

FLIGHT DATA FILE

Flight Plan

STS-51

BRANCH CHIEF
B. NUTE
DH41
BOND

(FRR Cycle Trajectory)

Mission Operations Directorate Operations Division

Final June 10, 1993

EVENT	CDT		
Launch	08:20	Thur	July 15
ACTS/TOS Deploy	04:18	Thur	July 15
ORFEUS/SPAS Deploy	10:05	Fri	July 16
ORFEUS/SPAS Retrieve	08:10	Thur	July 22
KSC Landing	06:19	Sat	July 24



National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



STS-51 FLIGHT PLAN

FINAL (June 10, 1993)

PCN-1 (June 25, 1993) Sheet 1 of 1

List of Implemented Change Requests (482s):

FLT PLN-1476	FLT PLN-1500A	FLT PLN-1512
FLT PLN-1492	FLT PLN-1501A	
FLT PLN-1495	FLT PLN-1502	
FLT PLN-1496A	FLT PLN-1503	
FLT PLN-1498	MULTI-864	
FLT PLN-1499	MULTI-867	

Incorporate the following:

1. Replace iii thru vi
2. Replace 1-3 & 1-4
3. Replace Section 2 (2-1 thru 2-20)
4. Replace 3-3 thru 3-14, 3-17 thru 3-20, 3-23 thru 3-52
5. Replace 4-13 & 4-14
6. Replace 5-5 & 5-6
7. Replace 6-3 & 6-4, 6-11 & 6-12

BRANCH CHIEF
B. NUTE
DH41
BOND

Prepared by:

Mark Vondy
Book Manager

Approved by:

Ben E Ferguson
Head, Flight Planning and
Operations Section

Robert H Nutt
Chief, Flight Activity Branch

Encl: 80 pages



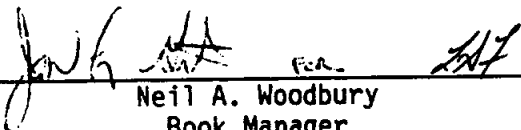
File this PCN immediately behind the front cover as a permanent record

MISSION OPERATIONS DIRECTORATE

STS-51 FLIGHT PLAN

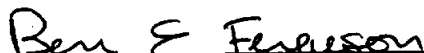
FINAL
June 10, 1993

PREPARED BY:




Neil A. Woodbury
Book Manager

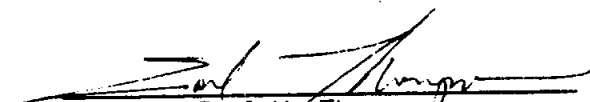
APPROVED BY:



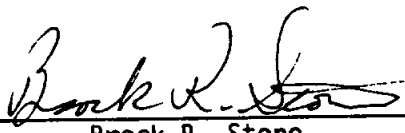
Ben E. Ferguson
Head, Flight Planning and
Operatios Section



Robert H. Nute
Chief, Flight Activity Branch



Earl W. Thompson
Chief, Operations Division



Brock R. Stone
Assistant Director for
Space Shuttle Program

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Incorporates the following:

482#:	FLT PLN-1456	FLT PLN-1482
	FLT PLN-1483	FLT PLN-1484
	FLT PLN-1457	FLT PLN-1485A
	FLT PLN-1458	FLT PLN-1486
	FLT PLN-1464	FLT PLN-1487
	FLT PLN-1466B	FLT PLN-1488
	FLT PLN-1467	FLT PLN-1489
	FLT PLN-1468	FLT PLN-1490
	FLT PLN-1469	MULTI-825
	FLT PLN-1471	MULTI-834
	FLT PLN-1473	MULTI-848A
	FLT PLN-1474	MULTI-849B
	FLT PLN-1475	MULTI-852
	FLT PLN-1478	MULTI-855A
	FLT PLN-1479	MULTI-856
	FLT PLN-1480	MULTI-859A
	FLT PLN-1481	MULTI-861

EXEMPTION: #56

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager/Lead FAO	DH4/N. Woodbury	244-7714
Timelines	DH4/J. Giles	244-7747
Pointing	DH4/L. Friedl	244-7754

FLIGHT PLAN
STS-51

LIST OF EFFECTIVE PAGES

FINAL 06/10/93
PCN-1 06/25/93

Sign Off.....*	51/FIN	3-25.....	51/FIN 1
ii.....*	51/FIN	3-26.....	51/FIN 1
iii.....*	51/FIN 1	3-27.....	51/FIN 1
iv.....*	51/FIN 1	3-28.....	51/FIN
v.....*	51/FIN 1	3-29.....	51/FIN 1
vi.....*	51/FIN	3-30.....	51/FIN 1
vii.....	51/FIN	3-31.....	51/FIN 1
viii.....	51/FIN	3-32.....	51/FIN 1
ix.....	51/FIN	3-33.....	51/FIN 1
x.....	51/FIN	3-34.....	51/FIN
1-1.....	51/FIN	3-35.....	51/FIN
1-2.....	51/FIN	3-36.....	51/FIN 1
1-3.....	51/FIN 1	3-37.....	51/FIN 1
1-4.....	51/FIN 1	3-38.....	51/FIN 1
2-1.....	51/FIN	3-39.....	51/FIN 1
2-2.....	51/FIN 1	3-40.....	51/FIN
2-3.....	51/FIN 1	3-41.....	51/FIN 1
2-4.....	51/FIN 1	3-42.....	51/FIN 1
2-5.....	51/FIN 1	3-43.....	51/FIN
2-6.....	51/FIN 1	3-44.....	51/FIN 1
2-7.....	51/FIN 1	3-45.....	51/FIN 1
2-8.....	51/FIN 1	3-46.....	51/FIN
2-9.....	51/FIN 1	3-47.....	51/FIN 1
2-10.....	51/FIN 1	3-48.....	51/FIN 1
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2-17.....	51/FIN 1	4-1.....	51/FIN
2-18.....	51/FIN 1	4-2.....	51/FIN
2-19.....	51/FIN 1	4-3.....	51/FIN
2-20.....	51/FIN	4-4.....	51/FIN
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3-23.....	51/FIN	6-3.....*	51/FIN 1
3-24.....	51/FIN 1	6-4.....*	51/FIN

(*) - Omit from flight book

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7-10.....* 51/FIN

STS-51 FLIGHT PLAN CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card Code</u>
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DAP A1.....	6-6	FLT PLN-2b/51/0/A
A1.....	6-6	FLT PLN-3a/51/0/A
DAP A2.....	6-7	FLT PLN-3b/51/0/A
A2.....	6-7	FLT PLN-4a/51/0/A
DAP A3.....	6-7	FLT PLN-4b/51/0/A
A3.....	6-7	FLT PLN-5a/51/0/A
DAP A4.....	6-8	FLT PLN-5b/51/0/A
A4.....	6-8	FLT PLN-6a/51/0/A
DAP A5.....	6-8	FLT PLN-6b/51/0/A
A5.....	6-8	FLT PLN-7a/51/0/A
DAP A6.....	6-9	FLT PLN-7b/51/0/A
A6.....	6-9	FLT PLN-8a/51/0/A
DAP A7.....	6-9	FLT PLN-8b/51/0/A
A7.....	6-9	FLT PLN-9a/51/0/A
DAP A8.....	6-10	FLT PLN-9b/51/0/A
A8.....	6-10	FLT PLN-10a/51/0/A
DAP A9.....	6-10	FLT PLN-10b/51/0/A
A9.....	6-10	FLT PLN-11a/51/0/A
DAP A11.....	6-11	FLT PLN-11b/51/0/A
A11.....	6-11	FLT PLN-12a/51/0/B
DAP A19.....	6-11	FLT PLN-12b/51/0/A
A19.....	6-11	FLT PLN-13a/51/0/A
(Blank).....	6-12	FLT PLN-13b/51/0/A
DAP B.....	6-12	FLT PLN-14a/51/0/A
DAP B1.....	6-12	FLT PLN-14b/51/0/A
B1.....	6-12	FLT PLN-15a/51/0/B
DAP B2.....	6-13	FLT PLN-15b/51/0/A
B2.....	6-13	FLT PLN-16a/51/0/A
DAP B3.....	6-13	FLT PLN-16b/51/0/A
B3.....	6-13	FLT PLN-17a/51/0/A
DAP B4.....	6-14	FLT PLN-17b/51/0/A
B4.....	6-14	FLT PLN-18a/51/0/A
DAP B5.....	6-14	FLT PLN-18b/51/0/A
B5.....	6-14	FLT PLN-19a/51/0/A
DAP B6.....	6-15	FLT PLN-19b/51/0/A
B6.....	6-15	FLT PLN-20a/51/0/A
DAP B7.....	6-15	FLT PLN-20b/51/0/A
B7.....	6-15	FLT PLN-21a/51/0/A
DAP B8.....	6-16	FLT PLN-21b/51/0/A
B8.....	6-16	FLT PLN-22a/51/0/A
DAP B11.....	6-16	FLT PLN-22b/51/0/A
B11.....	6-16	FLT PLN-23a/51/0/B
DAP B12.....	6-17	FLT PLN-23b/51/0/B
B12.....	6-17	FLT PLN-24a/51/0/B
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ALT1.....	6-18	FLT PLN-27a/51/0/A
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ALT2.....	6-19	FLT PLN-28a/51/0/A
DAP ALT3.....	6-19	FLT PLN-28b/51/0/A

STS-51 FLIGHT PLAN CUE CARDS (Cont)

ALT3.....	6-19	FLT PLN-29a/51/0/B
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**DELAY: ORFEUS/SPAS CAPTURE.....	6-20	FLT PLN-30a/51/0/B
**DELAY: RICS FILMING.....	6-20	FLT PLN-30b/51/0/B
UNIV PTG.....	6-21	FLT PLN-31a/51/0/A
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<u>CONTENTS</u>	<u>PAGE</u>
INTRODUCTION.....	ix
STS-51 OVERVIEW.....	1-1
SUMMARY TIMELINE.....	2-1
DETAILED TIMELINE.....	3-1
FD1.....	3-2
FD2.....	3-6
FD3.....	3-12
FD4.....	3-18
FD5.....	3-24
FD6.....	3-29
FD7.....	3-35
FD8.....	3-41
FD9.....	3-47
FD10.....	3-53
CONTINGENCY TIMELINES.....	4-1
FD2 ACTS/TOS - FD3 ORFEUS/SPAS TIMELINE.....	4-2
MINIMUM DURATION FLIGHT (MDF) TIMELINE.....	4-9
10-DAY OVERVIEW.....	4-11
ATTITUDE TIMELINE.....	5-1
STS-51 DAP BOOK.....	6-1
STS-51 FLIGHT PLAN NOTES.....	7-1

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INTRODUCTION

The STS-51 Flight Plan is the Flight Data File article that contains the on-orbit timeline. It does not contain the detailed timelines that are covered in the Ascent, Post Insertion, Deploy, Rendezvous, Deorbit Prep, and Entry Checklists. The detailed ACTS/TOS deploy procedures required during the deploy timeframe are in the TOS Deploy Checklist. The detailed ORFEUS/SPAS Deploy, Rendezvous, and Retrieval procedures are located in the Rendezvous Checklist. For continuity, the entire flight is shown in the summary level timeline.

This on-orbit timeline satisfies the objectives specified in the Flight Definition and Requirements Directive and the requirements of the STS-51 Flight Requirements Document.

The flight profile used for this Flight Plan is for a launch date of July 15, 1993, at 8:20 CDT. Orbiter inertial attitudes are expressed relative to a Mean of 1950 (M50) reference frame.

The trajectory used for this document is a propagated trajectory from state vectors from the FRR Cycle.

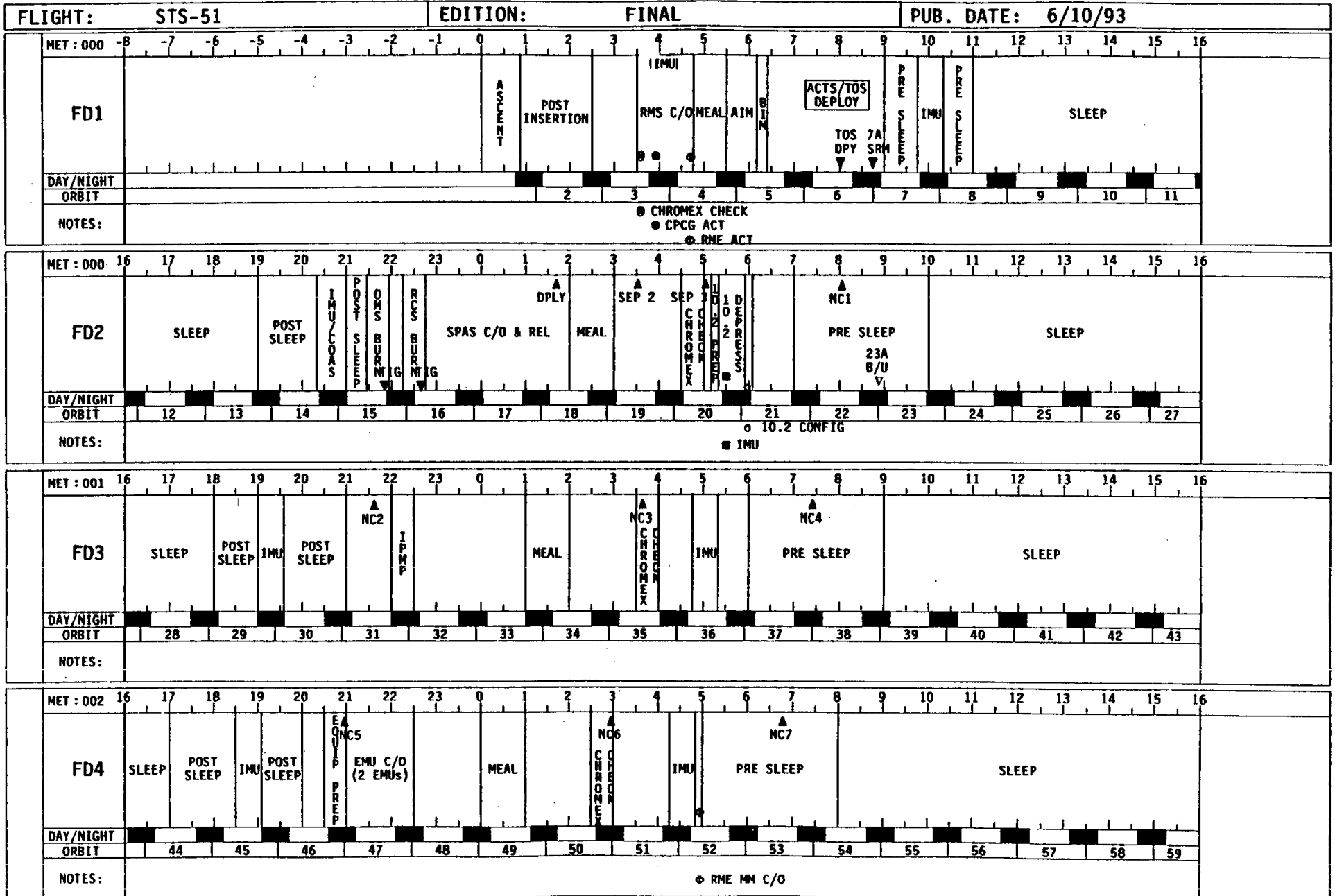
JSC-22359, Crew Scheduling Constraints (Appendix K, CPMP), Basic, Rev B, January 1992, has been used to build the timelines contained in this Flight Plan. Exemption #51 allows DSO 622 activities during the post-sleep timeframe. Exemption #52 allows DSO 603B and 604 activities during the post-sleep timeframe on entry day. Exemption #56 allows for possible encroachment on FDI pre-sleep due to RMS activities associated with the monitoring of the TOS SRM burn.

The timeline formats used in this Flight Plan are based on JSC-19933, Timeline Format Definitions and Standard Notes, Rev C, May 1990.

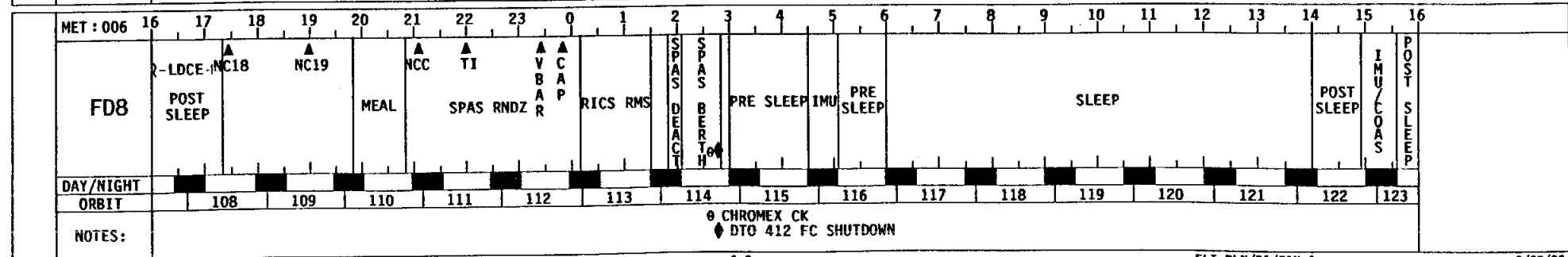
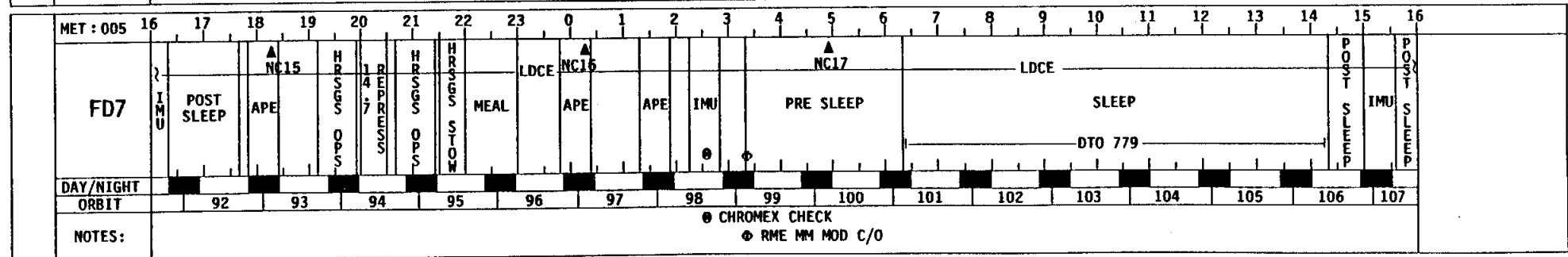
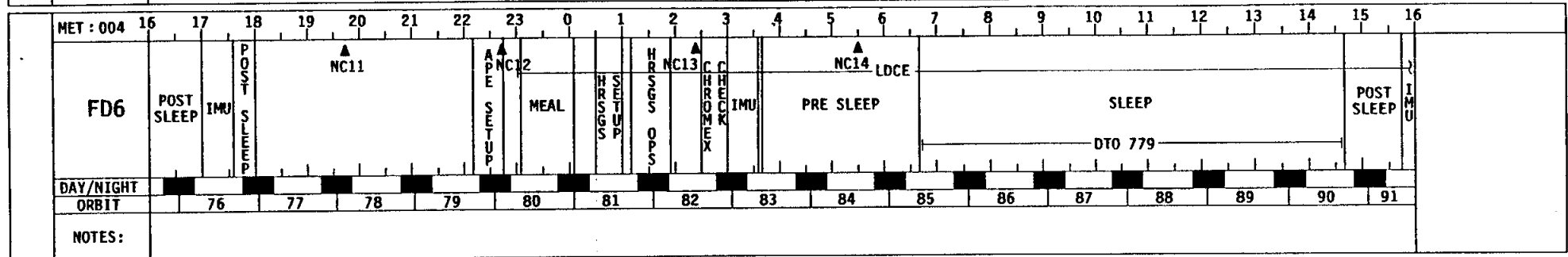
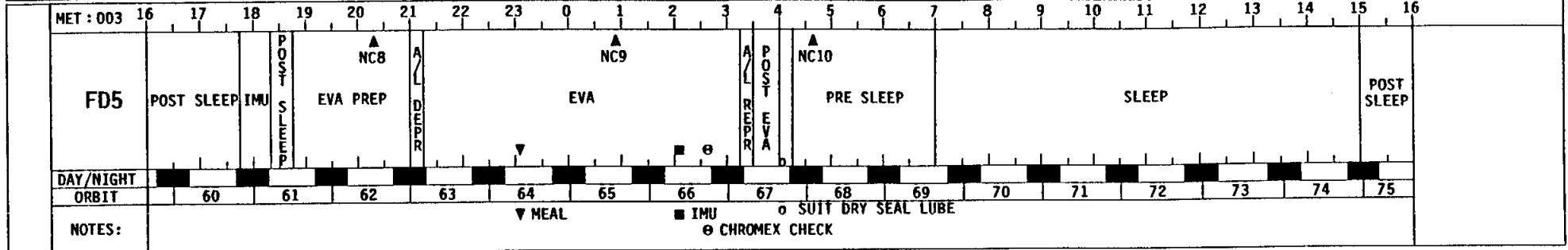
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STS-51 OVERVIEW

OVERVIEW



FLIGHT: STS-51 EDITION: FINAL, PCN-1 PUB. DATE: 6/25/93



MET : 007	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
FD9	POST SLEEP	POST SLEEP	POST SLEEP PREP EVA	FCS C/O	HOT FIRE	AMORPHICS	MEAL	WPC WPC	CHECK XFR	CABIN STOW	PRE SLEEP	IMU	PRE SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	POST SLEEP	IMU
DAY/NIGHT	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
ORBIT	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139								
NOTES:	♦ DTO 412 FC RESTART																								

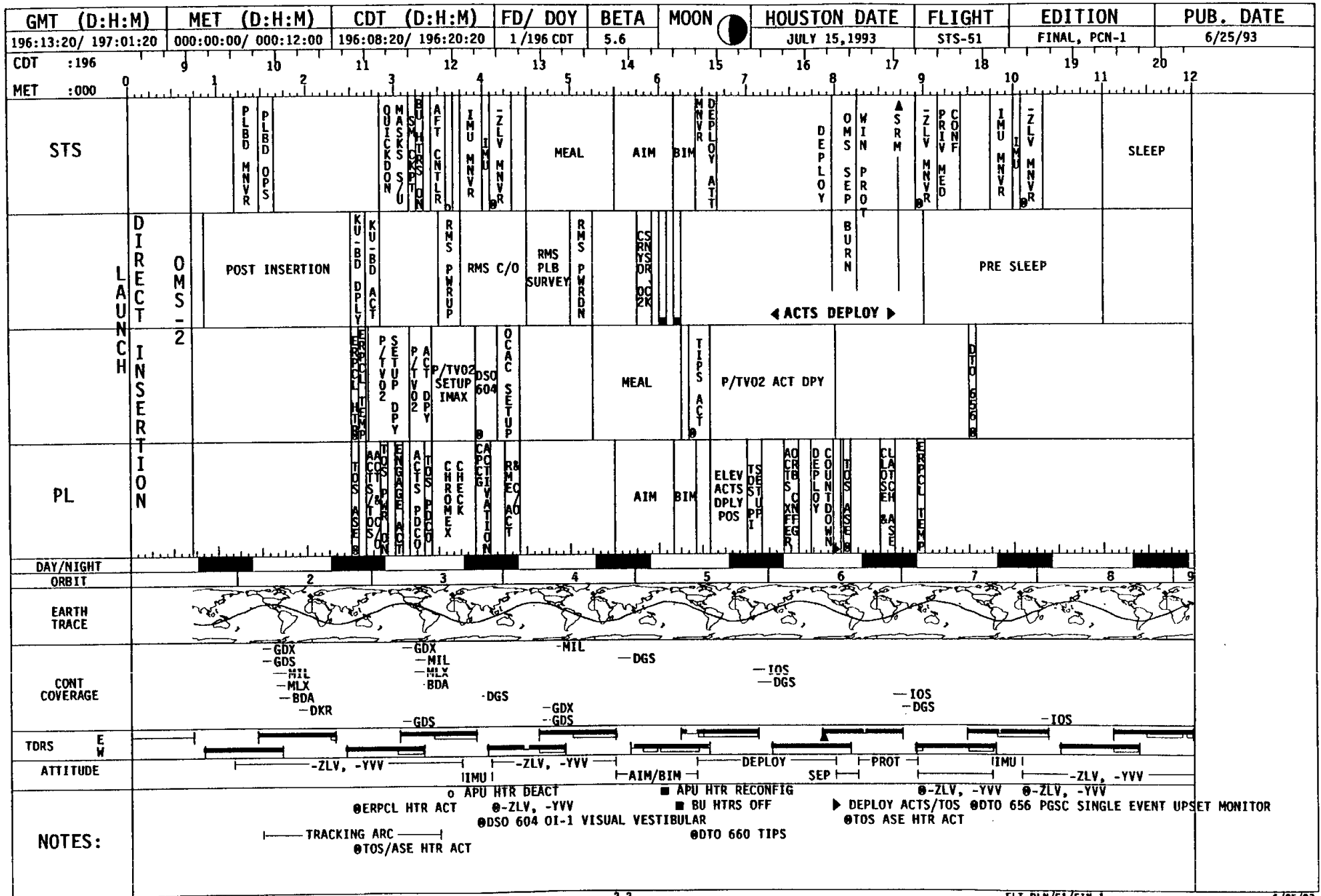
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FD10	POST SLEEP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP	DEORBIT PREP
DAY/NIGHT	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
ORBIT	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154									
NOTES:	KSC LANDING 8/21:59																								


MET : 009	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
FD																									
DAY/NIGHT	█	█	█	█	█	█	█	█	█																
ORBIT	155	156	157	158	159	160																			
NOTES:																									

MET : 010	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
FD																									
DAY/NIGHT																									
ORBIT																									
NOTES:																									

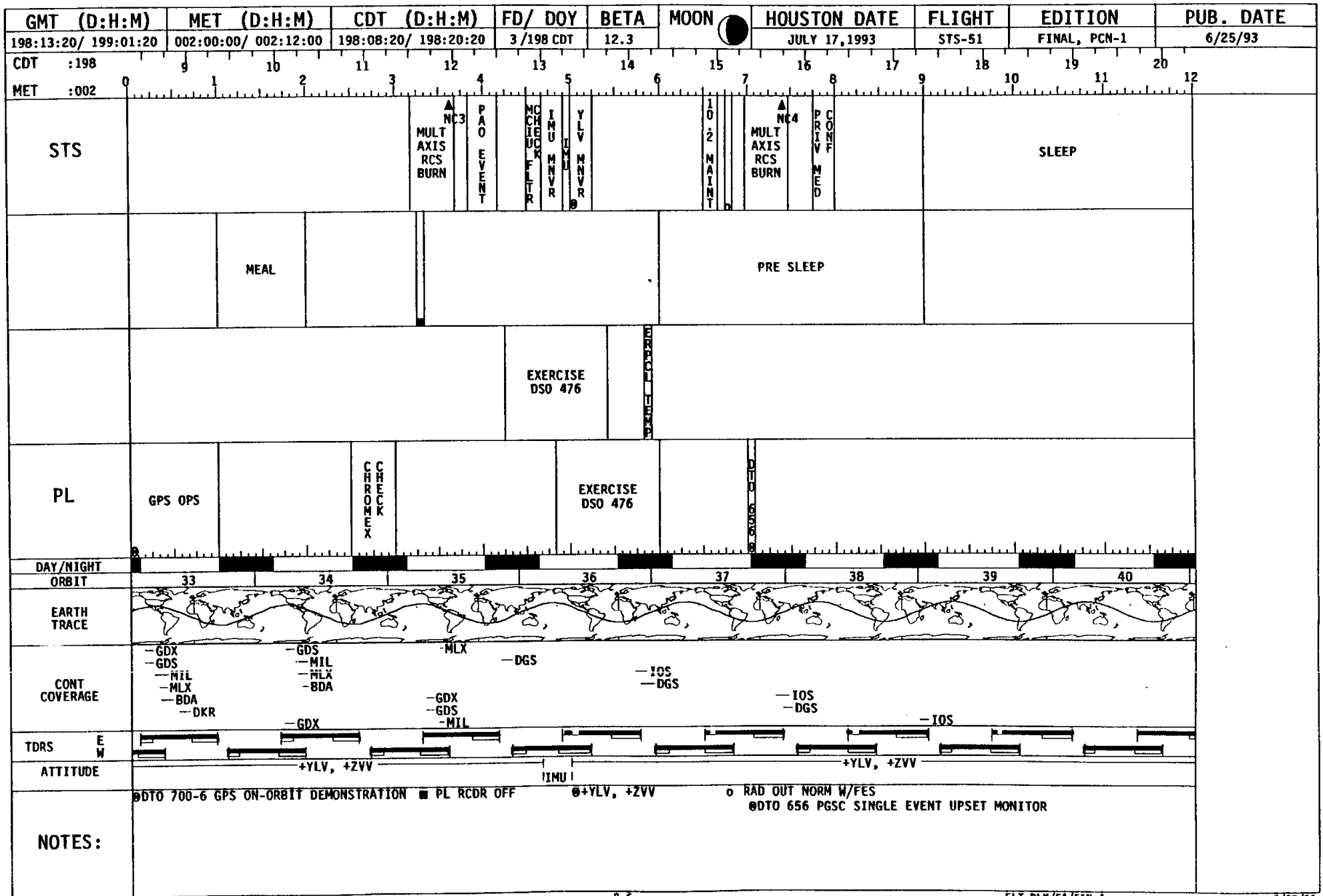
SUMMARY TIMELINE

SUMMARY TIMELINE

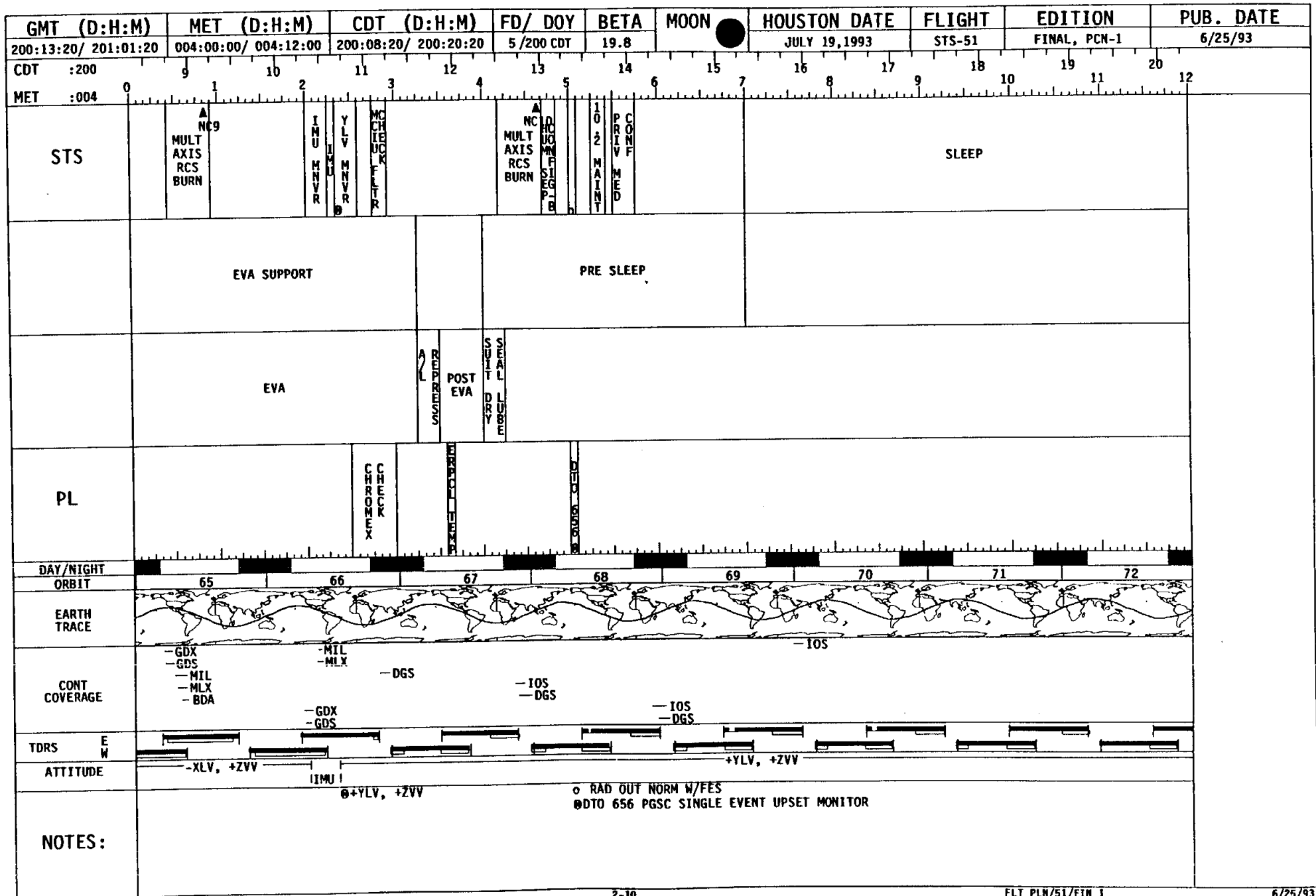


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197:01:20/ 197:13:20	000:12:00/ 001:00:00	196:20:20/ 197:08:20	2/196 CDT	7.2		JULY 15, 1993	STS-51	FINAL, PCN-1	6/25/93														
CDT :196	21	22	23	0	CDT:197	1	2	3	4	5	6	7	8	0	MET:001								
MET :000	12	13	14	15	16	17	18	19	20	21	22	23											
STS	SLEEP										IMU/COAS	MNRV	ZLV	MNRV	OMS BURNE	HIT	CIRC	ZLV	MNRV	MNRV	GYRO COMP		
	POST SLEEP										GRAPPLE												
											BCDA	RM	MS	P/TVO3	SETUP	ORF	ACT	PROC 2	PROC 3	PROC 1	BCDA	RM	MS
PL											ACT	SETUP	ORF	TCS	SETUP	SPAS	ACT	SPAS	ACT	SPAS	ACT	SPAS	ACT
DAY/NIGHT	ORBIT										EARTH TRACE												
CONT COVERAGE	-DKR										-DKR												
TORS	E										W												
ATTITUDE	-ZLV, -YVV										-ZLV, -YVV												
NOTES:											@DSO 476 AEROBICS @AFT STATION @-ZLV, +YVV @-ZLV, -YVV @DTO 700-5 TCS @DTO 656 PGSC SINGLE EVENT UPSET MONITOR @RMS HTR ACT @DTO 668 ADV. LOWER BODY RESTRAINT TEST												

GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE							
197:13:20/ 198:01:20	001:00:00/ 001:12:00	197:08:20/ 197:20:20	2/197 CDT	8.8		JULY 16, 1993	STS-51	FINAL, PCN-1	6/25/93							
CDT :197	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
MET :001	0	1	2	3	4	5	6	7	8	9	10	11	12			
STS	GYRO MNVRS	MRA NET VLT REASE	REL MNVR	RMS PWRDR	MULT AXIS RCS BURN	SEP21 TRK MNVR	MULT AXIS RCS BURN	IMU MNVR	YLV MNVR	PGSR DOWN	CONF MED	MULT AXIS RCS BURN	102 MAINT	SLEEP		
		RMS MNVR	MEAL		SETUP	10.2 DEPRESS							PRE SLEEP			
	PROC3	PROC 4 GPS R3		EXERCISE DSO 476		EXERCISE DSO 476										
PL	EMU TV			DTO 700-6 SETUP	CHROMEX	EMU TV	DSO 604	DTO 700-7 SETUP								
DAY/NIGHT ORBIT																
EARTH TRACE																
CONT COVERAGE	-GDX -GDS -MIL -BDA -MLX -DKR	-GDS -MIL -MLX -BDA	-MLX		-DGS	-GDX -GDS		-IOS -DGS								
TDRS																
ATTITUDE	DEPLOY GYRO	TGT TRK	RICS	TGT TRK	IMU			+YLV, +ZVV								
NOTES:	<p>o SPAS DOOR TEST o MNVR TO DEPLOY ▶ SPEE DEADFACE</p> <p>o +YLV, +ZVV @ DTO 700-5 TCS o RAD OUT NORM W/FES</p> <p>o DTO 700-6 GPS ON-ORBIT DEMONSTRATION o DSO 604 OI-3 VISUAL VESTIBULAR o DTO 700-7 GPS & PLB RNDZ LASER DATA COMPARISON</p> <p>o DTO 656 PGSC SINGLE EVENT UPSET MONITOR</p>															



