

**FLIGHT DATA FILE**

# Flight Plan

## STS-31 (HST Deploy)

### (Cycle 2 Trajectory)

**Mission Operations Directorate  
Operations Division**

**Final, Rev A  
March 20, 1990**

| <u>EVENT</u> | <u>CST</u> |      |        |
|--------------|------------|------|--------|
| Launch       | 07:44      | Mon  | Mar 26 |
| HST Release  | 13:07      | Tues | Mar 27 |
| EDW Landing  | 08:59      | Sat  | Mar 31 |



National Aeronautics and  
Space Administration

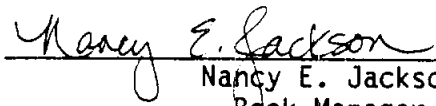
Lyndon B. Johnson Space Center  
Houston, Texas

MISSION OPERATIONS DIRECTORATE

**STS-31 FLIGHT PLAN**

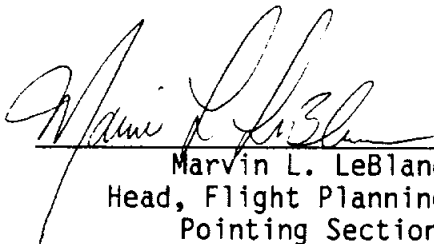
FINAL, REVISION A  
March 20, 1990

PREPARED BY:

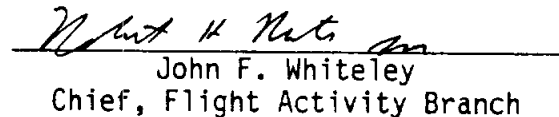


Nancy E. Jackson  
Book Manager

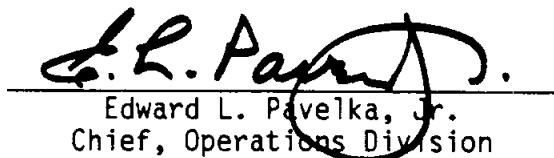
APPROVED BY:



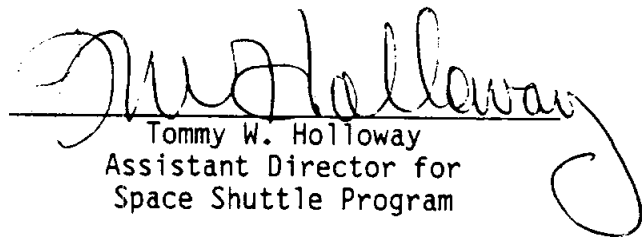
Marvin L. LeBlanc  
Head, Flight Planning and  
Pointing Section



John F. Whiteley  
Chief, Flight Activity Branch



Edward L. Pavelka, Jr.  
Chief, Operations Division



Tommy W. Holloway  
Assistant Director for  
Space Shuttle Program

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|                             | FLT PLN-776  | FLT PLN-782  | FLT PLN-787   |
|                             | FLT PLN-777A | FLT PLN-783  |               |
|                             | FLT PLN-778  | FLT PLN-784A |               |

AREAS OF TECHNICAL RESPONSIBILITY

|                   |                   |          |
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| Nominal Timelines | DH4/M. A. Plaza   | 483-4413 |
| Pointing          | DH4/K. A. Amidon  | 483-4451 |

STS-31 FLIGHT PLAN

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REV A 03/20/90

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(\*) - Omit from flight book

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## INTRODUCTION

The STS-31 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, Deorbit Prep, and Entry Checklists. The detailed deploy procedures required during the deploy timeframe are in the HST Deploy 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-31 Flight Requirements Document. This Flight Plan, as part of the Flight Data File, meets the specifications of the Cycle 2 version of the STS-31 Flight Initialization Data Pack.

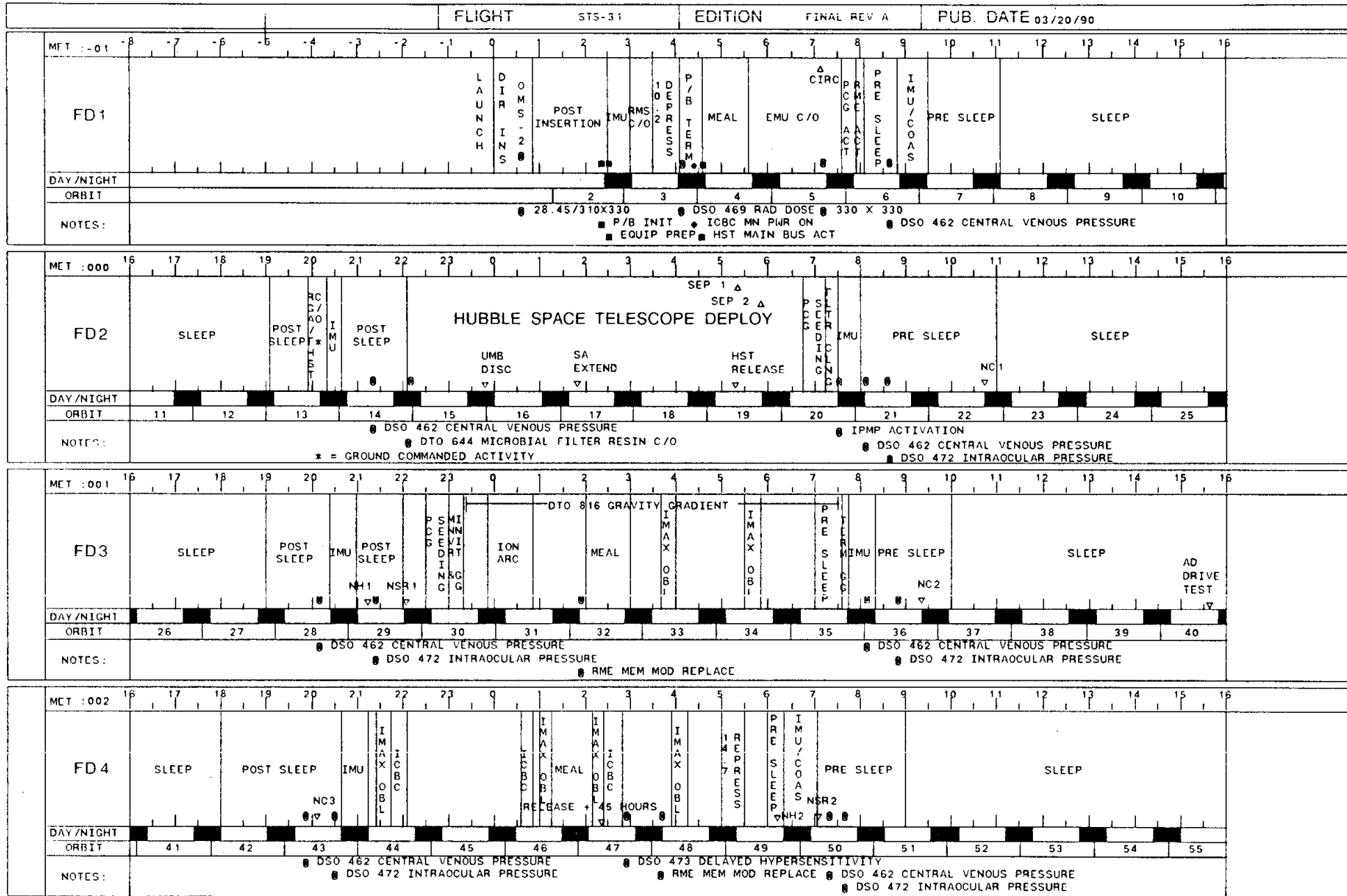
The flight profile used for this Flight Plan is for a launch date of March 26, 1990, at 7:44 CST. Orbiter inertial attitudes are expressed relative to a Mean of 1950 (M50) reference frame.

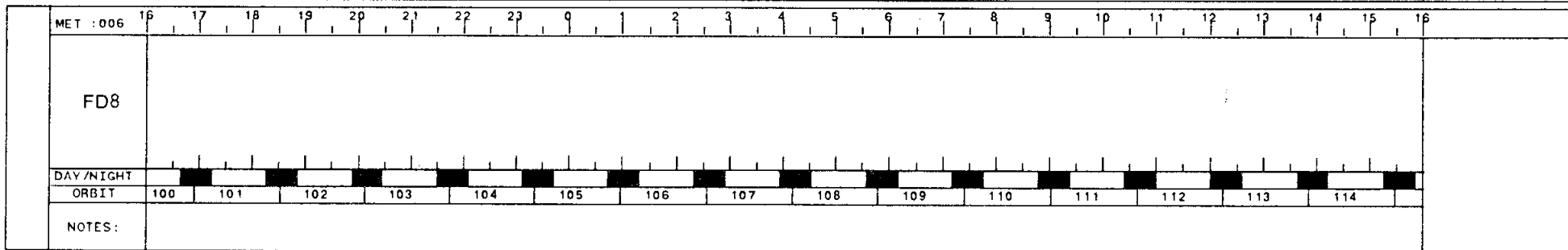
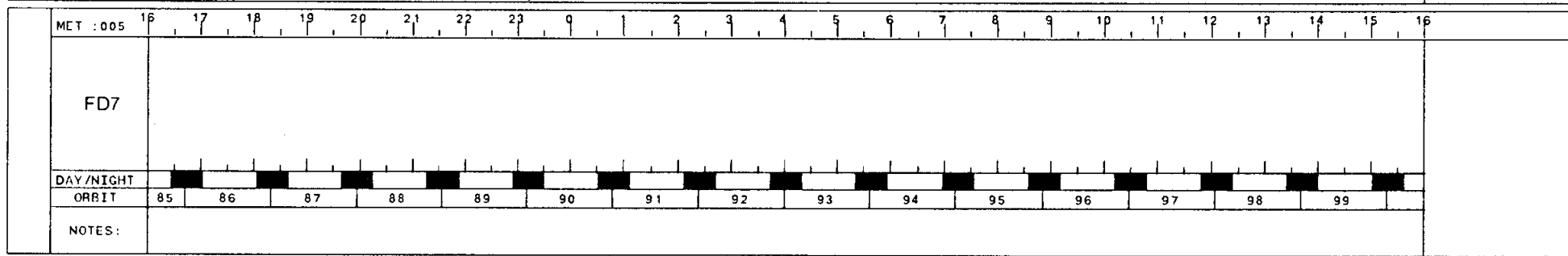
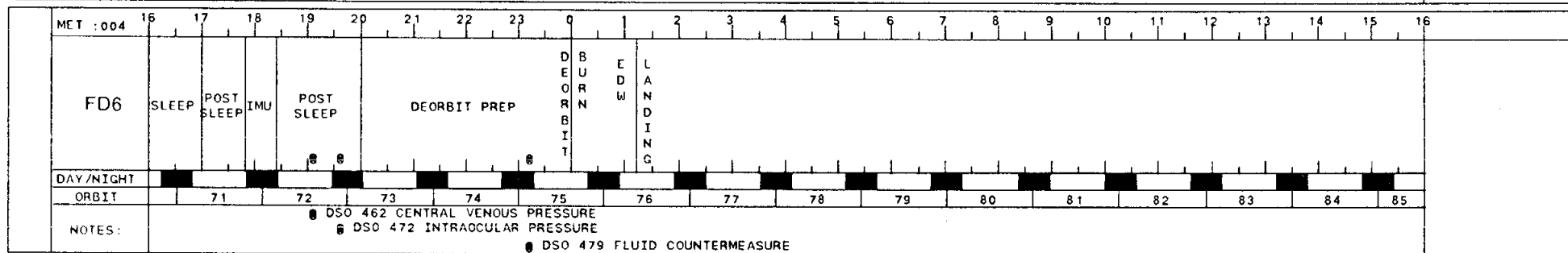
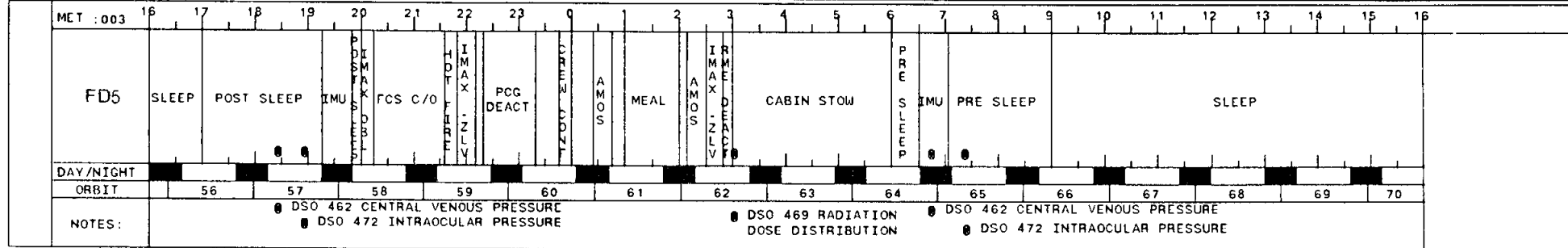
JSC-22359, Crew Scheduling Constraints (Appendix K, CPMP), Basic, March 1987, has been used to build the timelines contained in this Flight Plan. The preparation required on Flight Day 1 to support an unscheduled quick response EVA on Flight Day 2 is specifically addressed in approved Exemption 1403 #2 to the CPMP. This exemption authorizes the Flight Day 2 unscheduled EVA timeline in Section 4.

The timeline formats used in this Flight Plan are based on JSC-19933, Timeline Format Definitions and Standard Notes, Revision B, May 25, 1987.

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STS-31 OVERVIEW



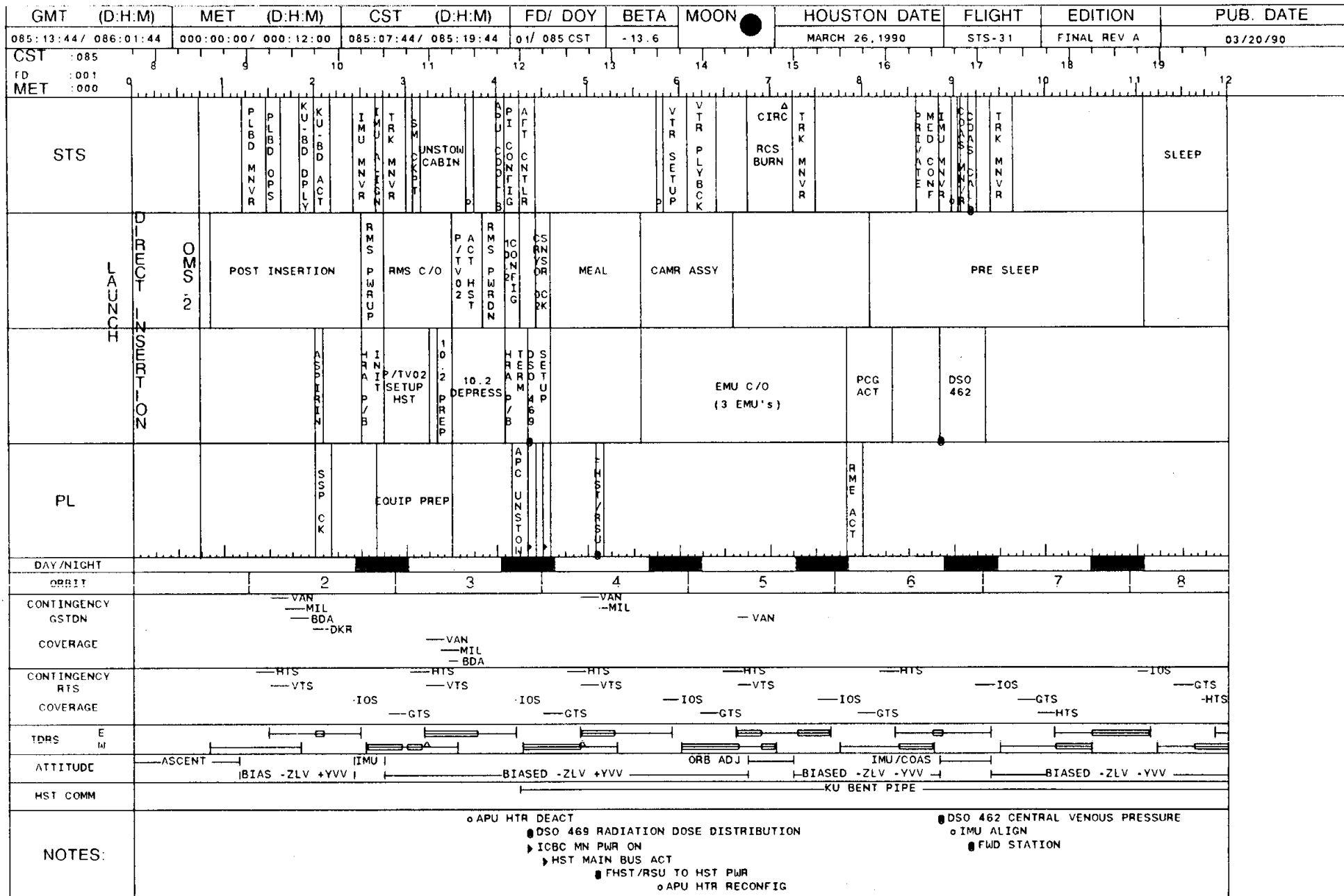


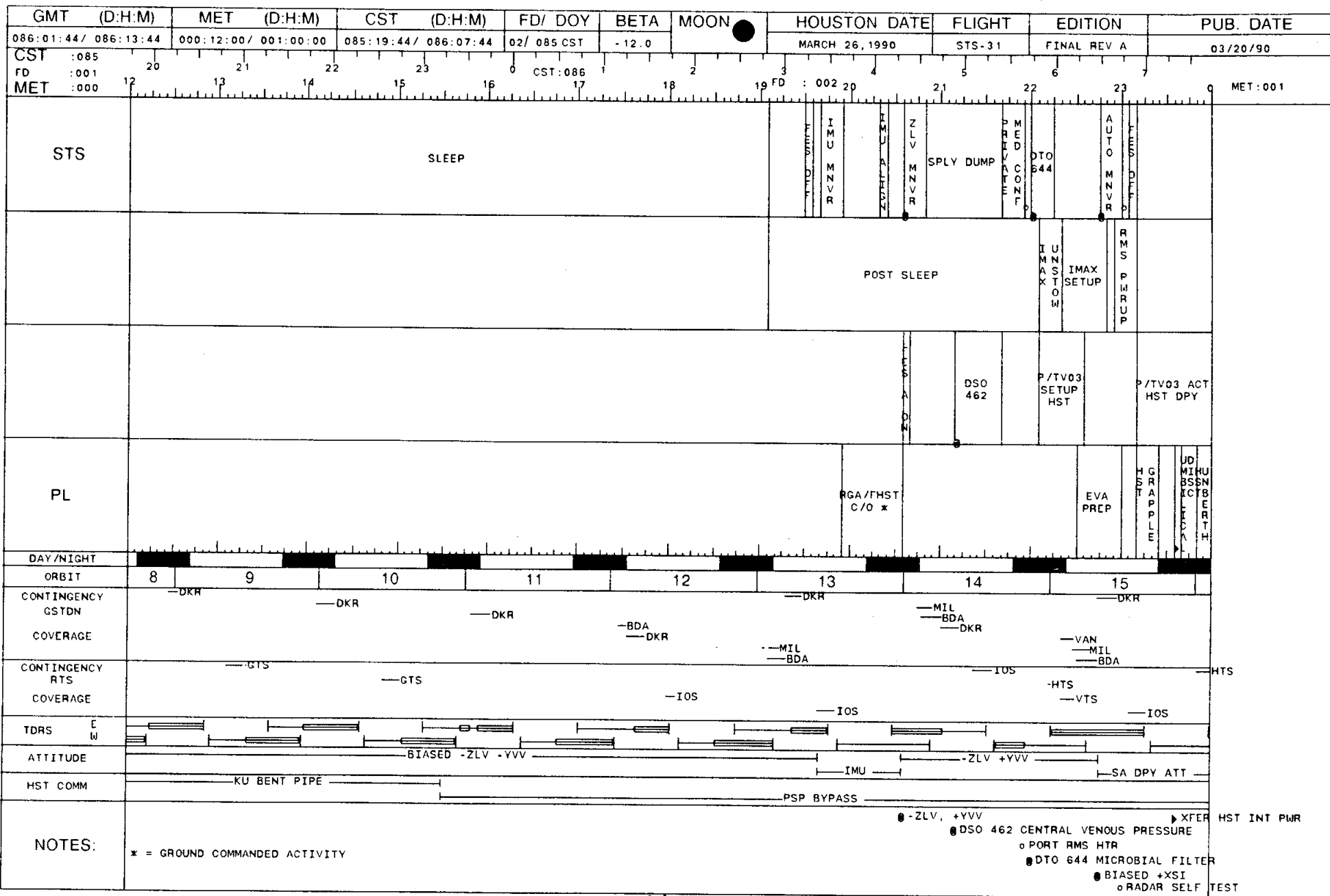
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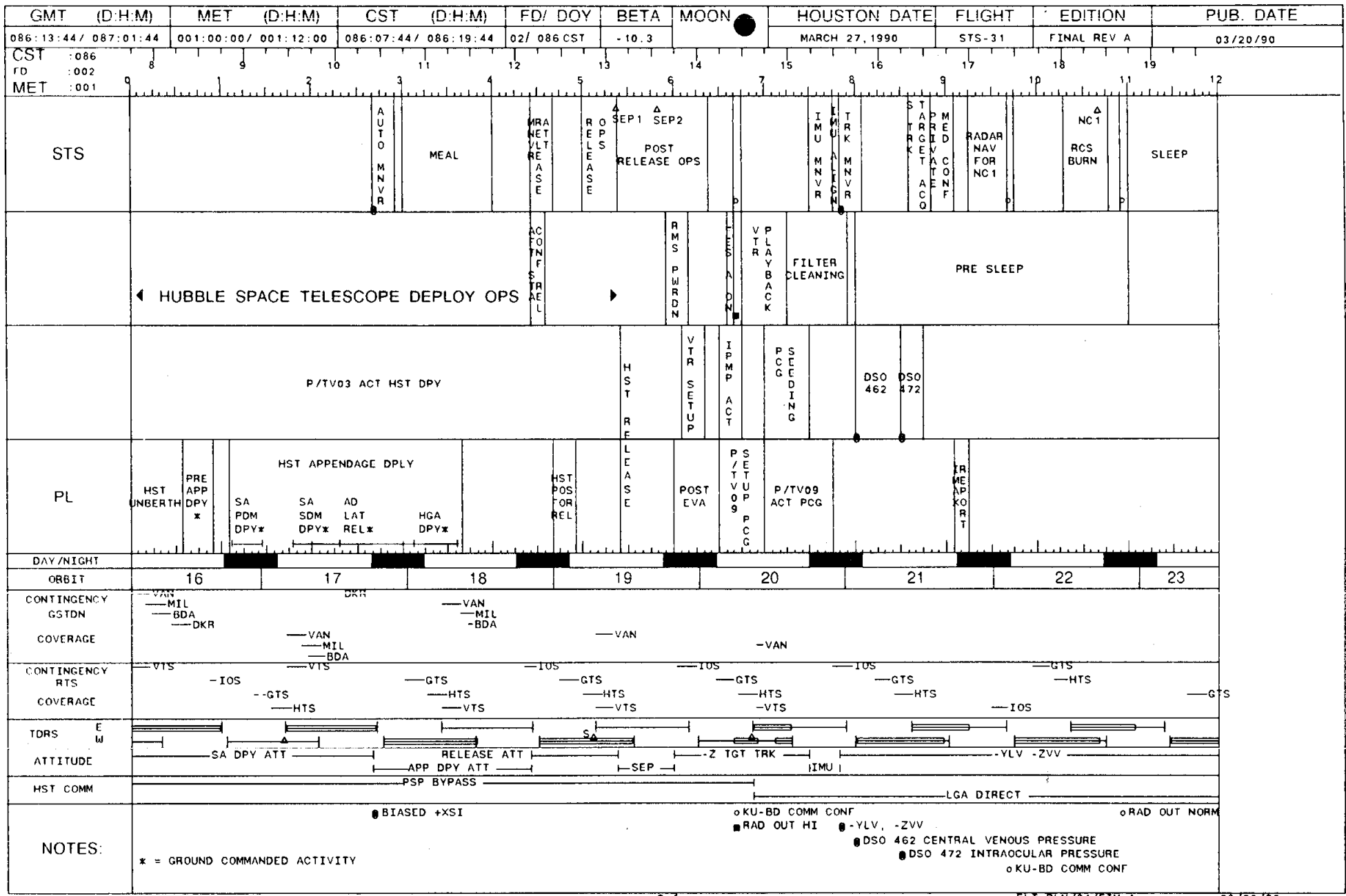
SUMMARY TIMELINE



