



NAS 9-14444

SPACE SHUTTLE ORBITER AVIONICS SOFTWARE

POST REVIEW REPORT

FOR THE ENTRY FACI

(FIRST ARTICLE CONFIGURATION INSPECTION)

(NASA-CR-151742) SPACE SHUTTLE ORBITER
AVIONICS SOFTWARE: POST REVIEW REPORT FOR
THE ENTRY FACI (FIRST ARTICLE CONFIGURATION
INSPECTION) (IBM Federal Systems Div.)

N78-27164

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CSSL 22B G3/16

Unclas

25172

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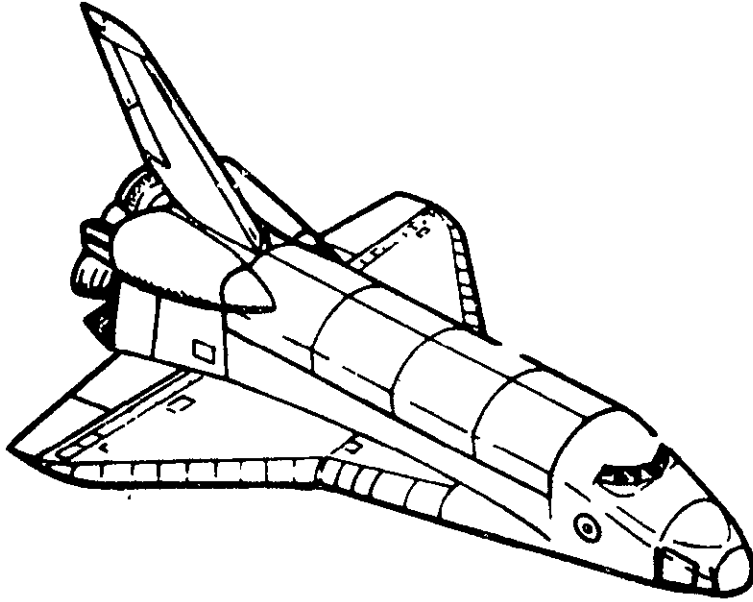
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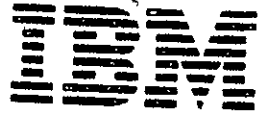


IBM FEDERAL SYSTEMS DIVISION
1322 Space Park Drive
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ENTRY FACI DELIVERY

space shuttle programs



Federal Systems Division
1322 Space Park Drive, Houston 77058

H. MARKOS
MAY 9, 1978

AGENDA

DELIVERY STATUS

SSW SOFTWARE

SM SOFTWARE

DL SOFTWARE

GNC SOFTWARE

LEVEL 3/4 TESTING

LEVEL 5 TESTING

PERFORMANCE ANALYSIS

SDL

VERIFICATION

ENTRY FACI DELIVERY

H. MARKOS

Space Shuttle MMU Computer Program Software

Orbital Flight Test Integrated System

OFTIS- 8.0

CLASS A

RELEASE AUTHORIZATION

MMU SOFTWARE ELEMENTS

ELEMENT	AREA 1		AREA 2		AREA 3	
	ENT R08V04.01	PS	PMD3 R07V06.02	P*	ACA R06V05.03	*
BFS	N/A		N/A		N/A	
DCP	7.0		7.0		5.4	
GPC-IPL (STP)	1.0		1.0		 	
SSME	N/A		N/A		N/A	
TCS	Skeleton		 		 	
D T&G	Skeleton		 		 	
TFL	N/A		2.0		N/A	
PDI	N/A		N/A		N/A	

*Incorporates all previously applied patches applicable to this system.

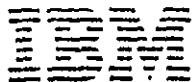
MASTER TAPE - PART NUMBER LTG-8
 - SERIAL NUMBER 100078

APPROVAL *H. Markos* DATE 4/26/78

H. Markos, Manager
 Shuttle Software System Build & Control - IBM

APPROVAL *John W. Garmin* DATE 4/26/78

J. R. Garmin, Chairman
 MMU Release Coordination Team - NASA/FR



Federal Systems Division
 Houston, Texas 77058

Space Shuttle Orbiter Avionics Software

Primary Avionics Software System

RELEASE AUTHORIZATION

RO8VO4.01 (ENTR)
RELEASE/VERSION

CLASS A

0/1&2/FCOS		0/2/UI		0/2/SC		0/2/DL	
7	PS	5	PS	5	PS	20	I

				3/GN MFB						9/VU MFB		14/SM MFB			
				3	PS							I	I		
1/4/GN1&6		2/5/GN2		3/6/GN3		8/7/GN8		9/8/GN9		6/12/SM8		7/13/SM9		4/15/SM2	
				5	PS									1	I

DOWNLIST

MC1		MC2		MC3		MC8		MC9		MC6		MC7		MC4	
				23bu	S									24	I

SM CKPT		GN CKPT		IMU CKPT		ILOAD		SSL		CRIT DISP TRIS		SM DATA			
				1.0	I	*	S	SSW2		2G	I	3.1	I		

*derived from PCR's (includes MPAD memo) and CR's

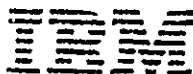
UPF SYSTEM ID - 6

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MASTER TAPE 2043/2052

APPROVAL *H. Markos* DATE 4/26/78

H. Markos, Manager
Shuttle Software System Build & Control - IBM



Federal Systems Division
Houston, Texas 77058

Space Shuttle Orbiter Avionics Software

Primary Avionics Software System

RELEASE AUTHORIZATION

R06V05.03 (ACL/AOA)
RELEASE/VERSION

CLASS B

0/1&2/FCOS		0/2/UI		0/2/SC		0/2/DL	
4		4		5		39	

3/GN MFB		9/VU MFB				14/SM MFB	
2							

1/4/GN1&6		2/5/GN2		3/6/GN3		8/7/GN8		9/8/GN9		6/12/SM8		7/13/SM9		4/15/SM2	
1				4											

DOWNLIST

MC1		MC2		MC3		MC8		MC9		MC6		MC7		MC4	
21				23a											

SM CKPT		GN CKPT		IMU CKPT		ILOAD		SSL		DEU CRIT FMTS					
						2.0									

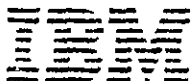
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MASTER TAPE 2045/2057

APPROVAL *H. Markos*

DATE 4/27/78

H. Markos, Manager
Shuttle Software System Build & Control - IBM



Federal Systems Division
Houston, Texas 77058

Space Shuttle Orbiter Avionics Software

Primary Avionics Software System

RELEASE AUTHORIZATION

R07V06.02 (PND3)
RELEASE/VERSION

CLASS B

0/1&2/FCOS		0/2/UI		0/2/SC		0/2/DL	
7	P	5	P	5	P	40	

				3/GN MFB						9/VU MFB		14/SM MFB			
				2						1					
1/4/GN1&6		2/5/GN2		3/6/GN3		8/7/GN8		9/8/GN9		6/12/SM8		7/13/SM9		4/15/SM2	
								5		7 P		11 P			

DOWNLIST

MC1		MC2		MC3		MC8		MC9		MC6		MC7		MC4	
								43		47		41 45			

SM CKPT		GN CKPT		IMU CKPT		ILOAD		SSL		DEV CRIT FMTS					
						3.00									

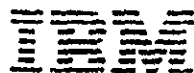
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MASTER TAPE 2045/2052

APPROVAL *H. Markos* DATE 4/27/78

H. Markos, Manager
Shuttle Software System Build & Control - IBM



Federal Systems Division
Houston, Texas 77059

Space Shuttle MMU Computer Program Software

Orbital Flight Test Integrated System

OFTIS- 8.1

CLASS D

RELEASE AUTHORIZATION

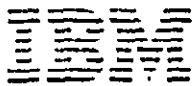
MMU SOFTWARE ELEMENTS

ELEMENT	AREA 1		AREA 2		AREA 3	
PASS	ENT R08V04.01		PMD3 R07V06.02A	P	AOA R06V05.03	
BFS	N/A		N/A		N/A	
DCP	7.0		7.0		5.4	
GPC-IPL(STP)	1.0		1.0		 	
SSME	N/A		N/A		N/A	
TCS	Skeleton		 		 	
D T&G	Skeleton		 		 	
TFL	N/A		2.0		N/A	
PDI	N/A		N/A		N/A	

MASTER TAPE - PART NUMBER N/A
 - SERIAL NUMBER N/A

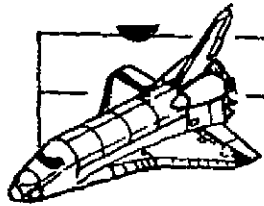
APPROVAL *H. Markos* DATE 4/28/78
 H. Markos, Manager
 Shuttle Software System Build & Control - IBM

APPROVAL *J. R. Garman* DATE 4/28/78
 J. R. Garman, Chairman
 MMU Release Coordination Team - NASA/FR



Federal Systems Division
 Houston, Texas 77058

SPACE SHUTTLE PROGRAMS



Title ENTRY FACI DELIVERY

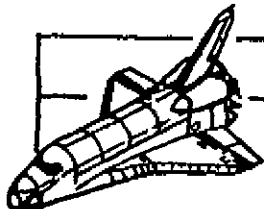
Date

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IBM

ENTRY FACI DELIVERY REQUIREMENTS

<u>TAPES</u>	<u>NUMBER</u>	
COLDSTART		
DEORBIT	8	
ENTRY	8	
IEF	7	
SDF	4	
BUILD D. S.	3	
MASTER PRINT	4	
HAL LBR	3	
HALSTAT	3	
DASS	2	
PARMLIST	5	
LINKEDIT	2	
HALSTAT (ADL)	2	
MM LOAD GSE	8	
MM LOAD LPS	4	
MM LOAD ACE	6	
TOTAL	<u>125</u>	TAPES

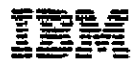


SPACE SHUTTLE PROGRAMS

Title ENTRY FACI DELIVERY

Date

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ENTRY FACI DELIVERY REQUIREMENTS

MICROFICHE

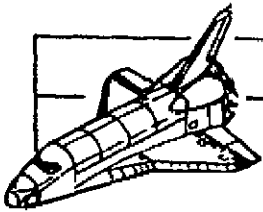
NUMBER

MASTER LISTING	18
HAL LBR.	16
HALSTAT	17
DASS	17
MACRO LBR	13
PARMLIST	14

LISTINGS/DOC.

NUMBER

LINKEDIT	14
MM BUILD	14
MM DUMP	14
PARMLIST	12
SDF	3
GPC DUMP (PER COLDSTART)	8
DR REPORT	14
PRN	43
COLDSTART INIT.	8
USER GUIDE	43
SOURCE PROGRAM DIR.	18



SPACE SHUTTLE PROGRAMS

Title ENTRY FACI DELIVERY

Date

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11/11/71
11/11/71
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11/11/71

PMD3 DELIVERY REQUIREMENTS

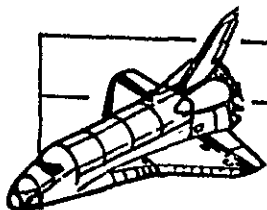
<u>ITEM</u>	<u>NUMBER</u>
DASS	6
HALSTAT	3
IEF	3
PRN UPDATE	35

SPACE SHUTTLE PROGRAMS

Title ENTRY FACI DELIVERY

Date

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DELIVERY STATUS (5/1)

ALL ITEMS DELIVERED EXCEPT

- PARMLIST
- IEF (ENTRY & PMD3)
- DASS (G3)
- HAL LBR TAPE
- BUILD DS

GOAL TO COMPLETE DELIVERY 5/15 WITH
OCL DELIVERY

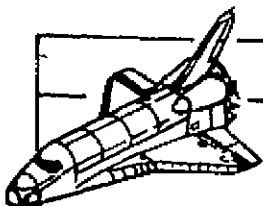
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SPACE SHUTTLE PROGRAMS

Title ENTRY FACI DELIVERY

Date

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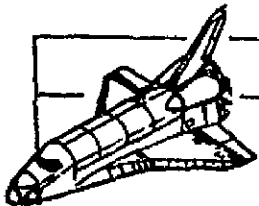


IBM

ENTRY FACI DR SUMMARY

- NUMBER OF MM PATCHES - 51
- NUMBER OF P-NOTES -102
- NUMBER OF OPEN DR'S - 59

SPACE SHUTTLE PROGRAMS



Title ENTRY FACI DELIVERY

Date

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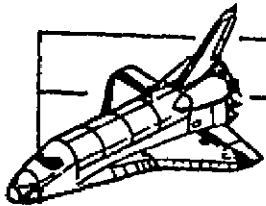
IN

ORBIT CLOSED LOOP

- TO BE DELIVERED 5/15 INDEPENDENT OF ENTRY
- RSVG SYSTEM BASE
- COLDSTART TAPE AND SPECIFICALLY DEFINED SET OF DELIVERIES
- DELIVERY INCLUDES OCL PRN

ENTRY
SYSTEM SOFTWARE

C. V. MICHALIK



SPACE SHUTTLE PROGRAMS

Title SSW-2 REQUIREMENTS BASELINE

Date 5/9/78

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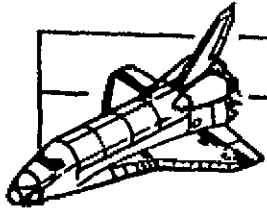


BASELINE DOCUMENT

PLUS CR's

OFT SYSTEM LEVEL REQUIREMENTS	2439A	DELTA NAVIGATION COMMAND LOAD
SOFTWARE	12003	PAYLOAD ATTITUDE DATA TO ON-ORBIT DAP
LEVEL A	12164	VENT TIMELINE COMMAND LOAD
SS-P-0002-170C	12386	DELETE CONSECUTIVE GPC EXCEPTION COUNTS
24 FEBRUARY 1978	12928B	INTER-GPC SYNC DESIGN (CRA0093).
	19334 A	ARITHMETIC EXCEPTION + SPACE INTERRUPT HANDLING.
	20513	ADD GNC FA MDM OUTPUT TO SM9 & GNC9 OPS.
	21350	(PARTIAL) I/O SCRUB - ENTRY PACKAGE
	21865	BCE DELAY IN HFE OUTPUT
	22650	DELETE THE SHARED STACK SPACE (SCRUB).
	23069	ENTRY POINTS FOR PSW SYSTEM MASKS.

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SPACE SHUTTLE PROGRAMS

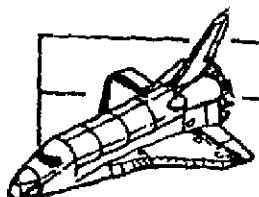
Title

Date 5/9/78

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PROGRAMS

<u>CR/PCR NUMBER</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
2439A	UPLINK	Delta Navigation Command Load. Add the command capability to UPLINK validity table.
2508A	DOWNLIST	D/L Comment Cards. Identify SSW parameter for downlist.
2610	MISCELLANEOUS	Display the last active or freeze dried OPS. As stated.
12003	I/O	Payload Sensor Data Output and HFE Output Delay. Increase the payload sensor data output word count.
12069A	MISCELLANEOUS	Delete termination control latch support. Remove the FCOS services to set and reset voter and timer termi- nation control latches. Remove certain checks from the FCOS level A interrupt processor.
12164	UPLINK	Vent Timeline Command Load. Add the command capability to UPLINK validity table.



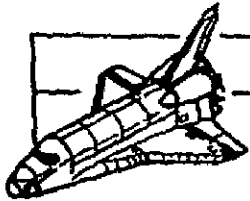
SPACE SHUTTLE PROGRAMS

Title

Date 5/9/78

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<u>CR/PCR NUMBER</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
12386 PCR/19334A	MISCELLANEOUS	Error Interrupt Processing. Ignore the following errors when they occur within the applications processes: Exponent overflow, divide by zero, and unnormalized divide. Mask the following errors: fixed point overflow, significance, exponent underflow, external interrupts 3 and 4.
12400	DOWNLIST	DEU response words and bite status change in D/L. Add downlist comments cards for DEU response words.
12928B	CONFIGURATION MANAGEMENT	Inter-GPC Sync Design. Eliminate the time delay code after the final read in all sync routines.
20513	I/O	GN&C FA MDM Outputs in G9 and S9. Add output I/O capability to write FA MDM analog/discretes VCO actuator tests.
21350	I/O	I/O CPU Scrub - Entry package. Make downlist and SRB I/O timer initiated.



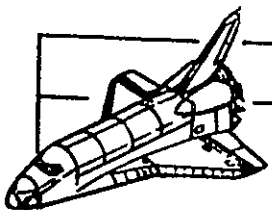
SPACE SHUTTLE PROGRAMS

Title

Date 5/9/78

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<u>CR/PCR NUMBER</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
21865	I/O	BCE delay in HFE output. Increase BCE delay time in HFE Output I/O transaction to allow concurrent GN&C output computation.
22650	MISCELLANEOUS	Delete FCOS stacks. Delete pre-allocated FCOS stacks for HAL programs.
23069	MISCELLANEOUS	FCOS SSM labels. Add labels to all SSM instructions for field use.