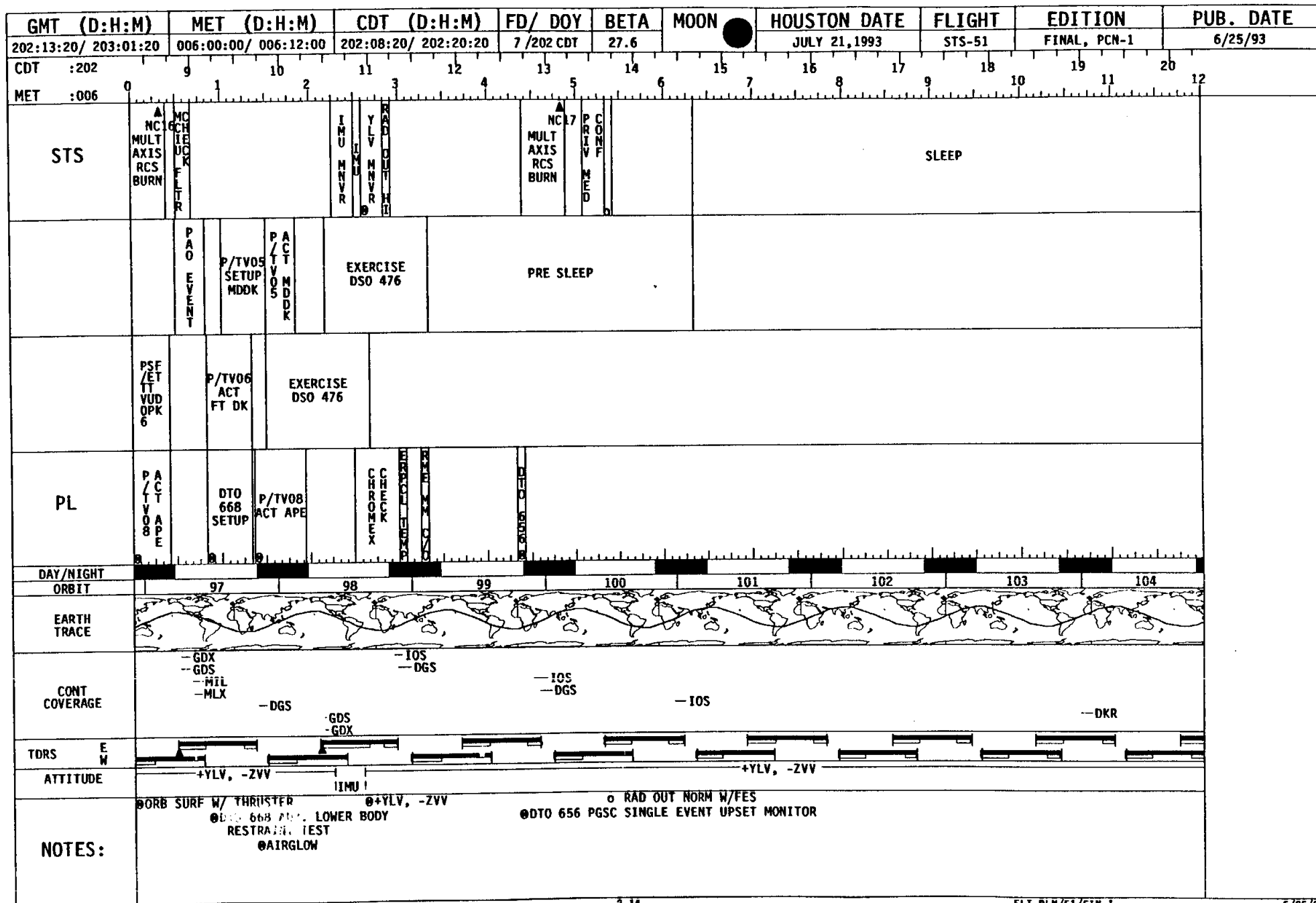
GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE
199:13:20/ 200:01:20	003:00:00/ 003:12:00	199:08:20/ 199:20:20	4 /199 CDT	16.0	☉	JULY 18, 1993	STS-51	FINAL, PCN-1	6/25/93
CDT :199	0 1 2 3 4 5 6 7 8 9 10 11 12								
MET :003	0 1 2 3 4 5 6 7 8 9 10 11 12								
STS	MEAL		MIDDECK PREP		EXERCISE DSO 476		PRE SLEEP		SLEEP
PL			EXERCISE DSO 476						
DAY/NIGHT ORBIT	49 50 51 52 53 54 55 56								
EARTH TRACE									
CONT COVERAGE	<ul style="list-style-type: none"> - GDX - GDS - MIL - MLX - BDA - DKR 								
TDRS	<ul style="list-style-type: none"> - GDX - GDS - DGS - GDX - GDS - DGS - IOS - DGS - IOS - DGS - IOS - DGS 								
ATTITUDE	<ul style="list-style-type: none"> +YLV, +ZVV IIMU I +YLV, +ZVV +YLV, +ZVV 								
NOTES:	<ul style="list-style-type: none"> o CABIN TEMP CNTL RECONFIG o +YLV, +ZVV o RAD OUT NORM W/FES o DTO 656 PGSC SINGLE EVENT UPSET MONITOR 								



GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE
201:01:20/ 201:13:20	004:12:00/ 005:00:00	200:20:20/ 201:08:20	6/200 CDT	21.8	●	JULY 19, 1993	STS-51	FINAL, PCN-1	6/25/93
CDT :200									
MET :004									MET:005
STS	SLEEP								
PL									
DAY/NIGHT									
ORBIT									
EARTH TRACE									
CONT COVERAGE									
TDRS									
ATTITUDE									
NOTES:									

GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE			
201:13:20 / 202:01:20	005:00:00 / 005:12:00	201:08:20 / 201:20:20	6 / 201 CDT	23.7	●	JULY 20, 1993	STS-51	FINAL, PCN-1	6/25/93			
CDT :201	MET :005											
STS	CHIEF UC K PL	HC UN FT SI EG - B	PA O E V E N T	MULT AXIS RCS BURN	NC13	IMU MNV R	YLV MNV R	CON F P R I V M E D	10:2 M A I N T	MULT AXIS RCS BURN	NC14	SLEEP
						FILTER CLEANING						PRE SLEEP
PL	P/TVO5 SETUP MDDK	HRSGS SETUP	HRSGS OPS			CH R O M E X						
DAY/NIGHT												
ORBIT												
EARTH TRACE												
CONT COVERAGE	-GDX -GDS -MLL -MLX											
TDRS												
ATTITUDE												
NOTES:												

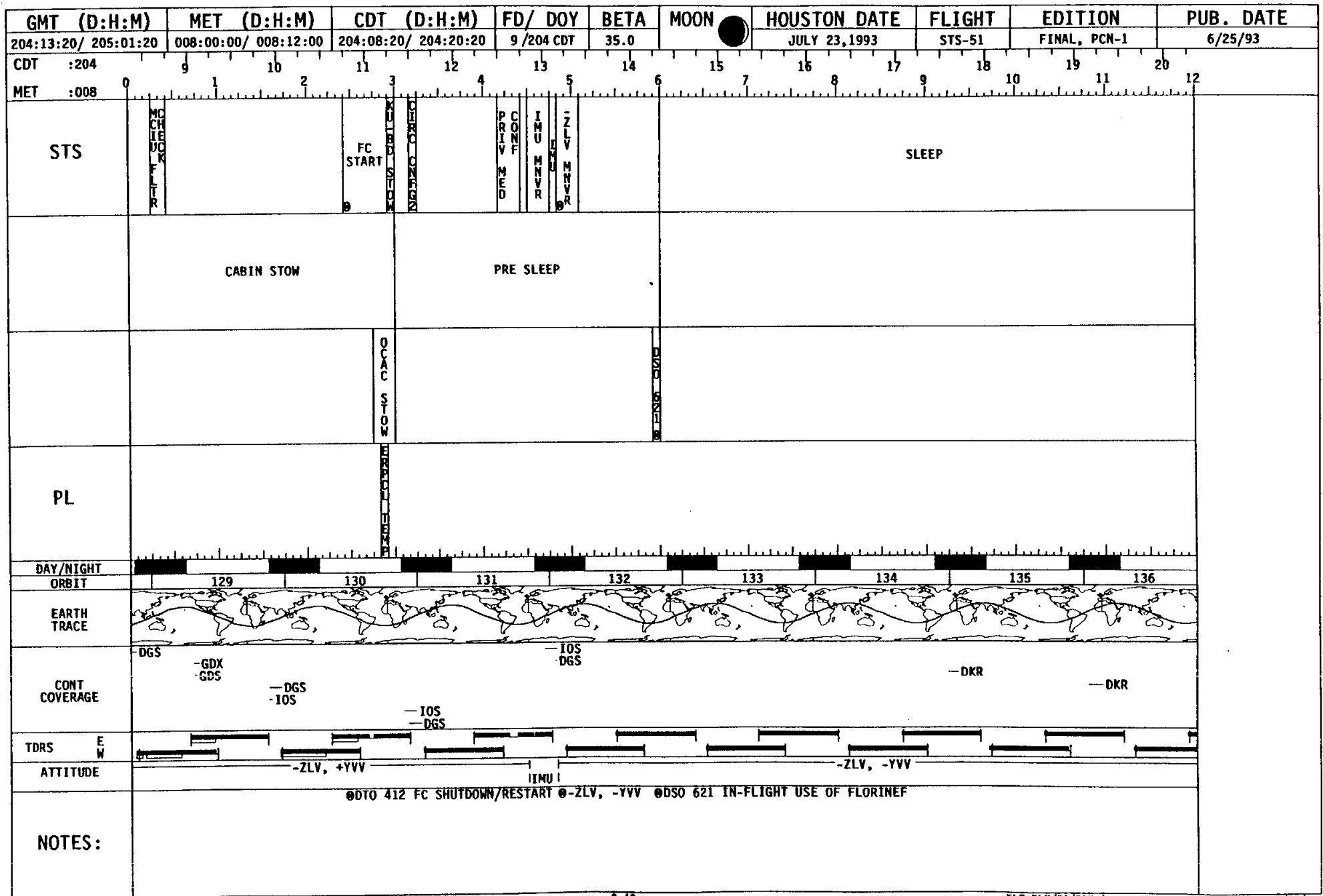
GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE
202:01:20/ 202:13:20	005:12:00/ 006:00:00	201:20:20/ 202:08:20	7/201 CDT	25.6	●	JULY 20, 1993	STS-51	FINAL, PCN-1	6/25/93
CDT :201			CDT:202						
MET :005									MET:006
STS	SLEEP								
PL									
DAY/NIGHT									
ORBIT	89	90	91	92	93	94	95	96	
EARTH TRACE									
CONT COVERAGE	-DKR	-DKR	-DKR -DGS	-DKR -IOS -DGS	-IOS -DGS	-MLX -MIL -BDA -DKR -IOS	-GDX -GDS -MIL -BDA -MLX -DKR	-GDS -MIL -MLX -BDA	
TDRS									
ATTITUDE	+YLV, -ZVV								
NOTES:	<p> @+YLV, -ZVV @DSO 476 AEROBICS @DTO 656 PGSC SINGLE EVENT UPSET MONITOR @ORB SURF W/ THRUSTER @ORB SURF W/O THRUSTER @DTO 660 TIPS HRS GS TEMP STOW SIMO DUMP MULT AXIS RCS BURN P/TV06 SETUP FT DK @+YLV, -ZVV @ORB SURF W/THRUSTER </p>								



GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE						
203:01:20 / 203:13:20	006:12:00 / 007:00:00	202:20:20 / 203:08:20	8 / 202 CDT	29.5	☉	JULY 21, 1993	STS-51	FINAL, PCN-1	6/25/93						
CDT :202	21	22	23	0	CDT:203	1	2	3	4	5	6	7	8	0	MET:007
MET :006	12	13	14	15	16	17	18	19	20	21	22	23	0		
STS	SLEEP														
PL															
DAY/NIGHT															
ORBIT	105	106	107	108	109	110	111	112							
EARTH TRACE															
CONT COVERAGE	-DKR	-DKR	-BDA -DKR	-MLX -BDA -DKR	-IO5 -DGS	-MIL	-MLX	-BDA -DKR	-IO5 -DGS	-GDX -GDS -MIL	-DKR	-BDA -DKR	-GDX -GDS -MIL -MLX -BDA		
TDRS															
ATTITUDE	+YLV, -ZVV IMU +YLV, -ZVV RCS +YLV, -ZVV RCS TGT TRK														
NOTES:	◎DSO 476 AEROBICS ◎STEP 1 ◎RMS HTR ACT ◎RAD OUT NRM/NO FES ◎+YLV, -ZVV ◎DTO 656 PGSC SINGLE EVENT UPSET MONITOR ◎DTO 700-5 TCS ◎DTO 668 ADV. LOWER BODY RESTRAINT TEST ◎MNVR TO PRECRADLE ◎MNVR TO CAPTURE														

GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE					
203:13:20/ 204:01:20	007:00:00/ 007:12:00	203:08:20/ 203:20:20	8/203 CDT	31.4		JULY 22, 1993	STS-51	FINAL, PCN-1	6/25/93					
CDT :203														
MET :007	0	1	2	3	4	5	6	7	8	9	10	11	12	
STS	TRK MNVR	PAO EVENT	LOAD APCHU HEAD	ZLV MNVR ORBIT C.C. HUTTDOWN	PRIV MED	CON F							SLEEP	
		RICS PHOTO SEQ	SPAS DEACT	SPAS BERTH		PRE SLEEP								
		P/TV04 ACT RETR		RMS P ZLV ORBIT HUTTDOWN	ORBIT HUTTDOWN	ORBIT HUTTDOWN								
PL	EMU TV OFF TV SHUTDN		EMU TV OFF BTVS TO CACT	CHROME X										
DAY/NIGHT														
ORBIT	113	114	115	116	117	118	119	120						
EARTH TRACE														
CONT COVERAGE	-GDX -GDS -MIL -MLX		-DGS			-IOS -DGS		-IOS					-DKR	
TDRS	E W													
ATTITUDE	SOLAR TRK -ZLV, +YVV IMU -ZLV, -YVV													
NOTES:	@DTO 700-5 TCS @-ZLV, +YVV @DTO 412 FC SHUTDOWN/RESTART @-ZLV, -YVV @DS0 621 IN-FLIGHT USE OF FLORINEF @DTO 656 PGSC SINGLE EVENT UPSET MONITOR													

GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE						
204:01:20/ 204:13:20	007:12:00/ 008:00:00	203:20:20/ 204:08:20	9/203 CDT	33.2	☉	JULY 22, 1993	STS-51	FINAL, PCN-1	6/25/93						
CDT :203	21	22	23	0	CDT:204	1	2	3	4	5	6	7	8	0	MET:008
MET :007	12	13	14	15	16	17	18	19	20	21	TIG	22	23		
STS	SLEEP			IMU MNRV HUD MNRV ZLV MNRV WASTE INIT DUMP		MDA SHTP	FCS C/O	RCS HOT FIRE	ADD TV CK P/TVO9	TRK MNRV AMOS RCS	ZLV MNRV	CREW CONF			
			POST SLEEP				POST EVA ENT PREP		P/TVO9 SETUP CONF		MEAL	PACTV09		FILTER CLEANING	
									DTO 668 PLB SURVEY						STOW METER
PL				PADM SETUP			P/TVO7 IMAX RELOAD		DSO 604		P/TVO8 SETUP APE		APE STOW	CHECK	
DAY/NIGHT	[Day/Night Cycle]														
ORBIT	121 122 123 124 125 126 127 128														
EARTH TRACE	[Earth Trace Map]														
CONT COVERAGE	-DKR -DGR -DGS -MIL -MLX -BDA -DKR -IOS -DGS -MLX -MIL -BDA -DKR -IOS -DGS -GDS -GDX -MIL -MLX -BDA -DKR -GDS -GDX -MIL -MLX -MIL -MLX -BDA -DKR -GDS -GDX														
TDRS	[TDRS Coverage]														
ATTITUDE	-ZLV, -YVV (HUD) (IMU) -ZLV, +YVV (FAMOS) -ZLV, +YVV														
NOTES:	◎ DSO 476 AEROBICS ◎ -ZLV, +YVV ■ APU HTR ACT ○ APU HTR RECONFIG ◎ DTO 656 PGSC SINGLE EVENT UPSET MONITOR ◎ DSO 604 OI-3 VISUAL VESTIBULAR ◎ -ZLV, +YVV ◎ RMS HTR ACT ◎ DSO 621 IN-FLIGHT USE OF FLORINEF ◎ THRUSTER EMISSIONS ◎ DTO 700-6 GPS ON-ORBIT DEMONSTRATION ◎ DTO 700-7 GPS & PLB RNDZ LASER DATA COMPARISON ◎ DSO 604 OI-1 VISUAL VESTIBULAR														



GMT (D:H:M)	MET (D:H:M)	CDT (D:H:M)	FD/DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE						
205:01:20 / 205:13:20	008:12:00 / 009:00:00	204:20:20 / 205:08:20	10 / 204 CDT	36.7		JULY 23, 1993	STS-51	FINAL, PCN-1	6/25/93						
CDT :204	21	22	23	0	CDT:205	1	2	3	4	5	6	7	8	0	MET:009
MET :008	12	13	14	15	16	17	18	19	20	21	22	23			
STS	SLEEP			IMU MNV R	XSI MNV R	CONF MED		IMU MNV R	IMU ALG ZGLO S	PBL BURN MNV R					
			POST SLEEP		DEORBIT PREP				DEORBIT BURN*		KSC LANDING*				
PL						DSO 604	DSO 603 B								
DAY/NIGHT															
ORBIT	137		138		139		140		141		142		143		144
EARTH TRACE															
CONT COVERAGE	-DKR		-DKR -IOS -DGS		-DKR -IOS -DGS		-MLX -MIL -BDA -DKR		-MIL -MLX -BDA -DKR -IOS		-GDS -GDX -MIL -MLX -BDA -DKR		-GDS -MIL -MLX -BDA		-GDX -GDS -MIL
TDRS	E		W												
ATTITUDE	-ZLV, -YVV		IMU		-XSI		IMU/VERIF		D/O BURN		ENTRY				
NOTES:			@DSO 476 AEROBICS		@DSO 604 01-3 VISUAL VESTIBULAR		@DSO 603 B ORTHOSTATIC FUNCTION				* DEORBIT BURN 8/20:59		* KSC LANDING 8/21:59		

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DETAILED TIMELINE

DETAILED
TIMELINE

DETAILED
TIMELINE

STS 51 (FD 01)

STS

PL

MCC

MET
DAY 000

00:00

Activities prior to 0/02:30 MET are located in the ASCENT and POST INSERTION checklists. Orbiter attitude when entering the FLT PLN is -ZLV, -YVV.

01:00

ORB
2

FD01 EZ ACTIVITIES:
M010W H2O TK N2 REG INLET SYS 2 VLV - CL
Report Cabin Pressure from S66 ENVIRONMENT, PNL 01 meter, and Fluke Pressure to MCC
LAMP TEST (ORB OPS, EPS) (5 Min)
SMK DETN CKT TEST (ORB OPS, ECLS) (5 min)
CPA OPS (ORB OPS, CREW SYS) (15 Min)

02:00

A1(B1)
AUTO/VERN

KU-BD ANT DEPLOY (ORB OPS, COMM/INST)
KU-BD ACTIVATION (COMM mode) (ORB OPS, COMM/INST)

A6L HTR ENA - AUTO
ERPL STATUS CHECK (PL OPS, SPAS)
P/TV02 SETUP (SAT DPLY ACTS/TOS) (PHOTO/TV, P/TV SCENES)

TOS/ASE HTR ACT (TOS DPY, POST INS OPS)
ACTS/TOS ACT AND C/O (TOS DPY, POST INS OPS)

03:00

ORB
3

QUICKDON MASKS
Unstow, Install, Verify operation

SM CKPT INIT (ORB OPS, OPS)
SM 203 ACTS SAFETY
B/U RCS LN HTRS ON - ITEM 3 + 1(2) EXEC (*)

P/TV02 ACT (SAT DPLY ACTS/TOS) (PHOTO/TV, P/TV SCENES)

TOS PWR ON (TOS DPY, PREDPY CHECKS)
ENG ROT AND TILT ACTUATORS (TOS DPY, PREDPY CHECKS)

AFT CONTROLLER C/O (ORB OPS, GNC)
APU STEAM VENT HTR DEACT
R2 BLR PWR (three) - OFF

RMS POWERUP (PDRS OPS, RMS PWRUP)

P/TV02 SETUP (SAT DPLY ACTS/TOS) (PHOTO/TV, P/TV SCENES)
IMAX SETUP

ACTS PREDEPLOY C/O (TOS DPY, PREDPY CHECKS)
TOS PREDEPLOY C/O (TOS DPY, PREDPY CHECKS)
STATUS CHECK (PL OPS, CHROMEX)

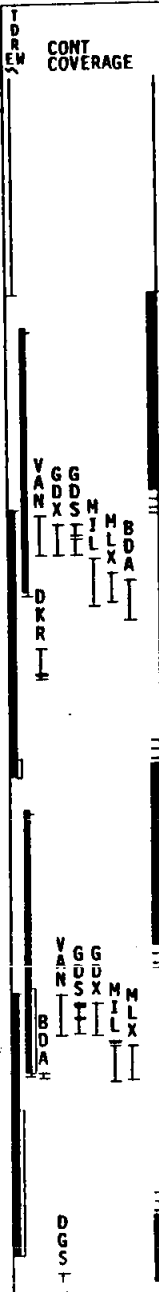
MNVR IMU ALIGN ATT STAR PAIR (A1)
A/AUTO/VERN Init MNVR at SS

RMS CHECKOUT (PDRS OPS, RMS C/O) (2 Cmn)

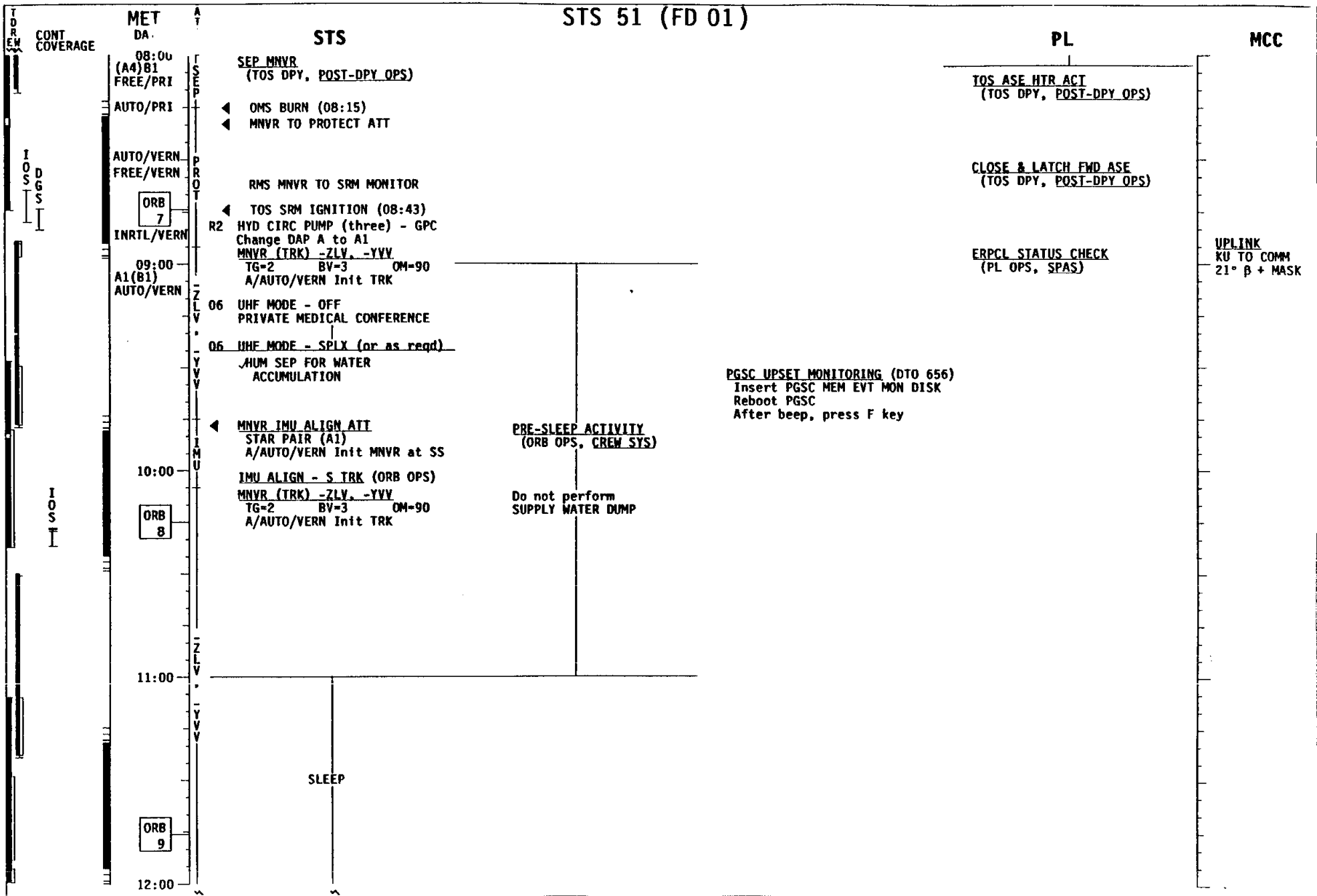
VIS VEST INTEG 01-1 (DSO 604) (BIOMED, DSOs)

ON-ORBIT ACTIVATION (PL OPS, CPCG-II)

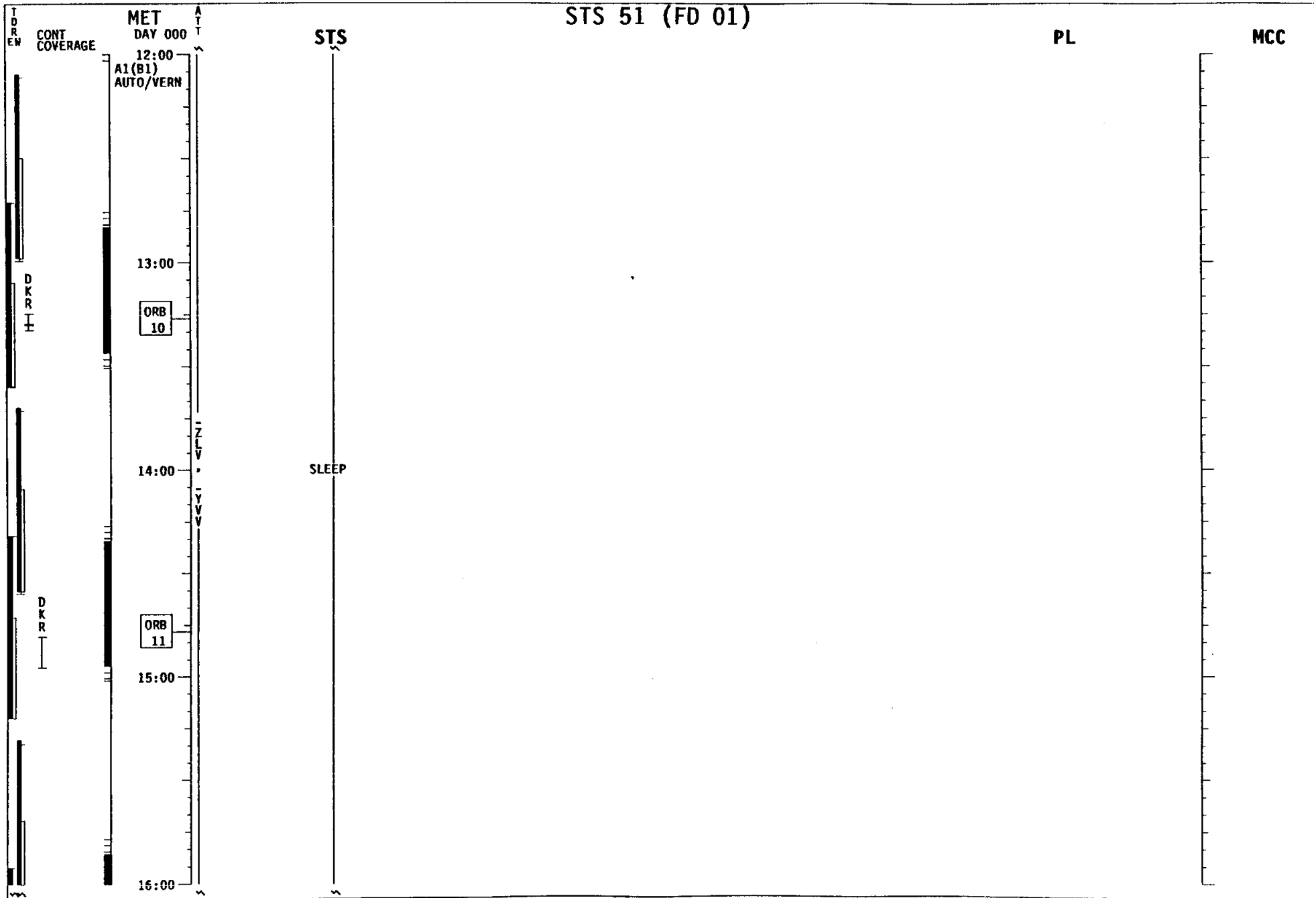
04:00



STS 51 (FD 01)



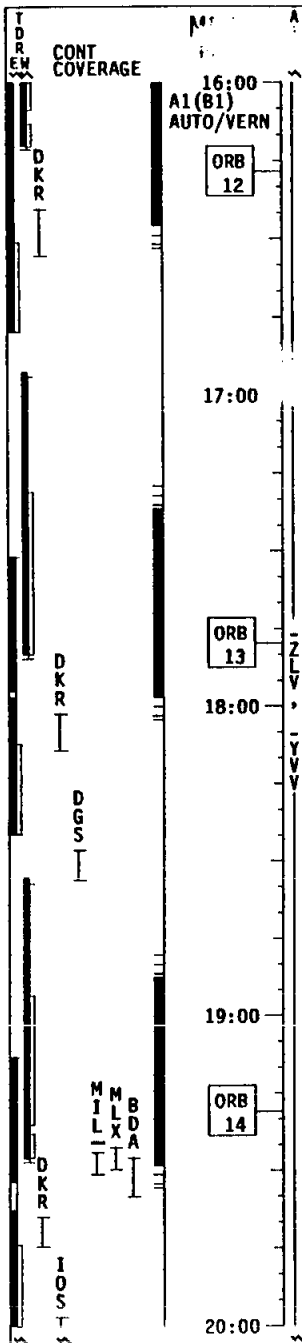
STS 51 (FD 01)



STS 51 (FD 02)

PL

MCC



STS

SLEEP

FD02 EZ ACTIVITIES:
 OCAC FILTER CLEANING
 CPA OPS (ORB OPS, CREW SYS) (15 Min)
 EXERCISE (1 Hr/A11)
 MF14M CPCG FAN INLET CLEANING & TEMP CK

CRIM TEMP ____ °C, CMD TEMP ____ °C

SEQ TIME ____ : ____ : ____ , CRIM TIME ____ : ____ : ____

INFLIGHT AEROBIC EXERCISE (DSO 476)
 (BIOMED, DSOs) CDR, MS2
 Step A (2 hrs prior exercise), and B
 EXERCISE LOG (DSO 617) (BIOMED, DSOs) (A11)
 FLUID/MEAL LOG (DSO 621) (BIOMED, DSOs) MS3

POST-SLEEP ACTIVITY
 (ORB OPS, CREW SYS)