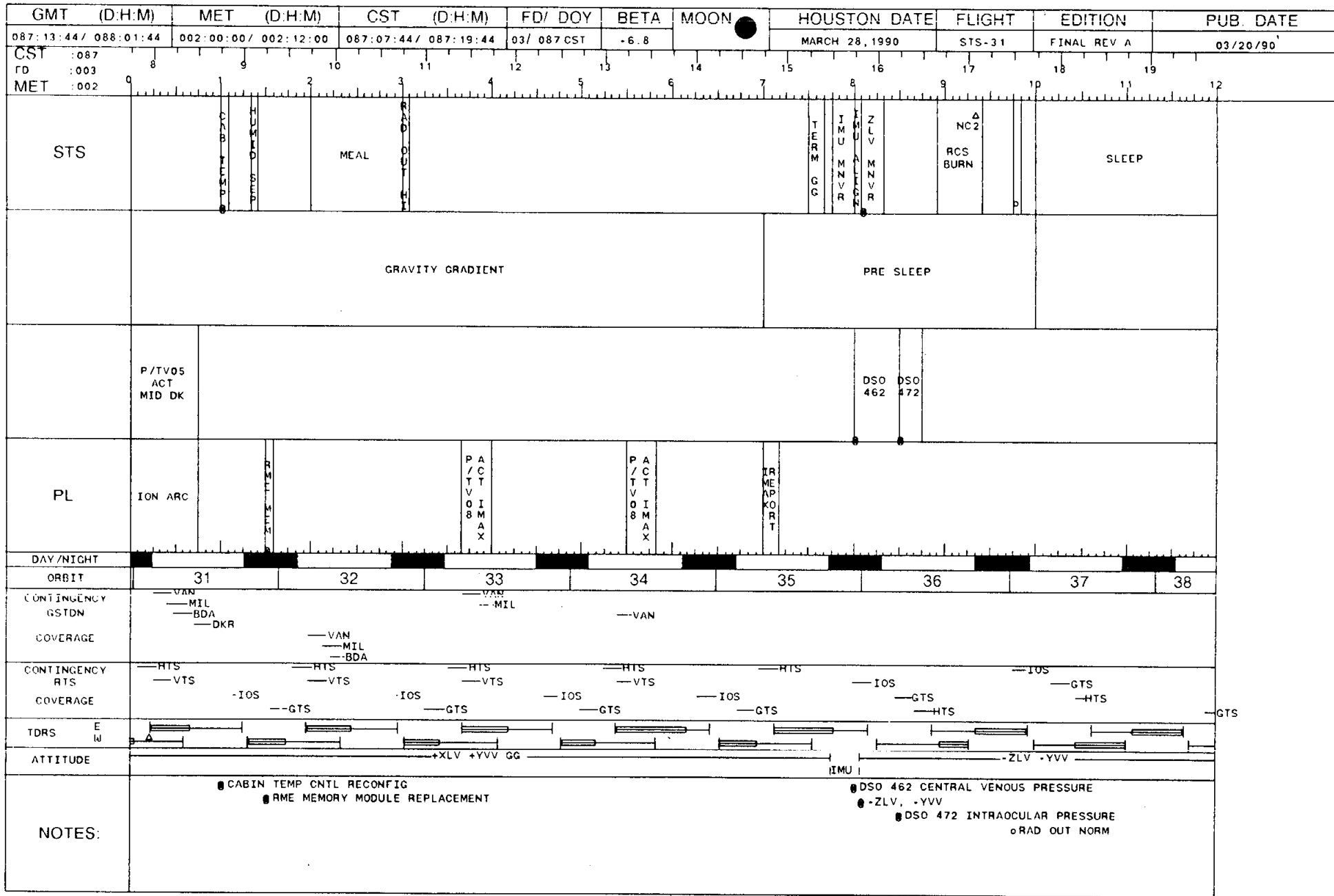
# SUMMARY TIMELINE

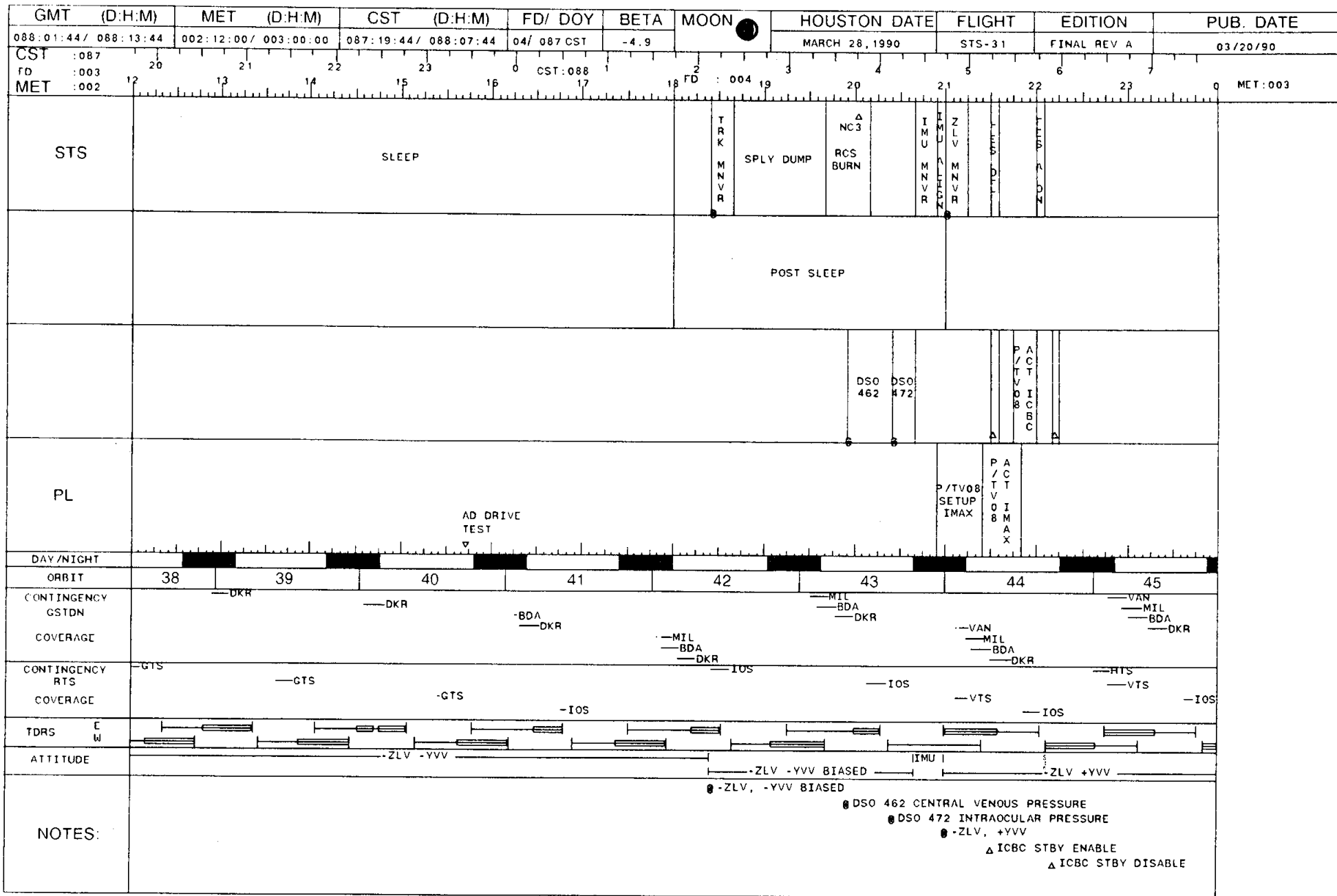


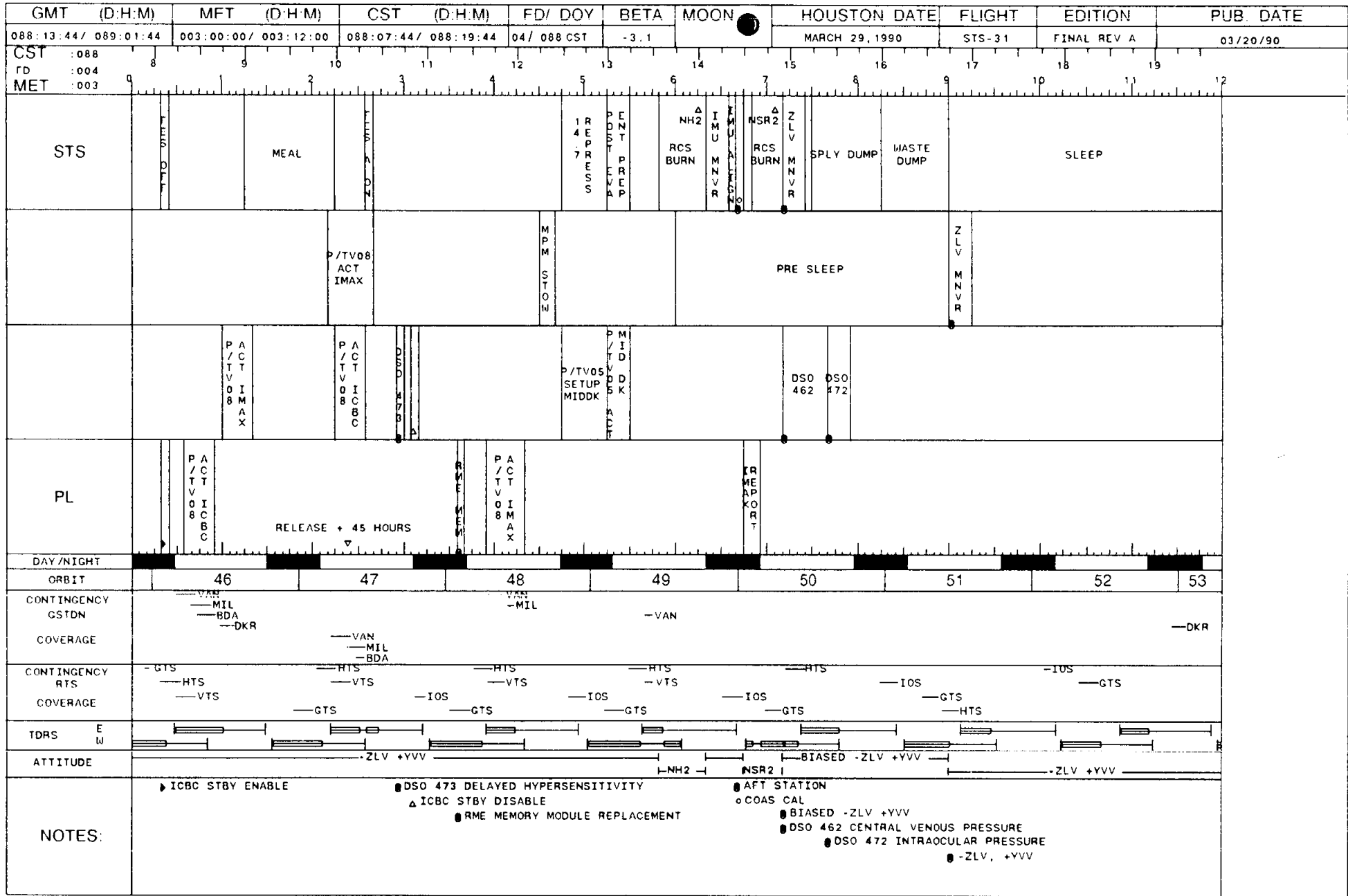


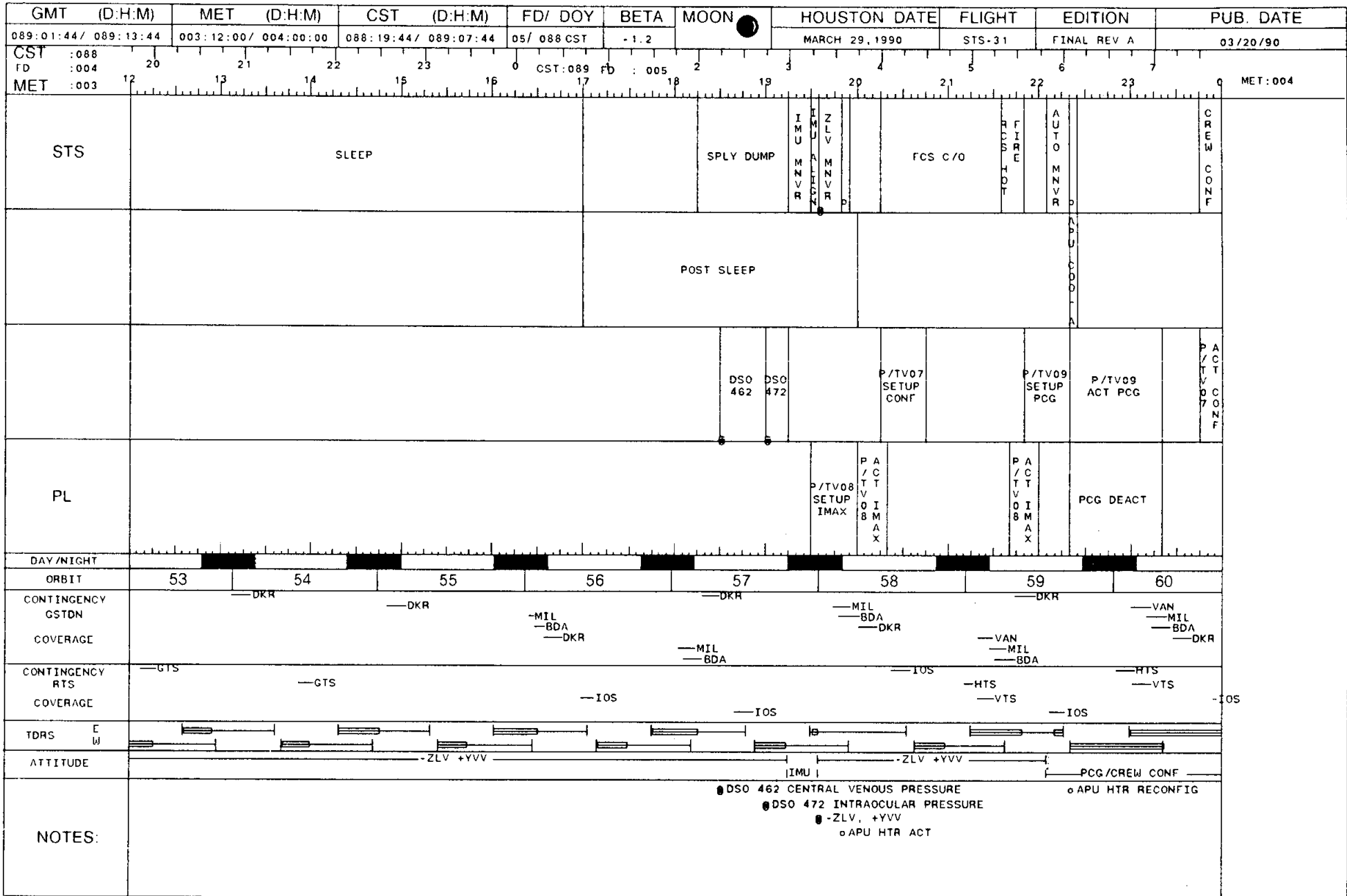


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|-----------------------|--|-----------------------|--------------|------|------|----------------|--------|-------------|-----------|----------|----|----|----|----|---|---------|
| 087:01:44 / 087:13:44 | 001:12:00 / 002:00:00  | 086:19:44 / 087:07:44 | 03 / 086 CST | -8.6 |      | MARCH 27, 1990 | STS-31 | FINAL REV A | 03/20/90  |          |    |    |    |    |   |         |
| CST :086              | 20   | 21                    | 22           | 23   | 0    | CST:087        | 1      | 2           | 19        | FD : 003 | 20 | 21 | 22 | 23 | 0 | MET:002 |
| FD :002               | 12   | 13                    | 14           | 15   | 16   | 17             | 18     | 19          | 20        | 21       | 22 | 23 | 0  |    |   |         |
| MET :001              |  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| STS                   | SLEEP  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
|                       |  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
|                       |  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
|                       |  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| PL                    |  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| DAY/NIGHT             | [Day/Night Cycle]  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| ORBIT                 | 23   | 24                    | 25           | 26   | 27   | 28             | 29     | 30          |           |          |    |    |    |    |   |         |
| CONTINGENCY<br>GSTDN  | ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR ---DKR   |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| COVERAGE              | ---MIL ---BDA ---DKR ---MIL ---BDA ---DKR ---MIL ---BDA ---DKR ---MIL ---BDA ---DKR ---MIL ---BDA ---DKR   |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| CONTINGENCY<br>RTS    | ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS ---GTS   |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| COVERAGE              | ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS ---IOS   |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| TDRS                  | [TDRS Coverage Bars]   |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| ATTITUDE              | -YLV -ZVV +XLV -YVV BIASED +XLV +YVV GG I  |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |
| NOTES:                | DSO 462 CENTRAL VENOUS PRESSURE<br>DSO 472 INTRAOCULAR PRESSURE<br>DSO 462 +XLV, -YVV BIASED<br>DSO 472 +XLV +YVV GG I<br>DSO 0816 GRAVITY GRADIENT ATTITUDE CONTROL |                       |              |      |      |                |        |             |           |          |    |    |    |    |   |         |