SPACE SHUTTLE PROGRAMS

Title ENTRY TEST SUMMARY

Date 5/2/78

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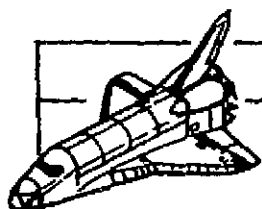
LEVEL 1 AND 2

- SUBSYSTEM TESTING COMPLETED (LEVEL 1 & 2)
- FCOS - 6 FEBRUARY 1978
- UI/SC -6 FEBRUARY 1978

LEVEL 3

- DEVELOPMENT INTEGRATED TEST COMPLETED 20 MARCH 1978
- POST BUILD TEST COMPLETED 10 APRIL 1978
- TEST REPORT ~
SYSTEM SOFTWARE/ENTRY LEVEL 3 TEST REPORT
5 APRIL 1978

SPACE SHUTTLE PROGRAMS



Title

Date

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Space Shuttle
Program

ENTRY DR SUMMARY

AS OF 5/1/78

22 DR's

PATCHED

28 DR's

RELEASE NOTED

19 CARRIED FORWARD FROM PRIOR SYSTEMS

9 ENTRY GENERATED

35 DR's

USER NOTED

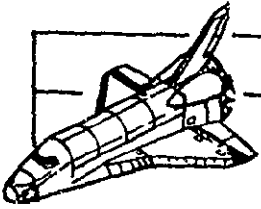
34 CARRIED FORWARD FROM PRIOR SYSTEMS

1 ENTRY GENERATED

13 DR's

OPEN (4/28 DELIVERED GREEN SHEET SHOWED 45 OPEN)

SPACE SHUTTLE PROGRAMS



Title

Date

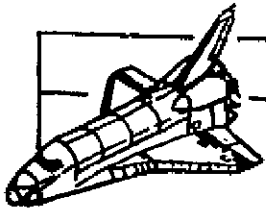
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ENTRY DR STATUS CONTINUED

DR#	DESCRIPTION	STATUS
FCOS		
14282	EXTRA SYNC FAIL MESSAGE	UNDER INVESTIGATION
24045	PROGRAM CHECK FOLLOWING I/O TERMINATE B	PATCH
25733	DEU I/O ITERATION COUNT INCORRECT	PATCH
UI/SC		
14277	SYNC FAIL ON G9 TO G0 TRANSITION	UNDER INVESTIGATION
14281	INCONSISTENT DOWN ARROWS AND M's ON STRING ASSIGNMENTS	UNDER INVESTIGATION
14283	SYNC FAIL WHEN FAULT SUMMARY PAGE CALLED UP DURING TRANSITION	UNDER INVESTIGATION
14290	INVALID MESSAGE LINE AFTER GPC/CRT 2,2 EXEC	RELEASE NOTE
14297	GARBAGE DPS DISPLAY AFTER A SECONDARY GPC IPL	PATCH
15888	SPEC 3 CORE LIMIT CHECK IS WRONG	RELEASE NOTE
24048	AUX DPS DATA ITEM PROBLEM	RELEASE NOTE
24579	OPS TRANS FTS, OPS O P7	UNDER INVESTIGATION
25630	SPEC 2 NOT CALLED UPON THIRD DEU	UNDER INVESTIGATION
26538	ITEM DATA ACCEPTED WITH ILLEGAL SYNTAX	RELEASE NOTE

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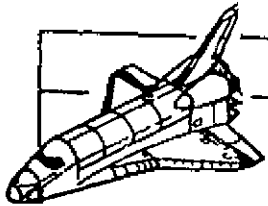
SPACE SHUTTLE PROGRAMS

Title SSW-2 RELEASE NOTES

Date 5/2/78

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<u>TITLE</u>	<u>DR</u>
UNEXPECTED PRIME SWITCH	14279
MESSAGE LINE STACK COUNT AND NUMBER OF FAULT SUMMARY PAGE MESSAGES DO NOT AGREE	14287
UNABLE TO BRING SPEC 103 UP ON TWO OR MORE CRTS AT THE SAME TIME.	14291
FREEZE DRY PROBLEMS	14296
NO BUS RECONFIGURATION WHEN AN INCORE OPS IS SCHEDULED	20944
SPEC 004 - READ/WRITE - PRIORITY OF WRITE DONE FROM READ/WRITE SPEC IS TOO HIGH	24773
FAILURE TO RESUME CONTROL OF DEU FROM EFS.	24991
SPEC 002 - TIME MANAGEMENT - EVENT AND MISSION TIMERS AT OPS TRANSITIONS.	25628
MISSING FCOS DOWNLIST PARAMETERS	25689
CPU ERROR MESSAGE ON OVERLAY	24357



SPACE SHUTTLE PROGRAMS

Title SSW RLS NOTE

Date

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ISSUE

Unexpected Prime Switch (R)

DESCRIPTION

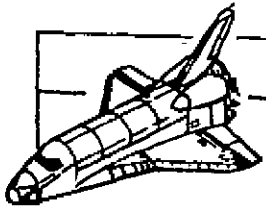
Prime reassignment occurs even though the requested input was rejected. A logic error allows ICC message to be passed even though an error was detected.

USER RESPONSE

Use caution when reassigning prime GPC. Insure the GPC to be assigned as prime is in the RS and is commanding strings 1-3.

DR REFERENCE

14279N



SPACE SHUTTLE PROGRAMS

Title SSW RLS NOTE

Date

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11/11/77
11/11/77
11/11/77
11/11/77

Message Line Stack Count And Number Of Fault Summary Page
Messages Do Not Agree (R)

DESCRIPTION

When a common set is formed with the higher GPC initialized first, the message line count and the number of messages on the Fault Summary Page (FSP) do not agree. The BUS hierarchy used to assign CRTs to GPCs gives command of the CRT to the lowest numbered GPC in the set. (See Section 4.6.4.3.1 of the level A CPDS). The message lines are not ICCed but the counts are; therefore the discrepancy occurs.

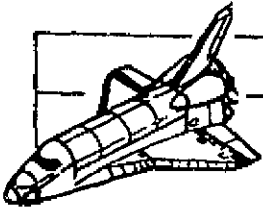
USER RESPONSE

To obtain a correct and equal FSP and error message count, either clear the FSP with a SPEC 99 PRO or do a message reset on the controlling GPC.

DR REFERENCE

14287N

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SPACE SHUTTLE PROGRAMS

Title SSW RLS NOTE

Date

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REPRODUCTION
OF THIS DOCUMENT
IS UNLIMITED

Unable To Bring SPEC 103 Up On Two Or More CRTs At The Same Time (R)

DESCRIPTION

This problem occurs because SPEC 103 is unique from all other SPECs. The control segment for SPEC 103 issues a schedule to another module, which reads the SASTP from mass memory and sends the data via fills to the DEU. Because the control segment is already active when the second request is made, the control segment is not reentrant.

Display coordination tries to bring the SPEC up on the other DEU resulting in the problem described above.

USER RESPONSE

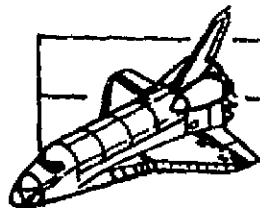
Do not request SPEC 103 if already active on another CRT.

DR REFERENCE

14291N

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OF POOR QUALITY

SPACE SHUTTLE PROGRAMS



Title SSW RLS NOTE

Date

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MMU

Freeze Dry Problems

DESCRIPTION

Freeze dry does not work when a GPC does not have command of a MMU necessary for the overlay.

USER RESPONSE

Do not use AUX-DPS item inputs to FREEZE DRY a GPC. A freeze dry may be done procedurally by entering the OPS, keying in OPS 0, switching the GPC to STDBY and HALT as desired.

DR REFERENCE

14296N

No Bus Reconfiguration when an Incore OPS is Scheduled (U)

DESCRIPTION

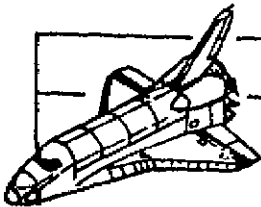
No bus reconfiguration occurs when an incore OPS is scheduled. Problems only occur if you're going from OPS 0 to a single GPC non-simplex.

USER RESPONSE

Use Mode Recall to force the desired bus reconfiguration.

DR REFERENCE

20944N

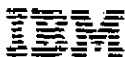


SPACE SHUTTLE PROGRAMS

Title SSW RLS NOTE

Date

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SPEC 004 - Read/Write - Priority Of Write Done From Read/Write
SPEC Is Too High (R)

DESCRIPTION

The Read/Write SPEC control segment runs at priority 158. Writes
done in a redundant set may cause fail-to-sync.

USER RESPONSE

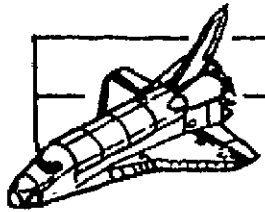
Do not do redundant set writes from the Read/Write SPEC.

DR REFERENCE

24773N

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SPACE SHUTTLE PROGRAMS



Title SSW RLS NOTE

Date

Page 26 of 124

Failure To Resume Control Of DEU From BFS (R)

DESCRIPTION

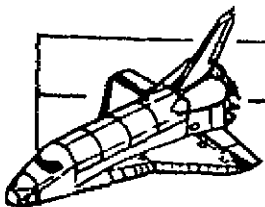
When the BFS DEU select switch changes from one position to another (not to OFF), the PASS system will give up control of the selected DEU but will not reassume control of the previously selected DEU.

USER RESPONSE

When trying to change the BFS DEU selection, first position to the OFF position to enable the PASS to reassume the DEU, then switch to the alternate DEU.

DR REFERENCE

24991N



SPACE SHUTTLE PROGRAMS

Title SSW RLS NOTE

Date

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1000

SPEC 002 - Time Management - Event And Mission Timers At OPS
Transitions (R)

DESCRIPTION

Time management event and mission timers are not maintained throughout the CS so that OPS transitions which change the RS are subject to fail-to-sync. (Software to clear timers in all GPC's in the new RS prior to RS formation will be available on the OFT 1 system.)

USER RESPONSE

Clear all TM timers prior to OPS transitions which will change RS.

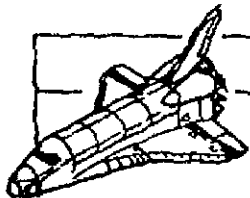
1. Force mission timers (items 14-16, 17-19, 3-5, 6-8) to expire by inputting values a few seconds greater than current mission time.
2. Force CRT timer (items 20-22) to expire by inputting a value a few seconds greater than current event timer.
3. Stop event timer (item 13).

DR REFERENCE

25628N

1000

SPACE SHUTTLE PROGRAMS



Title SSW USER NOTE

Date

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CPU Error Message on Overlay (R)

DESCRIPTION

A CPU error message is displayed on the MCDS after an overlay.

USER RESPONSE

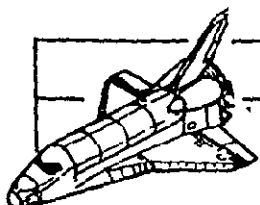
Expected Result: During an OPS Transition, checksum verification and main memory reprotection are implemented only after the OPS has been loaded into main memory. Checksum verification and main memory reprotection are CPU bound requiring one/more seconds of CPU and will dominate a GPC if they are running as the highest priority PCT available in the system. Checksum verification and main memory reprotection utilize a PCT priority the same as the OPS requestor.

DR REFERENCE

24357N

ENTRY FACI
SYSTEMS MANAGEMENT

E. SOLOMON



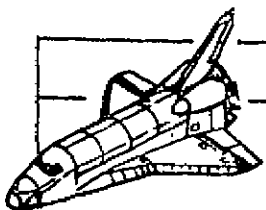
SPACE SHUTTLE PROGRAMS

Title SM PBD-DROP CAPABILITIES, SM2

Date 5/4/78

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FUNCTION	DESCRIPTION	REQUIREMENTS	EXCEPTIONS
OPS CONTROL	PROVIDES AN INTERFACE BETWEEN THE ONBOARD MCDS USER AND THE PAYLOAD BAY DOOR SEQUENCE. ONLY THE REQUIREMENTS FOR OPS 2 MODE 02 are SATISFIED BY THE OPS.	SS-P-0002-530F, 3.1.1	
DATA ACQUISITION	ACQUIRES DATA FROM THE PCM MASTER UNIT (PMU) AND PAYLOAD MDM's (PL MDM) FOR DOWNLIST, DISPLAY AND COMPUTATION PURPOSES.	SS-P-0002-530F, 4.1	
SPECIAL PROCESS-ES EXECUTIVE	CONTROLS THE EXECUTION OF ALL SM COMPUTATIONS AND SEQUENCES, AND THE INPUT/OUTPUT REQUIRED BY EACH	SS-P-0002-530F 6.1-6.12, 6.14-6.16	ONLY THE PBD SEQUENCE AND ASSOCIATED INPUT/OUTPUT IS SUPPORTED FOR THIS DELIVERY.
PAYLOAD BAY DOOR (PBD) SEQUENCE	RESPONDS TO USER REQUEST TO OPEN OR CLOSE THE PAYLOAD BAY DOORS AND ASSOCIATED LATCHES, AND PROVIDE LATCH/DOOR AND SWITCH POSITION STATUS.	SS-P-0002-530F, 6.11 SD76-SH-0027B, 6.11	



SPACE SHUTTLE PROGRAMS

Title SM PBD-DROP LEVEL 1 TEST SUMMARY

Date 5/4/78

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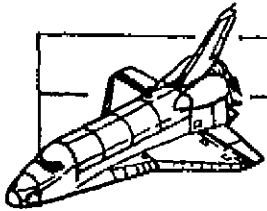
(UNIT TESTING)

- 7 COMPILATION UNITS TESTED

- TESTING STARTED ON SEPTEMBER 19, 1978

- TESTING COMPLETED FEBRUARY 10, 1978

- ALL UNITS COMPLETED SUCCESSFULLY



SPACE SHUTTLE PROGRAMS

Title SM PBD-DROP LEVEL 2 TEST SUMMARY

Date 5/4/78

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- 9 TEST CASES DEFINED

- TESTING STARTED ON JANUARY 9, 1978

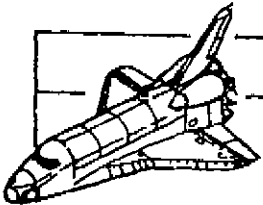
- TESTING COMPLETED ON MARCH 17, 1978

- 4 DR's OPENED

- ALL CASES CLOSED WITH NO KNOWN DISCREPANCIES

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SPACE SHUTTLE PROGRAMS



Title SM PBD-DROP LEVEL 3 TEST SUMMARY

Date 5/9/78

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IBM

- 2nd TEST CASES DEFINED

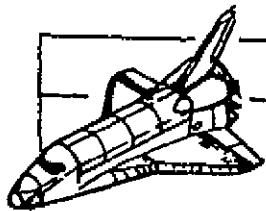
- TESTING STARTED FEBRUARY 13, 1978

- TESTING COMPLETED MARCH 27, 1978

- 1 DR OPENED

- ALL CASES CLOSED WITH NO KNOWN DISCREPANCIES

SPACE SHUTTLE PROGRAMS



Title SM PBD-DROP RELEASE NOTE

Date 5/4/78

Page ~~34~~ of ~~124~~

FUNCTION

DOWNLIST

1. PARENTS FOR THE SM2 DOWNLIST LOADING (R)

DESCRIPTION

THE FOLLOWING PARENT WORDS ARE NOT IN THE DOWNLIST LOADING:

V72M7919P	V72M7948P
V72M7922P	V72M7951P
V72M7926P	

THE DISCRETES REFERENCED IN THESE WORDS ARE DOWNLISTED AT 1 S/S IN THE FRAME AND WORD INDICATED BELOW:

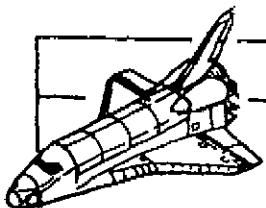
	<u>FRAME/WORD</u>
V72M7919P	17/17
V72M7922P	18/32
V72M7926P	18/17
V72M7948P	19/17
V72M7951P	20/17

USER RESPONSE

NONE

DR REFERENCE

24007N

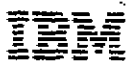


SPACE SHUTTLE PROGRAMS

Title SM PBD-DROP DR's

Date 5/4/78

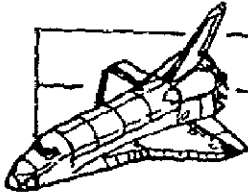
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DR#	DESCRIPTION	DISPOSITION
	NONE	

ENTRY DOWNLIST

M. BELL



SPACE SHUTTLE PROGRAMS

THE RELEASE NOTES - DOWNLIST

Date 5/9/78

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FUNCTION

DOWNLIST

DESCRIPTION

FOLLOWING IS A LIST OF WORD AND FRAME NUMBERS CONTAINING SOFTWARE DISCRETES FOR WHICH NO PARENT HAS BEEN DEFINED:

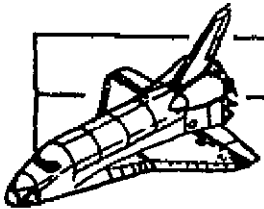
<u>FRAME</u>	<u>WORD</u>
4	115
11	115
11	117
17	120

USER RESPONSE

NONE

DR REFERENCE

25681 N



SPACE SHUTTLE PROGRAMS

Title RELEASE NOTES- DOWNLIST

Date 5/9/78

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FUNCTION

DOWNLIST

DESCRIPTION

THE FOLLOWING GUIDANCE PARAMETERS ARE MISSING FROM ENTRY DOWNLIST,
FORMAT 23:

V90R1133C	ALTITUDE RATE FEEDBACK CORRECTION
V90A1134C	CONST DRAG LEVEL TO REACH TARGET
V90A1135C	REF DRAG
V90R1137C	DERIVATIVE OF RANGE WRT DRAG
V90J1138C	ENTRY GUID SUBPHASE INDICATOR
V90R1139C	REF ALT RATE
V90H1142C	REF ROLL ANGLE
V90U1148C	LIFT/DRAG REFERENCE
V90U1160C	CURRENT ENERGY/MASS
V90L1188C	EQUILIB GLIDE/CONST DRAG BNDRY VEL
V90U1190C	LIFT OVER DRAG RATIO

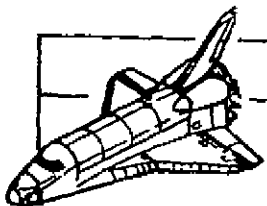
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USER RESPONSE

NONE

DR REFERENCE

25964N



SPACE SHUTTLE PROGRAMS

Title RELEASE NOTES -DOWNLIST

Date 5/9/78

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IBM

FUNCTION

DOWNLIST

DESCRIPTION

THE FOLLOWING IMU SELECTION FILTER PARAMETERS ARE NOT LOADED IN THE ENTRY DOWNLIST FORMAT 23:

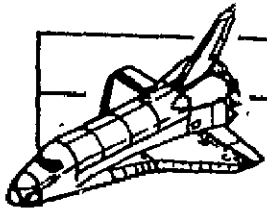
V90X2503X	IMU SELECTION FILTER COMMAND
V90L2557C	SEL TOTAL X VEL M50
V90L2558C	SEL TOTAL Y VEL M50
V90L2559C	SEL TOTAL Z VEL M50

USER RESPONSE

NONE

DR REFERENCE

25966 N



SPACE SHUTTLE PROGRAMS

Title RELEASE NOTES- DOWNLIST (POST 5/1)

Date 5/9/78

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FUNCTION

FUNCTION

DOWNLIST

DESCRIPTION

THE FOLLOWING PARAMETERS ARE REQUESTED IN ENTRY FORMAT 23 BUT ARE VALID ONLY IN THE VU SENSOR SELF TEST FUNCTION, WHICH IS N/A FOR ENTRY.

V74K0108X	MSBLS NO. 1 TEST
V74K0118X	MSBLS NO. 2 TEST
V74K0128X	MSBLS NO. 3 TEST
V74K0174X	RADAR ALT NO. 1 TEST
V74K0184X	RADAR ALT NO. 2 TEST

USER RESPONSE

NONE

DR REFERENCE

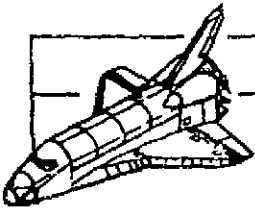
25952N (CLOSED - NO DR)

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ENTRY

GNC SUMMARY

E. J. ZATPEK



SPACE SHUTTLE PROGRAMS

Title

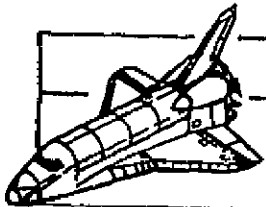
GN&C SUMMARY

Date

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- BASELINE
 - BASELINE DOCUMENTS
 - CR'S
 - PCR'S
- CAPABILITIES
- PROGRAM NOTES
 - RELEASE NOTES
 - USER NOTES
- DISCREPANCIES
- TEST SUMMARY
 - LEVEL 1
 - LEVEL 2
 - LEVEL 3/4



SPACE SHUTTLE PROGRAMS

Title BASELINE REQUIREMENTS, GN3

Date

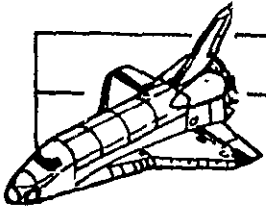
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BASELINE DOCUMENTS

1. OFT FUNCTIONAL LEVEL REQUIREMENTS, GUIDANCE, NAVIGATION AND CONTROL, SS-P-0002-510F&G (1/19/77 & 4/11/77)
2. OFT FUNCTIONAL LEVEL REQUIREMENTS, VU-02 SS-P-0002-550D (1/7/77).
3. FUNCTIONAL SUBSYSTEM REQUIREMENTS, PART A, GUIDANCE, ENTRY THROUGH LANDING, SD76-SH-0001B, 11/19/76.
4. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART A, GUIDANCE, ASCENT/RTLS SD76-SH-0002C, 5/16/77.
5. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART A, GUIDANCE, ON-ORBIT 1, SD76-SH-0003A, AUGUST 77.
6. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART B, NAVIGATION, ENTRY THROUGH LANDING SD76-SH-0004B, 12/17/76.
7. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS PART B, VOL 2, NAVIGATION, ASCENT/RTLS, SD76-SH-0005A, MAY 77.
8. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART C, FLIGHT CONTROL, ENTRY SD76-SH-0007, 11/26/76.