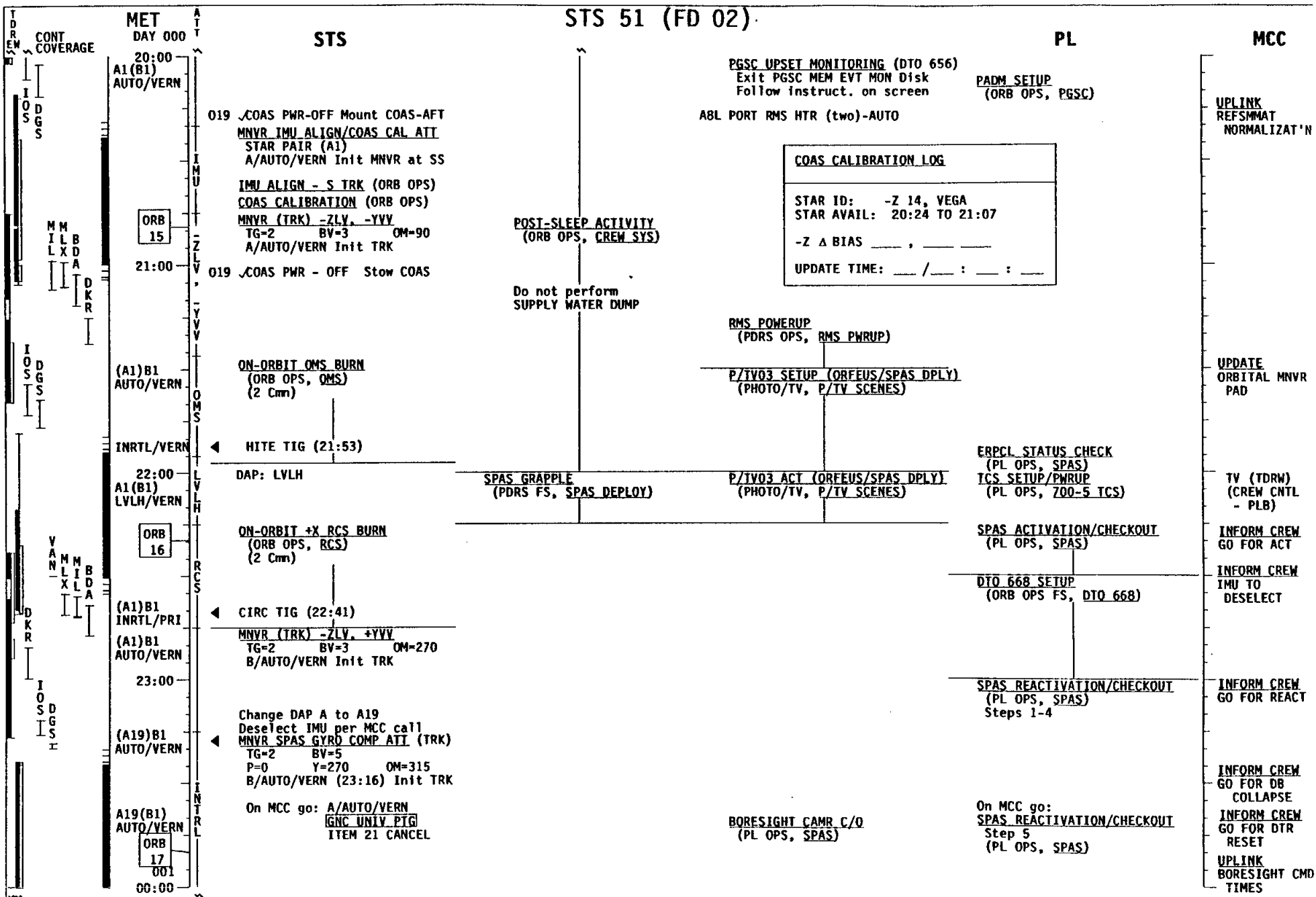
Do not perform
 SUPPLY WATER DUMP

INFLIGHT AEROBICS (DSO 476)
 (BIOMED, DSOs)
 (CDR, MS2)
 Pulse Rate

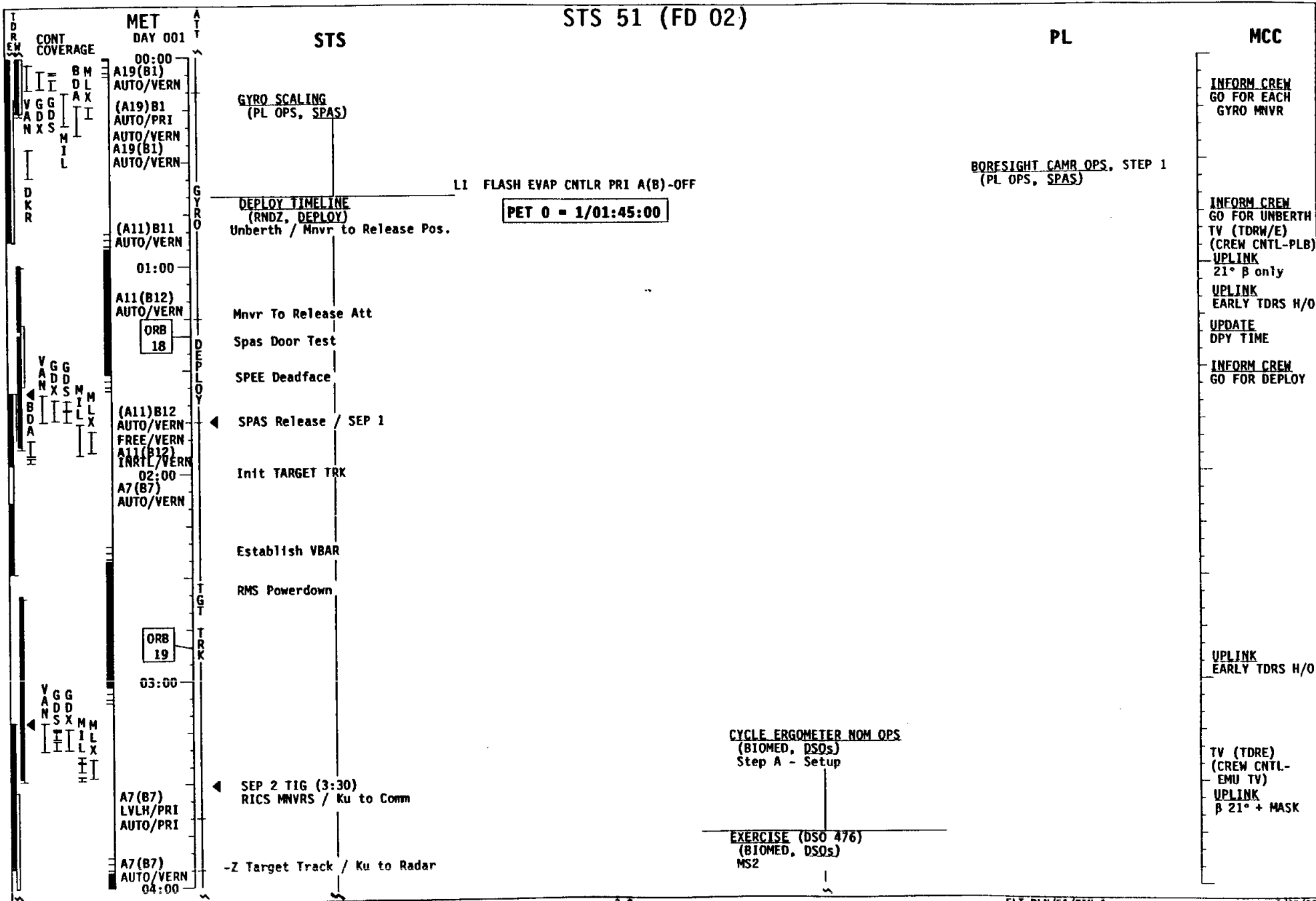
UPLINK
 FUEL CELL
 PURGE

PADM XFER
 PGSC UPDATES

STS 51 (FD 02)



STS 51 (FD 02)



STS 51 (FD 02)

PL

MCC

PGSC UPSET MONITORING (OTO 656)
Insert PGSC MEM EVT MON DISK
Reboot PGSC
After beep, press F key

STS

MET DAY 001

08:00 LVLH/PRI

A1(B1) AUTO/VERN

ORB 23

09:00

10.2 PSI MAINTENANCE
(EVA, 10.2 PSI CABIN)

PRE-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

SUPPLY WATER DUMP USING FES
(ORB OPS, ECLS)
Perform Step 2 w/FES reqd

Do not perform
SUPPLY WATER DUMP

10:00

ORB 24

11:00

SLEEP

12:00

ORB 25

TDR EN

CONT COVERAGE

I O S

A T

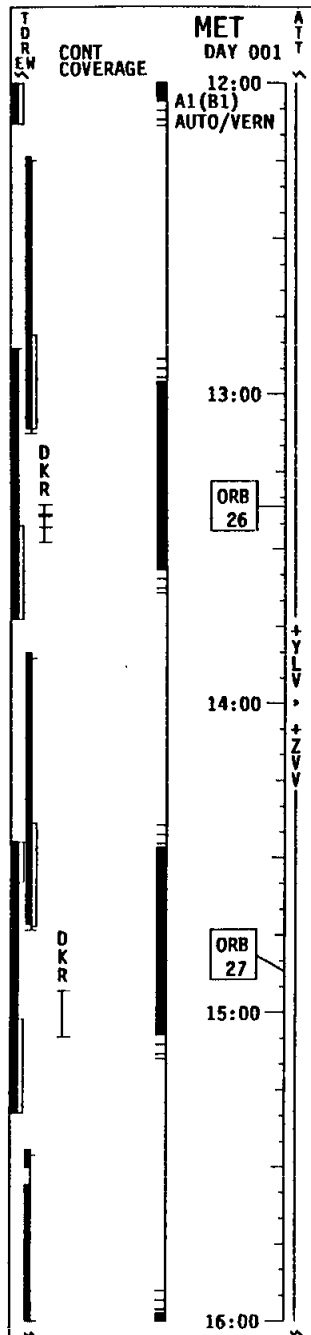
Y L V

Z V V

STS 51 (FD 02)

PL

MCC



STS

SLEEP

STS 51 (FD 03)

PL

MCC

MET DAY 001

16:00
A1(B1)
AUTO/VERN

ORB 28

17:00

ORB 29

18:00

ORB 30

19:00

20:00

CONT COVERAGE

DRW

D K R R

B D A I K R R

I O S S S

M L X A

B D A

D K R R

M I L I

Y L V

Z V V

STS

SLEEP

FD03 EZ ACTIVITIES:
 OCAC FILTER CLEANING
 EXERCISE (1 Hr/A11)
 CPA OPS (ORB OPS, CREW SYS) (15 Min)
 MF14M CPGG FAN INLET CLEANING & TEMP CK

CRIM TMEP ____ °C, CMD TEMP ____ °C

SEQ TIME ____ : ____ : ____ , CRIM TIME ____ : ____ : ____

INFLIGHT AEROBIC EXERCISE (DSO 476)
 (BIOMED, DSOs) CDR, MS2
 Step A (2 hrs prior exercise), and B
EXERCISE LOG (DSO 617) (BIOMED, DSOs) (A11)
FLUID/MEAL LOG (DSO 621) (BIOMED, DSOs) MS3

INELIGHT AEROBICS (DSO 476)
 (BIOMED, DSOs)
 (CDR, MS2)
 Pulse Rate

POST-SLEEP ACTIVITY
 (ORB OPS, CREW SYS)

Do not perform
 SUPPLY WATER DUMP

← **MNVR IMU ALIGN ATT**
 STAR PAIR (A1)
 A/AUTO/VERN Init MNVR at SS

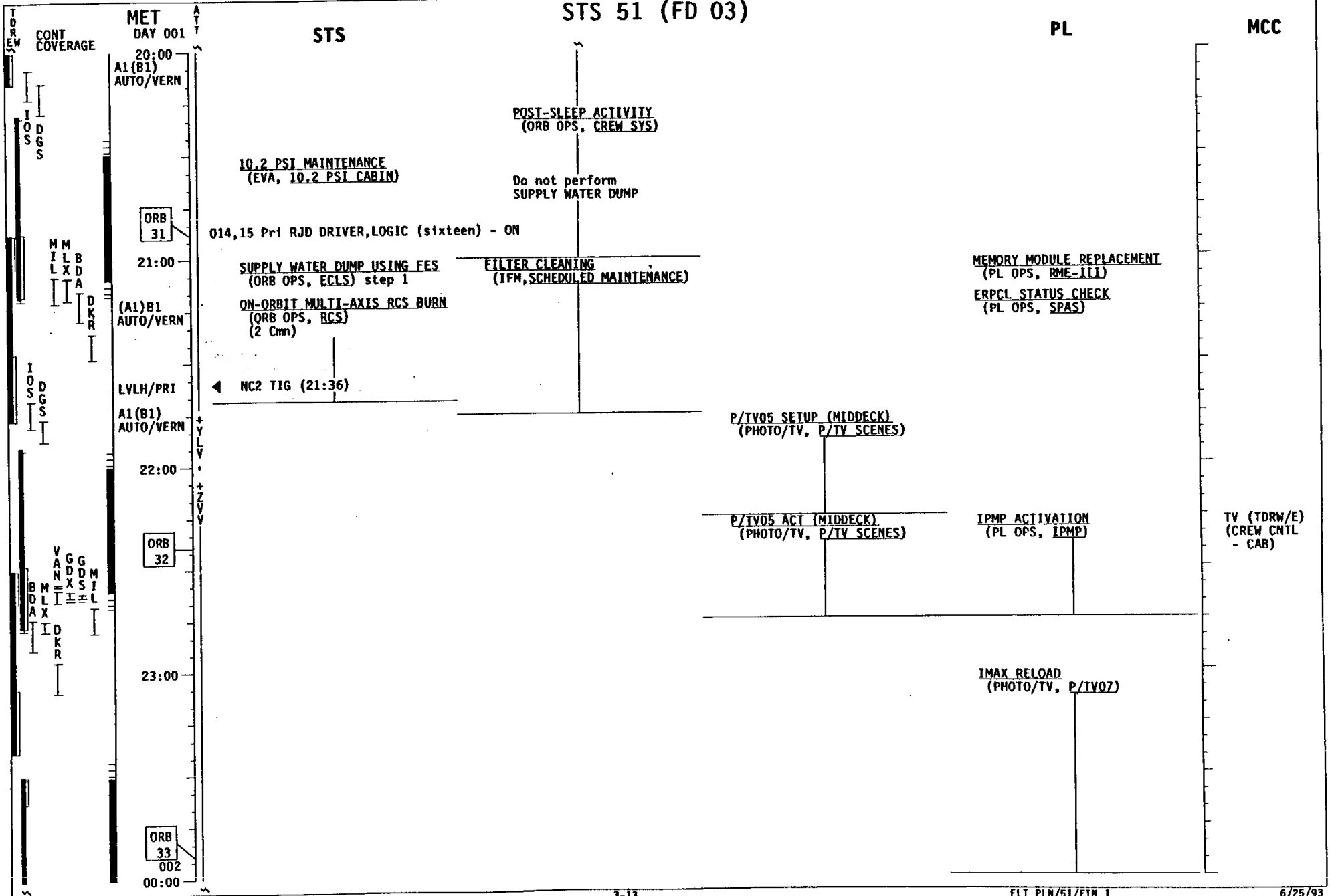
IMU ALIGN - S TRK (ORB OPS)
MNVR (TRK) +YL, +ZV
 TG = 2 BV = 5
 P = 0 Y = 90 OM = 90
 A/AUTO/VERN Init TRK

PGSC UPSET MONITORING (UTO 656)
 Exit PGSC MEM EVT MON Disk
 Follow instruct. on screen

PADM SETUP
 (ORB OPS, PGSC)

PADM_XFER
 PGSC UPDATES

STS 51 (FD 03)



STS 51 (FD 03)

PL

MCC

MET
DAY 002

STS

PAO VOICE CHECK/EVENT
TV at TDRE (03:52 to 04:10)

04:00
A1(B1)
AUTO/VERN

ORB
36

L17 Check MCIU filter screen

◀ MNVR IMU ALIGN ATT
STAR PAIR (B1)
A/AUTO/VERN (4:40) Init MNVR

05:00

IMU ALIGN - S TRK (ORB OPS)
MNVR (TRK) +YLV, +ZVV
TG = 2 BV = 5
P = 0 Y = 90 OM = 90
A/AUTO/VERN Init TRK

ORB
37

06:00

10.2 PSI MAINTENANCE
(EVA, 10.2 PSI CABIN)

SUPPLY WATER DUMP USING FES
(ORB OPS, ECLS)
Perform Step 2 w/FES reqd

ON-ORBIT MULTI-AXIS RCS BURN
(ORB OPS, RCS)
(2 Cmn)

07:00

(A1)B1
AUTO/VERN

LVLH/PRI

ORB
38

A1(B1)
AUTO/VERN

08:00

06 UHF MODE - OFF
PRIVATE MEDICAL CONFERENCE

06 UHF MODE - SPLX (or as reqd)

EXERCISE (DSO 476)
(BIOMED, DSOs) CDR or MS2

EXERCISE (DSO 476)
(BIOMED, DSOs) CDR or MS2

ERPCL STATUS CHECK
(PL OPS, SPAS)

PRE-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

Do not perform
SUPPLY WATER DUMP

PGSC UPSET MONITORING (DTO 656)
Insert PGSC MEN EVT MON DISK
Reboot PGSC
After beep, press F key

TDRE
CONT
COVERAGE

DGS

VAN

DGS

DGS

STS 51 (FD 03)

STS

PL

MCC

MET
DAY 002

08:00
A1 (B1)
AUTO/VERN

ORB
39

09:00

10:00

ORB
40

11:00

ORB
41

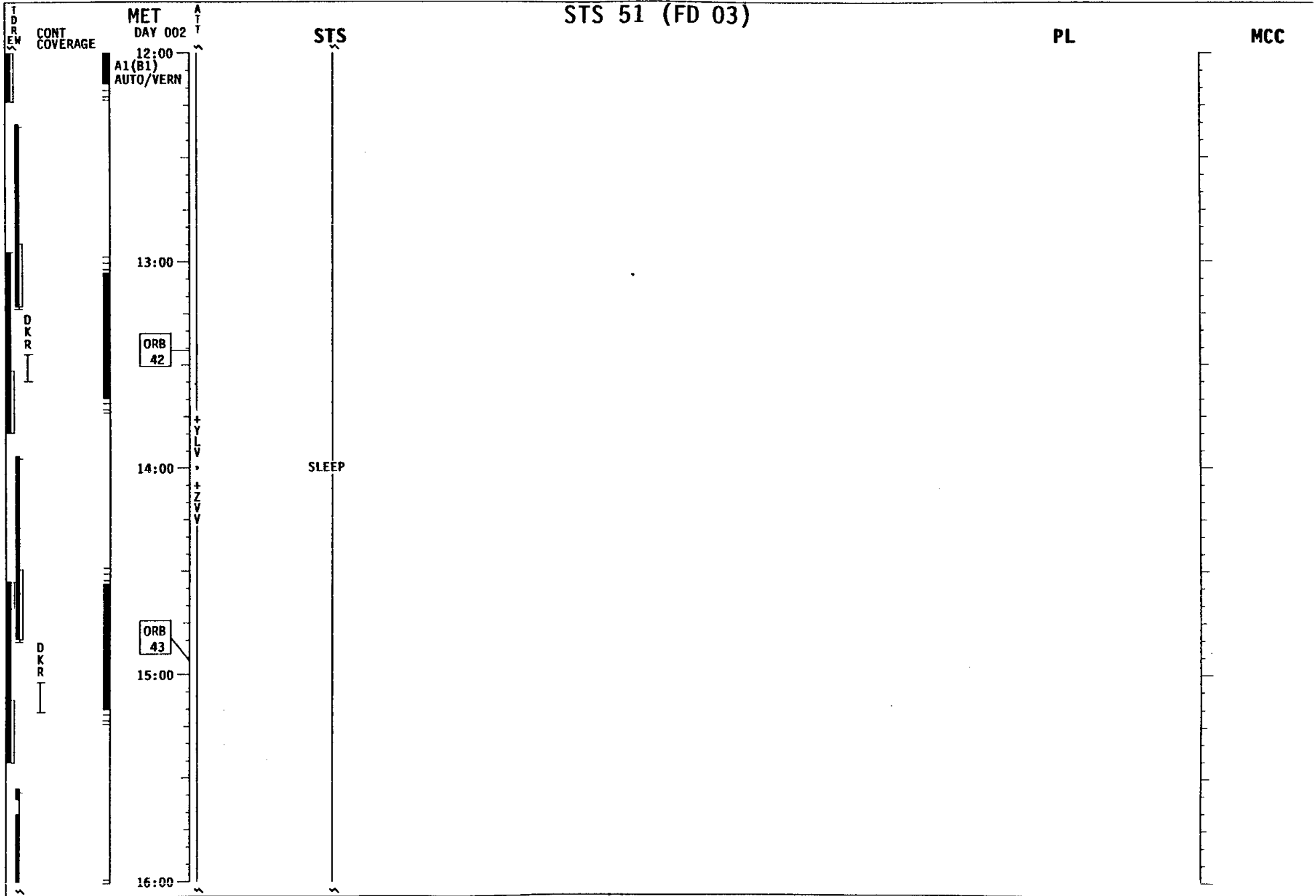
12:00

PRE-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

Do not perform
SUPPLY WATER DUMP

SLEEP

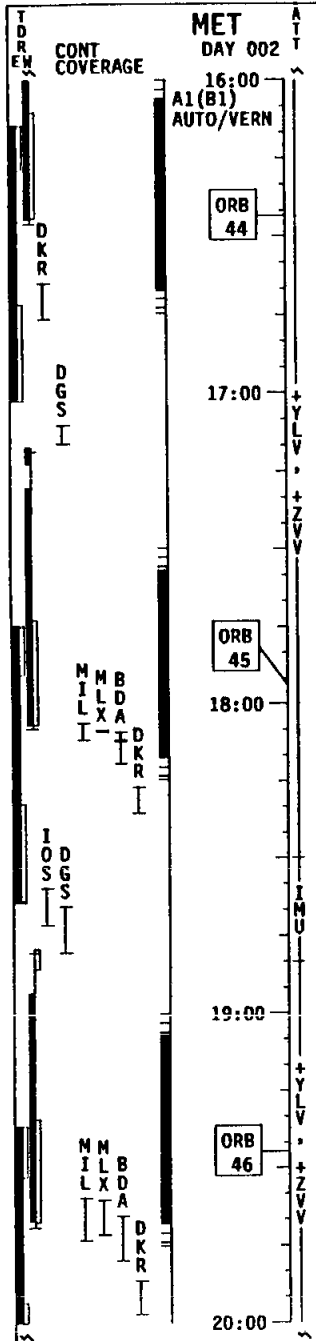
STS 51 (FD 03)



STS 51 (FD 04)

PL

MCC



MET DAY 002

16:00
A1(B1)
AUTO/VERN

ORB 44

17:00

ORB 45

18:00

19:00

ORB 46

20:00

STS

SLEEP

ED04 EZ ACTIVITIES:
 OCAC FILTER CLEANING
 EXERCISE (1 Hr/A11)
 CPA OPS (ORB OPS, CREW SYS) (15 Min)
 MF14M CPG FAN INLET CLEANING & TEMP CK

CRIM TEMP ____ °C, CMD TEMP ____ °C
 SEQ TIME ____:____:____, CRIM TIME ____:____:____

INFLIGHT AEROBIC EXERCISE (DSO 476)
 (BIOMED, DSOs) CDR, MS2
 Step A (2 hrs prior exercise), and B
EXERCISE LOG (DSO 617) (BIOMED, DSOs) (A11)
FLUID/MEAL LOG (DSO 621) (BIOMED, DSOs) MS3

INFLIGHT AEROBICS (DSO 476)
 (BIOMED, DSOs)
 (CDR, MS2)
 Pulse Rate

PGSC UPSET MONITORING (DTO 656)
 Exit PGSC MEM EVT MON Disk
 Follow instruct. on screen

PADM SETUP
 (ORB OPS, PGSC)

PADM_XFER
 PGSC UPDATES

POST-SLEEP ACTIVITY
 (ORB OPS, CREW SYS)

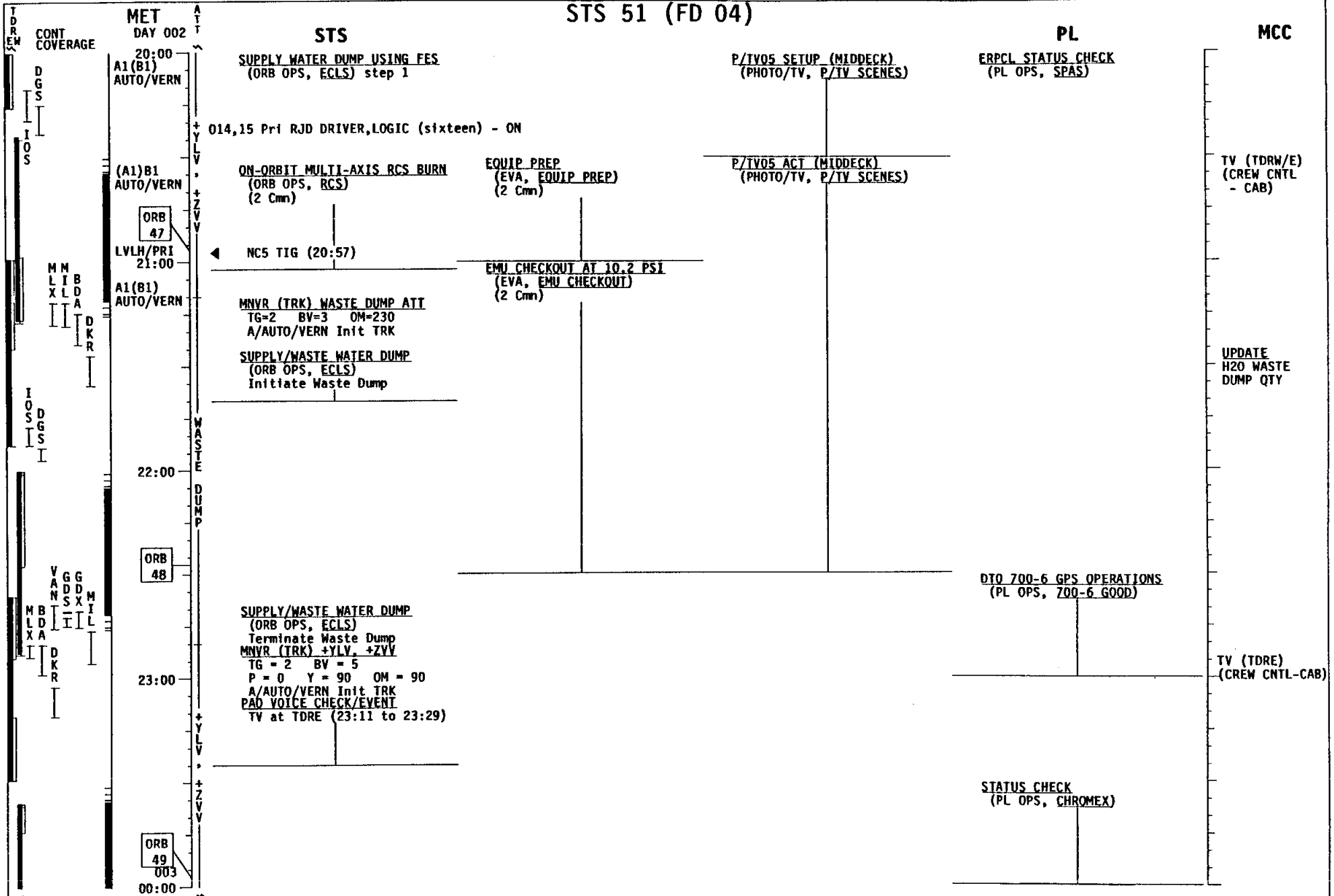
Do not perform
 SUPPLY WATER DUMP

← **MNVR IMU ALIGN ATT**
 STAR PAIR (C1)
 A/AUTO/VERN (18:30) Init MNVR

IMU ALIGN - S TRK (ORB OPS)
MNVR (TRK) +YLV, +ZVV
 TG = 2 BV = 5
 P = 0 Y = 90 OM = 90
 A/AUTO/VERN Init TRK

10.2 PSI MAINTENANCE
 (EVA, 10.2 PSI CABIN)

STS 51 (FD 04)



STS 51 (FD 04)

STS

PL

MCC

TDR
EM
CONT
COVERAGE

MET
DAY 003
00:00
A1(B1)
AUTO/VERN

VAN
GDD
XS
MIL
MLXA
MBDA
DKR
I

ORB
50

VAN
GDD
XS
MIL
MLXA
VANI

ORB
51

(A1)B1
AUTO/VERN

03:00
LVLH/PRI
A1(B1)
AUTO/VERN

VAN
GDD
XS
MIL
MLXA

ORB
51

04:00

01:00

CABIN TEMP CNTL RECONFIG
MD44F Pin CAB TEMP CNTL act link
to secondary act
L1 CABIN TEMP CNTLR - 2
HEATER RECONFIG-Config B
(ORB OPS, EPS)
ECLSS REDUND COMPONENT C/O
(ORB OPS, ECLS)

02:00

ON-ORBIT MULTI-AXIS RCS BURN
(ORB OPS, RCS)
(2 Cmn)

03:00

◀ NC6 TIG (2:59)

L17 Check MCIU filter screen

MEAL
(A11)

MIDDECK PREP
(EVA, EVA PREP)

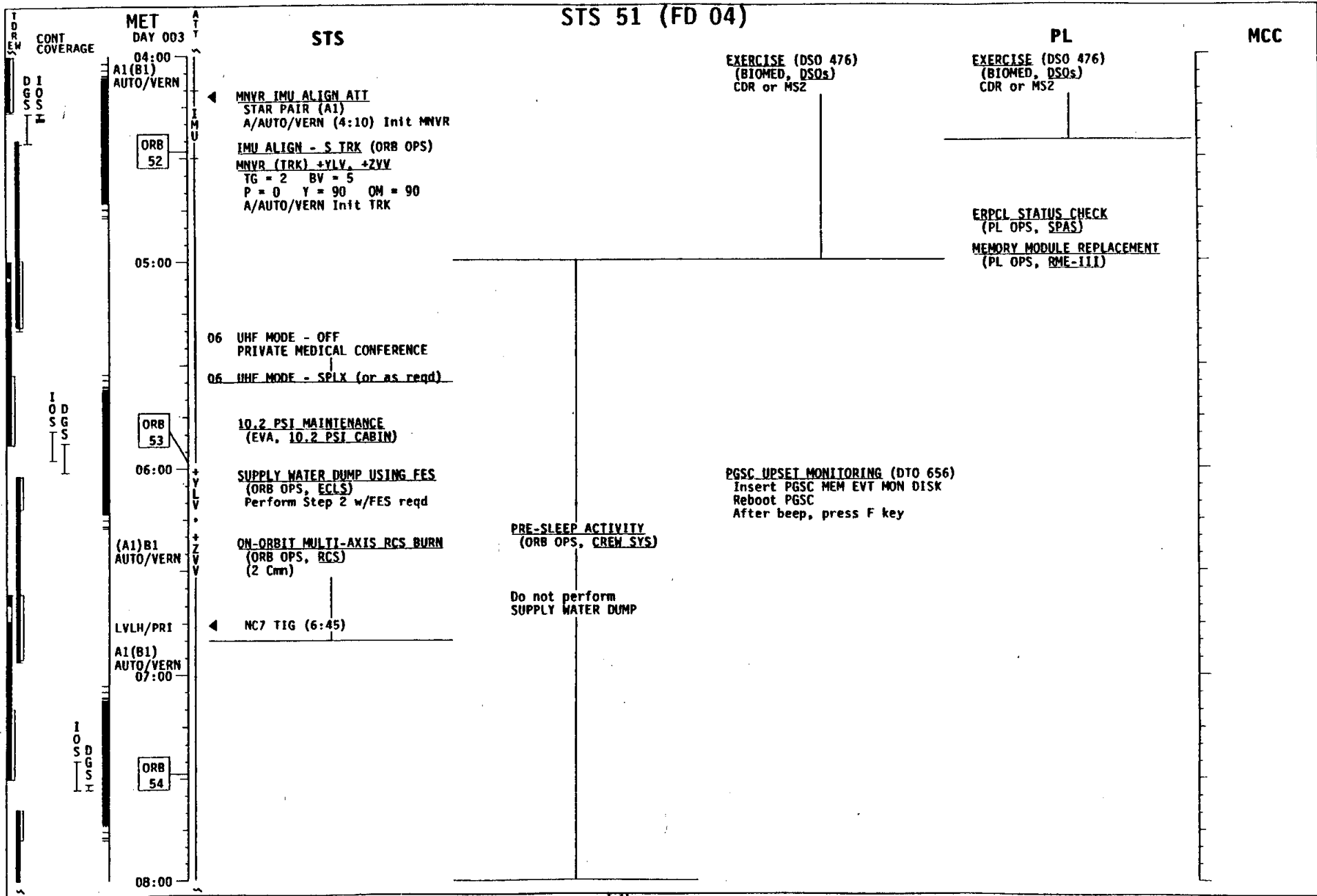
PREP FOR DOWNING, steps 13 & 17
(EVA, EVA PREP)

EXERCISE (DSO 476)
(BIOMED, DSOs)
CDR or MS2

EXERCISE (DSO 476)
(BIOMED, DSOs)
CDR or MS2

TV (TDRW/E)
(CREW CNTL-CAB)

STS 51 (FD 04)



STS 51 (FD 04)

PL

MCC

TDR
EM

CONT COVERAGE

MET
DAY 003

08:00
A1(B1)
AUTO/VERN

09:00

10:00

11:00

12:00

ORB 55

ORB 56

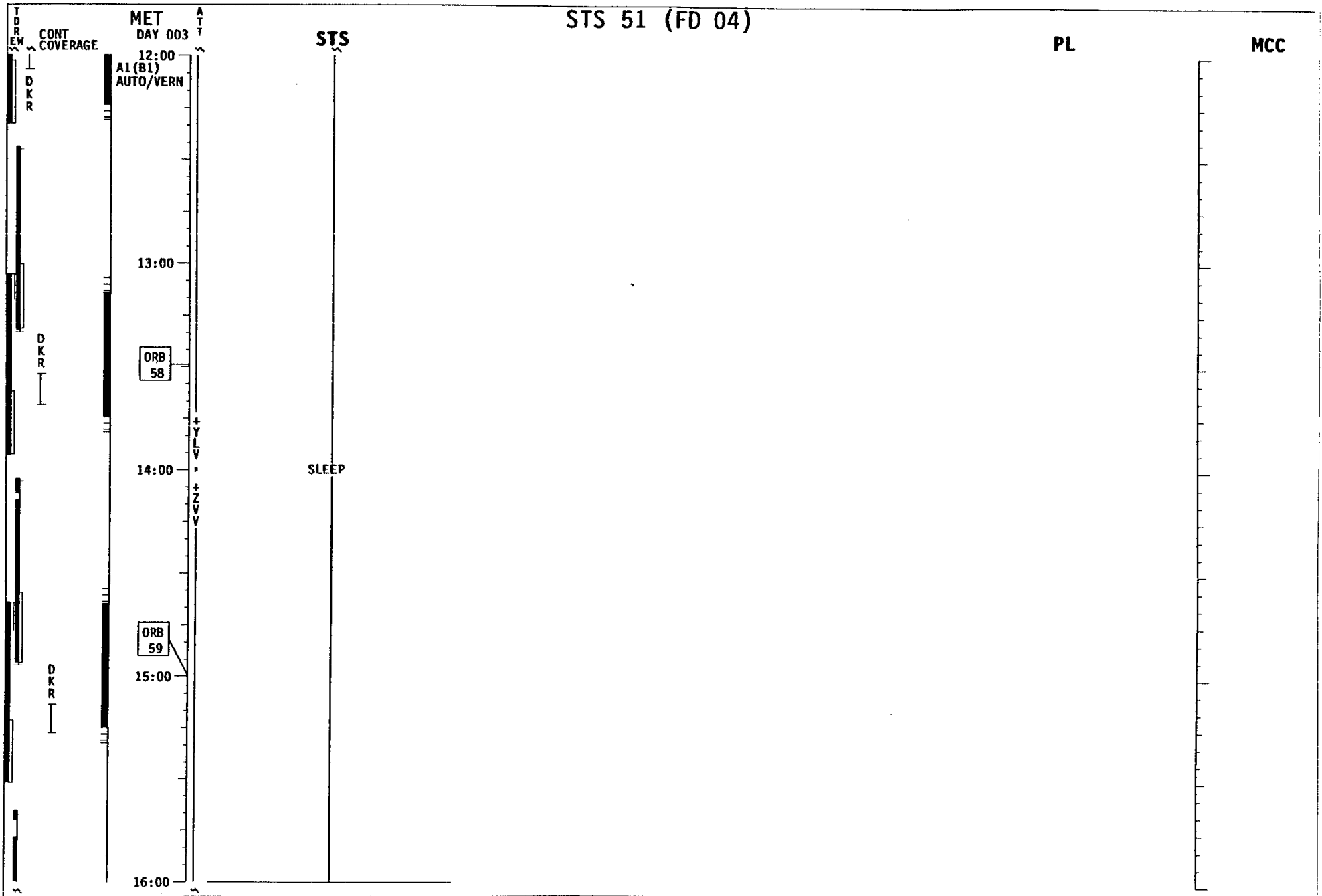
ORB 57

SRKO

STS

SLEEP

STS 51 (FD 04)



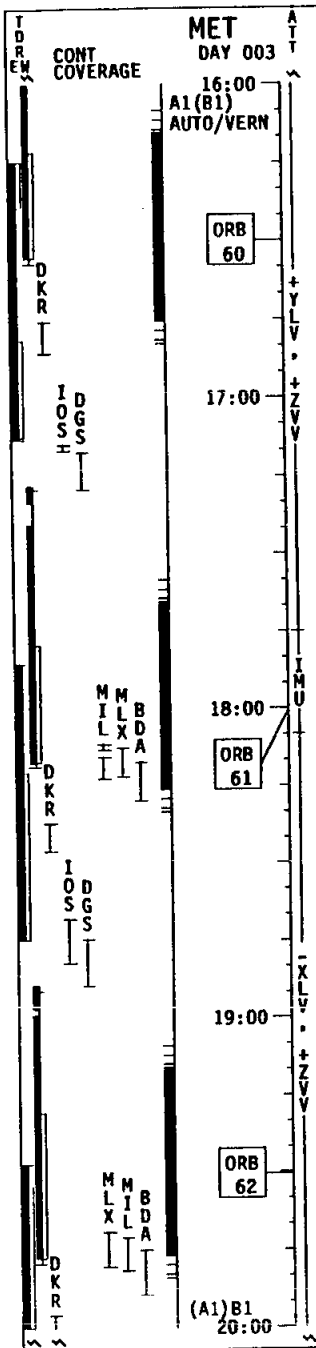
STS 51 (FD 05)