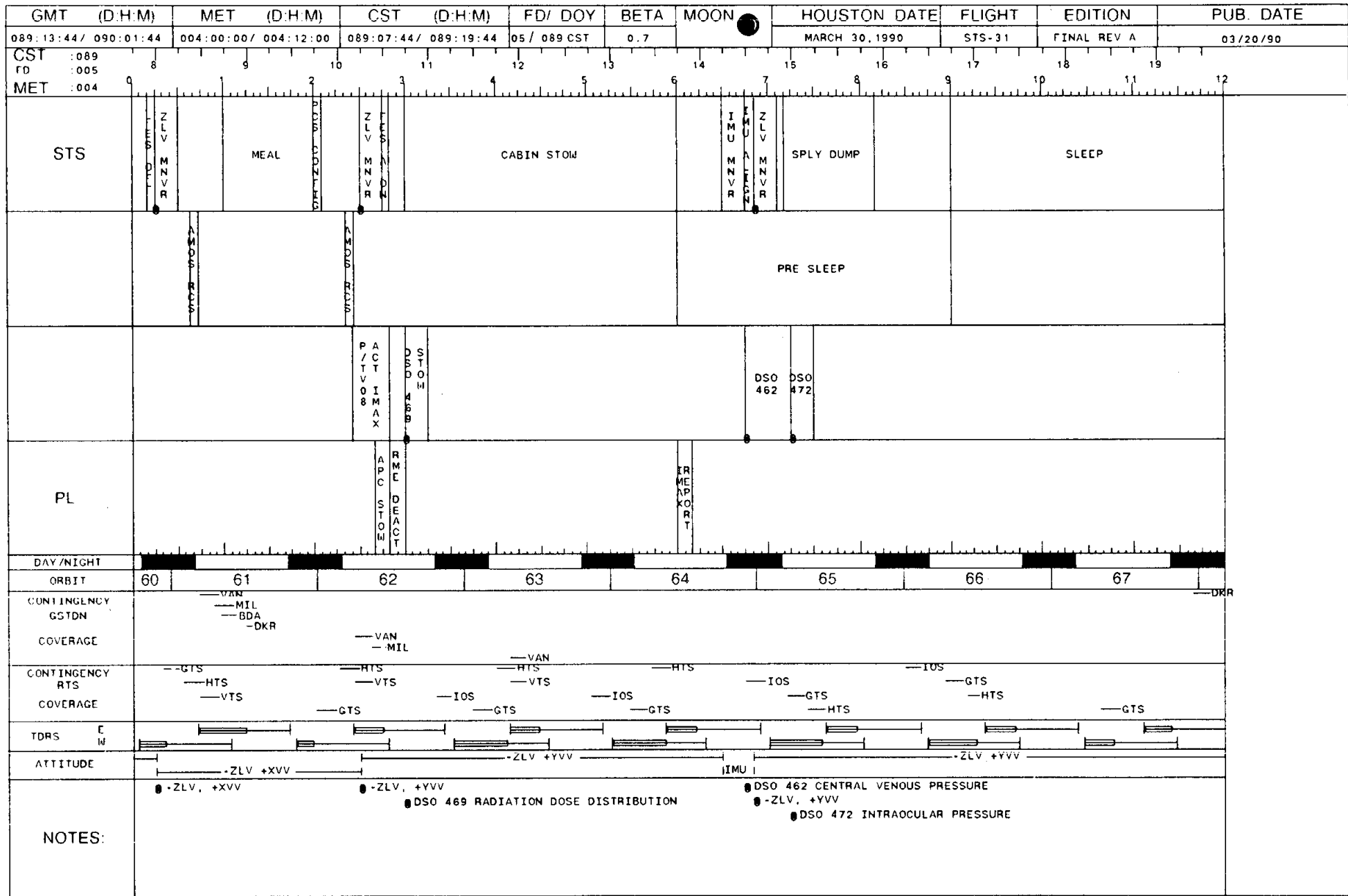


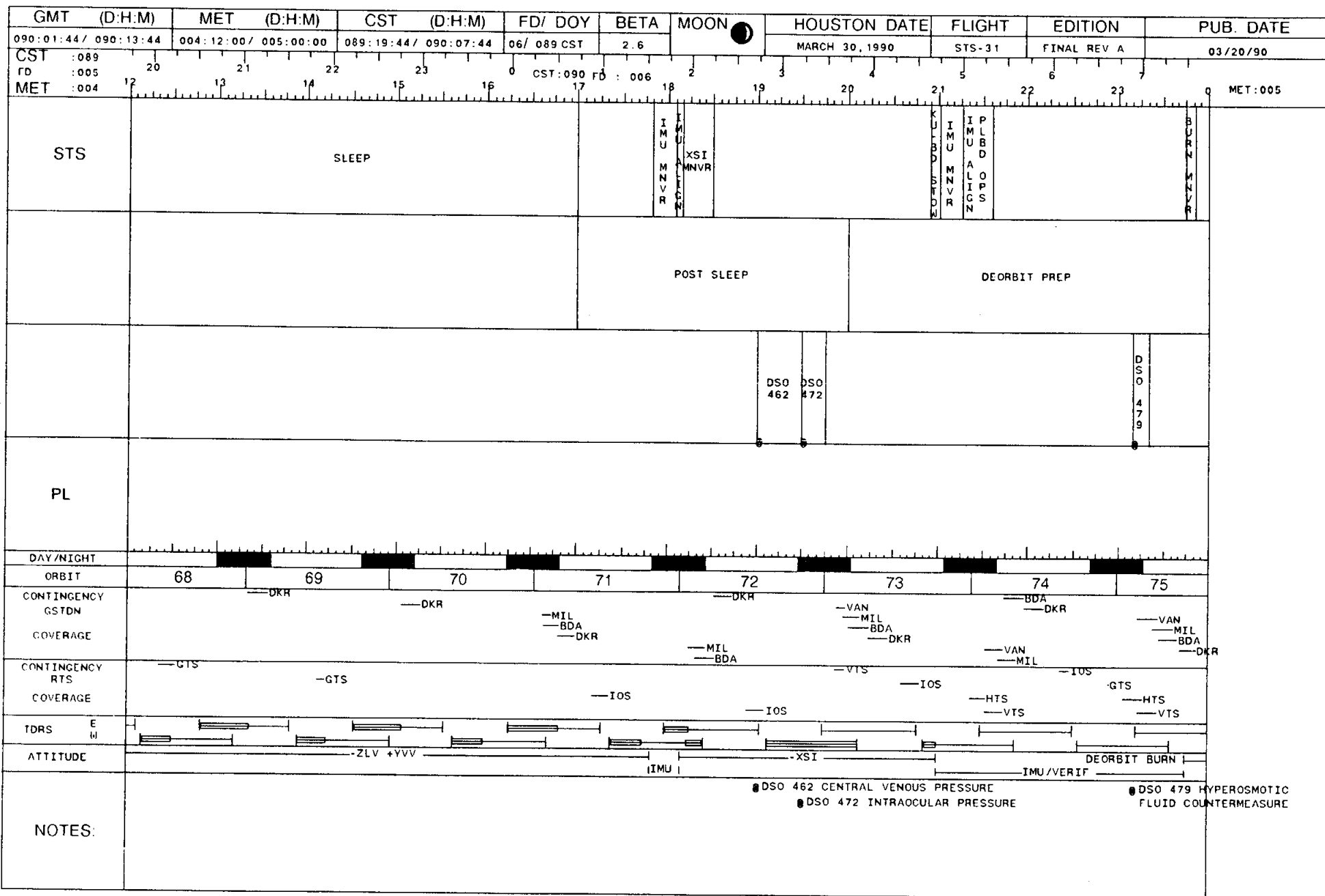










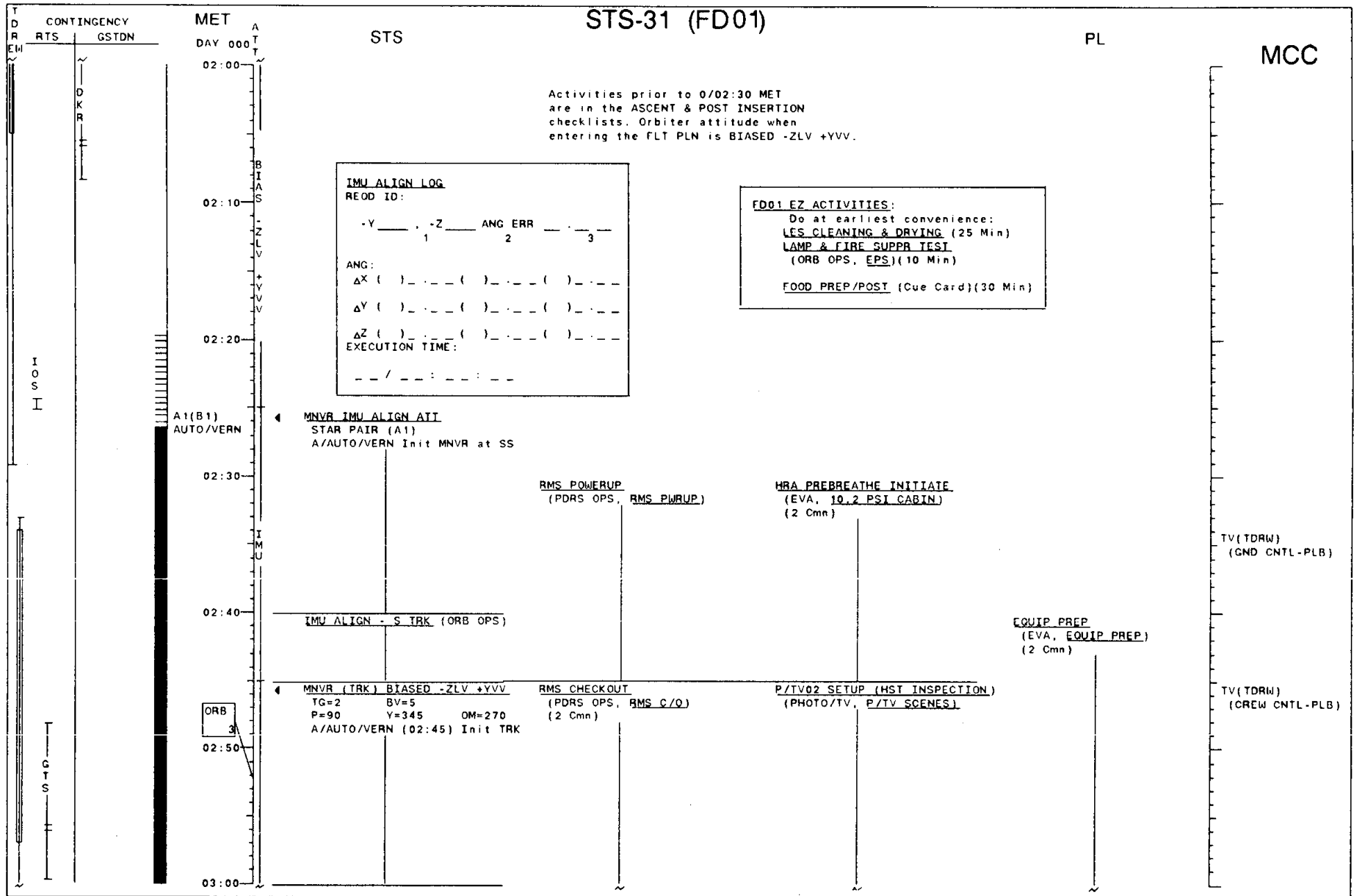


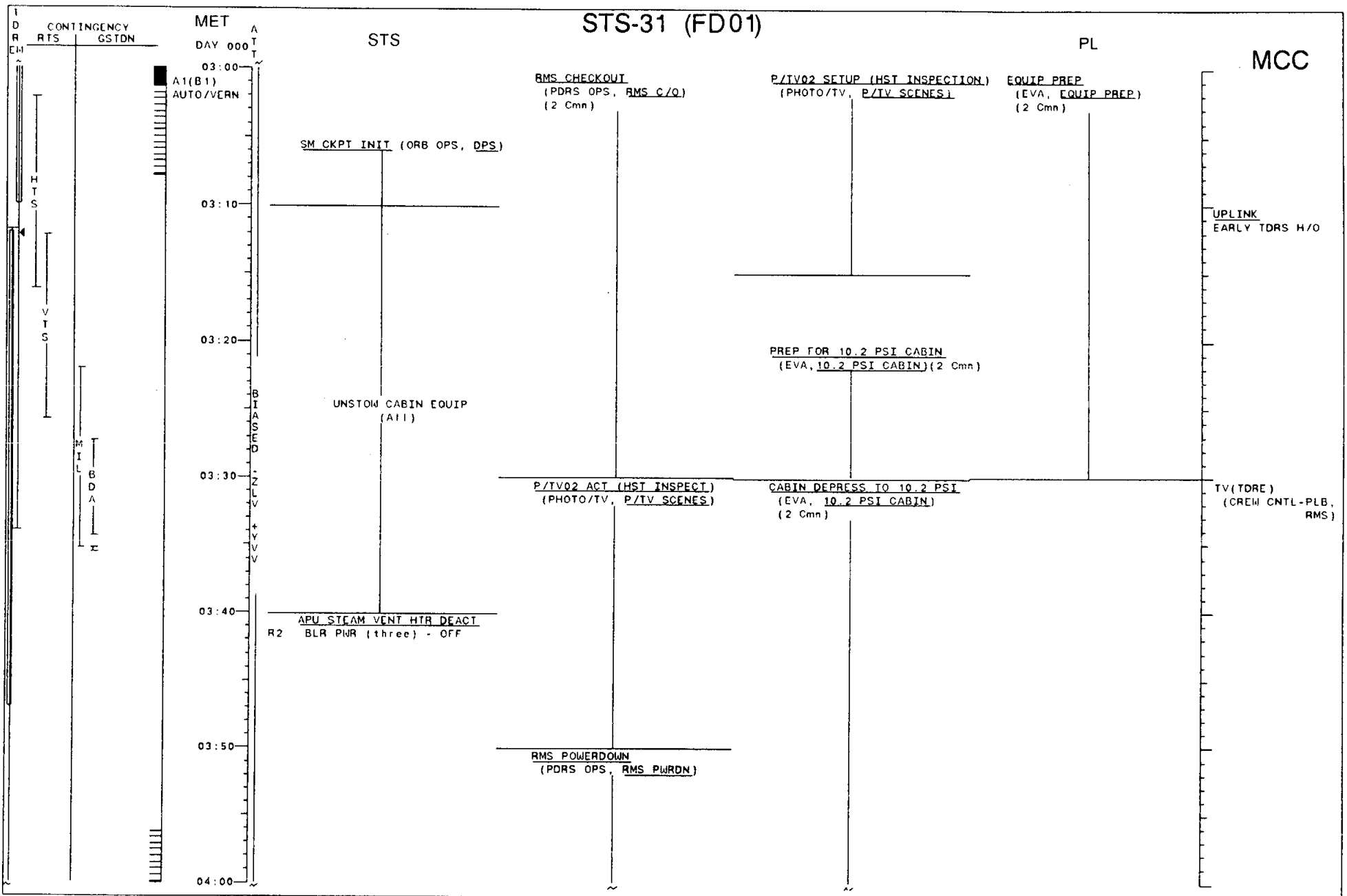
| GMT (D:H:M)             | MET (D:H:M)             | CST (D:H:M)           | FD/ DOY                | BETA                 | MOON         | HOUSTON DATE   | FLIGHT | EDITION     | PUB. DATE |
|-------------------------|-------------------------|-----------------------|------------------------|----------------------|--------------|----------------|--------|-------------|-----------|
| 090:13:44 / 091:01:44   | 005:00:00 / 005:12:00   | 090:07:44 / 090:19:44 | 06/ 090 CST            | 4.5                  |              | MARCH 31, 1990 | STS-31 | FINAL REV A | 03/20/90  |
| CST :090                |                         |                       |                        |                      |              |                |        |             |           |
| rd :006                 |                         |                       |                        |                      |              |                |        |             |           |
| MET :005                |                         |                       |                        |                      |              |                |        |             |           |
| STS                     |                         |                       |                        |                      |              |                |        |             |           |
| DEORBIT                 | EDW                     |                       |                        |                      |              |                |        |             |           |
| BURN *                  | LANDING *               |                       |                        |                      |              |                |        |             |           |
| PL                      |                         |                       |                        |                      |              |                |        |             |           |
| DAY/NIGHT               |                         |                       |                        |                      |              |                |        |             |           |
| ORBIT                   | 75                      | 76                    | 77                     | 78                   | 79           | 80             | 81     | 82          | DKR       |
| CONTINGENCY<br>GSTDN    |                         | -VAN<br>-MIL<br>-BDA  |                        | -VAN<br>-MIL         |              | -VAN           |        |             | -DKR      |
| CONTINGENCY<br>RTS      | IOS                     | -IOS                  | -IOS                   | -IOS                 | -IOS         | -IOS           | -IOS   | -IOS        | -DKR      |
| CONTINGENCY<br>COVERAGE | -GTS<br>-HTS<br>-VTS    | -GTS<br>-HTS<br>-VTS  | -GTS<br>-HTS<br>-VTS   | -GTS<br>-HTS<br>-VTS | -GTS<br>-HTS | -GTS<br>-HTS   | -IOS   | -GTS        |           |
| TORS                    |                         |                       |                        |                      |              |                |        |             |           |
| ATTITUDE                | ENTRY                   |                       |                        |                      |              |                |        |             |           |
| NOTES:                  | * DEORBIT BURN 05/00:00 |                       | * EDW LANDING 05/01:12 |                      |              |                |        |             |           |