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SPACE SHUTTLE PROGRAMS

Title BASELINE REQUIREMENTS, GN 3

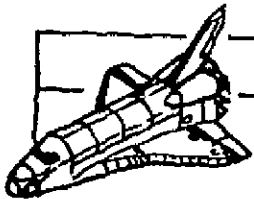
Date

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BASELINE DOCUMENTS

9. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART C, FLIGHT CONTROL, ASCENT
SD76-SH-0008A, 6/01/77.
10. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART D, REDUNDANCY-MANAGEMENT
SD76-SH-0010c, 11/04/77.
11. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART E, SOPS, IMU-
SD76-SH-0013, 12/17/76.
12. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART E, NAV. AIDS SOPS
SD76-SH-0014, 11/26/76.
13. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART E, FLIGHT CONTROL SENSORS/
CONTROLLERS SOPS SD76-SH-0015, 11/26/76.
14. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, PART E, FLIGHT EFFECTORS SOPS
SD76-SH-0016, 11/26/76.
15. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, DISPLAY AND CONTROL, BOOK II
SD76-SH-0020, 1/25/77, PLUS CHANGE NOTICES 1 THROUGH 9.
16. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, SEQUENCING
SD76-SH-0026, 12/10/76.

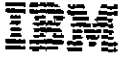


SPACE SHUTTLE PROGRAMS

Title BASELINE REQUIREMENTS, GN3

Date

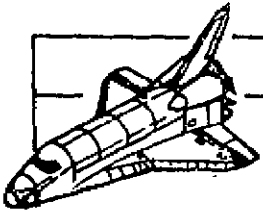
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BASELINE DOCUMENTS

17. OFT SYSTEM LEVEL REQUIREMENTS, SOFTWARE,
SS-P-0002-170c
18. FUNCTIONAL SUBSYSTEM SOFTWARE REQUIREMENTS, DISPLAY & CONTROL, BOOK IA,
SD76-SH-0020, 3/18/77

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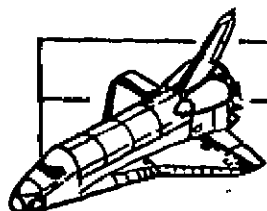
Date

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CR's	DOCUMENTS AFFECTED
1998-OFT D&C FSSR UPDATE	15
2001-REV. TO OFT GN&C LEVEL B, ON-ORBIT, ASCENT & ENTRY	1
2049-REV. TO OFT GN&C LEVEL B, RTLS FUNCTIONAL REQUIREMENTS	1
2071-DOUBLE RANGE Q-BAR REFERENCE FOR TAEM	3
2124-DYNAMIC TITLES FOR NOMICIAL TRAJECTORY 1&2 FORMATS	1
2131A-EIU INPUT HANDLING	17
2157-CORRECTION TO DUPLICATE MNEMONICS IN LEVEL B	1
2166-ENTRY FUNCTION UPDATE	1
2173A-ABORT MODE RESELECTION	1,4,14,16,17
2182A-ASCENT INTEGRATION UPDATE	1
2185-NOSE WHEEL STEERING LIMITS	8
2186B-LEVEL B CHANGES FOR HYD. THER. COND., ORB & SRB SLEW, DAP INIT.	1
2212-REVISED ENTRY GUIDANCE CONTROLLER DRAG GAIN	3
2213-ENTRY GUIDANCE FOR RUNWAY REDESIGNATION AND FOR MANUAL CONTROL MODES	3
2222A-EVENT LIGHT PROCESSING	1

SPACE SHUTTLE PROGRAMS



Title BASELINE REQUIREMENTS, GN3

Date

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CR's

DOCUMENTS AFFECTED

2226-ELIMINATION OF UNNECESSARY LOW RATE MODULE EXECUTIONS

8

2238-SPEEDBRAKE CHANNEL EXECUTION RATES

8

2243-DELETION OF ALPHA LIMIT IN ZERO YARJET

8

2313A-SRB MONITOR FUNCTION/SEL. FILTER/SRB SEP SEQUENCE REVISIONS

1,10,14,16

2316A-ABORT CONTROL SEQUENCE SCHEDULING CHANGE

1

2321A-ENTRY DISPLAY 'PRO' SEQUENCE DELETION

1

2340D-REVISION TO PROCESSING AND DISPLAY OF ATTITUDE DATA & AN IMU DATA UPDATE

1,15

2343A-RETAIN RCS FUNCTIONS

1

2356-LANDING DISCRETE TRANSITIONS

13

2363-CUBIC PLUS LINEAR TAEM ATTITUDE RANGE REFERENCE

3

2387A-DELETE "TLM" OUTPUT FOR PRL SATURATION FLAGS

8

2409-IMU GIMBAL FLIP REQUIREMENTS

10

2417B-REVISION OF ENTRY DISPLAYS

15

2418A-GENERAL CORRECTION & CLARIFICATION OF REQUIREMENTS

8

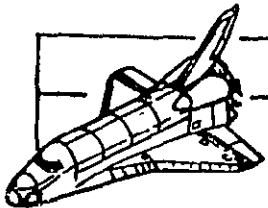
2420-PRL RATE SATURATION INDICATORS

8

2422-FLIGHT CONTROL/GUIDANCE INTERFACE SMOOTHER

8

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SPACE SHUTTLE PROGRAMS

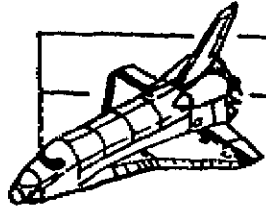
Title **BASELINE REQUIREMENTS, GN3**

Date

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CR's	DOCUMENTS AFFECTED
2425A-BODY FLAP CHANNEL	8
2464A-MML # IN THE RM LEVEL C FSSR	10
2471-DISCREPANCY IN PRECISION FOR V_AVGG IN ASCENT UPP SUB-FUNCTIONS	7
2474-DELETE A DESTINATION FOR A VARIABLE IN ASCENT UPP	6
2500A-EXECUTION RATE OF VENT DOOR SEQUENCE	1
2510-ENERGY TAPE SCALE-VERTICAL SITUATION DISPLAYS	1,15,6
2551-REDESIGN OF AMI AND AVVI TAPE SCALES	15
2601-RCS RM PROCESSING RATE REDUCTION	10
2602A-RADAR ALTIMETER SOP CHANGES	12,15,10
2603-GAX CPU SCRUB	15
2607-UPDATE TO D&C, BOOK II	15,16,9
2609-OMS/OMS CONN, RCS/RCS XFEED RATE CHANGE	1
12000B-ASCENT FLIGHT CONTROL GSSR P.F. I/O TABLE UPDATE	9
12001-ADDITION OF PITCH ATTITUDE TAPE SCALE TO VERTICAL SITUATION DISPLAYS 1&2	1,5,8,14,15
12005-A/E ATTITUDE PROCESSING	9

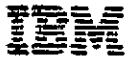


SPACE SHUTTLE PROGRAMS

Title BASELINE REQUIREMENTS, GN3

Date

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CR's

DOCUMENTS AFFECTED

12007-DELETE IND. SCALE FACTORS AND BIASES FROM AERO ACT
MPS TVC CMD, SRB TVC CMD SOPS

14

12011-ORB RGA: AA FDIR RATE REDUCTION

10,15

12015-ENTRY AND ASCENT SYSTEM SUMMARY DISPLAY CHANGES

15

12022-BODY FLAP POSITION-CONVERSION TO PERCENT

1,14,15

12033-ABORT CONTROL SEQUENCE UPDATE

1,4,9,14,16

12040-REDUCE ORB RG SOP PROCESSING RATE

1,13

12046A-OMS TO OMS CROSSFEED SEQUENCE REVISION

1,16

12047-VENT DOOR SEQUENCE

16

12051-AXFDCOMP-CORRECTION OF SINLFL LIMIT

8

12054A-HORIZONTAL SITUATION DISPLAY CHANGES

1,6,7,15

12056-A/E ATTITUDE PROCESSOR FORMULATION CORRECTIONS

9

12071-MNVR EXECUTE DISPLAY CHANGES

4,5,9,14,15

12076-RCS PROPELLANT CROSSFEED SEQUENCE REVISION

15,16

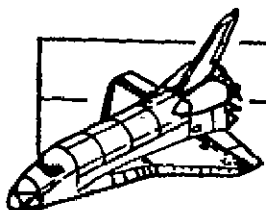
12112=GAX ANNUNCIATION REWRITE

10,12,14,15,16

12148-MSBLS SOP CHANGES

6,7,10,12,15

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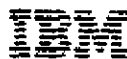


SPACE SHUTTLE PROGRAMS

Title BASELINE REQUIREMENTS

Date

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CR's

DOCUMENTS AFFECTED

12160-RS LAUNCH SEQUENCE REVISION

1, 15, 16

12177A-INTERIM DEDICATED DISPLAY RATE REDUCTION

9

12209A-IMU RM

10

12215B-ST SOP RATE TEST (SCRUB)

10, 12

12225B-GN&C LEVEL C UPLINK REQUIREMENTS

4, 5, 6, 7, 9, 10, 11,
16

12266-TACAN SOP & RM

6, 7, 10, 12, 13, 16

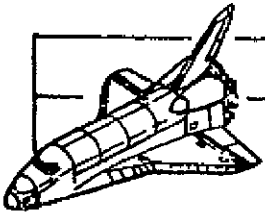
12336-I-LOAD OPT-1 BASELINE OF MISSION AND LRU DEPENDENT
PARAMETERS3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 16

12337-I-LOAD OPT-1 BASELINE OF DESIGN DEPENDENT PARAMETERS

1, 3, 4, 5, 6, 7, 8, 9,
10, 11, 12, 13, 14, 15,
16

12270-BLOCK UPDATE TO OPS 3 DEORBIT GUIDANCE FUNCTION

5, 9, 15, 16



SPACE SHUTTLE PROGRAMS

Title BASELINE REQUIREMENTS, GN3

Date

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11/11/83
11/11/83
11/11/83
11/11/83

PCR's

20374-USE OF NEW SEQUENCING REQUIREMENTS

20387-TRANS DAP DESIGN CHANGES

20388-MANEUVER DISPLAY UPDATE RATE (SCRUB)

20430-MECO ACCURACY IMPROVEMENT FOR AOA

20595-CONTROL OF INITIAL GN&C PROCESS PHASING

20596-HFE/SIP SKEW (INTERNAL)

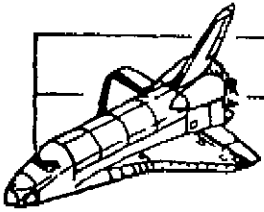
21016-GN&C SYSTEM SUMMARY DISPLAY RATE

21017-GAX ANNUNCIATION SCRUB CHANGES

21033-ORBITER TATE CORRECTION FOR USER PARAMETERS

21462-MODIFICATION OF EXECUTION RATES AND TIMELINES TO THE AREO ACTUATOR COMMAND
SOP FOR ASCENT & RTLS

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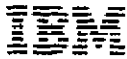


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PCR's

21463-OMS TVC CMD AND FB SOP RATE REDUCTIONS

21464-REDUCTION ATT. PROCESSING RATE TO 12.5HZ

21537-REDUCTION OF RATES FOR HSI, AMI, AVVI AND UPP

21546-REDUCTION FOF RATE FOR ADI AND ATT_PROC_DISP

21859-DEFAULT CONDITION FOR ADI ATT SEL SIMPLEX SWITCHES- RM FSSR

22252-GUIDANCE AND MANEUVER DIP CHANGES

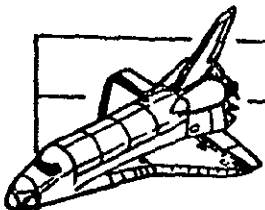
22438-ELIMINATION OF INTERFACE BETWEEN DEORBIT DIP AND TRANSITION DAP

22446-GENERATION OF QUATERNION FROM EULER ANGLE SEQ.

22608-REQUEST IMPLEMENTATION OF CR 12148

22896-IBM PRECISE PREDICTOR

22951-BUFFERS TO ARRAYS OF RANK 2 (INTERNAL)



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PCR's

23278-ORBITAL ALTITUDE AND TIME TASK ACCURACY CORE CPU SAVINGS

23439-RCS JET AVAILABLE TABLE REORDERING

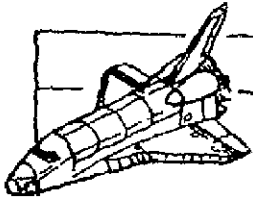
23794-DEFINITION OF ADDITIONAL AOA I-LOAD PARAMETERS

23828-MANIFOLD STATUS LOGIC IN RCS RM

23837-IMU RESOLVER PROCESSING EXECUTION RATES

24695-I-LOADS FOR ENTRY FACI SEQUENCING

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Date

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11/11/81

FUNCTION

DESCRIPTION

REQUIREMENTS

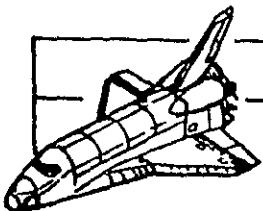
OPS CONTROL
SEGMENT

THE OPS CONTROL SEGMENT INITIALIZES APPLICATIONS
PROCESSING, SCHEDULES EXECUTIVES, SUPPORTS MAJOR
MODE PROCESSING AND PRESENTS DISPLAYS.

SS-P-0002-510F
3.1 - 3.10

CR's 2001, 2049,
2124, 2157
2166, 2222A,
2313A, 2316A,
2471, 2474,
12033

PCR's 20374, 20387,
20430, 20595,
20596, 21462

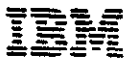


SPACE SHUTTLE PROGRAMS

Title ENTRY OPS CAPABILITIES - GN 3

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FUNCTION

DESCRIPTION

REQUIREMENTS

SPEC CONTROL

SEGMENTS

SPECIALIST FUNCTION CONTROL SEGMENTS CONTROL THE INITIALIZATION AND CLEANUP OF SPEC SUPPORTING PROCESSES, REQUEST THE APPROPRIATE DISPLAY TO BE PRESENTED TO THE CREW AND INITIATE PROCESSING OF KEYBOARD ENTERED SPEC ITEMS.

ALL SPEC CONTROL SEGMENTS CALL THE CONTROL SEGMENT COMMON PROCESSOR (GUS) TO PERFORM SPEC INITIALIZATION ITEM PROCESSING ANF SPEC CLEANUP. THE HORIZONTAL SITUATION SPEC CONTROL SEGMENT (GUL) IS SUPPORTED FOR ENTRY WITH GUS.

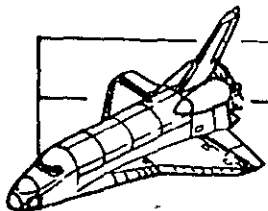
EXECUTIVES

THE EXECUTIVES CONTROL THE EXECUTION OF ALL GNC MODULES, PROTECT INTERPROCESS DATA AND ISSUE ALL GNC COMMAND OUTPUTS TO HARDWARE.

SS-P-0002-510F
3.1 - 3.10, 4,214

CR's 2001,2049
2124,2157
2166,2173A
2186B,2222A
2313A,2316A
2340c,2343

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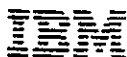


SPACE SHUTTLE PROGRAMS

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FUNCTION

DESCRIPTION

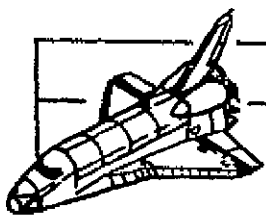
REQUIREMENTS

EXECUTIVES

(CONTINUED)

CR's 2471,2474
2601,2603
2609,12011
12015,12033
12040,12071
12112.

PCR's 20374,20387
20388,20430
21462,21463
21465,21537

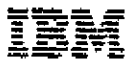


SPACE SHUTTLE PROGRAMS

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FUNCTION

DESCRIPTION

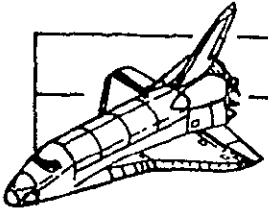
REQUIREMENTS

DISPATCHER TABLE
UPDATE (DTU)

THE DISPATCHER TABLE UPDATE FUNCTIONS
ADJUST THE ACTIVITY STATUS AND RATE OF
EXECUTION OF MODULES DISPATCHED. THE
DISPATCHER TABLES REQUIRE UPDATING ON
MODE CHANGES AND ON VARIOUS OTHER OCCUR-
RENCES DURING THE FLIGHT.

SS-P-0002-510F
3.1 - 3.10, 4.214
CR's 2001, 2049, 2124,
2157, 2166, 2173A,
2186B, 2222A, 2313A,
2316A, 2340D, 2343A,
2471, 2474, 2601, 2603,
2609, 12011, 12015,
12033, 12040, 12071,
12112
PCR's 20374, 20387,
20388, 20430, 21462,
21463, 21464, 21537

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FUNCTION

DESCRIPTION

REQUIREMENTS

KEYBOARD INTERFACE PROCESSORS (KIP)

KEYBOARD INTERFACE PROCESSORS PERFORM ALL SPECIALIZED PROCESSING IN RESPONSE TO KEYBOARD ITEM ENTRIES ASSOCIATED WITH OPS OR SPECIALIST FUNCTION DISPLAYS.

SS-P-0002-510G
6.21, 6.35

CR's 2340D, 2186B

THE FULL-UP ENTRY DELIVERY SUPPORTS ALL ENTRY DISPLAYS. *

12054(PARTIAL)

*1. THE TACAN INPUT ITEMS ASSOCIATED WITH THE HORIZONTAL SITUATION DISPLAY ARE NOT SUPPORTED.