STS

PL

MCC

MET DAY 003



INFLIGHT AEROBICS (DSO 476)
(BIOMED, DSOs)
(CDR, MS2)
Pulse Rate

PGSC UPSET MONITORING (DTO 656)
Exit PGSC MEM EVT MON Disk
Follow instruct. on screen

PADM SETUP
(ORB OPS, PGSC)

PADM_XEER
PGSC UPDATES

POST-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

Do not perform
SUPPLY WATER DUMP

EO5 EZ ACTIVITIES:

OCAC FILTER CLEANING
EXERCISE (1 Hr/A11)
CPA OPS (ORB OPS, CREW SYS) (15 Min)
MF14M CPG FAN INLET CLEANING & TEMP CK

CRIM TEMP ____ °C, CMD TEMP ____ °C

SEQ TIME ____ : ____ : ____ , CRIM TIME ____ : ____ : ____

EXERCISE LOG (DSO 617) (BIOMED, DSOs) (A11)
FLUID/MEAL LOG (DSO 621) (BIOMED, DSOs) MS3

16:00

17:00

18:00

19:00

ORB 62

(A1)B1
20:00

◀ **MNVR IMU ALIGN ATT**
STAR PAIR (A1)
A/AUTO/VERN (17:45) Init MNVR

IMU ALIGN - S TRK (ORB OPS)
MNVR (TRK) -XLV, +ZVV
TG-2 BV-2 OM-0
A/AUTO/VERN Init TRK

10.2 PSI MAINTENANCE
(EVA, 10.2 PSI CABIN)

RCS REGULATOR RECONFIGURE
(ORB OPS, RCS)

SUPPLY WATER DUMP USING FES
(ORB OPS, ECLS) step 1

ERPCL STATUS CHECK
(PL OPS, SPAS)

HUM SEPs for H2O
accumulation, then
HUMIDITY SEP RECONFIG
L1 HUMIDITY SEP B - OFF
A - ON
014,15 Pri RJD DRIVER, LOGIC (sixteen) - ON

ON-ORBIT MULTI-AXIS RCS BURN
(ORB OPS, RCS)
(2 Cmn)

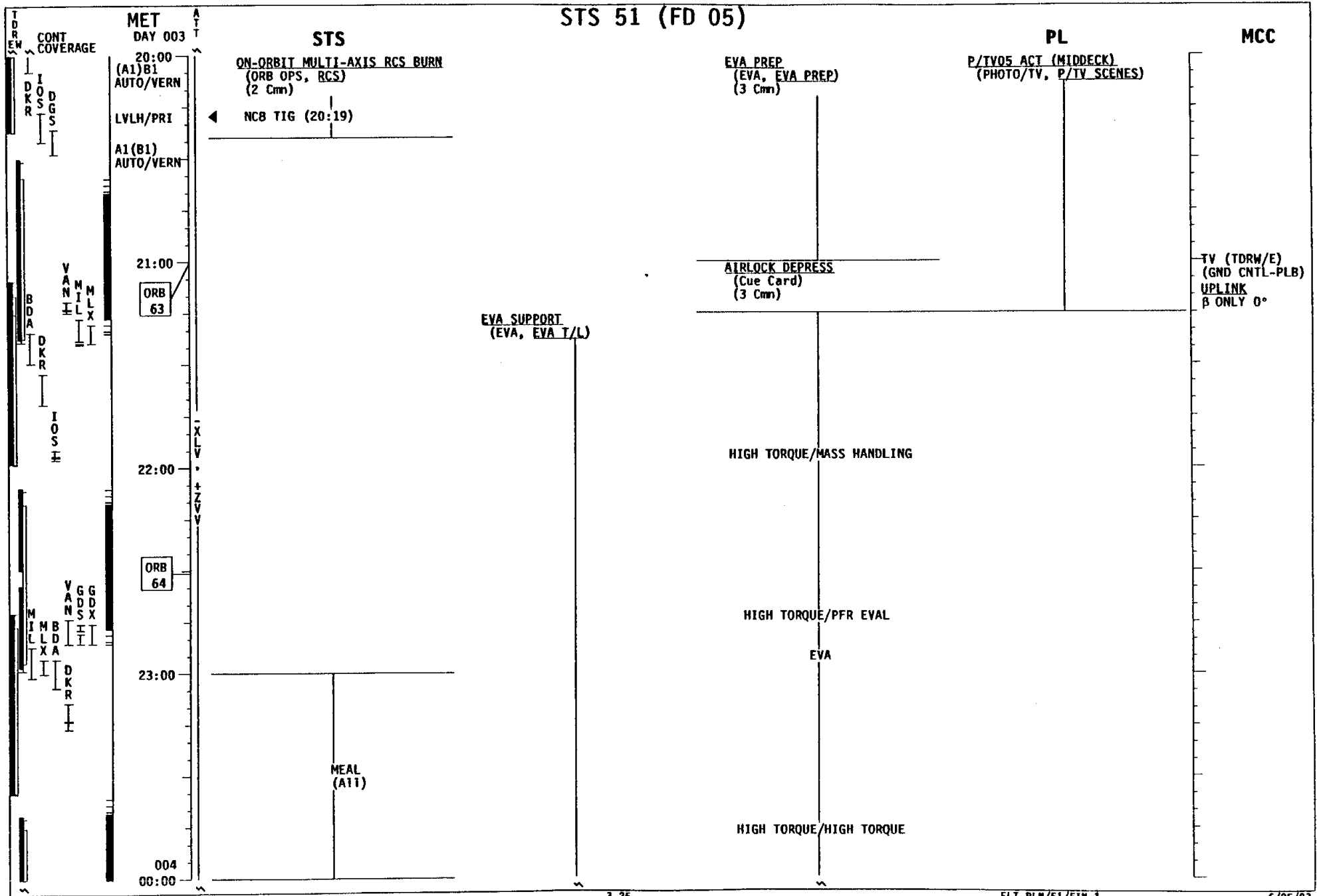
EVA PREP
(EVA, EVA PREP)
(3 Cmn)

P/TV05 SETUP (MIDDECK)
(PHOTO/TV, P/TV SCENES)

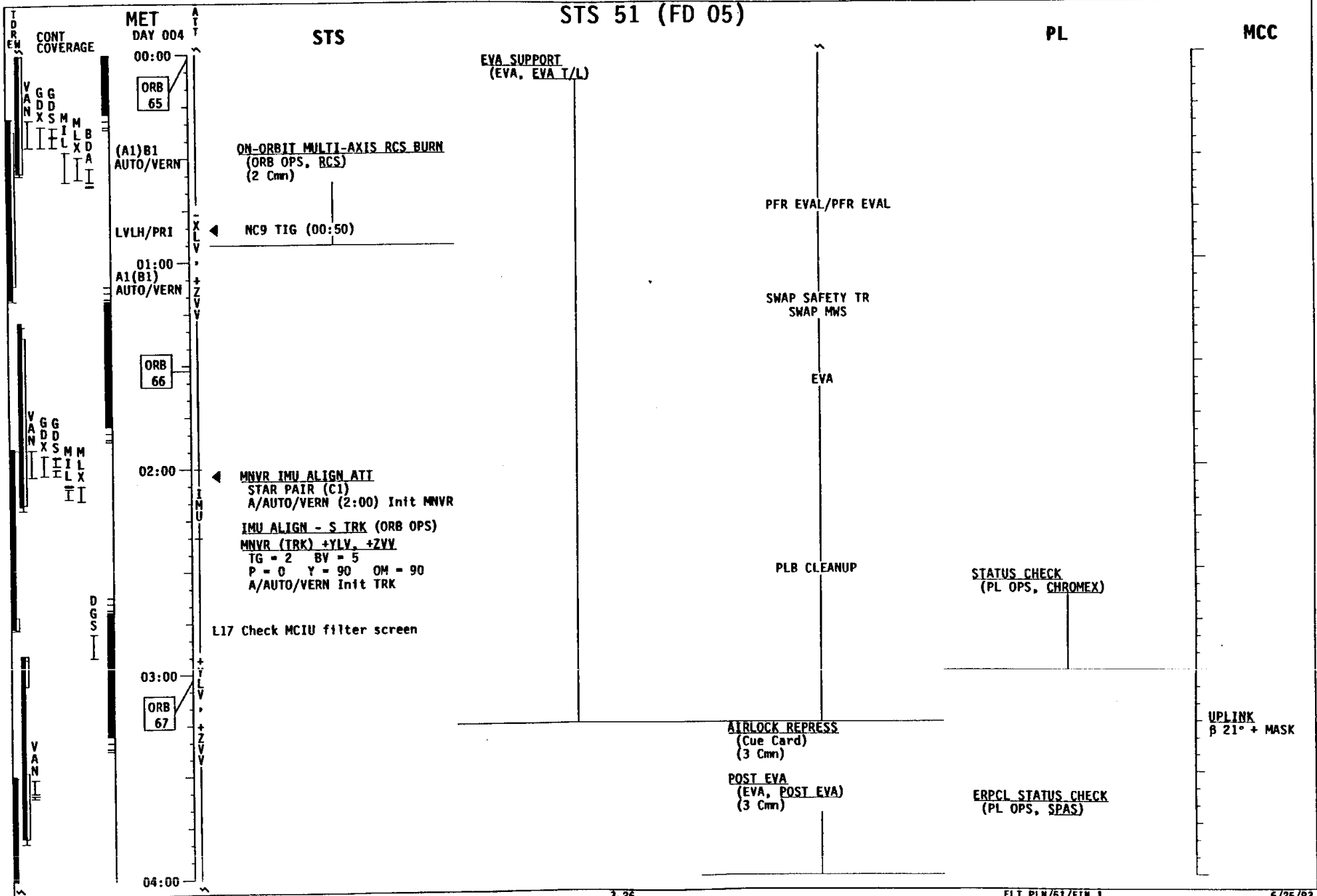
P/TV05 ACT (MIDDECK)
(PHOTO/TV, P/TV SCENES)

TV (TDRW/E)
(CREW CNTL
- CAB)

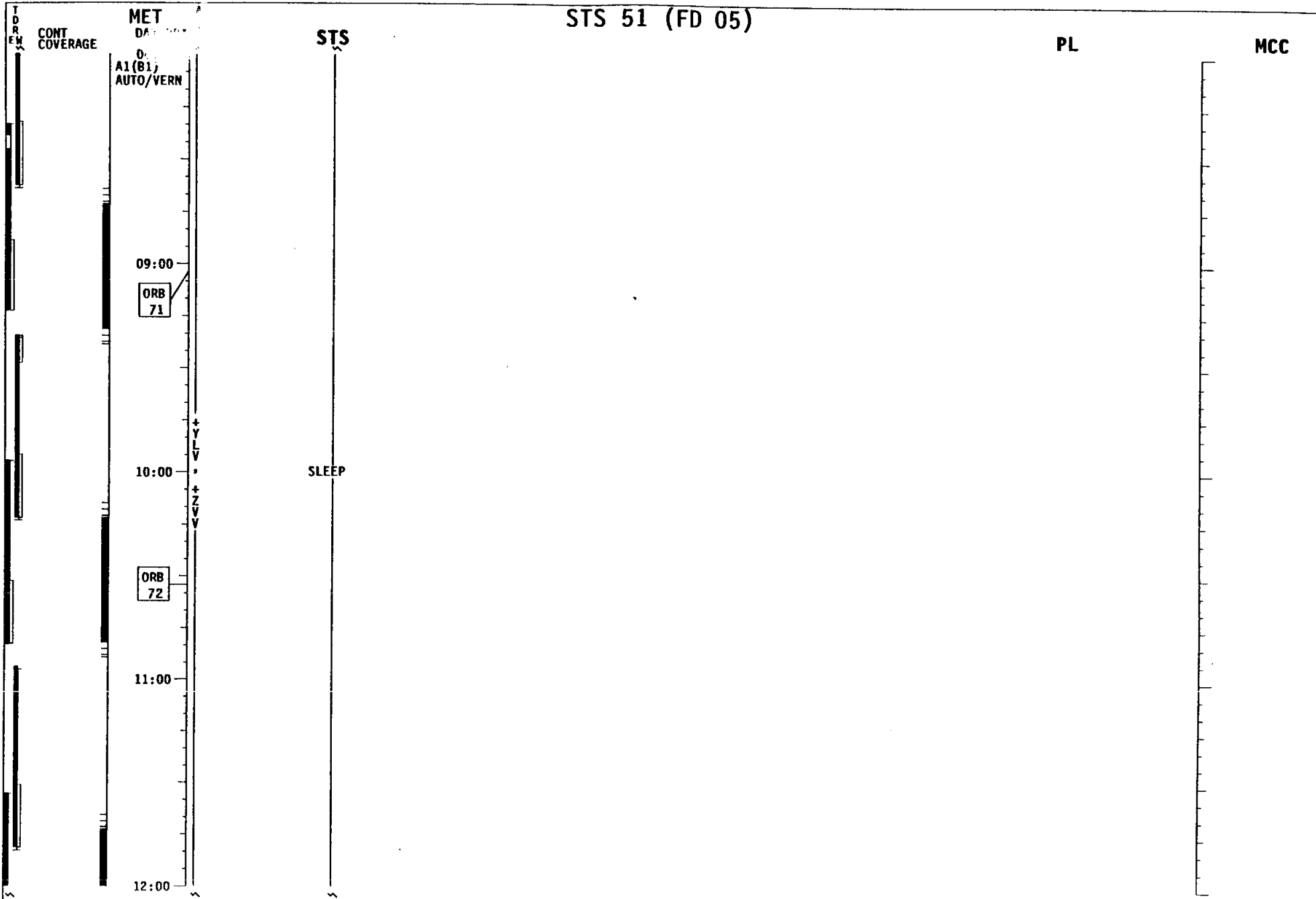
STS 51 (FD 05)



STS 51 (FD 05)



STS 51 (FD 05)



MET
DATA
0.
A1(B1)
AUTO/VERN

09:00

ORB
71

10:00

ORB
72

11:00

12:00

STS

SLEEP

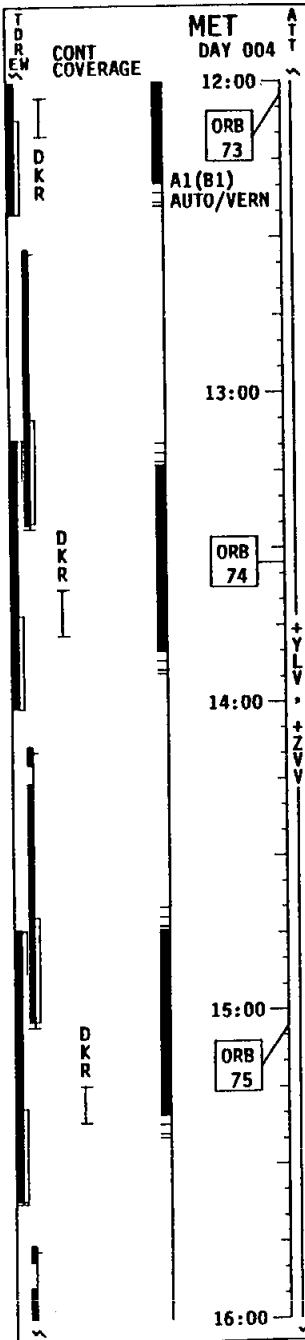
PL

MCC

STS 51 (FD 06)

PL

MCC



STS

SLEEP

POST-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

Do not perform
SUPPLY WATER DUMP

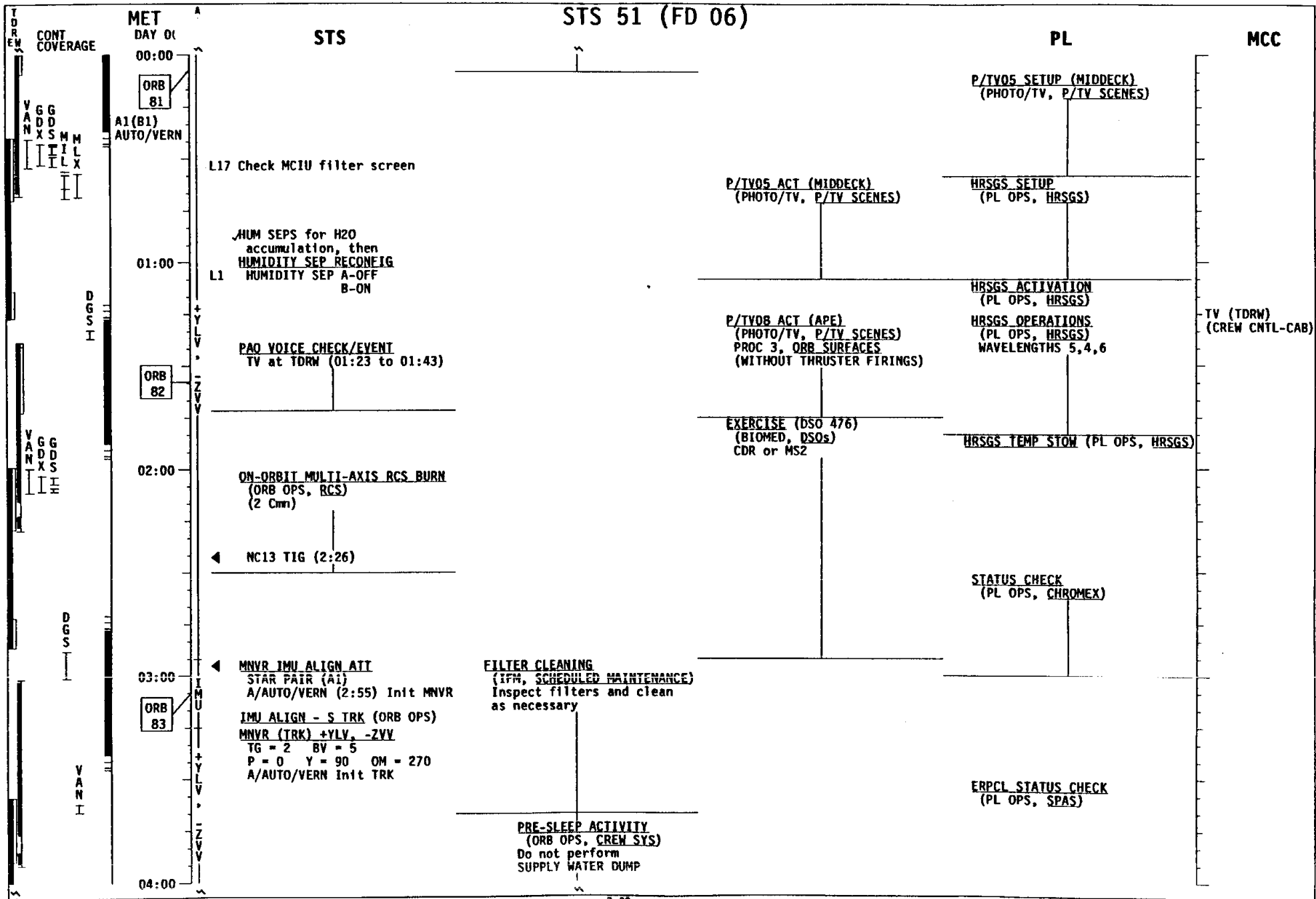
INFLIGHT AEROBICS (DSO 476)
(BIOMED, DSOs)
(CDR, MS2)
Pulse Rate

GI FUNCTION (DSO 622)
(BIOMED, DSOs)
Steps A, B, C, D.1

GI FUNCTION (DSO 622)
(BIOMED, DSOs)
Steps D.2 - D.9

PADM_XFER
PGSC UPDATES

STS 51 (FD 06)



STS 51 (FD 06)

PL

MCC

YDRR EW
CONT COVERAGE
I O D S S I
I O D S S I
I O S L I

MET DAY 005
04:00
A1(B1)
AUTO/VERN
ORB 84
05:00
(A1)B1
AUTO/VERN
LVLH/PRI
A1(B1)
AUTO/VERN
06:00
ORB 85
07:00
ORB 86
08:00

06 UHF MODE - OFF
PRIVATE MEDICAL CONFERENCE
06 UHF MODE - SPLX (or as reqd)

ORB 84

10.2 PSI MAINTENANCE
(EVA, 10.2 PSI CABIN)
SUPPLY WATER DUMP USING FES
(ORB OPS, ECLS)
Perform Step 2 w/FES reqd

05:00
(A1)B1
AUTO/VERN

ON-ORBIT MULTI-AXIS RCS BURN
(ORB OPS, RCS)
(2 Cmn)

PRE-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

PGSC UPSET MONITORING (DTO 656)
Insert PGSC MEM EVT MON DISK
Reboot PGSC
After beep, press F key

LVLH/PRI
A1(B1)
AUTO/VERN

◀ NC14 TIG (5:28)

Do not perform
SUPPLY WATER DUMP

DSO 622 REMINDER: MS1, MS2
Immediately following wakeup on FD7
collect urine.

06:00
ORB 85

07:00

SLEEP

ORB 86

08:00

STS 51 (FD 06)

DR
EM

CONT COVERAGE

MET
DAY 005

08:00
A1(B1)
AUTO/VERN

09:00

ORB
87

10:00

Y
L
V

Z
V

11:00

12:00

DKR
TE

STS

SLEEP

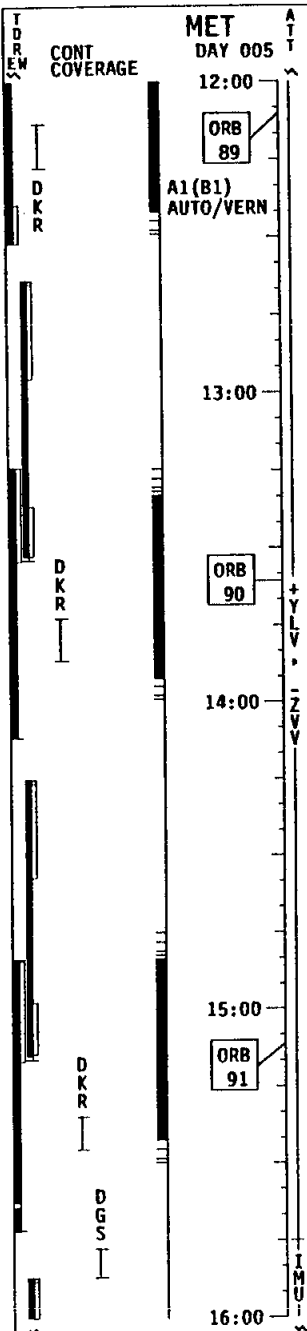
PL

MCC

STS 51 (FD 07)

PL

MCC



MET DAY 005

12:00

ORB 89

A1 (B1) AUTO/VERN

13:00

ORB 90

14:00

15:00

ORB 91

16:00

STS

SLEEP

POST-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

Do not perform
SUPPLY WATER DUMP

◀ MNVR IMU ALIGN ATT
STAR PAIR (C1)
A/AUTO/VERN (15:45) Init MNVR

INFLIGHT AEROBICS (DSO 476)
(BIOMED, DSOs)
(CDR, MS2)
Pulse Rate

PGSC UPSET MONITORING (DTO 656)
Exit PGSC MEM EVT MON Disk
Follow instruct. on screen

PADM SETUP
(ORB OPS, PGSC)

PADM_XFER
PGSC UPDATES

STS 51 (FD 07)

PL

MCC

STS

IMJ ALIGN - S TRK (ORB OPS)
MNVR (TRK) +YLV, -ZVY
 TG = 2 BV = 5
 P = 0 Y = 90 OM = 270
 A/AUTO/VERN Init TRK

POST-SLEEP ACTIVITY
 (ORB OPS, CREW SYS)

Do not perform
 SUPPLY WATER DUMP

10.2 PSI MAINTENANCE
 (EVA, 10.2 PSI CABIN)

FD07 EZ ACTIVITIES:

OCAC FILTER CLEANING
 EXERCISE (1 Hr/A11)
 CPA OPS (ORB OPS, CREW SYS) (15 Min)
 MF14M CPCG FAN INLET CLEANING & TEMP CK

CRIM TEMP ____ °C, CMD TEMP ____ °C

SEQ TIME ____:____:____, CRIM TIME ____:____:____

INFLIGHT AEROBIC EXERCISE (DSO 476)
 (BIOMED, DSOs) CDR, MS2
 Step A (2 hrs prior exercise), and B
EXERCISE LOG (DSO 617) (BIOMED, DSOs) (A11)
FLUID/MEAL LOG (DSO 621) (BIOMED, DSOs) MS3

014,15 Pri RJD DRIVER, LOGIC (sixteen) - ON

ON-ORBIT MULTI-AXIS RCS BURN
 (ORB OPS, RCS)
 (2 Cmn)

NC15 TIG (18:17)

ERPCL STATUS CHECK
 (PL OPS, SPAS)

P/TV08 ACT (APE)
 (PHOTO/TV, P/TV SCENES)
 PROC 3, ORB SURFACES
 (WITH THRUSTER FIRINGS)

P/TV05 SETUP (MIDDECK)
 (PHOTO/TV, P/TV SCENES)

P/TV05 ACT (MIDDECK)
 (PHOTO/TV, P/TV SCENES)

TIPS PAPER CHANGEOUT (DTO 660)
 (ORB OPS FS, TIPS)

P/TV08 ACT (APE)
 (PHOTO/TV, P/TV SCENES)
 PROC 3, ORB SURFACES
 (WITHOUT THRUSTER FIRINGS)

HRSGS ACTIVATION
 (PL OPS, HRSGS)

HRSGS OPERATIONS
 (PL OPS, HRSGS)
 WAVELENGTHS 3,7,2

HRSGS TEMP STOW
 (PL OPS, HRSGS)

MET DAY 005

16:00
 A1(B1)
 AUTO/VERN

ORB 92

17:00

18:00
 (A1)B1
 AUTO/VERN

ORB 93

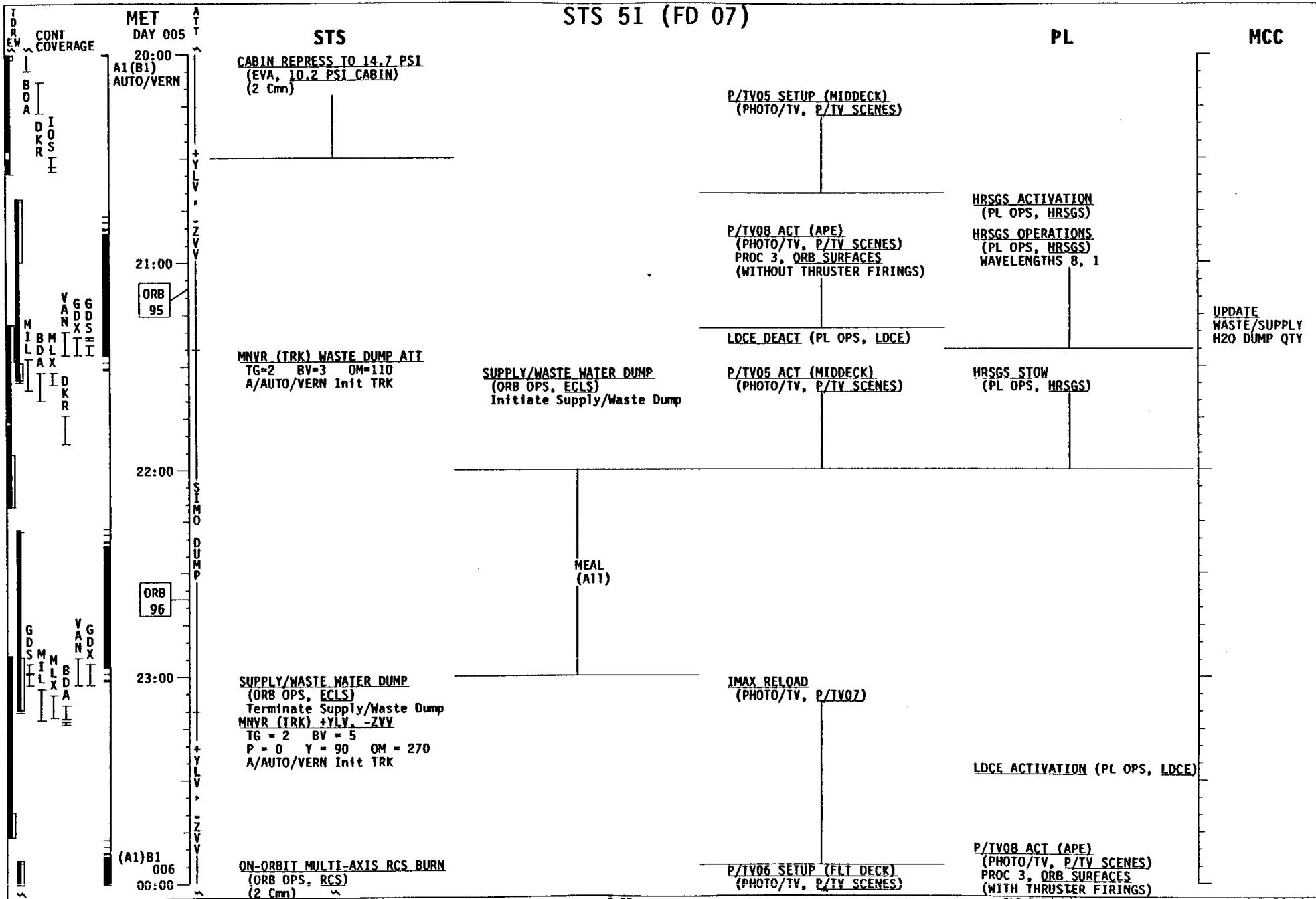
LVLH/PRI
 A1(B1)
 AUTO/VERN

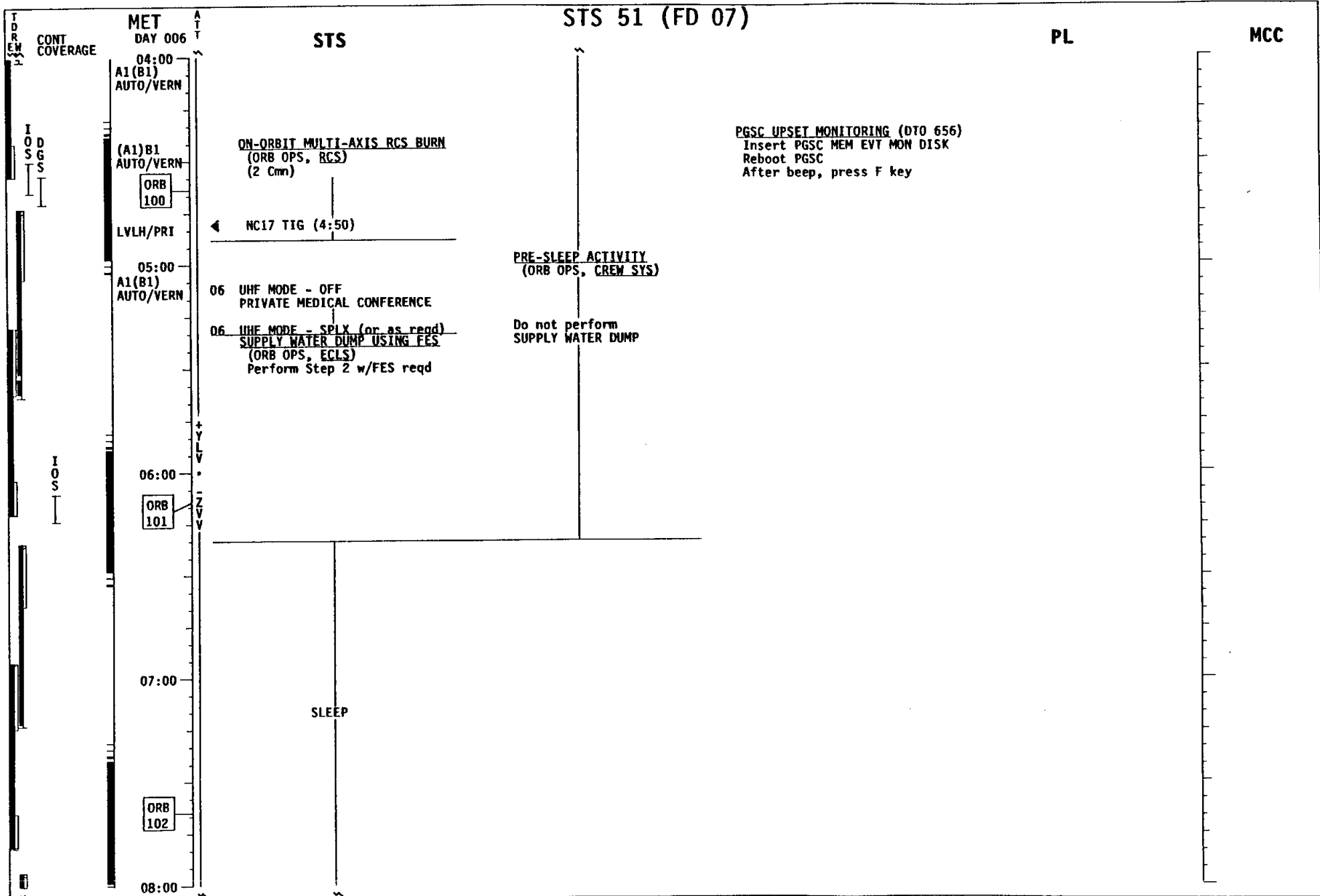
19:00

ORB 94

20:00

STS 51 (FD 07)

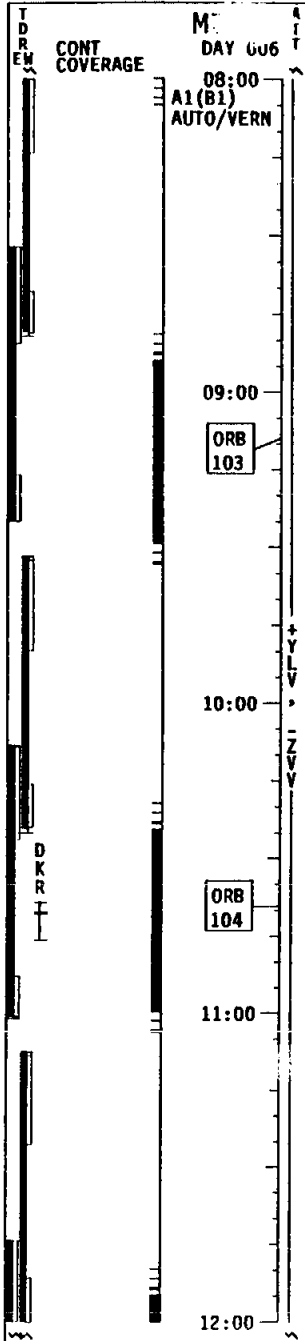




STS 51 (FD 07)

PL

MCC



STS

SLEEP

STS 51 (FD 08)

PL

MCC

MET DAY 006
 12:00
 A1(B1)
 ORB 105
 AUTO/VERN
 13:00
 + YLV
 - ZVY
 ORB 106
 14:00
 B D A D K R R
 I O S G D
 15:00
 ORB 107
 + YLV
 - ZVY
 16:00

STS

SLEEP

FD08 EZ ACTIVITIES:
 OCAC FILTER CLEANING
 CPA OPS (ORB OPS, CREW SYS) (15 Min)
 EXERCISE (1 Hr/A1)
 MF14M CPCG FAN INLET CLEANING & TEMP CK

 CRIM TEMP ____ °C, CMD TEMP ____ °C
 SEQ TIME ____ : ____ : ____ , CRIM TIME ____ : ____ : ____

 EXERCISE LOG (DSO 617) (BIOMED, DSOs) (A1)
 CONSUME 2 QTS LIQUID W/MEALS LOG (DSO 621) (MS3)
 FLUID/MEAL LOG (DSO 621) (BIOMED, DSOs) MS3