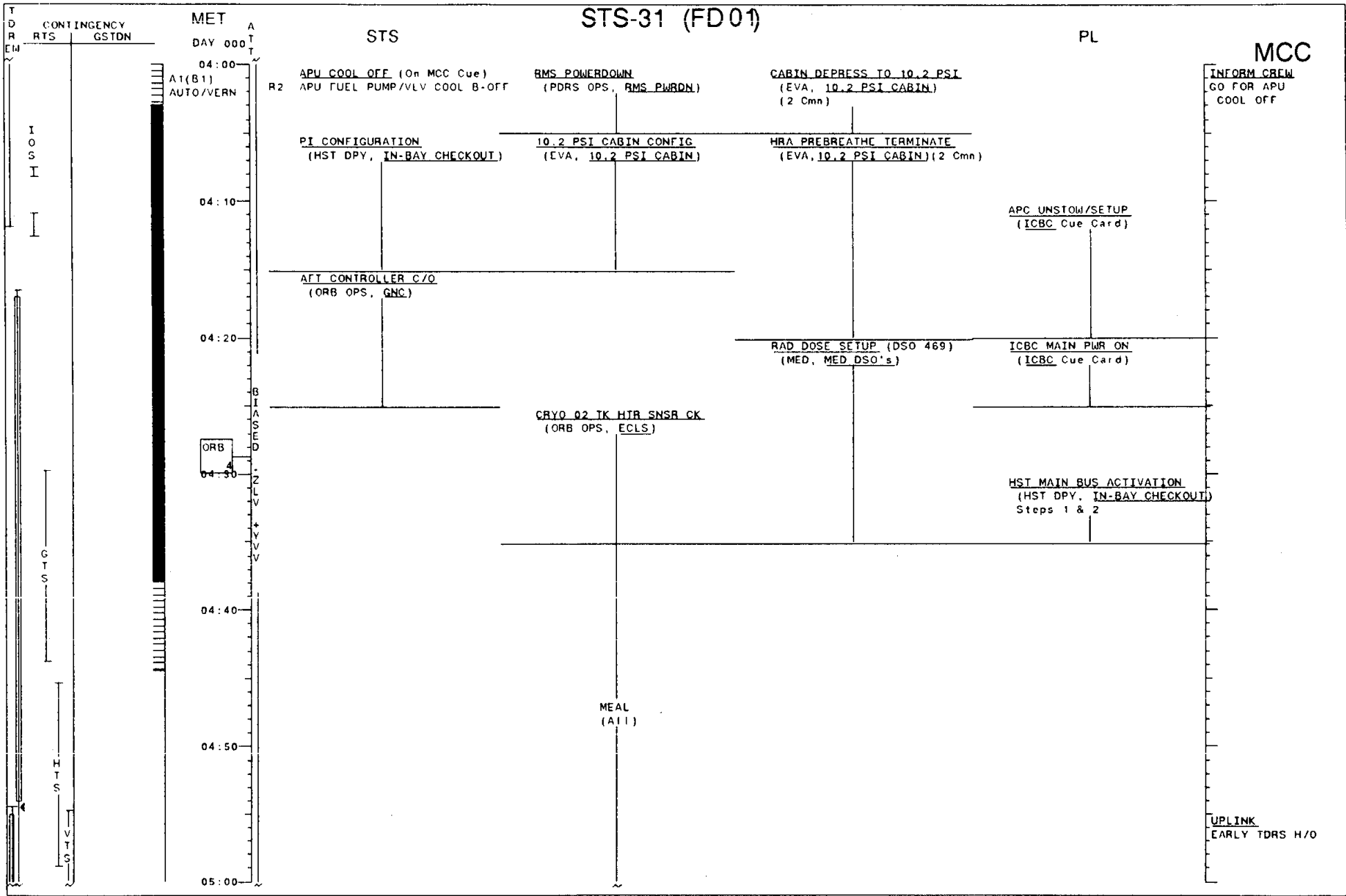
DETAILED TIMELINE

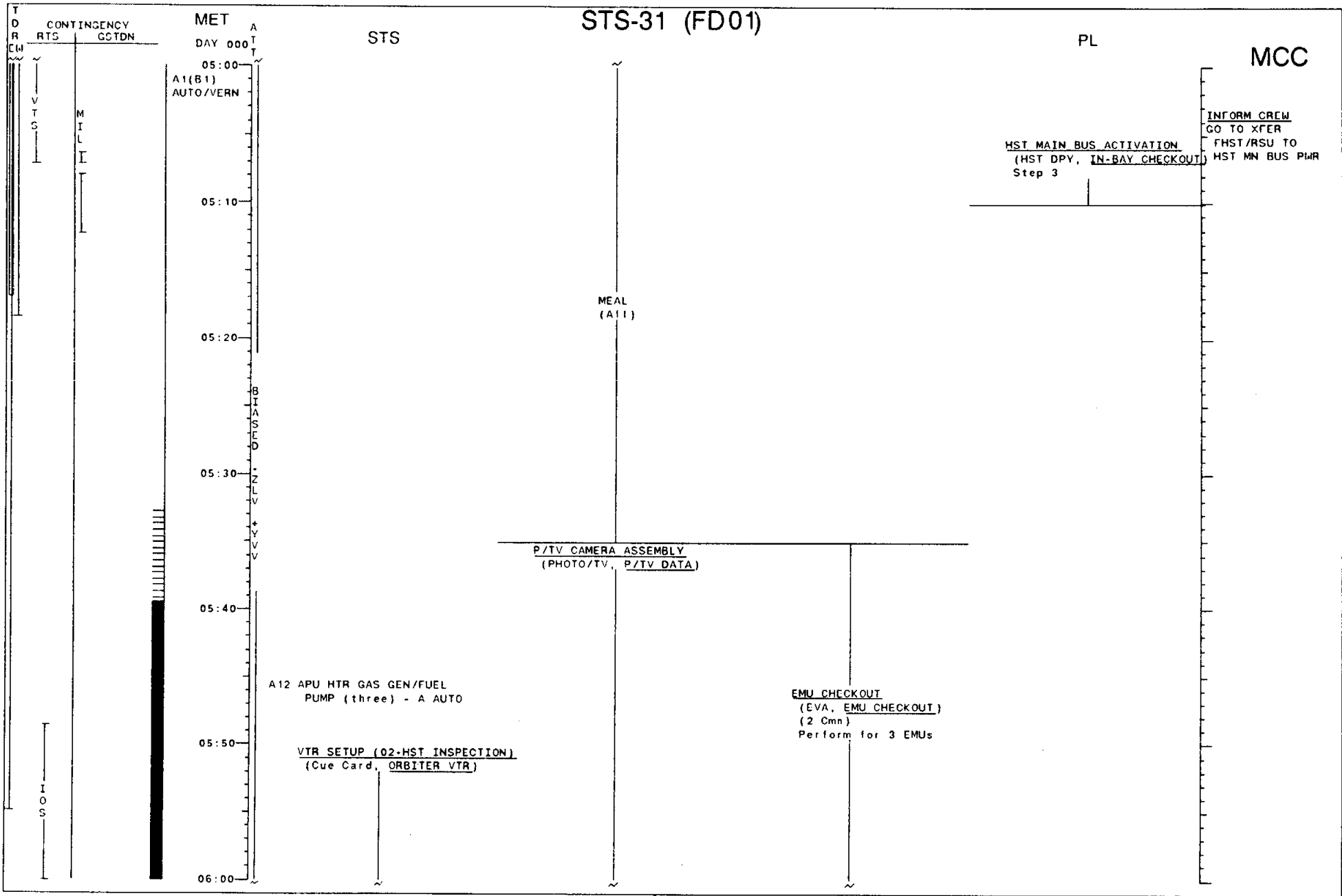
DETAILED  
TIMELINE

# DETAILED TIMELINE

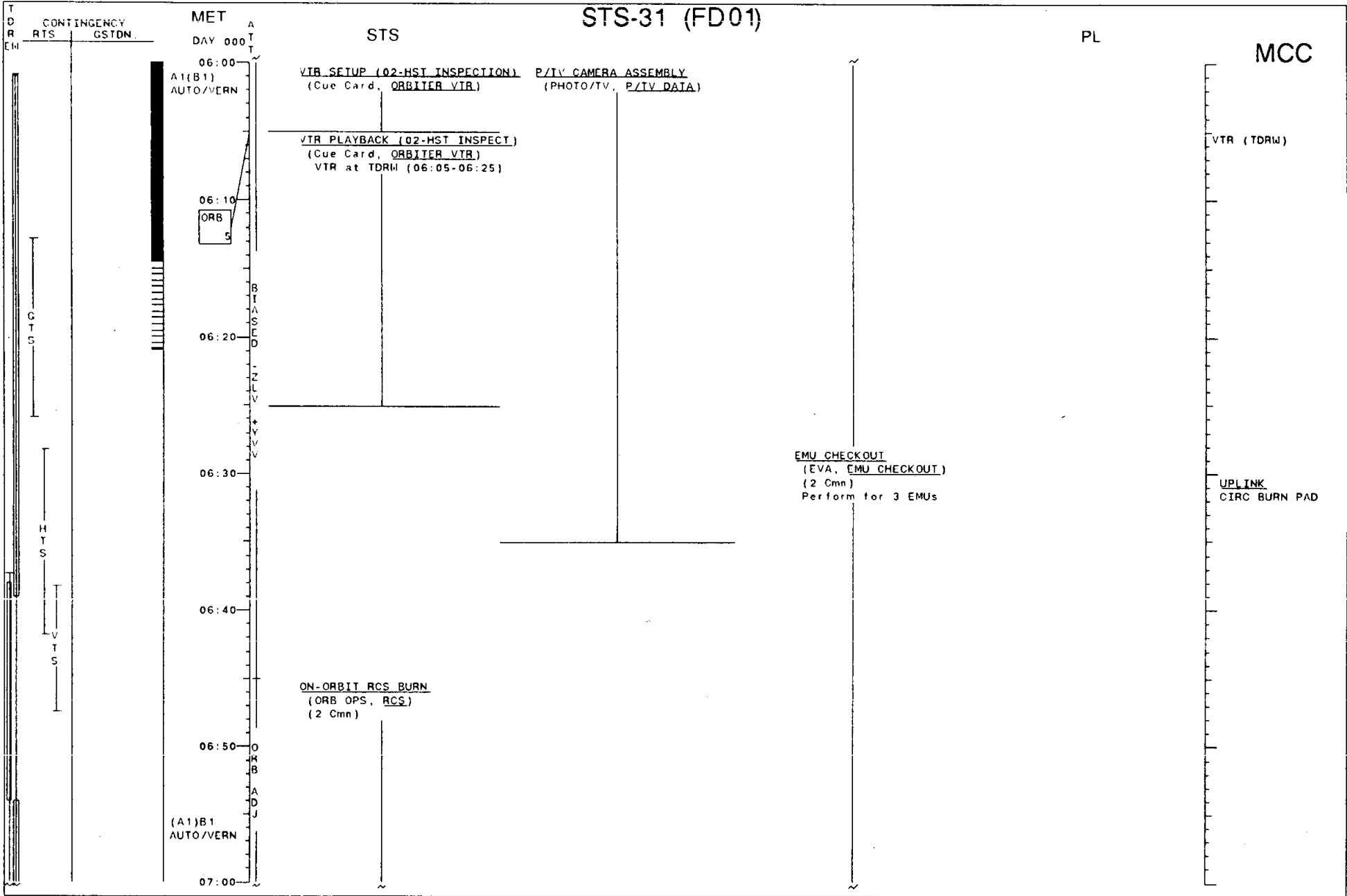


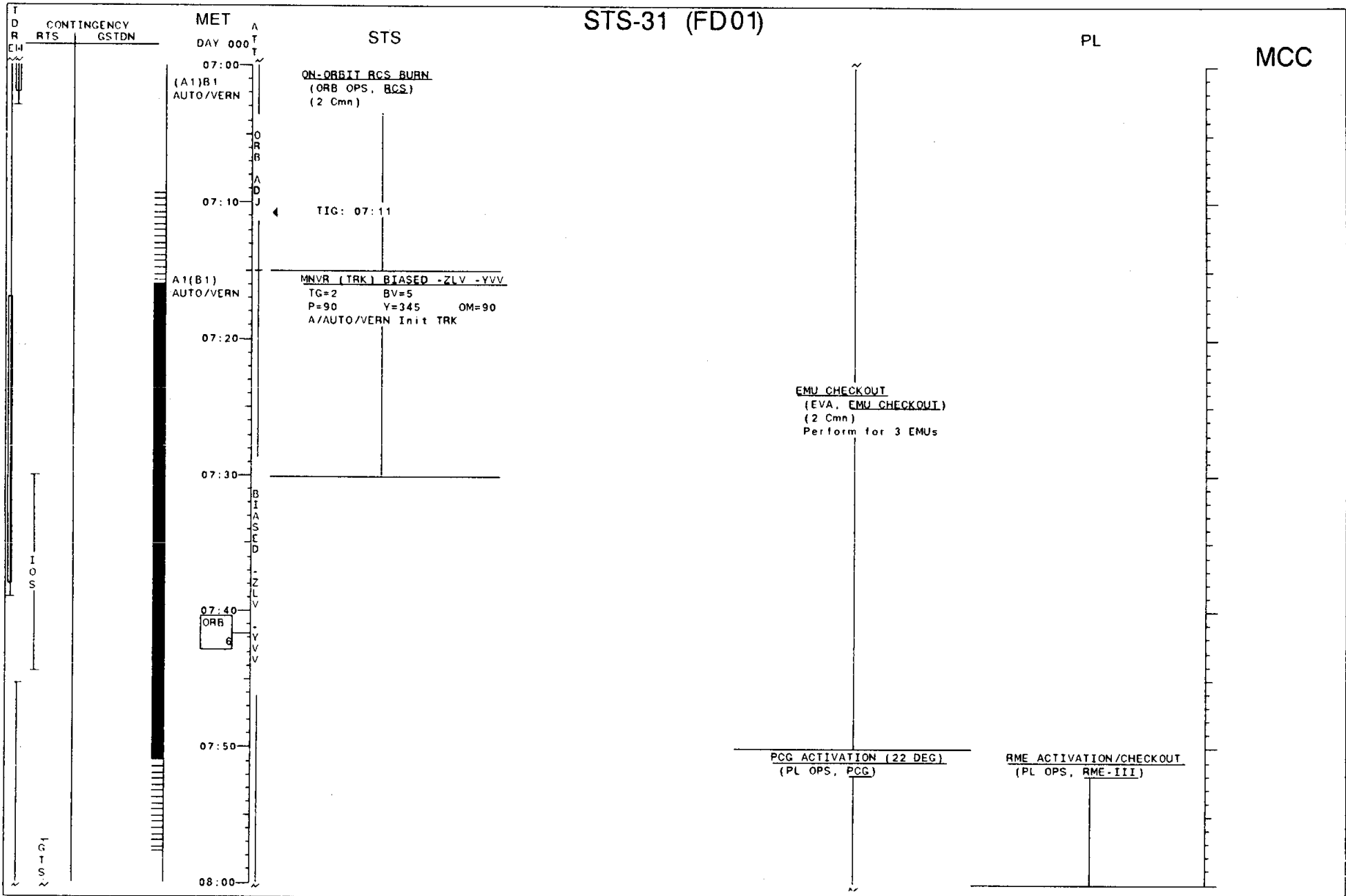


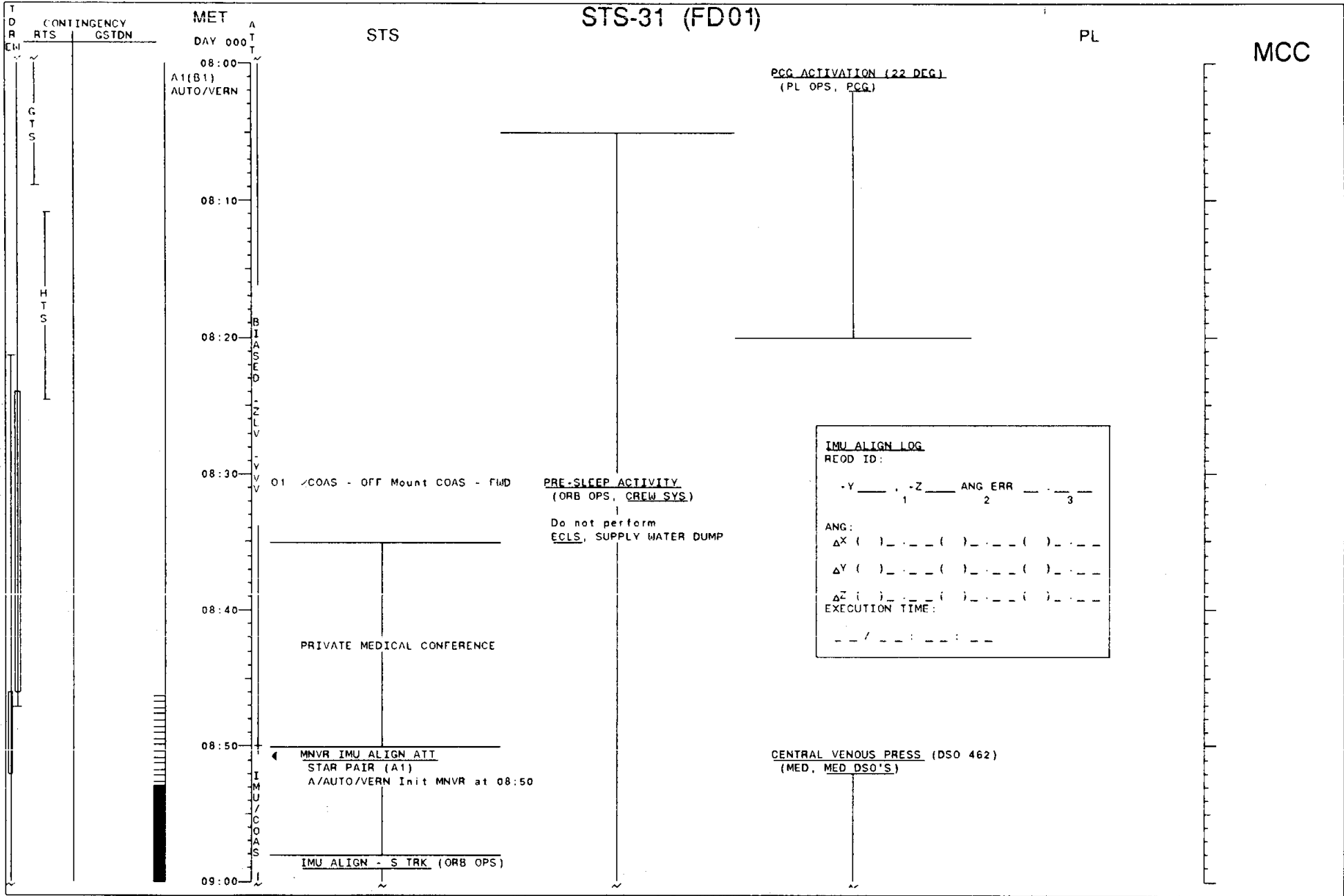


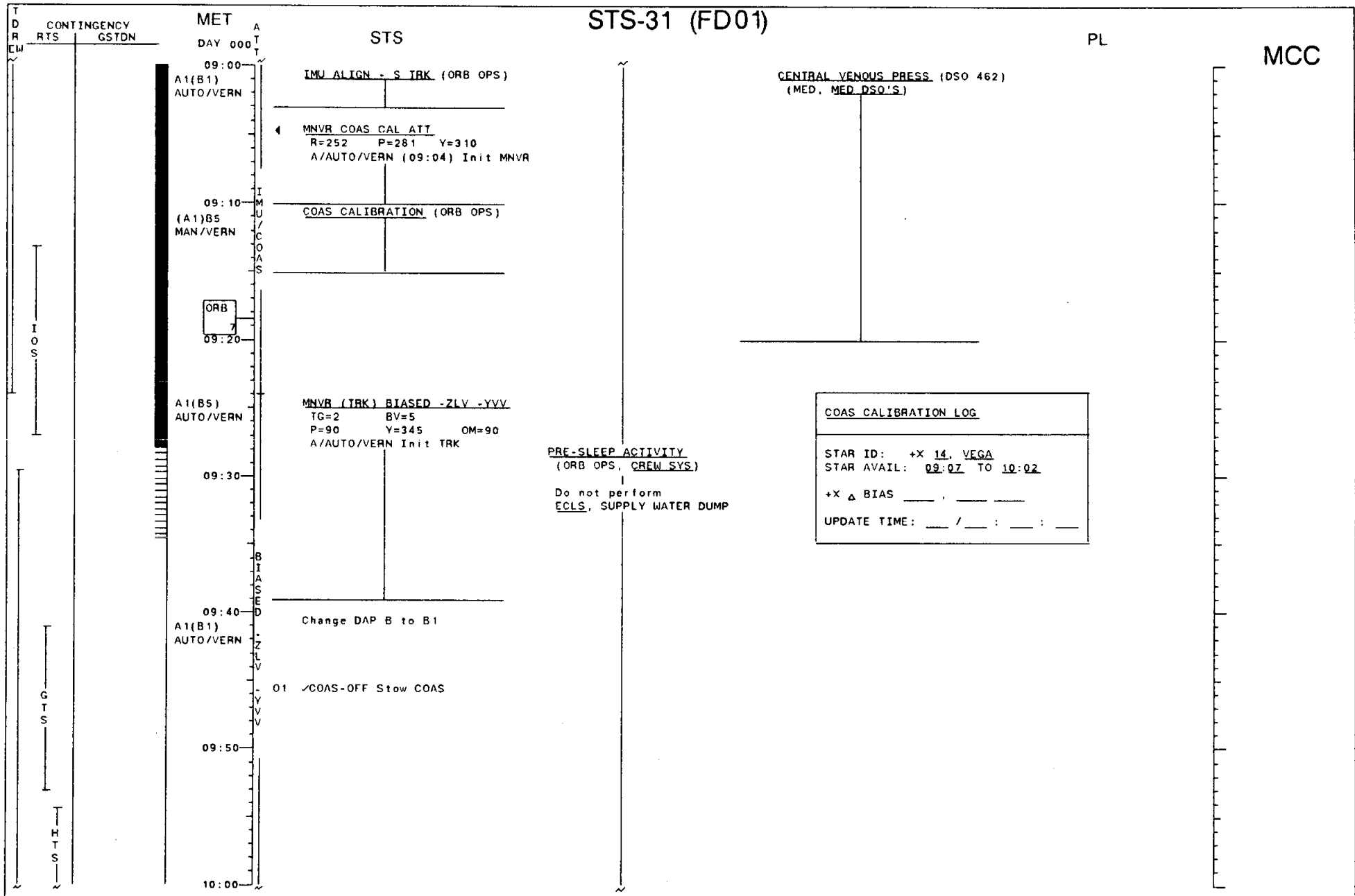












# STS-31 (FD01)

CONTINGENCY  
RTS GSTDN

MET  
DAY 000

STS

PL

MCC

09:00  
A1(B1)  
AUTO/VERN

09:10  
(A1)B5  
MAN/VERN

ORB  
09:20

A1(B5)  
AUTO/VERN

09:30

09:40  
A1(B1)  
AUTO/VERN

09:50

10:00

IMU ALIGN - S TRK (ORB OPS)

← MNVR COAS CAL ATT  
R=252 P=281 Y=310  
A/AUTO/VERN (09:04) Init MNVR

COAS CALIBRATION (ORB OPS)

MNVR (TRK) BIASED -ZLV -YVV  
TG=2 BV=5  
P=90 Y=345 OM=90  
A/AUTO/VERN Init TRK

Change DAP B to B1

01 ✓COAS-OFF Stow COAS

CENTRAL VENOUS PRESS (DSO 462)  
(MED. MED DSO'S)

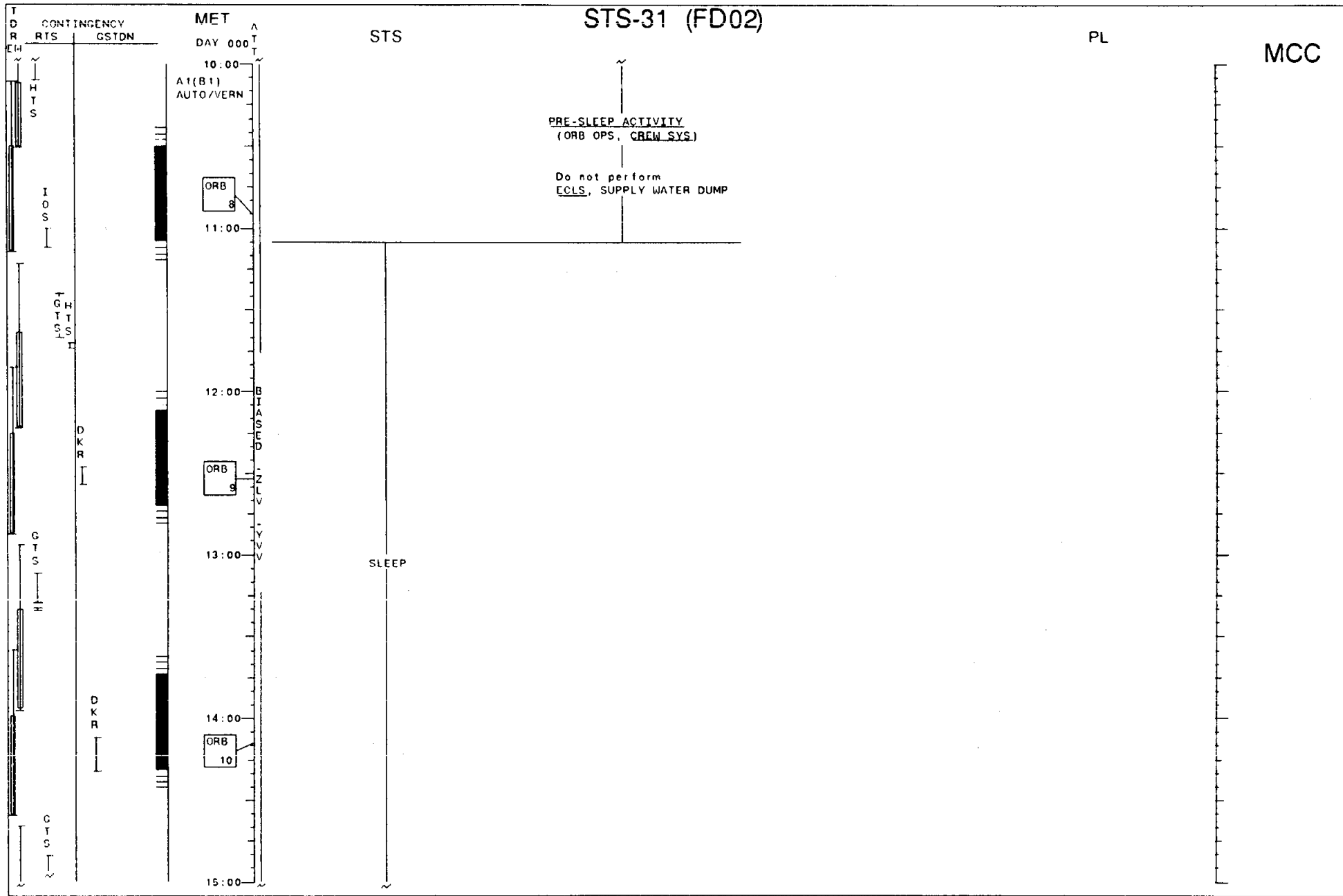
PRE-SLEEP ACTIVITY  
(ORB OPS, CREW SYS)  
Do not perform  
ECLS, SUPPLY WATER DUMP

COAS CALIBRATION LOG

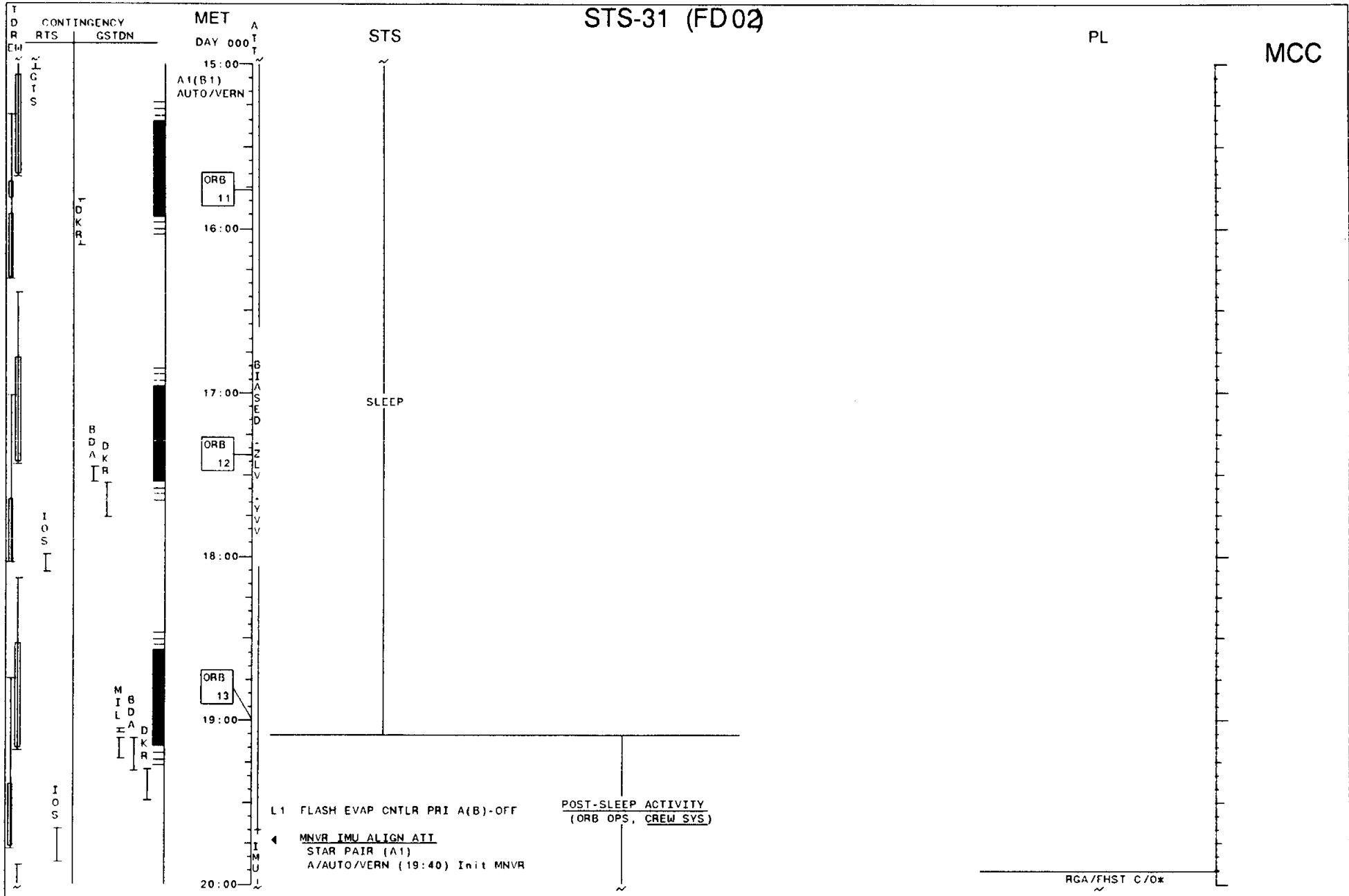
STAR ID: +X 14, VEGA  
STAR AVAIL: 09:07 TO 10:02

+X Δ BIAS \_\_\_\_\_

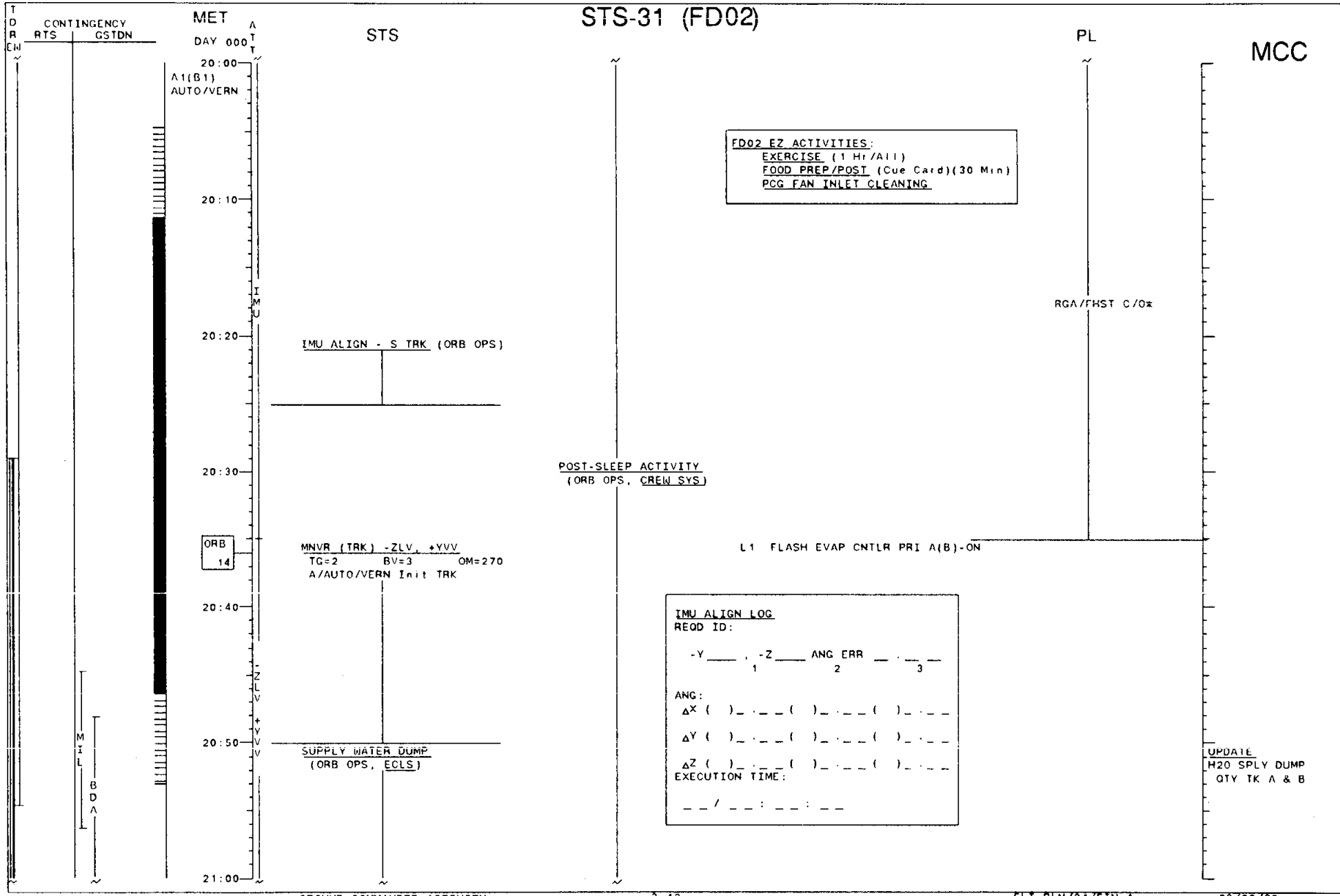
UPDATE TIME: \_\_\_ / \_\_\_ : \_\_\_ : \_\_\_



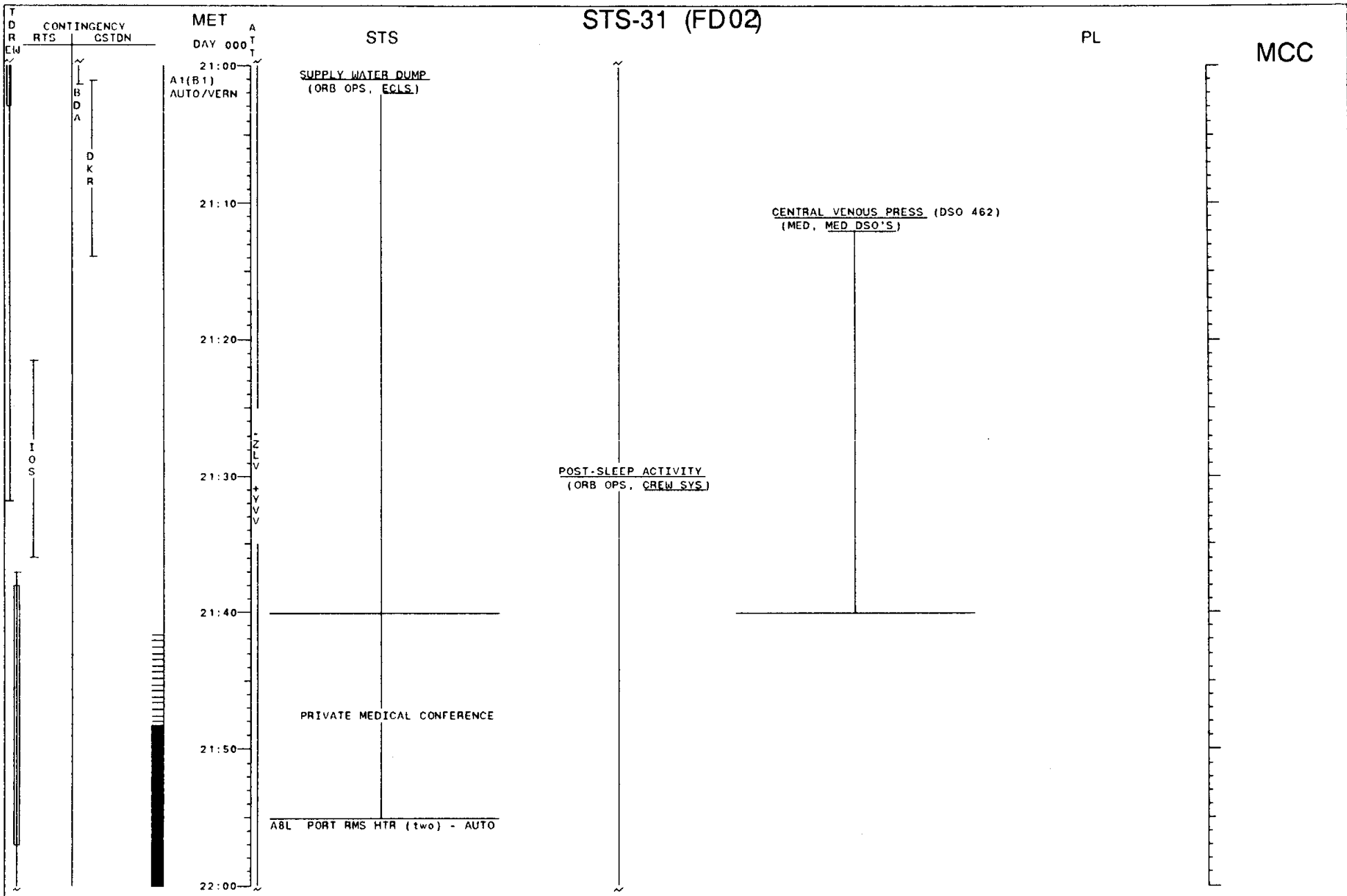
# STS-31 (FD02)