PCR's 20388, 22252

2. ON THE DEORBIT MANEUVER DISPLAY, ACTUATOR SELECTION ITEMS ARE NOT SUPPORTED.

SEQUENCERS

REDUNDANT SET SEQUENCES CAUSE VARIOUS ORBITER HARDWARE SUBSYSTEM OPERATIONS TO OCCUR. EXAMPLES ARE SEPARATION OF THE SRB'S AND SEPARATION OF THE EXTERNAL TANK. FURTHER, THE SEQUENCERS MONITOR HARDWARE AND FLIGHT SOFTWARE CONDITIONS AND GENERATE EVENTS WHICH ULTIMATELY CONTROL, IN PART, FLIGHT SOFTWARE EXECUTION SEQUENCE.

SS-P-0002-510F
4.215, 4.182, 4.185

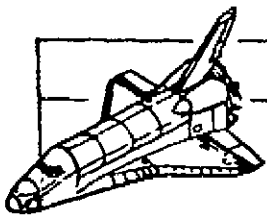
4.183, 4.161, 4.102

CR's 2500A, 2609,

12046A, 12047,

12076, 12160

PCR's 20374, 24695



SPACE SHUTTLE PROGRAMS

Title ENTRY OPS CAPABILITIES - GN3

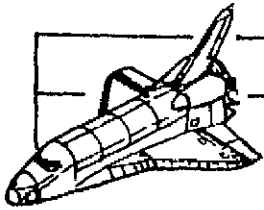
Date

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FUNCTION	DESCRIPTION	REQUIREMENTS
<u>CRT/ANNUNCIATION</u>	<p>THE ANNUNCIATION MODULES PROVIDE ALL GN&C CRT MESSAGES AND CORRESPONDING ANNUNCIATION INFORMATION TO SYSTEMS SOFTWARE. THE CRT MODULES INCLUDE SOFTWARE WHICH WILL CREATE THE DISPLAY IMAGE AS WELL AS SUPPORT PROCESSING NECESSARY TO PROVIDE INFORMATION FOR DISPLAY.</p>	<p>SS-P-0002-510g 4.110,4.150,4.154 4.211,6.15,6.16, 6.17,6.18,6.19,6.20 6.21,6.33,6.35,6.40</p>
	<p>THE FULL-UP ENTRY DELIVERY SUPPORTS ALL ENTRY DISPLAYS. *THE ANNUNCIATION AREA IS COMPLETE EXCEPT THAT</p> <ul style="list-style-type: none"> -ADTA DATA IS NOT AVAILABLE -TACAN DATA IS NOT AVAILABLE -OMS ALERT DATA IS NOT AVAILABLE -OMS GIMBAL FAIL DATA IS NOT AVAILABLE 	<p>CR's 1998,2166, 2186A,2321A,2510, 2603,2607,12001, 12022,12054A(PARTIAL),12071,12148, 12270.</p>
	<p>*THE TACAN SECTION ON THE HORIZONTAL SITUATION DISPLAY IS NOT SUPPORTED.</p>	<p>PCR's 20388,21016, 21017,22252,22438, 22446,23278.</p>

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SPACE SHUTTLE PROGRAMS

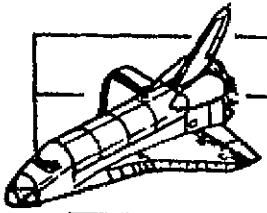
Title ENTRY OPS CAPABILITIES - GN3

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FUNCTION	DESCRIPTION	REQUIREMENTS
<u>DEDICATED DISPLAYS</u>	DEDICATED DISPLAY COMPILATION UNITS CONVERT, SCALE AND FORMAT ATTITUDE, POSITION AND VELOCITY DATA TO THE DDU FOR DISPLAY ON THE FOLLOWING COMMANDER AND PILOT PANEL INDICATORS:	SS-P-0002-510G
	ATTITUDE DIRECTOR INDICATOR (ADI)	4.102 - 4.108
	HORIZONTAL SITUATION INDICATOR (HSI)	CR's 2166, 2186B
	ALPHA/MACH INDICATOR (AMI)	2222A, 2340D, 2551
	ALTITUDE/VERTICAL VELOCITY INDICATOR (AVVI)	2607, 12177A
	CONTROL WORDS AND TEST WORDS ARE ALSO SUPPLIED TO THE DDU FOR EACH DEDICATED DISPLAY. THESE WORDS ARE USED IN DETERMINING THE VALIDITY OF THE DATA.	PCR's 21537, 21546
	IN ADDITION TO OUTPUT TO THE DDU, EVENT LIGHTS AND THE SURFACE POSITION INDICATOR ARE DRIVEN AS DEDICATED DISPLAYS. THE FIVE EVENT LAMPS (CONFIGURATION LIGHT, FLARE LIGHT, GEAR LIGHT, AIRSPEED LIGHT, AND NAVIGATION LIGHT) ARE TURNED OFF, ON, OR FLASHED TO	21859, 22951



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Date

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10/10/77
10/10/77
10/10/77
10/10/77
10/10/77
10/10/77
10/10/77
10/10/77
10/10/77
10/10/77

FUNCTION

DESCRIPTION

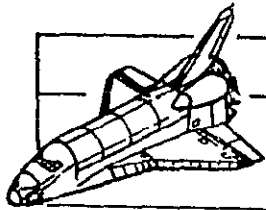
REQUIREMENTS

DEDICATED
DISPLAYS

SERVE AS STATUS INDICATORS FOR THE SHUTTLE
CREW. THE SPI COMPILATION UNIT SCALES AND
BIASES ELEVON, AILERON, RUDDER, SPEEDBRAKE,
AND BODY FLAP POSITION DATA FOR DISPLAY ON
THE SURFACE POSITION INDICATOR.

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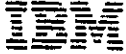
SPACE SHUTTLE PROGRAMS



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FUNCTION

DESCRIPTION

REQUIREMENTS

FLIGHT CONTROL

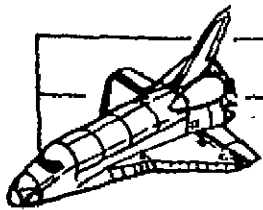
ENTRY FLIGHT CONTROL SOFTWARE PROVIDES CONTROL OF THE ORBITER IN RESPONSE TO AUTOMATIC AND MANUAL GUIDANCE COMMANDS DURING THE ENTRY, TAEM AND AUTOLAND MISSION PHASES. CONTROL IS PROVIDED BY GENERATING COMMANDS TO DRIVE THE FOLLOWING FORCE EFFECTORS: RCS JETS, ELEVONS, SPEEDBRAKE, RUDDER, BODYFLAP AND NOSEWHEEL. THIS SOFTWARE COMPLETELY IMPLEMENTS THE TIMING, SEQUENCING, RECONFIGURATION AND CONTROL LAW REQUIREMENTS FOR THE AERO-JET DIGITAL AUTOPILOT.

THE TRANSITION DAP SOFTWARE PROVIDES CONTROL OF THE ORBITER DURING PRE-DEORBIT COAST, DEORBIT EXECUTION AND PRE-ENTRY MONITOR. IT CONVERTS GUIDANCE AND MANUAL COMMANDS AND FEEDBACKS FROM VEHICLE SENSORS INTO RCS COMMANDS FOR ROTATIONAL AND TRANS-LATIONAL CONTROL OF THE ORBITER AND FOR THE OMS ENGINE DURING THE OMS BURNS.

SS-P-0002-510F:
4.36
SS-P-0002-510G:
4.201

CR's: 2166, 2185,
2226, 2238,
2243, 2343A,
2387A, 2418A,
2420, 2422,
2425A, 12005,
12033, 12051

PCR's: 20387, 23439,
23794, 23837



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FUNCTION

DESCRIPTION

REQUIREMENTS

FLIGHT CONTROL SOPS

FLIGHT CONTROL SOP SOFTWARE PROVIDES AN INTERFACE BETWEEN FLIGHT CONTROL SOFTWARE AND THE ORBITER EFFECTOR, SENSOR AND CONTROLLER HARDWARE. HARDWARE INPUTS ARE CONVERTED TO ENGINEERING UNITS THROUGH SEALING AND BIASING. OUTPUTS FOR THE HARDWARE ARE PREPARED BY CONVERTING FLIGHT CONTROL COMMANDS FROM ENGINEERING UNITS TO THE PROPER DISCRETE AND VOLTAGE SETTINGS.

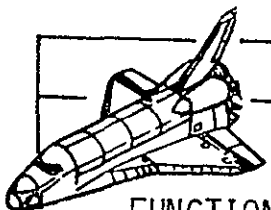
SS-P-0002-510F,
4.40, 4.42, 4.46,
4.47, 4.48, 4.49,
4.50, 4.51, 4.52,
4.53, 4.55, 4.56,
4.57, 4.58, 4.64,
4.65, 4.221, 4.232

CR's: 2166, 2182A,
2186B, 2313A,
2356, 12001,
12007, 12022,
12033, 12040

PCR's: 21462, 21463

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FUNCTION

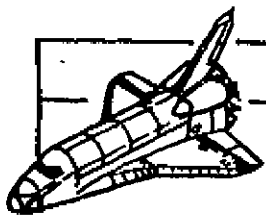
DESCRIPTION

REQUIREMENTS

REDUNDANCY
MANAGEMENT

REDUNDANCY MANAGEMENT PROVIDES FOR SELECTION FILTER AND FAULT DETECTION IDENTIFICATION AND RECONFIGURATION (FDIR) PROCESSING FOR INPUTS FROM THOSE HARDWARE DEVICES SUPPORTED BY THE FLIGHT CONTROL SOPs, FROM THE MICROWAVE SCAN BEAM LANDING SYSTEM, AND FROM THE IMU. THIS INCLUDES SELECTION FILTER AND FDI PROCESSING FOR GN&C SWITCHES REQUIRED IN ASCENT, ORBIT, AND ENTRY MAJOR MODES. THE SELECTION FILTER PROCESSING WILL PRODUCE A SINGLE DATA VALUE FROM THE REDUNDANT HARDWARE INPUTS TO REPRESENT THE DATA FROM EACH OF THE HARDWARE DEVICES. FDI PROCESSING PROVIDES FOR THE DETECTION AND IDENTIFICATION (IF POSSIBLE) OF EQUIPMENT FAILURES AS WELL AS

SS-P-0002-510G:
4.71, 4.74, 4.76,
4.78, 4.81, 4.82,
4.83, 4.84, 4.87,
4.88, 4.89, 4.95,
4.91, 4.72, 4.180
CR's 2166, 2313A,
2409, 2464A, 2601,
12011, 12209A, 12215B,
12225B, 12336, 12337,
PCR's 19873, 22438,
23828

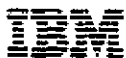


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FUNCTION

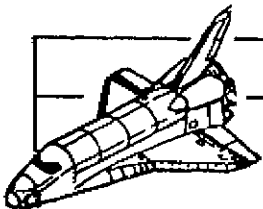
DESCRIPTION

REQUIREMENTS

FOR THE RECONFIGURATION OF THE APPROPRIATE SELECTION FILTER, BOTH SELECTION FILTER STATUS AND FDI STATUS DATA HAVE BEEN INITIALIZED SO THAT ALL LRU'S FOR EACH DEVICE ARE SELECTED AND WILL BE AVAILABLE FOR SELECTION FILTER AND FDI PROCESSING.

REDUNDANCY MANGAEMENT OF THE RCS JETS PROVIDES FOR THE DETERMINATION OF FAIL OFF, FAIL ON, AND FAIL LEAK JET FAILURES, AS WELL AS FOR THE CLOSING OF JET FUEL MANIFOLDS BASED ON FAIL ON AND FAIL LEAK FAILURES, MDM FAILURES AND COMPUTER FAILURES. IN ADDITION, THE AVAILABILITY OF RCS JETS IS DETERMINED BASED UPON FAIL OFF JET FAILURES, SELECT/DESELECT JET STATUS, MANIFOLD OPEN/CLOSE STATUS, AND JET ENABLE/INHIBIT STATUS.

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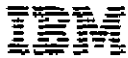


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FUNCTION

DESCRIPTION

REQUIREMENTS

GUIDANCE

THE ENTRY GUIDANCE SOFTWARE COMPUTES COMMANDS USED TO GUIDE THE ORBITER:

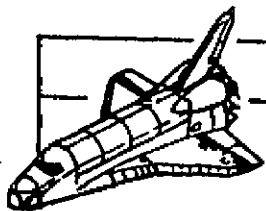
- O DURING THE DEORBIT MANEUVER
- O FROM THE ENTRY INTERFACE POINT TO A STOP ON THE RUNWAY.

THIS INCLUDES THE COMPLETE SET OF SOFTWARE TO SUPPORT THE ENTRY, TAEM AND AUTOLAND GUIDANCE REQUIREMENTS, AND USER PARAMETER PROCESSING SOFTWARE TO PROPAGATE THE NAVIGATION STATE VECTOR BETWEEN NAV UPDATES AND TO COMPUTE A COMMON SET OF GUIDANCE RELATED PARAMETERS FOR USE BY OTHER SOFTWARE FUNCTIONS.

SS-P-0002-510F:
4.8, 4.9, 4.10,
4.23, 4.24, 4.25,
4.209, 4.214

CR's: 2071, 2131A,
2212, 2213,
2363, 2417B,
2510, 12270

PCR's: 21033, 21537



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FUNCTION

DESCRIPTION

REQUIREMENTS

NAVIGATION AIDS

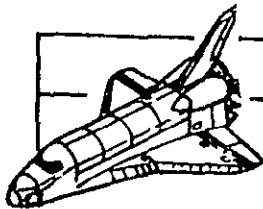
THE RADAR ALTIMETER SOP IS COMPLETELY OPERATIONAL AND IS USED TO SUPPORT THE USER PARAMETER PROPAGATION FUNCTION.

THE NABIGATIONALLY DERIVED AIR DATA (NAVDAD) SOP IS OPERATIONAL, AIR SPEED, PRESSURE AND MACH VALUES ARE GENERATED, BUT THEY ARE DERIVED VALUES, NOT MEASURED.

AUTO TACAN SELECTION IS FULLY OPERATIONAL, THE TRACTICAL AIR NAVIGATION (TACAN) SOP IS PARTIALLY IMPLEMENTED, IT PROCESSES RANGE, BEARING, AND CHANNEL ID DATA INPUT FROM THE THREE TACAN TRANSCEIVERS, AND IT GENERATES THE CONTROL WORD OUTPUT TO EACH TRANSCEIVER IN SUPPORT OF AUTOMATIC TACAN CHANNEL SELECTION. TACAN ANTENNA SELECTION PROCESSING AND TACAN SELF-TEST PROCESSING ARE NOT SUPPORTED. TACAN FDI IS NOT

SS-P-0002-510G
4,45,4,43,4,44,
4,39,4.122,4.233
CR's 2602A,12148,
12177A,1266(PATIAL)
PCR's 22608,

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IBM

FUNCTION

DESCRIPTION

REQUIREMENTS

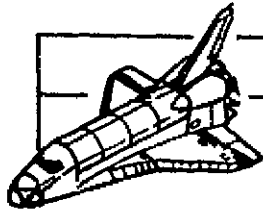
NAVIGATION
AIDS

IMPLEMENTED, BUT A STUB (GRY) HAD BEEN CODED TO SELECT DATA FOR NAVIGATION FROM TACAN TRANSCIVER NO. 1.

THE MICROWAVE SCANNER BEAM LANDING SYSTEM(MSBLs) SOP IS COMPLETELY OPERATIONAL. IT PROCESSES THE RANGE, AZIMUTH, AND ELEVATION DATA INPUT FROM THE THREE MSBLs TRANSCIVERS. THE MSBLs FDIR, NAVIGATION, AND THE HSI (WHEN THE HSI SOURCE SWITCH IS IN "MSBLs" POSITION). MSBLs SELF-TEST PROCESSING IS NOT SUPPORTED.

THE ADTA SOP CAPABILITIES ARE NOT SUPPORTED FOR ENTRY.

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FUNCTION

DESCRIPTION

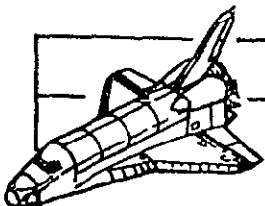
REQUIREMENTS

NAVIGATION

ENTRY NAVIGATION IS A COMPLETE NAVIGATIONAL PACKAGE. ALL REQUIRED CAPABILITIES FOR DE-ORBIT THROUGH LANDING HAVE BEEN IMPLEMENTED. THE ORBITER STATE VECTORS ARE MAINTAINED BY INCORPORATING THE APPROPRIATE COMBINATION OF COMPUTED (SUPER_G), INTERNAL (IMU) AND EXTERNALLY ACQUIRED (TACAN, BARO, DRAG, MSBLS) DATA. (SEE NAVIGATION AIDS TO DETERMINE THE AVAILABILITY OF EXTERNAL MEASUREMENT DATA.)

ENTRY ATTITUDE PROCESSING PROVIDES VEHICLE ATTITUDE AND RELATED DATA, SUCH AS DISPLAY VARIABLES, DERIVED AIR DATA AND VELOCITY. THIS DATA IS BASED ON THE SLOW RATE (1.04HZ), PRECISE COMPUTATION OF AN ATTITUDE QUATERNION, INCORPORATING SELECTED IMU RESOLVER DATA. THIS QUATERNION IS ALSO PROPAGATED DURING HIGH RATE

SS-P-0002-510F
4.123,4.124,4.127
4.144,4.223,4.226
CR's 2340,12000B,
12005,12054(PARTIAL),
12056(PARTIAL),
12177
PCR's 22896



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FUNCTION	DESCRIPTION	REQUIREMENTS
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NAVIGATION

COMPUTATIONS BY INTEGRATING A QUATERNION DIFFERENTIAL EQUATION, AS DRIVEN BY SELECTED RGA DATA.

IMU

IMU INERTIAL PROCESSING IS PROVIDED. THIS CONSISTS OF OPERATING THE IMU'S IN AN INERTIAL STATE, BY PERFORMING ACCELEROMETER, RESOLVER, GYRO AND BITE PROCESSING, TO PROVIDE VELOCITY, ATTITUDE, STATUS AND FAILURE DATA TO OTHER PROGRAM ELEMENTS.

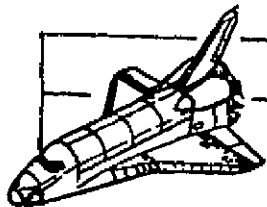
SS-P-0002-550D

4.11A

SS-P-0002-510F

4.38

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RELEASE NOTE - ENTRY, GN3

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IBM

Incorrect Name for A/L Parameter

DESCRIPTION

The flatturn reference altitude (CGPS_FLATTURN_ALT) was specified as a local ILOAD, but should be specified as a compool ILOAD.

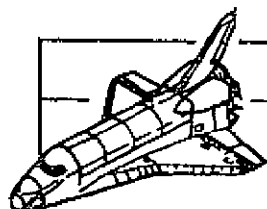
USER RESPONSE

None. Problem will be fixed for OFT1 delivery. CGPS_FLATTURN_ALT exists both in CGDAUT as a local parameter, and in compool CCCFL1. Both are correctly initialized, so a problem does not exist in the code. When the code is fixed, the local will be removed from CGDAUT.