INFLIGHT AEROBICS (DSO 476)
 (BIOMED, DSOs)
 (CDR, MS2)
 Pulse Rate

UPLINK
 FUEL CELL
 PURGE

SUPPLY WATER DUMP USING FES
 (ORB OPS, ECLS) step 1
 MNVR IMU ALIGN ATT
 STAR PAIR (A1)
 A/AUTO/VERN (15:00) Init MNVR

IMU ALIGN - S TRK (ORB OPS)
 MNVR (TRK) +YLV, -ZVY
 TG = 2 BV = 5
 P = 0 Y = 90 OM = 270
 A/AUTO/VERN Init TRK

POST-SLEEP ACTIVITY
 (ORB OPS, CREW SYS)

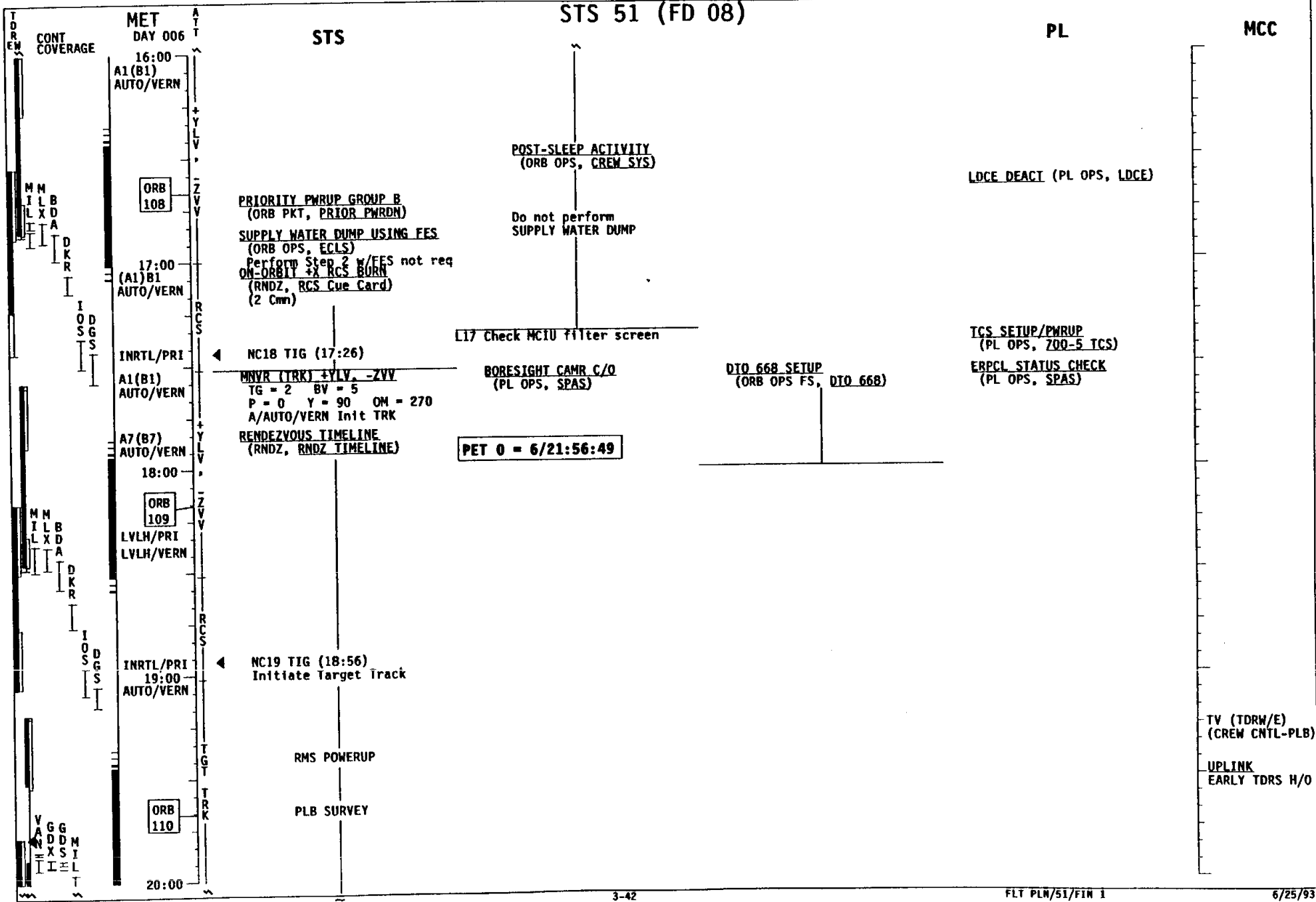
Do not perform
 SUPPLY WATER DUMP

PGSC UPSET MONITORING (DTO 656)
 Exit PGSC MEM EVT MON Disk
 Follow instruct. on screen

PADM SETUP
 (ORB OPS, PGSC)

PADM_XFER
 PGSC UPDATES

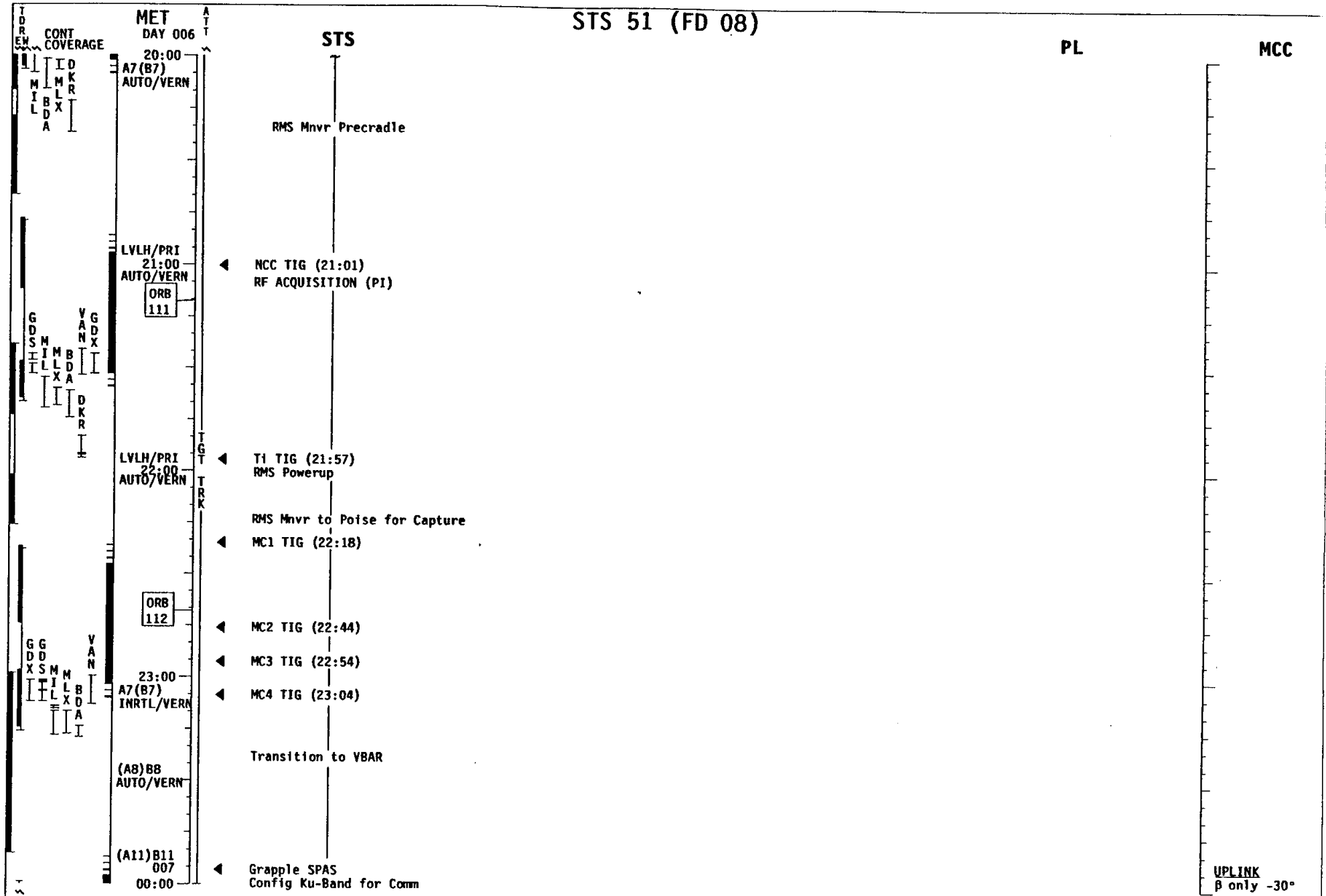
STS 51 (FD 08)



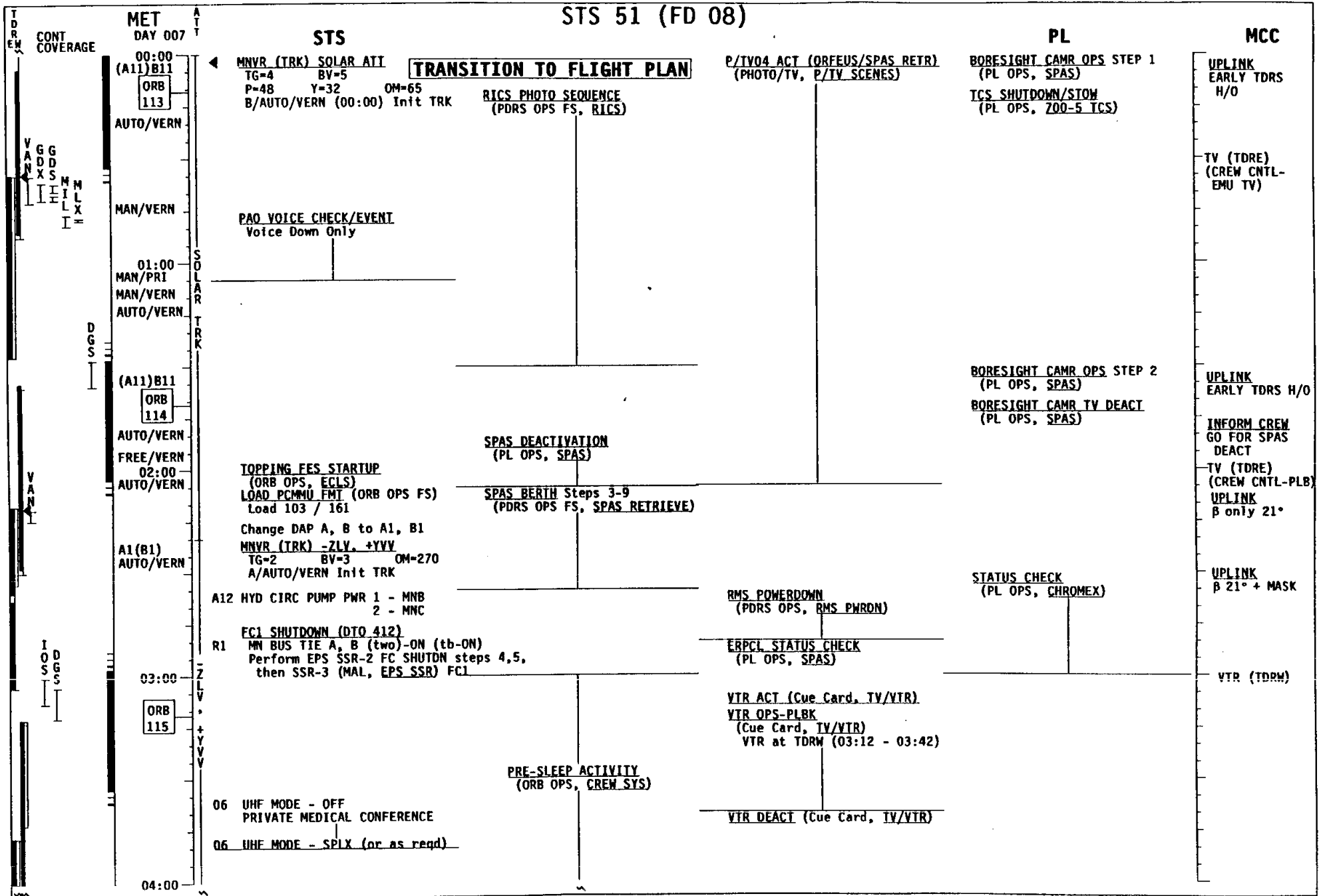
STS 51 (FD 08)

PL

MCC



STS 51 (FD 08)



STS 51 (FD 08)

STS

PL

MCC

MET
DAY 007

04:00
A1(B1)
AUTO/VERN

ORB
116

05:00

◀ MNVR IMU ALIGN ATT
STAR PAIR (A1)
A/AUTO/VERN Init MNVR at SS

IMU ALIGN - S TRK (ORB OPS)

MNVR (TRK) -ZLY, -YVV
TG-2 BV-3 OM-90
A/AUTO/VERN Init TRK

PRE-SLEEP ACTIVITY
(ORB OPS, CREW_SYS)

PGSC UPSET MONITORING (DTO 656)
Insert PGSC MEM EVT MON DISK
Reboot PGSC
After beep, press F key

06:00

ORB
117

FLORINEF (DSO 621) (BIOMED, DSOs) (MS3)
Consume Tablets

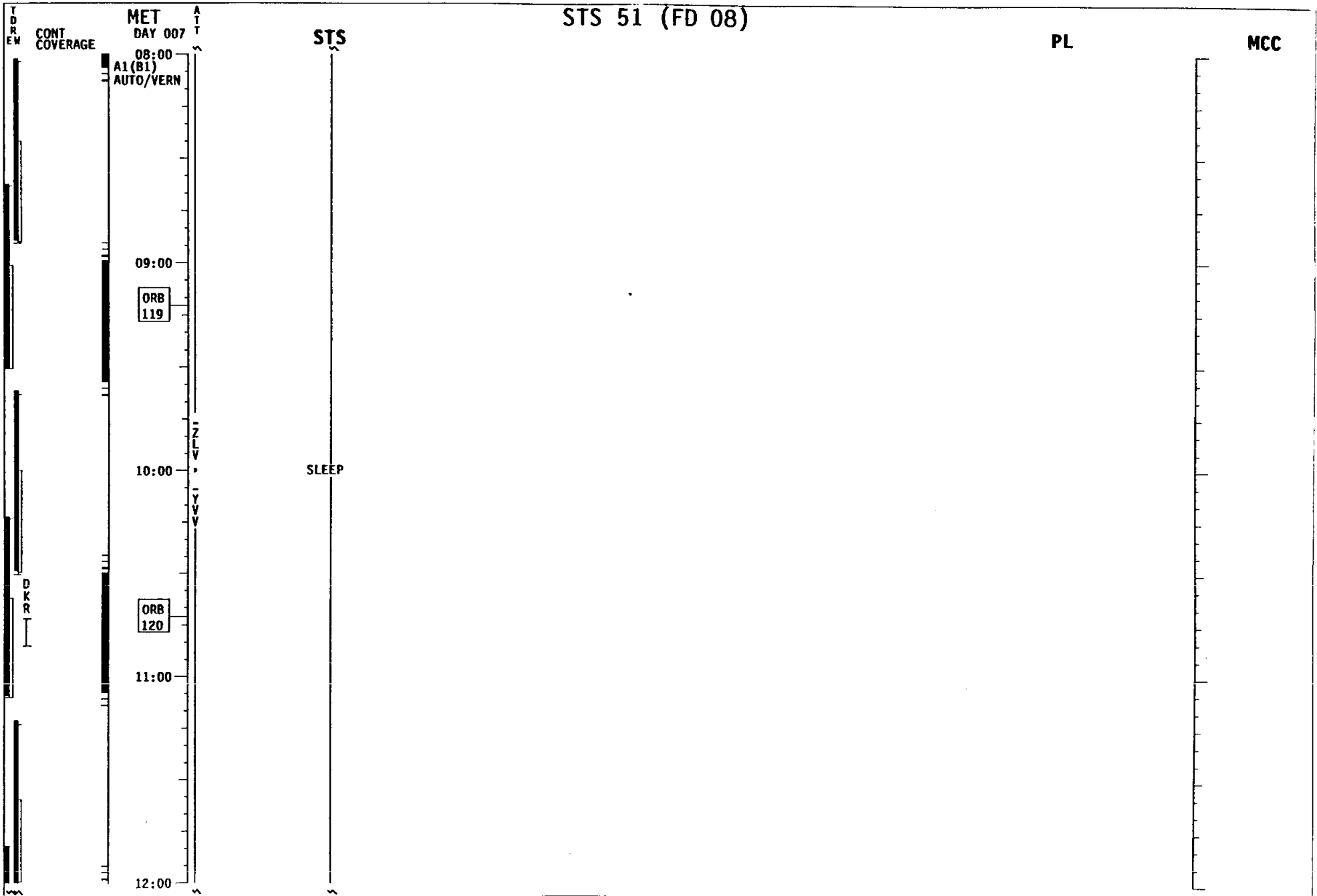
07:00

SLEEP

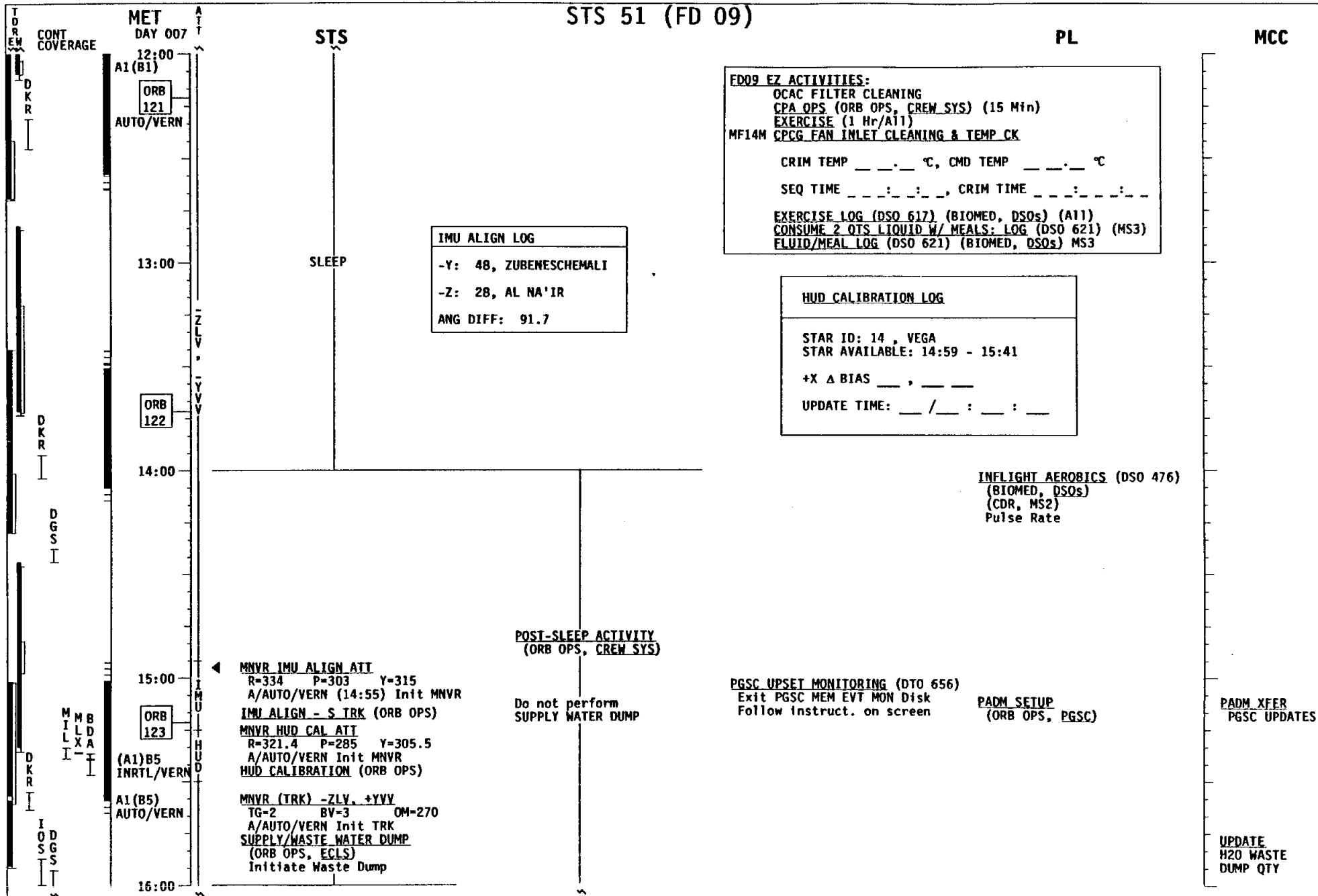
ORB
118

08:00

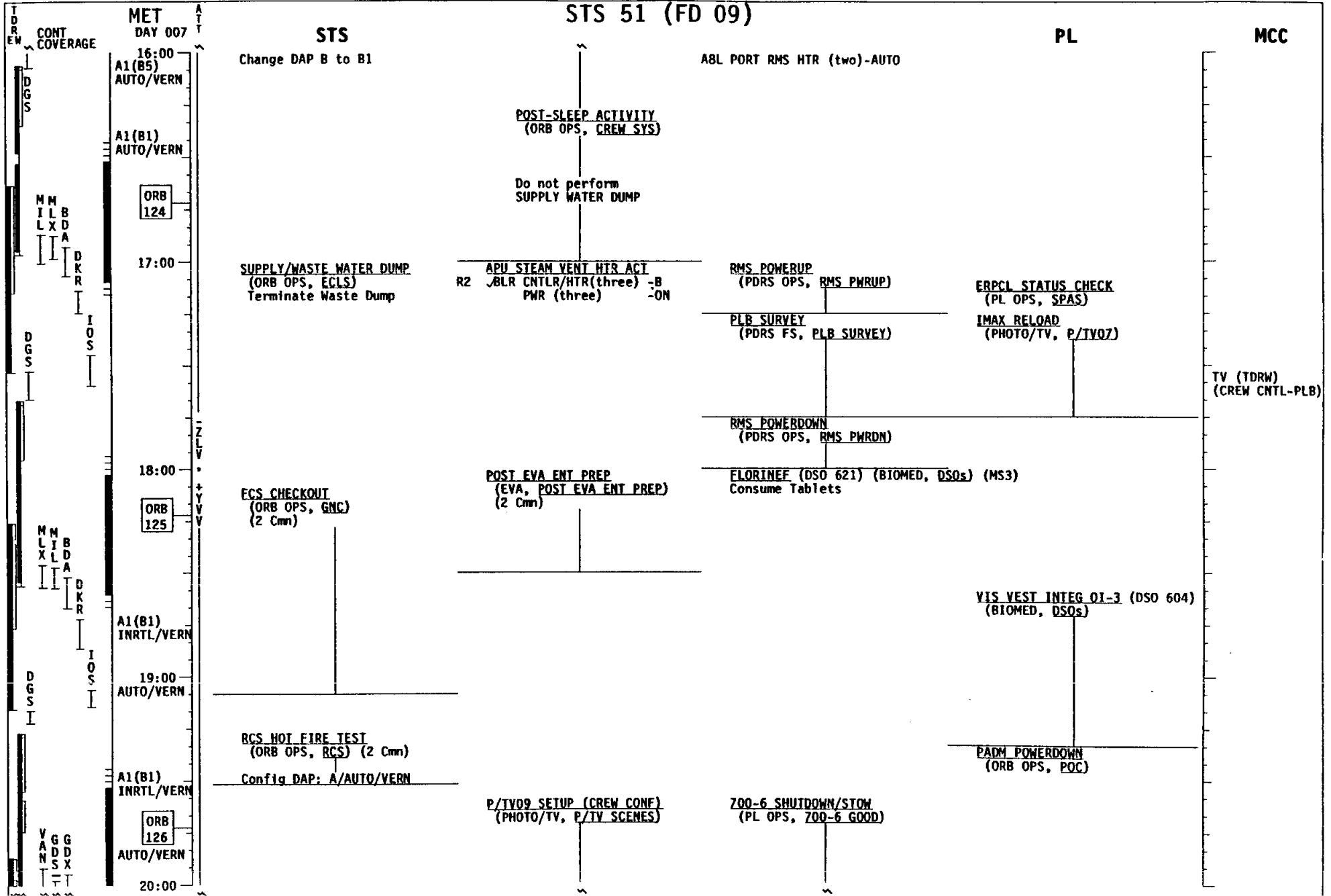
STS 51 (FD 08)



STS 51 (FD 09)



STS 51 (FD 09)



STS 51 (FD 09)

STS

PL

MCC

MET DAY 008

00:00

A1 (B1)

AUTO/VERN

ORB 129

L17 Check MCIU filter screen

01:00

CABIN CONFIG/STOW (A11)

As time permits, perform PRE-DEORBIT PREP ACTIVITIES [A]

[A] PRE-DEORBIT PREP ACTIVITIES

OCAC STOW
 STOW QUICK DON MASKS
 AIRLOCK CLOSEOUT
 Remove loose items stored in Airlock
 Perform AIRLOCK ENT & SW VERIF
 (DEORBIT PREP, ENT SW LIST/VERIF),
 p. 3-27 & 3-28
 SEAT INSTALLATION

02:00

EPS SSR-6 FC PWRUP (DTO 412)
 (MAL, EPS SSR) FC 1

OCAC STOW
 (ORB OPS, CREW SYS)

ERPL STATUS CHECK
 (PL OPS, SPAS)

UPLINK
 FUEL CELL
 PURGE

03:00

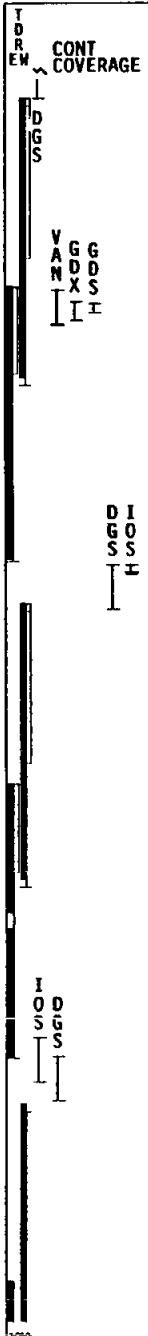
KU-BD ANT STOW
 (ORB OPS, COMM/INST)

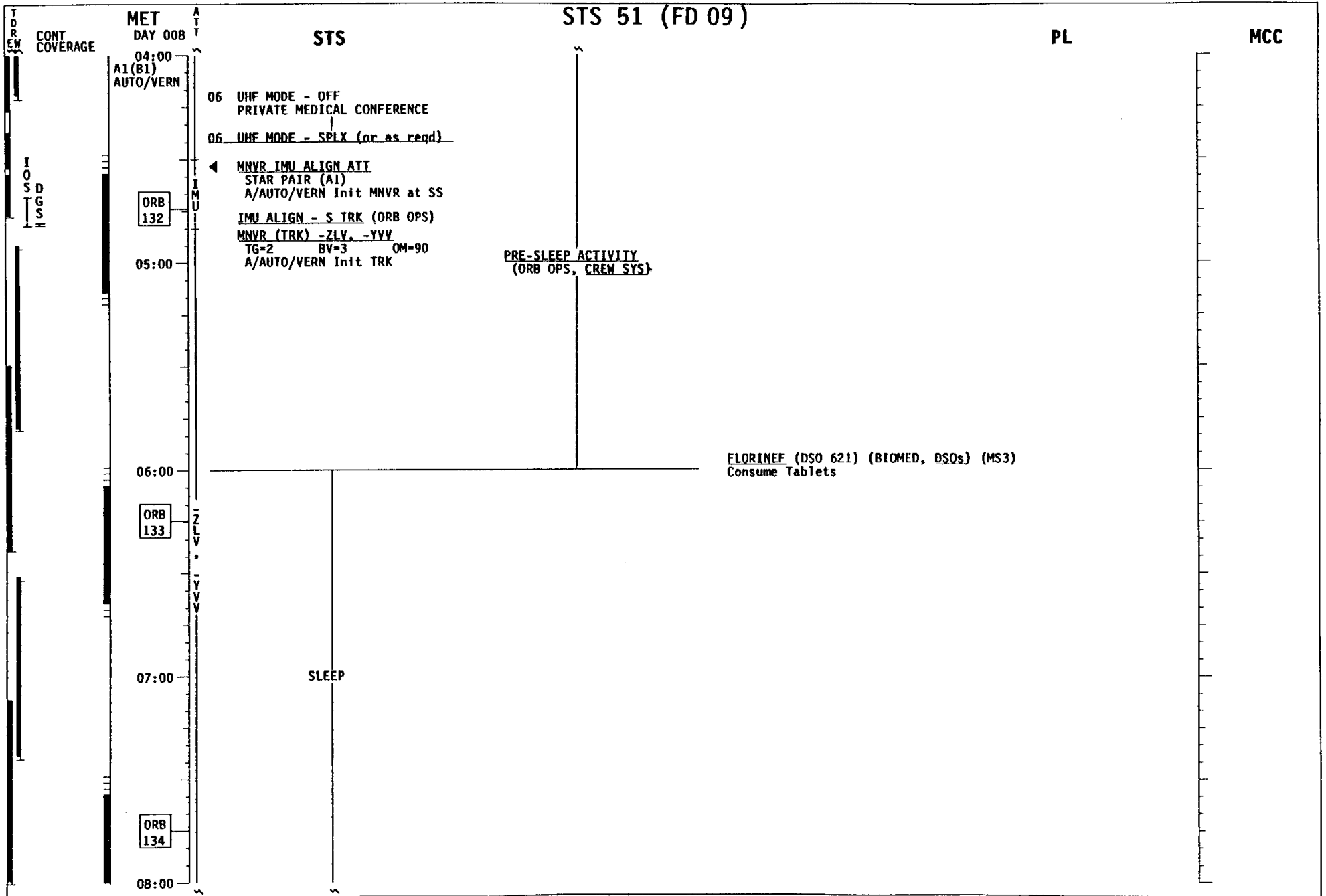
ORB 131

A12 HYD CIRC PUMP PWR 1 - MNA
 2 - MNB

PRE-SLEEP ACTIVITY
 (ORB OPS, CREW SYS)

04:00

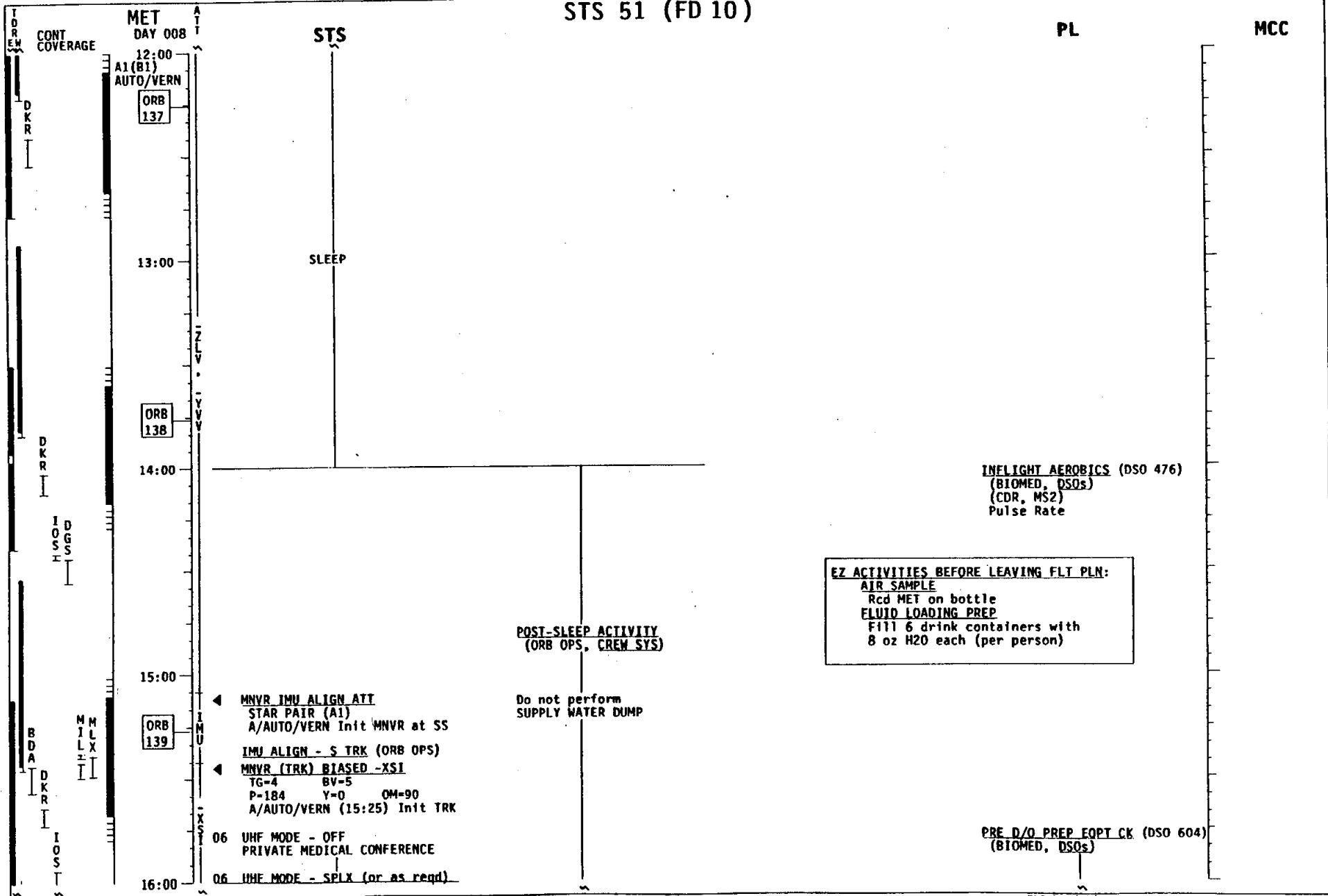




STS 51 (FD 10)

PL

MCC

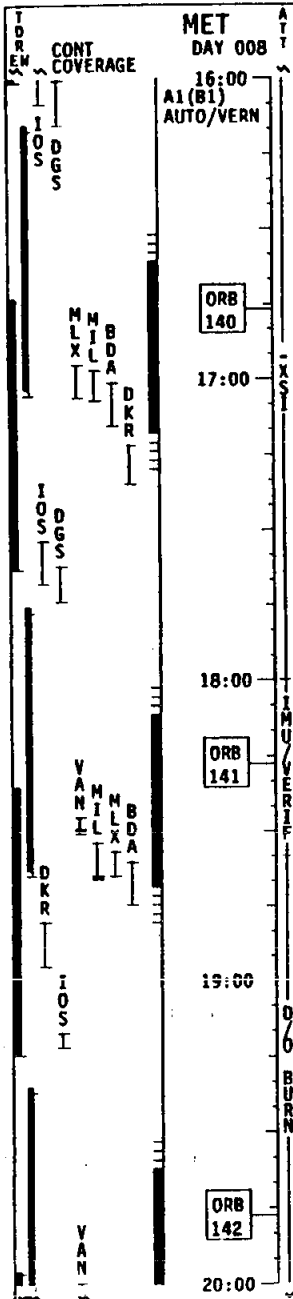


STS 51 (FD 10)

STS

PL

MCC



POST-SLEEP ACTIVITY
(ORB OPS, CREW SYS)

Do not perform
SUPPLY WATER DUMP

Update: CRT TIMER SETUP PAD
in NOMINAL DEORBIT PREP

GO TO DEORBIT PREP AT 8/16:59

PRE D/O PREP EQPT CK (DSO 604)
(BIOMED, DSOs)

ORTHO FUNCTION (DSO 603B)
(BIOMED, DSOs)