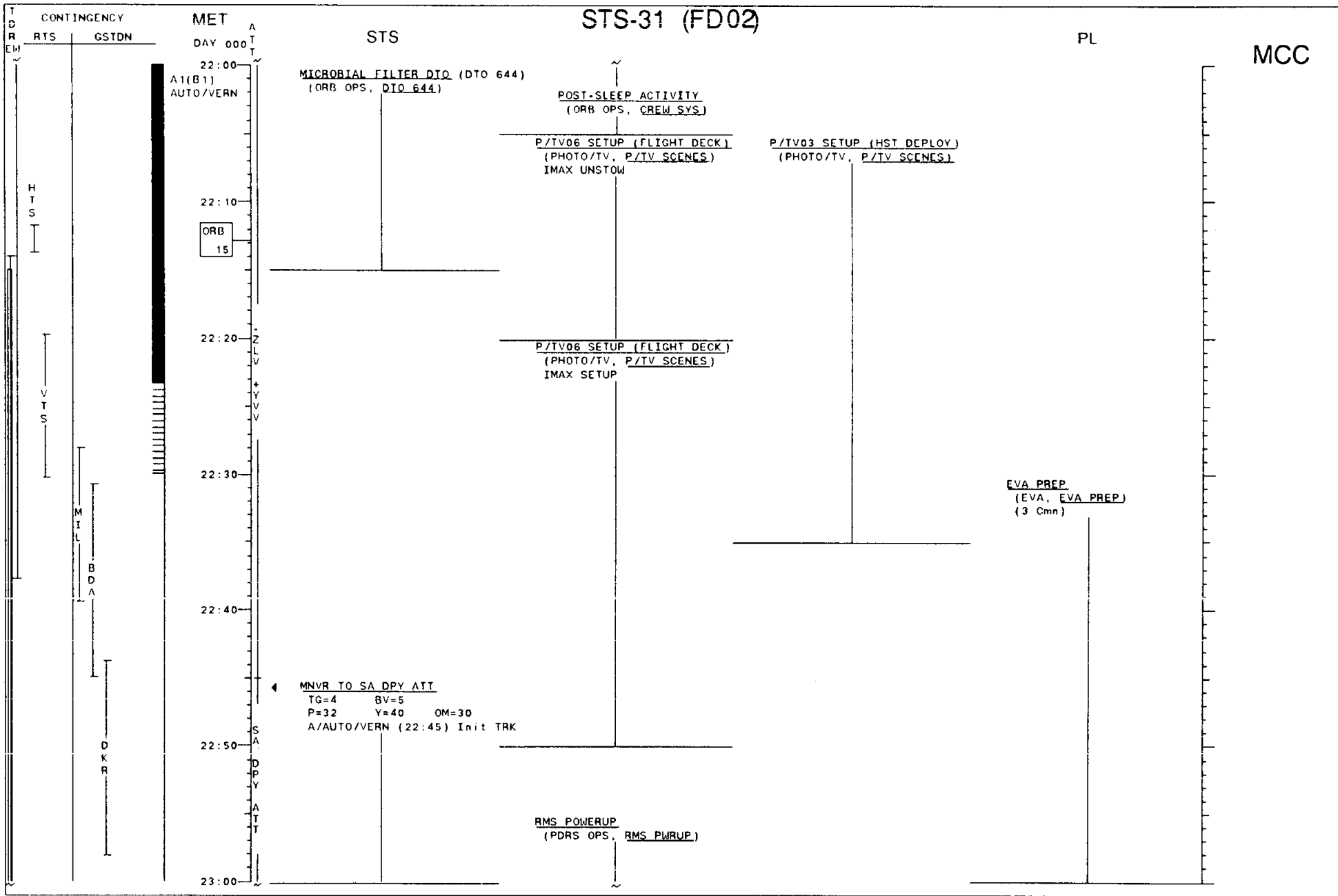
\* = GROUND COMMANDED ACTIVITY

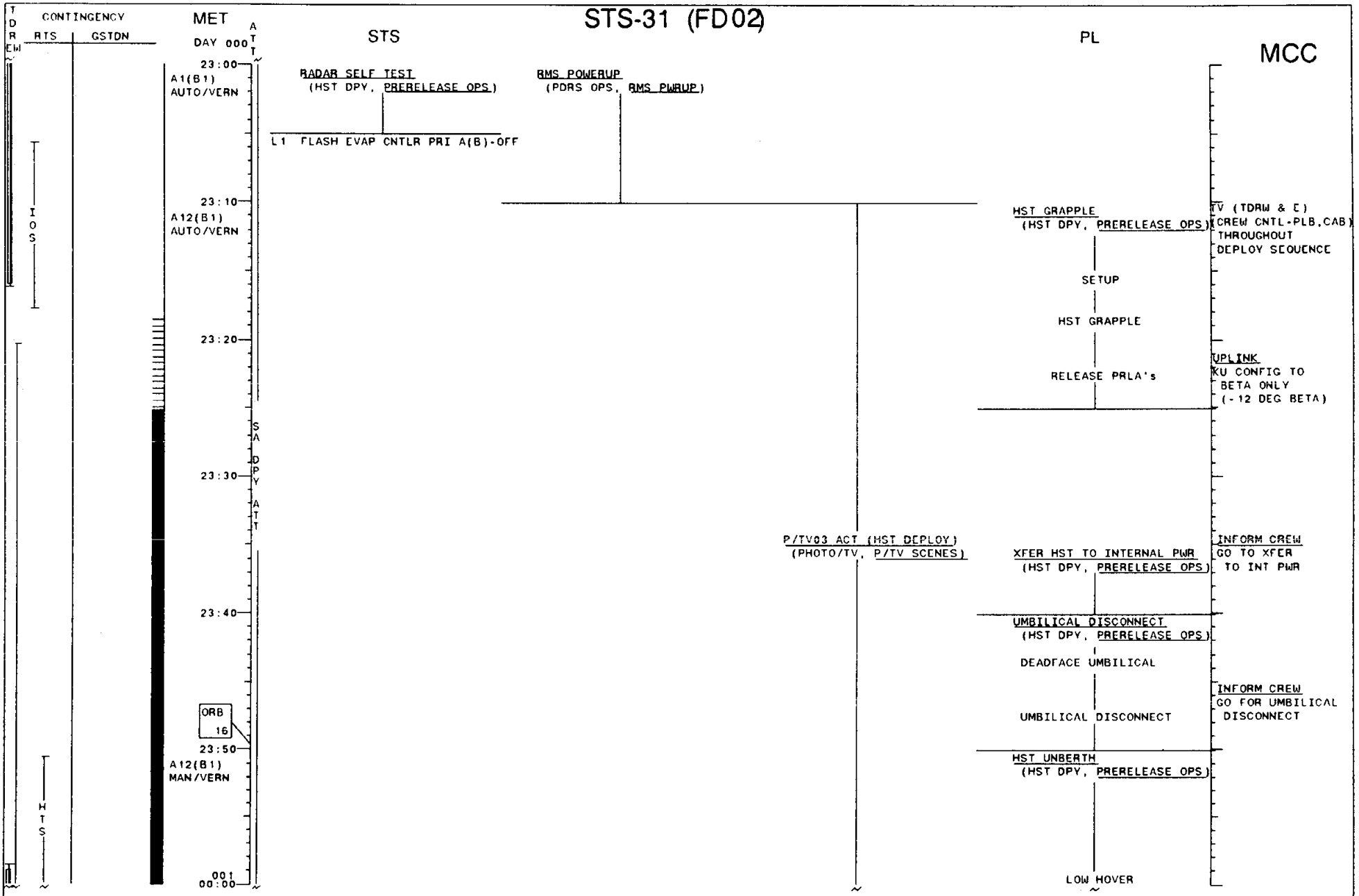


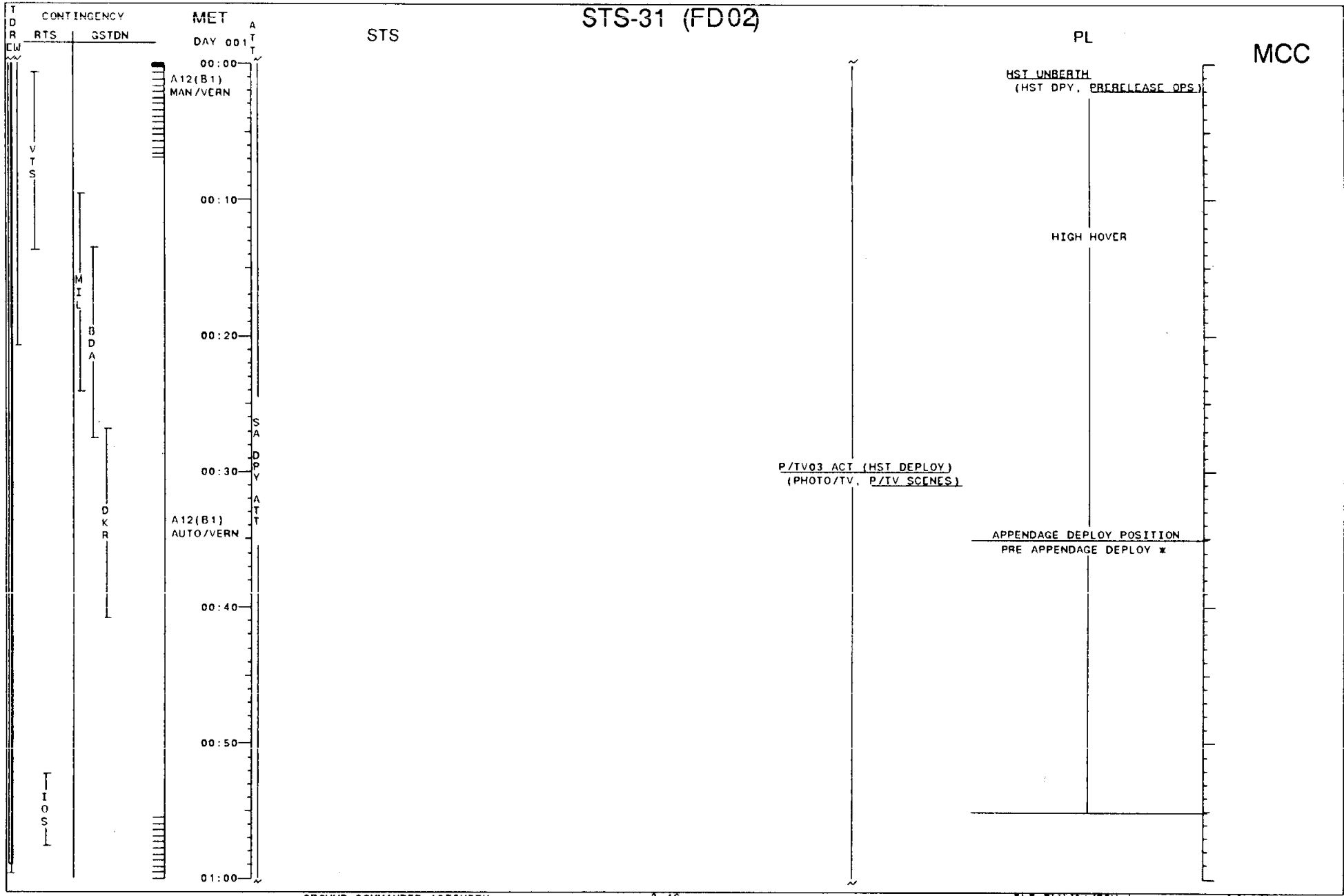
\* = GROUND COMMANDED ACTIVITY



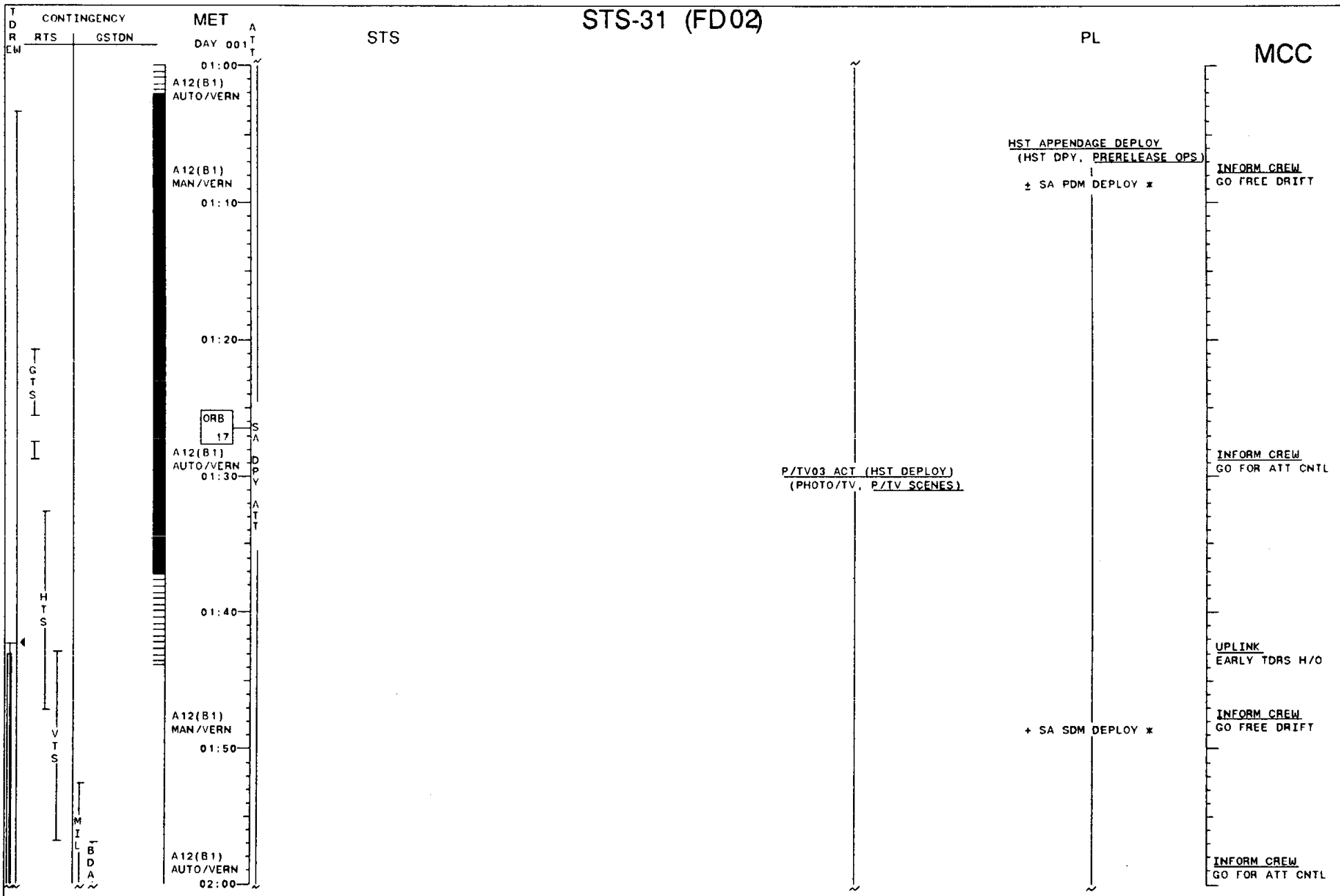








\* = GROUND COMMANDED ACTIVITY

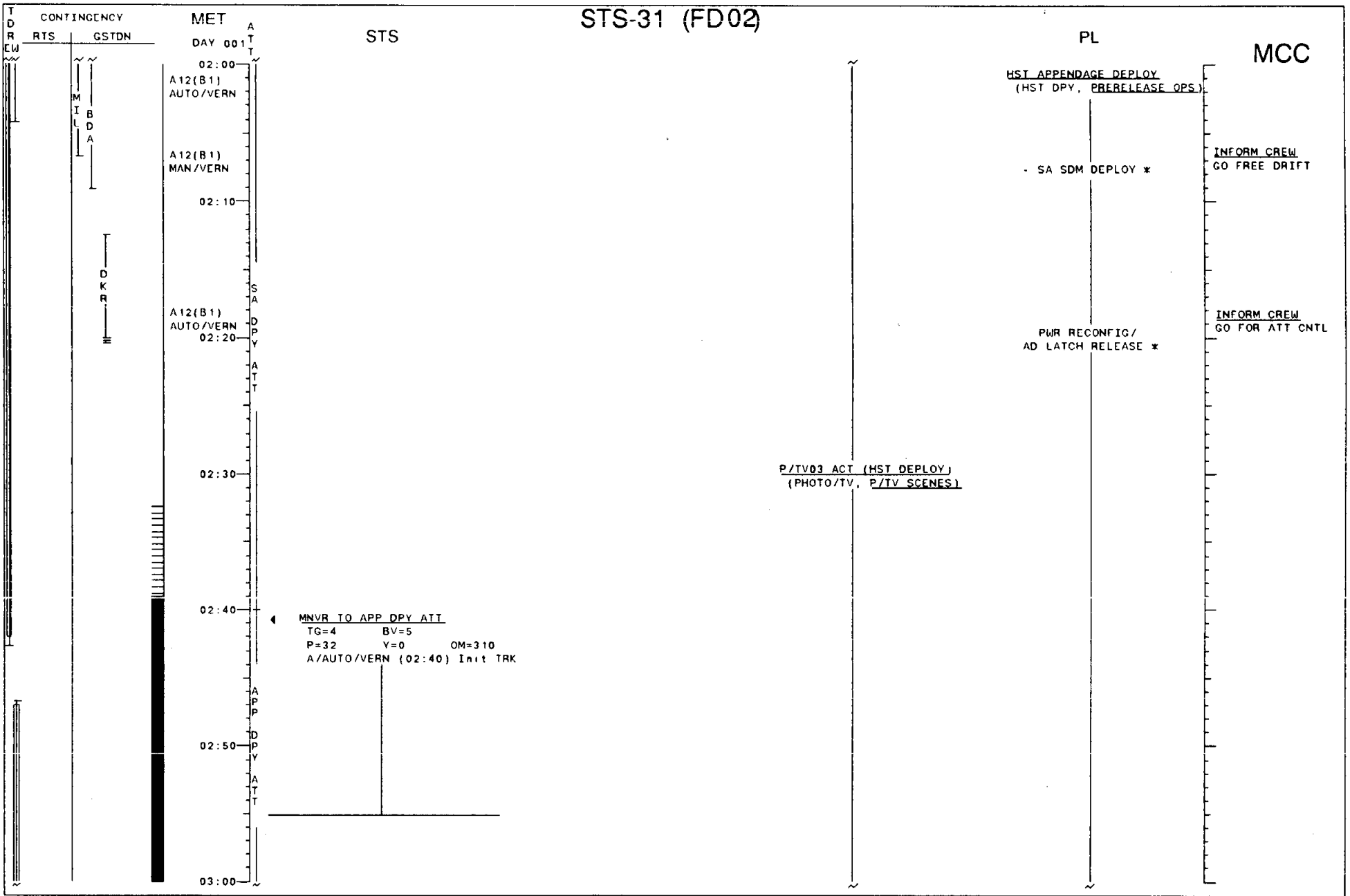


\* = GROUND COMMANDED ACTIVITY

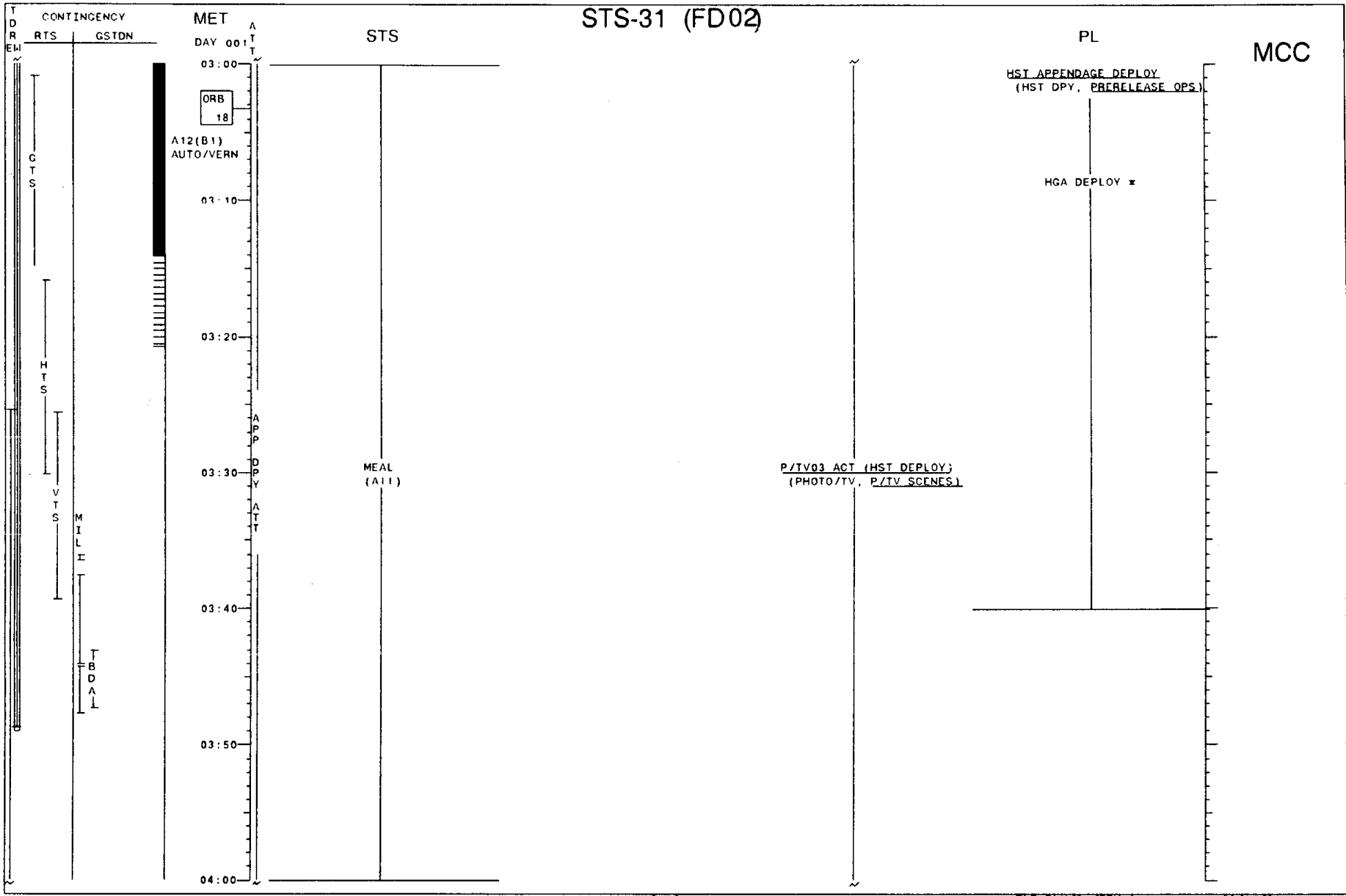
3-17

FLY PLN/31/FIN A

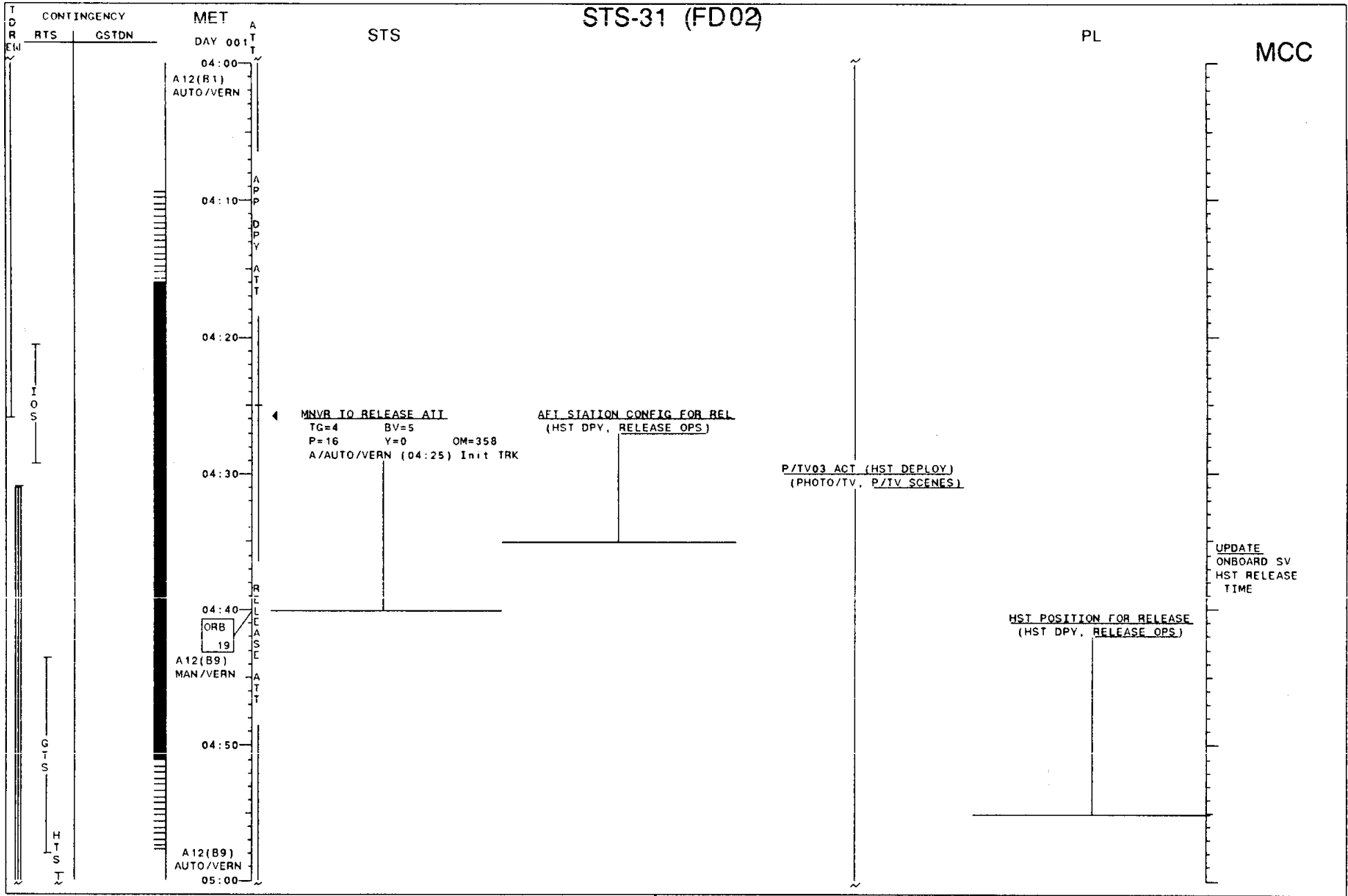
03/20/90

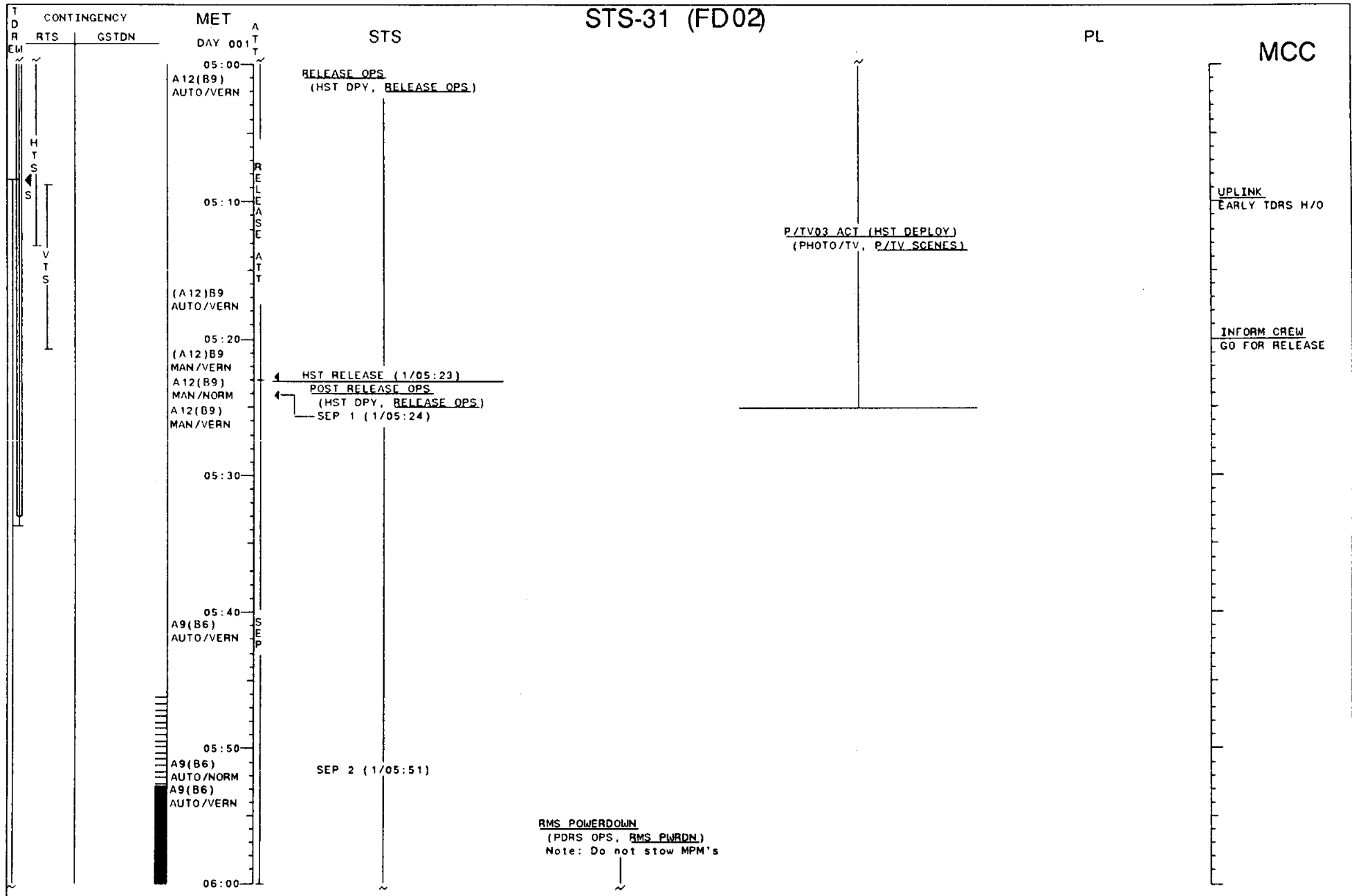


\* = GROUND COMMANDED ACTIVITY

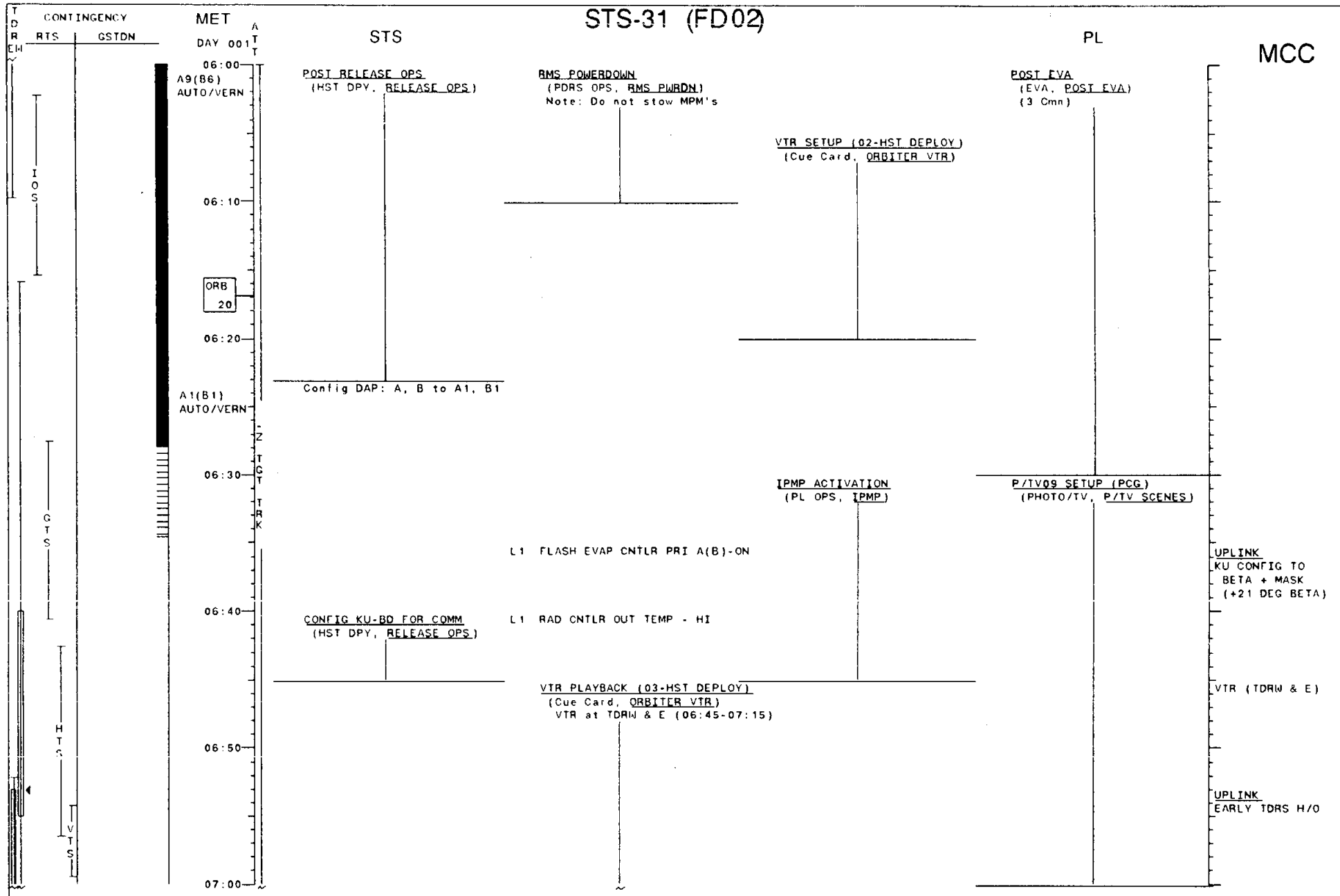


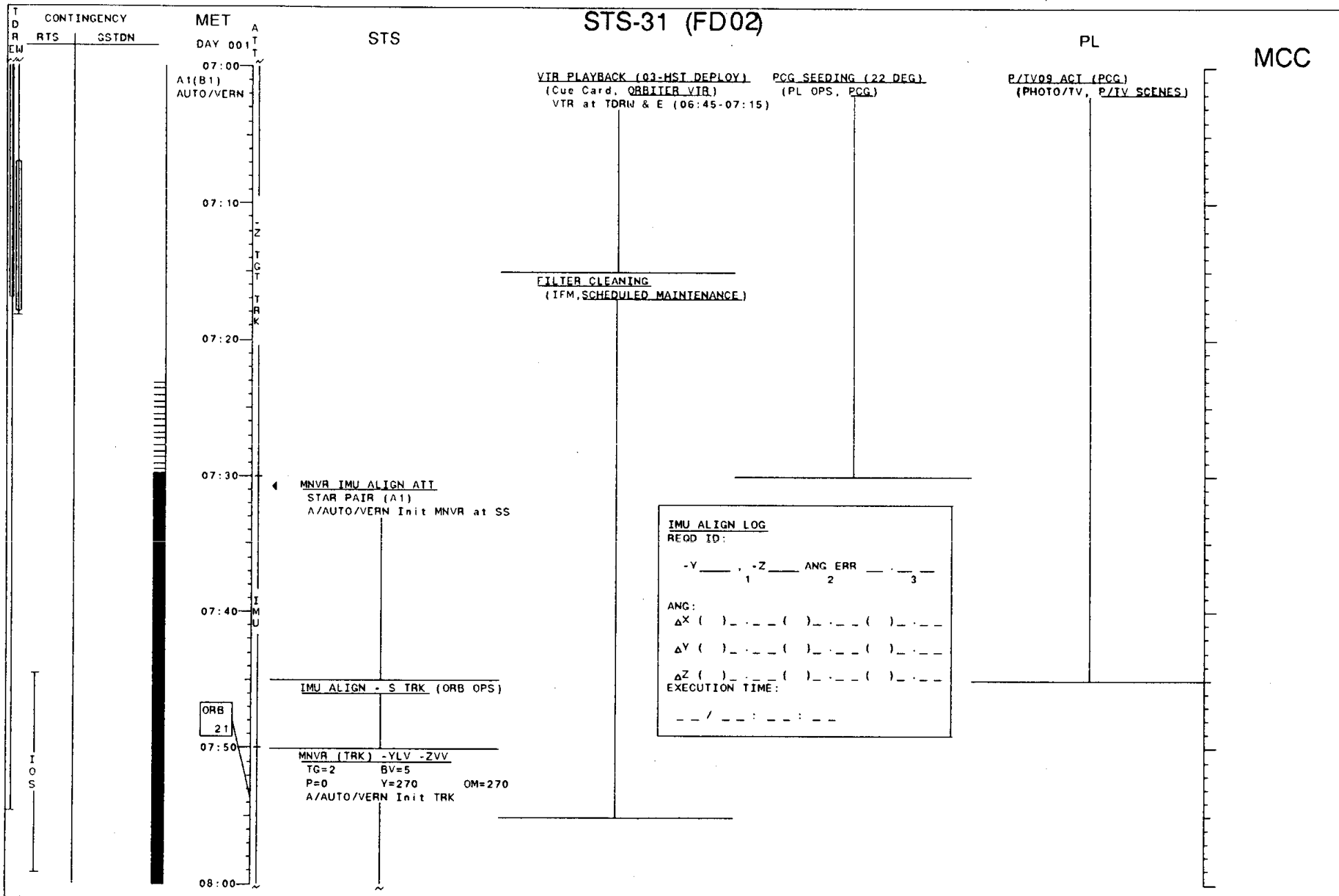
\* = GROUND COMMANDED ACTIVITY

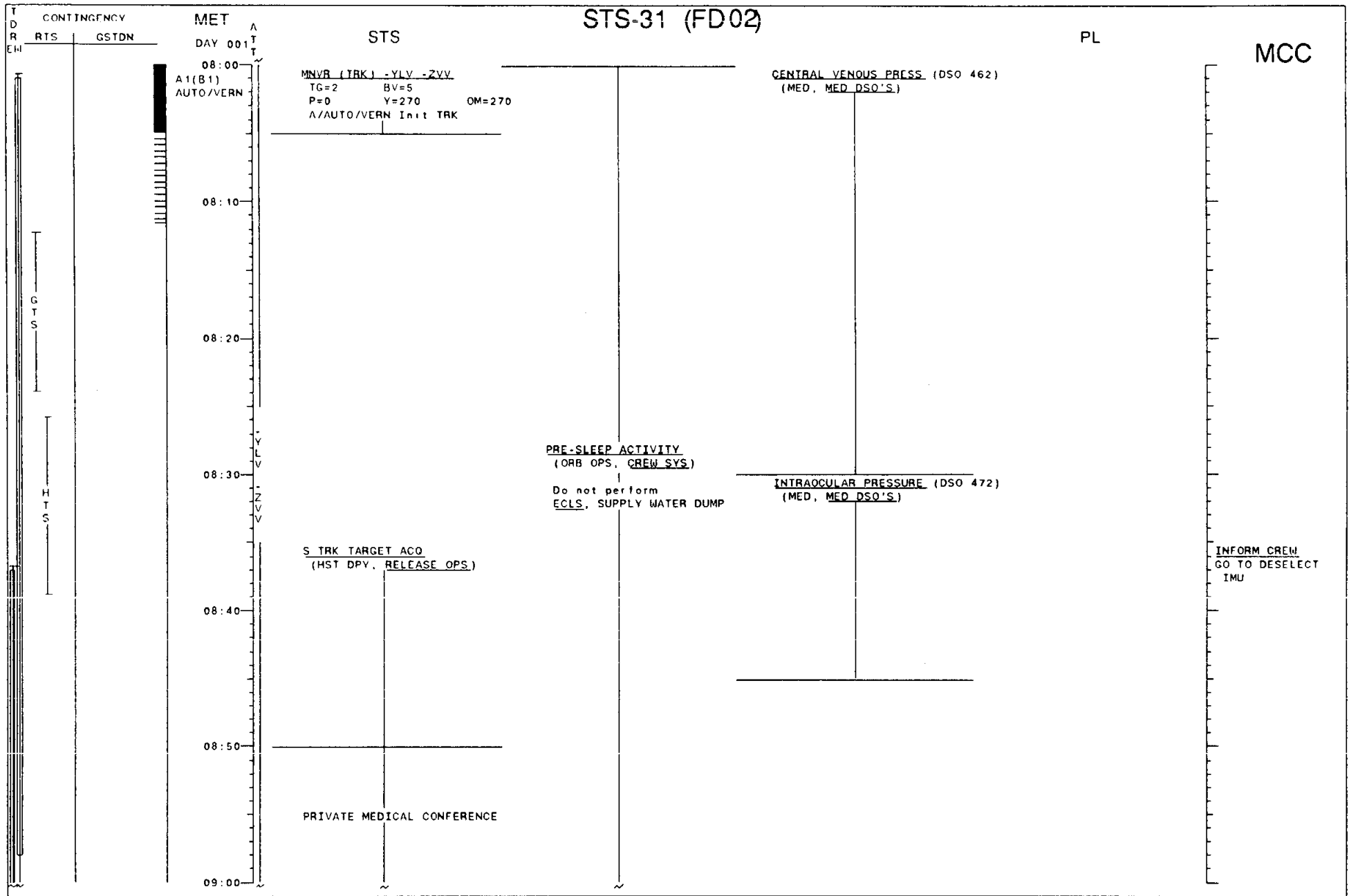


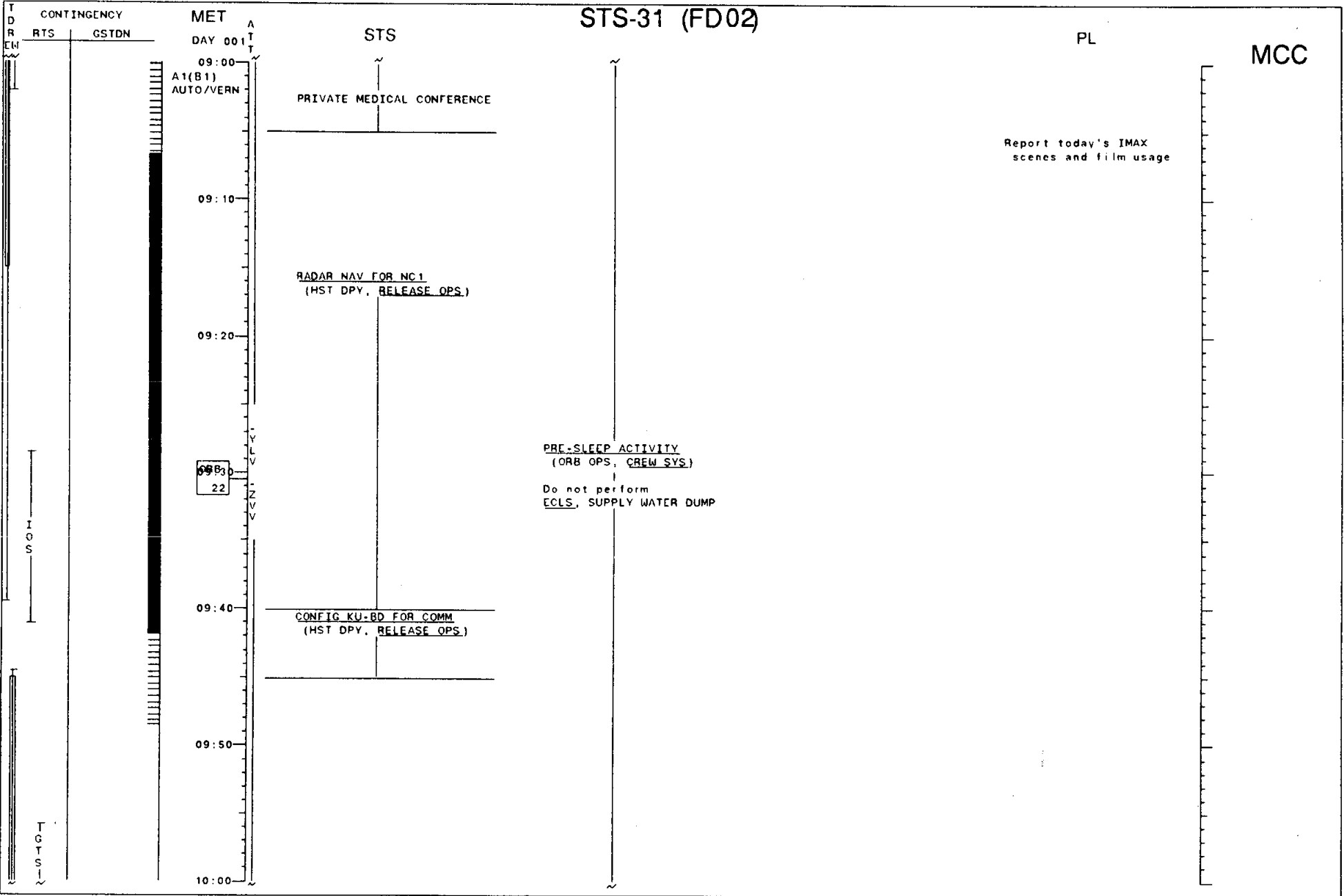


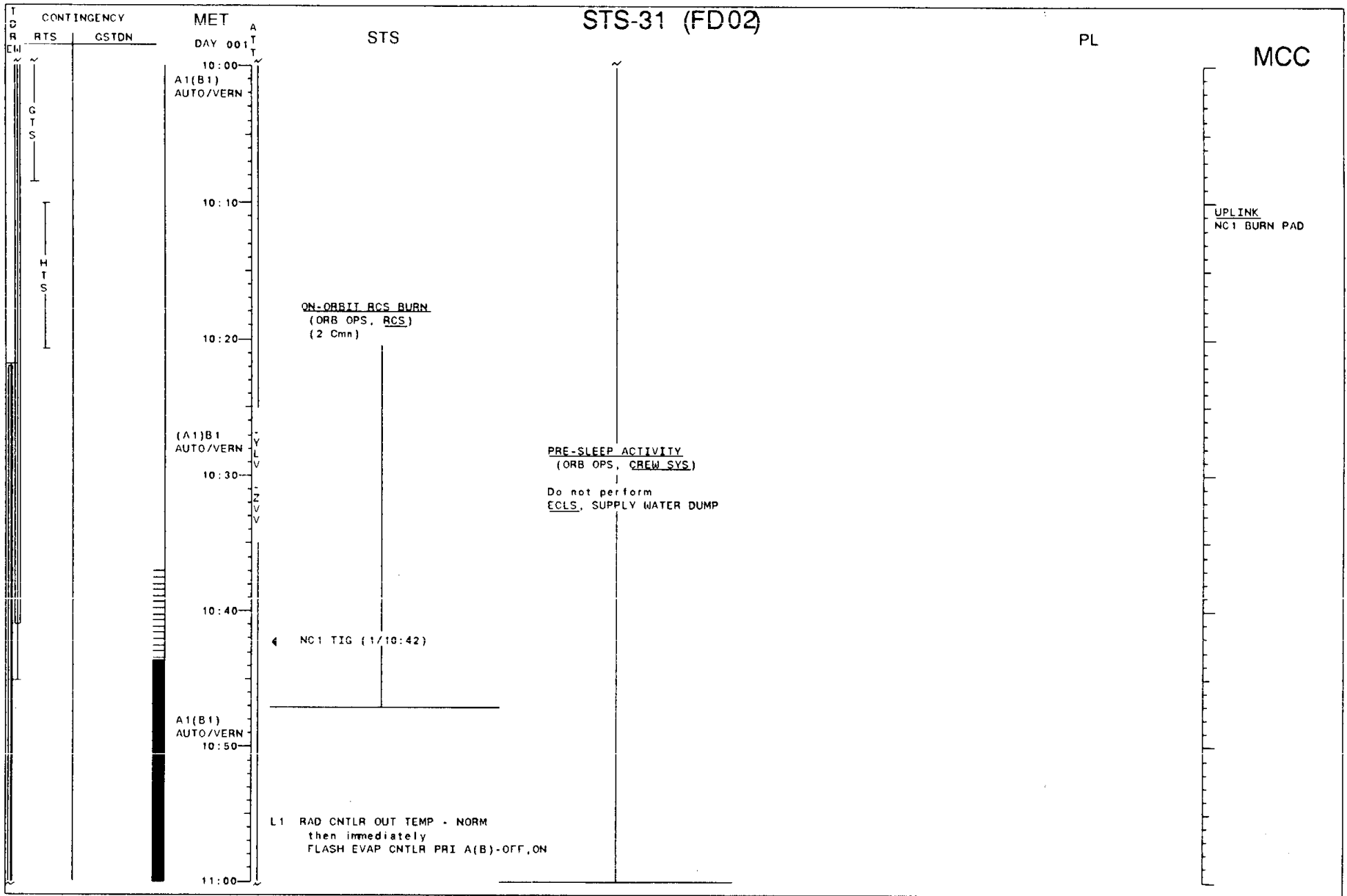




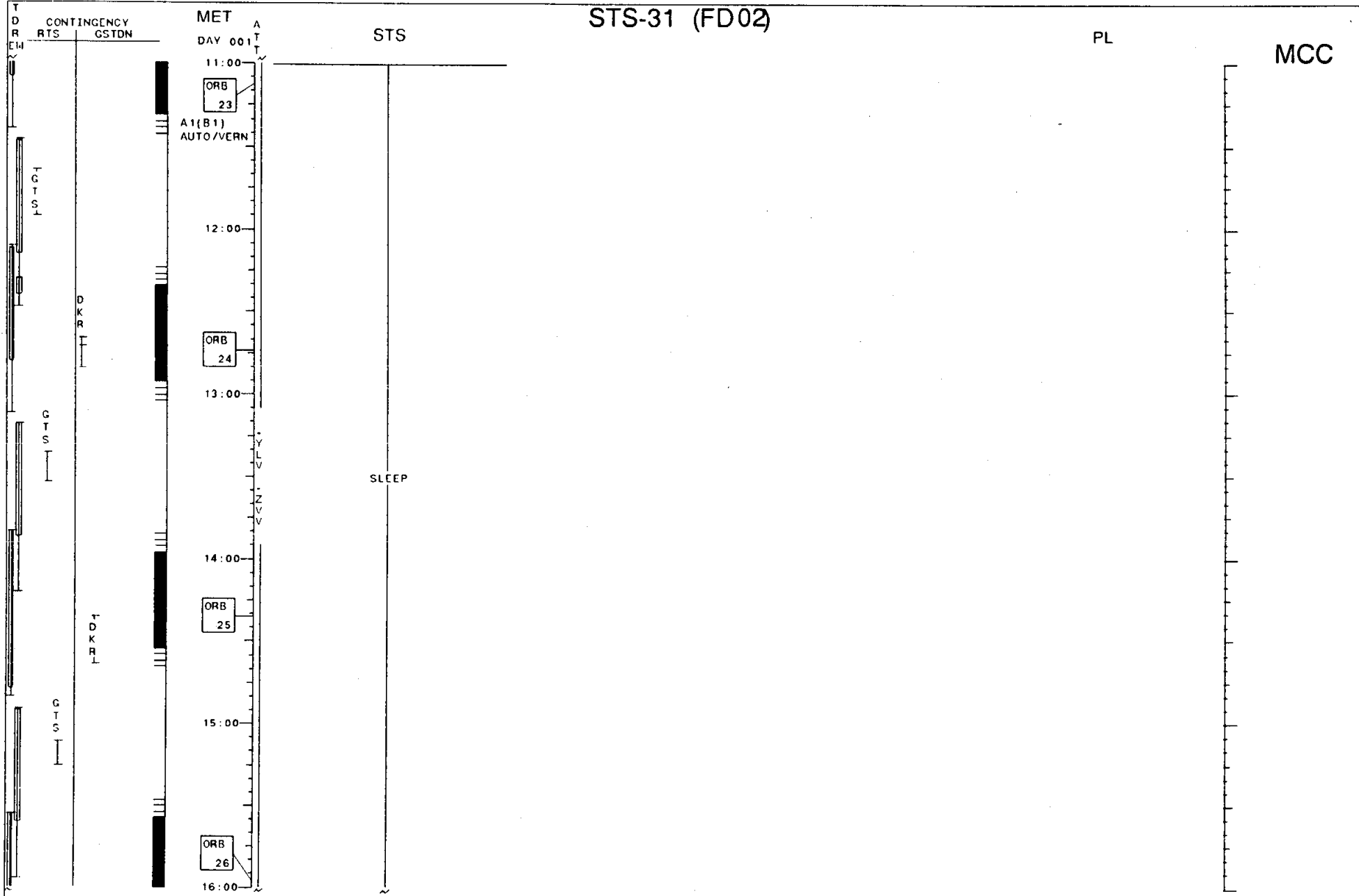


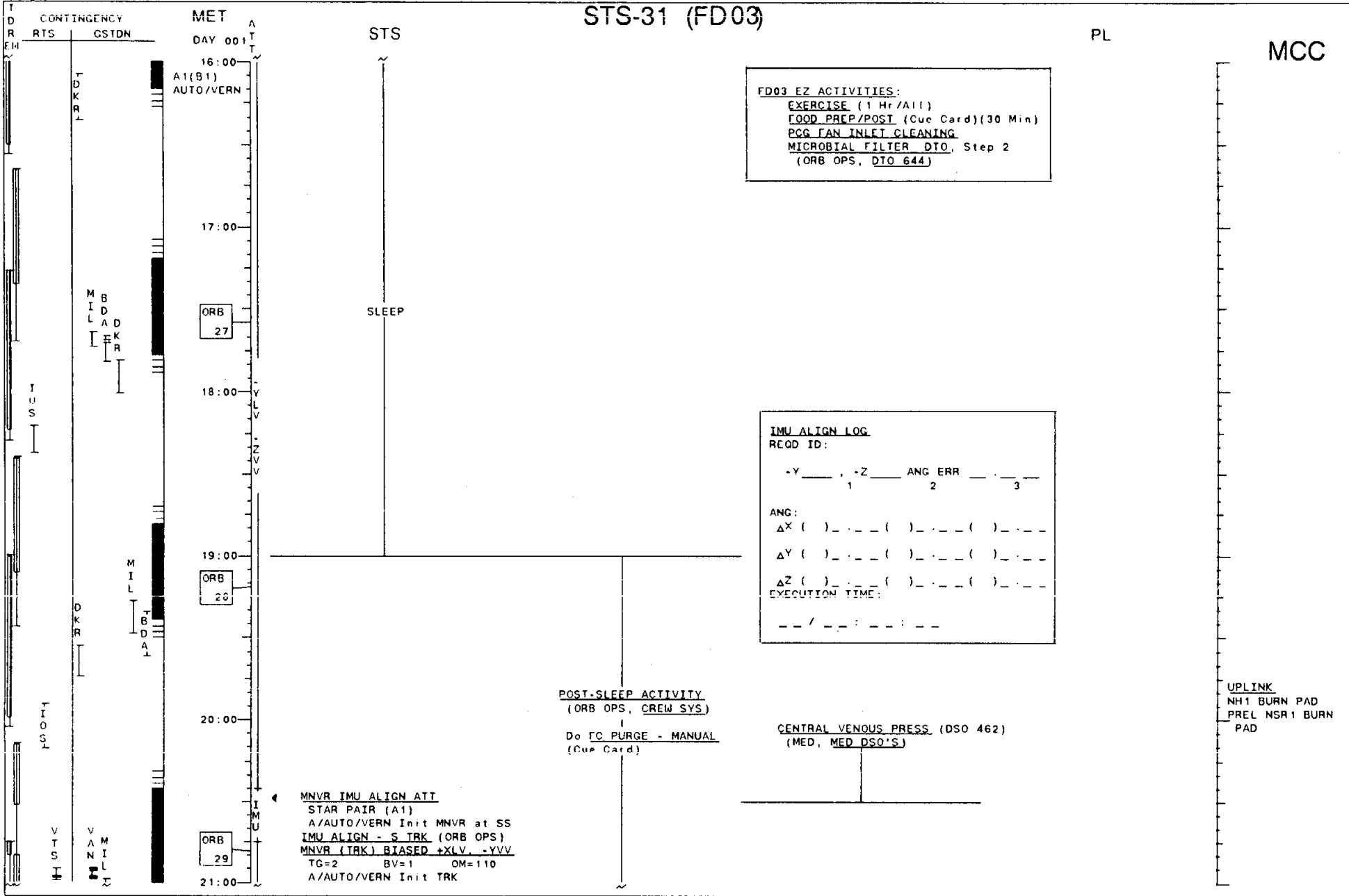






# STS-31 (FD02)





STS-31 (FD03)

PL

MCC

FD03 EZ ACTIVITIES:  
EXERCISE (1 Hr/All)  
FOOD PREP/POST (Cue Card)(30 Min)  
PCG FAN INLET CLEANING  
MICROBIAL FILTER DTO, Step 2  
 (ORB OPS, DTO 644)

IMU ALIGN LOG  
 RECD ID: \_\_\_\_\_

|    |    |         |  |
|----|----|---------|--|
| -Y | -Z | ANG ERR |  |
| 1  | 2  | 3       |  |

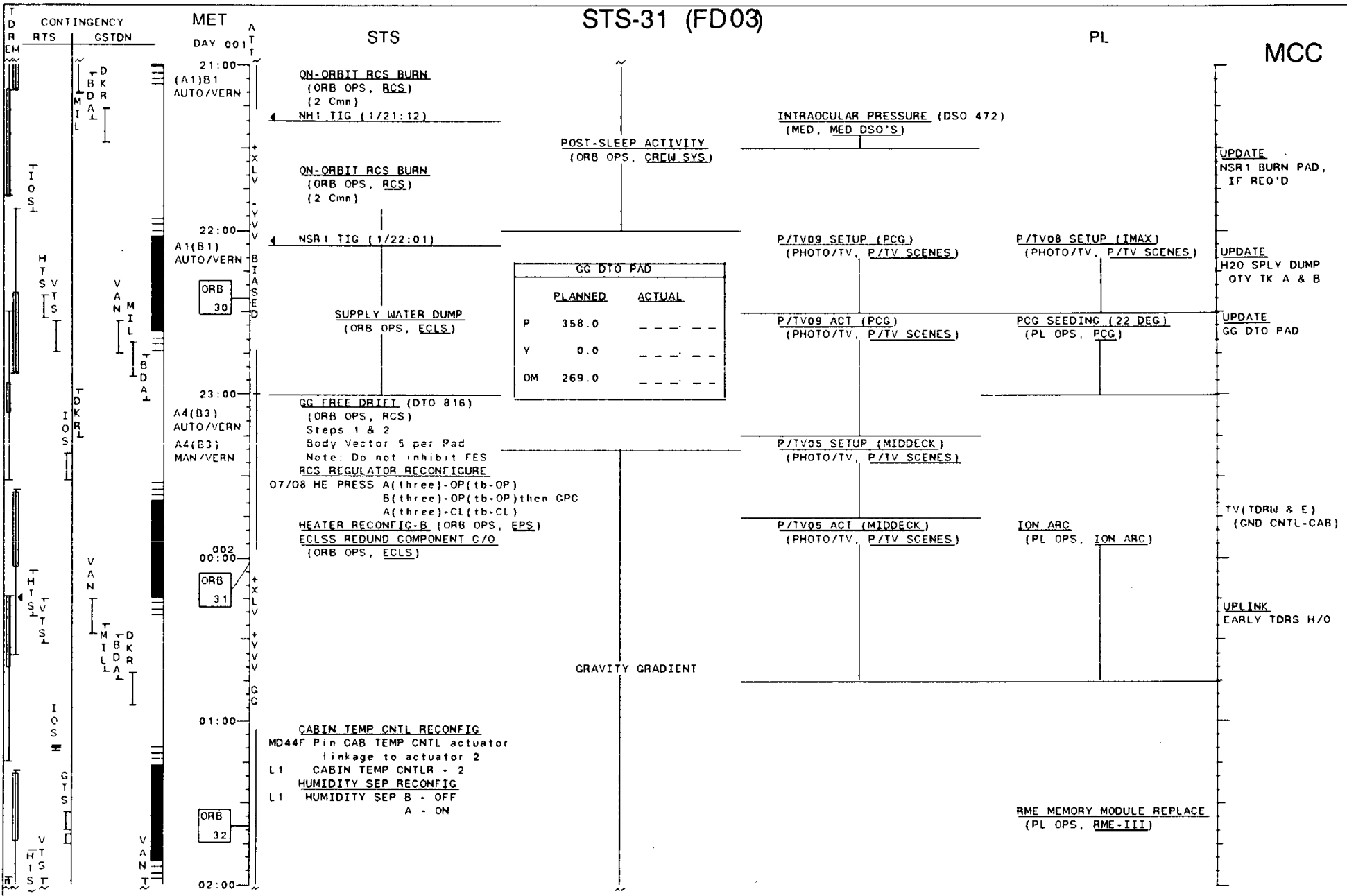
ANG:  
 ΔX ( ) ( ) ( ) ( )  
 ΔY ( ) ( ) ( ) ( )  
 ΔZ ( ) ( ) ( ) ( )  
 EXECUTION TIME:  
 - / - : - - : - -

POST-SLEEP ACTIVITY  
 (ORB OPS, CREW SYS)  
 Do FC PURGE - MANUAL  
