6.1

TITLE

VOICE TAPE COPIES (DELETED)

SOP 6.2

TITLE

SLEEP PERIOD CONFIGURATION FOR A/G VOICE (DELETED)

SOP 6.3

TITLE

PRIVATE A/G COMMUNICATIONS WITH PRIVATE TELEVISION OPTION

PURPOSE

To define the coordination and procedures required to establish A/G voice system and/or downlink video configuration for a private medical conference (PMC), private family conference (PFC), private medical video conference (PMVC), or private family video conference (PFVC).

PARTICIPANTS

FD	BME
GC	HOUSTON VOICE
SURGEON	CCRF
*CAPCOM	NCC OPS
* COMM TECH	NCC TV
CHIEF, FLIGHT MEDICINE	WSC OPS
VOICE RECORDERS	WSC TV
DATA RECORDERS	CSTC
	STATION COMM TECH
	HOUSTON TV

GENERAL

- A. This procedure outlines a method for establishment of PVT A/G communications between Flight Crew and Surgeon. The shuttle avionics system mixes A/G voice with digital data. Therefore, use of this procedure requires special handling of digital PMC/PFC tapes recorded at the groundsite of the TDRSS, the RTS, and the GN networks having the capability to monitor/record the uplink/downlink A/G voice.
- B. Private television will be provided to the BIOMED personnel in building 30-S, room 3304. The configuration for PMC/PFC television will authorize only the decoder routed to the medical support room (BIOMED MPSR) to be used (if private television is requested). The BIOMED personnel will be the only ones to have video recording capabilities during these PMVC's/PFVC's.
- C. Under no circumstances will PMC/PFC tapes be reproduced or replayed without prior authorization from the Chief, Flight Medicine, Surgeon, or Flight Director on duty. All requests will be submitted by MDRF and only authorized names, submitted to HOUSTON VOICE preflight, will have signature authority for MDRF request.
- D. The A/G-1 voice channel is prime for PMC/PFC A/G communications; however, the A/G-2 voice channel may be used if required.
- E. The PMC/PFC A/G circuit terminates on keysets 4819, 4820, and 4822 on the BIOMED consoles BIOMED-0 and BIOMED-1 in room 3304. Room access is controlled by the SURGEON.

THROUGHPUT PROCEDURES (TDRSS/RTS/GN)

A. Notification

1. FD, FAO, and SURGEON determine the time to be reserved for the PMC/PFC/PMVC/PFVC.
2. FD informs INCO and GC of the PMC/PFC/PMVC/PFVC time.
3. GC informs COMM TECH, Houston TV, and NCC OPS of the PMC/PFC/PMVC/PFVC time.
4. COMM TECH informs CCRF and the appropriate network personnel. Network contacts for the COMM TECH and Houston TV are as follows:

TDRSS - NCC OPS, WSC OPS, WSC TV, NCC TV
RTS - SUNNYVALE DATA
GN - STATION COMM TECH

B. External configuration

1. At least 10 minutes prior to conducting a PMVC or PFVC, Houston COMM TECH will request NCC OPS and WSC OPS on the TN COORD to configure the network for a private video conference. Houston TV will request WSC TV to configure for PMVC/PFVC on TV conference.
2. Five minutes prior to the PMC/PFC/PMVC/PFVC, network personnel will inhibit any monitoring or analog recording of A/G voice and remove voice patches made at the DMS for external distribution. If a PMVC/PFVC is requested, WSC OPS will turn off K-band channel number 3 TV monitor and will inhibit voice and video recording during PMVC/PFVC.
3. Within 5 minutes of the scheduled PMC/PFC/PMVC/PFVC, GC will obtain positive response from NCC OPS, and COMM TECH/Houston TV will obtain a positive response from all other appropriate personnel confirming that the above actions have been completed.
4. For a PMVC/PFVC, WSC TV will inhibit all decoder capabilities except the BIOMED MPSR. Houston TV will confirm with all television centers that their decoders are disabled.

C. Internal configuration

1. Approximately 30 minutes before the private communication, BME will alert COMM TECH and TV of pending private communication (with audio only or audio plus video). If PMC/PFC is audio only, BME will check with COMM TECH

- on private A/G circuit. If PMC/PFC is audio plus video (PMVC/PFVC), Houston TV will confirm with BME that TV is present.
2. Just before the private communication, COMM TECH will contact INCO to confirm that the onboard recorders are configured for data only.
 3. BME will notify COMM TECH of the SURGEON's arrival in the BIOMED MPSR.
 4. COMM TECH will inform GC that the network is configured for a PMC/PFC/PMVC/PFVC after completion of steps B.2 and C.2. Houston TV will inform GC that the network is configured.
 5. GC will notify FD that the network is configured, and on a "go" from FD, will direct COMM TECH to configure for the private communication. COMM TECH will press the appropriate PVT A/G switch. The PVT A/G switch connects the PVT A/G voice loop to the air-ground voice system and inhibits the monitor and talk capability of the normal A/G voice loops.

NOTE

The COMM TECH will take immediate action to ensure that private communication information is not released as a result of mechanical failure or equipment misconfiguration.

D. PMC/PFC/PMVC/PFVC

1. SURGEON will monitor the COMM TECH loop for "go for voice" announcement and will then begin the conference.
2. When two-way voice is established, COMM TECH will deselect COMM TECH monitor capability of the PVT A/G. COMM TECH will monitor the audio signal with the Vu-meter, O-scope, and COMM MANAGEMENT display.
3. If loss of uplink or downlink capability is experienced, COMM TECH will access the PVT A/G to announce loss of signal or a "go for voice" when capability is restored.
4. If loss of TV signal is experienced, BME will access Houston TV on their loop to inform of anomaly.

E. Termination of PMC/PFC/PMVC/PFVC

1. SURGEON/BME advises COMM TECH, Houston TV, and FD that the PMC/PFC/PMVC/PFVC is completed.
2. COMM TECH advises CAPCOM and GC when the A/G voice capability is reenabled.
3. GC advises FD that the A/G voice system is reconfigured for NORMAL operations.
4. INCO advises FD that onboard telemetry/voice recording has resumed.

5. COMM TECH advises appropriate network personnel and CCRF to reconfigure for normal A/G and television and to initiate the tape-handling procedures documented in NOSP 601/STS, section 11, and NOSP 602/NSTS, section 9.
6. Houston TV advises WDC TV to reconfigure for normal television operations. Houston TV will confirm with the network that normal TV has been reestablished and will report to GC when completed. GC advises FD when TV is reconfigured.

NOTE

Digital data tapes containing a PMC may be played back to recover data segments, but the playbacks will not be configured to the air-to-ground voice system. Authorization as outlined under GENERAL, paragraph C, must be followed.

- F. PMC-to-offsite-location procedure
1. This procedure will be used only when a flight crew requests a PMC and the SURGEON cannot get to the MCC in time to support the schedule.
 2. BME will call the SURGEON with instructions to call HOUSTON VOICE on 244-6088.
 3. BME will notify COMM TECH on the HOU COMM TECH CONF or 483-3291 of the pending PMC.
 4. COMM TECH will direct the appropriate network personnel to configure for a PMC and will obtain a positive response from them confirming that actions required by paragraphs B.1, C.2, and C.3 have been taken.
 5. SURGEON will call HOUSTON VOICE. After verifying good communications with the SURGEON, HOUSTON VOICE will extend the external line to the PVT A/G remote and will notify COMM TECH.
 6. HOUSTON VOICE will not monitor the call unless instructed to do so by COMM TECH.
 7. COMM TECH will notify GC that the SURGEON is ready for the PMC.
 8. GC will notify FD and, on a GO from FD, will direct COMM TECH to configure the PVT A/G.
 9. COMM TECH will configure the PVT A/G and will enable the PVT PTT key.
 10. COMM TECH will announce a "go for voice" on the PVT A/G.
 11. After two-way voice is established, COMM TECH will take those actions required by paragraphs D.2 and D.3.
 12. On completion of the PMC, COMM TECH will reestablish normal A/G configuration and will notify CAPCOM, GC, and HOUSTON VOICE.
 13. GC will notify FD that A/G has been reestablished.
 14. COMM TECH notifies the network per paragraph E.5.

SOP 6.4

TITLE

CAPCOM TELEPHONE COMMUNICATIONS

PURPOSE

To define the methods used for restoration of air-to-ground (A/G) voice communications in case of DVIS failure.

PARTICIPANTS

*CAPCOM
GC
*COMM TECH
FD
ACR (Building 2) (Audio Control Room)
HOUSTON VOICE

GENERAL

This procedure outlines a method for establishment of the A/G voice communications in case of DVIS failure. This SOP contains contingency patching procedures to restore the A/G voice.

The A/G-1 voice channel is prime for voice communications; however, the A/G-2 voice channel can be used.

Implementation of this procedure terminates A/G voice capability on all DVIS keysets.

A. Notification

1. FD, GC, and CAPCOM determine the need for communications to the orbiter via telephone.
2. FD informs GC of the configuration requirement, including the desired A/G channel.
3. GC informs COMM TECH to take appropriate action for telephone patch.

B. External Configuration

1. COMM TECH will advise ACR in building 2 of incoming telephone call.
2. CAPCOM will call ACR at extension 35270 or 38678.

C. Internal Configuration

1. GC will coordinate with COMM TECH for configuring A/G voice via telephone.
2. COMM TECH will initiate appropriate patching.
3. Refer to MOH, vol. III, for specific patching requirements.

4. Upon recovery of the DVIS equipment after a go from FD, COMM TECH will reconfigure to normal operations. This should ensure that critical voice traffic is not interrupted.

SOP 6.5

TITLE

DIGITAL VOICE INTERCOM SYSTEM (DVIS) MODIFIED COLD START

PURPOSE

To define the method for recovering from DUAL DVIS CPU failure.

PARTICIPANTS

GC
*HOUSTON VOICE
*COMM TECH
ALL DVIS KEYSSET USERS

GENERAL

- A. This procedure outlines a method for DVIS to recognize all active keyset users after a DUAL CPU failure.
- B. HOUSTON VOICE will manage the reconfiguration process and notify GC when DVIS is available for all keyset users to re-sign on their keyset.
- C. Notification
 1. HOUSTON VOICE and COMM TECH are responsible for reloading all connectivity into DVIS.
 2. GC and HOUSTON VOICE will coordinate with all Flight Control Team (FCT), Operations Support Team (OST), and FSM positions to re-sign on each discipline's keysets in an orderly manner on a room by room basis.
 3. FSM will coordinate with all M & O keyset positions to sign their keysets on.
 4. HOUSTON VOICE will coordinate with all Shuttle Mission Simulator (SMS) bldg. 2 audio control room (ACR), and all remaining keyset positions to re-sign on to DVIS.
 5. At a convenient opportunity, a fanout failover should be initiated to identify all keyset positions not recognized by the DVIS CPU. This will enable HOUSTON VOICE to identify and sign off any remaining unused keyset positions.
 6. HOUSTON VOICE will report back to GC upon completion of modified cold start.

SOP 6.6

TITLE

VOICE PLAYBACK (DELETED)

SOP 6.7

TITLE

KSC VOICE COMMUNICATIONS CONTROL (DELETED)

SOP 6.8

TITLE

PABX INTERCEPT

PURPOSE

To define the interface necessary to inhibit incoming PABX calls during high activity periods.

PARTICIPANTS

MCC F/C's
*HOUSTON VOICE
GC

PROCEDURES

- A. PABX intercept function provides the capability to intercept all incoming calls to any console PABX without disabling outgoing calls or console-to-console calls. This capability is available for all telephones which have numbers in the 483-56XX and 244-60XX groups which are normally assigned to console PABX's. When operations or maintenance schedules are such that incoming calls are not desired, the PABX intercept operator (HOUSTON VOICE) will dial in the correct code for that individual extension, and the incoming calls for that number are terminated at the intercept telephone. The intercept operator will advise the calling party that the called party is not available or cannot be interrupted.
- B. To place a PABX on intercept:
 1. Call HOUSTON VOICE on the VOICE CONTROL loop or extension 35656.
 2. Request intercept capability for the PABX by extension number.
- C. To release a PABX from intercept:
 1. Call HOUSTON VOICE on the VOICE CONTROL loop or extension 35656.
 2. Request that the intercept capability be terminated for the PABX. Identify by extension number.
- D. All intercepts will be verified by HOUSTON VOICE at the end of the shift (7 a.m., 3 p.m., and 11 p.m.). If intercept capability is no longer required, the F/C should notify GC, who will in turn notify HOUSTON VOICE.
- E. It should be noted that although a PABX is on intercept, if a caller identifies the call as an emergency or as mission-critical, the call will be throughput to the console.
- F. FCR F/C's who share a PABX with their MPSR can instruct the MPSR to answer and filter all incoming calls as an alternate method of PABX intercept.

SOP 6.9

TITLE

VOICE COMMUNICATIONS STANDARDS

PURPOSE

To provide standardization in voice communication phraseology.

PARTICIPANTS

MCC F/C'S

PROCEDURES

- A. Effective communications are directly dependent upon an understanding of network phraseology and the strict adherence to established procedures, which by their nature ensure system discipline. During flight time, voice transmission via A/G circuits will be restricted to that necessary for the application of flight control procedures contributing to the safety of space flight and the success of the mission.
- B. The following procedures have been developed to ensure effective standardized voice communications.
 - 1. Letter and Numbers

It is most important to use the accepted phonetic alphabet for letters and digits for all numbers. Through worldwide acceptance, certain abbreviations may be given by letter only without using the phonetic alphabet. Examples of these are PCM (Pea-See-Em), GMT, IUS, SRB, OI, ET, VHF, UHF, RF, and JSC. Common usage of certain number sets allow unambiguous use of word groupings rather than digits. Examples of these are: Three Seventy," Seven Forty Seven," Building Thirty," and Six Forty Two B."

NOTE

Fifty microvolts" can be misunderstood for fifteen microvolts," but five zero microvolts" is unambiguous. Test B" can be misunderstood for Test D," but Test Bravo" is unambiguous.

When transmitting times in GMT, care must be exercised in the use of the letter Z since the phonetic pronunciation (Zulu") could be mistaken for Two Two." The following example will prevent any ambiguity: Lift-off occurred at one six hours, four zero minutes, zero zero seconds GMT."

a. Phonetic Alphabet

When use of the phonetic letter equivalent is required due to poor receiving conditions or for other reasons, the phonetic alphabet, as given below, will be used.

A - Alpha	H - Hotel	O - Oscar	V - Victor
B - Bravo	I - India	P - Papa	W - Whiskey
C - Charlie	J - Juliet	Q - Quebec	X - X-ray
D - Delta	K - Kilo	R - Romeo	Y - Yankee
E - Echo	L - Lima	S - Sierra	Z - Zulu
F - Foxtrot	M - Mike	T - Tango	
G - Golf	N - November	U - Uniform	

b. Numerals

Numerals will be pronounced as:

1 - Wun	4 - Fower	8 - Ate
2 - Two	5 - Fi-yiv	9 - Niner
3 - Tha-ree	6 - Six	0 - Zero
	7 - Seven	

EXAMPLES

- (1) 15 is pronounced as one five.
- (2) 150 is pronounced as one five zero.
- (3) 1500 is pronounced as one five zero zero.
- (4) 15000 is pronounced as one five zero zero zero.
- (5) 1.5 is pronounced as one point five.
- (6) 0.015 is pronounced as zero point zero one five.

2. Procedure Words

The following procedure words (prowords) and their meanings have been established:

Proword	Meaning
Affirmative	Yes.
All after	I refer to all the transmission following XXX. For example: GC GOLDSTONE, say again all after XXX."
Break break	I wish to interrupt a transmission in progress.

NOTE

This proword is not used except to interrupt with urgent traffic.

Copy Understand.

Disregard Cancel my transmission in progress, or cancel my last transmission. For example: Disregard my last transmission."
Figure Numerals are to follow.

NOTE

This proword need not be used in requesting or giving parameter readouts, or when transmitting times.

I spell I will spell the following phonetically. For example: ACCU, I spell, Alpha Charlie Charlie Uniform ACCU."

Negative No.

On my mark An event is to take place. A countdown will be at 1-second intervals. The countdown may start with 10, 5, or 2, but the count should be at 1-second intervals toward zero and should end 1 second after "one" with the word "Mark."

Read back Repeat all, or the specified portion of my last transmission. For example: MADRID, COMMAND. Carrier-on time, zero four two one five six. Read back all after time." COMMAND, MADRID. I read back, zero four two one five six."

Roger I have received your transmission.

NOTE

Never say Roger when you mean Affirmative or Negative.

Say again Repeat all, or the following portion of your last transmission. For example: Say again all after XXX," or Say again word after XXX."

Speak slower You are talking too fast.

Standby I must pause for a few seconds.

NOTE

Since "Standby" requires that the called party ignore his other calls and wait for your transmission, this would only be used if the waiting time is going to be less than the time it would take to break communications and reestablish them. "Roger, I will call you back" should be used if the waiting time is longer than this.

Unknown station or station calling I do not know the identity of the station calling me. For example: Unknown station, HOUSTON, say again," or Station

calling HOUSTON, say again."

Wilco I have received your message; I understand it, and will comply.
For example: COMMAND, MADRID, Wilco."

NOTE

Roger" is never used with Wilco."

Word after I refer to the word after XXX. For example: GOLDSTONE,
COMMAND, say again word after XXX"; COMMAND,
GOLDSTONE, I say again XXX."

Word before I refer to the word before XXX.

Words twice Communications are difficult. Transmit, or I will transmit, each
word, or group, twice.

3. Standard Voice Checks

When testing voice circuits, a standard short count (1, 2, 3, 4, 5, 5, 4, 3, 2, 1) should be spoken directly into the microphone at normal voice level. Voice checks provide the means to ensure that the circuit is operating, to check the intelligibility and quality of the speech on the circuit, and to verify that the speech is clearly understood and is of normal tonal quality for the type of circuit under test. The degree signal strength and readability of the transmission are expressed in the following terms or combinations.

Signal Strength

Readability

Loud

Clear

Good

With distortion

Weak

With background noise

Barely audible

With fading but readable

Unreadable

SOP 6.10

TITLE

TDRS/GN HANDOVERS

PURPOSE

To define the procedure for conducting a support handover from TDRS to GN and vice versa.

PARTICIPANTS

GC
TRACK
COMM TECH
COMM CONTROL
*INCO
COMM SUPPORT
*COMMAND

GENERAL

Whenever a GN station and the TDRS have a line of sight with the SSO, a potential for handing over Command, Telemetry, Air-to-Ground Comm, and Tracking support will exist.

PROCEDURES

A. Scheduled Handovers

1. Two minutes prior to a scheduled handover, COMMAND will notify GC, COMM TECH, TRACK, and COMM CONTROL of upcoming handover.
2. When a scheduled handover time is to be changed, COMM SUPPORT contacts COMMAND and updates the handover as required.

B. Real-Time (RT) (Unscheduled) Handover

If a required handover is unscheduled

INCO advises COMMAND of the support handover requirements and the time of the handover. COMMAND will advise GC, COMM TECH, and COMM CONTROL.

SOP 6.11

TITLE

TDRS EARLY HANDOVERS

PURPOSE

To document the procedures for scheduling early TDRS handovers during real-time mission operations.

PARTICIPANTS

GC	FAO
* INCO	F/C Team
FD	COMMAND

PROCEDURES

A. Prepermission Procedures

1. TDRS handover times are planned prepermission and transmitted to GSFC in the form of schedule orders (SHO's). The standard for handover time planning is to schedule all handovers to occur at the LOS of the spare west satellite. This is the default for onboard antenna management, and it minimizes conflicts with the east satellite which is heavily scheduled. In order to further minimize resource usage, both S-band and Ku-band services are normally handed over simultaneously.
2. Nonstandard handovers are also planned and scheduled prepermission and are noted in the flight plan for crew and flight controller reference.

B. Mission Procedures

1. Mission-unique requirements may result in justifiable requests for early handover times for S-band or Ku-band.
 - a. Maximizing Ku-band line-of-sight visibility for acquisition of high rate data (e.g., Spacelab data) or for sending TIPS messages.
 - b. Minimizing the periods when the S-band line-of-sight to TDRS is in a weak region of the antenna pattern (e.g., off the nose or tail).
 - c. Avoiding loss of telemetry due to nominal handover during critical events (e.g., OMS burn).
2. In the event an F/C sees a need for operating in a nonstandard fashion and desires an early handover, the following procedures should be used.
 - a. Notify both GC and INCO of the request including the specific orbits, whether the request is for S-band and/or Ku-band and the rationale. The request should be made at least 90 minutes prior to the TDRS spare/west AOS for event desired to ensure time for resolution of any conflicts.

- b. INCO and GC will discuss the request and will arrive at a joint decision to concur or not concur.
- c. With joint concurrence, the FD and FAO will be notified for final approval. The decision will be based on interference with, and priority relative to, other mission requirements and the time available to coordinate with GSFC. The GC will request COMMAND to attempt to schedule the event upon FD approval.
- d. If the FD does not concur or the schedule request is denied by GSFC, the originator will be notified.
- e. A denial by GSFC may be appealed to the FD for further evaluation.

SOP 6.12

TITLE

TDRS HANDOVER DURING HIGH INCLINATION ENTRY TO KSC

PURPOSE

To define a standard set of procedures for performing TDRS-west to TDRS-east handovers during 57° entry to Kennedy Space Center.

PARTICIPANTS

*INCO	GC
FDO/GPO	FD
COMMAND	CAPCOM

GENERAL

This procedure allows the INCO to hand over the operational communications link from TDRS-west to TDRS-east in order to improve communications during the entry timeframe. Orbiter roll maneuvers that occur during the period normally associated with S-band communications blackout may allow an increased AOS period if antenna pointing is carefully managed. It has been found that the plasma generated during entry primarily affects the lower S-band quad antennas and that, if pointing to a TDRS satellite can be maintained through an upper S-band quad antenna, communications with the orbiter can be significantly increased.

This procedure is valid only for 57° entries to KSC. It has been found that entries to Edwards AFB cannot be improved by this procedure for any flight inclination because TDRS-east goes LOS prior to the time that it would be used. It has been found that 28° inclination entries to KSC do not benefit from this procedure either, because of the relative geometries involved and the planned flight trajectories. It should be noted that inclinations other than 28° and 57° will have to be evaluated on a case-by-case basis to determine if they can benefit from this procedure.

PROCEDURES

- A. Approximately 3 hours prior to deorbit TIG, INCO will verify with COMMAND that simultaneous SHO's have been built for the planned and backup entry times.
- B. Approximately 1 hour prior to deorbit TIG, INCO will contact the Flight Dynamics Officer (FDO) and request the times and directions of the "FIRST NON-ZERO ROLL COMMAND" and all "ROLL REVERSALS" that will occur during the computed blackout period. These times will be provided to INCO by FDO as a part of the "Deorbit/Landing Data" sheet. An example of this sheet is shown in figure 6.12-1.
- C. INCO will evaluate the groundtrack, event times, and roll directions to determine if a handover to TDRS-east from TDRS-west will improve the AOS times for the orbiter.
- D. If INCO determines that a handover will increase the AOS period with the orbiter, he will contact FDO or the Guidance Procedures Officer (GPO) and request that both a TDRS EAST/WEST and a TDRS EAST/EAST state vector be built.

- E. INCO will determine the time at which the handover will occur. Generally, this will be about 30 seconds prior to the expected time of the FIRST NON-ZERO ROLL COMMAND."
- F. INCO/COMM SUPPORT will notify COMMAND, GC, FD, and CAPCOM of the planned handover time.
- G. Several minutes prior to the planned handover time, INCO will place the TDRS EAST/EAST vector in the BFS two-stage command buffer using the manual execute option.
- H. At the planned handover time, INCO will execute the BFS two-stage buffer.
- I. A short LOS may occur as the orbiter rolls and the pointing changes to different antennas.
- J. Handover to the Merritt Island STDN (MILA) station should occur at the normal time.

DEORBIT/LANDING DATA
DEORBIT TO KSC ON ORBIT 142

GENERATED 07/20:00

EVENT	TIME MET/CENTRAL	LAT (D:M)	LONG (D:M)	H	VEL (KFPS)	COMMENTS
DEORBIT TIG	8/21:08:52 93/04:22:32	29:14 S	94:01 E	158.9 NM	25.3 VI	dV = 408 FPS dT = 3:40 M:S XRNG = 684 NM
TDRS-W AOS	8/21:08:22 93/04:22:02	27:26 S	92:34 E	161 NM	25.3 VI	EI MINUS 30 MIN
EI	8/21:38:12 93/04:51:52	22:09 S	130:45 W	406 KFT	25 VREL	RANGE 4216 NM
MACH 5	8/22:00:40 93/05:14:20	28:08 N	82:56 W	122 KFT	5.0 VREL	
MACH 4	8/22:01:35 93/05:15:15	28:25 N	82:13 W	107 KFT	3.0 VREL	
MACH 3	8/22:02:35 93/05:16:15	28:27 N	81:35 W	91 KFT	3.0 VREL	
MACH 2	8/22:05:07 93/05:17:20	28:28 N	81:07 W	77 KFT	1.0 VREL	
MACH 1	8/22:05:07 93/05:18:47	28:32 N	80:44 W	50 KFT	.9 VREL	
HAC I/C	8/22:05:48 93/05:19:28	28:34 N	80:37 W	39 KFT	.9 VREL	TURN ANGLE 253 DEG
LANDING	8/22:09:22 93/05:23:02					RUNWAY KSC 33

ROLL SCHEDULE

1ST ROLL COMMAND (TO THE RIGHT)	24.9	10:56:55 Z
1ST ROLL REVERSAL (RIGHT TO LEFT)	10.6	11:09:20 Z
2ND ROLL REVERSAL (LEFT TO RIGHT)	5.4	11:03:52 Z
3RD ROLL REVERSAL (RIGHT TO LEFT)	3.1	11:16:12 Z

CLOUDS
WEATHER:

40 SCT 120 BKN 250 BKN
VIS 7 ALT _____
WINDS 300/10G16 TEMP _____

COMMENT: DEORBIT BURN OUT-OF-PLANE ANGLE IS 51 DEGREES
FDO: Keith Fletcher

Figure 6.12-1. Deorbit/landing data sheet

SOP 6.13

TITLE

NASCOM PRIORITIES

PURPOSE

To document the preflight definition of NASCOM priorities to be used for restoral of failed NASCOM data or voice communications circuits, and to define the interface procedure for real-time redefinition of those priorities.

PARTICIPANTS

*COMM CONTROL

FC Team

*GC

HOUSTON VOICE

PROCEDURES

A. Preflight Planned Priorities

1. In the event of voice or high speed data communications circuit failure, COMM CONTROL or HOUSTON VOICE initiates restoral procedures, based on priorities assigned in tables 6.13-1 and 6.13-2, and informs GC.
2. In the event of wideband (WB) data communications circuit failure, COMM CONTROL restores data flow on backup circuits, if available, and informs GC.
3. In the event of voice circuit failure, HOUSTON VOICE initiates restoral procedures based on priorities assigned in table 6.13-1 and informs GC.

B. Priority Redefinition

1. F/C requiring a redefinition of NASCOM voice or high speed data circuit restoral priorities contacts FD on FD loop and makes the request.
 - a. FD coordinates circuit restoral priority changes with all FC disciplines affected by the change.
 - b. If approved, FD advises GC, who coordinates with HOUSTON VOICE or COMM CONTROL on the priority reassignment.
 - c. HOUSTON VOICE or COMM CONTROL initiates the change and performs any external MCC coordination that may be required.
2. WB data circuits, in general, have primary or backup designations which indicate priority and service restoral plans.

Table 6.13-1. Data circuit priorities

Priority		Prelaunch/ ascent	On orbit	Entry/ landing	
JCS/GSFC/NGT					BROADCAST NTWK
	(1)	P	P	P	
	(2)	B/U	B/U	B/U	
JSC/KSC	(1)	P	P	P	7.2 kb L/L RADAR
	(2)	B/U	B/U	B/U	7.2 kb L/L RADAR
		P	P	P	75 bps CASRS
		NO B/U			
GSFC/MILA	(1)	P	P	P	224 kb FDX TLM/CMD (72k)
	(2)	B/U	B/U	B/U	224k NISDN FDX TLM/CMD (72k)
	(3)	B/U	B/U	B/U	224k HALF FDX CMD (72k)
	(4)	P	P	P	56 kb FDX CMD (32k)
	(5)	B/U	B/U	B/U	56 kb FDX CMD (32k)
	(6)	B/U	B/U	B/U	224 kb FDX SFR DATA
GSFC/DFRF	(1)		P	P	224 kb FDX TLM/CMD 72/32
	(2)		B/U	B/U	224 kb FDX NISDN TLM/CMD
	(3)		B/U	B/U	224 SPX NISDN TLM
GSFC/GDS	(1)		P	P	224k FDX TLM/CMD
	(2)		B/U	B/U	56k FULL DUPLEX 32k CMD
GSFC/BDA	(1)	P	P	P	224k FDX TLM/CMD

NO B/U

GSFC/JPL	(2)		P		224 kb FDX TLM/CMD (72k)
JPL	(1)				

NO CMD B/U

JPL/RID	(1)		P	P	512kb
JPL/CAN	(1)		P	P	512kb

Table 6.13-2. Voice comm priorities

Major I/F	Priority	Prelaunch/ascent	Orbit	Entry/landing
GSFC -JSC	1	A/G UHF	TN COORD	A/G UHF
	2	SITE COORD	SITE COORD	SITE COORD
	3	TN COORD	COMM MGR	TN COORD
	4	COMM MGR	TRACK COORD	COMM MGR
	5	TRACK COORD	A/G UHF	TRACK COORD
	6	OST/NST	P/B COORD	OST/NST
	7	GSCF ODF	GSFC ODF	GSFC ODF
	8	GC/NOM	GC/NOM	GC/NOM
	9	MISSION AUDIO	OST/NST	MISSION AUDIO

NOTE

Priority of remaining voice circuits to be established in real time.