UPLINK
FUEL CELL
PURGE

UPDATE
CRT TIMER
SETUP PAD

CONTINGENCY TIMELINES

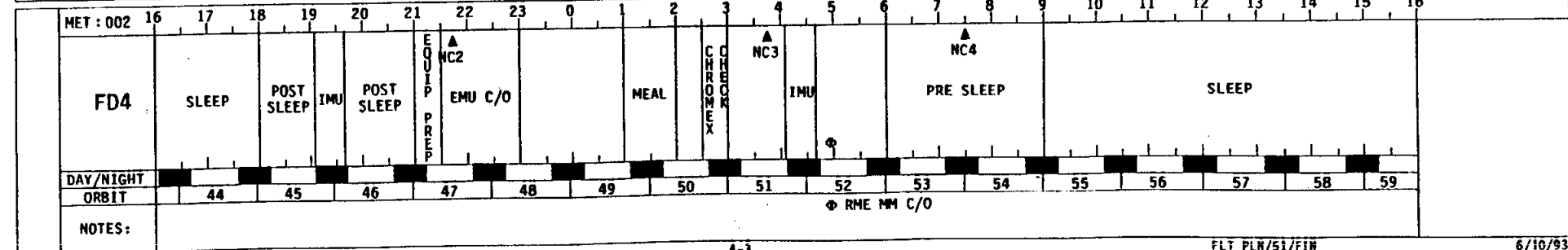
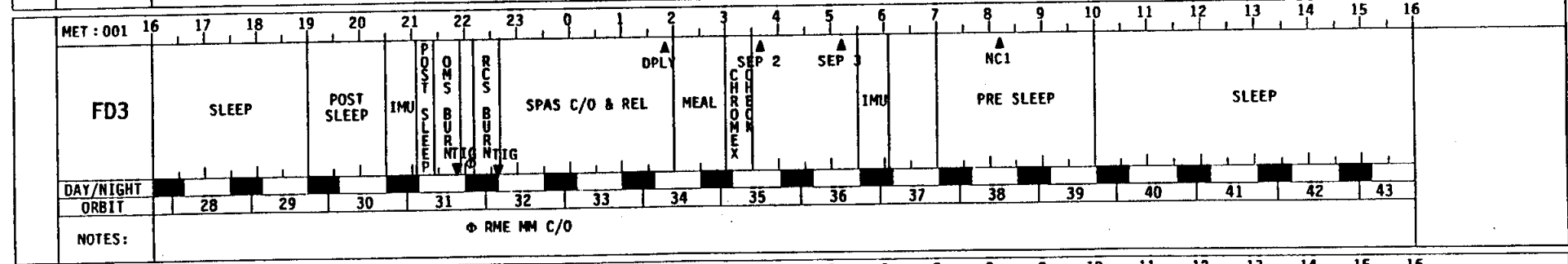
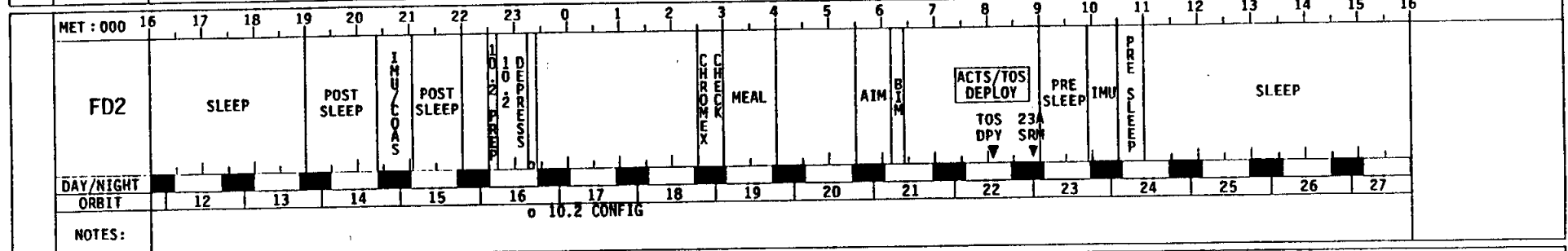
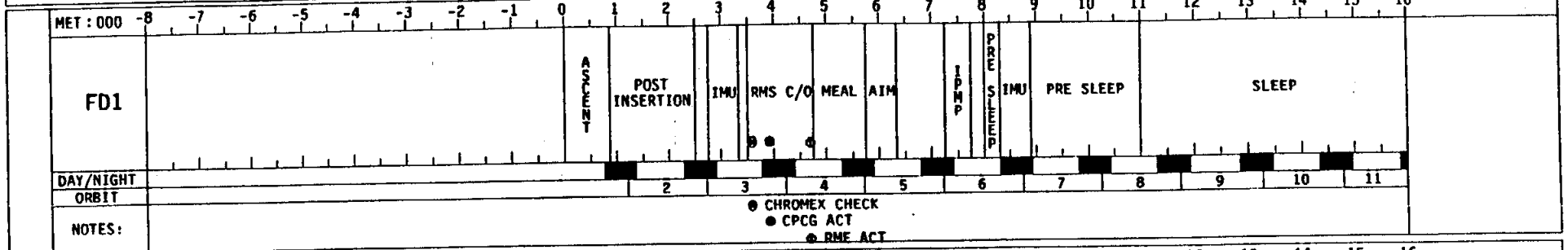
FD2 ACTS/TOS - FD3 ORFEUS/SPAS TIMELINE.....	4-2
MINIMUM DURATION FLIGHT (MDF) TIMELINE.....	4-9
10-DAY OVERVIEW.....	4-11

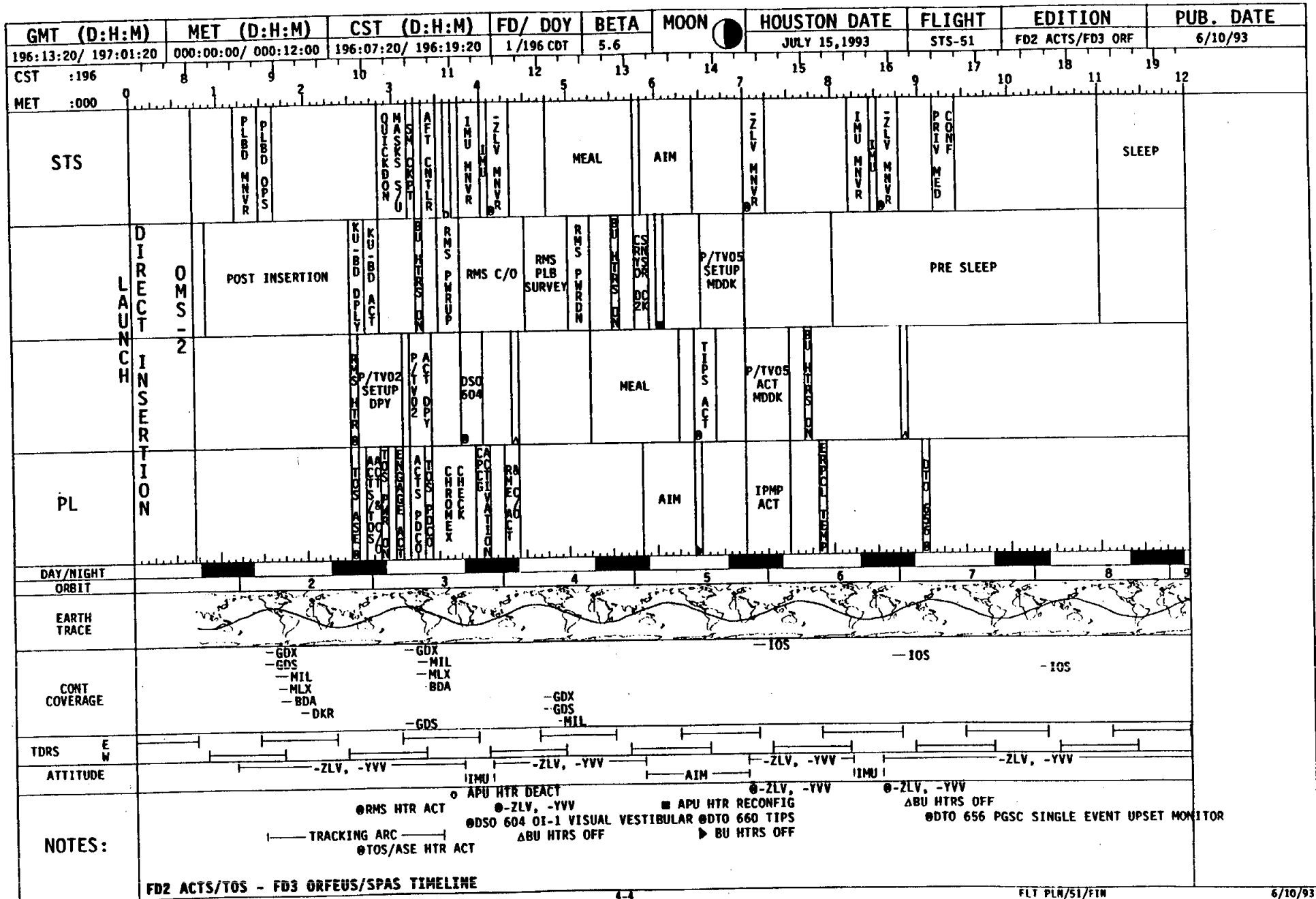
CONTINGENCY
TIMELINES

FD2 ACTS/TOS - FD3 ORFEUS/SPAS TIMELINE

The Flight Day 2 ACTS/TOS - FD3 ORFEUS/SPAS Timeline assumes a launch slip such that the Flight Day 1 ACTS/TOS deploy opportunity has been lost. (After 1400 GMT assuming a 6/30/93 launch.) Some ACTS/TOS activities will occur on Flight Day 1 and those which require repeating will occur during the deploy timeframe on Flight Day 2. ORFEUS/SPAS deploy activities slip one day to Flight Day 3. ORFEUS/SPAS retrieval will occur as planned on Flight Day 8.

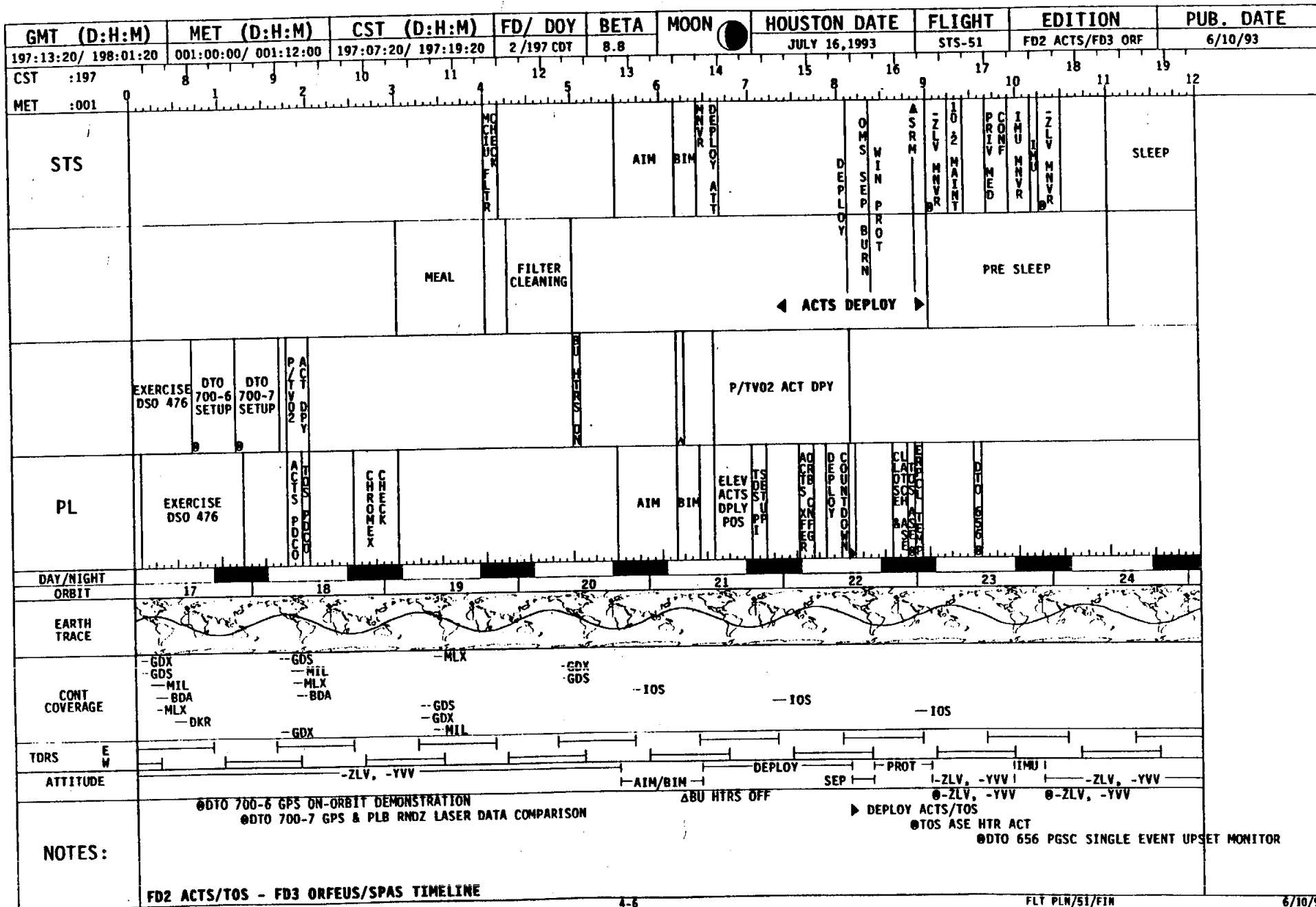
CONTINGENCY
TIMELINES



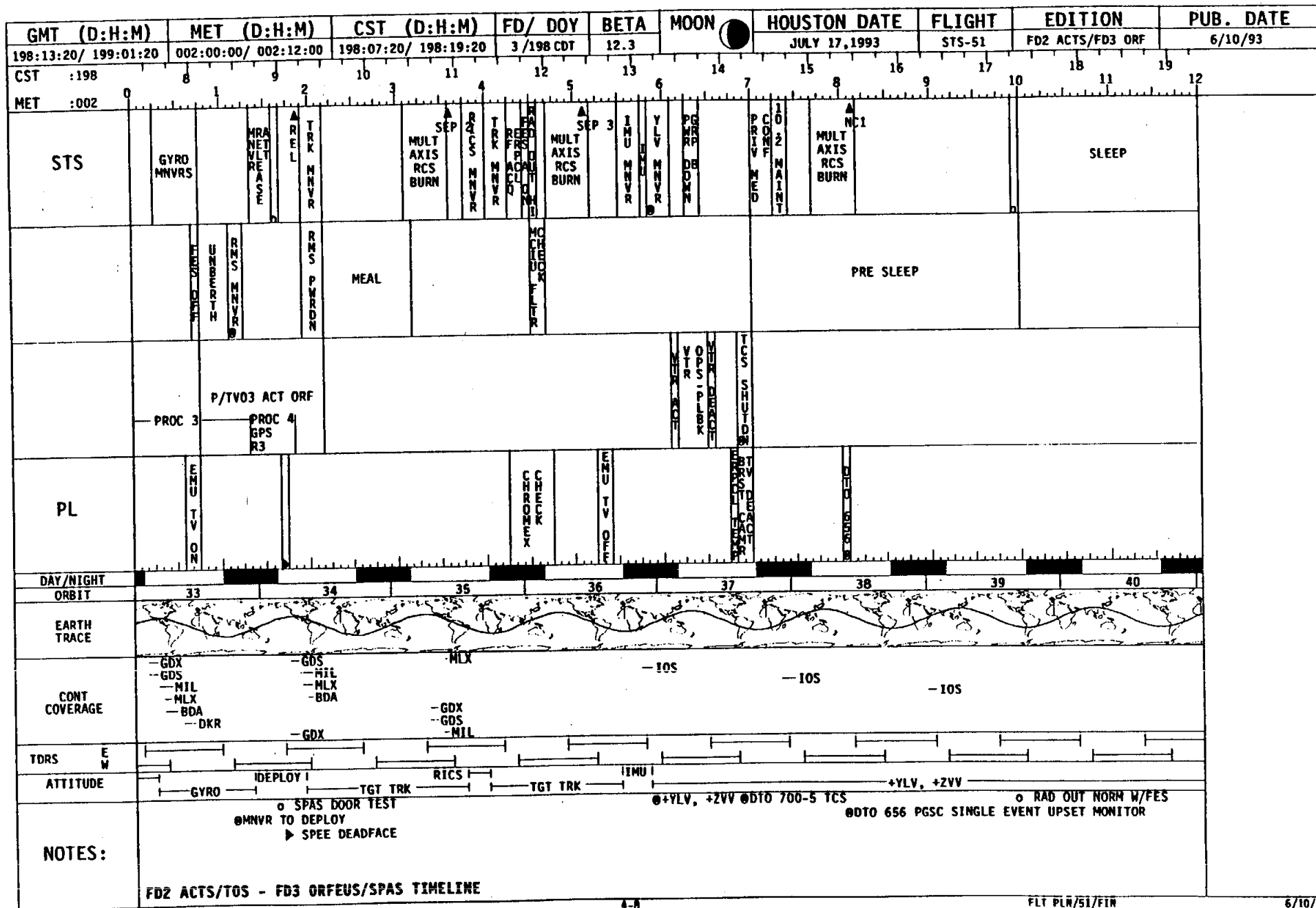


GMT (D:H:M)	MET (D:H:M)	CST (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE						
197:01:20/ 197:13:20	000:12:00/ 001:00:00	196:19:20/ 197:07:20	2/196 CDT	7.2		JULY 15, 1993	STS-51	FD2 ACTS/FD3 ORF	6/10/93						
CST :196	20	21	22	23	0	CST:197	1	2	3	4	5	6	7	0	MET:001
MET :000	12	13	14	15	16	17	18	19	20	21	22	23	0		
STS	SLEEP										10.2 DEPRESS		10.2 DEPRESS	10.2 DEPRESS	
	POST SLEEP														
											P/TVO2 SETUP DPY	TVO2 SETUP IMAX	EDSO 476		
PL													DSO 604		
DAY/NIGHT															
ORBIT	9	10	11	12	13	14	15	16							
EARTH TRACE															
CONT COVERAGE	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR	-DKR
TDRS															
ATTITUDE															
NOTES:	<p>DSO 476 AEROBICS @AFT STATION @-ZLV, -YVV @BU HTRS OFF @DTO 656 PGSC SINGLE EVENT UPSET MONITOR</p> <p>DSO 604 01-3 VISUAL VESTIBULAR</p>														

FD2 ACTS/TOS - FD3 ORFEUS/SPAS TIMELINE

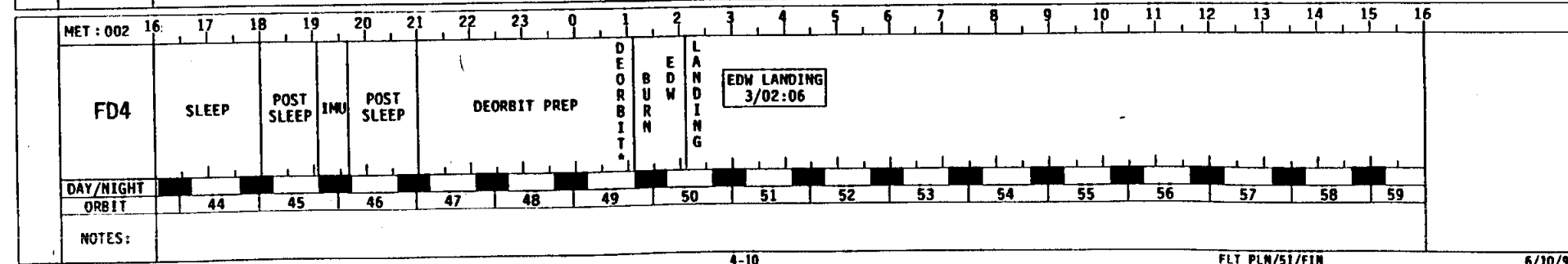
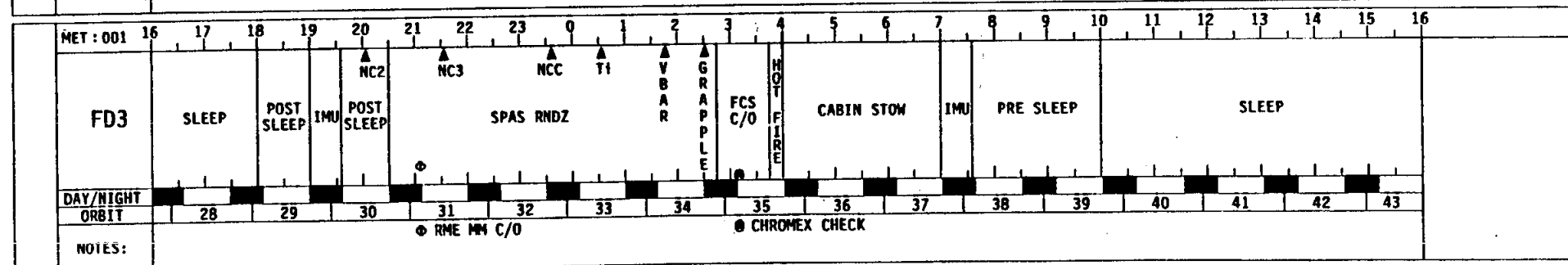
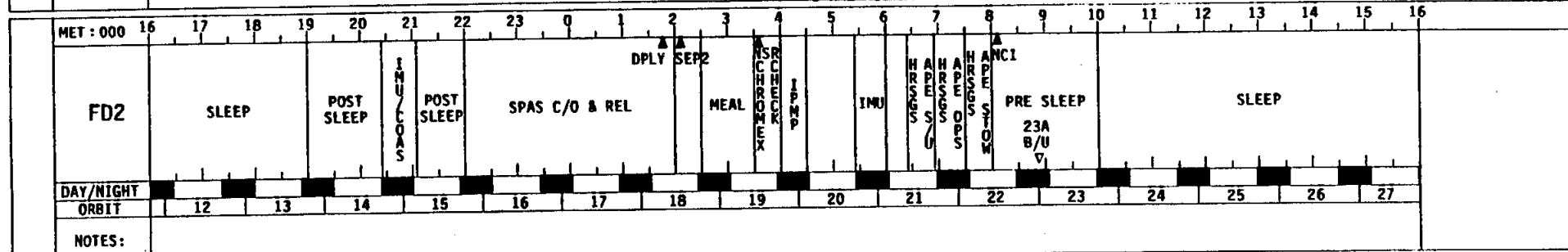
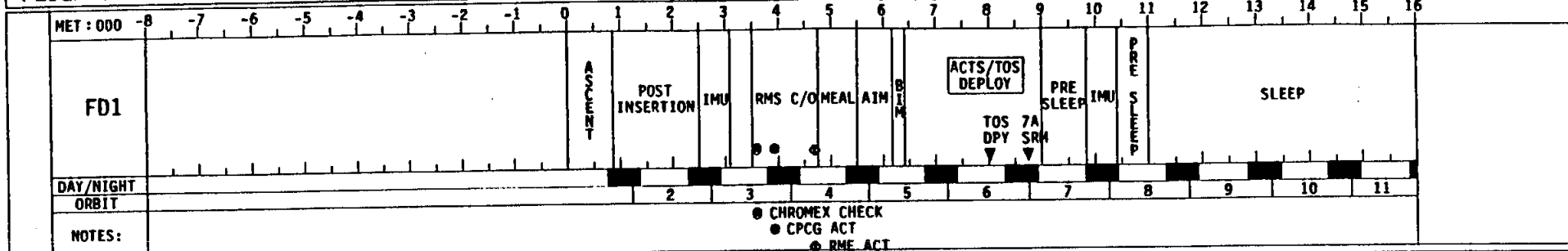


GMT (D:H:M)	MET (D:H:M)	CST (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE																
198:01:20/ 198:13:20	001:12:00/ 002:00:00	197:19:20/ 198:07:20	3/197 CDT	10.5		JULY 16, 1993	STS-51	FD2 ACTS/FD3 ORF	6/10/93																
CST :197	20	21	14	22	15	23	16	0	CST:198	1	18	2	19	3	20	4	21	5	22	6	23	7	0	MET:002	
MET :001	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
STS	SLEEP										POST SLEEP														
PL																									
DAY/NIGHT	[Day/Night Cycle]										[Day/Night Cycle]														
ORBIT	25										26														
EARTH TRACE	[Earth Trace]										[Earth Trace]														
CONT COVERAGE	-DKR										-DKR, -MLX, -BDA, -DKR, -IOS, -MIL, -MLX, -BDA														
TDRS	[TDRS]										[TDRS]														
ATTITUDE	-ZLV, -YVV										IIMU, LVLH, RCS, INTRL														
NOTES:											@DSO 476 AEROBICS @-ZLV, -YVV @RMS HTR ACT @DSO 700-5 TCS @DTO 656 PGSC SINGLE EVENT UPSET MONITOR @DTO 668 ADV. LOWER BODY RESTRAINT TEST														
FD2 ACTS/TOS - FD3 ORFEUS/SPAS TIMELINE																									



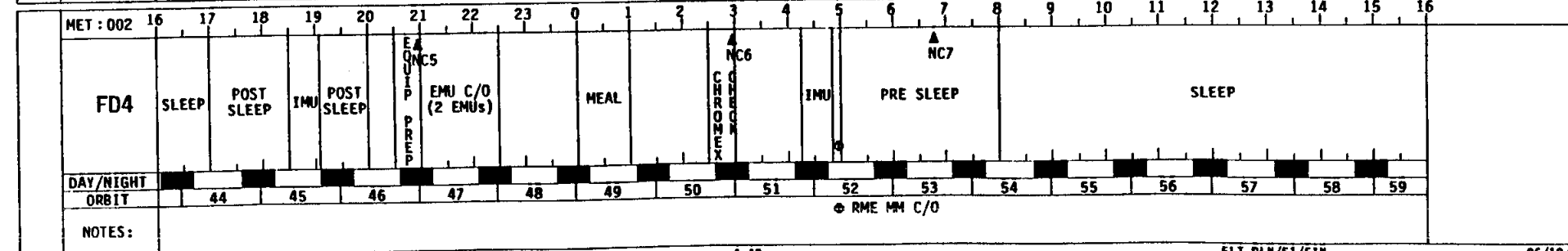
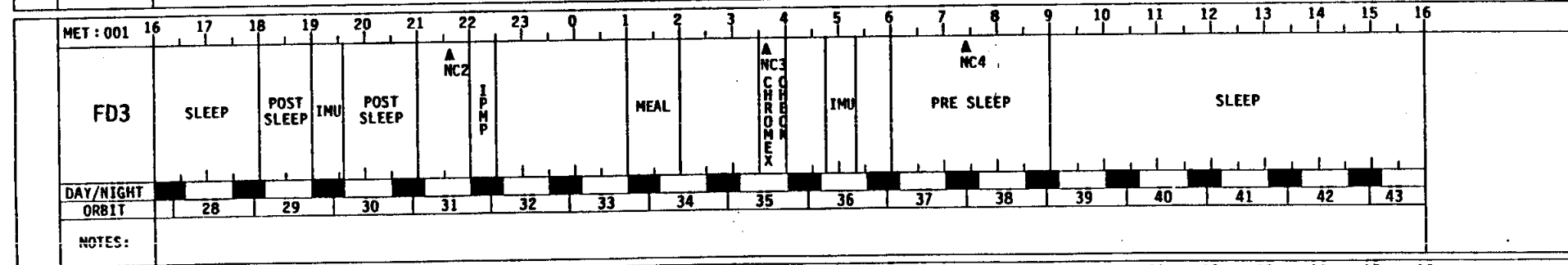
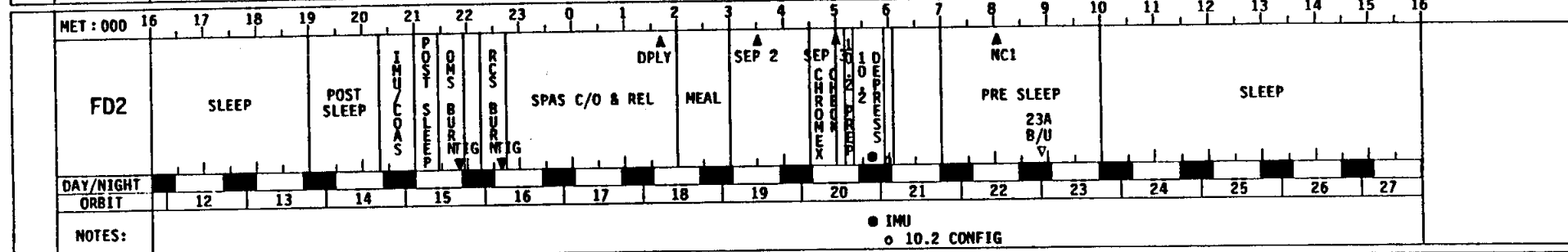
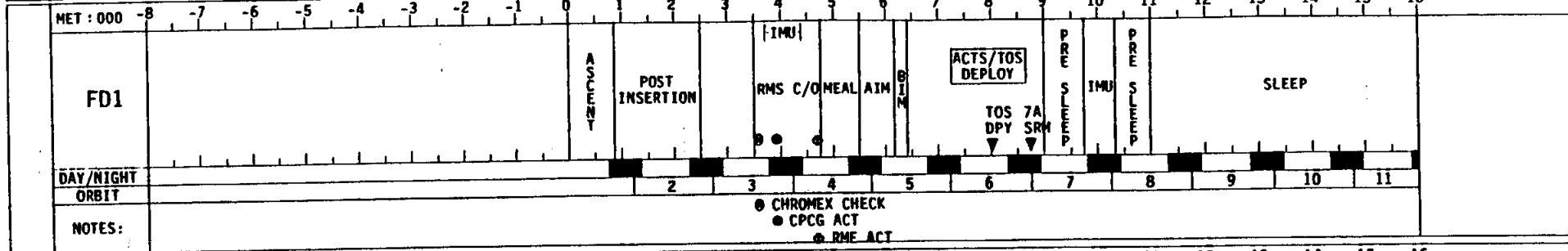
MINIMUM DURATION FLIGHT (MDF) TIMELINE

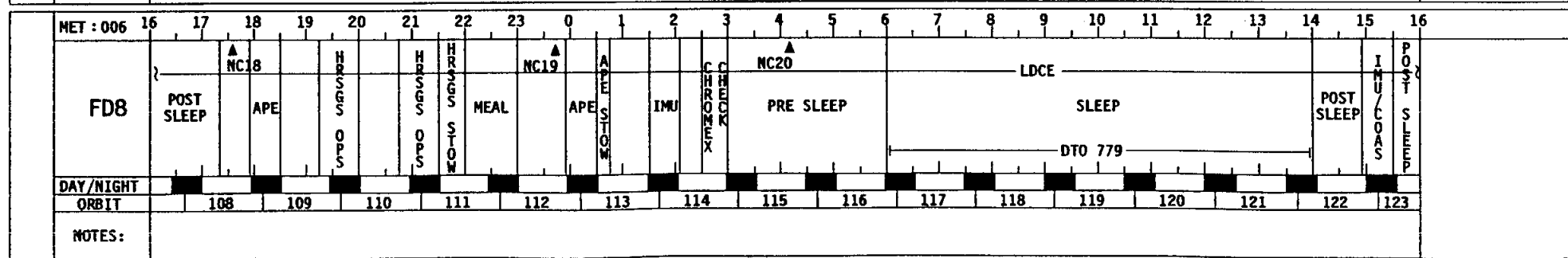
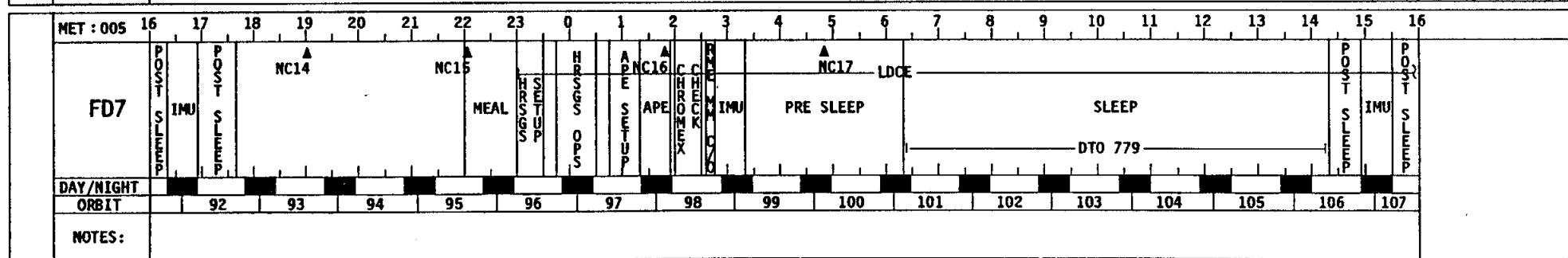
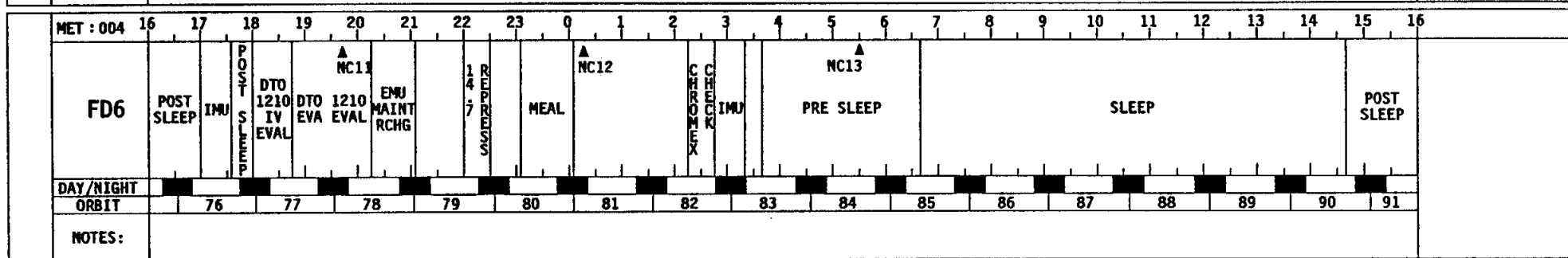
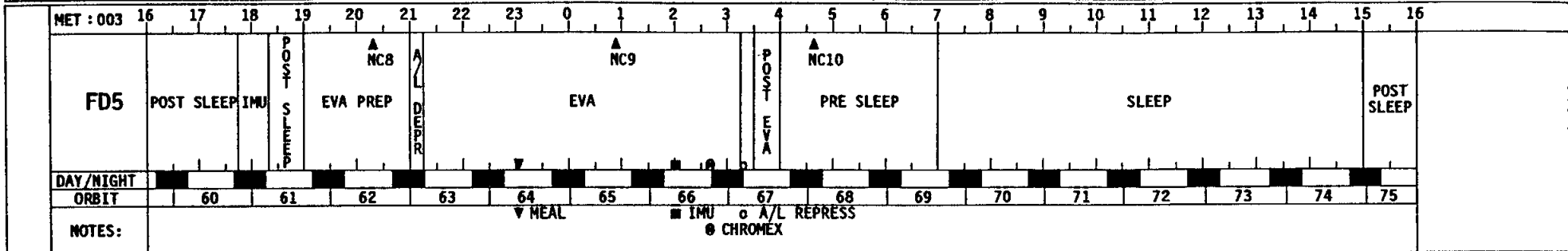
The MDF timeline assumes that a failure occurred during or shortly after ascent which places the orbiter in an MDF posture. The timeline is designed to achieve the highest priority mission objectives. The nominal trajectory was used for this timeline.