 (Cue Card)

CENTRAL VENOUS PRESS (DSO 462)  
 (MED, MED DSO'S)

UPLINK  
 NH1 BURN PAD  
 PREL NSR1 BURN  
 PAD

MNVF IMU ALIGN ATT  
 STAR PAIR (A1)  
 A/AUTO/VERN Init MNVR at SS  
 IMU ALIGN - S TRK (ORB OPS)  
 MNVR (TRK) BIASED +XLV, -YVV  
 TG=2 BV=1 OM=110  
 A/AUTO/VERN Init TRK



STS-31 (FD03)

MET DAY 001

STS

PL

MCC

21:00  
A1(B1)  
AUTO/VERN

ON-ORBIT RCS BURN  
(ORB OPS, RCS)  
(2 Cmn)  
NH1 TIG (1/21:12)

INTRAOCULAR PRESSURE (DSO 472)  
(MED, MED DSO'S)

POST-SLEEP ACTIVITY  
(ORB OPS, CREW SYS)

UPDATE  
NSR1 BURN PAD,  
IF REQ'D

22:00  
A1(B1)  
AUTO/VERN

ON-ORBIT RCS BURN  
(ORB OPS, RCS)  
(2 Cmn)  
NSR1 TIG (1/22:01)

P/TVO9 SETUP (PCG)  
(PHOTO/TV, P/TV SCENES)

P/TVO8 SETUP (IMAX)  
(PHOTO/TV, P/TV SCENES)

UPDATE  
H2O SPLV DUMP  
OTV TK A & B

| GG DTO PAD |         |        |
|------------|---------|--------|
|            | PLANNED | ACTUAL |
| P          | 358.0   | ---    |
| Y          | 0.0     | ---    |
| OM         | 269.0   | ---    |

SUPPLY WATER DUMP  
(ORB OPS, ECLS)

P/TVO9 ACT (PCG)  
(PHOTO/TV, P/TV SCENES)

PCG SEEDING (22 DEG)  
(PL OPS, PCG)

UPDATE  
GG DTO PAD

23:00  
A4(B3)  
AUTO/VERN  
A4(B3)  
MAN/VERN

GG FREE DRIFT (DTO 816)  
(ORB OPS, RCS)  
Steps 1 & 2  
Body Vector 5 per Pad  
Note: Do not inhibit FES  
RCS REGULATOR RECONFIGURE  
07/08 HE PRESS A(three)-OP(tb-OP)  
B(three)-OP(tb-OP)then GPC  
A(three)-CL(tb-CL)  
HEATER RECONFIG-B (ORB OPS, EPS)  