DR REFERENCE

22056N

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OMS Cutoff Accuracy of OMS Fire Sequencer (R)

DESCRIPTION

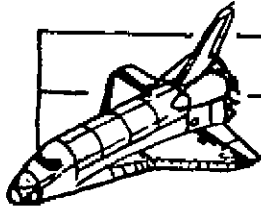
The current implementation of OMS cutoff processing in OMS Fire Sequencer gives a bias error of 80 msec (i.e., the accuracy of 80 ± 20 ms). Further, the computation of the timing criteria is also more complicated than necessary.

USER RESPONSE

None. The sequencer performs satisfactorily. Further, the requirements documents do not specify an accuracy tolerance. The proposed simplification of the computation will be implemented in future releases.

DR REFERENCE

23949N



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Entry Trajectory (R)

DESCRIPTION

A guidance trailer might appear on the far left of the "ENTRY TRAJ 1" display when guidance is first calculated. If the guidance trailer does appear on the far left of the screen, then it will remain displayed for about 3 minutes.

The above problem is the second of two problems addressed by DR26522N. The first problem has been corrected via Mass Memory patch.

USER RESPONSE

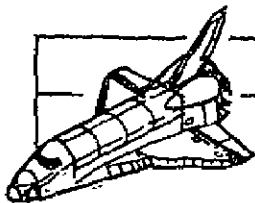
The guidance trailer should be ignored. The cause of the misplacement of the guidance trailer is understood and will be corrected for the July Entry release.

DR REFERENCE

26522N

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IBM

Fluctuation in Computed Angle of Attack at a Dynamic
Pressure (Q) Value of 20 lbf/ft² (R)

DESCRIPTION

Because a correction which would modify the computed value of Angle of Attack in the Aerojet DAP Attitude Processor as a function of vehicle beta was not implemented for this delivery, small discontinuities (several degrees) exist in computed angle of attack values across the \bar{Q} value of 20 lbf/ft² (which is the transition value for the HIGH \bar{Q} DAP flight regime). Several seconds after this threshold is reached the angle of attack computation will be correct unless the \bar{Q} fluctuates back through a value less than 19 lbf/ft². In that case additional, corresponding discontinuities will occur in the computed angle of attack.

USER RESPONSE

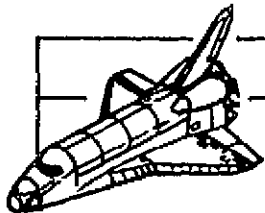
While this effect cannot be eliminated totally, it can be reduced to a single discontinuity by lowering the value of the HIGH \bar{Q} transition hysteresis value from 19 lbf/ft² by patching:

GCBAER.GCB_AERO_DAP_1H.CGCS_QBAR5 equal to 16.0.

DR REFERENCE

26523N

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FCS Saturation Annunciation During MM304 (R)

DESCRIPTION

During the transition to the HIGH \bar{Q} Aerojet DAP flight regime an FCS saturation annunciation message may occur. Analyses indicate that this is associated with the computed angle of attack discontinuity defined in DR 26523.

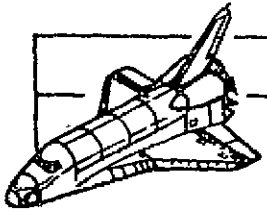
USER RESPONSE

None

DR REFERENCE

26524N

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IBM

RCS Jet Failed Annunciation During OPS 3 (R)

DESCRIPTION

There exists a possibility for RM to fail several RCS jets during OPS 3. The problem is the result of a timing inconsistency between the SDL RCS Model requirement and the FSW RM processor requirement for 40 msec (minimum impulse) firings. Modeled RCS chamber pressures may not be of sufficient values at RM sample times for some minimum impulse firings. However, the engines do fire properly, until failed. A requirement change which will result in the limiting of minimum impulse firings to 80 msec (CR12401) and revised RM requirements (CR-TBD) will eliminate this problem for future deliveries.

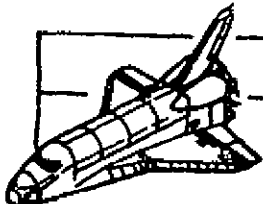
USER RESPONSE

If RCS jet failures are experienced, please contact Ted W. Keller, IBM, Houston, 333- 3300, ext. 3521.

DR REFERENCE

26525N

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TACAN Receiver 1 Comfaulted in MM305 (R)

DESCRIPTION

TACAN Receiver 1 is being comfaulted by FSW in MM305 because the TACAN Data Processor is referencing the wrong data bit. TACAN Receivers 2 and 3 are being processed properly, and this problem has no effect on the flight, the TACAN processing into NAV, or the TACAN residuals. The problem only results in the first of the three "M"'s on the System Summary Display staying on throughout MM305.

USER RESPONSE

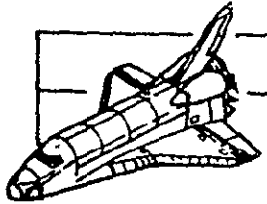
A patch solution is available:

Patch ID (Oct)	Base	Displ (Hex)	Patch Addr. Hex	Old Data Hex	New Data Hex	P/U	Phase Load Blk	Offset In Load Blk (Dec)
CSECT	FTSBB	Word No In Block (Dec)	Oct	Oct	Oct			
001046	24E18	D9	24EF1	0004	0003	P	6	
#CGYTTAC	55400	499	447361	0004	0003		21	16893
001046	24E18	70	24E8A	0004	0003	P	6	
#CGYTTAC	55400	396	447212	0004	0003		21	16780

DR REFERENCE

26527N

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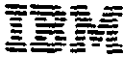


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INCORRECT VALUE USED FOR RADAR ALTIMETER RANGE TEST (CGGS R GO RAMP)

DESCRIPTION

AN INCORRECT VALUE OF THE RADAR ALTIMETER RANGE TEST PARAMETER HAS BEEN USED. THE CURRENT VALUE RESULTS IN THE INCORPORATION OF RA DATA INTO THE UPP RUNWAY POSITION ONLY WITHIN 1000 FEET OF THE RUNWAY THRESHOLD INSTEAD OF WITHIN 4000 FEET AS DEFINED IN PCR 24688. THIS COULD RESULT IN THE VEHICLE LANDING AN UNDESIRABLE DISTANCE FROM THE NOMINAL RUNWAY TARGET IN AUTOLAND IF SUFFICIENT FSW STATE ERRORS EXIST.

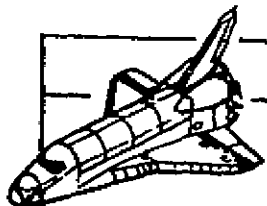
USER RESPONSE

Patch ID (Oct)	Base	Displ (Hex)	Patch Addr Hex	Old Data Hex	New Data Hex	P/U	Phase	Offset In Load Blk (Dec)
CSECT	FTSBB	Word No In Block (Dec)	Oct	Oct	Oct		Load Blk	
001050	B9A2	1CA	BB6C	45F4	46F4	U	6	
#PCGGC13	55103	262	135554	42764	43364		11	2310
001050	B9A2	1CB	BB6D	2400	2400	U	6	
#PCGGC13	55103	263	135555	22000	22000		11	2311

DR REFERENCE

26532-N

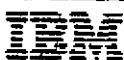
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Missing Hardware Output Buffer Downlist Comments (R)

DESCRIPTION

The V72 MSID downlist comment cards are missing for certain hardware parameters (16 total):

LH,RH	Body Flap	Auto, manual
LH,RH	Speed Brake	Auto, manual
LH,RH	Pitch FCS Mode	Auto, CSS
LH,RH	Roll/Yaw FCS Mode	Auto, CSS

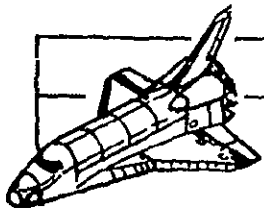
USER RESPONSE

None.

DR REFERENCE

25951N

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IBM

ADTA Parameters Not Loaded In ENTRY Downlist (R)

DESCRIPTION

ADTA PDI is not supported for the ENTRY delivery and the following parameters are not loaded in the ENTRY downlist format 23:

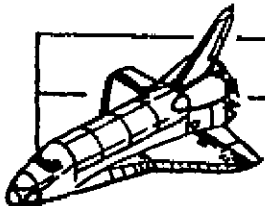
V90P4706C	Center Selected ADTA PS
V90P4710C	Center Selected ADTA PAU
V90P4711C	Center Selected ADTA PAC
V90P4712C	Center Selected ADTA PAL
V90X4840X	ADTA Dilemma Flag
V90X4870X	Left Probe Deploy Status
V90X4871X	Right Probe Deploy Status
V90X5001X	ADTA 1 Fail
V90X5051X	ADTA 2 Fail
V90X5101X	ADTA 3 Fail
V90X5151X	ADTA 4 Fail
V90X5180X	ADTA Data Good

USER RESPONSE

None.

DR REFERENCE

25955N

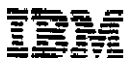


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TACAN Parameters Not Loaded In ENTRY D/L (R)

DESCRIPTION

TACAN FDI is not supported for the ENTRY delivery and the following parameters are not loaded in downlist format 23:

V90X3601X	TACAN 1 Fail
V90X3701X	TACAN 2 Fail
V90X3801X	TACAN 3 Fail
V90U3851C	Sel TACAN LRU No.
V90X3855X	TACAN Data Good

USER RESPONSE

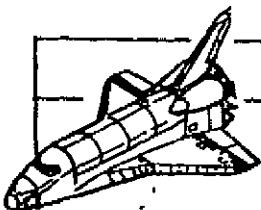
None.

DR REFERENCE

25954N

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IBM

ADTA Parameters not Loaded in Entry D/L (R)

DESCRIPTION

The following parameters are not loaded in Entry D/L -
Fmt 23:

V90T4715C Center Selected ADTA - TT
V90X5020X ADTA 1 Calc Flag
V90X5070X ADTA 2 Calc Flag
V90X5120X ADTA 3 Calc Flag
V90X5170X ADTA 4 Calc Flag

NOTE: These are parameters which no longer exist (as of
CR12416A)

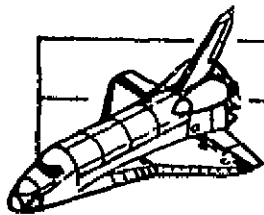
USER RESPONSE

None

DR REFERENCE

25956N

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TACAN GPC Parameters not Loaded in Entry D/L (R)

DESCRIPTION

The following TACAN parameters are not loaded in Entry D/L-
LMT 23:

V74K1515B - TACAN No. 1 GPC

V74K1615B - TACAN No. 2 GPC

V74K1715B - TACAN No. 3 GPC

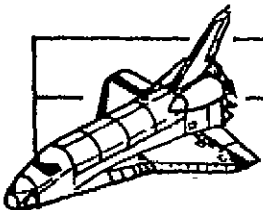
USER RESPONSE

None

DR REFERENCE

25958N

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IBM

Discrete Out Parents not Loaded in Entry D/L (R)

DESCRIPTION

The following parameters are not loaded in the ENTRY D/L -
FMT 23:

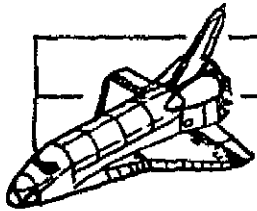
V72M7861P
V72M7868P
V72M7881P
V72M7888P
V72M8775P

USER RESPONSE

None

DR REFERENCE

25963N



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Body Yaw Parameter Not Loaded In ENTRY Downlist (R)

DESCRIPTION

The following parameter is not required for D/L by the FSSR
baselined for the ENTRY delivery and is not loaded in downlist
format 23:

V90H2230C Body Yaw Attitude Euler Angle

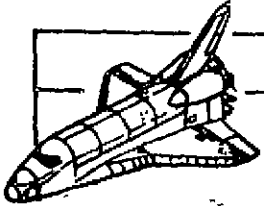
USER RESPONSE

None.

DR REFERENCE

25965N

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IM

L/R OMS Engine Fail Parameters Not Loaded In ENTRY D/L (R)

DESCRIPTION

OMS engine FDI is not supported for the ENTRY delivery and the following parameters are not loaded in D/L format 23:

V90X7670X	Left OMS Engine Fail OFF
V90X7671X	Right OMS Engine Fail OFF

USER RESPONSE

None.

DR REFERENCE

25957N

IMU Sel Filter Parameters Not Loaded In ENTRY Downlist (R)

DESCRIPTION

The following parameters are not loaded in the ENTRY downlist format 23:

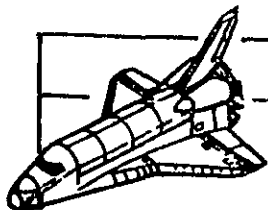
V90X2503X	IMU Selection Filter Command
V90L2557C	Sel Total X Vel M50
V90L2558C	Sel Total Y Vel M50
V90L2559C	Sel Total Z Vel M50

USER RESPONSE

None.

DR REFERENCE

25966N



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OMS Total Quantity Parameters Not Loaded in Entry D/L (R)

DESCRIPTION

The following parameters are not loaded in Entry D/L, Fmt 33:

V90Q8535C

V90Q8536C .

As it turns out, the above parameters are not required for the entry release in that the parameters are generated by functions that are not available until the OF1 release (9/4/78 release).

USER RESPONSE

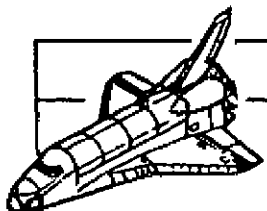
None

DR REFERENCE

25968N

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GN

Miscellaneous GN&C Parameters not Loaded in Entry D/L (R)

DESCRIPTION

The following parameters are not loaded in Entry D/L, Fmt 23:

- V90H0803C Commanded Angle of Attack
- V90H1011C Speedbrake Angle Command-Autoland
- V90R1027C Autoland Yaw Rate CMD

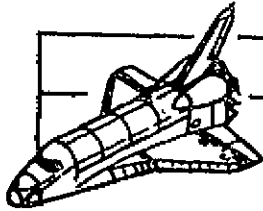
USER RESPONSE

None

DR REFERENCE

25962N

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Nav. Derived Parameters not Loaded in Entry D/L (R)

DESCRIPTION

The following parameters are not loaded in Entry D/L - Fmt 23:

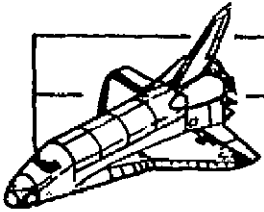
V90L0847C Nav derived Mach Number
V95P3170C Nav derived Dynamic Pressure
V95L3175C Nav derived Equivalent Airspeed

USER RESPONSE

None

DR REFERENCE

25970N



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IBM

Previous Baro Parameter not Loaded in Entry D/L (R)

DESCRIPTION

The following parameter is not loaded in Entry D/L - Fmt 23:

V95P3403C Previous Barometric Correction

USER RESPONSE

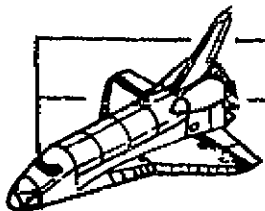
None

DR REFERENCE

25971N

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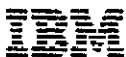
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Selected TACAN Parameters not Loaded in Entry D/L (R)

DESCRIPTION

The following parameters are not loaded in the Entry D/L -
FM 23:

- V95J5004C - Selected TACAN Channel ID
- V95H5010C - Selected TACAN Range
- V95H5015C - Selected TACAN Bearing

NOTE: These are not the MML numbers listed in the GN&C
Level C FSSR, Part B, Entry through Landing Navigation,
10/77.

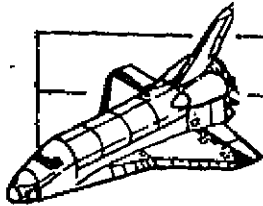
USER RESPONSE

None

DR REFERENCE

25973N

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IBM

Jet Leaking Parameters Not Loaded In ENTRY D/L (R)

DESCRIPTION

The following parameters are not loaded in the ENTRY downlist:

- Jet F4R Leaking
- Jet F4D Leaking
- Jet F5L Leaking
- Jet F5R Leaking

USER RESPONSE

None.

DR REFERENCE

25967N

Term/Idle Parameters Not Loaded In ENTRY D/L (R)

DESCRIPTION

The following parameter is not supported for the ENTRY delivery and is not loaded in the ENTRY D/L - Format 23:

V99X2716X Term/Idle In Progress

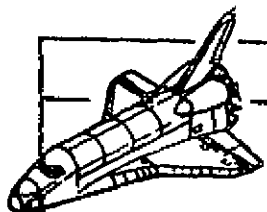
USER RESPONSE

None.

DR REFERENCE

25974N

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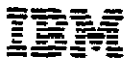


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Annunciation Discretes Not Loaded Correctly (R)

DESCRIPTION

The following discretes are all loaded in frame 24 word 119.
They should be loaded in the indicated frame and word:

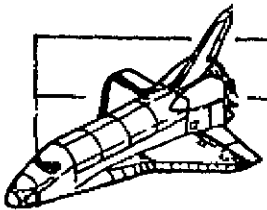
	<u>Frame</u>	<u>Word</u>
V72X4531X	12	119
V72X4526X	22	119
V72X4521X	12	119
V72X4533X	3	89
V72X4527X	12	119
V72X4523X	3	89
V72X4532X	22	119
V72X4533X	3	89
V72X4522X	22	119

USER RESPONSE

None.

DR REFERENCE

25676N



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TACAN Discretes not Loaded with Parent (R)

DESCRIPTION

The following discretes should be loaded in the indicated frame and word and are not:

V72K8410X - TACAN No. 1 Auto Discrete - Fr 21, Wd 79

V72K8430X - TACAN No. 2 Auto Discrete - Fr 10, Wd 79

V72K8450X - TACAN No. 3 Auto Discrete - Fr 5, Wd 65

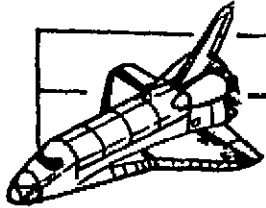
USER RESPONSE

None

DR REFERENCE

25677N

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IMU

Doppler Extractor Parameters Not Loaded In ENTRY D/L (R)

DESCRIPTION

The following parameters are not required for D/L by FSSR baselined for ENTRY delivery and are not loaded in ENTRY downlist format 23:

V74M7801P	DE 1 Status Word WD1
V74M7901P	DE 2 Status Word WD1
V74U7920B	DE 2 Ground Station ID

USER RESPONSE

None.

DR REFERENCE

25961N

IMU Discrete Not Loaded With Parent (R)

DESCRIPTION

The following discrete is loaded in frame 22 word 18; however the parent (V72M6633P) is loaded in frame 8 word 118:

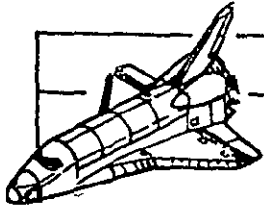
V71K2576	IMU 1 Operate Mode Command
----------	----------------------------

USER RESPONSE

None.