JSC-KSC	1	A/G 1	MIS COMM COORD	MISSION COMM COORD
	2	A/G 2	FD	FD
	3	FD	DDMS COORD	TRACK COORD
	4	FCO PVTLINE	DDMS COMM COORD	DDMS COORD
	5	NTD (OIS 232)	LANDING FIELD PRIME 1	LANDING FIELD PRIME 1
	6	LANDING FIELD PRIME 1	TRACK COORD	CONVOY CDR
	7	MISSION COMM COORD	LANDING FIELD PRIME 2	LANDING FIELD PRIME 2
	8	TRACK COORD	DOD PATCH 1	ARTCC/FAA
	9	FCO PRIME	DOD PATCH 2	DDMS COMM COORD
	10	ACFT WX	DOD PATCH 3	DOD PATCH 3
	11	DDMS COORD		
	12	DDMS COMM COORD		

Table 6.13-2. Voice comm priorities (continued)

JSC-DFRF	Priority	Prelaunch/ascent	Landing - 2 hours through egress
	1	A/G UHF	A/G UHF
	2	FD	FD
	3	DFRF COMM COORD	DFRF COMM COORD
	4	LANDING FIELD PRIME 1	LANDING FIELD PRIME 1
	5	CONVOY CDR	CONVOY CDR
	6	LANDING FIELD PRIME 2	LANDING FIELD PRIME 2
	7	SURGEON	TRACK COORD
	8	ORBITER PROJECT OFFICE	ACFT WX
	9	TRACK COORD	FAA/ARTCC
	10	MISSION AUDIO	MISSION AUDIO
	11		SURGEON
	12	LRD (OIS 135)	LRD (OIS 135)

NOTE

Priority of remaining voice circuits to be established in real time.

JSC-WSMR	Priority	Prelaunch/ascent	Landing - 2 hours through egress
	1	A/G UHF	A/G UHF
	2	WSMR COMM COORD	WSMR COMM COORD
	3	LANDING FIELD PRIME 2	CONVOY CDR
	4	SURGEON	COOLING
	5		LANDING FIELD PRIME 2
	6	MISSION AUDIO	MISSION AUDIO
	7	CONVOY CDR	SURGEON

SOP 6.14

TITLE

AIR-TO-GROUND VOICE MANAGEMENT

PURPOSE

To define the procedures for normal management of A/G communications.

PARTICIPANTS

CAPCOM	GC
INCO	GSFC VOICE
*COMM TECH	MISSION SPECIALISTS 1, 2, and 3 (MS1, MS2, MS3)
STATION COMM TECH	PAYLOAD SPECIALISTS 1 and 2 (PS1, PS2)

GENERAL

- A. The vehicle call sign will be uniquely assigned for each flight. Crew call signs are Commander (CDR), Pilot (PLT), Mission Specialist (MS), and Payload Specialist (PS). During Extravehicular Activities (EVA) phases, the crew call signs will be the individual astronauts' first names.
- B. A/G communications capabilities and frequencies for the orbiter and ground stations are as follows.
 - 1. STDN:
 - S-band primary - transmit (U/L) 2106.4 MHz and receive (D/L) 2287.5 MHz
 - S-band backup - transmit (U/L) 2041.9 MHz and receive (D/L) 2217.5 MHz
 - UHF primary - simplex B, transmit and receive - 259.7 MHz
 - UHF backup - simplex A, transmit and receive - 296.8 MHz
 - 2. Air Traffic Control (ATC):
 - UHF emergency - simplex, transmit and receive - 243.0 MHz
 - 3. Air Force Satellite Control Facility (AFSCF) SGLS:
 - S-band primary - transmit (U/L) 1831.7 MHz and receive (D/L) 2287.5 MHz
 - S-band backup - transmit (U/L) 1775.7 MHz and receive (D/L) 2217.5 MHz
 - 4. TDRS:
 - S-band primary - transmit (U/L) 2106.4 MHz and receive (D/L) 2287.5 MHz
 - S-band backup - transmit (U/L) 2041.9 MHz and receive (D/L) 2217.5 MHz

- C. Station support capabilities for S-band and UHF A/G voice transmission/reception are summarized in table 6.14-1.

Table 6.14-1. Station S-band and UHF A/G capabilities

SIMO S-band and UHF A/G		S-band A/G only	UHF only
MIL BDA IOS	DFRF PDL TCS	CAN RTS RID GDY	SAL PK

- D. Two A/G voice circuits are provided between JSC MCC and GSFC for routing to STDN sites. MIL uniquely has a third A/G voice circuit for direct interface to JSC MCC.
- E. S-band Voice 1 (V-1) is prime for A/G voice communications between the orbiter crew and the MCC during all flight phases, except during Spacelab flights where V-2 is prime and V-1 is reserved for scientific communications.
- F. UHF is backup for A/G voice communications between the orbiter crew and MCC during all flight phases.

PROCEDURES

- A. COMM TECH is responsible for defining, coordinating, and implementing A/G voice configuration.
1. CAPCOM coordinates A/G problems and reconfiguration with COMM TECH on COMM TECH loop.
 2. COMM TECH coordinates A/G problems and remote site reconfiguration with STATION COMM TECH's.
 3. "GO FOR VOICE" procedures are specified in FCOH SOP 3.2.
- B. COMM TECH configures A/G voice loops for the defined flight phases. Nominal configurations for each phase are as follows.

NOTE

See Network Operations Support Plan (NOSP) for network flow diagrams of the following configurations. V-1 and V-2 refer to S-band A/G voice channels 1 and 2, respectively.

1. Prelaunch through tower clear - configuration ALPHA
MIL remotes KSC A/G-1 Astrocom to JSC A/G-1 (JKSC63300) and KSC A/G-2 Astrocom to JSC A/G-2 (JKSC63304); MIL to JSC direct circuits. The UHF is remoted to an A/G longline through GSFC. JSC will build digital U/L.
2. Ascent - configuration BRAVO
Nominal ascent phase after tower clear; digital throughput U/L and D/L. MIL and BDA hand over A/G UHF at Houston COMM TECH direction.
3. Flight operations (orbit) - configuration DELTA
Nominal orbit is supported with a digital throughput U/L and D/L. Stations with UHF remote to A/G-2 longline.
4. Landing - configuration HOTEL
Nominal landing at EAFB is supported with a digital throughput U/L and D/L selected between GDS, VAN, and DFRF. The UHF will be handed over at Houston COMM TECH direction.
5. Ground operations - postlanding - configuration INDIA
For postlanding at EAFB, use DFRF throughput S-band (192 kbps) and UHF to support KSC's requirements for communications with the orbiter. Configuration GOLF starts at Mating-Demating Device (MDD) arrival.
6. Ground operations - contingency landing/postlanding - configuration JULIET
In the event of a contingency landing at Northrup Flight Strip, Salinas Peak provides A/G-UHF coverage. Configuration HOTEL includes postlanding requirements for KSC/MILA support.
7. Contingency landing - configuration KILO
In the event of a contingency landing, configuration KILO will be implemented a minimum of 2 hours prior to landing. UHF monitor only is remoted from Contingency Landing Site (CLS) through DOD Contingency Support Center to JSC.
8. Orbit operations (UHF) - configuration CHARLIE
Stations supporting with UHF-only capability remote UHF on A/G circuit through GSFC to JSC.
9. Flight operations EVA - configuration FOXTROT
Stations under TDRS with UHF and scheduled as backup to the SN remote 259.7-MHz simplex B to the A/G longline (same as configuration CHARLIE).
10. KSC landing/postland - configuration LIMA
For nominal landing at KSC, MIL configures for a digital throughput U/L and D/L. UHF is remoted to an A/G longline through GSFC.

11. Flight operations (EVA) - configuration GOLF

Nominal EVA is supported by GN stations equipped with throughput capabilities. Stations with UHF capability remote to A/G-2 longline.

12. Contingency landing - Bermuda - configuration MIKE

In the event of a contingency landing at BDA, CAPCOM will simultaneously uplink on A/G-1, A/G-2, and UHF. During postlanding, HOUSTON VOICE will request GSFC/MIL to enable KSC UHF after crew egress.

NOTE

In nominal situations, COMM TECH coordinates all A/G voice loop reconfigurations with CAPCOM prior to the reconfiguration. In emergency situations requiring immediate response to a problem, COMM TECH first resolves the emergency, and then provides CAPCOM, INCO, and GC with A/G status and details of any reconfiguration required to restore support.

- C. For ascent phase and landing phase support, CAPCOM uses multiaccess to talk/listen on A/G-1, A/G-2, and A/G-UHF simultaneously.

NOTE

During landing at DFRF, HOUSTON COMM TECH will inhibit the UHF unless S-band has a failure. This is necessary to prevent any ECHO between UHF and S-band.

- D. Thermal Impulse Printer System (TIPS)/Portable Audio Data Modem (PADM) message uplink is via A/G-2 (V-2).
- E. A/G voice loop configuration for each site is specified in the NOSP.
- F. FD and INCO keyset capability to key the A/G is enabled/disabled by COMM TECH as per the launch/ landing count.

SOP 6.15

TITLE

A/G VOICE - CONTINGENCY MANAGEMENT

PURPOSE

To define contingency plans for A/G voice communications failures between the STS, GN, and JSC/MCC.

PARTICIPANTS

FD
*CAPCOM
*COMM TECH
STATION COMM TECH
INCO

GENERAL

- A. Certain classes of A/G voice communications failures can be identified preflight, and workaround procedures and ground responses developed. This SOP contains those contingency procedures defined preflight. For A/G voice communications failures not covered, contingency responses are developed in real time.
- B. Management of A/G voice capability as defined in FCOH SOP 6.1.1 applies for contingency situations and is summarized as follows.
 1. COMM TECH is responsible for defining A/G voice configuration and for coordinating implementation.
 - a. CAPCOM coordinates A/G problems and reconfiguration with COMM TECH on HOU COMM TECH loop.
 - b. COMM TECH coordinates A/G problems and remote site reconfiguration with Station COMM TECH's.
 2. In nominal situations, COMM TECH coordinates all A/G DVIS conference reconfigurations with CAPCOM prior to the reconfiguration. In emergency situations requiring immediate response to a problem, COMM TECH first resolves the emergency, then provides CAPCOM, INCO, and GC with A/G status and details of any reconfiguration required to restore support.

CONTINGENCY PROCEDURES

- A. For loss of one or more MCC tone-key transmitters capability, COMM TECH switches to a backup AGVS string.
- B. For loss of A/G UHF voice circuit to a GN site, reconfigure according to the guidelines in table 6.15-1.
- C. In the event of no response from the spacecraft after a UHF handover has been accomplished, COMM TECH calls the STATION COMM TECH and confirms good

uplink/downlink. Where there are indications of a possible longline voice circuit failure, COMM TECH makes a brief voice check with STATION COMM TECH.

- D. In the event of total loss of A/G communications between MCC and GN station, the STATION COMM TECH advises the crew (if the crew attempts to contact MCC) that communications are out to MCC and that the station is standing by to log any crew comments for relay to the MCC when communications are restored.
- E. For loss of S-band capability, either ground or spacecraft problem, utilize UHF where applicable.
- F. For loss of all MCC tone-key transmitters or loss of all tone-key receivers at a GN site:
 - 1. For loss of MCC tone-key transmitters, COMM TECH immediately notifies STATION COMM TECH.
 - 2. For loss of a GN station's tone-key receivers, the STATION COMM TECH notifies COMM TECH of the problem. The COMM TECH notifies CAPCOM and GC.
 - 3. COMM TECH directs STATION COMM TECH to use manual key for UHF A/G voice.
 - 4. For UHF-only situations, COMM TECH advises CAPCOM to repeat the spacecraft call sign for A/G transmissions. The first iteration of the spacecraft call sign is the cue for the STATION COMM TECH to key the transmitter.

EXAMPLE

CDR, CDR, Houston (text), over." The transmitter is manually keyed after the first "CDR," allowing "CDR, Houston (text), over" to be transmitted to the spacecraft. The STATION COMM TECH releases the manual key when the CAPCOM says "over."

- 5. For S-band-only and S-band/UHF situations, CAPCOM repetition of the spacecraft call sign is not required.
- G. For loss of CAPCOM's communication keyset, CAPCOM uses the right-hand CAPCOM CONSOLE keyset. GC requests COMM TECH to enable tone-keying from that keyset.

Table 6.15-1. A/G circuit loss guidelines

Configuration	A/G-1 loss	A/G-2 loss
ALPHA	If MILA A/G-1 is lost, use UHF on GSFC A/G longline; V-1 on MILA A/G-3; V-2 on MILA A/G-2	If MILA A/G-2 is lost, use V-1 on MILA A/G-1; V-2 on MILA A/G-4; UHF on GSFC A/G longline
HOTEL	GDX/DFRC digital throughput. Use UHF on DFRF A/G-2 longline	GDX/DFRC digital throughput. Use UHF on DFRC A/G longline
BRAVO	MIL/PDL/BDA digital throughput. Use UHF on GSFC A/G longline	MIL/PDL/BDA digital throughput. Use UHF on GSFC A/G longline
DELTA	GN throughput S-band voice. Use UHF on GSFC A/G longline	GN throughput S-band voice. Use UHF on GSFC A/G longline

SOP 6.16

TITLE

ACCESS TO A/G VOICE UPLINK

PURPOSE

To define interface coordination required to allow specific F/C's access to A/G loop(s) for uplink voice communications.

PARTICIPANTS

FD	GC
CAPCOM	*COMM TECH
SURGEON	INCO

GENERAL

- A. SURGEON console keyset is configured with all three A/G comm loops; however, it is normally not enabled for access to tone-keying. COMM TECH controls equipment as necessary to enable/disable SURGEON keyset for uplink capability.
- B. SURGEON requires access to A/G loops for:
 - 1. Evaluation of flight crew health on a periodic and as-required basis during a flight.
 - 2. Postlanding communication with rescue (medical) team in contingency situations after orbiter powerdown.
- C. For prelaunch countdown command coordination, INCO requires talk access (and tone-keying) on the A/G-1 loop. Talk capability (and tone-keying) from these consoles is inhibited shortly before launch for the duration of the flight.

PROCEDURES

- A. SURGEON A/G Access
 - 1. SURGEON informs FD when need arises to talk to flight crew (inflight) or rescue team (postlanding).
 - 2. After FD approval, GC coordinates the request for A/G communication access.
 - 3. GC requests COMM TECH to enable the appropriate A/G loop on SURGEON's keyset.
 - 4. COMM TECH reports configuration completion to GC.
 - 5. GC informs FD that the approved A/G loop is enabled.
 - 6. FD informs GC when use of the A/G loop is completed.
 - 7. GC requests COMM TECH to inhibit A/G uplink capability on SURGEON's keyset.

8. COMM TECH reports SURGEON A/G inhibit completion to GC.
 9. GC informs FD that SURGEON's keyset is inhibited for A/G uplink.
- B. Prelaunch Countdown Command Coordination Via A/G-1
1. At approximately T - 9 minutes before launch, A/G-1 becomes the command coordination channel. All uplinked commands are marked" on A/G-1.
 2. At T - 10 minutes, GC requests COMM TECH to enable INCO talk on A/G-1.
 3. GC notifies INCO that A/G-1 talk is enabled.
 4. At completion of required uplink commanding (at approximately T - 5 minutes), GC requests COMM TECH to inhibit A/G-1 talk and tone-keying for the INCO position.
 5. GC notifies INCO when A/G-1 talk is inhibited for the INCO position.

SOP 6.17

TITLE

MISSION CONTROL CENTER-MOSCOW/MISSION CONTROL CENTER-HOUSTON (MCC-M/MCC-H) A/G COMMUNICATION - CONTINGENCY MANAGEMENT

PURPOSE

To define the procedure for contingency communications between the MCC-M to the MIR space station or the MCC-H to the space shuttle orbiter in the event of a failure or loss of communication.

PARTICIPANTS

FD
GC
*COMM TECH
MCC-H
MOSCOW VOICE
MCC-M
RIO
CAPCOM

GENERAL

In the event of a failure or loss of communication between MCC-H to the space shuttle or MCC-M to the MIR, communication restoration is desirable. Two circuits are utilized for monitoring respective A/G communications. These external circuits are CHANNEL 2 A/G MIR (MCC-M) and CHANNEL 9 A/G SHUTTLE (MCC-H). A/G MIR (MCC-M) will be prime and A/G SHUTTLE (MCC-H) is back-up restoration.

PROCEDURES

- A. FD will direct GC to implement contingency configuration.
- B. GC directs COMM TECH to start configuration.

NOTE

Since COMM TECH utilizes both A/G monitor circuits, the monitor circuit for A/G MIR (MCC-M) conference will not be available during this configuration.

- C. COMM TECH configures the prime and back-up circuits for the contingency operation.
- D. COMM TECH reports to GC that they are configured and standing by for event. CG reports to FD.
- E. At the FD call, GC directs COMM TECH to enable prime circuit on the designated A/G.
- F. At the end of this contingency event, FD direct GC/COMM TECH to normal up external lines.

SOP 6.18

TITLE

PRELAUNCH A/G VOICE CHECKS

PURPOSE

To specify when prelaunch orbiter A/G voice checks are made.

PARTICIPANTS

CDR
PLT
CAPCOM
*COMM TECH
NTD
INCO
INSTRUMENTATION

PROCEDURES

- A. Prelaunch A/G voice checks are performed when the orbiter is on the launch pad during the Terminal Countdown Demonstration (TCD) and the actual countdown.
- B. The voice checks are performed by CAPCOM, CDR, PLT, MS, and PS. COMM TECH may be requested to perform the voice checks for comm activation.
- C. As contained in OMI S-0017 (TCD) and OMI S-0007 (launch countdown), the NTD will request on OIS 232 (NTD loop) that the voice checks be performed. The CCSE and CAPCOM will then coordinate the voice checks on OIS214 and OIS215 loops as sequenced in OMI V-1117.

SOP 6.19

RESERVED

SOP 6.20

RESERVED

SOP 6.21

TITLE

CONTINGENCY LANDING SITE (CLS) COMMUNICATIONS

PURPOSE

To describe capabilities and procedures for communicating with a CLS upon a decision to land at the CLS.

PARTICIPANTS

LSO	FDO
* DOD LSO	SURGEON
DOD COMM COORD	PAO
HOUSTON VOICE	KSC LANDING AND RECOVERY
SMG (WEATHER)	DIRECTOR (LRD)

GENERAL

- A. All CLS communications are established through the DOD Manager for Space Shuttle Support (DDMS) Shuttle Operations Center (SOC) at Patrick Air Force Base, and use the DOD AUTOVON network.
- B. Normally, there are no dedicated longlines to the CLS's. However, dedicated longlines are established once a decision is made to land at a CLS. These longlines (table 6.21-1) are dedicated to orbiter support from touchdown (TD) - 2 hours through TD + 2 hours.
- C. The dedicated longlines are under DOD control, and communications are usually conducted by DOD personnel. It is anticipated though, that certain MCC/KSC positions will need direct communications with CLS personnel.
 - 1. FD - Verify TD time and orbiter status
 - 2. LSO, FDO - Verify CLS airfield status and orbiter approach profile
 - 3. SMG (WEATHER) - Verify local CLS weather conditions
 - 4. SURGEON - Coordinate crew medical requirements
 - 5. KSC - Obtain postlanding orbiter status and coordinate ground operations effort
 - 6. PAO - Coordinate public affairs requirements

PROCEDURES

- A. After a decision to land at a CLS, DOD LSO directs DOD COMM coordinator (at DDMS SOC) to establish the dedicated longlines between MCC and the CLS through DDMS SOC at TD - 2 hours (see table 6.21-1).

- B. DOD LSO notifies LSO when the longlines are available.
- C. LSO requests GC to establish the additional loop and longline configurations specified in table 6.21-1.

NOTE

The patch of A/G-UHF (MCC internal loop) to DOD PATCH 1 is not made until TD - 15 minutes, and is released at orbiter powerdown.

- D. GC directs HOUSTON VOICE to establish the additional patches and notifies LSO when they are available.
- E. LSO informs FD that CLS communications are established on LF PR 2 (primary MCC/CLS coordination loop) and LF PR 1 (reserved for LF PR 2 overflow) and that A/G-UHF and LF PR 1 will be set up to monitor crew/CLS tower communications at TD - 15 minutes.
- F. At orbiter UHF AOS, the CLS remotes the A/G-UHF conversation to MCC via DOD PATCH 1 circuit. MCC/KSC talk capability on DOD PATCH 1 is inhibited until orbiter powerdown.
- G. To gain talk access to CLS personnel, an F/C contacts LSO on MPSR DYN loop. KSC personnel request access through LSO on OIS 135 (LRD) loop. Priorities for the use of the CLS longlines are as follows.

	<u>LF PR 1</u>	<u>LF PR 2</u>
Prelanding	1. A/G-UHF 2. DOD LSO 3. FD, LSO 4. WEATHER	1. DOD LSO 2. FD, LSO 3. WEATHER
Crew egress	1. DOD LSO 2. KSC - Orbiter status 3. PAO	1. DOD LSO 2. FD/Pilot debriefing 3. SURGEON 4. KSC-ground operations

1. LSO contacts DOD LSO, who verifies that the necessary CLS personnel are available. DOD LSO has approval authority for all MCC/KSC talk capability requests.
2. LSO directs the requestor to use LF PR 2 (or LF PR 1, if necessary).

Table 6.21-1. A/G circuit loss guidelines

Terminations	DDMS CSC circuits with CLS		
	DOD PATCH 1 ^{a,b}	DOD PATCH 2 ^b	DOD PATCH 3 ^c
SOC-to-MCC longline	DOD PATCH 1	DOD PATCH 2	DOD PATCH 3
MCC internal conference	DOD PATCH 1	DOD PATCH 2	DOD PATCH 3
Additional distribution:			

MCC-to-KSC longline	Landing Field Prime 1	Landing Field Prime 2	N/A
MCC internal conference	Landing Field Prime 1 A/G-UHF	Landing Field Prime 2	N/A

^aFrom orbiter UHF AOS through orbiter powerdown, A/G voice between crew and CLS tower is remoted to MCC on DOD PATCH 1 (monitor only). MCC/KSC talk capability is inhibited by SOC/CLS.

^bMCC/KSC talk access requests are made through LSO and approved by DOD LSO. The primary circuit is DOD PATCH 2; DOD PATCH 1 can be used except during UHF A/G AOS.

^cDOD PATCH 3 is reserved for DOD command and control use between DOD LOS, SOC, and CLS Airfield Support Coordinator.

SECTION 6
COMMUNICATIONS

03/16/95
SHUTTLE OPS
FCOH/JSC-26843

DATE:
REV:

7/31/96
FINAL, REV B

**SOP 7
TELEVISION**

SOP 7.1

TITLE

REAL-TIME TV AND VIDEO TAPE RECORDING

PURPOSE

To define the real-time TV and Video Tape Recorder (VTR) dump management procedure and to identify the necessary voice reports by the STDN stations.

PARTICIPANTS

INCO	FD
*HOUSTON TV	HOUSTON VOICE
STATION OPSR	JOHNSON TV (bldg. 8)
GC	

GENERAL

- A. Real-time TV is normally downlinked without interleaved voice but can be downlinked with interleaved voice if required.
- B. TV downlinked during a VTR dump may or may not contain interleaved voice.
- C. VTR dumps are made at a 1:1 ratio (i.e., same rate as real-time TV).

PROCEDURES

- A. Stations are advised verbally of TV downlink support requirements by HOUSTON TV.

NOTE

Only NGT, GDS, and MIL are equipped to support TV downlink. Stations do not normally deinterleave the voice from TV.

- B. If TV remoting to MCC is required, GC notifies HOUSTON TV, who advises stations of TV support and remoting requirements.
- C. HOUSTON VOICE configures an available MCC B30S internal voice playback loop for the interleaved voice channel from real-time TV.
- D. HOUSTON TV configures "lip-sync'ed" TV audio for MCC B30S distribution.

E. Sequence of Events

<u>CUE</u>	<u>ACTION</u>
1. Prior to AOS	STATION OPSR starts video recorders. Verify A/G-1 to audio track 1 and A/G-2 to audio track 2.
2. FM carrier present	OPSR REPORT: (station) has FM carrier AOS."
3. Video data present on FM carrier	OPSR REPORT: Video quality is (1, 2, 3, 4, or 5)."

NOTE

1 = Unfit for broadcast	
2 = Objectionable impairment (i.e., video interference)	
3 = Noticeable impairment (i.e., readily observed)	
4 = Detectable impairment (i.e., visible with oscilloscope)	
5 = Perfect picture; no impairments (If video quality is 1, 2, or 3, an FM downlink signal strength reading is required in the STATION OPSR report.)	
4. Interleaved voice present in video	HOUSTON TV monitors voice quality; reports problems to INCO and/or GC.
5. Loss of FM carrier modulation	OPSR REPORT: Loss of video."
6. Loss of FM carrier	OPSR REPORT: (station) has loss of FM carrier."
7. HOUSTON TV announces end of video activity	STATION OPSR stops video recorders.

SOP 7.2

TITLE

TV PLAYBACKS

PURPOSE

To define the procedure for obtaining video tape playbacks.

PARTICIPANTS

FC TEAM
*HOUSTON TV
GC

STATION OPSR
HOUSTON VOICE
JOHNSON TV (bldg. 8)

PROCEDURES

A. Retrieval from GN/SN

1. GC will coordinate with HOUSTON TV to schedule video circuit.
2. GC requests HOUSTON TV coordinate with STATION OPSR on configuration for video playback.
3. GC informs FD when the playback is ready and requests HOUSTON TV to begin the playback.
4. HOUSTON TV coordinates TV playback start/stop with STATION OPSR.
5. After TV playback is completed, GC contacts HOUSTON TV and releases the TV circuits and the GN/SN site.

B. Playback from Johnson TV (bldg. 8) video recorders

1. All requests for HTV video playback are submitted to HOUSTON VOICE on an MDRF, completed and routed according to FCOH SOP 10.1.
2. GC schedules the playback with HOUSTON TV and informs the requester when the playback is ready.
3. When the requester is ready, GC requests HOUSTON TV begin the TV playback.
4. GC notifies HOUSTON TV when to stop the playback.

SOP 7.3

TITLE

BUILDING 30S FLIGHT CONTROL ROOM CONSOLE VIDEO PICTURE-IN-PICTURE

PURPOSE

To define the procedure necessary to bring up a video picture-in-picture on a bldg. 30S Flight Control Room (FCR) workstation.

PARTICIPANTS

*GC
BLDG 30S FCR WORKSTATION

PROCEDURES

- A. Users log onto a bldg. 30S FCR workstation. Users position cursor in leftmost monitor of console.
- B. On the DISPLAY NAV MENU 3, User clicks on *Global Apps* pull-down menu and then on *Pict-in-Pict*.
- C. A blank presized video screen will appear on the far left monitor.
- D. On the pop-up menu that appears, select the desired channel, which will appear in the screen capture window.
- E. Problems with TV video will be reported to GC.

**SOP 8
TIME**

SOP 8.1

TITLE

ORBITER VEHICLE TIME UPDATES

PURPOSE

To ensure that the orbiter clocks are synchronized to the desired time bases and that all MCC operators are cognizant of a time change or correction.

PARTICIPANTS

FC TEAM	CAPCOM
FD	FAO
*DPS	INCO
FDO	

GENERAL

The onboard clocks maintain GMT and MET. Onboard time changes can be accomplished by the crew or by MCC F/C's via uplink command. After lift-off, GMT can only be updated in increments of 15 msec or less, while MET is not constrained. Uplinked time changes will be done with DEU equivalents. The GMT time base should not change during the mission and no updating should be necessary for the GMT clocks. MET is an arbitrary time base until lift-off, at which time it will reset to zero and count up. MET time base changes may be necessary for the rendezvous and entry portions of the mission. Time updates are not valid in OPS 1 and OPS 3, but can be exercised in all other GPC operational sequences.

PROCEDURES

- A. DPS monitors orbiter onboard time via his appropriate displays and initiates any necessary time updates. If a time update is necessary, DPS advises FLIGHT on the FD loop. Other MCC FC team members monitor the discussion and make applicable comments on the FD loop.
- B. If the update is approved by FLIGHT for crew input, DPS provides CAPCOM with written instructions and coordinates verbally via the FD loop. If a ground uplink is preferred, DPS and INCO coordinate the uplink on INCO loop.
- C. MET updates are coordinated between FAO, FDO, and DPS. FDO contacts DPS on the MOCR DPS/CDMS loop. Inputs to FDO are made on MOCR DYN.
- D. CAPCOM advises the orbiter crew of the update and provides any necessary instructions via A/G-1, A/G-2, or A/G-UHF loop.
- E. DPS monitors the update and informs FLIGHT of the results on the FD loop.

INFORMATION

Prior to launch, onboard GMT is set within 1 msec of a ground reference GMT; under normal operating conditions, onboard GMT should never require an inflight update.