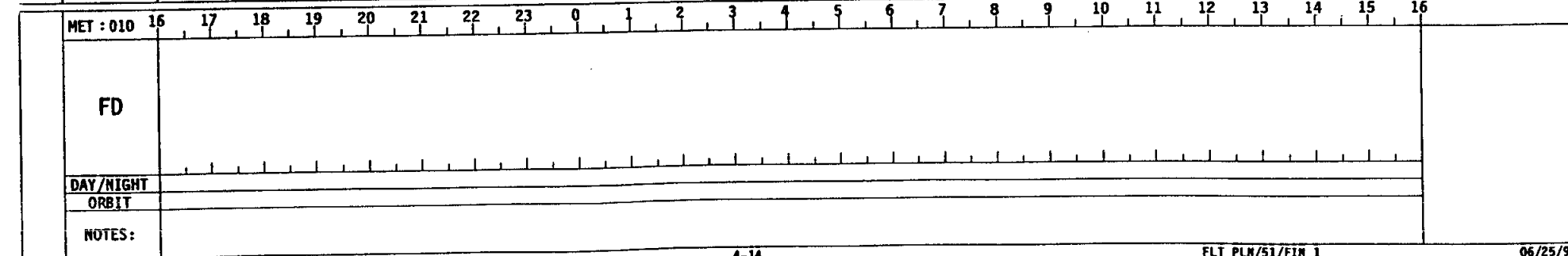
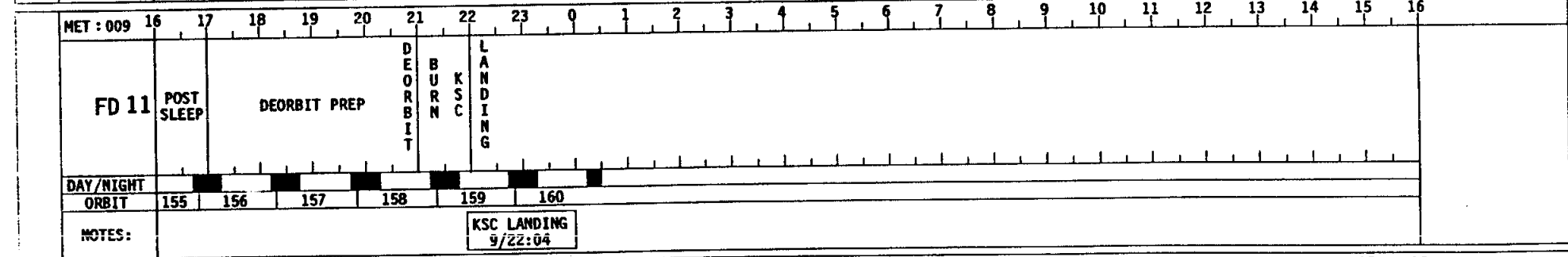
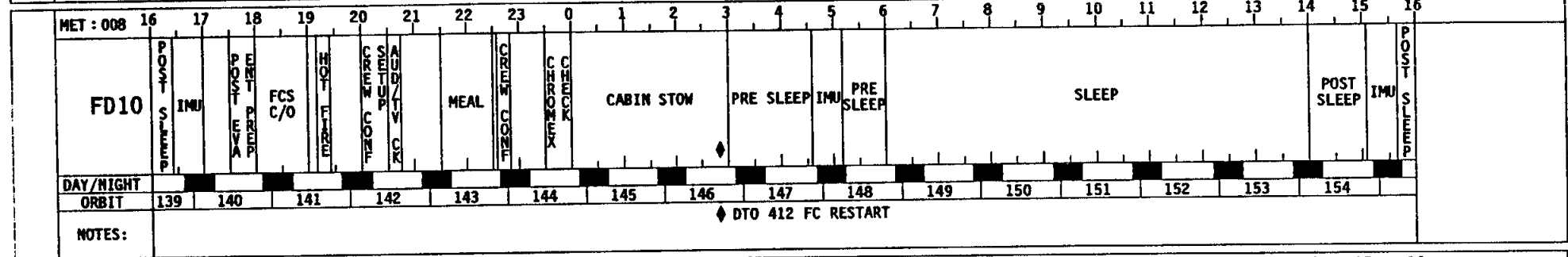
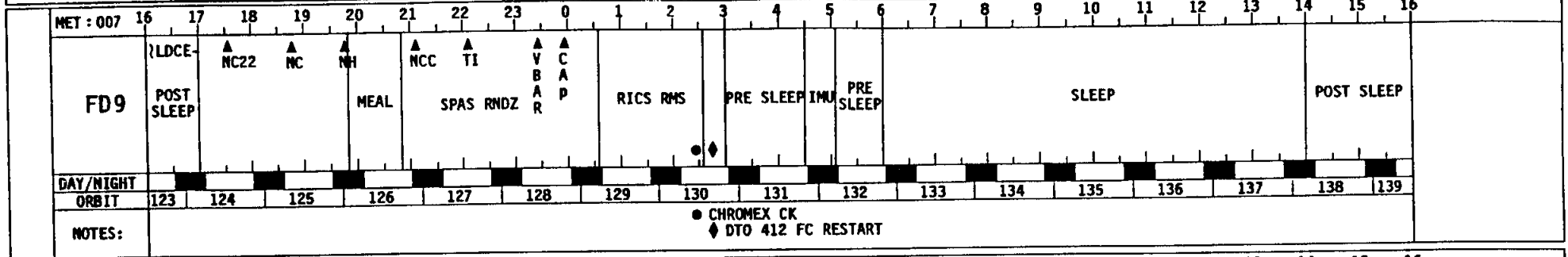


10-DAY OVERVIEW

The 10-day Overview timeline shows how the crew sleep cycle is affected by the real-time addition of a tenth day. ORFEUS/SPAS science collection is extended an extra day so that retrieval would occur on Flight Day 9. Activities nominally scheduled for Flight Day 6 and beyond would occur as planned but one day later. This ensures the orbiter is not exposed to additional orbital debris risks.







The sections following this divider page
will not be included in flight copies.

ATTITUDE TIMELINE

ATTITUDE
TIMELINE

Attitude Timeline						
GMT/MET	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT	
1 000/00:40:00 MET 196/14:00:00 GMT	INRTL R=147.00 MNVR P= 37.00 Y=297.00	TRN AUTO PRI	DSC 0.500 DB AT 3.50 DB RT 0.50	SUN R 86 P 174		OHS-2 ATT.
2 000/01:12:00 MET 23:42 196/14:32:00 GMT 43:42	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO PRI	DSC 0.200 DB AT 5.00 DB RT 0.20	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV -YVV NOSE NORTH IMU ALIGN: STARS O' OPP.
3 000/03:45:00 MET 53:40 196/17:05:00 GMT 13:40	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 126 P 130	STAR PAIR A1: -Z: 14 -Y: 26	IMU ALIGN (IF REQUIRED)
4 000/04:05:00 MET 15:25 196/17:25:00 GMT 35:25	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV -YVV NOSE NORTH
5 000/05:30:00 MET 35:38 196/18:50:00 GMT 55:38	INRTL R=242.00 MNVR P=140.00 Y=353.00	A4 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 176 P 93		AIM 1
6 000/05:40:00 MET 43:00 196/19:00:00 GMT 03:00	INRTL R=332.00 MNVR P=140.00 Y=353.00	A4 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 86 P 93	+90 DEG ROLL	AIM 2
7 000/05:48:00 MET 51:00 196/19:08:00 GMT 11:00	INRTL R= 7.92 MNVR P=233.71 Y=332.23	A4 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 87 P 86	+90 DEG PITCH	AIM 3
8 000/05:56:00 MET 06:02:00 196/19:16:00 GMT 22:00	INRTL R=352.08 MNVR P= 53.71 Y= 27.77	A4 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 93 P 94	-180 DEG PITCH	AIM 4
9 000/06:10:00 MET 13:58 196/19:30:00 GMT 33:58	INRTL R=252.31 MNVR P= 27.15 Y= 48.21	A4 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 207 P 73	TOS BIM ARI	7A BIM ATT
10 000/06:25:00 MET 29:18 196/19:45:00 GMT 49:18	TGT=4 RA= 114.516 BV=5 DEC= 21.533N P=283.39 Y= 0.00 OM= 90.00 SUN BETA= +6.61	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 180 P 77	INRTL R=251.63 P= 78.70 Y= 41.31	DEPLOY ATT DPY: 0/07:58:02
11 000/07:57:02 MET 196/21:17:02 GMT DEPLOY -01:00		B1 FREE PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 180 P 77	INRTL R=251.63 HOLD P= 78.57 Y= 41.36	FREE DRIFT FOR DEPLOY
12 000/07:58:27 MET 196/21:18:27 GMT DEPLOY +00:25	INRTL BV=5 ROTR P= 0.00 Y=270.00	B1 FREE PRI	DSC 0.800 DB AT 3.00 DB RT 0.20		INRTL R=251.63 P= 78.57 Y= 41.36	2.2 FPS -X SEP -56 DEG PITCH

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

Attitude Timeline

GMT/MET	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT	
1 000/07:59:37 MET 196/21:19:37 GMT		B1 INRT PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 180 P 21	INRTL R=147.71 HOLD P=189.55 Y= 73.75	NULL PITCH RATE
2 000/08:07:00 MET 12:32 196/21:27:00 GMT 32:32 DEPLOY +09:00	INRTL R= 89.00 MNVR P= 71.00 Y=309.00	B1 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 305 P 163	TIG: 0/08:15:06	OMS SEP
3 000/08:17:00 MET 21:21 196/21:37:00 GMT 41:21	TGT=1 BV=5 P=276.00 Y= 0.00 OM= 57.00	B1 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20		RNDZ NAV must be enabled	WINDOW PROTECT
4 000/08:43:00 MET 196/22:03:00 GMT		B1 INRT VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 171 P 97	INRTL R=283.75 HOLD P= 35.13 Y= 24.82	INERTIAL HOLD TOS SRM: 0/08:43:08
5 000/08:55:00 MET 09:08:27 196/22:15:00 GMT 28:27	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV -YVV NOSE NORTH
6 000/09:45:00 MET 53:40 196/23:05:00 GMT 13:40	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 125 P 130	STAR PAIR A1	IMU ALIGN
7 000/10:05:00 MET 15:11 196/23:25:00 GMT 35:11	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV -YVV NOSE NORTH
8 000/20:20:00 MET 28:41 197/09:40:00 GMT 48:41	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 125 P 130	STAR PAIR A1 -Z COAS: 14, VEGA 0/20:24-0/21:07	IMU ALIGN COAS CAL
9 000/20:45:00 MET 56:06 197/10:05:00 GMT 16:06	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV -YVV NOSE NORTH
10 000/21:37:00 MET 45:16 197/10:57:00 GMT 11:05:16	INRTL R= 27.00 MNVR P=221.00 Y= 67.00	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 249 P 10	TIG: 0/21:52:27	HITE BURN - OMS
11 000/21:54:00 MET 197/11:14:00 GMT	DAP: LVLH	B1 LVLH VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 68	LVLH R=359.74 HOLD P=201.68 Y= 0.42	LVLH HOLD BETWEEN BURNS CIRC @ 0/22:41
12 000/22:45:00 MET 52:38 197/12:05:00 GMT 12:38	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV +YVV NOSE SOUTH

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

Attitude Timeline

GHT/MET	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT	
1 000/23:16:00 MET 24:12 197/12:36:00 GMT 44:12	TGT=2 BV=5 P= 0.00 Y=270.00 OM=315.00	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 270 P 90	LVLH R= 90.00 P=180.00 Y= 45.00	ORFEUS-SPAS GYRO COMP
2 000/23:40:00 MET 197/13:00:00 GMT ON MCC GO	GNC UNIV PTG ITEM 21 CANCEL	A19 INRT VERN	DSC 0.020 DB AT 0.10 DB RT 0.01	SUN R 257 P 89	INRTL R=161.92 HOLD P=115.97 Y= 11.05	GYRO COMP 30-MINUTE INERTIAL HOLD
3 001/00:10:00 MET 13:42 197/13:30:00 GMT 33:42	INRTL R= 67.00 MNVR P= 53.00 Y=348.00	B1 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 15 P 134	PROC IN PL OPS IN ATTITUDE: A19/VERN	ORFEUS-SPAS GYRO SCALING INITIAL ATT.
4 001/00:18:00 MET 21:00 197/13:38:00 GMT 41:00	INRTL R= 77.00 MNVR P=328.04 Y= 22.47	B1 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 45 P 79	+90 DEG. YAW	ORFEUS/SPAS GYRO SCALING
5 001/00:24:00 MET 27:00 197/13:44:00 GMT 47:00	INRTL R=347.00 MNVR P=328.04 Y= 22.47	B1 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 135 P 79	-90 DEG. ROLL	ORFEUS/SPAS GYRO SCALING
6 001/00:30:00 MET 33:00 197/13:50:00 GMT 53:00	INRTL R=337.00 MNVR P= 53.00 Y=348.00	B1 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 105 P 134	+90 DEG PITCH	ORFEUS/SPAS GYRO SCALING
7 001/01:15:00 MET 26:12 197/14:35:00 GMT 46:12	TGT=2 BV=5 P=264.00 Y=342.00 OM=289.00	A11 AUTO VERN	DSC 0.200 DB AT 2.00 DB RT 0.04	EARTH R 198 P 96	LVLH R=359.77 P= 18.73 Y=288.04	BIAS +ZLV +YVV RELEASE ATT.
8 001/01:44:00 MET 197/15:04:00 GMT RELEASE -01:00		A11 INRT VERN	DSC 0.200 DB AT 2.00 DB RT 0.04	SUN R 73 P 64	INRTL R= 28.00 HOLD P=240.91 Y=355.46	INERTIAL HOLD
9 001/01:44:30 MET 197/15:04:30 GMT RELEASE -00:30		A11 FREE VERN	DSC 0.200 DB AT 2.00 DB RT 0.04	SUN R 73 P 64	INRTL R= 28.00 HOLD P=240.91 Y=355.46	FREE DRIFT FOR RELEASE REL. @ SR+14
10 001/01:46:00 MET 197/15:06:00 GMT		A11 INRT VERN	DSC 0.200 DB AT 2.00 DB RT 0.04	SUN R 73 P 64	INRTL R= 28.00 HOLD P=240.91 Y=355.46	INERTIAL HOLD FOR SEP 1
11 001/01:50:00 MET 02:02:11 197/15:10:00 GMT 22:11 RELEASE +05:00	TGT=1 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A7 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02		RNDZ NAV must be enabled	-2 TGT TRK
12 001/01:57:00 MET 197/15:17:00 GMT		A7 INRT VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 248 P 168	INRTL R=299.61 HOLD P= 20.96 Y=299.36	INERTIAL HOLD

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

Attitude Timeline

GMT/MET	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT	
1 001/02:15:00 MET 24:59 197/15:35:00 GMT 44:59	TGT=2 BV=2 P=180.00 Y= 0.00 OM= 0.00	A7 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 180	LVLH R= 0.00 P= 90.00 Y= 0.00	-XLV +ZVV VBAR STAT. KEEP
2 001/03:30:00 MET 197/16:50:00 GMT		A7 LVLH PRI	DSC 0.200 DB AT 2.00 DB RT 0.20	EARTH R 331 P 180	LVLH R= 0.00 HOLD P= 90.00 Y= 0.00	LVLH HOLD FOR SEP 2
3 001/03:34:00 MET 35:00 197/16:54:00 GMT 55:00	TGT=2 BV=5 P=240.00 Y= 0.00 OM= 0.00	B7* AUTO PRI	DSC 1.000 DB AT 5.00 DB RT 0.20	EARTH R 180 P 120	LVLH R= 0.00 P= 30.00 Y= 0.00	BIAS TAIL EARTH *MODIFIED B7
4 001/03:37:00 MET 197/16:57:00 GMT	INRTL BV=3 ROTR P= 90.00 Y= 0.00	B7* AUTO PRI	DSC 1.000 DB AT 5.00 DB RT 0.20		INRTL R= 68.77 P=152.84 Y=342.05	YAW ROTATION FOR RICS FILM *MODIFIED B7
5 001/03:43:00 MET 197/17:03:00 GMT	INRTL BV=5 ROTR P= 60.00 Y= 0.00	B7* AUTO PRI	DSC 1.000 DB AT 5.00 DB RT 0.20		INRTL R= 68.77 P=152.84 Y=342.05	BIAS YAW ROTAT. FOR RICS FILM *MODIFIED B7
6 001/03:49:00 MET 197/17:09:00 GMT	GNC UNIV PTG ITEM 21 CANCEL	B7* AUTO PRI	DSC 1.000 DB AT 5.00 DB RT 0.20	SUN R 351 P 95	INRTL R= 68.77 HOLD P=152.84 Y=342.05	CANCEL *MODIFIED B7
7 001/03:49:10 MET 53:49 197/17:09:10 GMT 13:49	TGT=1 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A7 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02		RNDZ NAV must be enabled	-Z TGT TRK
8 001/05:30:00 MET 41:46 197/18:50:00 GMT 19:01:46	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 125 P 129	STAR PAIR A1	IMU ALIGN (IF REQUIRED)
9 001/05:50:00 MET 57:22 197/19:10:00 GMT 17:22	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH IMU ALIGN: STARS O' OPP.
10 001/19:00:00 MET 12:34 198/08:20:00 GMT 32:34	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 125 P 129	STAR PAIR A1	IMU ALIGN
11 001/19:20:00 MET 27:56 198/08:40:00 GMT 47:56	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH
12 002/04:40:00 MET 50:34 198/18:00:00 GMT 10:34	INRTL R=142.00 MNVR P= 3.00 Y=326.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 345 P 146	STAR PAIR B1	IMU ALIGN

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

Attitude Timeline

NET/GMT	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT	
1 002/05:00:00 MET 07:00 198/18:20:00 GMT 27:00	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH
2 002/18:30:00 MET 42:54 199/07:50:00 GMT 08:02:54	INRTL R=180.00 MNVR P=288.00 Y= 76.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 0 P 31	STAR PAIR C1	IMU ALIGN
3 002/18:50:00 MET 58:38 199/08:10:00 GMT 18:38	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH
4 002/21:10:00 MET 18:04 199/10:30:00 GMT 38:04	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=230.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 90	LVLH R=180.00 P= 0.00 Y= 50.00	BIAS -ZLV +YVV RETROGRADE WATER DUMP
5 002/22:50:00 MET 58:04 199/12:10:00 GMT 18:04	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH
6 003/04:10:00 MET 22:06 199/17:30:00 GMT 42:06	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 124 P 128	STAR PAIR A1	IMU ALIGN
7 003/04:30:00 MET 37:31 199/17:50:00 GMT 57:31	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH
8 003/17:45:00 MET 56:40 200/07:05:00 GMT 16:40	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 124 P 127	STAR PAIR A1	IMU ALIGN
9 003/18:05:00 MET 16:19 200/07:25:00 GMT 36:19	TGT=2 BV=2 P=180.00 Y= 0.00 OM= 0.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 284 P 180	LVLH R= 0.00 P= 90.00 Y= 0.00	-XLV +ZVV TAIL DOWN
10 004/02:00:00 MET 11:36 200/15:20:00 GMT 31:36	INRTL R=180.00 MNVR P=288.00 Y= 76.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 360 P 32	STAR PAIR C1	IMU ALIGN
11 004/02:20:00 MET 29:58 200/15:40:00 GMT 49:58	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH
12 004/16:55:00 17:08:43 201/06:15:00 28:43	INRTL R=180.00 MNVR P=288.00 Y= 76.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 359 P 33	STAR PAIR C1	IMU ALIGN

*** ALL ATTITU
*** PYR EULER SEQUENCE

MEAN OF 1950 ***

5-6

FLT PLN/51/FIN 1

Attitude Timeline

GHT/MET	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT	
1 004/17:15:00 MET 26:42 201/06:35:00 GMT 46:42	TGT=2 BV=5 P= 0.00 Y= 90.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P= 90.00 Y= 90.00	+YLV +ZVV NOSE SOUTH
2 004/19:26:00 MET 33:49 201/08:46:00 GMT 53:49	INRTL R=102.00 MNVR P=325.00 Y= 44.00	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 26 P 64		NC11 - RCS
3 004/19:45:00 MET 59:59 201/09:05:00 GMT 19:59	TGT=1 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02		RNDZ NAV must be enabled	-Z TGT TRK
4 004/22:26:00 MET 40:59 201/11:46:00 GMT 12:00:59	INRTL R=101.00 MNVR P=325.00 Y= 43.00	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 27 P 64		NC12 - RCS
5 004/22:45:00 MET 54:16 201/12:05:00 GMT 14:16	TGT=2 BV=5 P= 0.00 Y= 90.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P=270.00 Y=270.00	+YLV -ZVV NOSE NORTH ORBITER BEHIND
6 005/02:55:00 MET 03:04:16 201/16:15:00 GMT 24:16	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 123 P 126	STAR PAIR A1	IMU ALIGN
7 005/03:15:00 MET 24:55 201/16:35:00 GMT 44:55	TGT=2 BV=5 P= 0.00 Y= 90.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P=270.00 Y=270.00	+YLV -ZVV NOSE NORTH
8 005/15:45:00 MET 53:07 202/05:05:00 GMT 13:07	INRTL R=180.00 MNVR P=288.00 Y= 76.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 359 P 34	STAR PAIR C1	IMU ALIGN
9 005/16:05:00 MET 12:29 202/05:25:00 GMT 32:29	TGT=2 BV=5 P= 0.00 Y= 90.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P=270.00 Y=270.00	+YLV -ZVV NOSE NORTH
10 005/21:25:00 MET 32:39 202/10:45:00 GMT 52:39	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=110.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 90	LVLH R=180.00 P= 0.00 Y=290.00	BIAS -ZLV -YVV POSTGRADE WATER DUMP
11 005/23:10:00 MET 17:39 202/12:30:00 GMT 37:39	TGT=2 BV=5 P= 0.00 Y= 90.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P=270.00 Y=270.00	+YLV -ZVV NOSE NORTH
12 006/02:15:00 MET 23:20 202/15:35:00 GMT 43:20	INRTL R=180.00 MNVR P=288.00 Y= 76.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 359 P 34	STAR PAIR C1	IMU ALIGN

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

ATTITUDE TIMELINE						
GHT/MET	MNVR OPTION	DAP	E/S	REF AT1/REMARKS	EVENT	
1 006/02:35:00 MET 42:12 202/15:55:00 GMT 16:02:12	TGT=2 BV=5 P= 0.00 Y= 90.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P=270.00 Y=270.00	+YLV -ZVV NOSE NORTH
2 006/15:00:00 MET 09:34 203/04:20:00 GMT 29:34	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 122 P 125	STAR PAIR A1	IMU ALIGN
3 006/15:20:00 MET 30:04 203/04:40:00 GMT 50:04	TGT=2 BV=5 P= 0.00 Y= 90.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P=270.00 Y=270.00	+YLV -ZVV NOSE NORTH
4 006/17:11:00 MET 24:13 203/06:31:00 GMT 44:13	INRTL R=268.00 MNVR P=152.00 Y=352.00	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 149 P 81		NC18 - RCS
5 006/17:31:00 MET 40:03 203/06:51:00 GMT 07:00:03	TGT=2 BV=5 P= 0.00 Y= 90.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 90 P 90	LVLH R= 0.00 P=270.00 Y=270.00	+YLV -ZVV NOSE NORTH
6 006/18:41:00 MET 54:18 203/08:01:00 GMT 14:18	INRTL R=272.00 MNVR P=332.00 Y= 8.00	B1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 211 P 99		NC19 - RCS
7 006/19:01:00 MET 03:21 203/08:21:00 GMT 23:21	TGT=1 BV=3 P= 90.00 Y= 0.00 OM= 0.00	B7 AUTO PRI	DSC 0.500 DB AT 2.00 DB RT 0.20		RNDZ NAV must be enabled	-Z TGT TRK NCC Ti
8 006/23:08:00 MET 203/12:28:00 GMT		A7 INRT PRI	DSC 0.200 DB AT 2.00 DB RT 0.20	SUN R 328 P 90	INRTL R= 89.08 HOLD P=151.40 Y=341.85	INERTIAL LOS RATES
9 006/23:30:00 MET 37:22 203/12:50:00 GMT 57:22	TGT=2 BV=2 P=180.00 Y= 0.00 OM= 0.00	A7 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 56 P 180	LVLH R= 0.00 P= 90.00 Y= 0.00	-XLV +ZVV ESTABLISH VBAR
10 007/00:00:00 MET 09:09 203/13:20:00 GMT 29:09	TGT=4 BV=5 P= 48.00 Y= 32.00 OM= 65.00 RA= 121.278 DEC= 20.337N	A8 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 40 P 55	INRTL R= 68.29 P=241.20 Y= 2.05	RICS PHOTO SEQ. POSITION SUN PROTECT ORFEUS STAR TRKR FOV
11 007/02:20:00 MET 34:48 203/15:40:00 GMT 54:48	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV +YVV NOSE SOUTH
12 007/04:30:00 MET 41:14 203/17:50:00 GMT 18:01:14	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 122 P 124	STAR PAIR A1	IMU ALIGN

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

Attitude Timeline

GMT/MET	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT	
1 007/04:50:00 MET 05:03:02 203/18:10:00 GMT 23:02	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV -YVV NOSE NORTH
2 007/14:55:00 MET 15:03:05 204/04:15:00 GMT 23:05	INRTL R=334.00 MNVR P=303.00 Y=315.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 162 P 123	SPECIAL PAIR: -Z: 28 -Y: 48	IMU ALIGN
3 007/15:15:00 MET 16:15 204/04:35:00 GMT 36:15	INRTL R=321.40 MNVR P=285.00 Y=305.50	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 171 P 122	HUD STAR: 14, VEGA 7/14:59-7/15:41	HUD CAL
4 007/15:30:00 MET 39:58 204/04:50:00 GMT 59:58	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV +YVV RETROGRADE WATER DUMP
5 007/21:00:00 MET 07:36 204/10:20:00 GMT 27:36	TGT=2 BV=5 P= 45.00 Y= 62.10 OM=180.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 69 P 71	LVLH R=126.83 P=334.92 Y= 38.68	AMOS PRCS 45 DEG. TEST TCA: 7/21:24:15
6 007/21:30:00 MET 37:36 204/10:50:00 GMT 57:36	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV +YVV NOSE SOUTH
7 008/04:30:00 MET 39:51 204/17:50:00 GMT 59:51	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 121 P 124	STAR PAIR A1	IMU ALIGN
8 008/04:50:00 MET 05:02:32 204/18:10:00 GMT 22:32	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV -YVV NOSE NORTH
9 008/15:05:00 MET 15:29 205/04:25:00 GMT 35:29	INRTL R=282.00 MNVR P=119.00 Y=320.00	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 121 P 123	STAR PAIR A1	IMU ALIGN
10 008/15:25:00 MET 29:52 205/04:45:00 GMT 49:52	TGT=4 BV=5 P=184.00 Y= 0.00 OM= 90.00 SUN BETA= +37.2 RA= 122.912 DEC= 20.006N	A1 AUTO VERN	DSC 0.200 DB AT 1.00 DB RT 0.02	SUN R 180 P 176	INRTL R=236.40 P= 37.43 Y=311.20	-XSI COLD SOAK
11 008/18:00:00 MET 09:14 205/07:20:00 GMT 29:14	INRTL R=281.00 MNVR P=322.00 Y=323.00	A1 AUTO PRI	DSC 0.200 DB AT 5.00 DB RT 0.20	SUN R 218 P 129	STAR PAIR: -Y: 29 -Z: 30	DEORBIT IMU
12 008/18:15:00 MET 17:55 205/07:35:00 GMT 37:55	INRTL R=344.00 MNVR P=310.00 Y= 25.00	B1 AUTO PRI	DSC 0.500 DB AT 3.00 DB RT 0.20	SUN R 145 P 74	STAR PAIR: -Y: 14 -Z: 26	DEORBIT VERIF COMM ATT

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

Attitude Timeline

GMT/MET	MNVR OPTION	DAP	E/S	REF AT/REMARKS	EVENT	
1 008/20:42:00 MET 45:54 205/10:02:00 GMT 05:54	INRTL R=156.00 MNVR P= 91.00 Y= 46.00	TRN AUTO PRI	DSC 0.500 DB AT 3.50 DB RT 0.50	SUN R 261 P 70	DEORBIT TIG: 8/20:57:29	DEORBIT BURN
2 008/21:23:28 MET 27:55 205/10:43:28 GMT 47:55	INRTL R=265.00 MNVR P=329.00 Y=340.00	TRN AUTO PRI	DSC 0.500 DB AT 3.50 DB RT 0.50	SUN R 226 P 121		EI-5 ATTITUDE
3 008/21:28:28 MET 29:06 205/10:48:28 GMT 49:06	TGT=2 BV=5 P=230.00 Y= 0.00 OM= 0.00	TRN AUTO PRI	DSC 0.500 DB AT 3.50 DB RT 0.50	EARTH R 180 P 130	LVLH R= 0.00 P= 40.00 Y= 0.00	EI ATTITUDE

*** ALL ATTITUDES IN MEAN OF 1950 ***
*** PYR EULER SEQUENCE ***

STS-51 DAP BOOK

DAP A CONFIGURATIONS

	ITEM #	A1*	A2	A3	A4	A5	A6	A7	A8	A9	A11	A19
<u>TRANSLATION</u>												
PULSE ft/sec	1	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.25	0.10	0.05
<u>ROTATION</u>												
DSC RT NORM °/sec	2	0.200	0.400	0.200	0.500	0.200	0.200	0.200	0.200	0.200	0.100	0.100
VERN °/sec	3	0.200	0.400	0.008	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.020
PULSE NORM °/sec	4	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.04	0.04
VERN °/sec	5	0.010	0.010	0.010	0.010	0.050	0.010	0.010	0.010	0.010	0.005	0.002
COMP NORM °/sec	6	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
VERN °/sec	7	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
<u>DEADBAND</u>												
ATT NORM (deg)	8	5.00	1.00	1.00	3.00	5.00	5.00	2.00	2.00	1.00	3.00	1.00
VERN (deg)	9	1.000	1.000	0.070	1.000	1.000	1.000	1.000	1.000	1.000	2.000	0.100
RATE NORM °/sec	10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
VERN °/sec	11	.020	.020	.010	.020	.020	.020	.020	.020	.010	0.040	0.010
<u>JET OPT</u>												
P	12	1	1	1	1	1	3	1 or 3	1	3	3	1
Y	13	1	1	3	1	1	3	1 or 3	1	3	3	1
CNTL ACCEL	14	0	0	0	0	0	0	0	0	0	0 - 4	0

*I-LOADED OPS-2 DAP Configuration

6-2

FLT PLN/SI/FIN

DAP B CONFIGURATIONS

	ITEM #	B1*	B2	B3	B4	B5	B6	B7	B8	B11	B12	B20
<u>TRANSLATION</u>												
PULSE ft/sec	15	0.10	0.02	0.02	0.02	0.02		0.05	0.01	0.10	0.05	0.10
<u>ROTATION</u>												
DSC RT NORM °/sec	16	0.500	0.200	0.200	0.200	0.200		0.500	0.200	0.100	0.050	0.100
VERN °/sec	17	0.200	0.200	0.200	0.008	0.016		0.200	0.200	0.200	0.020	0.020
PULSE NORM °/sec	18	0.04	0.04	0.04	0.04	0.04		0.04	0.04	0.04	0.04	0.04
VERN °/sec	19	0.002	0.002	0.002	0.002	0.002		0.002	0.002	0.010	0.005	0.002
COMP NORM °/sec	20	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00
VERN °/sec	21	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
<u>DEADBAND</u>												
ATT NORM (deg)	22	3.00	3.00	3.00	0.30	3.00		2.00	2.00	5.00	1.00	0.30
VERN (deg)	23	1.000	1.000	1.000	0.100	0.033		1.000	1.000	3.000	0.500	0.100
RATE NORM °/sec	24	0.20	0.20	0.20	0.20	0.20		0.20	0.20	0.20	0.20	0.20
VERN °/sec	25	.020	.020	.020	.010	.020		.020	.020	.200	.010	.010
<u>JET OPT</u>												
P	26	1	3	1	3	3		1 or 3	1	3	3	1
Y	27	1	3	1	3	3		1 or 3	1	3	3	1
<u>CNTL ACCEL</u>	28	0	0	0	0	0		0	0	0 - 4	2	0

*I-LOADED OPS-2 DAP Configuration

ALT DAP CONFIGURATIONS

	ITEM #	ALT1*	ALT2	ALT3
RATE DEADBAND	32	0.200	0.070	0.100
JET OPTION	33	1	1 or 3	3
NUMBER OF JETS	34	2	1	2
ON TIME	35	0.08	0.08	0.08
DELAY	36	0.00	0.00	**

*I-LOADED OPS-2 DAP Configuration

**DELAY: ORFEUS-SPAS RELEASE

- 5.5 BERTHED TO LOW HOVER
LOW HOVER
- 8.7 LOW HOVER TO RELEASE
RELEASE

DELAY: ORFEUS-SPAS CAPTURE

- 5.5 CAPTURE TO LOW HOVER
LOW HOVER TO BERTH
- 8.7 NOM CAPTURE
SJ CAPTURE

DELAY: RICS FILMING

- 5.5 RICS #1, #14
- 8.0 RICS #2, #3, #9, #13



<u>DAP</u>	<u>PURPOSE</u>	<u>DAP</u>	<u>PURPOSE</u>
A1	- NOMINAL IMU ALIGN LOSS OF VERN (NOSE & TAIL)	B1	- NOMINAL PRCS IMU ALIGN OMS & RCS BURNS SPAS GYRO CAL
A2	- PTC	B2	- LOSS OF VERN (TAIL ONLY)
A3	- GG	B3	- LOSS OF VERN (NOSE & TAIL) GG MNVR
A4	- PRE/POST DEPLOY TOS ARI	B4	- SSUS DEPLOY
A5	- IMU ROTATION	B5	- COAS CAL
A6	- LOSS OF VERN (TAIL ONLY)	B6	- (Blank)
A7	- RENDEZVOUS	B7	- RENDEZVOUS
A8	- PROX OPS	B8	- PROX OPS
A9	- TOS DEPLOY	B11	- SPAS UNBERTH/BERTH RICS PHOTO SURVEY
A11	- SPAS PARKING	B12	- SPAS PRE-RELEASE DB COLLAPSE
A19	- SPAS GYRO CAL	B20	- TOS ARI

FLT PLN-1a/51/0/A



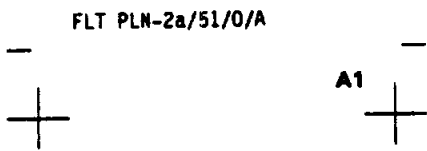
This DAP Book Page Intentionally Blank

FLT PLN-1b/51/0/A





DAP A



FLT PLN-2a/51/0/A

A1



DAP A1

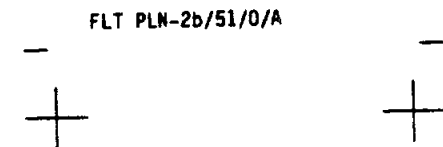
PURPOSE:

NOMINAL
IMU ALIGN
LOSS OF VERN
(NOSE & TAIL)



A1

0.1 0	1	TRANSLATION PULSE
0.2 0 0	2	ROTATION DSC RT NORM
0.2 0 0	3	VERN
0.1 0 0	4	PULSE NORM
0.0 1 0	5	VERN
.0 0 0	6	COMP NORM
.0 0 0	7	VERN
5.0 0	8	DEADBAND ATT NORM
1.0 0 0	9	VERN
0.2 0	10	RATE NORM
.0 2 0	11	VERN
1	12	JET OPT P
1	13	Y
0	14	CNTL ACCEL



FLT PLN-2b/51/0/A



FLT PLN-3a/51/0/A

A2



A1

DAP A2

PURPOSE:
PTC

FLT PLN-3b/51/0/A



A2

DAP A3

PURPOSE:
GG

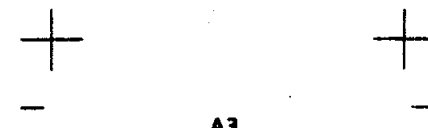
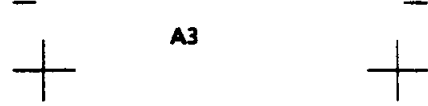
FLT PLN-4b/51/0/A