DR REFERENCE

25678N



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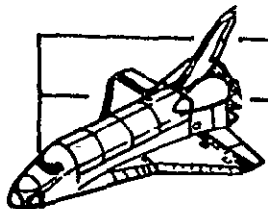
IBM

Parent MSID's Not in Downlist Loading (R)

DESCRIPTION

The following list of parent MSID's are not loaded in the indicated FR and WD. The asterisk (*) indicates the MSID is not in the downlist requirements.

<u>Parent</u>	<u>Should be Loaded in:</u>		<u>Not in D/LRE</u>
V72M6774P	FR 2	WD 89	*
V72M7887P	2	120	*
V72M6782P	3	89	
V72M7880P	3	119	*
V72M6780P	3	120	
V72M6674P	4	119	
V72M6625P	5	85	
V72M7820P	5	118	*
V72M7847P	5	119	*
V72M7840P	6	119	*
V72M7827P	7	118	*
V72M6636P	8	119	
V72M6733P	9	15	*
V72M6726P	10	89	
V72M6759P	10	116	*
V72M6736P	10	119	
V72M6680P	11	119	
V72M6682P	12	119	
V72M6686P	14	119	
V72M6676P	16	89	
V72M7860P	16	119	*
V72M6683P	17	89	*



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V72M7867P	18	119	*
V72M7848P	19	89	
V72M6724P	19	119	
V72M7841P	20	15	
V72M6730P	20	119	
V72M6728P	21	119	
V72M6732P	22	119	
V72M7828P	23	15	
V72M7821P	23	89	
V72M6630P	23	118	
V72M6628P	24	118	*
V72M6632P	24	119	

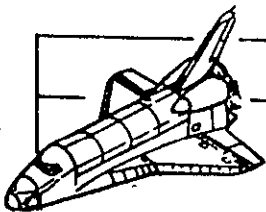
USER RESPONSE

None

DR REFERENCE

25679N

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SPACE SHUTTLE PROGRAMS

Title RELEASE NOTE - ENTRY, GN3

Date

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Parameter Type Incorrect in Downlist Loading (R)

DESCRIPTION

The following parameters are indicated as Type 1 (single precision floating point). These parameters should be Type 9 raw GPC output parameters.

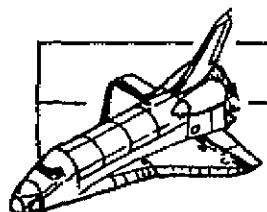
- | | |
|--------------------------|----------|
| V72Q1370C - RCS FWD-OX | QUANTITY |
| V72Q1371C - RCS FWD-FU | ↓ |
| V72Q1374C - RCS L AFT OX | |
| V72Q1375C - RCS L AFT FU | |
| V72Q1378C - RCS R AFT OX | |
| V72Q1379C - RCS R AFT FU | |

USER RESPONSE

None

DR REFERENCE

25680N



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Title RELEASE NOTE - ENTRY, GN3

Date

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IBM

Hardware Output Buffer Downlist Parameters (R)

DESCRIPTION

The following 16 hardware parameters should have downlist comments, using V72 MSID numbers. Instead, they are commented with V90 MSID numbers.

LH,RH	Body Flap	Auto, manual
LH,RH	Speedbrake	Auto, manual
LH,RH	Pitch FCS Mode	Auto, CSS
LH,RH	Roll/Yaw FCS Mode	Auto, CSS

USER RESPONSE

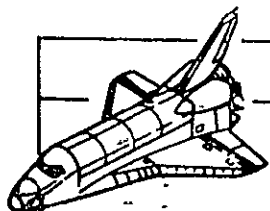
None.

DIR REFERENCE

25682N

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SPACE SHUTTLE PROGRAMS



Title RELEASE NOTE - ENTRY, GN3

Date

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IBM

Missing Scaling Parameters on MLS Downlist Data (R)

DESCRIPTION

Scaling parameters associated with the downlist comments for selected ISBLS Range, Azimuth, and Elevation were not supplied. These values should be as follows:

 Sel. MLS range (V90H3062C) A0=0, A1=.0025

 Sel. MLS azimuth (V90H3002C) A0=0, A1=.0039062

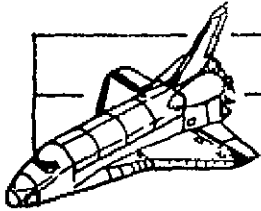
 Sel. MLS elevation (V90H3032C) A0=0, A1=.0039062

USER RESPONSE

None

DR REFERENCE

25865N



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Requirements Inconsistency for ADI Error in Roll (U)

DESCRIPTION

Current requirements for commanded body quaternion during deorbit use instantaneous unit position vector for roll reference. Trans DAP requirements maintain a constant inertial roll reference during deorbit. This results in a slowly increasing body error angle displayed on the ADI. Requirements are being met in both areas. A PCR or CR is required.

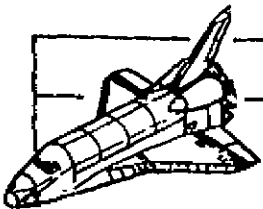
USER RESPONSE

None

DR. REFERENCE

26518N

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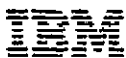


SPACE SHUTTLE PROGRAMS

Title USER NOTE - ENTRY, GN3

Date

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Missing ILOAD Required for Dedicated
Display Pitch Error Output (U)

DESCRIPTION

Due to a missing ILOAD requirement for the normal acceleration error filter constant in the aerojet DAP, the dedicated display output for pitch error will be zero, unless a data patch is made.

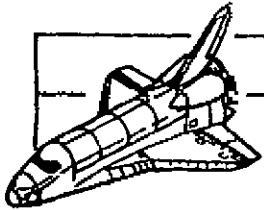
USER RESPONSE

A patch solution is available.

Patch ID (Oct)	Base	Displ (Hex)	Patch Addr Hex	Old Data Hex	New Data Hex	P/U	Phase	Offset In Load Blk (Dec)
CSECT	FTSBB	Word No In Block (Dec)	Oct	Oct	Oct		Load Blk	
001045	6040	18	6058	0000	4110	U	6	
#DGCAER	55011	162	60130	0000	40420	U	6	2210
001045	6040	19	6059	0000	0000	U	6	
#DGCAER	55011	163	60131	0000	0000		6	2211

PCR REFERENCE

26559



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11/11/81
11/11/81
11/11/81
11/11/81

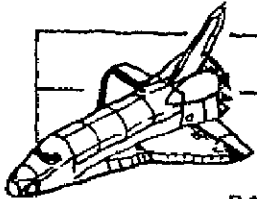
POTENTIAL OMS TO RCS DOWNMODE INDICATION ON DEORBIT MNVR DISPLAY FOR FIRST SECOND OF DEORBIT BURN.

DESCRIPTION

THERE IS A REMOTE POSSIBILITY THAT DURING AN OMS BURN FOR DEORBIT, A 4-JET RCS TGO AND VGO SOLUTION MAY APPEAR ON THE DEORBIT MANEUVER DISPLAY FOR ONE SECOND (FET) AT THE START OF THE BURN. THIS COULD OCCUR ONLY IF, ON THE FIRST GUIDANCE PASS AFTER TIG, THE MFE SHADOW COPY OF THE OMS FIRE COMMANDS HAVE NOT YET BEEN SET VIA AN UPDATE BLOCK FROM THE HFE (THERE IS A POTENTIAL ≈ 300 TIME LAG IN PASSING THIS DATA TO THE MFE). IN THIS EVENT THE OMS ENGINES WILL STILL IGNITE ON TIME AS REQUIRED, AND THE PERFORMANCE OF THE BURN IS NOT AFFECTED. AFTER ONE SECOND (THE NEXT GUIDANCE PASS) THE GUIDANCE SOLUTION REFLECTS THE OMS FIRE COMMAND AND THE DISPLAYED SOLUTION RECONVERGES TO THE CORRECT TGO AND VGO FOR THE ACTUAL OMS CONFIGURATION. THIS PROBLEM IS DUE TO THE ABSENCE OF OMS FDIR IN THE ENTRY FACI DELIVERY. WITHOUT OMS FDIR, THE ONLY WAY FOR GUIDANCE TO MEET AUTOMATIC DOWNMODING REQUIREMENTS IS TO CHECK THE ACTUAL FIRE COMMANDS WHICH REFLECT (MANUAL) CREW CONFIGURATION SELECTION. IMPLEMENTATION OF COMPLETE OMS FDIR REQUIREMENTS WILL ELIMINATE THIS POTENTIAL PROBLEM ON FUTURE DELIVERIES.

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SPACE SHUTTLE PROGRAMS



Title USER NOTE-ENTRY, GM3

Date

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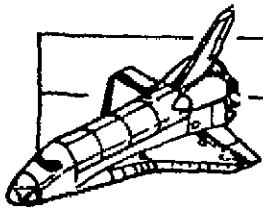
POTENTIAL OMS TO RCS DOWNMODE INDICATION ON DEORBIT MNVR DISPLAY FOR FIRST
SECOND OF DEORBIT BURN.

(CONTINUED)

USER RESPONSE: NONE

DR REFERENCE: 26531N

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SPACE SHUTTLE PROGRAMS

Title USER NOTE - ENTRY, GN3

Date

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MM

COLDSTART INPUTS (U)

DESCRIPTION

IN ORDER TO EXECUTE THE ENT-F FSW FROM THE MMU, COLDSTART VALUES AND OTHER DATA INITIALIZATION VALUES MUST BE PATCHED.

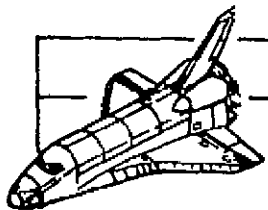
USER RESPONSE

REFER TO SECTION 7.4.2.4 OF THE PRN FOR A LISTING OF ALL PATCHES REQUIRED TO EXECUTE THE ENT-F FSW BEGINNING AT TWO SPECIFIC POINTS:

- (A) AOA DEORBIT, OMS 2- 6 MINUTES (MM301)
- (B) OFT-1 NOMINAL ENTRY, EI - 60 SECONDS (MM304)

DR REFERENCE

NONE

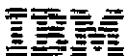


SPACE SHUTTLE PROGRAMS

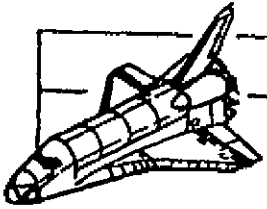
Title DR STATUS (4/28/78 LIST)

Date

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DR #	DESCRIPTION	DISPOSITION
14298N	GFC PREVIOUS SOFT STOP FLAG NOT RESET	PATCH SUPPLIED
24047N	UNABLE TO GET OUT OF GNC 201	N/A TO ENTRY-OCL DR
24458N	INSTRUCTION MONITOR IN GNC1LM1-ANNUNCIATION MESSAGES	N/A TO ENTRY-OCL DR
24689N	INSTRUCTION MONITOR IN GABDIR	N/A TO ENTRY-OCL DR
25812N	INCORRECT GCQ (RECON) TO ENABLE GC7 (PART 1 FILTER PROCESSING)	N/A TO ENTRY-OCL DR
26006N	RECONFIGURATION FROM 1 ENGINE TO 2 ENGINE OMS BURN	CLOSED-NO MOD
26196N	ORBIT DAP MODULE (GC7) NEVER EXECUTES	N/A TO ENTRY-OCL DR
26530N	INCORRECT HAL NAME REFERENCED BY TAEM GUIDANCE	PATCHED IN COLDSTART DATA



SPACE SHUTTLE PROGRAMS

Title DR STATUS (4/28/78 LIST)

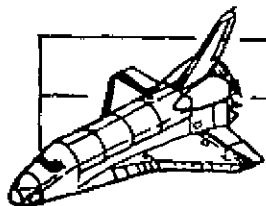
Date

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NASA

DR #	DESCRIPTION	DISPOSITION
26573N	GFFORB CODE ERRORS FOUND DURING LEVEL 1 TEST	N/A TO ENTRY-OCL DR
26576N	GFFORB CODE ERRORS FOUND DURING LEVEL 1 TEST	N/A TO ENTRY-OCL DR
26581N	TRAN PULSE (GFFORB) PROCESSED FOR ALL AXES RATHER THAN BY AXIS	N/A TO ENTRY-OCL DR
26583N	GFFORB CODE ERRORS FOUND DURING LEVEL 1 TEST	N/A TO ENTRY-OCL DR
26586N	GFFORB CODE ERRORS FOUND DURING LEVEL 1 TEST	N/A TO ENTRY-OCL DR
26532N	INCORRECT VALUE USED FOR RADAR ALTIMETER RANGE TEST	RELEASE NOTE
26781N	PROBLEMS WITH BODY FLAP CHANNEL	U. I.
24050N	INVALID MISSING DATA INDICATOR ON SYS. SUMMARY FOR IMU 1.	U. I.

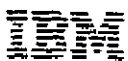
SPACE SHUTTLE PROGRAMS



Title GNC ENT OPS3 LEVEL 1 TEST SUMMARY

Date

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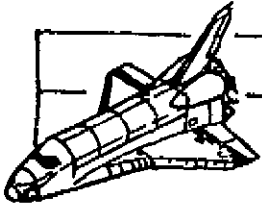


- 124 COMPILATION UNITS TESTED
 - 98 NEW IN ENT (DISPLAYS, NAV., RM)
 - 26 CHANGED FROM AOA (DEDICATED DISPLAYS, FLIGHT CONTROL, SOPS, GUID)

- TESTING STARTED 8/16/77

- TESTING COMPLETED 3/16/78

- ALL UNITS COMPLETED SUCCESSFULLY



SPACE SHUTTLE PROGRAMS

Title GNC ENT OPS 3 LEVEL 2 TEST SUMMARY

Date

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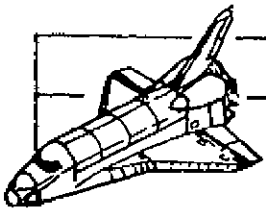
Approved
Disapproved
Not Reviewed

- 3 LEVEL 2 TEST DEFINED
 - DEORBIT MANEUVER DISPLAY
 - HORIZONTAL SITUATION DISPLAY
 - ENTRY NAVIGATION
- HORIZONTAL SITUATION DISPLAY AND ENTRY NAVIGATION TESTS WERE COMPLETED AS PLANNED
- DEORBIT MANEUVER DISPLAY LEVEL 2 TEST WAS SUSPENDED IN FAVOR OF LEVEL 3 TEST

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ENTRY FACI
LEVEL 3/4 TESTING

W. A. MADDEN



SPACE SHUTTLE PROGRAMS

Title ENTRY FAC1 LEVEL 3/4 TEST SUMMARY

Date

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TEST CASES

SINGLE FLIGHT COMPUTER

- DEORBIT TO ENTRY INTERFACE
- ENTRY INTERFACE TO LANDING
- DEORBIT TO LANDING
- OPS 2 TO OPS 3 THROUGH DEORBIT BURN

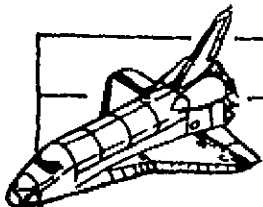
MULTI-FLIGHT COMPUTER

- DEORBIT TO ENTRY INTERFACE (DUAL)
- ENTRY INTERFACE TO LANDING (DUAL)
- DEORBIT MM301 - MM302 (TRIPLE)

FUNCTIONS TESTED

GUIDANCE, NAVIGATION & CONTROL

- DEORBIT GUIDANCE
- ENTRY GUIDANCE
- TAEM GUIDANCE
- AUTOLAND GUIDANCE
- TRANSITION DAP (MANUAL, AUTO MODES)



SPACE SHUTTLE PROGRAMS

Title ENTRY FACI LEVEL 3/4 TEST SUMMARY

Date

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- AEROJET DAP (MANUAL, AUTO MODES)
- NAVIGATION (STATE PROP., NAV FILTERING, USER PARAM)
- DEDICATED DISPLAYS (ADI, HSI, AVVI/AMI, SPI, EVENT LIGHTS)
- CRT DISPLAYS (MVR DIP, ENTRY TRANS/TRAJ, ENTRY SYS SUMM., VERT. SIT, HORIZ. SIT)
- SPECIALIST FUNCTIONS (DEORBIT MNVR, HORIZ. SIT)

SYSTEMS SOFTWARE

- DOWNLIST
- AUX DPS SPEC
- TIME MGMT SPEC
- DATA CONTROL SPEC
- GENERAL MEMORY R/W SPEC
- I/O ERROR HANDLING

DELIVERIES

SITE COLDSTARTS

- PRE-DEORBIT (TIG-5MIN)
- ENTRY INTERFACE (400 KFT)

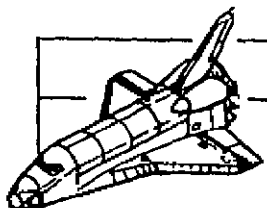
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ENTRY FACI

LEVEL 5 TESTING

B. J. THOMAS

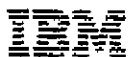
SPACE SHUTTLE PROGRAMS



Title ENTRY FACI LEVEL 3/4 TEST SUMMARY

Date

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● 107 OPS. 3 GN&C DR's DISPOSITIONED AS FOLLOWS

47 SOURCE FIX

16 PATCH FIX

35 RELEASE NOTED

7 NO MOD

2 UNDER INVESTIGATION

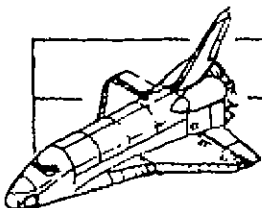
107

● INITIATED FOLLOWING PCR's TO MODIFY REQUIREMENTS/ILOADS

25849, 26186, 26415, 24682, 26559

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SPACE SHUTTLE PROGRAMS



Title LEVEL 5 TESTING

Date

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TOTAL RUNTIME ON THE FINAL SYSTEM PRIOR TO DELIVERY

SMS

4 COMPUTER SET

6 HRS - ENTRY - (3 HRS. REDUNDANT SET)

2 HRS - PALMDALE 3 - (1 HR REDUNDANT SET)

SAIL

SINGLE STRING ONLY

6 HRS - ENTRY FACI

2 HRS - PAYLOAD DOORS DROP

18 HRS - PALMDALE 3

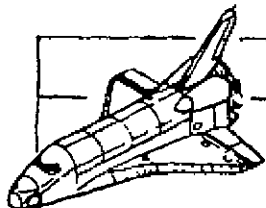
PROBLEMS

ONE DR WRITTEN

- DR 17158 WAS WRITTEN ON A PATCH PROBLEM IN PALMDALE THREE

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SPACE SHUTTLE PROGRAMS



Title

LEVEL 5 TESTING (CONTINUED)

Date

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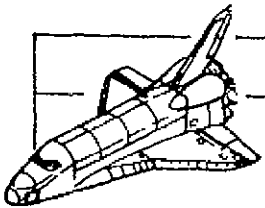
Level 5
Testing
Summary

- ENVIRONMENT: BOTH THE SMS AND SAIL HAD STATIC DATA FOR AVIONICS INPUTS. THE SMS HAD 4 TRAINER GPCs WHILE THE SAIL HAD ONE PRODUCTION GPC.