SOP 8.2

TITLE

WALL CLOCK DISPLAY CONTROL

PURPOSE

To define the procedure for control and configuration of Wall Clocks within bldg. 30S operations facilities.

PARTICIPANTS

FD
*GC
MCC F/C'S

GENERAL

MCC (30S) wall clock time displays are divided into three categories: (1) Mission Operations Computer (MOC) generated timers, referred to as MOC, (2) F/C created Global Event Timers (FCOH SOP 8.2.1), referred to as Global, and (3) standard clocks (GMT, SGMT, T-/MET, Local), referred to as Clocks. GC manages/coordinates the selection of wall clock timers to fill the eight slots of the White FCR overhead clock displays, which are also reproduced in the Wall Clock display available at each WFCR/MPSR workstation.

PROCEDURES

- A. The detailed procedures for setting and configuring timers and clock displays are contained in the "Group Display Software/Timing Services Software User's Handbook."
- B. GC will configure the contents of the wall clocks in accordance with mutually agreed-upon (by FD and F/C) sets of timers grouped by mission phase.
- C. Currently agreed-upon wall clock sets for simulation support are contained in the following table:

Slot	Launch	Orbit	Deploy	RNDZ	Landing
1 (L)	GMT	GMT	GMT	GMT	GMT
2 (L)	T-	MET	MET	MET	MET
3 (L)	SGMT	SGMT	SGMT	SGMT	SGMT
4 (L)	G-AOS	TK-AOS	G-AOS	G-AOS	G-AOS
1 (R)	T-	O-DAY	PL-DPY	PET	EI
2 (R)	MECO+	AWAKE	0-IGN	0-IGN	0-IGN
3 (R)	O-IGN	TW-AOS	TW-AOS	TW-AOS	TW-AOS
4 (R)	TS-AOS	TE-AOS	TE-AOS	TE-AOS	TD

- D. Changes to a Wall Clock display set will be coordinated between the F/C position and the GC on GC call loop, with FD concurrence.

SOP 8.2.1

TITLE

FLIGHT CONTROL POSITION RESPONSIBILITY FOR MCC (30S) GLOBAL EVENT TIMERS

PURPOSE

To define the procedure for setting global event timers, including SGMT and (Sim) MET, in bldg. 30S Flight Control facilities (White FCR/MPSR, Special Vehicle Operations).

PARTICIPANTS

FD
*GC
MCC F/C'S
SIM SUP

GENERAL

The responsibility for accurately setting the contents of a manual timer lies with the F/C position that has the required information (e.g., FDO for PL-DPY, FAO for SLEEP1). Once a timer has been set and designated as Global, the GC can select it to a position on the wall clock as required. Also, other FCR/MPSR positions will be able to select those timers to their individual Timer Display.

PROCEDURE

- A. The detailed procedures for setting and configuring timers and clock displays are contained in the "Group Display Software/Timing Services Software User's Handbook."
- B. SGMT and (Sim) T-/MET are special case manual timers and will be set by the GC via the Sim Delta window. FD and Sim Sup will coordinate to determine "Go to Run" time and pass this to the GC for initialization of SGMT/MET wall clocks.
- C. The following table defines standard manual timer labels and the F/C position that is responsible for the setting and accuracy of these timers. It is understood that only these positions (or GC in certain circumstances) will have the authority to set or modify these specific timers.

Label	Description	Position
MECO+	MAIN ENGINE CUTOFF	BOOSTER
EVA-ET	EXTRA VEHICULAR ACTIVITY ELAPSED TIME	EVA
AWAKE(X)	CREW AWAKE (1, 2, 3)	FAO
SLEEP(X)	CREW SLEEP (1, 2, 3)	FAO
FET	FLIGHT ELAPSED TIME	FAO
EI	ENTRY INTERFACE	FDO
PL-DPY	PAYLOAD DEPLOY	FDO
TD	TOUCH DOWN	FDO
ET	EVENT TIMER	GC
L-	LAUNCH COUNTDOWN (WITHOUT HOLDS)	GC
EXP(X)ET	EXPERIMENT (1 THROUGH 6) ELAPSED TIME	PAYLOADS
EXP-ET	EXPERIMENT ELAPSED TIME	PAYLOADS
PET	PHASE ELAPSED TIME	PAYLOADS
PL(X)-TM	PAYLOAD (1 THROUGH 4) TIME	PAYLOADS
RNDV	RENDEZVOUS	RNDV

- D. Additionally, F/C's may wish to create global, nonstandard timers to cover unique situations. When this occurs, the F/C will coordinate with FD and GC to place it on the wall clock, if required.

SOP 8.3

TITLE

FEP ONBOARD TIME SUBSTITUTION

PURPOSE

To define the coordination required to substitute a good time word for an anomalous TLM time word in FEP outputs.

PARTICIPANTS

GC	*DPS
FD	NIP SUP
FC TEAM	

GENERAL

- A. Orbiter MTU-1 GMT (OGMT) and MTU-1 MET (OMET) are normally routed to the MOC in the header portion of the data buffer used to transfer TLM data from the TPC to MOC. MTU-1 GMT is the source of data time for TPC.
- B. In the MOC, the above times are used in the header portion of all standard TLM displays. Additionally, the MOC transmits these times to the MCC timing subsystem at every AOS to synchronize and start both OGMT and OMET, which are normally configured for display on the general purpose TV Time display and FCR group displays. The MOC automatically sends control information to the timing subsystem at the beginning of each LOS period such that these times are reset to all zeros and do not increment during LOS periods.

PROCEDURES

- A. DPS, on detecting an onboard OGMT or OMET problem, notifies FD and FC team, on FD loop, that a problem exists.
- B. DPS coordinates FEP time word substitution as follows.
 - 1. DPS recommends a substitute for the anomalous time. (Reference table 8.3-1 for list of nominal time substitution choices.)
 - 2. DPS contacts NIP SUP on NIP SUP loop and requests that the time word substitution be made at FEP. Information required by NIP SUP is:
 - a. Time word being replaced (anomalous time word).
 - b. Time word to be substituted for the anomalous time word.
 - 3. NIP SUP enters time word substitution in the FEP by MENU entry.
- C. DPS advises FD and FC team of change on FD loop after time word substitution is completed.
- D. GC verifies that OGMT and OMET on the General Purpose TV Time display is correct.

- E. After problem analysis, DPS reports status of onboard timing to FD and, if appropriate, recommends any additional changes in MCC configuration.
- F. If onboard time is subsequently corrected, DPS provides coordination with FC team as outlined in this SOP to restore FEP time to original configuration.

INFORMATION

- A. In the FEP-MOC and FEP-LAN interface buffer, time words in the data portion of the buffer will not be affected by a time substitution, only the header time.
- B. Note that time word substitution does not affect ID labels displayed on the DTE, TV Time display, or group displays. For example, if MCC GMT is substituted for OGMT, the ID label will still read OGMT, not GMT.

Table 8.3-1. TLM time words available for FEP time substitution

Orbiter GMT	
Time type	Priority
Orbiter MTU-1 GMT	Normal configuration
Orbiter MTU-2 GMT	First choice substitute
GPC GMT (primary GPC)	Second choice substitute
MCC GMT (building time) ^a	Third choice substitute

^aIf MCC GMT is used, DPS will coordinate with INCO and TELCOM to obtain the time biasing data needed to bias MCC GMT to approximate onboard GMT.

Orbiter MET	
Time type	Priority
Orbiter MTU-1 MET	Normal configuration
Orbiter MTU-2 MET	First choice substitute
GPC GMT (primary GPC)	Second choice substitute

SOP 8.4

TITLE

CONTROL OF AOS/LOS RTA'S (DELETED)

**SOP 9
REMOTE STATION INTERFACE**

SOP 9.1

TITLE

RELEASE AND RECALL OF STDN STATIONS

PURPOSE

To define the procedure for releasing an STDN station from STS support, and for requesting support from a station previously released.

PARTICIPANTS

FD	FAO
*GC	FDO
GSFC NOM	INCO
DFE	

GENERAL

STDN stations are scheduled to support certain STS view periods. Occasionally, the GSFC may require the release of a specific station/view period from support of STS.

PROCEDURES

- A. Release of an STDN Station from Scheduled STS Support
 1. GSFC NOM may contact GC to request the release of a station if:
 - a. The station is required for a contingency support or a declared spacecraft emergency.
 - b. Marginal coverage is predicted.
 - c. Unforeseen events prevent station support.
 2. GC advises FD that a station release has been requested, providing station, orbit, and rationale for release.
 3. GC polls FAO, FDO, INCO, and DFE to determine if they have support requirements for the station in question.
 4. GC advises FD of station support requirements, if any, and the FD will approve or reject the request for station release.
 5. GC notifies GSFC NOM of MCC approval or rejection of the station release request.

B. Recall of a Released Station

1. Normally, stations will be released per GSFC request; however, if subsequent STDN schedule changes indicate that the released station is available for STS support:
 - a. GSFC NOM will inform GC and reschedule the station for STS support.
 - b. GC will inform FD that the previously released stations have been rescheduled for support.
2. An orbiter flight contingency may dictate that FLIGHT direct GC to immediately recall a released station. GC contacts NOM to coordinate the recall and informs FLIGHT of the station's availability.
3. DFE may request that GC recall a released station for data playback support between orbiter view periods. GC forwards the request to GSFC NOM. GSFC NOM schedules the station, if available, and if station personnel overtime limits will not be exceeded, and informs GC.

C. Station Support After Final LOS for View Period

1. DFE may request that GC extend a station's support requirements beyond final LOS + 70 minutes for data playbacks. GC coordinates with GSFC NOM as in paragraph B.3.
2. DFE notifies GC when all data requirements are satisfied. GC then informs GSFC NOM.

INFORMATION

Scheduled station activities are

- A. A station scheduled for STS support must participate in pre-AOS (MCC/station) configuration verification tests.
- B. A station must receive, record, and output voice, telemetry, command, and television data during AOS as specified per SCM. Station-generated tracking data is also required.
- C. If a recorder dump of OD TLM was received during AOS, a playback to MCC is required.
- D. A station may be requested to replay the RT OD TLM to MCC after LOS.

SOP 9.2

TITLE

SITE CONFIGURATION

PURPOSE

To define the procedure for station configuration control.

PARTICIPANTS

*INCO
COMM SUPPORT
DFE
COMMAND

GENERAL

- A. Stations will configure for nominal support for the applicable mission phase.
- B. Updates to the nominal configuration will be passed verbally to the affected station(s).

PROCEDURES

- A. Stations will be configured to provide support in the configuration listed in tables 9.2-1, 9.2-2, 9.2-3, and 9.2-4.
- B. Changes to the nominal configuration will be provided to DFE or COMMAND by INCO or COMM SUPPORT. Changes will be passed verbally to the affected station(s) on SITE COORD at H-10 minutes by DFE or COMMAND.
- C. Subsequent to the H-10 briefing, changes will be passed directly to the applicable OST controller by INCO or COMM SUPPORT. The affected controller will relay the change on SITE COORD.
- D. Handover and carrier up/down times will be included in the H-10 briefing.
- E. Nominal frequency usage

PM UL	-	2106.4 (STDN/TDRS)	1831.7 (RTS)
OD DL	-	2287.5	
FM DL	-	2250.0	
UHF	-	259.7	

Table 9.2-1. Launch configuration

Station	PM UL mode	OD DL mode	FM DL mode	COMM config ^a
MIL	25S	05	22	Alpha/Bravo
PDL	24S	03	22	Bravo
BDA	25S	05	22	Bravo
<p>^aNot applicable to throughput operation. ^bEcho to tower clear, switch to Papa. ^cAscent handover times</p> <p style="padding-left: 40px;">MIL to PDL L plus 45 sec. PDL to MIL L plus 2:30 28.5° MIL to BDA L plus 5:45 57° MIL to BDA L plus 6:30</p>				

Table 9.2-2. Landing configuration

Station	PM UL mode	OD DL mode	FM DL mode	COMM config ^a
MIL	25H	05	01	Lima
PDL	-	03	01	-
GDX	25H	05	01	-
DFR	-	03	-	Hotel

^aNot applicable to throughput operation.

Table 9.2-3. Orbit configuration

Station	PM UL mode	OD DL mode	FM DL mode	COMM config ^a
BDA	25H ^b	05	13	Charlie
CAN	25H	05	13	
GDX	25H ^b	05	13	
RID	25H ^b	05	13	
MIL	25H ^b	05	13	Charlie

^aNot applicable to throughput operation.

^bStation will be configured as backup to TDRS.

Table 9.2-4. RTS orbit configuration

Station	PM UL mode	OD DL mode	FM DL mode
CTS	24H	03	13
DGS	24H	03	13
GTS	24H	03	13
HTS	24H	03	13
IOS	24H	03	13
NHS	24H	03	13
TCS	24H	03	13
TTS	24H	03	13
VTS	24H	03	13

SOP 9.3

TITLE

REQUESTS FOR STDN RECORDED DATA (DELETED)

SOP 9.4

TITLE

STDN PROCEDURAL CHANGE REQUEST

PURPOSE

To define the procedure for requesting changes in STDN procedures during STS flight operations.

PARTICIPANTS

FD
*GC
INCO
FC TEAM
NOM

BACKGROUND

Operational procedures used by the STDN during STS flight operations are documented in the NOSP.

To change NOSP procedures during STS flight operations, a request must be generated in the MCC and sent to the NOM at GSFC.

PROCEDURES

- A. F/C requiring STDN procedural change documents required changes. (No form required. Use plain writing paper.) Information required is:
 1. Brief description of current procedure
 2. Required changes
 3. Rationale
 4. Signature and F/C position of person requesting the change
- B. F/C submits written procedural change request(s) to INCO.
- C. INCO reviews requested change for impact to other F/C disciplines, and, if required, coordinates changes with other affected support areas.

INCO coordinates with GC or FD if FCOH or Flight Rules, respectively, are affected by the requested change.
- D. After approval, INCO sends STDN procedural change request to GC.
- E. INCO or GC, as appropriate, coordinates any significant changes with FD before approval.
- F. GC reviews requested change, and if approved:

1. Adds appropriate NOSP procedure number(s)
 2. Prepares message containing changes for transmittal to GSFC NOM
 3. Sends message to Message Center for transmittal
- G. F/C initiating the change request obtains status of the request by contacting INCO or GC as appropriate.
- H. Copies of messages sent to GSFC are provided per standard distribution list(s) posted in the Message Center.

SOP 9.5

TITLE

GCMR TRANSMISSIONS

PURPOSE

To define the procedure for normal management of ground configuration message request (GCMR) transmissions.

PARTICIPANTS

*COMMAND	GC
INCO/COMM SUPT	NCC OPS (GSFC)
COMM CONTROL	OST (MCC)
WSC	

GENERAL

COMMAND controls reconfigurable parameters of the TDRSS for tracking, telemetry, and command data processing requirements for STS and DOD real-time support. This is accomplished through GCMR via GSFC/NCC.

PROCEDURES

INCO/COMM SUPT will coordinate with COMMAND all real-time reconfiguration changes a minimum of 5 minutes prior to the reconfiguration. INCO will specify the service (i.e., S-band, Ku-band, forward, return) and data rate/frequency. COMMAND will build the GCMR and inform NCC OPS and all concerned OST positions of the planned reconfiguration. COMMAND will transmit the GCMR and inform NCC of the transmission. After reception of the GCM at WSC, a 30-second drop of all data might occur. Ku-band mode changes for FM/PM will take 30 seconds to reconfigure at WSC, causing a loss of all data during reconfiguration.

SOP 9.6

TITLE

ACQUISITION OF SIGNAL

PURPOSE

To define the procedure for acquisition of signal and for reacquisition of signal.

PARTICIPANTS

COMMAND

*INCO/COMM SUPT/INSTRUMENTATION
GC

PROCEDURES

- A. Initial acquisition will usually, but not always, occur as the SSO comes into line-of-sight with TDRS from an occluded part of its orbit. The following sequence of events is used for initial two-way acquisition.
 1. At initial acquisition, COMMAND will verify that S-band modulation is on at the FEP and that UPD's are being received.
 2. COMMAND will monitor ORBITER STATUS. When receiver lock and NSP frame sync lock have been verified on the ORBITER STATUS display, COMMAND will make a "GO FOR COMMAND" announcement on COMMAND/GC loops.
 - a. If NSP frame sync lock does not occur, COMMAND removes and reapplies S-band modulation at the FEP, then checks for NSP frame sync lock on the ORBITER STATUS DISPLAY. When NSP frame sync lock has been verified, COMMAND will advise INCO/GC that a good acquisition has been established.
 - b. If NSP frame sync lock again does not occur, COMMAND advises INCO of the problem and initiates the trouble isolation procedure (MOH, vol. IV).
- B. If during a pass there is a loss of two-way lock, the following sequence of events is used for reacquisition of data.
 1. COMMAND will remove uplink modulation at the FEP.
 - a. COMMAND will check the ORBITER STATUS display and verify that static phase error is <70 kHz.
 - b. If <70 kHz, reenable uplink modulation.
 - c. If >70 kHz, continue with step 2.
 2. COMMAND will transmit a GCMR 98.03 Forward Reacquisition.
 3. COMMAND will monitor ORBITER STATUS for S-band receiver lock.

- a. When ORBITER STATUS displays receiver lock, COMMAND will apply modulation at the FEP. Then, follow Initial Acquisition Sequence, step 2.
- b. If no receiver lock is observed, begin Return Reacquisition procedure.
4. Return Reacquisition procedure.
 - a. COMMAND will transmit GCMR 98.03 Return Reacquisition. Then, follow Initial Acquisition Sequence.
 - b. If first Return Reacquisition failed, COMMAND will attempt to establish return service noncoherent mode by sending GCMR 98.04 noncoherent mode followed by GCMR 98.03 Return Reacquisition.
 - c. If second Return Reacquisition failed, COMMAND will inform INCO/GC and respond to direction.
- C. For Ku-band initial acquisition, the following sequence of events is used.
 1. At initial acquisition, COMMAND will verify that Ku-band modulation is ON at the FEP and that UPD's are being received.
 2. COMMAND will monitor Ku-TRK indicator on ORBITER STATUS.

When Frame Sync Lock (216 kbps) or Ku-TRK/Data Good (72 kbps) has been verified, COMMAND will advise INCO/GC that a good acquisition has been established.

 - a. If Frame Sync Lock (216 kbps) or Ku-TRK/Data Good (72 kbps) does not occur, transmit GCMR 98.03 Forward Reacquisition. Then check for Ku-TRK indicator reapply modulation and check for Frame Sync Lock (216 kbps) Ku-TRK/Data Good (72 kbps). After verification, COMMAND will advise INCO/GC that a good acquisition has been established.
 - b. If Frame Sync Lock (216 kbps) or Ku-TRK/Data Good (72 kbps) does not occur, advise INCO/GC of the problem and respond to their direction.
- D. If during pass there is a loss of Ku-TRK, the following sequence of events will be followed:
 1. If in GPC mode, the SSO initiates an antenna scan sequence about its antenna direction at the time of loss after 20 seconds. If in GPC Designate mode, no scan will be initiated.
 2. If forward link carrier is acquired during scan, acquisition is complete. A complete scan requires 3 minutes and restarts every 20 seconds.
 3. The SSO will default to S-band if the Ku-band source was originally selected to the NSP.
 4. INCO has the option of operating normally with Ku-band in either the GPC (auto track) or GPC Designate (program track) mode.
 5. TDRS program track mode is considered nominal. INCO and COMMAND will coordinate the selection of TDRS auto track as required.

SOP 9.7

TITLE

TDRS SCHEDULING, TDRSS CONFLICT RESOLUTION, AND FCT DETERMINATION OF MISSION PRIORITY PERIODS

PURPOSE

To define the procedure for scheduling of TDRSS resources, resolving conflicts with other TDRSS users, and determining critical and highly desirable mission periods for shuttle flights.

PARTICIPANTS

FD
INCO
*GC
HOUSTON COMMAND
PAYLOADS
FAO
PAO
FDO
HOUSTON TRACK
GSFC/ND
GSFC/NCC SCHEDULING

GENERAL

The flight control team is responsible for premission designation of priority periods during each flight that are considered higher than routine according to the definitions and criteria that follow. These priority designations become significant during all TDRSS scheduling/rescheduling efforts when the GSFC network must resolve conflicts between two or more users who are vying for the same network resources during overlapping time periods.

The GSFC forecast scheduling team determines which user schedules get accepted and which get denied when the number of user requests for a given time period exceeds the network resources. This is accomplished during the forecast scheduling period (approximately L-21 days through L-14 days) and is based upon the priority designations submitted by each project. At the end of the forecast period, a single user will be scheduled for each string of network resources; those scheduled users cannot involuntarily be forced to forfeit their time slot by an equal or lesser priority user. That is the significance to accurately designating, in the premission planning, those activities that are of higher priority. When attempting to resolve conflicts during either the forecast or real-time periods, GSFC NCC SCHEDULING will explore all possible options to resolve the issue to both users satisfaction. These options include use of other TDRS satellites that may have limited capabilities, such as TDRS-Spare or TDRS-ZOE.

The procedure for upgrading, downgrading, or modifying the priority designations is described below. Prudence must be used when (re)designating priority periods, whether in the forecast or real-time periods, to ensure that they meet the criteria and definitions. Any perceived abuse of

the higher categories could result in other users elevating their priority designations to match and possibly overriding shuttle requests.

There are four categories of priority, as follows:

Shuttle Critical - An orbiter event or period requiring continuous command, telemetry, track, video, or air-to-ground voice capability to monitor or maintain the orbiter in a safe configuration or prevent possible loss or harm to the orbiter or crew.

Payload Critical - A payload event or period requiring continuous command, telemetry, track, video, or air-to-ground voice to do the following:

1. Maintain the payload in a safe configuration to prevent loss or damage to the payload.
2. Place a payload in a configuration to support continued science or prevent loss of science.
3. Support a coordinated activity between a shuttle payload and a ground- or space-based instrument or launch vehicle that cannot be rescheduled.
4. Accomplish a primary science objective that cannot be rescheduled without loss of a primary payload objective, or would result in a serious threat to a payload accomplishing its minimum objectives.

Highly Desirable - An activity that would result in a significant replanning impact if missed.

Routine - All remaining mission time periods that do not meet the criteria of the three categories above.

The shuttle critical category currently consists of agreed-upon generic times covering critical periods before and after the events listed in the table below. These times should be adjusted if required by circumstances. Rationale must be provided for extending the windows longer.

High priority PAO events normally fall into the highly desirable category and take precedence over routine operations, but are overridden by critical operations when there is a conflict for resources.

Event	Start critical period	End critical period
Launch (rendezvous mission)	Launch minus 4 hours	Last rendezvous burn on FD1
Launch (nonrendezvous mission)	Launch minus 4 hours	Go for orbit ops"
Payload deploy	Deploy minus 3 hours	Final sep burn plus 1 orbit delay
Undocking	Undocking minus 3 hours	Final sep burn plus 1 orbit delay
Rendezvous/grapple/ retrieve	2 hours before first day of rendezvous burn (X crew wakeup)	Payload berthing plus 1 orbit delay
Rendezvous/docking	2 hours before first day of rendezvous burn (X crew wakeup)	Hatch opening plus 1 orbit delay
EVA	EVA egress minus 1 hour	EVA ingress plus 1 hour
Landing	TD minus 5 hours	WOW

PROCEDURES

A. Determining and modifying critical or highly desirable mission periods

1. At L-30 days, any flight controller with a mission activity considered other than routine by definition will provide the FAO with the following information for each period.
 - Start and stop times in MET
 - Category (shuttle critical or highly desired)
 - Whether TDRSS K-band forward link services are required
 - Rationale for the requirement

The K-band service information is required so that the GSFC scheduler will know whether a different TDRS satellite can be substituted for the standard pair in case of conflict.

2. The FAO will combine the inputs from all flight controllers into a master table that will be maintained during the flight by the FAO position. A copy will be provided to the GC by L-25 days. The GC will provide a copy to HOUSTON COMMAND.
3. The GC will discuss and coordinate the mission priority table information with both the GSFC/ND and FD before L-21 days. This step will be completed before HOUSTON COMMAND sends the first set of TDRSS schedule requests to GSFC NCC SCHEDULING, which occurs no earlier than L-21 days.
4. The GSFC ND will ensure that coordinated priority times are provided to the GSFC FORECAST SCHEDULER. All critical times will be included in the Interim Support Instruction (ISI) sent to all network entities by GSFC.
5. Once each 24 hours during the mission, the FCT will review the priority periods for the next 72 hours. Any changes to the current table will be submitted to FAO, providing the same information as in step A.1 above. FAO will provide GC with updated copies of the table as soon as practical. Upon receipt of changes, GC will begin immediate coordination with the GSFC ND (or representative), and provide a copy to HOUSTON COMMAND. HOUSTON COMMAND will provide the changes to the GSFC NCC SCHEDULER.

B. Scheduling TDRSS services for nonrendezvous missions

1. At L-25 days, FAO will provide a table to INCO that covers the entire mission and lists all early TDRS handovers. INCO will pass the tables to HOUSTON COMMAND for use in building schedule requests.
2. At L-25 days, FDO will provide HOUSTON TRACK with vectors covering the entire mission. HOUSTON TRACK and HOUSTON COMMAND will schedule MCC resources to build satellite acquisition tables for entry into the TDRSS scheduling system.

3. At approximately L-21 days (per the standard TDRSS forecast scheduling template), HOUSTON COMMAND will transmit TDRSS schedule requests for the first week of the mission to GSFC NCC SCHEDULING.
- C. Scheduling TDRSS services for rendezvous missions
1. At L-25 days, FAO will provide a table to INCO that covers the entire mission and lists all early TDRS handovers. INCO will pass the tables to HOUSTON COMMAND for use in building schedule requests.
 2. At L-25 days, FDO will provide HOUSTON TRACK with vectors for a midrange phase angle profile that covers the entire mission. HOUSTON TRACK and HOUSTON COMMAND will schedule MCC resources to build satellite acquisition tables for entry into the TDRSS scheduling system. The schedules built from this data will act as placeholders; it is expected that these vectors may require updating at approximately L-7 days.
 3. At approximately L-21 days (per the standard TDRSS forecast scheduling template), HOUSTON COMMAND will transmit TDRSS schedule requests for the first week of the mission to GSFC NCC SCHEDULING.
 4. If required, at L-7 days FDO will provide HOUSTON TRACK with updated vectors covering the entire mission. HOUSTON TRACK and HOUSTON COMMAND will schedule MCC resources to build satellite acquisition tables for entry into the MCC scheduling system. FDO notifies GC if updated vectors or TDRSS schedules are required. GC notifies and coordinates the update requirements and the expected date of transmission with HOUSTON COMMAND and GSFC ND.
 5. As soon as updated schedules are built and ready for transmission to GSFC, HOUSTON COMMAND will delete the placeholder schedules and transmit the updated schedule requests to GSFC NCC SCHEDULING.
- D. Rescheduling TDRSS services for nonrendezvous missions following a launch slip (launch occurs later in window)
1. GSFC Scheduling will delete TDRS schedules postlaunch, starting with the first TDRS-West pass and all subsequent events for that day.
 2. HOUSTON COMMAND will slide (bias) the time for the deleted events by the amount of time that launch was delayed, and retransmit the new schedule requests to GSFC NCC SCHEDULING.
 3. HOUSTON COMMAND will notify GC of any schedules being rejected because of requested times overlapping with other users confirmed schedules (a.k.a. TDRSS conflicts). GC will notify FD of the scope (number of rejects, first TDRSS pass impacted) of the conflict list and the status of efforts by GSFC to resolve conflicts with other users.
 4. When all attempts to resolve the conflicts have been exhausted and the mission does not get all the TDRSS time requested, the GSFC NCC SCHEDULER will notify HOUSTON COMMAND. HOUSTON COMMAND will enter the data concerning the conflict on the TDRSS conflict spreadsheet and notify GC when the sheet is available

on the workstation. GC will notify FD by announcing on the FD loop that a new (or updated) TDRSS conflict sheet is on the workstation.