A2

0.1	0	1	TRANSLATION	
			PULSE	
ROTATION				
0.4	0	0	2	DSC RT NORM
0.4	0	0	3	VERN
0.1	0	0	4	PULSE NORM
0.0	1	0	5	VERN
0.0	0	0	6	COMP NORM
0.0	0	0	7	VERN
DEADBAND				
1.0	0	0	8	ATT NORM
1.0	0	0	9	VERN
0.2	0	0	10	RATE NORM
0.2	0	0	11	VERN
1		12	JET OPT	P
1		13		Y
0		14	CNTL ACCEL	

FLT PLN-4a/51/0/A



A3

A3

0.1	0	1	TRANSLATION	
			PULSE	
ROTATION				
0.2	0	0	2	DSC RT NORM
0.0	0	0	3	VERN
0.1	0	0	4	PULSE NORM
0.0	1	0	5	VERN
0.0	0	0	6	COMP NORM
0.0	0	0	7	VERN
DEADBAND				
1.0	0	0	8	ATT NORM
0.0	7	0	9	VERN
0.2	0	0	10	RATE NORM
0.1	0	0	11	VERN
1		12	JET OPT	P
3		13		Y
0		14	CNTL ACCEL	

FLT PLN-5a/51/0/A



A4



A3



DAP A4

PURPOSE:

PRE/POST DEPLOY
TOS ARI

A4

0.1 0 1 TRANSLATION
PULSE

0.5 0 0 2 ROTATION
DSC RT NORM
0.2 0 0 3 VERN
0.1 0 0 4 PULSE NORM
0.0 1 0 5 VERN
.0 0 0 6 COMP NORM
.0 0 0 7 VERN

DEADBAND
3.0 0 8 ATT NORM
1.0 0 9 VERN

0.2 0 10 RATE NORM
0.2 0 11 VERN

1 12 JET OPT P
1 13 Y

0 14 CNTL ACCEL

FLT PLN-5b/51/0/A

FLT PLN-6a/51/0/A



A5



A4

DAP A5

PURPOSE:

IMU ROTATION

A5

0.1 0 1 TRANSLATION
PULSE

0.2 0 0 2 ROTATION
DSC RT NORM
0.2 0 0 3 VERN
0.1 0 0 4 PULSE NORM
0.0 5 0 5 VERN
.0 0 0 6 COMP NORM
.0 0 0 7 VERN

DEADBAND
5.0 0 8 ATT NORM
1.0 0 9 VERN

0.2 0 10 RATE NORM
0.2 0 11 VERN

1 12 JET OPT P
1 13 Y

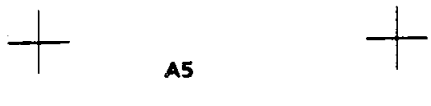
0 14 CNTL ACCEL

FLT PLN-6b/51/0/A

FLT PLN-7a/51/0/A



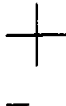
A6



A5

DAP A6

PURPOSE:
LOSS OF VERN
(TAIL ONLY)



A6

0.1 0	1	TRANSLATION	
		PULSE	
0.2 0 0	2	ROTATION	
		DSC RT	NORM
0.2 0 0	3		VERN
0.1 0 0	4	PULSE	NORM
0.0 1 0	5		VERN
.0 0 0	6	COMP	NORM
.0 0 0	7		VERN
DEADBAND			
5.0 0	8	ATT	NORM
1.0 0 0	9		VERN
0.2 0	10	RATE	NORM
.0 2 0	11		VERN
3	12	JET OPT	P
1	13		Y
0	14	CNTL ACCEL	

FLT PLN-7b/51/0/A

FLT PLN-8a/51/0/A



A7



A6



A7

DAP A7

PURPOSE:
RENDEZVOUS

0.1 0	1	TRANSLATION	
		PULSE	
0.2 0 0	2	ROTATION	
		DSC RT	NORM
0.2 0 0	3		VERN
0.1 0 0	4	PULSE	NORM
0.0 1 0	5		VERN
.0 0 0	6	COMP	NORM
.0 0 0	7		VERN
DEADBAND			
2.0 0	8	ATT	NORM
1.0 0 0	9		VERN
0.2 0	10	RATE	NORM
.0 2 0	11		VERN
1 or 3	12	JET OPT	P
1 or 3	13		Y
0	14	CNTL ACCEL	

FLT PLN-8b/51/0/A

FLT PLN-9a/51/0/A



A8





A7



DAP A8

PURPOSE:
PROX OPS

A8

0.0 5	1	TRANSLATION	
		PULSE	
		ROTATION	
0.2 0 0	2	DSC RT	NORM
0.2 0 0	3		VERN
0.1 0 0	4	PULSE	NORM
0.0 1 0	5		VERN
0.0 0 0	6	COMP	NORM
0.0 0 0	7		VERN
		DEADBAND	
2.0 0	8	ATT	NORM
1.0 0 0	9		VERN
		RATE	
0.2 0	10		NORM
0.2 0	11		VERN
		JET OPT	P
1	12		
1	13		Y
		CNTL ACCEL	
0	14		

FLT PLN-9b/51/0/A

FLT PLN-10a/51/0/A



A9



A8

DAP A9

PURPOSE:
TOS DEPLOY

A9

0.2 5	1	TRANSLATION	
		PULSE	
		ROTATION	
0.2 0 0	2	DSC RT	NORM
0.2 0 0	3		VERN
0.0 0 5	4	PULSE	NORM
0.0 1 0	5		VERN
0.0 0 0	6	COMP	NORM
0.0 0 0	7		VERN
		DEADBAND	
1.0 0	8	ATT	NORM
1.0 0 0	9		VERN
		RATE	
0.2 0	10		NORM
0.1 0	11		VERN
		JET OPT	P
3	12		
3	13		Y
		CNTL ACCEL	
0	14		

FLT PLN-10b/51/0/A

FLT PLN-11a/51/0/A



A11



DAP A11

PURPOSE:
SPAS PARKING



A11

0.1 0	1	TRANSLATION	
		PULSE	
ROTATION			
0.1 0 0	2	DSC RT	NORM
0.2 0 0	3		VERN
0.0 0 4	4	PULSE	NORM
0.0 0 5	5		VERN
.0 0 0	6	COMP	NORM
.0 0 0	7		VERN
DEADBAND			
3.0 0	8	ATT	NORM
2.0 0 0	9		VERN
0.2 0	10	RATE	NORM
.0 4 0	11		VERN
3	12	JET OPT	P
3	13		Y
0 - 4	14	CNTL ACCEL	

FLT PLN-11b/51/0/A



FLT PLN-12a/51/0/B



A19



A11

DAP A19

PURPOSE:
SPAS GYRO CAL



A19

0.0 5	1	TRANSLATION	
		PULSE	
ROTATION			
0.1 0 0	2	DSC RT	NORM
0.0 2 0	3		VERN
0.0 0 4	4	PULSE	NORM
0.0 0 2	5		VERN
.0 0 0	6	COMP	NORM
.0 0 0	7		VERN
DEADBAND			
1.0 0	8	ATT	NORM
0.1 0 0	9		VERN
0.2 0	10	RATE	NORM
.0 1 0	11		VERN
1	12	JET OPT	P
1	13		Y
0	14	CNTL ACCEL	

FLT PLN-12b/51/0/A

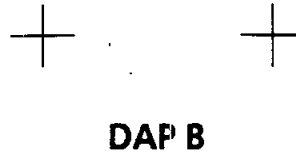


FLT PLN-13a/51/0/A

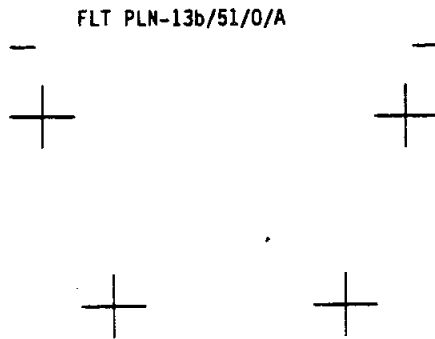




A19



DAP B

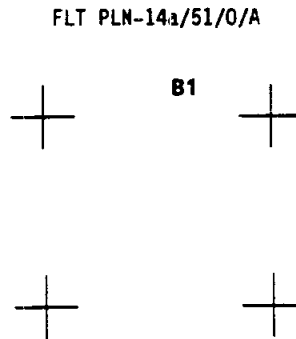


FLT PLN-13b/51/0/A

DAP B1

PURPOSE:

NOMINAL
 PRCS IMU ALIGN
 QMS & RCS BURNS
 SPAS GYRO CAL



FLT PLN-14a/51/0/A

B1

15	0.1 0
16	0.5 0 0
17	0.2 0 0
18	0.0 0 4
19	0.0 0 2
20	0.0 0 0
21	0.0 0 0
22	3.0 0
23	1.0 0 0
24	0.2 0
25	0.2 0
26	1
27	1
28	0

FLT PLN-14b/51/0/A



FLT PLN-15a/51/0/B



B2



B1

DAP B2

PURPOSE:
LOSS OF VERN
(TAIL ONLY)

FLT PLN-15b/51/0/A



B2

DAP B3

PURPOSE:
LOSS OF VERN
(NOSE & TAIL)
GG MNVR

FLT PLN-16b/51/0/A



B2

15	0.0 2
16	0.2 0 0
17	0.2 0 0
18	0.0 4
19	0.0 2
20	.0 0 0
21	.0 0 0
22	3.0 0
23	-1.0 0 0
24	0.2 0
25	.0 2 0
26	3
27	3
28	0

FLT PLN-16a/51/0/A



B3



B3

15	0.0 2
16	0.2 0 0
17	0.2 0 0
18	0.0 4
19	0.0 2
20	.0 0 0
21	.0 0 0
22	3.0 0
23	-1.0 0 0
24	0.2 0
25	.0 2 0
26	1
27	1
28	0

FLT PLN-17a/51/0/A



B4



DAP B4

PURPOSE:
SSUS DEPLOY

FLT PLN-17b/51/0/A



DAP B5

PURPOSE:
COAS CAL

FLT PLN-18b/51/0/A



B4

15	0.0	2
16	0.2	0 0
17	0.0	0 0 0 0
18	0.0	0 0 0 0 0 0
19	0.0	0 0 0 0 0 0 0 0
20	0.0	0 0 0 0 0 0 0 0
21	0.0	0 0 0 0 0 0 0 0
22	0.3	0
23	0.1	0 0 0
24	0.2	0
25	0.1	0 0
26		3
27		3
28		0

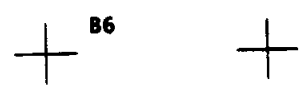
FLT PLN-18a/51/0/A



B5

15	0.0	2
16	0.2	0 0
17	0.0	0 0 0 0
18	0.0	0 0 0 0 0 0
19	0.0	0 0 0 0 0 0 0 0
20	0.0	0 0 0 0 0 0 0 0
21	0.0	0 0 0 0 0 0 0 0
22	3.0	0
23	0.1	0 0 0 0
24	0.2	0
25	0.2	0 0
26		3
27		3
28		0

FLT PLN-19a/51/0/A





B5



DAP B6

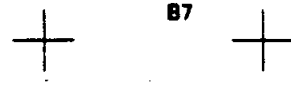
PURPOSE:
(Blank)

B6

15	---
16	---
17	---
18	---
19	---
20	---
21	---
22	---
23	---
24	---
25	---
26	---
27	---
28	---

FLT PLN-19b/51/0/A

FLT PLN-20a/51/0/A



B7



B6



DAP B7

PURPOSE:
RENDEZVOUS

B7

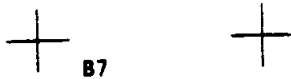
15	0.0 5
16	0.5 0 0
17	0.2 0 0
18	0.0 0 4
19	0.0 0 2
20	.0 0 0
21	.0 0 0
22	2.0 0
23	1.0 0 0
24	0.2 0
25	.0 2 0
26	1 or 3
27	1 or 3
28	0

FLT PLN-20b/51/0/A

FLT PLN-21a/51/0/A



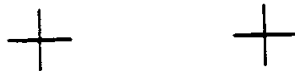
B8



DAP B8

PURPOSE:
PROX OPS

FLT PLN-21b/51/0/A



DAP B11

PURPOSE:
SPAS UNBERTH/
BERTH
RICS PHOTO
SURVEY

FLT PLN-22b/51/0/A



B8

15	0.0	1
16	0.2	0 0
17	0.2	0 0 0
18	0.0	0 0 4
19	0.0	0 0 2
20	0.0	0 0 0
21	0.0	0 0 0
22	2.0	0 0
23	1.0	0 0 0
24	0.2	0 0
25	0.2	0 0
26		1
27		1
28		0

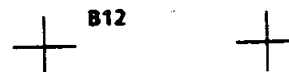
FLT PLN-22a/51/0/A



B11

15	0.1	0
16	0.1	0 0
17	0.2	0 0 0
18	0.0	0 0 4
19	0.0	1 0 0
20	0.0	0 0 0
21	0.0	0 0 0
22	5.0	0 0
23	1.0	0 0 0
24	0.2	0 0
25	0.2	0 0
26		3
27		3
28	0	4

FLT PLN-23a/51/0/B



+ +
B11

DAP B12

PURPOSE:
SPAS PRE-RELEASE
DB COLLAPSE

FLT PLN-23b/51/0/B

+ +

+ +
B12

DAP B20

PURPOSE:
TOS ARI

FLT PLN-24b/51/0/A

+ +

+ +

B12

15 0.0 5
16 0.0 5 0
17 0.0 2 0
18 0.0 4
19 0.0 5
20 0 0
21 0 0

22 1.0 0
23 0.5 0 0

24 0.2 0
25 0 1 0

26 3
27 3

28 2

FLT PLN-24a/51/0/B

+ +
B20

+ +

B20

15 0.1 0
16 0.1 0 0
17 0.0 2 0
18 0.0 4
19 0.0 2
20 0 0
21 0 0

22 0.3 0
23 0.1 0 0

24 0.2 0
25 0 1 0

26 1
27 1

28 0

FLT PLN-25a/51/0/A

+ +

+ 820 +

+ +

<u>DAP</u>	<u>PURPOSE</u>
ALT1	- NOMINAL I-LOAD
ALT2	- LOSS OF VERNS TOS ARI
ALT3	- LOADED RMS

FLT PLN-26a/51/0/A

+ ALT1 +

FLT PLN-25b/51/0/A

+ +

+ DAP ALT1 +

PURPOSE:
NOMINAL I-LOAD

+ ALT1 +

RATE DB	
32	0.2 0 0
JET OPT	
33	1
# JETS	
34	2
ON TIME	
35	- 0.0 8
DELAY	
36	- 0.0 0

FLT PLN-26b/51/0/A

FLT PLN-27a/51/0/A

+ ALT2 +

+ DAP ALT2 +

PURPOSE:

LOSS OF VERN
TOS ARI

FLT PLN-27b/51/0/A

+ ALT2 +

RATE DB	
32	<u>0.0</u> <u>7</u> <u>0</u>
JET OPT	
33	<u>1</u> or <u>3</u>
# JETS	
34	<u>1</u>
ON TIME	
35	- <u>0.0</u> <u>8</u>
DELAY	
36	- <u>0.0</u> <u>0</u>

FLT PLN-28a/51/0/A

+ ALT1 +

+ ALT3 +

+ DAP ALT3 +

PURPOSE:

LOADED RMS

FLT PLN-28b/51/0/A

+ ALT3 +

RATE DB	
32	<u>0.1</u> <u>0</u> <u>0</u>
JET OPT	
33	<u>3</u>
# JETS	
34	<u>2</u>
ON TIME	
35	- <u>0.0</u> <u>8</u>
DELAY	
36	<u>**</u>

FLT PLN-29a/51/0/B

+ ALT2 +

+ +



**DELAY: ORFEUS/
SPAS RELEASE



**DELAY: ORFEUS/
SPAS CAPTURE



5.5 BERTHED TO
LOW HOVER
LOW HOVER
8.7 LOW HOVER
TO RELEASE
RELEASE

5.5 CAPTURE TO
LOW HOVER
LOW HOVER
TO BERTH
8.7 NOM CAPTURE
SJ CAPTURE

(Cont next page)

FLT PLN-29b/51/0/B

FLT PLN-30a/51/0/B



ALT3



**DELAY: RICS
FILMING



5.5 RICS #1, # 14
8.0 RICS #2, #3,
#9, #13

FLT PLN-30b/51/0/B



UNIV PTG	
TGT ID	= 1 Orbiting Vehicle = 2 Earth ctr = 3 Earth tgt Input LAT (± 90) LON (± 180 , + = East) ALT (-3444.0 to 20000.0 nm) = 4 Sun ctr = 5 Celestial tgt Input RA (0-359.99) DEC (± 90) = 11-110 Nav Stars
BODY VECT	= 1 +X* = 2 -X* = 3 -Z* = 4 -Y Star Tracker* = 5 Optional input P (0-359.99) Y (270-359.99, 0-90) * input OM = OM (0-359.99)
MON AXIS	= 1 +X = 2 -X
CNTL ACCEL	= 0 Orbiter Alone = 1 Low Hover, RICS #1, #8, #9, #14 EVA Hover, EVA Worksite #1, #2 = 2 Release, Nom Capture, SJ Capture RICS #2, #10, #12, #13 = 3 RICS #3, #4, #5, #6 = 4 RICS #7 = 5 ACTS/TOS
PRIJET OPT	= 1 Normal = 2 Nose only = 3 Tail only
ALT JET OPT	= 1 Normal = 2 Illegal entry = 3 Tail only

FLT PLN-31a/51/0/A

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FLT PLN-31b/51/0/A

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STS-51
FLIGHT PLAN NOTES

FLT PLN NOTES

FLIGHT PLAN NOTES
(CONSTRAINTS AND GUIDELINES)

A. FLIGHT DESCRIPTION

The STS-51 (OV103) will launch from KSC July 15, 1993, with a direct insertion into a 160 nm orbit at an inclination of 28.45 degrees. The mission duration will be 9 days. Nominal landing occurs at KSC on July 24, 1993.

Landing opportunities are:

		<u>Landing Orbit No.</u>	<u>Site</u>	<u>Local Time</u>
Nominal	Primary	143	KSC	07:19
	1 Rev Late	144	EDW	05:45
	Weather Alt.	144	NOR	06:48
1 Day Late	Primary	159	KSC	07:24
	1 Rev Late	160	EDW	05:50
	Weather Alt.	160	NOR	06:53
2 Days Late	Primary	175	KSC	07:28
	Weather Alt.	176	EDW	05:55

Major Events

LAUNCH (KSC) July 15, 1993
MET (DD/HH:MM) 00/00:00
 Day of year 181
CDT/GMT 08:20/13:20

OMS-2 CUTOFF
MET (DD/HH:MM) 00/00:42
 DV (fps) 221.5
 ORBIT hp/ha (nm) 160/161

ACTS/TOS DEPLOY
MET (DD/HH:MM) 00/07:58

RCS SEP
MET (DD/HH:MM) 00/07:59
 DV (fps) 2.1
 ORBIT hp/ha (nm) 160/161

OMS SEP
MET (DD/HH:MM) 00/08:15
 DV (fps) 24.0
 ORBIT hp/ha (nm) 161/173

ACT/TOS SRM
MET (DD/HH:MM) 00/08:43

HITE
MET (DD/HH:MM) 00/21:53
 DV (fps) 25.6
 ORBIT hp/ha (nm) 158/161

FLT PLN NOTES

<u>CIRC</u>	
MET (DD/HH:MM)	00/22:41
DV (fps)	4.4
ORBIT hp/ha (nm)	158/159
<u>SPAS DEPLOY</u>	
MET (DD/HH:MM)	01/01:45
ORBIT hp/ha (nm)	158/159
<u>SEP2</u>	
MET (DD/HH:MM)	01/03:30
DV (fps)	0.5
ORBIT hp/ha (nm)	158/159
<u>SEP3</u>	
MET (DD/HH:MM)	01/05:00
DV (fps)	2.5
ORBIT hp/ha (nm)	158/159
<u>NC1</u>	
MET (DD/HH:MM)	01/08:01
DV (fps)	2.1
ORBIT hp/ha (nm)	158/159
<u>NC2</u>	
MET (DD/HH:MM)	01/21:35
DV (fps)	1.5
ORBIT hp/ha (nm)	159/159
<u>NC3</u>	
MET (DD/HH:MM)	02/03:37
DV (fps)	0.3
ORBIT hp/ha (nm)	158/159
<u>NC4</u>	
MET (DD/HH:MM)	02/07:23
DV (fps)	0.5
ORBIT hp/ha (nm)	158/159
<u>NC5</u>	
MET (DD/HH:MM)	02/20:57
DV (fps)	1.2
ORBIT hp/ha (nm)	158/159
<u>NC6</u>	
MET (DD/HH:MM)	03/02:58
DV (fps)	0.4
ORBIT hp/ha (nm)	157/160
<u>NC7</u>	
MET (DD/HH:MM)	03/06:45
DV (fps)	0.6
ORBIT hp/ha (nm)	157/159
<u>NC8</u>	
MET (DD/HH:MM)	03/20:18
DV (fps)	1.3
ORBIT hp/ha (nm)	157/159

<u>NC9</u>	
MET (DD/HH:MM)	04/00:50
DV (fps)	0.3
ORBIT hp/ha (nm)	157/159
<u>NC10</u>	
MET (DD/HH:MM)	04/04:36
DV (fps)	0.5
ORBIT hp/ha (nm)	157/159
<u>NC11</u>	
MET (DD/HH:MM)	04/19:40
DV (fps)	4.6
ORBIT hp/ha (nm)	156/162
<u>NC12</u>	
MET (DD/HH:MM)	04/22:41
DV (fps)	3.6
ORBIT hp/ha (nm)	156/164
<u>NC13</u>	
MET (DD/HH:MM)	05/02:26
DV (fps)	6.6
ORBIT hp/ha (nm)	156/160
<u>NC14</u>	
MET (DD/HH:MM)	05/05:28
DV (fps)	0.6
ORBIT hp/ha (nm)	156/160
<u>NC15</u>	
MET (DD/HH:MM)	05/18:17
DV (fps)	0.5
ORBIT hp/ha (nm)	155/160
<u>NC16</u>	
MET (DD/HH:MM)	06/00:17
DV (fps)	0.4
ORBIT hp/ha (nm)	155/160
<u>NC17</u>	
MET (DD/HH:MM)	06/04:50
DV (fps)	1.3
ORBIT hp/ha (nm)	155/161
<u>NC18</u>	
MET (DD/HH:MM)	06/17:26
DV (fps)	4.7
ORBIT hp/ha (nm)	156/161
<u>NC19</u>	
MET (DD/HH:MM)	06/18:56
DV (fps)	8.5
ORBIT hp/ha (nm)	152/160
<u>NCC</u>	
MET (DD/HH:MM)	06/21:00
DV (fps)	2.0
ORBIT hp/ha (nm)	152/160

Ti
MET (DD/HH:MM) 06/21:57
DV (fps) 5.6
ORBIT hp/ha (nm) 153/160

VBAR ARRIVAL
MET (DD/HH:MM) 06/23:30

SPAS GRAPPLE
MET (DD/HH:MM) 06/23:50
ORBIT hp/ha (nm) 155/160

DEORBIT
MET (DD/HH:MM) 08/20:59
DV (fps) 274.0

LANDING
MET (DD/HH:MM) 08/21:59

B. CREW

1. The five crewmembers flying this mission are:

CDR - Frank Culbertson
PLT - William Readdy
MS1 - Jim Newman
MS2 - Dan Bursch
MS3 - Carl Walz

C. COMMUNICATIONS AND INSTRUMENTATION

1. The Operational Instrumentation (OI) system will nominally be managed from the ground through uplink real-time commands (RTCs) coordinated with the crew.
2. TDRS coverage is assumed to be supported by TDRS-E (41 degrees W) and TDRS-W (SPARE) (174 degrees W) and is the prime mode of communication coverage.
3. There are four GN sites available for on-orbit contingency support: MIL(MLX), BDA(BDX), DKR, and GDS(GDX). MAD(MAX) and CAN are emergency sites (2-hour lead time required).
4. TDRS Ku-band is the prime mode of real-time TV; however, there are also two GN sites available as backups on GDS(GDX) and MIL(MLX) (90-minute lead time required).
5. TDRS-E and TDRS-W (SPARE) are available for ascent and entry support. IOS (RTS site) is available for UHF voice in an emergency (4-hour lead time required).
6. TDRS-E and TDRS-W are available to support Ku-band uplink (e.g., TAGS).
7. S-band HDR uplink (e.g., Teleprinter) is available through TDRS-E and TDRS-W.
8. RTS sites are available for contingency support or when scheduled in advance (4-hour lead time required): HTS, GTS, VTS, IOS, CTS, NHS, and DGS.

D. TELEVISION/PHOTOGRAPHY

1. The CCTV systems provide one color, wide-angle camera and one Canon A1 camcorder for in-cabin coverage. There will also be four PLB TV cameras. There are three different lens assemblies for the PLB cameras (color lens assembly, monochrome lens assembly, and wide-angle lens assembly). The type of lens assembly for each PLB camera is documented in the Flight Requirements Document. There will also be an RMS wrist and RMS elbow cameras.
2. There is one video tape recorder available with 30-minute cassettes.
3. Three camera systems are available: 35mm, 16mm, and 70mm.

E. PAYLOADS

1. Advanced Communications Technology Satellite/Transfer Orbit Stage (ACTS/TOS)

The ACTS/TOS payload consists of two major elements and their respective Airborne Support Equipment (ASE). The ACTS mission will provide flight verification of advanced high risk communications technology to support future communication systems in the Ka-band frequencies. The TOS is a propulsive stage used to place the ACTS into a geosynchronous transfer orbit.

2. Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer/Shuttle Pallet Satellite (ORFEUS/SPAS)

The ORFEUS/SPAS is a Remote Manipulator System (RMS) deployed and retrieved free-flying payload. The payload will carry the ORFEUS and Interstellar Medium Absorption Profile Spectrometer (IMAPS) telescopes as well as an RICS camera. The ORFEUS will study molecular hydrogen while the IMAPS will observe contrasts in the chemical and physical properties of the interstellar medium.

F. SECONDARY PAYLOADS

1. Limited Duration Space Environment Candidate Materials Exposure (LDCE)

The primary objective of the LDCE is to introduce developmental composite materials to a flux of atomic oxygen atoms in low Earth orbit. The candidate materials, polymeric, coated polymeric, and light metallic composite will have undergone extensive ground-based material performance testing prior to being attached to the shuttle. Beam configuration C is being flown on STS-51.

2. Commercial Protein Crystal Growth (CPCG)

The CPCG payload is designed to conduct experiments which will supply information on the scientific methods and commercial potential for growing large high-quality protein crystals in microgravity. The Block-II configuration will be flown on STS-51.

3. Chromosome and Plant Cell Division in Space (CHROMEX)

The CHROMEX payload is designed to determine whether roots of day lily and Haplopappis Gracilis can be initiated and undergo subsequent growth in microgravity at a level equivalent to that which occurs at 1 g on Earth.

4. High Resolution Shuttle Glow Spectroscopy - A (HRSGS-A)

The HRSGS-A payload is designed to obtain high resolution spectra in the visible and near visible wavelength range of the shuttle surface glow as observed on the vertical tail of the orbiter in low Earth orbit. The glow is observed only on shuttle surfaces which face the velocity vector, and it is hoped that the spectral resolution of 2 angstroms will help identify the cause of shuttle glow.

5. Auroral Photography Experiment - B (APE-B)

The objective of the APE-B is to obtain spectral images of orbiter thruster emissions, shuttle glow, air glow, and auroral air glow. Only shuttle glow images are scheduled in the Flight Plan.

6. Investigations into Polymer Membrane Processing (IPMP)

The research objective of the IPMP payload is to flash evaporate mixed solvent systems in the absence of convection to control the porosity of a polymer membrane.

7. Radiation Monitoring Equipment - III (RME-III)

The RME-III payload measures the ionizing radiation exposure in the orbiter crew compartment. The unit consists of a single handheld instrument with replaceable memory modules.

8. Air Force Maui Optical Site (AMOS)

The primary objective of AMOS is to use the Orbiter during cooperative overflights of Maui to obtain imagery and/or signature data to support calibration of the AMOS ground-based sensors and to observe orbiter plume phenomenology. No unique onboard hardware is associated with the AMOS test.

9. IMAX

The IMAX payload is a 70mm motion picture camera system. The camera and supporting equipment are stowed in the middeck and are for in-cabin use. On STS-51, IMAX will be used to photograph ACTS/TOS and ORFEUS/SPAS activities.

G. ON-ORBIT DTOs

1. Fuel Cell On-Orbit Shutdown/Restart (DTO 412)

One of the orbiter's three fuel cells will be shut down and subsequently restarted in order to gain confidence that a fuel cell may be shut down and successfully restarted on-orbit. Also,

the fuel cell will remain shut down for an extended period to determine the magnitude of voltage degradation and the fuel cell cool-down rate. This data will be used as a baseline for the future long duration flights to Space Station Freedom.

2. Payload and General Support Computer (PGSC) Single Event Upset Monitoring (DTO 656)

This DTO will determine PGSC random access memory susceptibility to single event upset (SEU) caused by cosmic radiation. The knowledge of PGSC susceptibility to SEU could lead to procedure and/or hardware and software changes to reduce the effects of cosmic radiation on PGSC operations.

3. Thermal Impulse Printer System (TIPS) Demonstration (DTO 660)

The purpose of this DTO is to evaluate the operational capability of the TIPS to uplink text and graphics via the orbiter S-band and Ku-band communication links. The printer will be evaluated as an alternative to the onboard Text and Graphics System hardcopier and teleprinter.

4. Advanced Lower Body Restraint Test (DTO 668)

This DTO is to provide on-orbit evaluation of an advanced lower body restraint which provides variability in positioning, adjustable lower body flexibility/rigidity, and upper body movement/reach envelope. The restraint will be used on the Aft Flight Deck during Remote Manipulation System (RMS) operations. Flight crew evaluations and photo/TV documentation will be used as design data to support restraint development.

5. Laser Range and Range Rate Device (DTO 700-2)

The purpose of this DTO is to demonstrate the capability to provide the orbiter flight crew with range and range rate data for rendezvous, proximity operations, and deploy operations. The major objective will be to show that a handheld laser can provide accurate and reliable range and range rate information, even if the target does not have a laser reflector.

6. Payload Bay Mounted Rendezvous Laser (DTO 700-5)

Like DTO 700-2, this DTO will demonstrate the capability to provide the orbiter crew with rendezvous data but will minimize direct crew involvement for acquiring this data. The DTO should demonstrate design capabilities planned for the Space Station cargo bay laser. The DTO will interface with the Payload and General Support Computer (PGSC) and will evaluate the feasibility of using the PGSC for displaying data directly to the pilot.

7. Global Positioning System (GPS) On-Orbit Demonstration (DTO 700-6)

This DTO will evaluate the performance of a GPS receiver in orbit by comparing its orbiter state vector to that determined by ground tracking and orbiter inertial measurement units. In addition, if SPAS GPS data is available real-time, the accuracy

of relative GPS will be evaluated using orbiter radar and laser range finders as reference data. Data will be collected on the PGSC.

8. GPS and Payload Bay Rendezvous Laser Data Comparison (DTO 700-7)

This DTO will provide the data to permit real-time evaluation of relative GPS and a more accurate assessment of the Payload Bay Laser as a rendezvous and proximity operations guidance aid. Specifically, the relative GPS as a rendezvous aid with respect to ground tracking, the star tracker, and the Ku-band will be evaluated by comparing in real-time their guidance solutions.

9. STS Orbiter Attitude Control Translation Thrusting (DTO 779)

This test will provide the data necessary to complete the database of vehicle thrusting that is necessary to maintain attitude during various unbiased attitude holds. These data can then be used in the flight design process to refine the predicted trajectory.

10. EVA Operations Procedures/Training (DTO 1210)

The primary objective of this DTO is to isolate and demonstrate specific differences between training facility simulations and operations in the actual extravehicular activity (EVA) environment. Additional objectives are to broaden the EVA team experience base and demonstrate improved proficiency and capability to support future EVAs including the Hubble Space Telescope and Space Station Freedom assembly and maintenance.

H. ON-ORBIT DSOs

1. In-Flight Aerobic Exercise (DSO 476)

The objectives of this DSO are to document the effects of daily aerobic exercise on (a) protection of left ventricular dimensions, (b) postflight orthostatic function, and (c) the rate at which these factors return to their pre-flight baseline values during the postflight period. Also, the effects of regular aerobic exercise on the maintenance of aerobic power and economy will be determined.

2. Orthostatic Function During Entry, Landing, and Egress (DSO 603B)

This DSO will document the relationship between mission duration and changes in orthostatic function of crewmembers during the actual stresses of entry, landing, and egress. These data will be used to determine whether precautions and countermeasures other than the operational saline countermeasure is needed to protect crewmembers in the event of an emergency egress.

3. Visual-Vestibular Interaction as a Function of Adaptation (DSO 604)

The objective of this DSO is to investigate visual-vestibular and perceptual adaptive responses as a function of longer missions and to determine the operational impact on performance of entry, landing, and egress procedures. The crew will perform investigations OI-1 and OI-3.

4. Evaluation of Functional Skeletal Muscle Performance Following Space Flight (DSO 617)

The objectives of this investigation are to determine the physiological effect of long duration space flight on skeletal muscle strength, endurance, and power.

5. In-Flight Use of Florinef to Improve Orthostatic Intolerance Postflight (DSO 621)

The purpose of this DSO is to evaluate the efficacy of Florinef on postflight orthostatic tolerance using heart rate, blood pressure, stroke volume, and other cardiovascular responses to orthostatic stress.

6. Gastrointestinal Function during Extended Duration Space Flight (DSO 622)

This DSO will measure changes in gastric emptying rate, estimate changes in gastrointestinal motility, calculate intestinal transit time and estimate the percentage of changes for gastric emptying rate and gastrointestinal transit time.

7. Documentary Television (DSO 901)

The DSO requires live television transmission or VTR dumps of crew activities and spacecraft functions which include: Payload Bay views, crew activities, in-flight crew conference/press opportunities, and unscheduled TV activities.

8. Documentary Motion Picture Photography (DSO 902)

The DSO 902 requires documentary and public affair motion picture photography of significant activities which best depicts the basic capabilities of the space shuttle and key objectives. This DSO includes motion picture photography of flight deck activities, middeck activities, and any unscheduled motion picture photography.

9. Documentary Still Photography (DSO 903)

This DSO requires still photography of crew activities and mission-related scenes of general public and historical interest. Still photography with 70mm format for exterior photography and 35mm format for interior photography is required.

NASA GSFC-AL
117 JETPLEX CIRCLE
SUITE C-7
MADISON, AL 35758
442/OLSON, K.

NAVAL RESEARCH LAB (NRL)
DEPARTMENT OF THE NAVY
4555 OVERLOOK AVE. SW
WASHINGTON, DC 20375-5000
41-43/CARRUTHERS, G.

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ROOM 103
KSC, FL 32899
MC OSC/ADAMS, S. (20)

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ROCKETDYNE DIVISION
6633 CANOGA AVENUE
CANOGA PARK, CA 91303
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055-LA38/LOVELY, R.G.

SPAR AEROSPACE
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CANADA L6S4J3
WOODLAND, C. (2)

TELEDYNE BROWN ENGINEERING
CUMMINGS RESEARCH PARK
300 SPARKMAN DRIVE, NW
P. O. BOX 070007
HUNTSVILLE, AL 35807-7007
MS 172/GILCHRIST, M.

UAB/CMC
2707 ARTIE STREET
SUITE #1
HUNTSVILLE, AL 35805
ADAMS, B. (5)

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