HARDWARE MASS MEMORIES WERE USED IN BOTH FACILITIES TO IPL FROM.
- THE ENTRY SYSTEM WAS IPLed FROM MM AND THE OPS 301 WAS CYCLED. THE SYSTEM WAS THEN MODED FROM OPS 301 TO 302 THROUGH 305.
- THE PAYLOAD BAY DOORS (SM OPS 202) OPS WAS CALLED IN FROM MEMORY AND THE DISPLAY EXAMINED. NO OPERATIONS OF THE DOORS WAS POSSIBLE DUE TO THE LACK OF HARDWARE.
- THE PALMDALE THREE SYSTEM WAS IPLed FROM MASS MEMORY. ALL OPS 0, SM OPS 8, 9 AND GNC 9 DISPLAYS WERE EXAMINED AND THE OPS CYCLED.

ENTRY FACI
PERFORMANCE EVALUATION

C. McGAHA



SPACE SHUTTLE PROGRAMS

Title

Date

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Figure
Table
Text
Equation
List

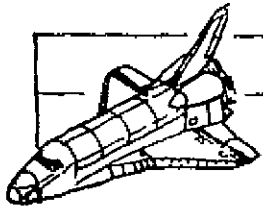
OBJECTIVES OF MEASUREMENTS

- 0 TO GAIN EARLY INSIGHT INTO ENTRY SYSTEM PERFORMANCE
- 0 TO OBTAIN DETAILED CPU MEASUREMENTS WITH WHICH TO VERIFY AND UPDATE CPU ESTIMATES.
- 0 TO INVESTIGATE NEW SYSTEM SOFTWARE PERFORMANCE (SSW-2)

OUTLINE OF PRESENTATION

- 0 MEASUREMENT ENVIRONMENT
- 0 CPU UTILIZATION BY PROCESS
 - oo MM 304
 - oo MM 302
- 0 ENTRY FACI DUTY CYCLE VS CPU ESTIMATES
- 0 FLIGHT CRITICAL TRANSPORT LAG AND INPUT JITTER
- 0 DATA HOMOGENEITY
- 0 CYCLE OVERRUNS
- 0 CONCLUSIONS & PLANS

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SPACE SHUTTLE PROGRAMS

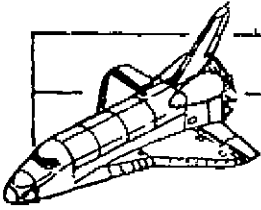
Title ENTRY FACI ENVIRONMENT SUMMARY (GN&C)

Date 5/9/78

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Major Mode Function	201	301	302	303	304	305 TAEM	305 A/L
GUIDANCE	<ul style="list-style-type: none"> Inactive 	Inactive	<ul style="list-style-type: none"> Deorbit Guidance 	Inactive	<ul style="list-style-type: none"> Entry Guidance 	<ul style="list-style-type: none"> TAEM Guidance 	<ul style="list-style-type: none"> A/L Guidance
NAVIGATION	<ul style="list-style-type: none"> User Parameter Processing 	<ul style="list-style-type: none"> Coasting Flight NAV 3 State Vectors 	<ul style="list-style-type: none"> Powered Flight NAV 3 State Vectors 	<ul style="list-style-type: none"> Coasting Flight NAV 3 State Vectors 	<ul style="list-style-type: none"> Drag 3 State Vectors 	<ul style="list-style-type: none"> TACAN & BARO 3 State Vectors 	<ul style="list-style-type: none"> MLS Msrmts 1 State Vector
FLIGHT CONTROL	<ul style="list-style-type: none"> On-Orbit DAP (Manual Mode) 	<ul style="list-style-type: none"> TRANS DAP AUTO Att Hold 	<ul style="list-style-type: none"> TRANS DAP AUTO OMS 	<ul style="list-style-type: none"> TRANS DAP Auto Att Hold 	<ul style="list-style-type: none"> Aero-Jet DAP Blended RCS and Aerodynamic Flt. Control 	<ul style="list-style-type: none"> Same as 304 	<ul style="list-style-type: none"> Aero Jet DAP Aerodynamic Flight Control
DISPLAYS	—	<ul style="list-style-type: none"> Deorbit Man. Coast System Summary 	<ul style="list-style-type: none"> Deorbit Man. Execute System Summary 	<ul style="list-style-type: none"> Same as 301 	<ul style="list-style-type: none"> Entry Traj. System Summary 	<ul style="list-style-type: none"> Vertical Situation System Summary 	<ul style="list-style-type: none"> Same as 305 TAEM



SPACE SHUTTLE PROGRAMS

Title CPU UTILIZATION BY PROCESS - MM 304

Date 5/9/78

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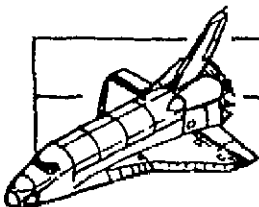
PROCESS NAME BY PRIORITY	RATE (HZ)	MEASURED CPU (%)				
		APPLICA-TION	APPL. I/O	SYNC	FCOS SERVICES	TOTALS
AIESIP - System Interface Proc.	25	3.5	0.1	1.5	2.0	7.1
GEPENT - High Frequency Exec.	25	24.8*	5.2	1.2	2.0	33.2
GEQENT - Mid Frequency Exec.	6.25	13.6	0.6	0.3	0.6	15.1
DMIMCD - MCDS Input Proc.	2.08	0.4	0.6	0.3	0.3	1.6
DUPNSP - Uplink Message Proc.	6.25	0.1	0.7	0.2	0.3	1.3
DCICYC - Cyclic Display Proc.	2.08	2.2	0.7	0.4	0.3	3.6
ARAGPC - GPC Switch Monitor	0.96	0.3	0	0.1	0.1	0.5
GERENT - Low Frequency Exec.	0.52	1.6	0	~0	~0	1.6
TOTALS		46.5	7.9	4.0	5.6	64.0

Source:

ENTRY SUBSYSTEM TEST DECK
 MM 304 -- EQUILIBRIUM GLIDE PHASE
 18/53 to 18/57 (~3.95 SEC. FET)
 FSW R8V03
 SINGLE FLIGHT COMPUTER
 AUX DPS; ENTRY TRAJECTORY 2 DISPLAYS
 NO DOWNLIST PROCESSING OR I/O in SIP-
 DOWNLIST WOULD INCREASE CPU BY 4.6%

* Flight Critical plus non-critical inline processing = 10.1% (4.05 milliseconds)

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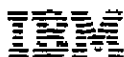


SPACE SHUTTLE PROGRAMS

Title CPU UTILIZATION BY PROCESS -- MM 302

Date 5/9/78

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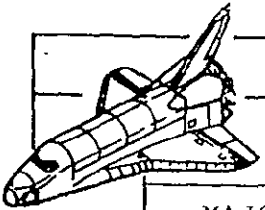
PROCESS NAME BY PRIORITY	RATE (HZ)	MEASURED CPU (%)				
		APPLICA-TION	APPL. I/O	SYNC	FCOS SERVICES	TOTALS
AIESIP - System Interface Proc.	25	4.8	2.7	2.2	2.0	11.7
GEPENT - High Frequency Exec.	25	17.1*	5.0	1.2	1.9	25.2
DGILDB - GSE Interface Proc. **	25	0.5	0	1.0	1.6	3.1
GEQENT - Mid Frequency Exec.	6.25	12.2	0.6	0.4	0.5	13.7
DMIMCD - MCDS Input Processor	2.08	0.5	0.6	0.3	0.3	1.7
DCICYC - Cyclic Display Proc.	2.08	1.1	0.6	0.4	0.3	2.4
ARAGPC - GPC Switch Monitor	0.96	0.3	0	0.1	0.1	0.5
GERENT - Low Frequency Exec.	0.52	2.0	0	~0	~0	2.0
TOTALS		38.5	9.5	5.6	6.7	60.3

Source:

ENTRY INTEGRATION TEST DECK (DEORBIT)
MM 302 DURING OMS BURN
11/13.0 - 11/17.0 (4 SECONDS FET)
FSW R8V03.3
SINGLE FLIGHT COMPUTER
DEORBIT MANEUVER EXECUTE DISPLAY
(WITH DOWNLIST ACTIVE)

* Flight Critical plus non-critical inline processing
= 5.9% (2.37 milliseconds)

SPACE SHUTTLE PROGRAMS



Title ENTRY FACI DUTY CYCLE vs AVERAGE CPU ESTIMATES

Date 5/9/78

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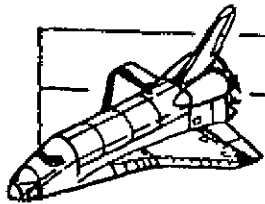
MAJOR MODE	MEASURED DUTY CYCLE ENTRY FSW 8.4/OCL FSW 8.3 MAJOR CYCLE (3.84 Sec) MIN - MAX (%)	ADJUSTED * MEASUREMENT AVG. (%)	ENTRY FACI ESTIMATE AVG. CPU (%) (4/21 Dev. Plan)
201 OCL	57 - 66		
301	49 - 89	80	86
302	64 - 68	76	78
303	60 - 66	68	74
304	70 - 76	82	86
305 T	71 - 74	82	86
305 A	71 - 75	82	84

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* Measurement adjusted to estimated environment

- SFC to MFC (4 GPCs)
- NSP and GSE Processes corrected
- Omitted functions added (OMS RM, RCS RM, etc)
- Cycle overruns adjusted
- Mode 301 includes Star Tracker & IMU Cal/Align Spec functions

Note: CPU differences between adjusted measurements and estimates include A/E Att. Proc, BFC buffering, and GN&C SW Processor



Title

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FLIGHT CRITICAL TRANSPORT LAG AND INPUT JITTER -- MM 304
(50 SECONDS FET OF NOMINAL TEST CASE -- NO I/O ERRORS)

FLIGHT CRITICAL
TRANSPORT LAG

FLIGHT CRITICAL
INPUT JITTER

LEVEL A REQUIREMENT:

WITHIN 15 MS.
INCLUDING SINGLE
BUS ERROR
(CR.12454 - INCREASE
TO 18 MS.)

- 96% MUST BE WITHIN ± 0.8 ms
- Rest MUST BE WITHIN ± 4.0 ms.

MEASURED VALUES:

AVERAGE: 13.2 ms
MAXIMUM: 13.6 ms
(NO I/O ERRORS)

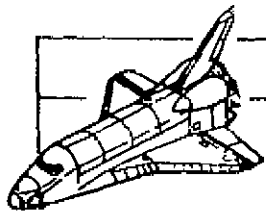
AVERAGE: 40.0 ms
MAXIMUM: 40.2 ms
MINIMUM: 39.8 ms

CONCLUSIONS:

- NO VIOLATIONS IN
LIMITED PERIOD OF
TIME INVESTIGATED

NO VIOLATIONS -- ENTRY FACI
SYSTEM IS WELL WITHIN JITTER
REQUIREMENTS

- HFE FLIGHT CRITICAL
PROCESSING COMPLETES
BEFORE OUTPUTS ARE
SENT (WITHIN DATA
HOMOGENEITY WINDOW)



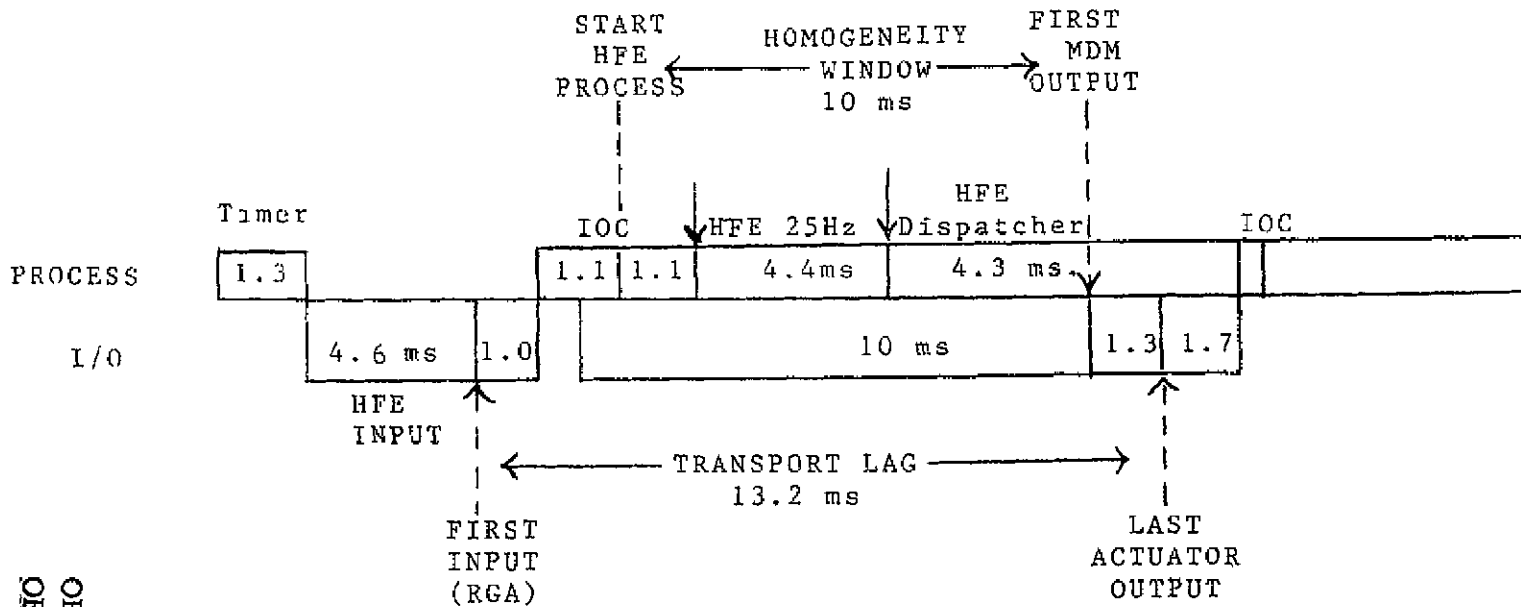
SPACE SHUTTLE PROGRAMS

Title HOMOGENEITY AND TRANSPORT LAG

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11:00
11:00
11:00
11:00
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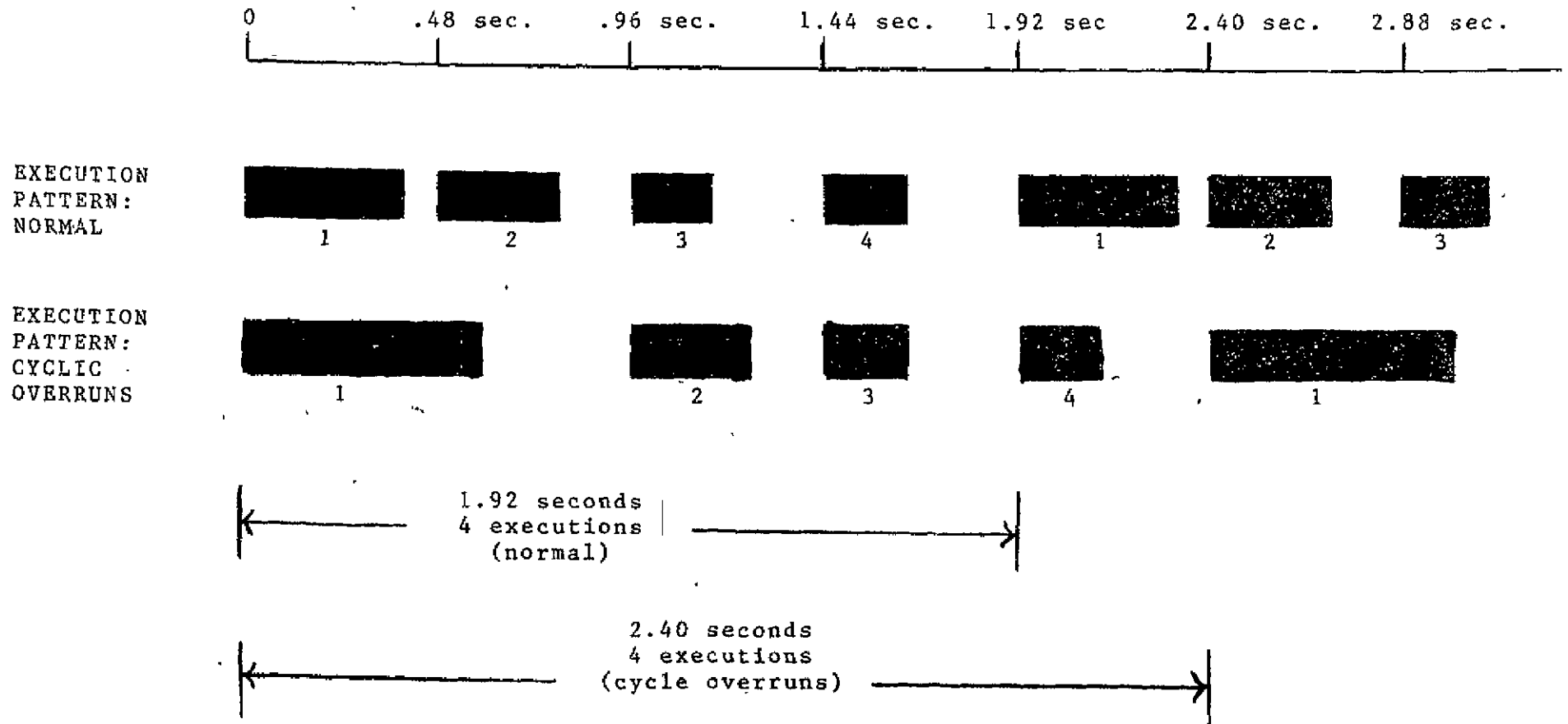
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CYCLE OVERRUNS

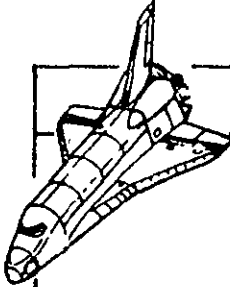
CYCLIC DISPLAY PROCESSOR CYCLE OVERRUNS WERE OBSERVED

- oo WHEN ENTRY SYSTEM SUMMARY IS ACTIVE
- oo WHEN CPU UTILIZATION IS ABOVE ~68%
- oo EVERY 2.4 SECONDS

SOLUTION TO CYCLE OVERRUN PROBLEM IS BEING PURSUED (PCR 22057)



SPACE SHUTTLE PROGRAMS



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CYCLE OVERRUNS (CONTINUED)

- MID FREQUENCY EXECUTIVE CYCLE OVERRUNS WERE OBSERVED
 - IN MM 303 ONLY
 - MISSES 1 OR 2 EXECUTIONS EVERY 8 SECONDS
 - DEORBIT MANEUVER DIP (RANGE TO LANDING SITE COMPUTATION) IS THE CAUSE OF MFE OVERRUNS

- PROBLEM IS BEING INVESTIGATED. ILOAD CHANGE WILL BE PROVIDED AS A PAPER PATCH FOR THE ENTRY FACI SYSTEM.