- E. Rescheduling TDRSS services for rendezvous missions following a launch slip (launch occurs later in window)
 - 1. HOUSTON TRACK will generate satellite acquisition tables postlaunch, as time permits, for scheduling TDRSS times until the planning satellite acquisition table becomes available at approximately 6 hours MET.
 - 2. HOUSTON COMMAND will build and transmit updated TDRSS schedules from the current satellite acquisition table; the first 24 hours of the mission should become available within 6 hours after liftoff.
 - 3. HOUSTON COMMAND will notify GC of any schedules being rejected because of requested times overlapping with other users confirmed schedules (a.k.a. TDRSS conflicts). GC will notify FD of the scope (number of rejects, first TDRSS pass impacted) of the conflict list and the status of efforts by GSFC to resolve conflicts with other users.
 - 4. When all attempts to resolve the conflicts have been exhausted and the mission does not get all the TDRSS time requested, the GSFC NCC SCHEDULER will notify HOUSTON COMMAND. HOUSTON COMMAND will enter the data concerning the conflict on the TDRSS conflict spreadsheet and notify GC when the sheet is available on the workstation. GC will notify FD by announcing on the FD loop that a new (or updated) TDRSS conflict sheet is on the workstation.
- F. Rescheduling TDRSS services for nonrendezvous missions following a 24-hour launch scrub.
 - 1. HOUSTON COMMAND will delete all TDRSS schedules through the new launch date and time plus 6 hours, then slide the times for the deleted events by the amount of time that launch was delayed and transmit the new requests to GSFC.
 - 2. GSFC NCC SCHEDULING will transmit new TDRSS conflict data to HOUSTON COMMAND.
- G. Rescheduling TDRSS services for rendezvous missions following a 24-hour launch scrub.
 - 1. Postscrub, FDO will generate trajectory data in the MOC for the next launch attempt.
 - 2. HOUSTON TRACK will generate satellite acquisition tables for the new launch date and time.
 - 3. HOUSTON COMMAND will build and transmit new schedule requests, delete the existing schedule in the GSFC database.
 - 4. HOUSTON COMMAND will notify GC of any schedules being rejected because of requested times overlapping with other users confirmed schedules (a.k.a. TDRSS conflicts). GC will notify FD of the scope (number of rejects, first TDRSS pass impacted) of the conflict list and the status of efforts by GSFC to resolve conflicts with other users.
- H. Conflict resolution (premission)

1. At approximately L-14 days, the GSFC NCC SCHEDULER will transmit TDRSS conflict data from the first week of the mission to HOUSTON COMMAND.
 2. HOUSTON COMMAND will provide the conflict information for at least the first 24 hours of the mission to GC. GC will e-mail the conflict data for the first 24 hours to mission leads in the following positions: FAO, INCO, PAYLOADS, FDO, PAO, and FD.
 3. Within 2 working days of receiving the TDRSS conflicts from the GC, all flight controllers are required to provide any comments or issues to GC. GC will discuss any issues with the GSFC ND and the FD and provide results to the appropriate flight controllers.
 4. TDRSS conflict data received from GSFC for the following will not be forwarded to the FCT unless specifically requested:
 - a. Conflicts for the placeholder schedules on a rendezvous mission.
 - b. Conflicts after the first 24 hours for any mission.
 5. For rendezvous missions, if conflicts are received covering the L-7 day vector data from GSFC prior to console manning for the mission, GC will distribute the first 24 hours of conflicts to the FCT leads via e-mail as described in H.2 above.
- I. Conflict resolution on console
1. A TDRSS conflict data file is available for viewing or printing on the workstation DNAV menu. When a new conflict appears in the table, GC will announce on the FD loop that the conflict table has been updated.
 2. Once each 24 hours during the mission during a designated (planning) shift, the FCT will review any conflicts on the table covering the next 72 hours. The FCT will provide response (either positive or negative) to GC at the end of the designated shift.
 3. A flight controller responding with an issue for a conflict will be required to provide rationale for elevating the priority to a higher status. Any changes to the priority status require FD concurrence.
- J. Scheduling TDRS-East Orbit One
- The TDRS-East pass on orbit one will be scheduled to ensure continuous support for all launch delays. In all cases, the TDRS-East orbit one schedule will start 30 minutes before the opening of the launch window. The duration of the TDRS-East event will include the following:
1. 30-minute prelaunch period, plus
 2. The duration of the launch window, plus
 3. 45 minutes to cover the duration of the TDRS-East pass, plus
 4. Padded time for the following unexpected situations:
 - a. 10 minutes extra pad for short launch windows (5 to 10 minute window)
 - b. 20 minutes extra pad for midrange launch windows (approximate 1-hour window)
 - c. 30 minutes extra pad for long launch windows (2.5-hour window)

**SOP 10
MCC INTERNAL DATA MANAGEMENT**

SOP 10.1

TITLE

MISSION DATA REQUEST FORM (MDRF)

PURPOSE

To identify the form used by F/Cs to request mission data products and define how data requests are handled.

PARTICIPANTS

FC
FC TEAM
GC
*HOUSTON VOICE
FC

PROCEDURES

- A. An MDRF, JSC form 629, is required whenever an F/C needs mission data or data products and cannot obtain them by a direct console workstation or MED terminal entry.
- B. All such requests are documented on an MDRF (figure 10.1-1) in triplicate.
- C. An originator faxes an MDRF to HOUSTON VOICE at 483-5339 then calls HOUSTON VOICE on the VOICE CONTROL loop to alert them of an incoming fax.
- D. HOUSTON VOICE reviews the MDRF for completeness and legibility and to screen unreasonable MDRFs. HOUSTON VOICE asks the originator or returns the MDRF to the originator for all missing information required. HOUSTON VOICE then adds a control number and priority number to the MDRF and any other required information to the CONTROL BLOCK.
 1. In the event of priority conflict, HOUSTON VOICE coordinates with the requesters for conflict resolution.
 2. If the conflict persists, HOUSTON VOICE coordinates with GC for conflict resolution.
 3. For unreasonable MDRFs, HOUSTON VOICE annotates the MDRF and returns it to the originator.
- E. HOUSTON VOICE schedules the data or data product, keeps the original MDRF or fax, and forwards a copy to the appropriate implementer.
- F. HOUSTON VOICE informs the requester when the requested data is ready.
- G. When the request on the MDRF is completed, HOUSTON VOICE closes the MDRF.
- H. Instructions for filling out an MDRF (figure 10.1-1) are defined below. Refer to the MDRF completion table (table 10.1-1) to determine which MDRF blocks and instructions apply to each request type.

MISSION DATA REQUEST						
① REQUEST TYPE	② SOURCE/FORMAT/ RATE/DVIS/EVENT	③ START/STOP GMT OF DATA				④ CONFIGURATION
A. PLAYBACK: VOICE VIDEO B. VOICE TAPE: VOXED W/GMT UNVOXED W/O GMT C. COMMAND HISTORY: _____ D. MEMORY DUMP E. VIDEO TAPE F. OTHER (SPECIFY) _____		DAY	HOUR	MIN	SEC	A. VOICE PLAYBACK LOOP: 1 PLBK 1 2 PLBK 1 OTHER: _____ 1 PLBK 2 2 PLBK 2 1 PLBK 3 2 PLBK 3 1 PLBK 4 2 PLBK 4
		MCC RECEIPT GMT				B. VIDEO FORMAT: VHS 1/2" 3/4"
						(WHEN APPLICABLE) APPROVED BY: _____ NAME / POSITION
⑤ REQUESTED OUTPUT: TYPE: _____ No. of Copies: _____		PRIORITY: _____ SITE/ORBIT: _____ RT/DUMP: _____ TAPE NO.: _____ COMMENTS				⑥ SPECIAL INSTRUCTIONS: (WHEN APPLICABLE) APPROVED BY: _____ NAME / POSITION
⑦ ORIGINATOR: _____ POSITION: _____ CONSOLE #: _____ ROOM: _____ GMT OF REQUEST: _____ PHONE/LOOP: _____ OUTPUT NEEDED (GMT): _____ SHORT STATEMENT OF TIME CRITICALITY: _____ DELIVER OUTPUT TO: _____						
						<div style="border: 1px solid black; width: 80px; height: 20px; margin: 0 auto;"></div> MDRF NUMBER
JSC Form 628 (Rev Aug 93) (PerForm Pro Plus Aug 93)						

Figure 10.1-1. Mission Data Request form (MDRF)

Table 10.1-1. MDRF completion table

Product required	MDRF block/instruction						
	1	2	3a	4	5	6	7
Playback video	A		GMT				All
Playback video + voice	A	B	GMT	A			All
Playback voice	A	B	GMT	A			All
Video tape	F	E	GMT			D	All
Voice tape with or without GMT	B	B	GMT			A	All

^aDuring a simulation, use SGMT for the data time interval.

^bAlso specify telemetry source (SITE/ORBIT/RT/DUMP).

Block Block title

1. REQUEST TYPE - Circle the appropriate letter (A,B,C,D,E,F,G)
 - a. For A, also circle TLM, VOICE, or both TLM and VOICE. MDRF is not required for Video PB but is required for video cassette duplication.
 - b. For B, also circle W/GMT or W/O GMT; VOXED or UNVOXED.
 - c. For MCC command history, use block 1h (reference SOP 3.2.5).
 - d. For memory dump printout, also attach form (FCOH figure 4.6-1).
 - e. For F, self-explanatory.
 - f. For G, please clearly describe your request to make it easily understood; e.g., SHIP RANGE TAPE TO MCC; DATA RETENTION INTERVAL CHANGE; SPECIAL BUILDING 12 COMPUTER RUN; MCC CMD HIST, VIDEO PB.

2. SOURCE/FORMAT/TYPE/RATE
 - a. For voice PB or dub, specify the voice source, such as DUMP ch 1, DUMP ch 2, internal loop name, and keyset position number.
 - b. For OTHER requests, specify source/format/type/rate as required.
 - c. For video PB or dub, specify title or name of activity.

3. START/STOP GMT OF DATA - Specify only one GMT interval per MDRF. During simulations, use an SGMT interval.

For memory dump printouts, specify SITE/ORBIT that received the memory dump and specify RT/DUMP telemetry.

NOTE

The remaining sections of block 3 are not used by the originator, but are reserved for HOUSTON VOICE use.

MCC RECEIPT GMT - Time of receipt of data at MCC (in GMT), filled in by HOUSTON VOICE. Receipt time is recorded on the MORF log kept by HOUSTON VOICE.

PRIORITY - Specified by HOUSTON VOICE based on information in block 7 of the MDRF

1 = Immediate action, interrupt other processing

2 = Begin by MDRF receipt time plus 15 minutes

3 = Begin by MDRF receipt time plus 1 hour

4 = Begin by MDRF receipt time plus 4 hours

5 = Not time critical

SITE/ORBIT - Data location (HOUSTON VOICE input, except as noted in 3).

RT/DUMP - Data type (HOUSTON VOICE input, except as noted in 3).

TAPE NO. - STDN or CCRF tape number (HOUSTON VOICE input).

4. CONFIGURATION - Circle the appropriate letter (A,B,C).
 - a. If A, also circle the OPS no. 1 or OPS no. 2 loop 1, 2, 3, or 4, or both 1 and 2, or both 3 and 4, or specify another internal loop to hear the voice PB on.
 - b. If B, circle VHS 1/2" or VHS 3/4"
5. REQUESTED OUTPUT
 - a. For voice dubs, specify cassette and number of copies.
 - b. For video dub, output product will be cassette.
 - c. For other request types, specify the type and number of copies of all required outputs.
6. SPECIAL INSTRUCTIONS - Supply these if necessary.
7. The originator signature, console position, phone and DVIS loop, console number, and room or mail code must be specified.

GMT of REQUEST is actual GMT (not SGMT) at the time the MDRF is filled out by originator.

The originator must specify when the output is needed (GMT not SGMT) and why the request is critical, ASAP can be specified rather than a GMT.

IMPORTANT

Use the phrase SYSTEMS PRIORITY to identify a request for data when a known or suspect system failure condition exists. HOUSTON VOICE will process SYSTEM PRIORITY MDRF's before ASAP and routine requests.

SPECIFIC PROCEDURES

The procedures performed for each of the different request types (1), in addition to the previously mentioned procedures, which are performed for all MDRF's.

A. Voice PB

1. HOUSTON VOICE coordinates with user.
2. User informs HOUSTON VOICE of the completion status after they are satisfied with the voice PB.
3. HOUSTON VOICE closes MDRF.

B. TV PB

1. HOUSTON VOICE routes copy of MDRF to HOU TV.
2. HOUSTON VOICE coordinates between the user and HOU TV.

C. Voice dub

1. Two types of voice dub: with GMT, without GMT.
2. User determines voxed or unvoxed. (Voxed eliminates quiet blank spaces, such that voice is continuous.) Vox statement recorded in Special Instructions.
3. HOUSTON VOICE coordinates between user and CCRF.
4. For quick-voice," no MDRF is necessary, and GC is called by user.

5. Users requesting a high priority can have their request processed, provided they have GC approval on the MDRF.
6. If a dub of a keyset is requested, the requester must obtain prior approval from the primary user of that keyset. The primary user must sign the MDRF for it to be processed. Note: Authorization for A/G Voice in the time frames of Private Medical Conference is addressed in FCOH SOP 6.3.

deleted

SOP 10.2

TITLE

DATA PRODUCT RETENTION

PURPOSE

To define the data retention period for data products generated during MCC Operations Support. In addition, this procedure defines the method for "holding" data products past the nominal retention period and the approval process for disposition of mission sensitive data.

PARTICIPANTS

HOUSTON VOICE	CCRF
MCC FC TEAM	ODRC
*GC	COMMAND
MER OPS	FSM
MCC COMPUTER OPERATIONS OFFICE	DFE
VOICE RECORDERS	

GENERAL

This procedure is consistent with the NASA Memorandum DC2-90-09, dated 3/15/90, from DA2/Assistant Director for Space Shuttle Programs (Subject: MCC Data Tape Retention) and the STSOC Transmittal Form (STF) No. 89-DC-121, dated 6/8/89, from DC32/G. M. Kane to RSOC, R01A/G. S. Lunney (Subject: New Policy on Near-Real Time (NRT) and Consolidated Communications Recording Facility (CCRF) tape retention). This procedure will be updated to maintain consistency with MOD policy changes.

PROCEDURES

- A. Table 10.2-1 defines the operational data type, location, and nominal retention period for MCC recorded data.
- B. Recorded data products may be extended past nominal retention period via the following process:
 1. All Data (except CCRF) - Submit an MDRF to the HOUSTON VOICE prior to expiration of the normal retention period. (Reference FCOH SOP 10.1 for MDRF completion and routing instructions.)

The MDRF will clearly identify the data as to type, date, start/stop time, and period of extension. Indefinite retention periods will not be approved; a specified retention end date is required.

HOUSTON VOICE will initiate appropriate action to ensure that the data products will be retained for the required period.

2. CCRF Data - Submit an MDRF to the CCRF prior to expiration of the normal retention period with details as specified in 2.A above.

The CCRF will initiate action to ensure retention of requested data.

- C. At the conclusion of the normal or extended retention period (per MDRF), disposal or transfer of all data products will be accomplished as indicated in table 10.2-1. NO ADVANCE WARNING WILL BE GIVEN MCC USERS.

EXCEPTIONS

The CCRF METRUM is considered sensitive with potential program impact if released prematurely. The GC office has sole authority, following appropriate coordination, to approve release and reuse of these Mission Data CCRF tapes.

- A. ALL CCRF METRUM data tapes will be retained automatically and released for disposition per table 10.2-1 guidelines in the following manner:

CCRF METRUM Tapes - The MCC CCRF will forward a complete listing of CCRF tapes to the GC office within 5 days following each mission. The GC will review the listing and submit a formal approval to the MCC CCRF specifying which tapes may be released and reused.

Release of CCRF METRUM tapes containing KSC LPS data from Mission Support must be coordinated with and approved by MER Operations.

- B. In the event of a declared mission contingency, the FCOH SOP 2.8, JSC Contingency Plan, will be implemented and will take precedence.

Table 10.2-1. Recorded data attention/disposition

Product/recorder type	Data type(s)	Retention location	Retention period/disposition	
			Sims, PAD, other	Termination count and flight
METRUM S-VHS	A. TDRS E/W S-BAND CH1, CH2, tracking B. RTS RT, dump C. GSFC 1.544 Mbs, 840 Kbs D. LLTD 1	CCRF, room 112A	Orbit Sim-7 days VALS-7 days PAD-EOM E-T-E-EOM Ascent/Entry 30 Days	Retain complete set for last flight of each vehicle until reflight EOM (see note)
	E. TDRS FWD link F. Command ECHO G. FEP output	CCRF, room 112A	Orbit Sim-7 days VALS-7 days PAD-EOM E-T-E-EOM Ascent/Entry 30 Days	Retain complete set for last flight of each vehicle until reflight EOM (see note)
	H. KSC LPS I. KSC T-0 J. SSME 1, 2, & 3	CCRF, room 112A	Sim-7 days VALS-7 days PAD-EOM E-T-E-EOM Ascent/Entry 30 Days	Retain complete set for last flight of each vehicle until reflight EOM (see note)
28-track PDRE high-density recorder 1-inch (EM1 9000SL)	A. High-rate experiment/payload data B. OPS Recorder dump data	CCRF, room 112A	Sim-7 days VALS-7 days PAD-EOM E-T-E-EOM	Retain until reflight or until released by GC and DACON concurrence (see note)
Voice recorders	MCC analog voice	HOUSTON VOICE, room 127	7 days	90 days then transfer to archives (Chief/JL Audio Visual Services)

Table 10.2-1. Recorded data attention/disposition

Product/recorder type	Data type(s)	Retention location	Retention period/disposition	
Voice recorders	OPS recorder dump voice	Houston Voice, room 127	N/A	90 days then transfer to archives (Chief/JL Audio Visual Services)
CM log tapes	Operator actions MED I/O, device I/O, etc.	Room 116	30 days	Retain for 30 days after flight termination
Real-time host CCS log tape, CCT	Input/output log of all TPC, NCTC, NOM MED's, DTE, etc.	Room 116	30 days *	30 days
MOC checkpoint CCT	Checkpoints of the MOC job within the real-time Host	Room 116	30 days *	30 days
Host system log (sys log database printout)	Operator actions, device I/O messages	Paramax U03D	20 days, then discard	120 days, then to archive for 1 year, then discard
MOC online printer output dataset	MOC job advisories	Paramax U03D	120 days, then discard	120 days, then to archive for 1 year, then discard
Host line printer output dataset	All job JCL, SME output, etc.	Paramax U03D	120 days, then discard	120 days, then to archive for 1 year, then discard

*TMC will manage these CCT outputs.

**SOP 11
COMPUTER OPERATIONS - ONLINE**

SOP 11.2

TITLE

L - 1 DAY MOC ASCENT CONFIDENCE RUN

PURPOSE

To define actions required to configure the MCC for a MOC ascent confidence run and to execute the run.

PARTICIPANTS

MCC FC TEAM	COMPUTER SUP
*GC	COMM TECH
*FDO	COMM CONTROL
DFE	DYNAMICS

GENERAL

A large number of MOC database parameters are updated during the week before launch, especially in the Trajectory application. The MOC confidence run has been established to ensure the quality of the MOC ascent database, using a telemetry tape chosen during the final flight-specific ascent sim.

PROCEDURE

NOTE

The MOC confidence run will be done at approximately L-24 hours.

- A. COMPUTER SUP will bring MOC up to support the mission (i.e., day 1 of the current year).
- B. DYNAMICS will then initialize the Trajectory application (P80 MED) for flight.
- C. The FDO Team will then configure the MOC for flight. Notify GC when ascent database is configured and ready for checkpoint.
- D. COMPUTER SUP will take MOC or MOC/DSC checkpoint.
- E. Upon receiving a GO from FDO, the GC will notify the FCT that the MOC is being configured for the MOC confidence run and to hold inputs not required for the confidence run.
- F. The following are special steps:
 1. The FDO Team will re-input P80 for the sim launch date.
 2. DYNAMICS will update the liftoff time (D65 MED), using the "i" time format to the sim launch date if required.

3. COMPUTER SUP will step the MOC ahead to day 180, if required due to the sim launch date being after day 180.
 4. If a ground-up rendezvous flight, DYNAMICS will then update the GMT of phase pane change (K13 MED), reset the IY reference time (K83 MED) to the sim liftoff time, and load the sim IY's (K81 MED).
 5. COMPUTER SUP will take another checkpoint that will be used only for the MOC confidence run. This checkpoint will be used if the MOC confidence run must be repeated.
- G. DFE will verify that ODRC and FEP JSC RT OD data are not configured for the duration of the confidence run. DFE will request that COMM CONTROL disconnect the JSC R/T OD group and deallocate the JSC R/T OD group from the DLRT FEP.
 - H. A run time will be chosen (XT-2 min) at which time DFE will begin flowing telemetry from a previous ascent sim case. (The sim run will be chosen by FDO during the final flight-specific sim.)
 - I. COMPUTER SUP will step the MOC timer ahead to sim time, and the ascent run will be executed (T-2 through approximately 12 min MET).
 - J. After the MOC has been synchronized with the tape, DYNAMICS will take the MOC to launch phase.
 - K. At the completion of the confidence run, if no anomalies occurred or when corrective action is confirmed, COMPUTER SUPV will recycle to checkpoint from step 4. If an anomaly occurred during the run and corrective action is taken, the run may be repeated, but this is not required.
 - L. GC will have COMPUTER SUP step the MOC ahead to real time for flight support.
 - M. DFE will configure the FEP and equipment for mission support.
 - N. The GC will notify the FCT that the confidence run is complete.
 - O. In the event of a launch scrub, only if the MOC is taken down from flight support due to an extended delay and the MOC is brought up cold, will the MOC confidence run have to be repeated.

SOP 11.3

TITLE

MOC CENTRAL PROCESSING UNIT LOADING CONTROL (DELETED)

SOP 11.4

TITLE

MOC SYSTEM FAILURE RECOVERY

PURPOSE

To provide procedures and guidelines to be followed when system hardware or software failures dictate a system selectover, restart, or coldstart.

PARTICIPANTS

FC TEAM	*GC
FDO	FD
*COMPUTER SUP	FSM
TRACK	COMMAND
	DFE

GENERAL

During real-time operations, three options are available for restoration of MOC support when MOC operation has degraded or is suspect: selectover, restart, and coldstart. These options are defined as follows.

A. Selectover

1. Only applicable when an MOC/DSC is available. Selectover causes the DSC to become the MOC and vice versa.
 - a. Time required for selectover is less than 1 second.
 - b. There is no loss of data.
 - c. All configuration data, such as display requests, etc., are not disturbed by selectover.
 - d. New MOC contains identical real-time data as old MOC at time of selectover.

B. Restart

1. Restart from checkpoint tape - Checkpoint tape loaded as base for MOC restart.
 - a. Time required for restart from checkpoint tape is approximately 10 to 15 minutes, and includes
 - Transfer of restart data
 - Resumption of applications processing
 - b. Use of checkpoint tape and permanent MED disk file results in an MOC configuration approximately the same as prerestart configuration. All manual inputs and configuration changes to the MOC initiated after the checkpoint tape was made are lost and, if still required, must be reexecuted, except permanent MED entries.

- c. After restart from checkpoint tape, all F/C's should recheck configuration, with special attention to
 - Display format selection - All F/C's
 - Command panel configuration - All F/C's
 - Command load generation - All F/C's
 - Trajectory planning data - FDO
 - TPC configuration/format selection - DFE
 - Console and command application status - COMMAND
- 2. Restart from computer-to-computer load - All data required to create a DSC provided by the MOC.
 - a. Designed primarily for use in configuring a host to a DSC while the current MOC is operating satisfactorily.
 - b. Time required for a computer-to-computer restart is 10 minutes.
- C. Coldstart - Coldstart is the process of loading a mission operational program into a host computer that is assumed to contain no programs other than the operating system. The FC team is required to enter all inputs necessary to configure the host to a usable MOC.

NOTE

Coldstart is not planned for use during operational support periods, except at the beginning of the period.

PROCEDURES

- A. Coordination for restart
 - 1. FC team member identifies problem in MOC processing and advises GC.
Problem verified by COMPUTER SUP/TRK/COMMAND/FSM.
 - 2. COMPUTER SUP evaluates need for an MOC restart as appropriate and advises GC.
 - 3. GC advises the FD that an MOC restart is required and provides an estimated time to complete the action.
 - 4. After FD concurs, GC directs COMPUTER SUP to initiate restart.
 - 5. COMPUTER SUP advises GC when action is complete.
 - 6. GC announces on FD loop that MOC restart has been completed.
 - 7. FC team verifies console configuration.
 - 8. After MOC restart FDO announces on FD loop when trajectory related data is valid.

NOTE

During all restarts, users must not make any inputs to the system until GC announces "MOC is GO for inputs."

- B. OPS Immediate Selectover
1. In the event of MOC failures which are total and the need for support restoral action is obvious, COMPUTER SUP initiates selectover.
 2. COMPUTER SUP announces on FD loop that MOC selectover has been completed.
- C. As a result of a restart from checkpoint tape, if a significant F/C effort is needed to restore the MOC to its previous configuration, then a new checkpoint tape should be made. GC verifies that all positions are ready before giving COMPUTER SUP a GO to make the checkpoint tape.
- D. Table 11.4-1 summarizes the recovery guidelines and gives approximate recovery times for each type of failure. The following statements may also apply in the estimation of recovery time:
1. During simulations, tests, and missions (when the situation allows time) MOCJOB or system standalone dumps may be taken to aid in troubleshooting. This will add approximately 10 minutes to recovery time.
 2. Drain downtime is defined as the time required to terminate and purge existing jobs running in a host. All times given in the recovery guidelines assume no drain downtime is necessary.
 - During mission operation, no drain downtime will be allowed. The host will be made available immediately via system reset.
 - During simulations, when running with a MOC only and it becomes necessary to move operations to another host, no drain downtime will be allowed. The host will be made available immediately.
 - During simulations, when running a MOC/DSC and one host is lost due to failure, GC will advise FD of single HOST operation.
 - During tests other than flight simulation, drain downtime will normally be allowed.

Table 11.4-1. MOC failure recovery

Type of failure	Activity	Recovery guidelines	Requirements to meet recovery guidelines
Catastrophic failure such as: § Loss of host; i.e., red light on master console § Loss of any MOC function that is still good in the DSC	Mission critical MOC/DSC	§ Selectover to DSC immediately. Inform Flight Director and GC § Determine if the lost capability is due to a host H/W or S/W problem or loss of peripheral equipment § Once host is back operational and preconditioned for DSC, coordinate a checkpoint and CPU-to-CPU to get back to MOC/DSC	§ Selectover capability exists
	Simulation critical MOC/DSC	§ Selectover to DSC immediately. Inform Flight Director and GC § Once host is back operational and preconditioned for DSC, coordinate a checkpoint and CPU-to-CPU to get back to MOC/DSC	§ Selectover capability exists
	Mission normal Ops, MOC only	§ Move MOC operations to another host § 40 minutes needed from the time decision is made to move another host until Operations Support Team (OST) can be cleared for inputs. This time includes 20 minutes to swing the external equipment and 20 minutes to IPL the most recent checkpoint tape § Additional time may be necessary for OST or Flight Control to make	§ Another host is available at the current mission level and is made available immediately. No drain downtime is included. A good checkpoint tape is available

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11.4-4

any inputs made since checkpoint

Table 11.4-1. MOC failure recovery(Continued)

Type of failure	Activity	Recovery guidelines	Requirements to meet recovery guidelines
Cold MOCJOB	Mission Simulation, Tests, Normal Ops, MOC Only	<ul style="list-style-type: none"> § Host is IPL'ed off MOCRES and MOCJOB submitted by Computer Sup § Computer Sup makes minimal initialization inputs after MOCJOB is up and then OST controllers are cleared for inputs § Allow 45 minutes from the time machine is made available until OST controllers are cleared for inputs 	<ul style="list-style-type: none"> § Host is available to IPL and at the correct activity level § If turning around from one mission simulation to another, allow an extra 20 minutes to restore DASD for a total turnaround time of 60 minutes
Checkpoint Tape RESTART	Mission Simulation, Tests, Normal Ops, MOC Only	<ul style="list-style-type: none"> § Host is IPL'ed off MOCRES and Tape Restart job is submitted by Computer Sup § Allow 30 minutes from the time machine is made available until MOCJOB is up and controllers are cleared. 	<ul style="list-style-type: none"> § Host is available to IPL and at the correct activity level § A good checkpoint tape is available
MOCJOB recycle after end of simulation subrun	Simulation Normal, Ops MOC Only	<ul style="list-style-type: none"> § At the end of a simulation subrun the GC will clear the Computer Sup to turn the machine around § The Computer Sup will request a red status from all controllers to turn the machine around § The Computer Sup will cancel the MOCJOB via the X03, NODUMP.MED. If any system dumps are needed for trouble analysis, they will be performed prior to bringing down the job and extra time will be required § Computer Sup will perform DASD restart 	<ul style="list-style-type: none"> § A good checkpoint dataset is available

Table 11.4-1. MOC failure recovery

Type of failure	Activity	Recovery guidelines	Requirements to meet recovery guidelines
MOCJOB recycle after end of simulation subrun, continued	Simulation Normal, Ops MOC Only, continued	<ul style="list-style-type: none"> § Allow 10 minutes from time of X03 NODUMP until Flight Control is cleared for inputs 	
	Simulation Critical MOC/DSC	<ul style="list-style-type: none"> § After the MOCJOB is back up, the Computer Sup will clear the OST controllers for inputs and ask for a green status when they are ready to clear Flight Control § Allow 20 minutes from the time of X03, NODUMP input until Flight Control is cleared for inputs § Follow the same guidelines as simulation normal Ops for turning MOC around § When the DSC is terminated, have the operator precondition to become a DSC again § After the MOCJOB is back up and before clearing any controllers for inputs, perform a CPU-to-CPU § Once the DSC is up, perform a sync check § Clear OST controllers for inputs and ask for a green status when they are ready to clear Flight Control 	<ul style="list-style-type: none"> § A good checkpoint dataset is available

Table 11.4-1. MOC Failure Recovery

Type of failure	Activity	Recovery guidelines	Requirements to meet recovery guidelines
MOCJOB turnaround from one flight simulation/test to another flight simulation test	Simulation/Test Normal MOC Only	<ul style="list-style-type: none"> § Upon termination of the first simulation/test, the normal MOC cleanup will be performed by the MOC operator § Disk pack will be restored to the proper level for the upcoming simulation/test. Allow 20 minutes for restoration § If the MOCRES is at a different IOCDs level, allow 30 minutes for a "Power On Reset" § The host will be IPL'ed and the MOCJOB submitted by the Computer Sup § Once MOCJOB is initialized, the Computer Sup will then clear the OST controllers for inputs § Once OST has been cleared for inputs, allow 25 minutes for initialization inputs prior to clearing Flight Control § Allow a total of 2 hours from the time the first simulation/test is terminated (X03, NODUMP) until Flight Control can be cleared for the next simulation/test 	<ul style="list-style-type: none"> § The listed guidelines assume that both simulation/tests are scheduled on the same host. If the simulation/tests are not on the same machine, other guidelines will be followed

SOP 11.5

TITLE

MOC MED ACCESS AND USE

PURPOSE

To provide a procedure for controlling access to and use of MOC MED emulation located in the MCC FCR and MPSR's. This SOP also defines all MED entries authorized for use by FCR and MPSR F/C's.

PARTICIPANTS

FD	MPS
GC	NAV
*COMPUTER SUPV	OMS/RCS
CONTROL	PADS
DPS	PAYLOAD DATA
DPS SUPPORT	POINTING
EPS	SENSING
FAO	COMM SUPPORT
MAIN ENG	INSTRUMENTATION
MECHANICAL	ALL WORKSTATION USERS
CDMS	

GENERAL

- A. Workstations (W/S) in the FCR and MPSR's are similar in capability to the W/S used by COMPUTER SUP to control MOC configuration and operation. There are limited SW or HW controls to limit capability of terminals which are interfaced to the MOC. Therefore, access to FCR and MPSR terminals is procedurally controlled to ensure that only authorized, qualified users have access to these devices. This philosophy also pertains to all W/S users.

NOTE

Only F/C personnel certified by their Division Chief will operate FCR/MPSR MOC terminals and W/S.

- B. All MED emulation menus authorized for FCR and MPSR use are listed in this procedure; MED emulation menus not listed will not be entered by FCR or MPSR F/C's.
- C. Scope of this procedure is limited to FCR/MPSR; procedures located in other MCC support areas are contained in the MOH operating procedures.

PROCEDURES

- A. Authorized users and control
1. Access to FCR/MPSR W/S's is controlled by F/C's located in the FCR and MPSR's. One person on each shift is assigned by name as being responsible for each W/S.

2. FC personnel assigned W/S access control responsibility monitor W/S utilization and ensure that all users: (1) have legitimate reason to use the W/S, (2) have been trained and certified, and (3) utilize W/S's only during approved time intervals.
3. W/S access and control are performed at the position authorization ID level.
4. COMPUTER SUP is responsible for controlling access for W/S.

NOTE

During initialization and checkpoints, hold inputs until positive clearance is given by GC.

B. Critical support time intervals

1. FCR/MPSR W/S can be utilized during all shuttle flight phases, except critical flight phases as follows.

Times	Constraint
a. L - 45 minutes through OMS-2 completion	Only NAV, GNC, COMM SUPPORT, BOOSTER, MECH, MAIN ENG, INSTRUMENTATION, DPS, DPS SUPPORT, and FAO (Pointing) will remain enabled during this phase.
b. EI - 35 minutes through landing	Only NAV, GNC, COMM SUPPORT, MECH, BOOSTER, MAIN ENG, and INSTRUMENTATION will remain enabled during this phase.

No other W/S will be authorized during these phases without FD approval and COMPUTER SUP notification.

2. At L - 45 minutes and EI - 35 minutes, GC announces on FD loop, "Nonauthorized MED users log off. All nonauthorized W/S users will be disabled for MED inputs." GC informs COMPUTER SUP when this announcement is made.
3. COMPUTER SUP will disable all W/S MED emulation inputs (EXCEPT for those specified in 1a or 1b above) and report status to GC.
4. W/S and MED emulation logon can be accomplished as required after expiration of critical support time intervals defined in item B.
5. In event of a delayed deorbit (one orbit or more), all F/C's are authorized to perform logon as soon as the decision to delay deorbit has been announced by the FD.

C. MOC and MOC/DSC Operations

Logon to the MOC or MOC/DSC should be performed as follows:

Type L MOC*" (* = 1 or 3).

Table 11.5-1. Authorized MED emulation list

F/C function	MED menu no.	Title	FCOH SOP
PADS, POINTING	C30	General Text Msg.	3.2.1
	C32	Text Page Automatic Generation	3.2.1
	C72	Text Message Manual Generation	N/A
	G00 through G15, G30 through G35, G50 through G52, G71, B17, R14	Pointing Menus	N/A
			N/A
EPS, MECH, SENSORS, CONTROL, ME, MPS, OMS/RCS, DPS SUPPORT, PAYLOAD DATA, INCO MPSR, CDMS	V00	TLM MED Selection List Menu	N/A
	V10 ^a	TLM Parameter Override	4.9.5A
	V20, Z20	TLM Special Comp Constant Change (EU)	4.9.4
	V21, Z21	TLM Special Comp Constant Change (Time)	4.9.4
	V22, Z22	TLM Hexadecimal Mask Change	4.9.5C
	V23, Z23	TLM Special Comp RTXT Parameter	4.9.4
	V30, Z30	TLM Operational Limit Change	4.9.1
	V31 ^b , Z31	TLM Offscale Limit Sense Control	4.9.1
	V33 ^b	TLM Critical Limits Change	4.9.1
	V40 ^b	TLM Universal Plot (Control data)	4.9.3
	V41 ^b	Universal Plot (Nominal Data)	4.9.3
V43 ^b	Universal Digital Display	4.9.3	
INCO MPSR	G40	Antenna Management	N/A
	G41	Special Target	N/A
	V80	Telemetry Recorder Management	N/A
	C24	System Management Table Maintenance	N/A
	C33	Payload Generation in Hex	3.2.1
	C34	KU Band Antenna Matrix	N/A
	C35	TEC History Addition/Deletion/Clear	N/A
	C36	TEC Command Load	N/A
	C37	PSP Configuration Load	N/A
	C40	Spare RTC Build	N/A
	C41	SPC/MSPC/MRTC Build/Update	N/A
	C47	SPC History Addition/Deletion/Clear	N/A
	C49	PCMMU TFL/PDI DFL Load	N/A
	C60	MRTC/Load Clear	N/A
	C73	Load Chaining	N/A
C75	Load Number Change	N/A	
PAYLOAD DATA	C52	Payload Coefficients Updates	N/A
	C33		N/A
	C35		N/A
	C36		N/A
	C40		N/A
	C41		N/A
	C60		N/A

^aAdvise COMPUTER SUP on Parameter Override.

^bMED entries which may be required during critical phases (L - 45 minutes through OMS-2 completion)

and EI - 35 minutes through landing). These require FD approval.

Table 11.5-1. Authorized MED emulation list(continued)

F/C function	MED menu no.	Title	FCOH SOP
FDO MPSR NAV	U18	Residuals Batch Plot Display MED	N/A
	U19	Residuals Batch Plot Display MED	N/A
	U50	General Display MED No. 1	N/A
	B50	LLTD Vector Staleness Factor MED	N/A
	B51	Restart/Stop LLTD	N/A
	B52	Exclude/Include Data from LLTD Processor	N/A
	B53	LLTD Flight MODEMED	N/A
	B57	Identify Valid Vehicle and Timetag Bias for High Speed	N/A
	K54	State Vector Update Control	N/A
	K56	Update MED for Plot Scale Factors	N/A
	P42	Orbit & Reentry Vent Table Maintenance	N/A
	P43	Vent Initialization Table Maintenance	N/A
	P44	VLT Vent Display Time	N/A
	P45	Bvent and Lvent MED	N/A
	P50	Jacchia Table Maintenance MED	N/A
	SXX	All S-MED's	N/A
All above	D01	MED Flight/Data Type Sign-on	N/A

Table 11.5-2. Valid W/S positions and MED codes

NUMBER OF ENTRIES 72		HOST MOC1			Page				
POS	Valid MED Characters	MOC	DSC		GPLN		CCLN		
		DSC	GDR	DTE	CUR	MAX	CUR	MAX	CMD
AGPO	BCD FGH K M P RS UV	B	N	N	M	M	E	E	N
BOOT	CD	B	N	N	M	M	E	E	N
CAP		B	N	N	M	M	E	E	N
CMAD		B	N	N	M	M	E	E	N
CMDC		B	N	N	M	M	E	E	N
COMS	ABCDEFGHIJKLMN PORSTUVWX	S	Y	Y	E	E	E	E	N
DAE	BCD FGH K M P RS U	S	N	N	M	M	E	E	N
DD		S	N	N	M	M	E	E	N
DEMO		S	N	N	M	M	E	E	N
DFE	D VW	S	Y	Y	E	E	E	E	N
DPS	CDE V	S	N	N	M	M	E	E	N
ECOM	CD G VW	S	N	N	M	M	E	E	N
EGIL	CD G VW	S	N	N	M	M	E	E	N
EPS	CD G VW	S	N	N	M	M	E	E	N
EVA	D	S	N	N	M	M	E	E	N
FAO		S	N	N	M	M	E	E	N
FD	C	S	N	N	M	M	E	E	N
FDO	BCD FGH K M P RS U	S	Y	Y	M	M	E	E	N
FST	BCD FGH K M P RS U	S	N	N	M	M	E	E	N
GC		S	N	N	M	M	E	E	N
GNC	CD G J V	S	N	N	M	M	E	E	N
INCO	CDE G J V	S	N	N	M	M	E	E	N
IPS	CD G J V	S	N	N	M	M	E	E	N
LCTL		S	N	N	M	M	E	E	N
LFD	C	S	N	N	M	M	E	E	N
LFDO	BCD FGH K M P RS U	S	Y	Y	M	M	E	E	N
LFSM		S	N	N	M	M	E	E	N
LGC		S	N	N	M	M	E	E	N
LGNC	CD G J V	S	N	N	M	M	E	E	N
LPAO		S	N	N	M	M	E	E	N
LSO	BCD FGH K M P RS U	S	Y	Y	M	M	E	E	N
ITEL	A CDE GHIJ L N T VW	S	Y	Y	M	M	E	E	N
MACS	CD J W	S	N	N	M	M	E	E	N
MCCA		S	N	N	M	M	E	E	N
MCCI		S	N	N	M	M	E	E	N
MCCM	ABCDEFGHIJKLMN PORSTUVWX	S	Y	Y	M	M	E	E	N
MCCT		S	N	N	M	M	E	E	N
MCTR		S	N	N	M	M	E	E	N
MCWS		S	N	N	M	M	E	E	N
MECH	CD UV	S	N	N	M	M	E	E	N

Table 11.5-2. Valid W/S positions and MED codes (continued)

NUMBER OF ENTRIES 72		HOST MOC1			Page		
POS PAID	Valid MED Characters	MOC DSC	DSC GDR	DTE	GPLN CUR MAX	CCLN CUR MAX	CMD
MEDS		B	N	N	E	E	N
MGM		B	N	N	M	E	N
MIS		B	N	N	M	E	N
MPCC		B	N	N	M	E	N
NAV	BCD FGH K M P RS U	S	Y	Y	M	E	N
NIPS	D J VW	S	Y	Y	M	E	N
NODN		S	N	N	M	E	N
ONAV	BCD FGH K M P RS U	B	N	N	M	E	N
OSGR		B	N	N	D	D	N
PAO		B	N	N	M	E	N
PDFE	D J VW	S	Y	Y	M	E	N
PLDC		B	N	N	M	E	N
POWER	CDE G UV	B	N	N	M	E	N
PPD		B	N	N	M	E	N
PROP	CD J V	B	N	N	M	E	N
PTG	B G R	B	N	N	M	E	N
PYLD	CDE V	B	N	N	M	E	N
REND	BCD FGH KLM P RS U	B	N	N	M	E	N
RGPO	BCD FGH K M P RS UV	B	N	N	M	E	N
RMS	CD J V	B	N	N	M	E	N
RTC	A CDE GHJ L N T VW	S	Y	Y	M	E	N
SDPH	A D H L N T VW	S	Y	Y	M	E	N
SPAN		B	N	N	M	E	N
SURG		B	N	N	M	E	N
TELC	A CDE GHJ L N T VW	S	Y	Y	M	E	N
TOSS		B	N	N	M	E	N
TOST	BCD FGH K M P RS U	S	Y	Y	M	E	N
TRDY	BCD FGH K M P RSTUVWX	S	Y	Y	M	E	N
TRNG		B	N	N	M	E	N
TR27	CDE G UV	B	N	N	M	E	N
TSS	BCD FGH K M P RS U	B	N	N	M	E	N
WLC		B	N	N	M	E	N

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F/V 77

W/S CONFIG GUIDE

RR0017A CH043

PAID	GPLN	CCLN	CMD	AUTH	PAID	GPLN	CCLN	CMD	AUTH	PAID	GPLN	CCLN	CMD	AUTH									
S	A	S	A	M/D	G	D	S	A	S	A	M/D	G	D	S	A	S	A	M/D	G	D			
ABPO	E	E	E	E	N	B	NN	INCO	E	E	E	Y	B	NN	MIS	E	E	E	E	N	B	NN	
BOOT	E	E	E	E	N	B	NN	IPS	E	E	E	E	N	B	NN	MPCC	E	E	E	E	N	B	NN
CAP	E	E	E	E	N	B	NN	LCTLE	E	E	E	E	N	B	NN	NAV	E	E	E	E	N	S	YY
CMAD	E	E	E	E	N	B	NN	LFD	E	E	E	E	N	B	NN	NIPS	E	E	E	E	N	S	YY
CMDC	E	E	E	E	N	B	NN	LFDD	E	E	E	E	N	S	YY	NODN	E	E	E	E	N	B	NN
COMS	E	E	E	E	N	S	YY	LFSM	E	E	E	E	N	B	NN	ONAV	E	E	E	E	N	B	NN
DAE	E	E	E	E	N	B	NN	LGC	E	E	E	E	N	B	NN	OSGR	E	E	E	E	N	B	NN
DD	E	E	E	E	N	B	NN	LGNC	E	E	E	E	N	B	NN	PAO	E	E	E	E	N	B	NN
DEMO	E	E	E	E	N	B	NN	LPRO	E	E	E	E	N	B	NN	PDFE	E	E	E	E	N	S	YY
DFE	E	E	E	E	N	S	YY	LSO	E	E	E	E	N	B	NN	PLDC	E	E	E	E	N	B	NN
DPS	E	E	E	E	N	B	NN	LTEL	E	E	E	E	N	S	YY	POWR	E	E	E	E	N	B	NN
ECOM	E	E	E	E	N	B	NN	MACS	E	E	E	E	N	B	NN	PPD	E	E	E	E	N	B	NN
EGIL	E	E	E	E	N	B	NN	MCCAE	E	E	E	E	N	B	NN	PROPE	E	E	E	E	N	B	NN
EPS	E	E	E	E	N	B	NN	MCCIE	E	E	E	E	N	S	YY	PTG	E	E	E	E	N	B	NN
EVA	E	E	E	E	N	B	NN	MCCM	E	E	E	E	N	B	NN	PYLDE	E	E	E	E	N	B	NN
FRO	E	E	E	E	N	B	NN	MCCT	E	E	E	E	N	B	NN	RENDE	E	E	E	E	N	B	NN
FD	E	E	E	E	N	B	NN	MCTR	E	E	E	E	N	B	NN	RGPO	E	E	E	E	N	B	NN
FDO	E	E	E	E	N	S	YY	MCWSE	E	E	E	E	N	B	NN	RMS	E	E	E	E	N	B	NN
FST	E	E	E	E	N	B	NN	MECHE	E	E	E	E	N	B	NN	RTC	E	E	E	E	N	S	YY
GC	E	E	E	E	N	B	NN	MEWS	E	E	E	E	N	B	NN	SDPH	E	E	E	E	N	S	YY
GNC	E	E	E	E	N	B	NN	MGMT	E	E	E	E	N	B	NN	SPAN	E	E	E	E	N	B	NN

GMT 1. 1:17:22:32

04/30/96 575
HCOPIY 2 .N 0

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Figure 11.5-1. Workstation configuration guide, page 1

SOP 11.6

TITLE

PERMANENT MED'S

PURPOSE

To define the procedure for utilizing the Permanent MED (PM) option.

PARTICIPANTS

FC TEAM
*COMPUTER SUP
COMMAND

GENERAL

- A. The PM capability allows certain predefined MED entries to the MOC to be defined as permanent prior to incorporation into the MOC program build and protects against the loss (due to MOC problems) of entries made since the last valid checkpoint.
- B. For simulations, the MOC is initialized with PMs; however, any simulation unique configuration is input via floppy disks or nonpermanent MEDs.
- C. PM's are stored on an MOC disk and are available for replay during MOC initialization.
- D. The MOC program also provides the capability to edit PMs (add or delete) and to print out all PMs currently saved on disk.
- E. MED entries are made from workstations using the MED emulator.
- F. Prior to the ILC, the COMPUTER SUP empties the PM data set.

PROCEDURES

- A. Permanent MED Option Utilization
 - 1. To identify a MED entry as permanent, enter PM" as follows.
 - a. For MED menus, enter PM" immediately following menu ID and pound sign.
Example: V31#PM
 - b. For positional MED's, enter PM" immediately following menu ID and comma.
Example: V31 PM,

NOTE

Use of the PM modifier on MEDs which do not have the PM option causes the entire MED to be rejected.

B. MED Inputs for MOC Initialization

1. Simulations

- a. Prior to each simulation, COMPUTER SUP replays all PM's from the MOC disk.

NOTE

PM printouts are available upon request from COMPUTER SUP.

- b. F/Cs input any required sim unique initialization data via utilization of nonpermanent MED entries from the workstation MED emulator.
- c. Each F/C ensures coordination across all teams before entering an MED as permanent.

2. Pad Test/Vehicle Interface

- a. Prior to any interface with the vehicle, COMPUTER SUP will delete all PMs from the permanent MED data set. F/Cs and COMPUTER SUP are responsible for reentering their desired PM's for the support period.
- b. Any unique initialization required for the support period must also be reentered by utilizing MED inputs from a workstation.

3. In Support of Launch Day

- a. PM Review/Removal
 - (1) COMPUTER SUP deletes all PMs from the permanent MED dataset. F/Cs are responsible for reentering their desired PM's for mission support.
 - (2) In the event of a MOC failure, COMPUTER SUP replays all PMs from the MOC disk.
 - (3) Computer Sup will reinitialize PMs with inputs supplied by the USA Load Manager immediately after Mission MOC is initialized.
- b. Any late changes in PMs are implemented by deleting the old version and entering the new version of the PM.

C. PM Use During Actual Flight Support

1. During the actual flight support period, all MED entries which have the PM option, except TLM limit changes, should be made as PMs.

INFORMATION

A. PM Maintenance

1. Permanent MED data stored on the MOC disk is not automatically incorporated into the next SW systems release. F/C MED users may use the PM listings available from COMPUTER SUP during simulations and pad tests to update the software change requirements via Data Pack and SRs.
2. After each new system release, COMPUTER SUP verifies that the PM data file on the MOC disk (for appropriate flight ID) has been cleared. If there are any changes which were not incorporated into the new release that are still required, F/Cs reenter them as permanent MED's using the MED emulator from a workstation.

B. PM Categories

1. Categories of MEDs which are candidates for use of the PM option are:
 - a. TLM application functions, such as calibration curve changes, limit changes, special computation changes, universal plot changes, parameter override, suspect data validation, and off?scale control.
 - b. Trajectory application constant and table changes for station characteristics, mass properties, attitude and pointing, and various constraint tables.

C. Command Application

1. The command software uses command data refresh instead of PMs. A command data refresh is initiated by COMMAND (via MED) after restart from checkpoint tape.
2. When using checkpoint tapes to turn around for different flight phase simulations, the command data refresh may not be desirable. COMMAND will coordinate with INCO for command data refresh during simulations.

SOP 11.7

TITLE

DATA DRIVER/TPC SELECTOVERS/RESTARTS/HANDOVERS (DELETED)

SOP 11.8

TITLE

TPC UTILIZATION AND PRIORITY PLAN (DELETED)

SOP 11.9

TITLE

COMPUTER SUPERVISOR RUN PREPARATION CHECKLIST

PURPOSE

To define the steps taken to verify the requirements for an upcoming support activity.

PARTICIPANTS

GC
*COMPUTER SUP
MOD SCHEDULING
MCC SCHEDULING
SIM CONTROL
FSM

GENERAL

Before any support activity, the COMPUTER SUP will initiate action to ensure that the various loads used for the activity are correct. In addition, the COMPUTER SUP will obtain any additional information that is pertinent to the support activity. The COMPUTER SUP will use the Run Preparation Checklist (figure 11.9-1) to ensure that all the proper steps in preparation are adhered to. The MCC Schedule should have information concerning the load levels to be used for the upcoming support activity.

PROCEDURES

The COMPUTER SUP should take the following steps before supporting any MCC activity:

- A. Check the most current MCC schedule for the load and version to be used for the support activity.
- B. Check the MOCRES status dataset for the current MOCRES for the upcoming support activity.
 1. Verify the proper MOCRES OWNER ID.
 2. Verify the tape numbers of the primary and backup restore tapes and place them on the checklist.

COMPUTER SUPERVISOR RUN PREPARATION FORM

SUPPORT TYPE: _____

FM: DATE _____ TIME _____ TO: DATE _____ TIME _____

COMPUTER SUPERVISOR(S): _____

1. VERIFY MOCRES LEVEL AND CALL DSS (483-5615 OR 483-5665)

MOCRES LEVEL: _____

PRIME C-TAPES	BACKUP C-TAPES	REL. DATE
1 _____	1 _____	____/____/____
2 _____	2 _____	

IPL PARM: _____

IPL ADDRESS (CHECK): 600 _____ 601/602 _____

VERIFY RUN ATTRIBUTES: SIM DAY/YR: ____/____

CONSOLES: OPS1 ___ OPS2 ___ OP3(IVT) ___

1b. TAPE RESTART (CHECK ONE): TBD YES NO

TAPE # _____ DAY _____ TIME _____

CHKPT D/S _____ RUN # _____ RUN DATE _____

CHECKPOINT CREATED ON: OPS1 ___ OPS2 ___ OP3(IVT) ___

1c. (OPTIONAL) VERIFY RUN ATTRIBUTES:

HOST (MOC) _____ HOST (DSC) _____

IOCDS _____ SWCO VERSION _____

NOTES:

2. CALL SCHEDULING FOR SMS LOAD ID BEFORE RUN: _____
(244-7687)

3. SUBMIT COPY OF CHECKLIST TO CS SUPERVISOR BEFORE RUN

DATE: _____ NAME: _____

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Figure 11.9-1. Computer Supervisor Run Preparation checklist

- C. Check with the GC or Test Conductor for any run details.
 - 1. Verify reference year of the flight.
 - 2. Verify simulation day, usually day 1 or 180.
 - 3. Get information concerning the checkpoint tape to come up from, if required.
 - 4. Obtain any additional information from the GC that will be pertinent to this support activity.
- D. Verify SMS loads to be used for the upcoming support.
 - 1. Contact Sim Control and obtain the SMS load to be used for the upcoming activity.
 - 2. Contact MOD Scheduling for any changes in the SMS load to be used for support.
 - 3. Cross-check the SMS and MCC loads using the most recent "Current MCC and SMS Loads" sheet to see if there are any discrepancies.
 - 4. If any discrepancies exist, contact GC to coordinate the proper actions to be taken.
- E. Provide OPERATIONS with restore and IPL information
 - 1. Give OPERATIONS the IPL address to be restored.
 - 2. Give restore tape numbers to OPERATIONS for the primary and backup restore tapes.
 - 3. Give OPERATIONS the WHOSDSK levels for MOCRES.
- F. Once all information has been completed on the checklist, the COMPUTER SUP should sign the checklist sheet and give the COMPUTER SUP Section Supervisor a copy for archive purposes.

SOP 11.10

TITLE

SECONDARY USER CHECK-IN RESPONSIBILITIES

PURPOSE

To define the steps taken to verify that a secondary activity does not interfere with a primary activity, such as simulation or mission.

PARTICIPANTS

COMPUTER SUPV

*FSM

MOD SCHEDULING

MCC SCHEDULING

SECONDARY USER

GENERAL

It is the responsibility of MCC and MOD Scheduling to verify that scheduled activities are not in conflict with other activities.

It is the responsibility of all users to adhere to the flight loads and software levels that are specified on the schedule. If changes are made they must be taken through the proper channels to ensure no last-minute conflicts are created.

PROCEDURE

Users who have scheduled time to support a secondary activity should take the following steps upon arrival at the MCC.

- A. Check in with FSM.
 1. Inform him/her of the type of activity you are there to support.
 2. Inform him/her of the software levels required for support.
 3. If there is any deviation from what was originally scheduled, make sure FSM is aware of it so that any possible conflicts can be identified.
- B. Check in with the COMPUTER SUPV on the primary activity. The primary activity includes, but is not limited to, mission support, simulation activity, testing involving the orbiter or payload. The primary activity is usually an operations activity and is designated on the MCC Schedule by a P1.
 1. Inform him/her of the type of activity you are planning to bring up.
 2. Inform him/her of the software levels required for support of the secondary activity.
 3. If there is any deviation from what was originally scheduled, make sure the COMPUTER SUPV is aware of it so that any possible conflicts can be identified.

**SOP 12
COMPUTER OPERATIONS - OFFLINE**

SOP 12.1

TITLE

CENTRAL COMPUTING FACILITY PRIORITIES

PURPOSE

To establish interface procedures and guidelines for prioritizing off-line application programs requiring support on Data Reduction Complex (DRC) (Univac 1108/1110 and Cyber 174) computer systems in support of space shuttle flight operations.

PARTICIPANTS

SPAN MOD REPRESENTATIVE
BUILDING 12 OPS MANAGER
MER DATA MANAGER

GENERAL

- A. Planned Support - DRC support of certain applications programs has been precoordinated as mandatory or highly desirable for space shuttle flight operations. These programs are collectively called planned support applications.
- B. Unplanned Support - A class of application programs exists under the general term of "user programs" which may be required for support of space shuttle flight operations. User programs are not normally part of planned support, but are available on request. In the event of onboard anomalies or contingency situations, user programs may be utilized to assist in the problem analysis/resolution process.

PROCEDURE

- A. Planned Support
 - 1. Relative priorities for planned support applications are listed in table 12.1-1. Generally, all listed applications are assigned Priority 1 (Immediate Response, see table 12.1-2) to guarantee faster run-times than routine DRF jobs.
 - 2. Building 12 OPS Manager uses the relative priorities to resolve resource conflicts if several planned support applications are input at the same time.
 - 3. Building 12 OPS manager contacts SPAN MOD Representative (PABX 5677) in the event of an unresolved conflict between planned support applications.
 - 4. Planned support applications required during prelaunch, ascent, or entry phases can be input to the DRC without an accompanying run request form. During orbit phase, run request guidelines are as follows.
 - a. No run request form is required for routine jobs (such as, Thermal Monitoring System or Radiation/Exposure Analysis).
 - b. JSC Form 588 initiated by the programmer is required for all other on-request jobs.

B. Unplanned Support

1. All unplanned support jobs should be documented on a JSC Form 588, which includes the appropriate processing priority (see table 12.1-2), and should be submitted directly to building 12 OPS Manager.
2. Building 12 OPS Manager reviews the requested job to identify any potential conflict with other planned support or in-progress routine jobs. If a conflict exists which cannot be resolved with the programmer, building 12 OPS Manager contacts SPAN MOD Representative for resolution. Priority Mission Contingency (MC) requests are not accepted, except as noted in paragraph C below.

C. MC support requires the DRC to provide dedicated space shuttle flight operations support and suspend noncritical jobs. Should a mission contingency be declared, SPAN MOD Representative advises building 12 OPS Manager (PABX 4101) of the situation and authorizes building 12 OPS Manager to accept Priority MC run requests.

D. Building 12 OPS Manager coordinates DRC system downtime with MER Data Manager.

Table 12.1-2. DRF processing priorities

Priority	Processing category
MC	Mission contingency (dedicated space shuttle support)
1	Immediate response
2	Less than 8-hour turnaround
3	Nominal 24-hour turnaround
4	Postflight (non-real-time support)

NOTE

Priorities 1 and MC take priority over all other center support.

Table 12.1-1. Planned DRC application relative priorities

System	Relative priority	Prelaunch	Ascent	Orbit
U1100-81	1	Day of launch winds and orbiter structural analysis	N/A	N/A
U1108	1	Day of launch winds and orbiter structural analysis	SVDS	IMU scale factors
	2	N/A	N/A	OMS/RCS propellant usage
U1110	1	SRB IP	SRB IP	APU consumables analysis
	2	N/A	N/A	Vent and uncoupled thrust
C174	1	N/A	APU consumables analysis	APU consumables analysis
	2	N/A	IMU scale factors	IMU scale factors
	3	N/A	N/A	Best estimate of trajectory
MCMP	1	N/A	N/A	Thermal monitoring system

**SOP 13
DOD INTERFACE**

SOP 13.1

TITLE

DDMS OPERATIONAL SUPPORT

PURPOSE

To describe the MCC interface with the DDMS for DOD operational support.