- HIGH MFE CPU PROCESSING CAUSES LOWER PRIORITY PROCESSES TO MISS EXECUTIONS IN MM 303 (DMI-MCDS INPUT POLLING; DCI-CYCLIC DISPLAY PROCESSOR)

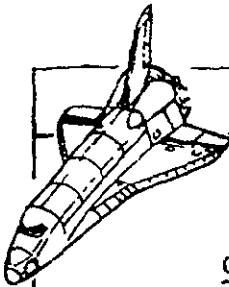
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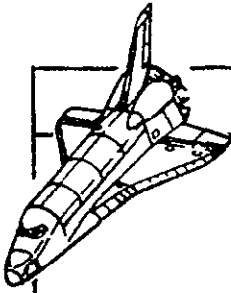
CONCLUSIONS

- EXCELLENT COMPARISON OF CPU ESTIMATES TO ENTRY FACI MEASUREMENTS PROVIDES HIGH CONFIDENCE IN CURRENT ESTIMATES.
 - A CPU SAVINGS OF 15-20% HAS BEEN ACHIEVED AS EXPECTED THROUGH IMPLEMENTATION OF 29 SCRUB ITEMS FOR ENTRY FACI.
 - ADDITIONAL CPU SAVINGS HAVE BEEN OBTAINED THROUGH DESIGN IMPROVEMENTS (ABOUT 2%).
- INITIAL MEASUREMENTS INDICATE FLIGHT CRITICAL TRANSPORT LAG AND INPUT JITTER MEET REQUIREMENTS IN A NOMINAL, ERROR-FREE CASE.
- FLIGHT CRITICAL PROCESSING WAS OBSERVED TO BE WELL WITHIN DATA HOMOGENEITY LIMITS.
- CYCLIC DISPLAY PROCESSOR OVERRUNS OCCUR WHEN LARGE DISPLAYS ARE ACTIVE. SOLUTIONS ARE BEING PURSUED (PCR 22057)
- MID FREQUENCY EXECUTIVE CYCLE OVERRUNS OCCUR IN MM303. PROBLEMS BEING INVESTIGATED.

PLANS

- AGGRESSIVELY CONTINUE CPU SCRUB IMPLEMENTATION.
- UPDATE ENTRY CPU ESTIMATES WITH DETAILED ENTRY FACI MEASUREMENTS (BOTH GN&C AND SYSTEM SOFTWARE)..
- UPDATE ORBIT CPU ESTIMATES.
- CONTINUE INVESTIGATION OF TRANSPORT LAG, INPUT JITTER, AND DATA HOMOGENEITY.
- REQUIREMENTS CHANGE WILL BE PURSUED TO FIX MFE CYCLE OVERRUN PROBLEM.
- CYCLIC DISPLAY PROCESSOR OVERRUNS WILL BE FIXED IN 9/4 ENTRY DELIVERY.

SPACE SHUTTLE PROGRAMS



Title

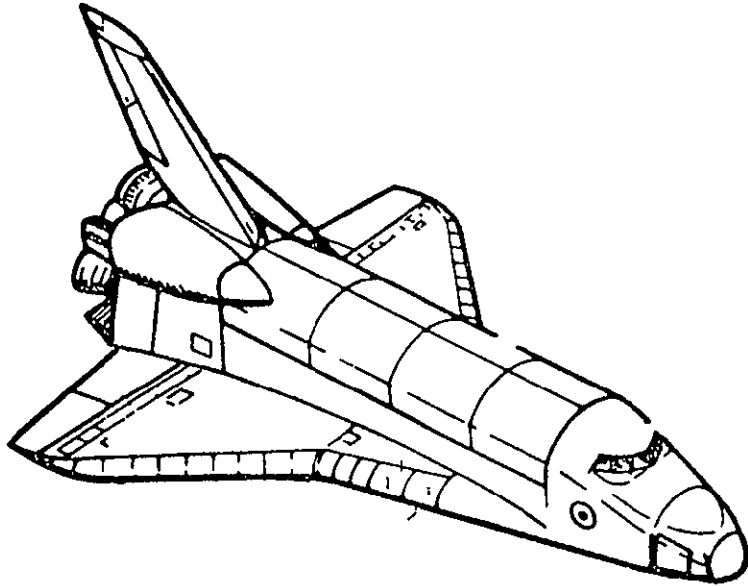
Date

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IBM

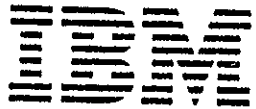
R8V4 GNC OPS 3 MEMORY SIZE

TOTAL	95518 FULL WDS.
LESS PATCH AREA	<u>2107</u>
	93411



SDL READINESS FOR ENTRY FACI

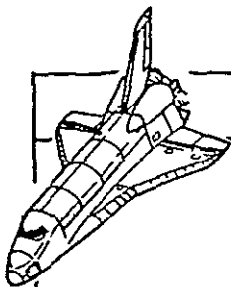
space shuttle programs



Federal Systems Division
1322 Space Park Drive, Houston 77058

C. C. ROTH
May 9, 1978

SPACE SHUTTLE PROGRAMS



Title SDL READINESS FOR
ENTRY FACI

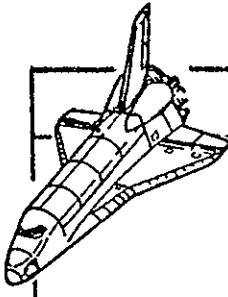
Date 5/9/78

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AGENDA

- SDL SYSTEM STATUS
- KNOWN PROBLEMS - HARDWARE/SOFTWARE
- PLANNED FUTURE CAPABILITIES
- PLANNED FUTURE DISCREPENCY FIXES
- SUMMARY

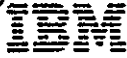
SPACE SHUTTLE PROGRAMS



Title SDL READINESS FOR ENTRY FACT

Date 5/9/78

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SDL SYSTEM STATUS

- SDL RELEASE 10.46 IS CURRENT
FLOOR SYSTEM - WILL BE USED BY VERIFICATION
- RELEASED AS FLOOR SYSTEM ON 4/10/78
- SELECTIVE LOGGING SUPPORTED
- ALL ENTRY RELATED MODELS ARE SUPPORTED
- CONTAINS THRUPUT ENHANCEMENTS
- AUTODOC SUPPORTED
- SYSTEM STABILITY FOR APRIL (10.46)
 - SFC 1834/1905 = 96%
 - DFC 135/155 = 87%
 - TFC 19/22 = 86%
- SYSTEM IS STABLE
- DRS
 - P1 = 2
 - P2 = 281
 - P3 = 47
 - 330

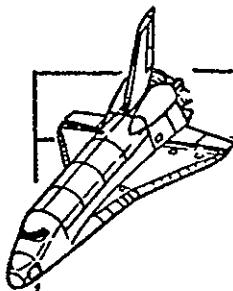
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SPACE SHUTTLE PROGRAMS

Title SDL READINESS FOR
ENTRY FACI

Date 5/9/78

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IBM

KNOWN PROBLEMS

HARDWARE

- 2701/FEID INTERFACE PROBLEM (3859 ABENDS)
 - PROBLEM IS INTERMITTENT
 - ATTEMPTS TO RE-CREATE HAVE FAILED

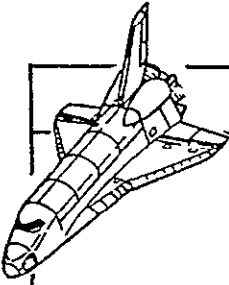
- IOPI/DEU CONTROLLER INTERFACE PROBLEM
 - SOFTWARE PATCHES TO WORKAROUND PROBLEM ARE IN PLACE
 - HARDWARE MOD IN TEST ON FEID1
 - HARDWARE MOD TO BE INSTALLED ON OTHER FEIDS WHEN FEID1 TEST COMPLETE

- BINARY CLOCK STOP PROBLEM
 - PROBLEM IS INTERMITTENT
 - ERROR TRAP PATCH IS AVAILABLE

SOFTWARE

- NO SIGNIFICANT PROBLEMS

SPACE SHUTTLE PROGRAMS



Title SDL READINESS FOR
ENTRY FACI

Date 5/9/78

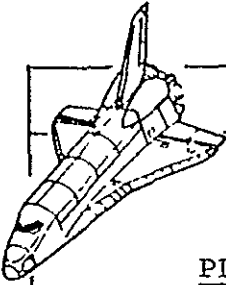
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IBM

PLANNED FUTURE CAPABILITIES FOR SDL 10.5 & 11.0

- CONTROL FUNCTIONS
 - LOGGING OF LARGER DIAGNOSTIC TABLES SUPPORTED ON 10.5
 - RESTART FROM DISK PLANNED FOR 11.0
- USER AIDS
 - GPC COMMAND CAPABILITY (SIMPLIFIES DECK SETUP)
 - PATCH YCON/ZCON PLANNED FOR 11.0
- FC/MFC SIMULATOR
 - ADDITIONAL 5 ACR SUPPORT PLANNED FOR 11.0
 - DEU CRITICAL FORMAL SUPPORT PLANNED FOR 11.0
- COMMUNICATOR
 - FLEX MDM SUPPORT PLANNED FOR 11.0
 - DYNAMIC MCIU CAPABILITY PLANNED FOR 11.0
 - HARDWARE MMU LOAD & VERIFY SUPPORT PLANNED FOR 11.0
- MATH MODELS
 - 12 ADDITIONAL CAPABILITIES SUPPORTED ON 10.5
 - 30 CAPABILITIES PLANNED FOR 11.0
- POST PROCESSOR
 - SUPPORT P.P. OF ENLARGED DIAGNOSTIC TABLES ON 10.5
 - ENTRY DOWNLIST UPGRADE SUPPORTED ON 10.5
 - SUPPORT DEU CRITICAL FORMATS ON 11.0
- DASS
 - AUTO I-LOAD (BASIC) SUPPORTED ON 10.5
 - IPL (BASIC) SUPPORTED ON 11.0

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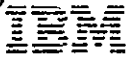


SPACE SHUTTLE PROGRAMS

Title SDL READINESS FOR
ENTRY FACI

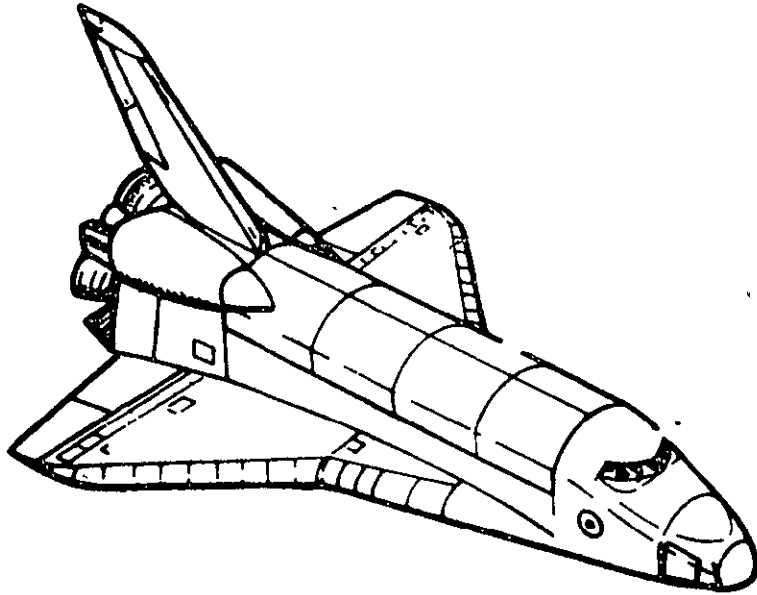
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PLANNED FUTURE DISCREPENCY FIXES FOR SDL 10.5 & 11.0

- CONTROL FUNCTIONS
 - 3 ON 10.5
 - 2 ON 11.0
- -- USER AIDS
 - 3 ON 10.5
 - 2 ON 11.0
- FC/MFC SIMULATOR
 - 5 ON 10.5
 - 6 ON 11.0
- COMMUNICATOR
 - 16 ON 10.5
 - 5 ON 11.0
- MATH MODELS
 - 24 ON 10.5
 - 25 ON 11.0
- POST PROCESSOR
 - 8 ON 10.5
- TOTALS
 - 59 DRs TO BE FIXED ON 10.5
 - 40 DRs TO BE FIXED ON 11.0



VERIFICATION ASSESSMENT

5/1 DELIVERY

space shuttle programs

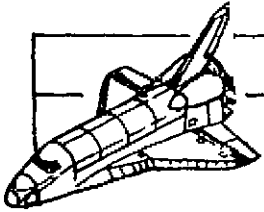


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5/9/78

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SPACE SHUTTLE PROGRAMS

Title INTRODUCTION

Date 5/9/78

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- RELEASES ADDRESSED
 - ENTRY FACI (GN3)
 - PAYLOAD BAY DOOR (SM2)
 - ORBIT CLOSED LOOP (GN2)

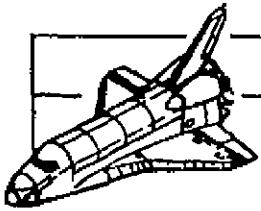
- CONTENTS
 - ASSESSMENT OF SOFTWARE QUALITY
 - VERIFICATION APPROACH
 - VERIFICATION PLANS

SPACE SHUTTLE PROGRAMS

Title ENTRY FACI - ASSESSMENT OF SOFTWARE QUALITY

Date 5/9/78

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11/11/78
11/11/78
11/11/78
11/11/78

- REVIEW DATA
 - 4/28/78 DR LIST
 - PRN RELEASE, OPS, USER NOTES
 - DEVELOPMENT TEST SUMMARY
 - EXPERIENCE WITH ECL TESTING
- SOFTWARE QUALITY IS GOOD
- NO OBVIOUS IMPEDIMENTS TO VERIFICATION TESTING

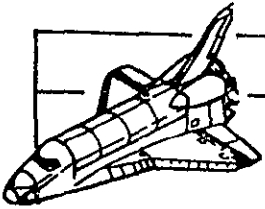
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SPACE SHUTTLE PROGRAMS

Title ENTRY FACI - VERIFICATION APPROACH

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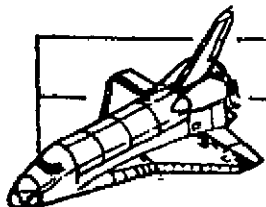


IBM

- CURRENT VERIFICATION TEST PLAN IS REDUCED WITH RESPECT TO ORIGINAL PLAN
 - CONTINUED HIGH CR ACTIVITY HAS IMPACTED PLAN
 - VERIFICATION TESTING IS REDUCED
- VERIFICATION TESTING (RUN FOR THE RECORD) WILL BEGIN IN SELECTED AREAS
 - AREAS SELECTED BASED UPON FUTURE CR TRAFFIC
 - VERIFICATION WILL BE INITIATED IN GNC DETAILED/FUNCTIONAL AREAS ONLY
 - FINAL TEST CASE CLOSURE CANNOT BE COMPLETED PRIOR TO 9/4
 - SUBSET OF TEST CASES WILL BE CLOSED WITH REGRESSION TEST OUTSTANDING
- TEST CASE VALIDATION WILL BEGIN/CONTINUE IN OTHER SELECTED AREAS
 - VALIDATION USED FOR DECK/SDL CHECKOUT
 - AREAS SELECTED BASED UPON FUTURE CR TRAFFIC
- DR CONFIGURATION CONTROL WILL BE INITIATED
 - GNC/SYSTEM SERVICES ARE ONLY AFFECTED AREAS
 - FINAL DR CLOSURE REQUIRES VERIFICATION APPROVAL

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SPACE SHUTTLE PROGRAMS



Title ENTRY FACI - VERIFICATION PLANS

Date 5/9/78

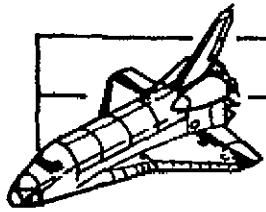
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VERIFICATION TESTING INITIATED 5/1 - 9/4

FUNCTIONAL AREA	TOTAL # OF CASES FINAL ENTRY CONFIGURATION	TOTAL # OF CASES INITIATED 5/1 - 9/4	DOCUMENTATION STATUS 5/1 - 9/4 CASES	
			SPEC	PROC
ENTRY FC	31	14	complete	complete
TRANS FC	20	13	partial	partial
SWITCH RM	3	3	complete	complete
NAVIGATION	30	24	complete	complete
NAVAIDS	40	3	complete	partial
IMU	11	4	complete	complete
RM	14	10	complete	partial
DED. DISP.	17	2	complete	complete
ENTRY GUIDANCE	12	11	complete	complete
TAEM GUIDANCE	9	9	complete	complete
A/L GUIDANCE	10	10	complete	complete
CRT	22	7	complete	complete
DEORBIT GUIDANCE	14	0	N/A	N/A
FC SOPS/RM	20	0	N/A	N/A
SEQUENCING	14	0	N/A	N/A
TOTALS	267	110		

SPACE SHUTTLE PROGRAMS



Title PAYLOAD BAY DOOR

Date 5/9/78

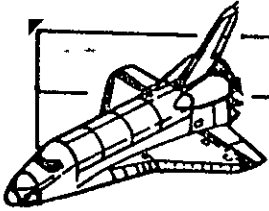
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IBM

- ASSESSMENT OF SOFTWARE QUALITY
 - REVIEW DATA
 - 4/28/78 DR LIST
 - PRN RELEASE, OPS, USER NOTES
 - DEVELOPMENT TEST SUMMARY
 - SOFTWARE QUALITY IS GOOD

- VERIFICATION APPROACH
 - VALIDATE ALL PBD TEST CASES
 - FUTURE CR TRAFFIC LOW

- VERIFICATION PLAN
 - ALL PBD DOCUMENTATION COMPLETE
 - 6 TEST CASES PLANNED FOR VALIDATION



SPACE SHUTTLE PROGRAMS

Title ORBIT CLOSED LOOP

Date 5/9/78

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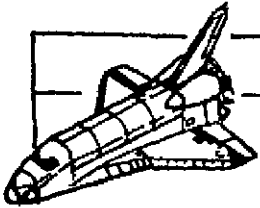
IBM

- ASSESSMENT OF SOFTWARE QUALITY
 - REVIEW DATA
 - DEVELOPMENT TEST SUMMARY
 - DESIGN/CODE REVIEW
 - SOFTWARE LACKS SUFFICIENT MATURITY TO DO MEANINGFUL CASE VALIDATION

- VERIFICATION APPROACH
 - LIMITED CASE VALIDATION TO INSURE SDL INTERFACES
 - PLACE ACTIVITY ON LOW PRIORITY

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SPACE SHUTTLE PROGRAMS



Title SUMMARY

Date 5/9/78

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- REDUCED ENTRY VERIFICATION PLAN WILL BE INITIATED FOR 5/1 DELIVERY
 - PLAN REDUCED DUE TO FUTURE CR IMPLEMENTATION
 - SOFTWARE QUALITY IS GOOD
 - DETAILED VERIFICATION PLAN HAS BEEN DEVELOPED

- PBD TEST CASE VALIDATION PLAN WILL BE INITIATED FOR 5/1 DELIVERY

- OCL TEST CASE VALIDATION PLAN WILL BE LIMITED FOR 5/1 DELIVERY

- SDL IS READY TO SUPPORT VERIFICATION ACTIVITIES