PARTICIPANTS

FD
OPS MANAGER
DOD MANAGER
*LSO
DOD LSO
SMB
DOD METEOROLOGY LIAISON OFFICER
HOUSTON VOICE
DOD COMM COORD
SURGEON
PAO
SUPPORT OPERATIONS CENTER (SOC)

GENERAL

- A. The Secretary of Defense has designated the Commander of the United States Space Command as the DOD Manager for Space Shuttle Support Operations (DDMS).
- B. The DOD Manager has established DDMS offices at Patrick AFB, Florida, and at JSC. DDMS serves as the working interface to receive, coordinate, and respond to NASA's Space Shuttle contingency support operations requirements. A position has been established in the MCC to direct DOD contingency support operations during a flight. This position is located in the Flight Dynamics MPSR and is manned by the DOD LSO. In addition, the NASA LSO function is also performed by DDMS personnel assigned to JSC.
- C. A DOD SOC, located at the Cape Canaveral Air Force Station (CCAFS), functions as a command and control element for the DOD Manager. The DOD SOC Director is the primary contact within the DOD SOC.

- D. DOD communication support is coordinated by a DOD COMM COORD in the SOC who interfaces with HOUSTON VOICE in the MCC.
- E. DOD weather support is provided from the weather facilities in the Range Control Center at the CCAFS.
- F. A DOD Information Officer and DOD Surgeon provide on-call support to the SOC Director, and provide an interface with NASA PAO and NASA medical personnel for any DOD-related activities.

PROCEDURE

A. DOD Manager

The DOD Manager's responsibilities during a flight are

1. To provide management, guidance, and supervision of dedicated DOD support elements
2. Should NASA require additional support, to evaluate and arrange for such support
3. To maintain current operational status of DOD augmented landing site (ALS)/ emergency landing site (ELS), associated support elements, dedicated recovery forces, and other mission-essential DOD support
4. To communicate with the National Military Command Center to keep the Joint Chiefs of Staff apprised of operational developments and to receive guidance should developments warrant
5. To interface with the FD, OPS Manager, and NASA HQ representatives as required

B. DOD LSO

1. The DOD LSO assists in carrying out the DOD Manager's responsibilities, as directed by the DOD Manager.
2. The DOD LSO is the LSO's direct contact for the acquisition and statusing of DOD support. He is supported by the SOC.

C. DOD SOC Director

1. Supports the DOD Manager and DOD LSO in providing EAFB, WSSH, and ELS/ALS landing support.
2. Provides the DOD interface with KSC NTD and KSC LRD for coordination of DOD contingency support in the KSC launch/landing contingency area.
3. Provides management of DOD support forces in the KSC launch/landing contingency area.
4. Provides an interface with regional Search and Rescue (SAR) coordinators through the Rescue Coordination Centers to ensure they are knowledgeable of mission developments, and are ready to respond should a need arise.

SOP 13.2

TITLE

AFSCN INTERFACE

PURPOSE

To define the procedure for MCC interface with the AFSCN.

PARTICIPANTS

FC TEAM

MISSION CONTROLLER (DOD equivalent to Station OPSR)

*GC

GENERAL

- A. The AFSCN Remote Tracking Sites (RTSs) are required for supplemental and backup support to the STDN. MCC interface with the OAS/RTS is via Programmable Telemetry Processor (PTP) GSFC with OAS/RTS operating in a throughput mode.
- B. The OAS at Sunnyvale, California, is the central control point for the AFSCN network and, with some differences, provides a similar function for the AFSCN network that GSFC provides for the STDN network.
- C. The MCC interfaces the OAS, via a direct MDM link, for all RTS support functions. The OAS performs all direct interfaces with the RTS.

PROCEDURES

- A. MCC voice interface with the OAS for RTS data is conducted over SHUTTLE SUPPORT loop by the same MCC F/C positions that interface with STDN sites.
- B. MCC F/Cs interface with a dedicated OAS Operations Team composed of four positions as follows.
 - Mission Director
 - Ground Controller
 - Data Controller
 - DICE Controller

The Mission Controller is a functional equivalent of the STDN STATION OPSR.

- C. Call sign for the OAS is "DICE." Mission Controller normally responds to calls from the MCC.
- D. During normal operation, all MCC to RTS voice coordination is conducted with the OAS; OAS provides direct communications with RTS. Direct voice communication between the MCC and RTS is not authorized, except in contingency situations where direct comm is required to expedite problem resolution.

INFORMATION

Major Differences in AFSCN Support:

- A. Orbiter S-band PM system must be switched to Space Ground Link System (SGLS) mode to establish downlink/uplink communications with the RTS. AFSCN SGLS is not directly compatible with the orbiter S-band PM system. The onboard S-band PM system must change modes in order to be compatible.
- B. RF signal strength readings are verbally reported to the MCC.
- C. Site playback of TLM (real-time or dump) is normally from recorders at the CSTC or the RTS site.
- D. Data Interface (I/F) from OAS to MCC is via PTP through GSFC.
- E. S-band A/G voice is digital to/from OAS/RTS/MCC.
- F. The RTS does not output automated site status messages; verbal reports from the OAS are employed.
- G. RTS/OAS provides Command History type II outputs only.
- H. RTS/OAS does not respond to STDN Network Management commands.
- I. Ops recorder dumps are throughput to MCC via PTP through GSFC.

**SOP 14
MCC/POCC INTERFACE**

SOP 14.1

TITLE

I/F CONTROL FOR POCC CMD FUNCTION

PURPOSE

To define the procedure for coordination and control of the CMD function for POCC (MCC and external) P/L CMD activity; procedure to cover P/L uplink via the orbiter CMD system and direct uplink to the P/L.

PARTICIPANTS

POCC TEAM

PAYLOADS

INCO

*COMMAND

PROCEDURES

Within the POCC, the Payload Command controller (PAYCOM) is responsible for executing real-time payload commands (RTC's), building and planning SPC's, and interfacing with space shuttle positions for payload command uplink.

A nominal command plan is developed by PAYCOM which contains all RTC and SPC sequences for the payloads.

PAYCOM executes all real-time commands after hearing COMMAND give GO for Command." Payload recorder commands and command uplink anomalies are coordinated through PAYLOADS to INCO on the INCO loop. For SPC commands, PAYCOM plans, builds, and assigns an SPC load number. The SPC load is sent to INCO for coordination and command uplink. Nonnominal command activity requiring command operation changes will be coordinated first in the POCC, then with Payload Officer (PAYLOADS), prior to interfacing with INCO.

**SOP 15
NATURAL ENVIRONMENT**

SOP 15.1

TITLE

LAUNCH AND LANDING SUPPORT WEATHER REPORTS

PURPOSE

To provide meteorological inputs on landing sites' acceptability for orbiter landings. Weather conditions must meet flight rule criteria for RTLS, AOA, TAL, ATO, nominal end-of-mission, and emergency landings (ELS) at the respective times for each type of landing.

PARTICIPANTS

*SMG (JSC WX)	LSO	LANDING SITE WEATHER COORDINATOR
FD	DOD LSO	FLIGHTCREW
CAPCOM	CCAFS WEATHER	ALS DOD METEOROLOGY
FDO	LANDING SITE WEATHER OFFICE	LIAISON OFFICER

LAUNCH PROCEDURES

The launch information and management flow for weather data is shown in figure 15.1-1. The flow originates at the CCAFS weather office. These inputs to the JSC weather office and the weather aircraft (STAT38) observations relayed through CAPCOM are passed to the FD and SMG. The FDO will make an assessment of all landing sites' weather conditions, advise the FD of the status of all landing sites, and make appropriate recommendations on use of the landing sites. Based on this data, the FD will make the GO/NO GO input for RTLS, AOA, and TAL landings, to the Launch Director.

A. Weather data collection for launch support.

1. Overall forecasts - from KSC, at L - 5 days through L - 1 day and at L - 12 hours and L - 4 hours.
2. Detailed forecasts - from KSC, EAFB, NOR, and TAL site L - 2 days through L - 1 day and at approximately L - 20 hours and L - 6 hours.
3. Observations - from KSC, EAFB, and E28-NOR hourly (L - 48 hours through launch).

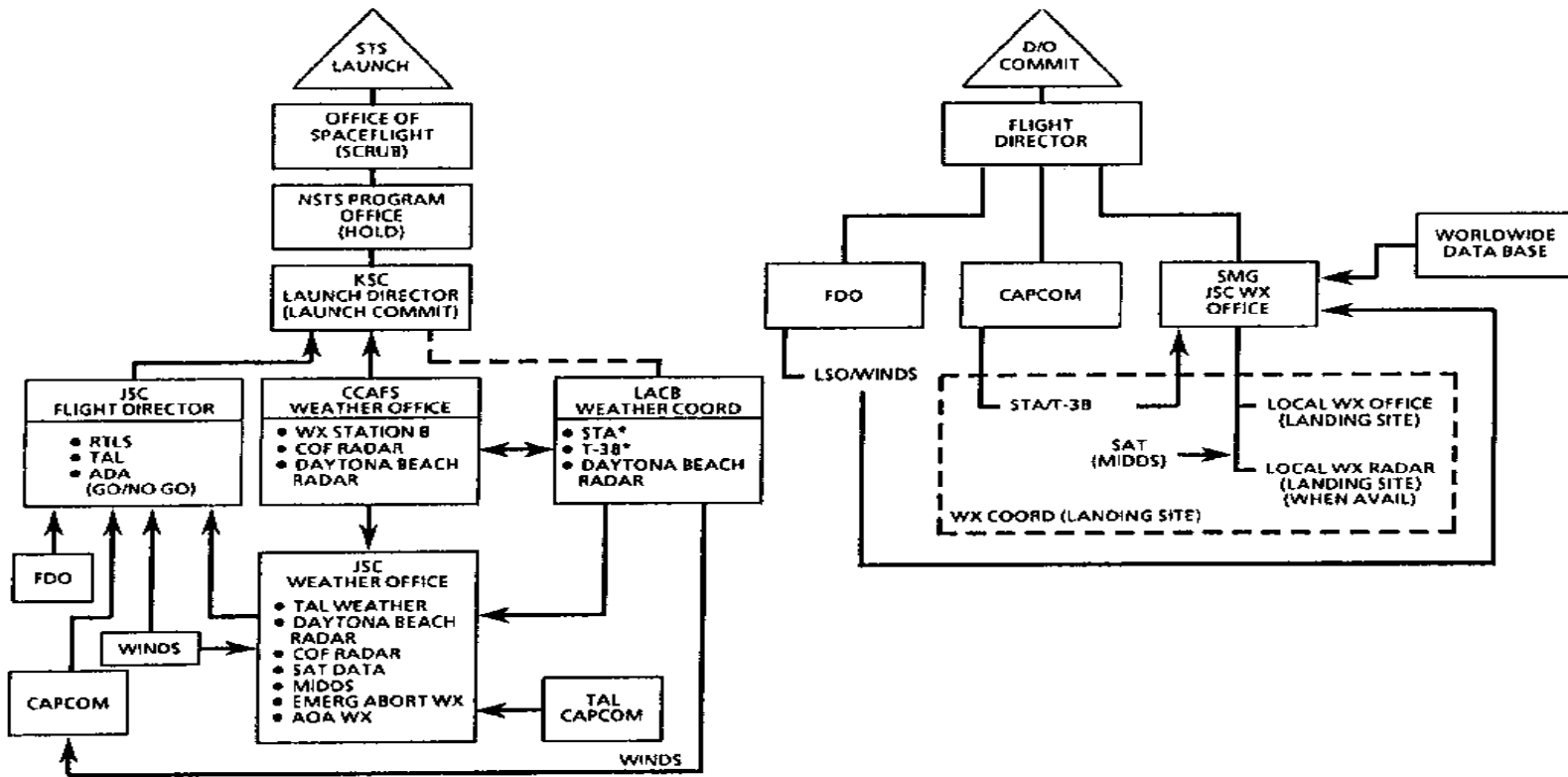
4. Prelaunch forecasts - from each ALS at site-specific 8-hour forecasting intervals.
 5. Standard aviation weather observations and forecasts - from each ALS periodically.
- B. SMG analyzes all received weather data and prepares weather charts suitable for prelaunch weather briefings.
- C. SMG gives weather reports to the FC team at approximately L - 10 hours and L - 3:55 hours. Weather charts are displayed on TV channel 70 and the RF; briefings are conducted on FD and AFD conference loops, respectively. Significant weather changes are announced to the FC team via interim reports. SMG provides WX briefings on forecasts to MMT for RTLS, TAL, TAL ALT, AOA, and PLS sites from L - 2 through L - 1.
- D. Prelaunch weather briefings to the flightcrew will be conducted per flight-specific schedules (normally L - 24 and L - 3:55).

LANDING PROCEDURES

The landing information and management flow is depicted in figure 15.1-1. The FD will make the D/O decision based on inputs from the FDO, CAPCOM, and JSC WX. The FDO will assess the suitability of the landing site with respect to the Flight Rules and mission objectives. CAPCOM will receive direct weather and landing aid observations from the STA/T-38. JSC weather office will collect and evaluate weather for the landing site and provide to the FD the forecast conditions expected at landing time.

- A. Weather data collection for landing support
1. Forecasts - from KSC, EAFB, WSSH every 8 hours for the next 24 and 48 hours (global).
 2. Detailed forecasts - KSC, EAFB, WSSH at landing - 20 hours and - 6 hours.
 3. Observations - from KSC, EAFB, WSSH beginning at launch at 1-hour intervals. At landing - 3 hours, observations are transmitted to JSC weather at 15-minute intervals.
 4. Standard aviation weather observations and forecasts - from each ELS periodically.
- B. The SMG, located in the Wx ops room in the MCC, provides assessments of landing weather conditions for KSC, WSSH, and EAFB for the next 48 hours. SMG briefs the FD and MMT on these assessments at least once per day.

- C. The SMG obtains weather data from the National Weather Network, the CCAFS Weather Detachment, the EAFB Weather Detachment, the WSSH Weather Detachment, or other special weather data from the DOD, as required.
- D. The SMG provides landing site weather data to the FDO and LSO, as requested as part of the FD briefing activities.
- E. The SMG provides the FD and CAPCOM significant weather data on a designated landing site for voice uplink to the flightcrew.



* Direct communications to MCC at flight director discretion.

(a) Launch information and management flow.

(b) GO/NO GO deorbit information and management flow.

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Figure 15.1-1. Launch information and management flow for weather data

SOP 15.2

TITLE

LANDING SUPPORT WEATHER REPORTS

PURPOSE

To provide meteorology inputs on landing sites acceptability for normal end-of-flight and early flight termination landing plans. Weather conditions must be acceptable for any safe orbiter landing.

PARTICIPANTS

SMG	DOD LSO
FD	ER WEATHER DETACHMENT
CAPCOM	EAFB WEATHER DETACHMENT
FLIGHTCREW	WSMR WEATHER DETACHMENT
FDO	ELS WEATHER AGENCY
*LSO	

PROCEDURES

- A. The SMG provides assessments of landing weather conditions for KSC, WSSA, and EAFB for the next 48 hours. SMG briefs the FD on KSC, WSSH, and EAFB once per day.
- B. The SMG obtains weather data from the National Weather Network, JSC MIDDS link, the EAFB Weather Detachment, the WSMR Weather Detachment, and weather data from the ELS's or other special weather data from the DOD, as required.
- C. The SMG provides landing site weather data to the FDO, LSO, and DOD LSO as requested as part of the Entry Message Weather summary.
- D. The SMG provides the FD and CAPCOM significant weather data on a designated landing site for uplink to the flightcrew.

SOP 15.3

TITLE

SPACE RADIATION ANALYSIS

PURPOSE

To provide space radiation exposure projections for possible hazards to the flight crew, experiments, payloads, film, etc., while in flight.

PARTICIPANTS

*SPACE RADIATION ANALYSIS GROUP (SRAG) PAYLOAD OFFICER
RADIOLOGICAL HEALTH OFFICER SPACE
ENVIRONMENT SERVICE
FLIGHT SURGEON CENTER
CAPCOM PERSONNEL
FLIGHTCREW

GENERAL

Space radiation analysis activities in support of the space shuttle flight operations, as well as related space environment and metrological support efforts, are conducted from the MCC NESR.

PROCEDURES

- A. During the preflight planning phase, the SRAG analyzes the projected space radiation environment for its possible effects during the planned flight times. Recommendations on the acceptability of the projected space radiation are provided to the flight planning personnel.
- B. During the flight, the SRAG first confirms the normal radiation environment exposure anticipated, including that due to trapped radiation (Van Allen Belts), galactic cosmic rays, and onboard originated radiation. This evaluation is completed after the first ground receipt of data from onboard radiation instrumentation to establish the baseline for analysis of changes in the normal radiation. This initial evaluation, plus daily assessment of all applicable space environment data, is used to periodically update the flight radiation exposure projections for the crew, experiments, payloads, and film to the FC Team.
- C. The next function is to analyze all artificial and natural phenomena changes to the previously established normal radiation environment. Crew exposure status is relayed through the Radiological Health Officer to the Flight Surgeon.
- D. The SRAG also supports radiation-sensitive and radioactive experiments and payloads as prearranged with the experiment and payload operators on a noninterference basis with the other SRAG functions.

- E. The information utilized by the SRAG for their analyses and evaluations is obtained from the orbiter onboard sensors and space radiation environment sources, such as the National Oceanic and Atmospheric Administrative Space Environment Service Center, the Air Force Air Weather Service, and NASA space environment monitoring capabilities.

**SOP 16
LAUNCH/LANDING INTERFACE**

SOP 16.1

TITLE

ASCENT ABORT PROCEDURES

PURPOSE

To maintain status of landing support and navigation aids in preparation for a possible RTLS, AOA, ATO, or TAL.

PARTICIPANTS

*LSO	DOD SOC
SPAN MANAGER	LRD (KSC)
FDO	WGM (WSSH)
DOD LSO	GOM (EAFB)
SMG	

GENERAL

The following is a description of the planned ascent abort modes which result in a landing at a predetermined site. There are four intact abort modes.

- A. RTLS - Could become required immediately after lift-off but cannot be initiated until after separation of the solid rocket boosters; would be initiated between 2 and 4-1/2 minutes after lift-off; results in a landing at KSC about 25 minutes after lift-off.
- B. TAL - Available as an abort mode, depending on type of failure, about 2-1/2 minutes after lift-off until MECO. Results in a landing at the selected TAL site about 35 minutes after lift-off.
- C. AOA - Available as an abort mode between about 5 and 40 minutes after lift-off; results in a landing at the selected CONUS site about 105 minutes after lift-off.
- D. ATO - Available as an abort mode between about 4 and 40 minutes after lift-off; could result in an early deorbit to the selected CONUS site.

PROCEDURES

- A. Prelaunch
 - 1. Beginning the day before launch, the LSO
 - a. Maintains status of all ALS's
 - b. Maintains status of dedicated DOD forces through the DOD LSO
 - c. Maintains status of the Palmdale TACAN station through the Los Angeles ARTCC
 - d. Maintains status of ELS's through the NOTAM system
 - e. Maintains status of the KSC TACAN through the LRD

- f. Provides ALPS as necessary and provides NOTAM's to the crew and FC team
2. The LSO periodically provides airfield support status to FDO.
3. SMG provides scheduled L - 24 weather briefings for the launch site and potential landing sites to the flightcrew and FC team.

B. RTLS

1. Upon decision for an RTLS, the LSO notifies the DOD LSO and LRD. SPAN MANAGER advises LRD of system anomalies and changes in crew postlanding procedures.
2. The LSO and DOD LSO monitor DOD and NASA contingency support operations. The LSO informs the DOD LSO of deviations which could result in changes to the DOD contingency support force operations.
3. The LSO informs the Miami ARTCC and the State Department of the RTLS decision.

C. AOA

1. Upon decision for an AOA, the LSO notifies the GOM, WGM, or LRD (as necessary). SPAN MANAGER advises the respective ground manager of system anomalies and changes in crew postlanding procedures.
2. The DOD LSO notifies the SOC.
3. The LSO informs the respective ARTCC of the AOA decision and provides deviations from the predicted approach profile. The ARTCC provides changes in TACAN status and takes actions per their Space Shuttle Support Plan.
4. FDO provides LSO with any significant deviations from the planned approach profile.
5. SMG provides weather updates for AOA site.

D. ATO

Procedures are the same as for an AOA, if there is an intention to land.

SOP 16.2

TITLE

EARLY FLIGHT TERMINATION READINESS

PURPOSE

To maintain a state of readiness to support an early termination of the flight.

PARTICIPANTS

FD	ONAV
*LSO	GC
FDO	DOD SOC
DOD LSO	GOM (EAFB)
GUIDANCE	WGM (WSSH)
SMG	LRD (KSC)
GNC	FAA

GENERAL

- A. The necessity to terminate a flight before the nominal end of mission can result in a deorbit to an ALS or ELS.
- B. The choice of a landing site depends upon the urgency for deorbit, opportunities for landing in daylight at sites within orbiter cross-range distance, weather, and status of landing site support.

PROCEDURES

- A. The following status is maintained by the LSO.
 - 1. Airfield support status of ALS's will be obtained from the appropriate ground operations manager.
 - 2. Airfield support status of the DOD ELS's will be obtained through the DOD LSO.
 - 3. Airfield support status of non-DOD ELS's will be monitored through the NOTAM system.
 - 4. Status of landing aids, such as TACAN's and MLS, will be obtained from the ground operations manager, DOD LSO, or the FAA, whichever is appropriate.
- B. SMG provides projected weather for landing opportunities per FCOH SOP 15.2.
- C. FDO maintains a list of landing opportunities projected for at least 24 hours. These landing opportunities are based on projected orbiter trajectory crossrange distance and daylight landings.
- D. In support of scheduled message uplinks, the LSO provides the status of airfields and navigation aids to the FDO. The LSO and FDO determine the primary landing site for each

day and for the early termination to determine the best site depending on lighting, cross-range, weather, and available support.

- E. The LSO provides landing opportunity updates to the GOM, LRD, WGM, DOD SOC, FAA ARTCC and ELS as necessary.
- F. The LSO provides TACAN and MLS status to FDO, GPO, O-NAV, and GNC.

SOP 16.3

TITLE

EARLY FLIGHT TERMINATION

PURPOSE

To describe procedures for determining an early flight termination landing site and for coordinating a landing at that site.

PARTICIPANTS

*FD	WX
*LSO	HOUSTON VOICE
FDO	DOD SOC
FAO	GOM (EAFB)
DOD LSO	WGM (WSSH)
GUIDANCE	LRD (KSC)
SURGEON	SPAN MANAGER

PROCEDURES

- A. A list of projected landing opportunities and preferred landing sites for each orbit is maintained by the FDO and LSO.
- B. When requested by the FD, the following actions are taken.
 1. The FC team determines the timeframe in which landing should occur.
 2. The FAO determines deorbit preparation timeline for the flight crew.
 3. WX analyzes the latest weather data from the potential landing sites.
 4. The FDO analyzes the trajectories to the potential landing sites.
 5. GUIDANCE analyzes the navigation requirements to the potential landing sites.
 6. The LSO and DOD LSO review the landing support status of the potential landing sites.
 7. FDO and LSO review the above information and agree on a recommended deorbit time/landing site and options. FDO provides these options to FD.

- C. Upon decision for deorbit by the FD, the following actions are taken:
1. If the landing site is a CLS, the DOD LSO requests the DOD Comm Coordinator to activate the required communication circuits (see FCOH SOP 6.21). The DOD Comm Coordinator and HOUSTON VOICE interface as required to complete MCC-to-CLS circuits.
 2. The LSO informs the DOD LSO, LRD, GOM, and NGM of the decision to land and provides orbiter approach data.
 - a. For DOD ELS landings, the DOD LSO provides any changes in airfield support status to the LSO.
 - b. For EAFB, WSSH, or KSC landings, the GOM, NGM, or LRD provides any changes in airfield support status to the LSO. Los Angeles, the DOD LSO, or the LRD provides any changes in TACAN status to the LSO. The LSO provides orbiter approach data changes to the ARTCC(s).
 3. WX maintains landing site weather status, if available.
 4. SURGEON, if required, provides crew medical status and data to the landing site and maintains status of landing site medical readiness.
 5. The SPAN MANAGER provides to the landing site any data pertaining to orbiter systems and payloads which could affect landing and postlanding operations.
 6. The LSO informs the FAA and the State Department of the decision for early deorbit, landing site and time.
- D. After deorbit, the following takes place.
1. The FC team monitors UHF A/G voice and provides assistance as required. For landings at EAFB, KSC, or WSSH, S-band telemetry and A/G voice are also available from the STDN stations and through NASCOM to the MCC. For a landing at an augmented landing site, UHF communication between the tower and orbiter is remoted (monitor only) to the MCC.
 2. After landing at an ALS and orbiter powerdown, the flight crew acts as advisors for local fire, crash, rescue, and ground handling personnel while awaiting arrival of the KSC Rapid Response Team. If required, special instructions from the MCC or KSC are communicated to the site until the Rapid Response Team arrives.

SOP 16.4

TITLE

LOCAL AREA CONTINGENCY AND REMOTE CONTINGENCY RESPONSE

PURPOSE

To define MCC operations in response to an orbiter crash, ditching, or flight crew ejection.

PARTICIPANTS

*FD	PAYLOAD
OPS MGR	PAO
LSO	DOD SOC
FDO	GOM (EAFB)
SURGEON	WGM (WSSH)
DOD LSO	LRD (KSC)
State Department	

DEFINITIONS

The following definitions apply:

- A. Local Area Contingency (Mode V or VI or VIII) - A landing contingency (crew bail-out landing, or crash) within the operating radius of the landing site local area.
- B. Remote Contingency (Mode VII or VIII) - A landing contingency (crew bail-out or crash) outside the operating radius of the landing site local area.
- C. Contingency Response Force - The organization of specialists and specialized teams designated to respond to a contingency to preserve life, reduce injury, preserve the orbiter and property, secure and safe the contingency site, and capture perishable data.
- D. Search and Rescue Operations - The employment of dedicated forces and other resources to search for and locate a crashed orbiter and/or bailed-out crew, and to recover the crew.

PROCEDURES

A. Local Area Contingency

For a landing contingency within the EAFB, WSSH, or KSC local areas, the local contingency response force provides support per the appropriate KSC Emergency Procedure OMI. For a landing contingency within the CLS area, support is provided through local plans. Participation by the MCC team consists primarily of the following:

1. FDO provides estimated crew bail-out and orbiter impact points, if required.
2. Appropriate F/C's provide systems or payload information of significance to rescue and safing operations.
3. SURGEON provides/receives information and advises on crew condition and care as appropriate.

4. LSO maintains status of contingency response operations through the DOD LSO and/or GOM, WGM, or LRD.

B. Remote Contingency

This could occur in the following situations:

1. During launch (launch contingency abort).
2. During entry/approach to EAFB, WSSH, or KSC.
3. As a result of an emergency deorbit to an ELS site or crew bail-out.

Dedicated DOD helicopters and HC-130's will support a launch contingency abort. Support during all other remote contingency situations depends upon available SAR resources. MCC activities consist of those previously listed for a local area contingency, with the addition of the following, as required.

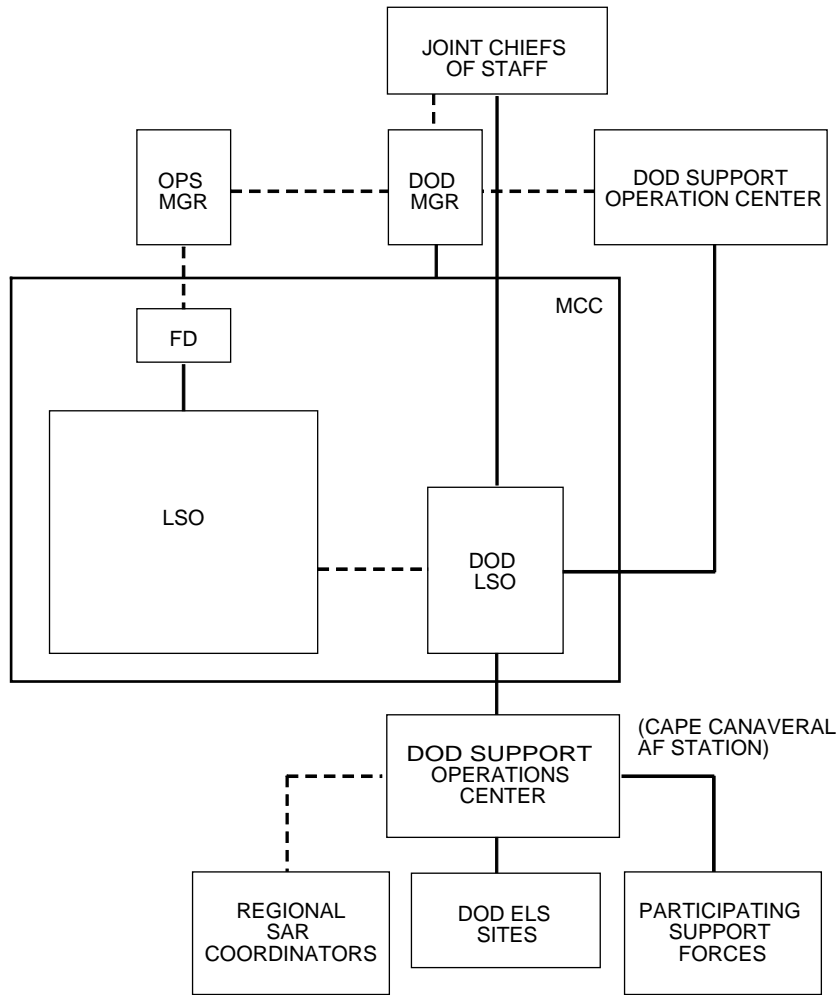
1. The LSO provides remote contingency information to the State Department.

NOTE

NASA HQ is responsible for coordinating with the State Department for the deployment of DOD and NASA resources into foreign territory.

2. The LSO provides information to the FAA.

The response to a remote contingency is basically one of SAR operations conducted by the DOD. The OPS MGR assumes responsibility from the FD once a remote contingency occurs. Figure 16.4-1 depicts the basic NASA-DOD interface.



j_26843_091

Figure 16.4-1. Basic NASA-DOD MCC interfaces

SOP 16.5

TITLE

PLANNED END-OF-FLIGHT PROCEDURES

PURPOSE

To provide landing support for a planned end of flight at EAFB (or NS).

PARTICIPANTS

FD	DOD LSO
SPAN MANAGER	GOM (EAFB)
*LSO	WGM (WSSH)
DOD LSO	TRAJECTORY
FDO	
GPO	
SMG	

BACKGROUND

KSC is the primary end-of-mission landing site. If forecast weather conditions at KSC are unacceptable, EAFB or WSSH could replace KSC. Additionally, when EAFB is the end-of-mission landing site, status of landing support at WSSH will be maintained for a potential underburn landing. Edwards will not normally support until EOM +1 and WSSH not until EOM +2. The procedures that follow pertain to either KSC, EAFB, or WSSH.

PROCEDURES

- A. Orbiter approach data and landing opportunities are provided to all landing sites and the respective ARTCC's about 30 days prior to launch. This information is updated during the flight if significant changes occur.
- B. About 6 hours prior to deorbit, the LSO will update the status of airfield support and navigation aids.
- C. About 6 hours prior to deorbit, the LSO obtains significant changes to the orbiter approach data from the Trajectory Officer. These changes are communicated to the appropriate Ground Operations Manager and ARTCC.
- D. About 3 hours prior to deorbit, the LSO and DOD LSO review potential SAR support (should a remote contingency occur during approach). The review covers SAR capabilities at the landing site. (Merchant vessel information and classified military information need not be included, but would be requested subsequent to a remote contingency if the information is applicable.)
- E. Significant changes to landing status and navigation aids status are reported as they occur, until orbiter landing.

- F. The LSO informs the appropriate Ground Operations Manager and ARTCC's of the deorbit burn status upon verification by FDO.
- G. Significant changes in crew status or orbiter systems status are communicated to the LRD, GOM, or WGM by SPAN MANAGER.
- H. LSO informs the ARTCC of significant deviations from the planned approach flight profile.

SOP 16.6

TITLE

AIRSPACE SCHEDULING AND COORDINATION

PURPOSE

To define and coordinate reserved airspace for orbiter approach and landing.

PARTICIPANTS

FDO	WGM (WSSH)
*LSO	LRD
DOD LSO	DOD SOC
GOM (EAFB)	TRAJECTORY

GENERAL

Prior to a flight, the LSO will determine orbiter approach data to the RTW and primary, backup, secondary, EOM, and AOA landing sites. The data will be provided to the appropriate ARTCC's and to FAA Headquarters.

PROCEDURES

- A. Prior to launch, the LSO interfaces with the appropriate ARTCC's to ensure cleared airspace for an intact abort.
- B. On Orbit
 1. EAFB, WSSH, and KSC
 - a. On orbit: If there are significant changes to the preflight provided orbiter approach data, the LSO provides these changes to the appropriate ARTCC's and landing sites.
 - b. Deorbit - 6 hours: The LSO obtains significant changes to the orbiter groundtrack from the Trajectory Officer and provides these changes to the ARTCC's and landing sites.
 - c. Deorbit TIG - 2 hours to touchdown: The LSO communicates to the appropriate ARTCC significant deviations from the planned approach flight profile which would occur within the ARTCC's controlled airspace.

2. TAL landing sites

Upon decision to land at a TAL site, the LSO provides the TAL GOM with orbiter approach data as soon as it can be determined.

3. Emergency landing

- a. If a landing is to occur in a remote area (ocean, desert, etc.) which is within airspace controlled by the FAA, the LSO provides orbiter approach data to the appropriate FAA agency through the FAA Flow Control Center as soon as possible.
- b. If a landing is to occur in foreign territory, the LSO provides orbiter approach data to the State Department and to the FAA COMM Control Center as soon as possible.
- c. The DOD LSO notifies the appropriate DOD organization if DOD support is required.

SOP 16.7

TITLE

STATUS OF NAVIGATION AIDS

PURPOSE

To define MCC procedures for maintaining status of ground navigation aids required to support an orbiter landing. This procedure is applicable to all orbiter landing sites. Status will be maintained on the MSBLS's at KSC, NS, and EAFB and on designated TACAN's for each landing site.

PARTICIPANTS

*LSO	GOM (EAFB)
FDO	WGM (WSSH)
GNC	LRD
DOD LSO	O-NAV
GPO	ENTRY SUPPORT
LOS ANGELES CENTER	

PROCEDURES

- A. The LSO obtains NAVAIDS status from the appropriate ground manager (LRD, WGM, GOM).
- B. The LSO obtains the status of the Palmdale TACAN from the Los Angeles Center.
- C. The LSO obtains the status of TACAN's at ALS's from the Ground Manager or the DOD LSO, whichever is appropriate.
- D. The LSO obtains the status of NAVAIDS and equipment at the ELS sites through the worldwide NOTAM system.
- E. The LSO should provide changes in status of NAVAIDS to FDO, GPO, O-NAV, and Entry Support.

SOP 16.8

TITLE

WEATHER AIRCRAFT OPERATIONS

PURPOSE

To define procedures to be used by the FC team for coordinating chase and weather aircraft activities during orbiter launch and landing timeframes.

PARTICIPANTS

*FD	WEATHER AIRCRAFT CREW
WX CAPCOM	VITT PERSONNEL
LSO	LRD
GC	GOM
HOUSTON VOICE	
COMM TECH	

GENERAL

- A. Weather Aircraft Flight Objectives
 - 1. Provide entry/approach wind and turbulence estimates.
 - 2. Provide in-flight weather observations.
 - 3. Provide operational checks of TACAN's and other Nav/Landing Aids.
 - 4. Provide status on outlying lakebeds.

PROCEDURES

- A. Aircraft Staging
 - 1. Two days prior to an STS launch, the weather aircraft deploys to KSC to support launch operations. They will also deploy to the planned landing site to cover an early or nominal end-of-mission landing.
- B. Aircraft Weather Flights
 - 1. Launch, RTLS, and AOA
 - a. Prelaunch T-38 weather evaluation at EAFB is not planned for the launch decision process.
 - b. At KSC, a Shuttle Training Aircraft (STA)/T-38 weather flight is scheduled for T/O at L - 2:20 minutes (the Wx CAPCOM will advise the pilot of launch slips). Observations are to be reported to the Wx CAPCOM in the MCC over 126.65 between L - 2:20 and L - 10 minutes. Any required reports to the spacecraft crew are provided by the CAPCOM.

- c. The weather aircraft stays airborne through lift-off. If an RTLS abort is declared, the weather aircraft evaluates the approach to the selected prelaunch runway for weather, visibility, and turbulence. The result of this evaluation, a "Go" or "switch runway" recommendation, is voiced to MCC near the end of powered flight on 126.65. The MCC makes the decision on whether a runway switch will be made after RTLS energy conditions have been evaluated. If a switch is necessary, the MCC requests the orbiter crew to change the runway via SPEC 50.
- d. If an AOA is required, a weather update is made if requested. This report is made to the MCC via 259.7 via the AOA site on A/G.

2. End of mission

EAFB

- a. STA/T-38 airborne weather reports are made, per FD direction, at TIG-3:30, TIG-1:00, TD-:30 minutes prior to orbiter landing. The LSO contacts the GOM via Landing Field Prime 1 communications loop to coordinate the weather flights, and the GC coordinates with HOUSTON VOICE for DFRF VHF configuration.
- b. The pilot evaluates turbulence on climbout and then observes the weather conditions while flying the planned orbiter approach flight path. The pilot reports the present weather observation and his recommendation for landing runway on 123.37 to the MCC.

C. TACAN Check

The weather aircraft pilot can be requested to report if he is receiving the landing site TACAN's. If so, the TACAN's to be checked are

<u>Edwards</u>	EDW/111 (Edwards) PMD/92 (Palmdale)
<u>Northrup Strip</u>	SNG/121Y (White Sands) HMN/92 (Holloman)
<u>KSC</u>	TTS/59Y (KSC) COF/97 (Patrick)

The following procedure will be used for reporting TACAN status:

KSC - prelaunch

TACAN checks will be made on the ground or during climbout and discrepancies will be reported to the Wx CAPCOM. The LRD will also report any maintenance problems to the LSO on Landing Field Prime 1. The LSO will report any problems to FD through the FDO.

Edwards

TACAN checks will be reported to the weather CAPCOM. The GOM will report any maintenance problems to the LSO on Landing Field Prime 1. The LSO will report any problems to the FD through the FDO.

D. MCC Communications With Weather Aircraft

Reference tables 16.8-1 and 16.8-2 for an overview of the MCC communications interface with the weather pilot.

Table 16.8-1. KSC communications with chase and weather crew

Aircraft	Time period	Crew location	Messages to A/C		A/C reports	
			From	Freq	To	Freq
WX	Prior to L - 2:20	KSC Ops (PAFB)	VITT Rep	Telephone 867-4792	None	None
WX	L - 2:20 to 0 to L - 20 min	Airborne	Wx CAPCOM	121.75	As required	As required
	L - 20 to L - 10	Airborne	OPS Mgr	121.75	OPS Mgr	121.7
	L - 9 to 0	Airborne	None		None	None
WX	RTLS declared	Airborne	Wx CAPCOM	126.65	MCC CAPCOM	259.7
	Pre-T/O	KSC Ops (PAFB)	None	None	None	None
	L - 9 min to L +RTLS	Airborne	KSC LRD	121.75	None	None

Table 16.8-2. EDW/MCC communications with chase and weather crew

Aircraft	Time period	Crew location	Messages to A/C		A/C reports	
			From	Freq	To	Freq
WX	Pre take-off	DFRF Control Room	LSO to EDW GOM	Landing Field Prime 1	None	None
WX	Landing - 4 hr 15 min	Airborne	MCC CAPCOM*	123.37	MCC CAPCOM*	259.7
WX	Landing - 2 hr 45 min	Airborne	MCC CAPCOM*	123.37	MCC CAPCOM*	259.7
WX	Landing - 30 min	Airborne	MCC CAPCOM*	123.37	MCC CAPCOM*	259.7
	Pre-T/O	Prime Crew Trailer	LSO to EDW GOM	Landing Field Prime 1	None	None
	Landing - 45 min	Airborne	MCC CAPCOM*	123.37	S/C Crew*	259.7
	Pre-T/O	DFRF Control Room	None	None	None	None
	Landing - 45 min	Airborne	EDW ASC	132.75	None	None

* During LOS periods.

SOP 16.9

TITLE

LANDING SITE GROUND SUPPORT SCHEDULING/RELEASE

PURPOSE

To describe procedures by which landing site personnel will be scheduled and released from support of daily landing opportunities.

PARTICIPANTS

FD	GOM (EAFB)
*LSO	WGM (WSSH)
DOD LSO	LRD (KSC)

GENERAL

Scheduling of landing site ground support (convoy, crash/rescue, MLS by local planners) is based on the following requirements:

- KSC
 - Immediate response posture until end of RTLS capability and AOA capability, if applicable
 - 4-hour alert posture for daily PLS
- EDWARDS
 - Immediate response posture until end of AOA capability, if applicable
 - 4-hour alert posture for daily PLS
- NORTHROP
 - 4-hour alert posture for daily PLS
- TAL abort sites
 - Immediate response posture until end of transoceanic abort capability

Should Northrup be designated as the AOA and/or end-of-mission site, the Edwards scheduling applies to Northrup.

For each landing site, support will be released if not notified of a intended landing before 4 hours prior to the daily PLS.

PROCEDURES

A. Preflight

1. The LSO will distribute landing opportunity tables for each landing site to the GOM, WGM, LRD, DDMS, GC, SMG, and SURGEON by 15 days prior to launch. These will be used to plan scheduling of resources.
2. The LSO will prepare ground release schedules for each of the three CONUS landing sites based on the landing opportunities and scheduling criteria described above. The schedules will be kept on console. The GOM, WGM, LRD, and DOD SOC will maintain similar schedules. These schedules will reflect Nav/Landing Aids scheduled support as well as the convoy call-up/release times.

B. Flight

1. After launch, the LSO will provide changes, if any, to the landing opportunities tables to the positions named above. The changes will be based on landing opportunities tables generated by TRAJECTORY after launch. Ground Support release schedules will be altered, if required.
2. Release times will be as published or modified during the daily LSO telecon with the sites. A positive confirmation of release is not required.

SOP 16.10

TITLE

LAUNCH COMMIT CRITERIA (LCC) ANOMALY RESOLUTION

PURPOSE

To establish procedures to be used by JSC flight controllers to resolve LCC anomalies during Space Shuttle Launch countdown.

PARTICIPANTS

MCC F/Cs
*JSC FLIGHT DIRECTOR
KSC NASA TEST DIRECTOR
GC

GENERAL

Shuttle Launch Commit Criteria (LCC) and Background (NSTS 16007) outlines the performance criteria for committing the Space Shuttle vehicle and ground systems for launch, consistent with crew safety, and maximizing launch probability.

LCC violations are identified and resolved by the Launch Control team in the Prime Firing Room. Support in resolving LCC violations is provided to the Prime Firing Room by the KSC Engineering team (located in the Backup Firing Room), the Mission Evaluation Room (MER), Huntsville Operations Support Center (HOSC), and the JSC Flight Control team.

A subsystem Engineering Team Lead (ETL), located in the Backup Firing Room, coordinates all design center inputs on LCC violations to the Launch Control Team. JSC involvement in the resolution of LCC violations prior to providing a "GO" to pick up from the T-9 minute hold will be worked through the KSC Engineering Team in the Backup Firing Room. After the T-9 minute hold, all inputs for the KSC Launch Control Team will be passed through the Flight Director. An updated ETL list with the corresponding OIS loops will be provided via Flight Director Office informal memo prior to each flight.

NOTE

For LCC violations prior to T-5 minutes, a dispositioned and approved waiver, signed by the MMT chairman, is required to continue the countdown past T-5 minutes. LCC violations first detected after T-5 minutes and counting for flight hardware or flight software or safety critical ground systems, will require a scrub or recycle.

PROCEDURES

Prior to "GO TO RESUME COUNT AT T-9 MINUTES":

1. Flight controller will tell Flight Director of LCC violation on FD 1 loop and which OIS loop the LCC violation will be discussed (per Flight Director Office memo). Flight controllers should provide a periodic update of the status of the LCC violation to the Flight Director on FD 1 loop.
2. Flight controller will contact the appropriate subsystem ETL on the required OIS loop. Representatives from the MER, HOSC, and Downey will provide input on this OIS loop.
3. Once a resolution or agreement on troubleshooting/contingency action is reached, the subsystem engineer in the Prime Firing Room will brief the Shuttle Project Engineer (SPE) on OIS 164.
4. The SPE will brief the NASA Test Director (NTD) on the Command Net (OIS 232 or OIS 212). After approval of the troubleshooting plan, the Flight Crew will be directed to perform any required steps.

After "GO TO RESUME COUNT AT T-9 MINUTES":

1. Flight controller will tell Flight Director of LCC violation on FD 1 loop. All discussion and preplanned actions will be discussed internally on the FD 1 loop.
2. If required, the JSC Flight Director will provide KSC NTD with information concerning the violation, recommendations on pre-planned actions, and a GO/NO-GO status.

LCC violations after T-5 minutes require a recycle or scrub (Launch Director call).

**SOP 17
WORKSTATION OPERATIONS**

SOP 17.1

TITLE

WORKSTATION SUPPORT AND RESPONSIBILITIES FOR LAN'S, HOST APPLICATIONS,
AND DATA TYPES

PURPOSE

To define interface coordination for workstations, LAN's, host applications, and data types.

PARTICIPANTS

WORKSTATION USER COMMUNITY

*FSM

COMPUTER SUPERVISORS

COMMAND

PAYLOADS

GC

DFE

GENERAL

Workstations require access to LAN's, host MOC job, and ODRC for retrieval of near real-time and trajectory data and for MED application interface including console initialization during simulations and missions.

PROCEDURES

A. Simulations

1. Prior to the start of a simulation, the multicast server and real-time host interface will be brought up for workstation use in initializing consoles 1 hour before the runstart checkpoint.
2. If at any time during the simulation the real-time host goes down or is recycled, or the CCC LAN is known to be experiencing problems. operations will inform GC of the situation. GC will then broadcast an advisory to the FC team, on the GC CALL voice loop, advising the team of the situation. Any actions required of the workstation operators will be announced by the GC CALL voice loop.

B. Mission

Procedures and communications for mission operations will be the same as those required for simulations, with the following exception: the real-time host interfaces to the CCC LAN will be brought up prior to first receipt of data from KSC prior to launch.

C. Simulations and Missions

The Front End Processors (FEP's) and the CCC LAN will operate in parallel with the TPC and MOC; i.e., whenever the MOC is processing data, the FEP's should also be processing data and transmitting it on the LAN. The DFE will maintain cognizance of the FEP's and their interfaces and will inform the GC of problems that may affect data quality at the workstations. The GC will announce LAN-related problems which may impact data processing at the workstation on the FD voice loop.

D. Responsibilities for LAN's, Host Applications, and Data Types

Applications (host)	Responsibility	Loop	Non-DVIS phone
MOC APPL HOST	COMPUTER SUPERVISOR	GC_CALL	3-2108
RETENTION APPL HOST	ODRC	282-3738	
MPCC PAYLOAD COMMAND	COMMAND	COMMAND	3-8723
LAN's			
	Responsibility	Loop	
SVO			
Common Support	FSM	DSS 1 and 2	3-5665
IPS	FSM	DSS 1 and 2	3-5665
ODRC	FSM	DSS 1 and 2	3-5665
White	FSM	DSS 1 and 2	3-5665
MOIR	FSM	DSS 1 and 2	3-5665
FEPS			
	Responsibility	Loop	
FEPS	DFE/FSM	DFE	
FEPS	COMMAND/FSM	COMMAND	3-8723
Data Types			
	Responsibility	Loop	
EDTE (EMULATED DTE)	COMP SUP	GC_CALL	
EVENTS	COMP SUP	GC_CALL	
GDR (GEN DATA RETRIEVAL)	COMP SUP	GC_CALL	
MED EMULATION	COMP SUP	GC_CALL	
MTM (MOC TLM MESSAGES)	COMP SUP	GC_CALL	
NDM (NET DATA MESSAGES)	FSM/DFE	DFE	
PBI EMULATION	COMP SUP	GC_CALL	
PPM (PROC. PLYD MSGS)	DFE/FSM	DFE	
Miscellaneous			
	Responsibility	Loop	
MED AUTHORIZATION	COMP SUP	GC_CALL	

SOP 17.2

TITLE

WORKSTATION PROBLEM REPORTING

PURPOSE

Provide a problem reporting plan for resolution of workstation-related problems during missions, nonmissions, and extended workstation maintenance/repair.

PARTICIPANTS

GC
OPERATING SYSTEM SUPPORT (OSS)
FSM
WORKSTATION MAINTENANCE
FC TEAM
WORKSTATION SYSTEM SUPPORT (WSS)
OPERATIONS SUPPORT TEAM (OST)
FACILITY OPERATIONS MANAGER (FSM)

GENERAL

WSS is responsible for troubleshooting workstation software application problems and is the initial point of contact for workstation difficulties. WSS will evaluate workstation status. If a problem cannot be resolved by WSS, then WSS will dispatch appropriate maintenance personnel. WSS is responsible for coordinating, tracking, and reporting the status of workstations connected to the MCC LAN. WSS is also responsible for following the repair priority checklist (FCOH 17.3) if multiple workstations have problems simultaneously. In the event that a repair conflict is encountered (i.e., multiple workstation failures with similar repair priorities occur at the same time), a real-time resolution will be reached between the FCT, GC, FD, and WSS.

M&O is not responsible for supplying or replacing toner or paper for printers connected to operational workstations. If problems are encountered by FCT when performing printer maintenance for toner, M&O will assist. Printer toner and paper are available in the substore (B30S, room 4301, extension 36942), and both are maintained as a mission consumable.

Workstation Maintenance is responsible for hardware configuration and maintenance of the workstations.

Operating System Support (OSS) is responsible for the software configuration baseline and maintenance of SOC provided software on the workstations.

TELCOM is responsible for configuring and monitoring the FEPS.

FSM is responsible for activity management, FEP configurations, and CCC network status and control.

PROCEDURES

- A. Workstation problem reporting during missions, sims, pad tests, or other high priority support.
1. For workstation users, the initial point of contact for all workstation problems is WSS, on WSS CALL loop.
 2. WSS is responsible for keeping GC apprised of outstanding workstation problems and resolution.
 3. Users will open an AR for all workstation problems in accordance with existing procedures. AR forms can be obtained from GC or FOM. Workstation ARs will be sent to FOM. In addition, users reporting problems should adhere to the following:
 - a. Provide workstation node name.
 - b. Provide room number and IGP number.
 - c. Provide black phone number.
 - d. Provide a description of the problem to include error messages and the application(s) being utilized.
 - e. Monitor WSS CALL loop until the problem is resolved.
 - f. In the MCC, do not power off workstations or workstation IGPs. This is an M&O function.
 - g. Do not attempt to unplug the workstation or plug anything into the workstation. Do not jiggle any plugs.
 - h. Printers may be powered off and on by FCT to resolve printer problems.
 4. FOM will time stamp and process the AR. Hardware and software maintenance support will be coordinated by WSS.
 5. If the necessary maintenance requires that the workstation CPU be taken down for repair, reboot, or if it is necessary to log in as Root, the responding technical personnel will contact WSS with this information. WSS will dispatch OSS.

NOTE

Without permission to log in with root authority, no problem analysis or isolation can occur. Consequently, the recovery effort would be limited to explanation of the problem.

6. If a workstation is to be taken down for an extended period of time, OSS or Workstation Maintenance will tag the workstation CPU and all associated IPGs with "down for repair" signs that include the WSS phone number. Technical support will notify WSS of the modification(s) to be performed and an estimated repair time. This step assumes that all permissions to proceed with repairs have been coordinated as above.

- B. Workstation problem reporting during nonmission support. Nonmission support is defined to be OST-supported runs that are not a mission, a sim, a pad test, or a similar high priority run. Workstation problem reporting for special events (e.g., stress test for new software releases) may vary from this procedure. The procedure is the same as above (section A).
- C. Workstation problem reporting for OST system anomalies that prevent workstation users from accessing required data (e.g., NRS, CM, Read/Write server, MOC, FEP, and LAN failures, etc.).
 - 1. If the problem is system-related, the appropriate OST discipline will notify GC and FSM as appropriate.
 - 2. GC will notify the FCT of the anomaly.
 - 3. OST/FSM will attempt to resolve the problem and provide GC with a status of the system. If an AR is required then the AR number will be included when reporting to others.
 - 4. The workstation user community will contact GC for system status. In the event a GC is not available then FSM will be the point of contact via FSM Loop.

SOP 17.3

TITLE

WORKSTATION REPAIR PRIORITY LIST

PURPOSE

To provide a workstation repair priority checklist in the event that multiple workstations experience problems simultaneously during mission support.

PARTICIPANTS

GC
*FSM
OPERATION SYSTEM SUPPORT (OSS)
WORKSTATION MAINTENANCE
FC TEAM

GENERAL

The workstation repair and repair priority checklist will be followed by support personnel in the event multiple workstations experience problems simultaneously during missions.

PROCEDURES

- A. See FCOH procedure SOP 17.2 for reporting workstation problems.
- B. The FSM section is responsible for generating and publishing a workstation repair and priority checklist prior to every mission. The JET provides FSM with a list for the current flight. Changes from previous flight are in bold type.
- C. The L - 14 checklist defines when the workstation repair and priority checklist is to be completed.

SOP 17.4

TITLE

USER COMP RUNS

PURPOSE

To establish procedures for coordination of USER COMP runs.

REFERENCE

- A. MCC Configuration Guide, SFOC-FL0546.
- B. FCOH, section 1.12, MCC Facility Scheduling

PARTICIPANTS

OST TEAM INCLUDING:

*FSM

COMP SUP
COMMAND
DFE

FC TEAM

PAYLOAD DATA
SCHEDULING

GENERAL

All participants must have DVIS-compatible headsets. Initial coordination concerning these runs will be conducted on DVIS loop FSM 1/2.

The first hour of the scheduled support start time is allowed for configuring requested equipment for the prime user scheduled. Piggyback users must report to the FSM and inform FSM of any resource requirements. If there are additional requirements, FSM will determine if equipment requirements are available.

PROCEDURES

- A. The REQUESTOR will submit the MCC Schedule Request form per the MCC Configuration Guide, section 2.10, SFOC-FL0546.
- B. Within 1 hour of the scheduled time, the user contacts the FSM console in person or on the FSM 1/2 loop. The OST will enable data after acknowledgment from the user. Any changes to the support requested can be discussed with the OST disciplines involved.
- C. The REQUESTOR will contact the FSM and other disciplines and piggyback users, if any, on the DVIS FSM 1/2 loop when the run is completed.

SOP 17.5

TITLE

OPERATIONAL SUPPLIES FOR WORKSTATIONS

PURPOSE

To define responsibilities and instructions for replacing the operational supplies required for operational W/S's and associated equipment as defined under item A" below.

PARTICIPANTS

- * FSM
- FC TEAM
- M&O (Microcomputer Systems Maintenance)
- SS (Substore (B-30S Room 4301))

GENERAL

M&O is not responsible for supplying or replacing toner or paper for printers connected to operational W/S's. If supplies of this nature are required then it is the responsibility of each FCT member to replace them. If problems are encountered by FCT when performing printer maintenance for toner, M&O will assist. Printer toner and paper are available in the substore, building 30S room 4301, and both are maintained as a mission consumable on the intensive management list."

PROCEDURES

- A. Procedure for getting the following operational supplies (only)

<u>Unit</u>	<u>Description for laser printer toner and paper</u>	<u>Catalog no.</u>
KT	DEC Turbo Printserve 20 = LPS2X-AA toner kit	760062P90
CA	QMS 1725 printer = HP 92291A cartridge	770007P835
RM	Paper 11 x 8 1/2	770007P206

NOTE

In order to add to this intensive management list, one must request approval of the new item by submitting a formal letter from your branch chief to the director or manager of logistics.

- B. Go to substore (B30S, room 4301)
- C. If your catalog number begins with the number 77, complete a Material Order form (see figure 17.5-1).

If your catalog number begins with a number other than 77, complete a Material Release Order Form (MRO) (see figure 17.5-2).

- D. If you are on the authorized signature list for the items listed under item A" of this procedure (check with substore clerk), complete the form and take possession of the supplies. If you are not on the list you must get an authorized signature or apply for signature authority.
- E. To apply for signature authority for items listed under item A" of this procedure, complete the following steps:
1. Submit a formal letter from your branch chief to the director or manager of logistics requesting signature authority.
 2. The formal letter must specify the length of time an individual will require signature authority.
 3. The formal letter must have the individual's name, typed and clearly legible.

MATERIAL ORDER

<input type="checkbox"/> TOOLING MATERIAL <input checked="" type="checkbox"/> MAINTENANCE, REPAIR OPERATING SUPPLIES <input type="checkbox"/> NESTING GAN <input type="checkbox"/> TOOL CRIB WITHDRAWAL					Date XX/XX/XX		No. M 279355							
Current Part No		Tool No		OTHER (Explain)		Employee (Requisitioner)		Dept. & I. D. No. Ext.						
Serial No		T.O. Comp. Sched.		Authority (T. O., J. O., W. O., etc.)		John Doe		199 1XXXX						
Pre Sketch: <input type="checkbox"/> Attached <input type="checkbox"/> Shown Remarks:					CRIB USE ONLY									
					Crib No.		<input type="checkbox"/> Charge Card			Dept. / Grd. Location		Fac. / Bldg. / On (Date)		
					<input type="checkbox"/> Charge Department		<input type="checkbox"/> Charge Replacement							
					Cost Stamp		Issuing Dept. Stamp			Authorized Signature		Title		
										MUST BE ON LIST				
										Accounting (To Be Completed By Requisitioner)				
Dept. By / Ledger Account		G.O./S.O.		Sub-Acct./Rel.		* * * *								
FINANCIAL USE ONLY														
Quantity	Unit	Description			Quantity issued	Unit Of Issue	Catalog No.	Converted Quantity	Unit Price	Ext.				
1	I	CA	Model 6140 Genicom EP-S cartridge					770007P381						
2	1	CA	Toner, Microfine, H.P. Series III-SI					770007P835						
3														
4														
5														
									TOTAL \$					

*Contact substore personnel for assistance. **FINANCIAL**

j_12805_094

Figure 17.5-1. Material Order form RSO918-L

PRESS HARD-This is a 6-part form.

MATERIAL RELEASE ORDER						C- 229012									
R E Q U E S T O R	PART NO	NOMENCLATURE	SMR	QTY.	UNIT OF ISSUE	DATE									
	760062P54	Genicom 5010 Toner Kit		1	KT	XX/XX/XX									
	EQUIVALENT PART NO.		SMR	SERIAL NO.		VOUCHER NO									
	REQUESTED BY	DEPT	EXT	APPROVED BY	DEPT	G.O.	REQUEST FOR (Check)								
	John Doe			XXX- Name must be XXXX on list	240		<input checked="" type="checkbox"/> Issue <input type="checkbox"/> Turn-In <input type="checkbox"/> Storage <input type="checkbox"/> Shipment <input type="checkbox"/> Loan <input type="checkbox"/> Repair								
	JUSTIFICATION				Model/Syst.	Replacement									
	Mission/Simulation Support				N/ Assy.	<input type="checkbox"/> Lost <input type="checkbox"/> Unserviceable									
					EQ/TPS	NEED DATE									
					DR/SR	XX/XX/XX									
Priority	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> Routine	AUTHORIZED BY	TITLE	DEPT. SHIP TO								
					Name must be on list	F/C GNC	240 Bidg 30S Substore								
M A T E R I A L	FROM	DEPT.	QTY.	Back-Ord	UNIT	W A R E H O U S E	FROM	DEPT.	QTY.	UNIT	I N S P E C T I O N	INSP.	LOT NO.	PRR NO.	
	TO	DEPT.	QTY.		UNIT		TO	DEPT.	QTY.	UNIT		Mat. Review	Disposition	DATE	
	SIGNATURE		Posted		Ckd.		RECEIVED BY	DATE		Yes		No	Scrap	Repair	
	DATE	MIN.	MAX.	STOCK BALANCE			LOCATION								
MATERIAL - REVIEW															
OK TO USE		SUPPLIER			NR MAT'L REV.										
		RETURN TO SUPPLIER:			CUSTOMER:										
COPY 1 MATERIAL ORDER															
PART NO.						NOMENCLATURE						QTY			

i_12805_095

Figure 17.5-2. Material Release Order form

SOP 17.6

TITLE

EDTE USAGE

PURPOSE

To define usage of EDTE in the MOC.

PARTICIPANTS

FD *COMP SUP
FCT
GC

GENERAL

EDTE allocation is as follows:

Ascent: 30 EDTE
On orbit: 36 EDTE
All other support: 36 EDTE (begins at orbit phase for missions)

PROCEDURES

- A. The enabling/disabling of EDTE is at FD direction.
- B. The Computer Sup will be the FCT point of contact for all questions/concerns on EDTE and may be reached on GC CALL loop.
- C. Any problems encountered in which EDTE is suspected to be the cause may require scaling down the EDTE allocation per priority list (table 17.6-1) or disabling all EDTE.
- D. EDTE will remain active across checkpoints.
- E. All emulated displays will be initialized (XWS, INIT) following any restart turnaround activity. Users may then recall their emulated displays and their workstations following clearance from GC.
- F. EDTE will be reduced from 36 to 30 at launch minus 45 minutes, then reallocated to 36 during the on-orbit phase. A list of the priority users for the displays are in table 17.6-1.

Table 17.6-1. EDTE utilizations during missions by priority

EDTE by mission phase		
Discipline	Launch	Orbit/ENT
FDO	3	2
BOOSTER	3	2
GPO	2	2
ARD	1	0
GDS	1	1
GNC	1	1
PROP	1	1
NIP	2	2
FAO	0	2
EVA	0	1
PTG	0	2
DPS	1	1
EGIL	2	4
EECOM	1	1
PLO	2	2
MMACS	2	2
INCO	3	3
PAYLOAD	1	2
COMP SUP	2	2
PLDCUST	0	2
GC	2	1
Total EDTE	30	36 mission requirements
Training	6	10 integrated sims, no mission rqmts

Note: Disciplines are sorted by priority with first being highest.

SOP 17.7

TITLE

WORKSTATION AUTHORIZATION

PURPOSE

To define procedures to be used by all MCC FCT members for authorization of a workstation not currently authorized for flight support.

PARTICIPANTS

*GC
FCT
WSS

GENERAL

A list of authorized workstations is developed premission at the JET Workstation Users meeting. This list is then provided to the WSS. An unauthorized user logging on will cause an "Intruder" alert.

This procedure provides a means to add a workstation to the list of workstations authorized for flight support.

PROCEDURES

If a workstation not currently authorized for flight support is required for flight support, the requesting flight controller contacts the GC and requests authorization to use the workstation for flight support. If the workstation belongs to an associated active FCR position, the requesting flight controller must first get permission from that flight control position prior to requesting activation by the GC. The GC will confirm with the FC position and then if it is determined that the workstation should not be on the mission approved list, the user will be notified of impending remote log-off. Have the WSS add the workstation to the approved list of flight workstations.

SOP 17.8

TITLE

USER COMP RUNS (DELETED)

SOP 17.9

TITLE

IPS DOL SUPPORT SYSTEM (MPSR) EXTENSION SUPPORT FOR ON-ORBIT CONTINGENCY OPERATIONS

PURPOSE

To define procedures to be used in the event of an on-orbit navigation anomaly requiring flight controller access to the IPS DOL Support System, in room 210 of B30 MOW, via the MPSR extension positions.

PARTICIPANTS

FDO
GC
FSM
FDO MPSR Navigation Support Team
IPS (IPS support team)
IPS Ops Engineer
*IPS Facility Project Manager

GENERAL

Navigation support team may require access to the IPS Support system platform application to help resolve in-flight anomalies.

PROCEDURES

A. Simulation

Mission support procedures will be used.

B. Mission

Two support periods are defined. The procedures vary slightly depending upon the timing of the request for support. The first period is referred to as "prime time" (roughly normal working hours) and the second is referred to as "off time." For both periods the first three steps are identical:

1. Requesting navigation flight controller will notify FDO of the requirement.
2. The FDO will notify the GC of the contingency requirement.
3. GC will instruct FSM to place the isolation switch in the new control center position.

If the emergency occurs during the prime time (0700 - 1900, normal work day)

4. FSM will notify the IPS Help Desk before reconfiguring the switch. The IPS Help Desk requires at least 10 minutes for user notification.
5. FSM will configure the switch to the new control center position.

6. FSM will notify the GC that the requested configuration change has been made.
7. When the requirement for the configuration no longer exists, the navigation flight controller will notify the FDO.
8. FDO will notify GC that the contingency configuration is no longer required.
9. GC will instruct FSM to return the switch to the IPS platform position.
10. FSM will put the switch back in the IPS platform position.
11. FSM will notify the GC that the switch has been reconfigured to the IPS platform position.
12. FSM will notify the IPS Help Desk that the switch has been reconfigured to the IPS platform position.

If the emergency occurs during the off hours (1900 - 0700 or anytime on a day that the IPS support team is not required to work; i.e., weekend or holiday).

4. FSM will configure the switch to the new control center position.
5. FSM will notify the GC that the requested configuration change has been made.
6. FSM will notify the IPS Ops engineer or the IPS facility project manager of the off-hour configuration change.
7. When the requirement for the configuration no longer exists, the navigation flight controller will notify the FDO.
8. FDO will notify GC that the contingency configuration is no longer required.
9. GC will instruct FSM to return the switch to the IPS platform position.
10. FSM will put the switch back in the IPS platform position.
11. FSM will notify the GC that the switch has been reconfigured to the IPS platform position.
12. FSM will notify the IPS Ops engineer or the IPS facility project manager of the off-hour configuration change.

Points of contact:

IPS Help Desk (prime time)	282-2841 or 282-3547
Georgia Norton, IPS Ops engineer	282-4977 work 482-7773 home 764-2444 beeper
Robert de la Garza, IPS facility project manager	282-3091 work 487-5574 home
Data Transfer System (DTS) operator	764-2490 beeper

SOP 17.10

TITLE

GENERALIZED DATA RETRIEVAL (GDR) USE

PURPOSE

To define usage of GDR on the CCLAN.

PARTICIPANTS

FD	COMP SUP
FCT	WSS
*GC	COMMAND
	DFE

GENERAL

Due to performance limitations, it is necessary to limit the amount of GDR usage on the CCLAN. GDR operational limits for various flight phases are as follows:

Launch	400,000 (bytes)
Orbit	450,000
Rendezvous	350,000
Landing	400,000

PROCEDURE

- A. The Computer Supervisor will be the central point of contact for all GDR concerns or problems.
- B. Use of GDR will be restricted to 400,000 bytes during ascent and entry, 350,000 bytes during rendezvous phase, and 450,000 bytes during orbit phase.
- C. Computer Supervisor will monitor GDR utilization. If the operational limits are exceeded, the Computer Supervisor will notify GC.
- D. GC will notify the FCT that due to high GDR utilization they are being asked to drop all nonessential GDR displays.
- E. If high GDR usage continues, the Computer Supervisor will identify any MOIR workstations signed on and utilizing GDR and will notify GC.
- F. GC will request Computer Supervisor or WSS to disable and purge all GDR for that workstation(s). GC will then request Computer Supervisor to disable the MOIR MOC access authorization ID's and purge all GDR transactions for MOIR workstation.

G. If high GDR usage continues, GC will ask all flight control positions, except those listed in table 17.10-1, to drop all GDR displays.

Table 17.10-1. Critical GDR dependencies

Discipline	W/S ID's	Critical ascent	Critical on orbit	Critical rendz	Critical entry
COMMAND/DFE	CGR	Yes	Yes	Yes	Yes
GC	WF12, WF31	Yes	Yes	Yes	Yes
INCO	WF, WM	Yes	Yes	Yes	Yes
Trajectory	WF10, WF29, WF11, WF30, TRJ, IPS-13	Yes	Yes	Yes	Yes
FD	WF	Yes	No	No	No
FAO	FAO	No	Yes	Yes	No
PDRS		No	Yes ²	Yes ²	No
Surgeon		No	Yes ¹	Yes ¹	No
PAO	PAO	No	Yes	Yes	No
Payloads		No	Yes	Yes	No
MOIR	MOIR1-43	No	No	Yes	No
COMSUP	COMS	Yes	Yes	Yes	Yes

¹During high solar radiation, surgeon is critical. (GC to notify Comp Sup of event.)

²Single shot only.

SOP 17.11

TITLE

SUPPORT LAN FAILURE CONTINGENCY PLAN

PURPOSE

To provide a method to recover required capability in the event of a Support LAN failure.

PARTICIPANTS

*GC
FD
MCC FC TEAM
FSM
COMPUTER SUPERVISOR
OST

PROCEDURE

- A. When indications of a Support LAN failure occur, the GC will be notified and the FD advised that the contingency plan should be activated.
- B. Prelaunch, if the failure is not understood or the failure could affect the alternate LAN (i.e., software problem), a launch hold will be invoked until the problem is resolved. If the failure is understood and will not affect the alternate LAN, the GC will make a NO-GO call, and a hold will occur at T - 5 minutes. If time is available to allow FSM to complete failure analysis and any recovery actions, the controllers will remain at their designated workstations. If there is not enough time to allow for recovery actions, the controllers will move to the designated backup workstations (defined prelaunch).
- C. Once the plan has been initiated, the FSM will disable the Support LAN bridges, and the Computer Supervisor will disable all transactions with the failed LAN.
- D. For positions with two controllers, one controller will move to the designated backup workstation, and the other will remain at the primary work area until the transition is complete.

NOTE

For missions with short launch windows, consideration will be given to preconditioning (logging on only) and pausing the alternate w/s's.

SOP 17.12

TITLE

WHITE LAN FAILURE CONTINGENCY PLAN

PURPOSE

To provide a method to recover required capability in the event of a White LAN failure.

PARTICIPANTS

*GC
FD
MCC FC TEAM
FSM
COMPUTER SUPERVISOR
OST

PROCEDURE

- A. When indications of White LAN failure occur, the GC will be notified and the FD advised that the contingency plan should be activated.
- B. Prelaunch, if the failure is not understood or the failure could affect the alternate LAN (i.e., software problem, unexplained anomaly, etc.), a launch hold will be invoked. The launch count will not resume until the problem is resolved. If the failure is understood and will not affect the alternate LAN, the GC will make a NO-GO call, and a hold will occur at T - 5 minutes. If the Flight Director determines there is enough hold time to allow FSM to complete failure analysis and any recovery actions, the controllers will remain at their designated workstations. If there is not enough hold time to allow for recovery actions, the controllers will move to the designated backup workstations (defined prelaunch).
- C. Once the plan has been initiated, the FSM will disable the White LAN bridges, and the Computer Supervisor will disable all transactions with the failed LAN.
- D. For a White LAN failure recovery, the Flight Director and Capcom A/G capability will need to be enabled and abort capability configured upon request.

SOP 17.13

TITLE

WORKSTATION LOGIN CONTROL FOR ASCENT

PURPOSE

To establish a policy for restricting workstation logins during the final hour of countdown through the post OMS-2 burn.

PARTICIPANTS

* GC
FCT
WSS

PROCEDURE

- A. All authorized users, per SOP 17.7, supporting flight should be logged into their workstations before L-1 hour.
- B. Inside L-1 hour, no further logins will be allowed to the mission activity without approval of the GC and the FCR position being supported. Authorized workstations that are required to login after L-1 hour, but before going into the final T-9 minute hold, must get approval from the GC.
- C. No new logins will be permitted after going into the T-9 minute hold. Users previously logged in that were logged out due to workstation problems will be permitted to log back in during this timeframe.
- D. WSS will notify the GC of any new logins after L-1 hour. If they are not authorized and are not recovering from a workstation problem, GC will direct WSS to log them out.
- E. This restriction will remain in effect until after completion of the OMS-2 burn.

**APPENDIX A
ACRONYMS AND ABBREVIATIONS**

A/G	Air-to-Ground
AERO	Aerodynamics
AFD	Assistant Flight Director
AFSCF	Air Force Satellite Control Facility
AGVS	Air-to-Ground Voice System
AIPC	Artificial Intelligence Printer Controller
ALMS	Automated Logistics Management System
ALS	Augmented Landing Site
AOA	Abort Once Around
AOS	Acquisition of Signal
ARTCC	Air Route Traffic Control Center
ASAP	As Soon As Possible
ASC	Airfield Support Coordinator
ATC	Air Traffic Control
ATO	Abort to Orbit
B/U	Backup
BCE	Bus Control Element
BDA	Bermuda (STDN site)
BFCS, BFS	Backup Flight Control System
BIOMED	Biological Medicine (medical)
BITE	Built-in Test Equipment
BME	Biomedical Engineer
BSE	Booster Systems Engineer
C&W	Caution and Warning
C/L	Checklist
C/O	Checkout
CAIP	Contingency Abort Impact Predictor
CAL	Calibration
CAN	Canberra (STDN site)
CAP	Crew Activity Plan
CAPCOM	Spacecraft Communicator
CARF	Central Airspace Reservation Facility (FAA)
CASTS/CASRS	Countdown and Status Transmitter (or Receiver) System
CCAFS	Cape Canaveral Air Force Station
CCE, COMMAND	Computer Command Engineer
CCM	Configuration Control Module
CCRF	Consolidated Communications Recording Facility
CCS	Console Communication System
	Command and Control System
CCSE	Cape Communications Systems Engineer
CCT	Computer Compatible Tape
CCTV	Closed Circuit Television
CDDT	Countdown Demonstration Test

CDE	Consolidated Development Environment
CDM	Configuration Data Manager
CDMS	Command and Data Management System
CDR	Commander
CLS	Contingency Landing Site
CM	Configuration Management
CMD	Command
CNTRL	Control
COB	Close of Business
COMM	Communications
CONF	Conference
CONFIG	Configuration
CONST	Constant
COORD	Coordination
CPU	Central Processing Unit
CRIT	Critical
CRP	Configuration Requirements Processor
CRT	Cathode-Ray Tube
CSC	Contingency Support Center
CSO	Computer Security Officer
CSR	Customer Support Room
CVD	Combined Voice/Data
D/L	Downlink/Downlist
DADS	Day-of-Launch Ascent Design System
DASD	Direct Access Storage Device
dBm	Decibel (referenced to one milliwatt)
DCC	Data Computation Complex
DDMS	DOD Manager for Space Shuttle Support
DEU	Display Electronics Unit
DFE	Data Flow Engineer
DFL	DECOM Format load
DFRF	Dryden Flight Research Facility
DIBS	Day-of-Launch I-Load Biasing System
DIST	Distribution
DLSM	Data Link Summary Message
DME	Distance Measuring Equipment
DOD	Department of Defense
DOLILU	Day-of-Launch I-Load Update
DPM	Data Products Manager
DPS	Data Processing System
DQM	Dump Quality Monitoring
DR	Discrepancy Report
DRK	Display Request Keyboard
DRO	Direct Readout
DSC	Dynamic Standby Computer
DSM	Digital Select Matrix
DSS	Data Systems Supervisor

DVIS	DIGITAL Voice Intercom System
DYN	Dynamics
EAFB	Edwards Air Force Base, CA
ECC	Emergency Communications Center
ECOS	Experiment Computer Operating System
EECOM	Environmental, Emergency and Consumables Engineer
EET	Entry Elapsed Time
EGIL	Electrical Generation and Illumination Engineer
EI	Entry Interface
ELS	Emergency Landing Site
EMCC	Emergency Mission Control Center
EMI	Electromagnetic Interference
EMSS	Emergency Medical Services System
EMU	Entry Memory Uplink
EOM	End of Mission
EPS	Electrical Power System
ER	Eastern Range
ET	Event Timer, External Tank
ETO	Estimated time until operation
EU	Electronic Unit/Engineering Units
EVA	Extravehicular Activity
EXEC	Execute
EXP	Experiment
F/C	Flight Controller
FAA	Federal Aviation Administration
FACS	Facsimile
FAO	Flight Activities Officer
FAP	Failure Analysis Program
FC	Flight Control
FCOH	Flight Control Operations Handbook
FCR	Flight Control Room
FCT	Flight Control Team
FD	Flight Director
FDA	Fault Detection and Annunciation
FDF	Flight Data File
	Flight Dynamics Facility
FDG	Flight Discipline Group
FDO/FIDO	Flight Dynamics Officer
FEP	Front End Processor
FET	Flight Elapsed Time
FICHE	Microfiche
FLT	Flight
FM/FM	Frequency Modulation/Frequency Multiplexing
FMT	Format
FOM	Facility Operations Manager

FOMR	Flight Operations Management Room (Skylab)
FPM	Facility Project Manager
FSM	Facility Systems Manager
FSW	Flight Software
G-MEM	General Memory
GAS	Get-Away Special
GC	Ground Controller
GCMR	Ground Configuration Message Request
GDx	Goldstone, California (STDN Site)
GEN	Generation
GET	Ground Elapsed Time
GHz	Gigahertz
GMT	Greenwich Mean Time
GN	Ground Network
GNC, GN&C	Guidance, Navigation, and Control
GND	Ground
GOM	Ground Operations Manager
GPC	General Purpose Computer
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
GSO	Guidance Support Officer
GSTDN	Ground Spacecraft Tracking and Data Network
GUID	Guidance
GUIDANCE	Guidance Officer
H-	Horizon minus
HAC	Heading Alignment Circle
HB	Handbook
HDR	High Data Rate
HEX	Hexadecimal
HH:MM	Hours:Minutes
HIST	History
HOSC	Huntsville Operations Support Center (MSFC)
HQ	Headquarters
HR	Hour
HS	High Speed
HSP	High Speed Printer
HW	Hardware
I/F	Interface
I/O	Input/Output
IBM	International Business Machine Corporation
ICOM	Intercommunications
ID	Identification
IECM	Induced Environment Contamination Monitor
IFM	In-Flight Maintenance
IGN	Ignition

ILC	Integrated Load Checkout
IMU	Inertial Measurement Unit
INCO	Integrated Communications Officer
INDAT	Incoming Data
INIT	Initial/Initiate
INSTR	Instrumentation
IPR	Interim Problem Report
IPS	Instrument Pointing System
IRAMS	Inertial Reference Alignment Monitoring System
ISD	Information System Directorate
ISS	International Space Station
IUS	Interim Upper Stage
JIN	JSC Information Network
JOIP	Joint Operations Integration Procedures
JSC	Johnson Space Center
kb/kbps	kilobits/kilobits per second
KSC	Kennedy Space Center
Ku-band	10.9 to 36 GHz
L-	Launch minus (counts through hold points)
lab	laboratory
LC	Launch Countdown
LCC	Launch Control Center Launch Commit Criteria
LDB	Launch Data Bus
LDO	Loads and DOLILU Officer
LDR	Low Data Rate
LED	Light Emitting Diode
LLTDS	Launch and Landing Tracking Data System
LOS	Loss of Signal
LPS	Launch Processing System
LRD	Landing and Recovery Director
LRU	Line Replaceable Unit
LSEAT	Launch Systems Evaluation Analysis Team
LSO	Landing Support Officer
LST	Life Support/Thermal
LTCT	Launch Target Constraints Table
LVLH	Local Vertical Local Horizontal
M&O	Maintenance and Operations
M/SID	Measurement/Stimulus Identification
MAC	MCC Action Center
MAIL	Mockup and Integration Laboratory
MAINT	Maintenance
MAR	Mission Action Request
MATS	Message and Timeline Support

MBI	Multibus Interface
MC	Mission Contingency
MCC	Mission Control Center
MCM	Multiple Command Module
MDD	Mating/Demating Device
MDM	Multiplexer/Demultiplexer
MDRF	Mission Data Request Form
ME	Main Engine
MECO	Main Engine Cutoff
MED	Manual Entry Device
MER	Mission Evaluation Room
MET	Mission Elapsed Time
MGA	Middle Gimbal Angle
MGR	Manager
MHz	megahertz
MIL	Merritt Island, Fla. (STDN site)
MILA	Merritt Island Launch Area
MIN	Minute
MIS	Mission Information System
MLR	Monodisperse Latex Reactor
MMACS	Maintenance, Mechanical, Arm, and Crew Systems
MML	Master Measurement List
MMT	Mission Management Team
MMU	Mass Memory Unit
MOC	Mission Operations Computer
MOD	Mission Operations Directorate
MOH	MCC Operations Handbook
MOIR	Mission Operations Integration Room
MOW	Mission Operations Wing
MPS	Main Propulsion System
MPSR	Multipurpose Support Room
MRR	MCC Reconfiguration Request
MRTC	Multiple Real-Time Command
MS	Mission Specialist
MSBLS	Microwave Scan Beam Landing System
MSFC	Marshall Space Flight Center
MSID	Measurement/Stimulus Identification
MTU	Master Timing Unit
MVE	Maneuver Vector End
MVI	Maneuver Vector Initiate
N.A.	Not available
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
NASCOM	NASA Communications Network
NASCOP	NASA Communication Operations Procedures
NAV	Navigation
ND	Network Director

NESR	Natural Environmental Support Room
NET	Network
NETCOM	Network Communications
NFS, NS	Northrup Flight Strip
NGM	NS Ground Manager
NIP	Network Interface Processor
NM	Network Manager (GSFC)
no.	number
NOCC	Network Operations Control Center (GSFC)
NOM	Network Output Multiplexer
	Network Operations Manager
NOSP	Network Operations Support Plan
NOTAM	Notice to Airmen
NRT	Near Real Time
NSP	Network Signal Processor
NSTSO	National STS Office
NTD	NASA Test Director
OAS	Office Automation Systems
OBS	Operational Biomed Sensors
OCA	Orbiter Communications Adapter
OD	Operations Division
ODBMPO	Operations Data Base Mass Properties Officer
ODDS	Operational Data Delivery Services
ODRC	Orbiter Data Reduction Complex
OFT	Orbital Flight Test
OGMT	Orbiter Greenwich Mean Time
OI	Operational Instrumentation
OIS	Operational Intercommunication System
OJT	On-the-Job Training
OMET	Orbiter Mission Elapsed Time
OMI	Operations and Maintenance Instruction
OMS	Orbital Maneuvering System
ONAV	Onboard Navigation
OPO	Orbiter Project Office
OPR	Operator
OPS	Operations
OPSR	Operations Supervisor
ORB	Orbiter
OREO	OMS/RCS Engineering Officer
OST	Operations Support Team
P/L or PL	Payload
PABX	Private Automatic Branch Exchange
PAD	Preparatory Advisory Data
PAM	Payload Assist Module
PAO	Public Affairs Officer
PAPAS	Prelaunch Alignment Performance Analysis Subsystem

PASS	Primary Avionics Software System
PB	Playback
PBI	Pushbutton Indicator
PCA	Program Change Authorization
PCM	Pulse Code Modulation
PCMMU	Pulse Code Modulation Master Unit
PCN	Page Change Notice
PCZ	Physical Control Zone
PDI	Payload Data Interleaver
PDIP	Payload Data Interface Panel
PDL	Ponce De Leon (STDN site)
PDP	Postinsertion Deorbit Preparation
PEG	Powered Explicit Guidance
PEP	Polynomial Error Protection
PET	Phase Elapsed Time
PI	Principal Investigator
PI&E	Program Integration and Engineering
PIP	Payload Integration Plan
PLBD	Payload Bay Doors
PLNR	Planner
PLT	Pilot
PLUM	Parameter List Update Message
PM	Phase Modulation
	Permanent MED
POCC	Payload Operations Control Center
POD	Payload Operations Division
PRIM	Primary
PROCED	Procedure
PROJ	Project
PROP	Propulsion
PS	Payload Specialist
PSAT	Predicted Site Acquisition Table
PSP	Project Support Plan
	Payload Signal Processor
PTC	Passive Thermal Control
PVT	Private
	Pressure-Volume-Temperature
QA	Quality Assurance
QUAT	Quaternion
R-OUT	Rollout
R/T or RT	Real Time
RCS	Reaction Control System
REFSMMAT	Reference to Stable Member Matrix
REPRO	Reproduction
REV	Revision
RF	Radio Frequency

RFI	Radio Frequency Interference
RI	Rockwell International
RID	Madrid, Spain (STDN site)
RIO	Russian Interface Operator
RM	Room
RMS	Remote Manipulator System
RMU	RMS, Mechanical, Upper Stages
RSC-Energia	Rocket Space Corporation-Energia (Russian company)
RTA	Real-Time Accumulator
RTC	Real-Time Command
RTLS	Return to Launch Site (abort)
RTS	Remote Tracking Site
S-band	1550 to 5200 MHz
S.V.	State Vector
S/C	Spacecraft
SAIL	Shuttle Avionics Integration Laboratory
SAR	Search and Rescue
SCA	Simulation Control Area
SCAP	Shuttle Configuration and Analysis Program
SCOS	Subsystem Computer Operating System
SCP	Standard Console Procedure
SCR	Stripchart Recorder
SD	Space Division or Systems Division
SDL	Software Development Laboratory
SDP	Shuttle Data Processor
SDPC	Shuttle Data Processing Complex
SDRS	Shuttle Data Reconfiguration System
SFL	Shuttle Forward Link
SGLS	Space Ground Link System (DOD)
SGMT	Simulated Greenwich Mean Time
SHO	Schedule Operations messages
SIM	Simulate/Simulation
SIMO	Simultaneously
SL	Spacelab
SLAPS	Systems Logic and Processing Section
SM	Systems Management
SMG	Spaceflight Meteorology Group
SMS	Shuttle Mission Simulator
SN	Space Network
SOC	Support Operations Center
SODB	Shuttle Operational Data Book
SOP	Standard Operating Procedure
SPA	Signal Processor Assembly
SPAN	Spacecraft Analysis
SPC	Stored Program Command
SPDC	Shuttle Data Processing Computer
SPEC	Specialist

SPT/SUPT	Support
SR	Statement of Requirement
SR&QA	Safety, Reliability, and Quality Assurance
SRAG	Space Radiation Analysis Group
SRB	Solid Rocket Booster
SSME	Space Shuttle Main Engine
SSO	Space Shuttle Orbiter
SSPO	Space Shuttle Program Office
SSR	Staff Support Room
STA	Shuttle Training Aircraft
STD	Shuttle Test Director
STDN	Space Flight Tracking and Data Network
STS	Space Transportation System
SUPV	Supervisor
SVD	Separate Voice/Data
SW	Software
SWCO	Software Checkout
SYS	System
T-	Terminal Count minus (stops at each hold point)
TACAN	Tactical Air Navigation System
TAEM	Terminal Area Energy Management
TAGS	Text and Graphics System
TBD	To Be Determined
TBS	To Be Supplied
TCA	Time of Closest Approach
TD	Touchdown
TDRSS	Tracking and Data Relay Satellite System
TECH	Technician
TFL	Telemetry Format Load
TIG	Time of Ignition
TM/TLM	Telemetry
TMBU	Table Maintenance Block Update
TMCC	Temporary Mission Control Center
TPC	Telemetry Preprocessing Computer
TRAJ	Trajectory
TS	Timing Subsystem
TST	Test
TTY	Teletype/Teletypewriter
TV	Television
U/L	Uplink
UDD	Universal Digital Display
UHF	Ultrahigh frequency (300 to 3000 MHz; commonly extended to 240 MHz in Shuttle documentation)
UP	Universal Plots
UPF	Universal Patch Format
UTC	Universal Coordinated Time

V/P	Variable Parameter
VAFB	Vandenberg Air Force Base, Calif.
VAT	Vector Administration Table
VEH ID	Vehicle Identification
VITT	Vehicle Integration Test Team
VORTAC	Vhf Omnirange Tactical Air Navigation
VPDR	Variable Parameter Display Request
VSS	Verified Support System
VTR	Videotape Recording (er)
W/S	workstation
WB	wideband
WCS	Waste Collection System
WOW	Weight On Wheels
WSC	White Sands Complex
WSMR	White Sands Missile Range
WSS	Workstation System Support
WSSH	White Sands Space Harbor
WR	Western Range
XMIT	Transmit