ECLSS REDUND COMPONENT C/O  
(ORB OPS, ECLS)

P/TVO5 SETUP (MIDDECK)  
(PHOTO/TV, P/TV SCENES)

P/TVO5 ACT (MIDDECK)  
(PHOTO/TV, P/TV SCENES)

ION ARC  
(PL OPS, ION ARC)

TV (TORV & E)  
(GND CNTL-CAB)

00:00  
ORB 31

GRAVITY GRADIENT

UPLINK  
EARLY TDORS H/O

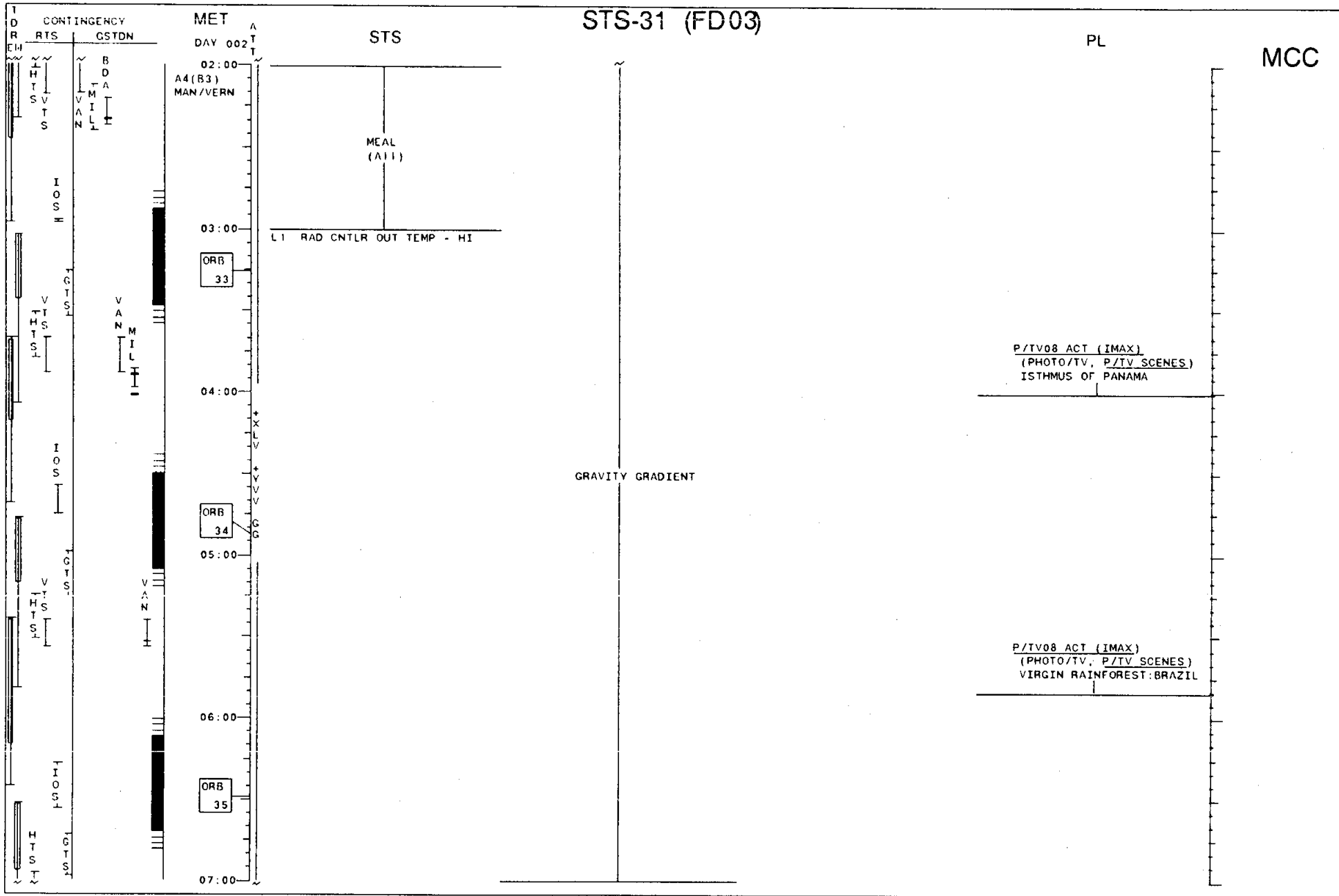
01:00  
ORB 32

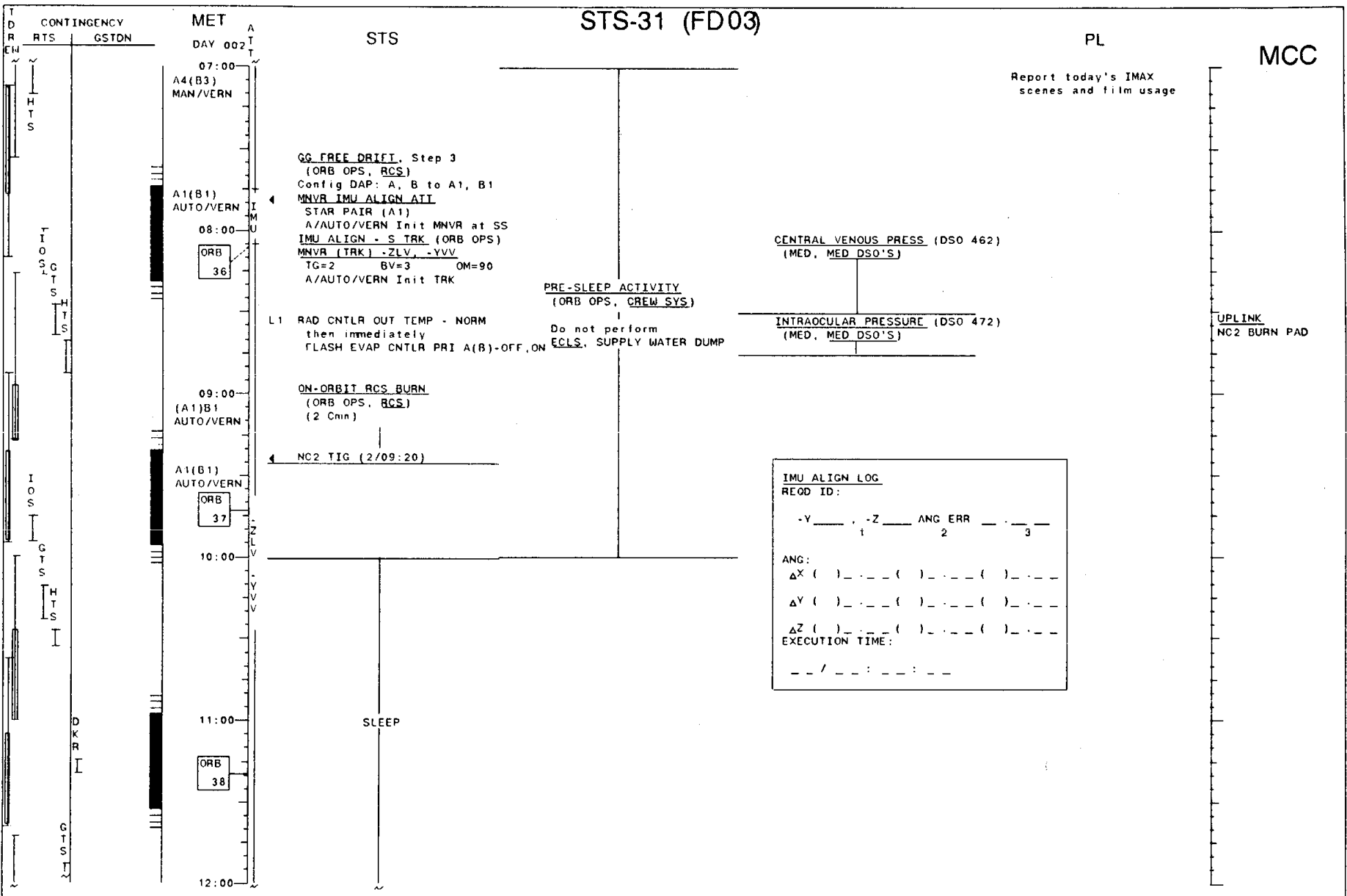
CABIN TEMP CNTL RECONFIG  
MD44F Pin CAB TEMP CNTL actuator  
linkage to actuator 2  
L1 CABIN TEMP CNTLR - 2  
HUMIDITY SEP RECONFIG  
L1 HUMIDITY SEP B - OFF  
A - ON

RME MEMORY MODULE REPLACE  
(PL OPS, RME-III)

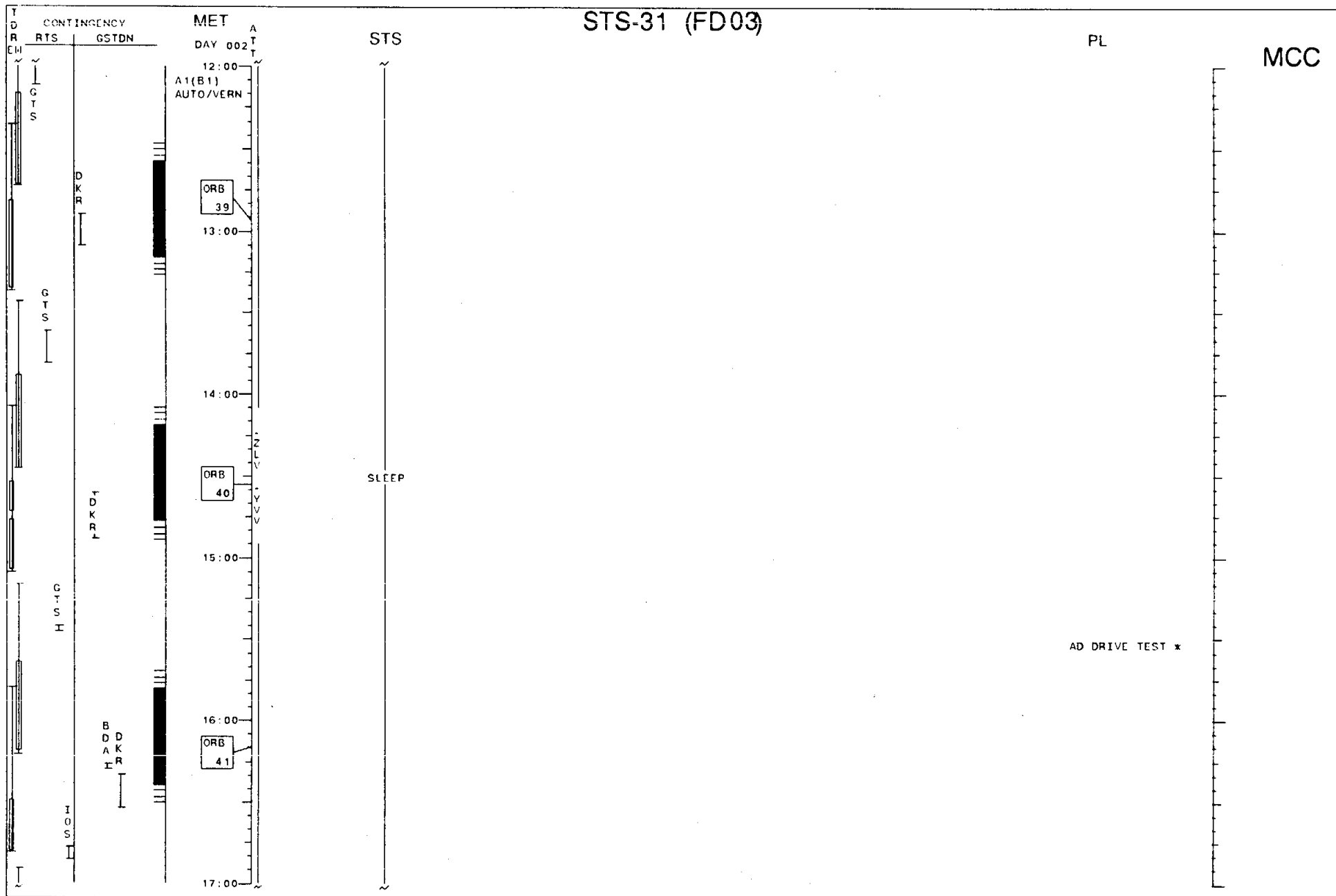
UPDATE  
GG DTO PAD







# STS-31 (FD03)



\* = GROUND COMMANDED ACTIVITY

CONTINGENCY  
RTS GSTDN

I O S I  
I O S I  
V T S I

H L I B  
H L I B  
M I L L  
M I L L  
M I L L  
M I L L  
L A D B T  
L A D B T  
L R K K D  
L R K K D

T D R EM

MET

DAY 002  
A1(B1)  
AUTO/VERN  
17:00  
ORB 42  
18:00  
ORB 43  
20:00  
A1(B1)  
AUTO/VERN  
21:00  
ORB 44  
22:00

STS

SLEEP

MNVR (TRK) BIASED -ZLV, -YVV  
TG=2 BV=3 OM=110  
A/AUTO/VERN Init TRK

SUPPLY WATER DUMP  
(ORB OPS, ECLS)

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

NC3 TIG (2/20:04)

MNVR IMU ALIGN ATT  
STAR PAIR (A1)  
A/AUTO/VERN Init MNVR at SS  
IMU ALIGN - S TRK (ORB OPS)  
MNVR (TRK) -ZLV, +YVV  
TG=2 BV=3 OM=270  
A/AUTO/VERN Init TRK

L1 FLASH EVAP CNTLR PRI A(B)-OFF

# STS-31 (FD04)

FD04 EZ ACTIVITIES:

EXERCISE (1 Hr/All)  
FOOD PREP/POST (Cue Card)(30 Min)  
PCG FAN INLET CLEANING & TEMP CK  
Log R/IM temp \_\_\_\_\_ deg C and  
MET / \_\_\_\_\_  
MICROBIAL FILTER DTO, Step 2  
(ORB OPS, DTO 644)

IMU ALIGN LOG

READ ID:

-Y \_\_\_\_\_, -Z \_\_\_\_\_ ANG ERR \_\_\_\_\_  
1 2 3

ANG:

$\Delta X$  ( ) \_\_\_\_\_ ( ) \_\_\_\_\_ ( ) \_\_\_\_\_

$\Delta Y$  ( ) \_\_\_\_\_ ( ) \_\_\_\_\_ ( ) \_\_\_\_\_

$\Delta Z$  ( ) \_\_\_\_\_ ( ) \_\_\_\_\_ ( ) \_\_\_\_\_

EXECUTION TIME:  
\_ / \_ : \_ : \_

POST-SLEEP ACTIVITY  
(ORB OPS, CREW SYS)

CENTRAL VENOUS PRESS (DSO 462)  
(MED, MED DSO'S)

INTRAOCULAR PRESSURE (DSO 472)  
(MED, MED DSO'S)

P/TV08 SETUP (IMAX)  
(PHOTO/TV, P/TV SCENES)

P/TV08 ACT (IMAX)  
(PHOTO/TV, P/TV SCENES)  
MOUTHS OF NIGER RIVER  
CONGO RIVER

ICBC STBY ENABLE  
(ICBC Cue Card)

P/TV08 ACT (IMAX)  
(PHOTO/TV, P/TV SCENES)  
ICBC - MADAGASCAR

MCC

UPDATE  
H2O SPLY DUMP  
QTY TK A & B

UPLINK  
NC3 BURN PAD

# STS-31 (FD04)

STS

PL

MCC

**CONTINGENCY**  
RTS      GSTDN

**MET**  
DAY 002

22:00  
A1(B1)  
AUTO/VERN

ORB 45

23:00

003  
00:00

ORB 46

01:00

ORB 47

02:00

03:00

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22:00  
23:00  
00:00  
01:00  
02:00  
03:00

L1 FLASH EVAP CNTLR PRI A(B)-ON

ICBC STBY DISABLE  
(ICBC Cue Card)

L1 FLASH EVAP CNTLR PRI A(B)-OFF

ICBC STBY ENABLE  
(ICBC Cue Card)

P/TV08 ACT (IMAX)  
(PHOTO/TV, P/TV SCENES)  
ICBC  
CARIBBEAN SEA

P/TV08 ACT (IMAX)  
(PHOTO/TV, P/TV SCENES)  
SOUTHERN TIP OF AFRICA

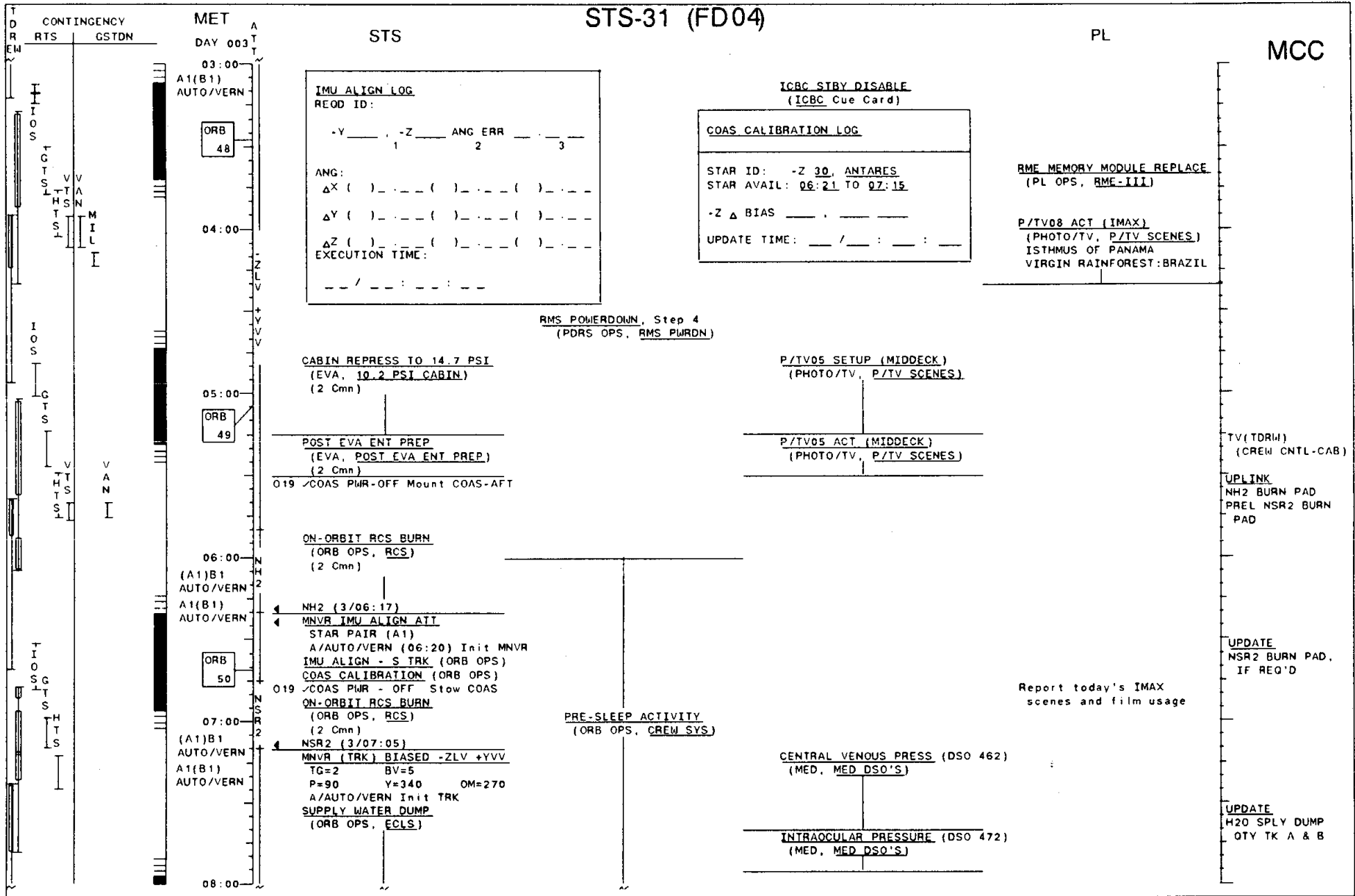
MEAL  
(A11)

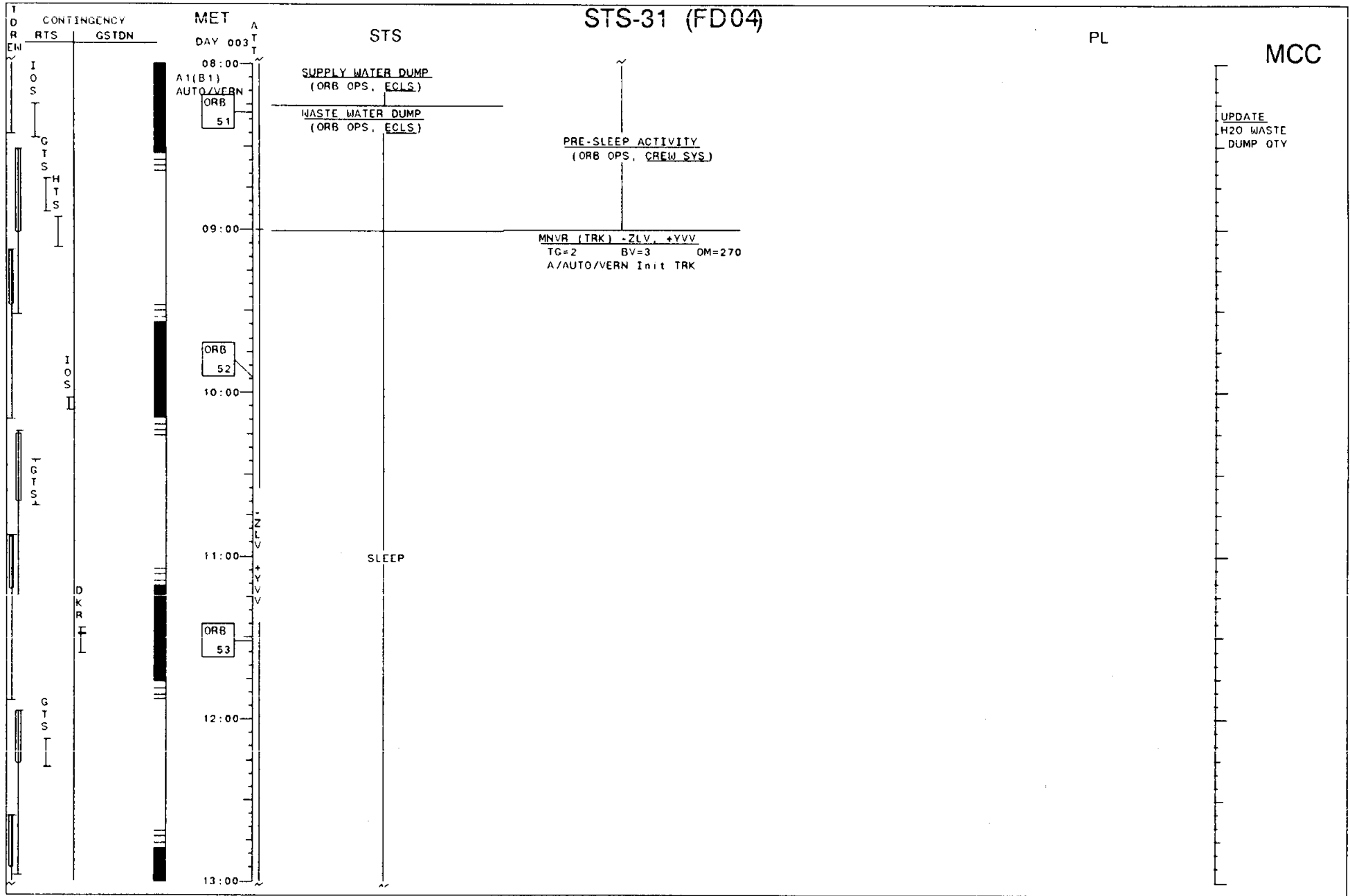
P/TV08 ACT (IMAX)  
(PHOTO/TV, P/TV SCENES)  
ISTHMUS OF PANAMA  
FRENCH GUIANA COAST  
MOUTHS OF AMAZON

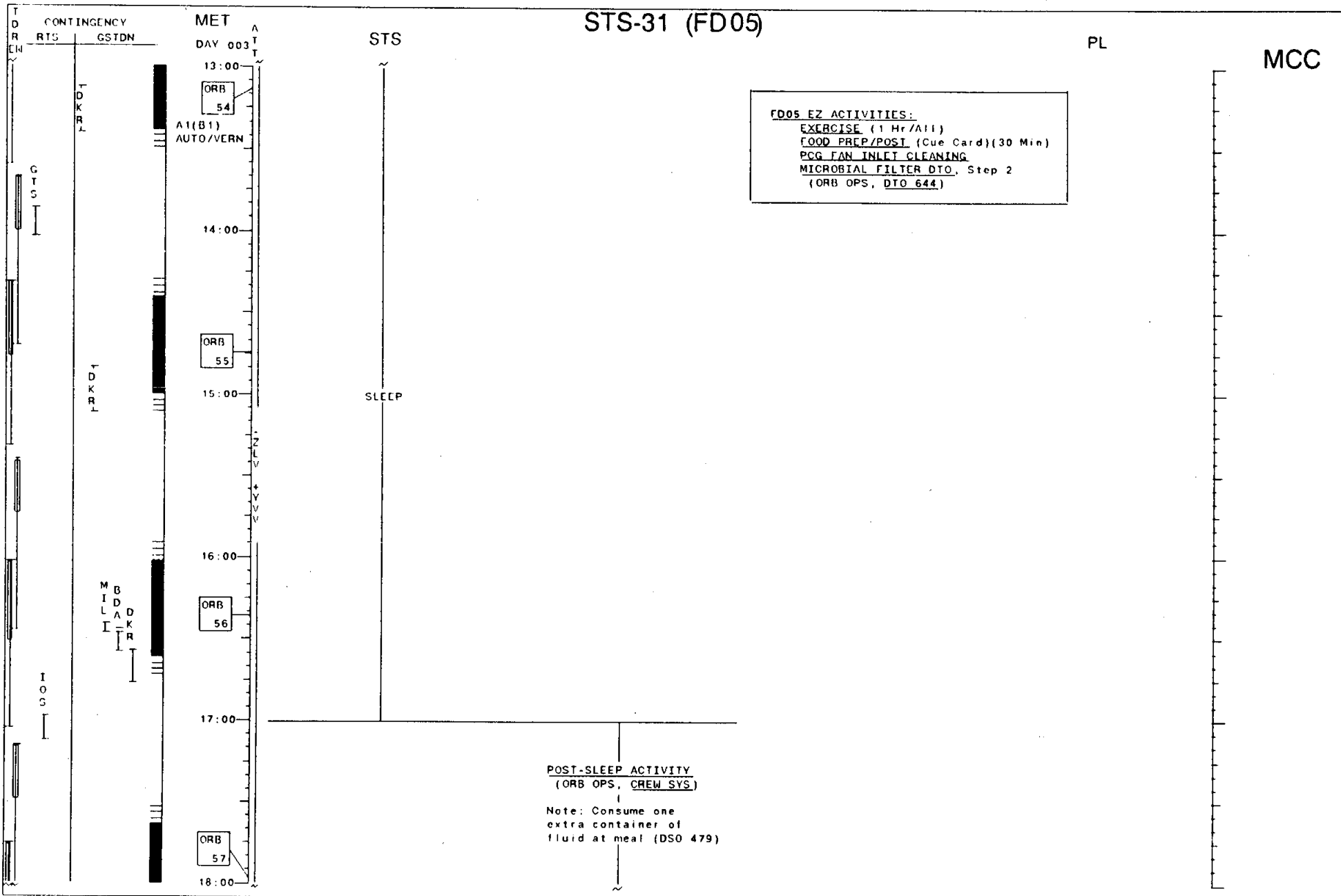
P/TV08 ACT (IMAX)  
(PHOTO/TV, P/TV SCENES)  
ICBC  
CARIBBEAN SEA

L1 FLASH EVAP CNTLR PRI A(B)-ON

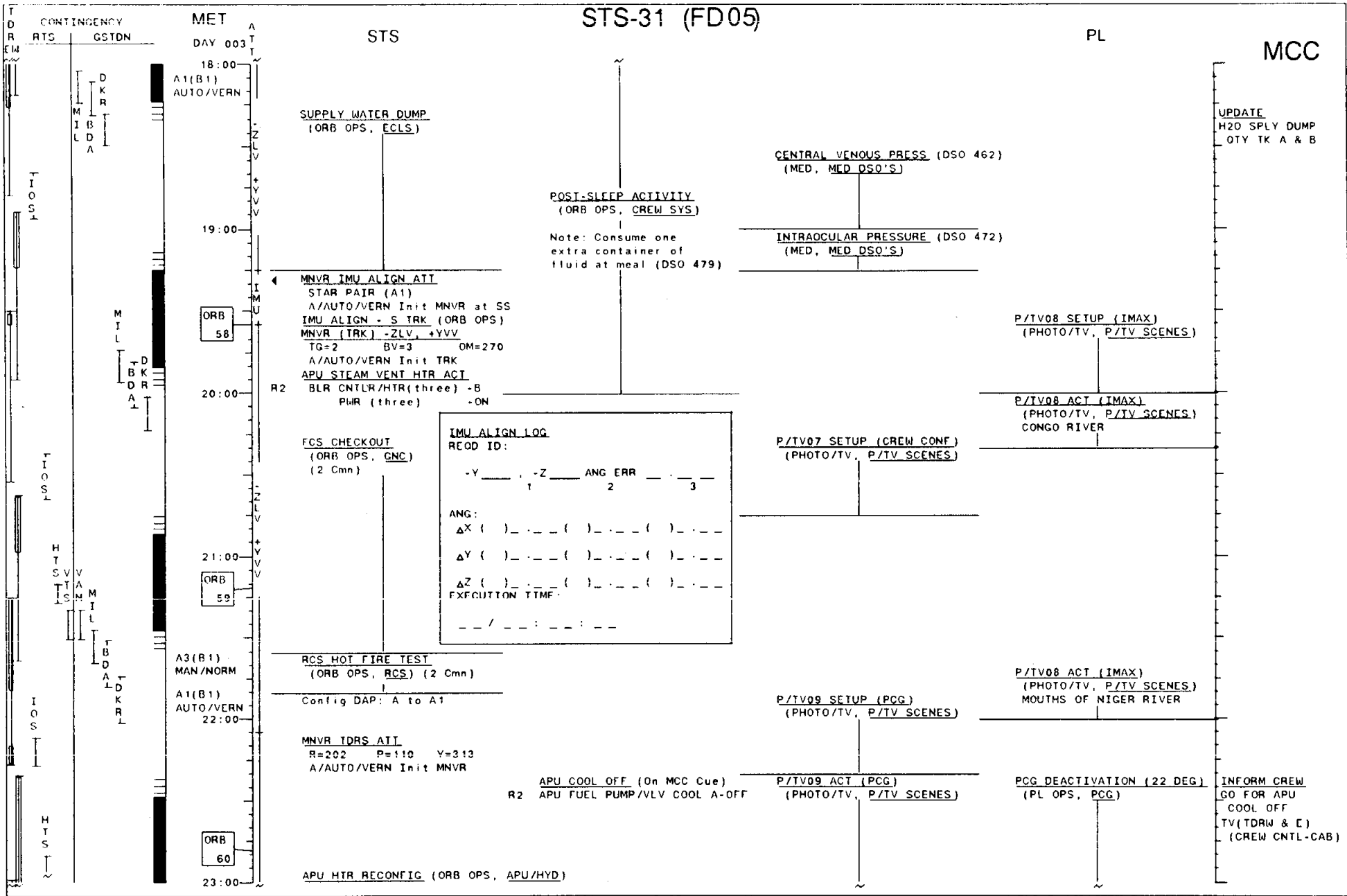
DELAYED HYPERSENSITIVITY (DSO 473)  
(MED, MED DSO'S)

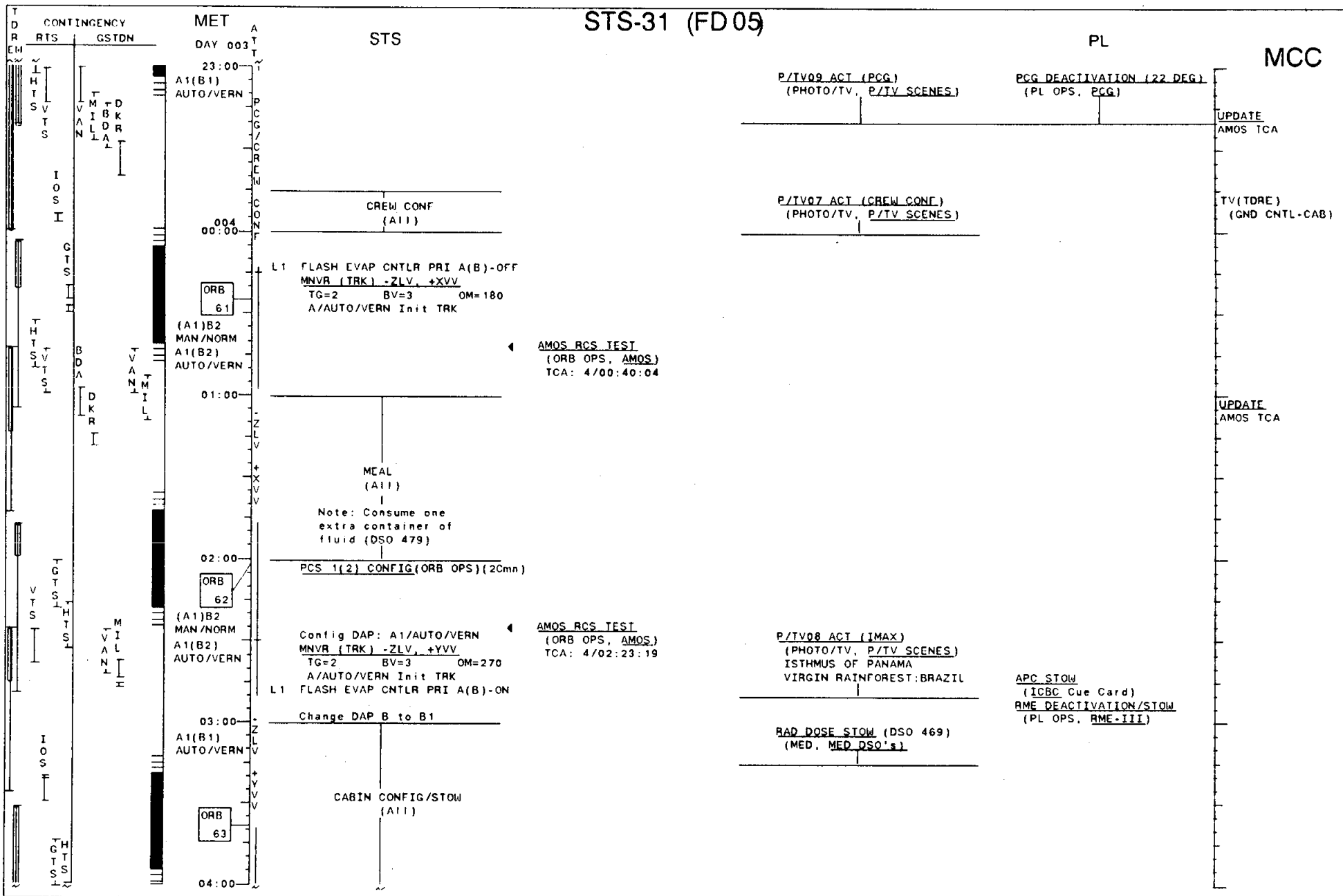




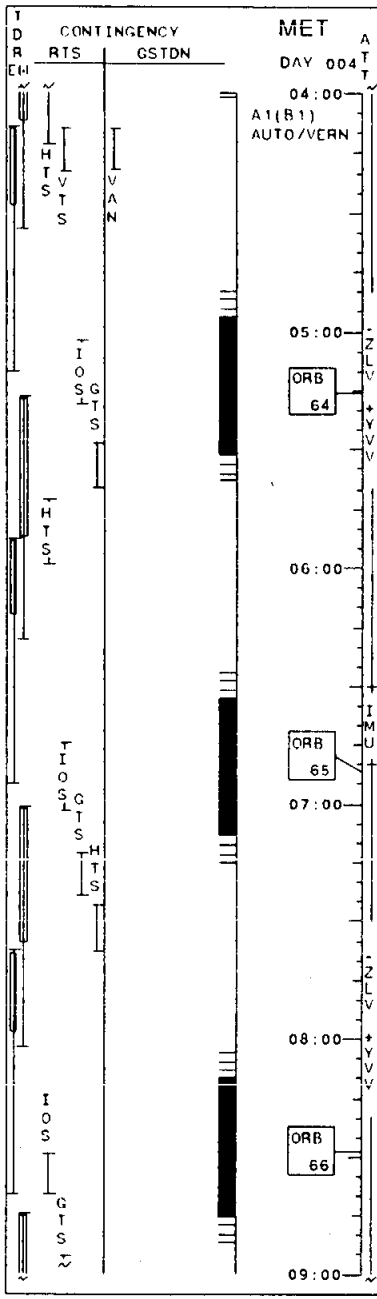








# STS-31 (FD05)



## STS

PL

MCC

IMU ALIGN LOG  
REQD ID:

-Y \_\_\_\_\_ -Z \_\_\_\_\_ ANG ERR \_\_\_\_\_  
                  1                   2                   3

ANG:  
ΔX ( ) \_\_\_\_\_ ( ) \_\_\_\_\_ ( ) \_\_\_\_\_  
ΔY ( ) \_\_\_\_\_ ( ) \_\_\_\_\_ ( ) \_\_\_\_\_  
ΔZ ( ) \_\_\_\_\_ ( ) \_\_\_\_\_ ( ) \_\_\_\_\_

EXECUTION TIME:  
\_\_\_\_ / \_\_\_\_ : \_\_\_\_ : \_\_\_\_

CABIN CONFIG/STOW  
(All)

ORB  
64

Report today's IMAX  
scenes and film usage

◀ MNVR IMU ALIGN ATT  
STAR PAIR (A1)  
A/AUTO/VERN Init MNVR at SS  
IMU ALIGN - S TRK (ORB OPS)  
MNVR (TRK) -ZLV, +YVV  
TC=2    BV=3    OM=270  
A/AUTO/VERN Init TRK

ORB  
65

CENTRAL VENOUS PRESS (DSO 462)  
(MED, MED DSO'S)

SUPPLY WATER DUMP  
(ORB OPS, ECLS)

PRE-SLEEP ACTIVITY  
(ORB OPS, CREW SYS)

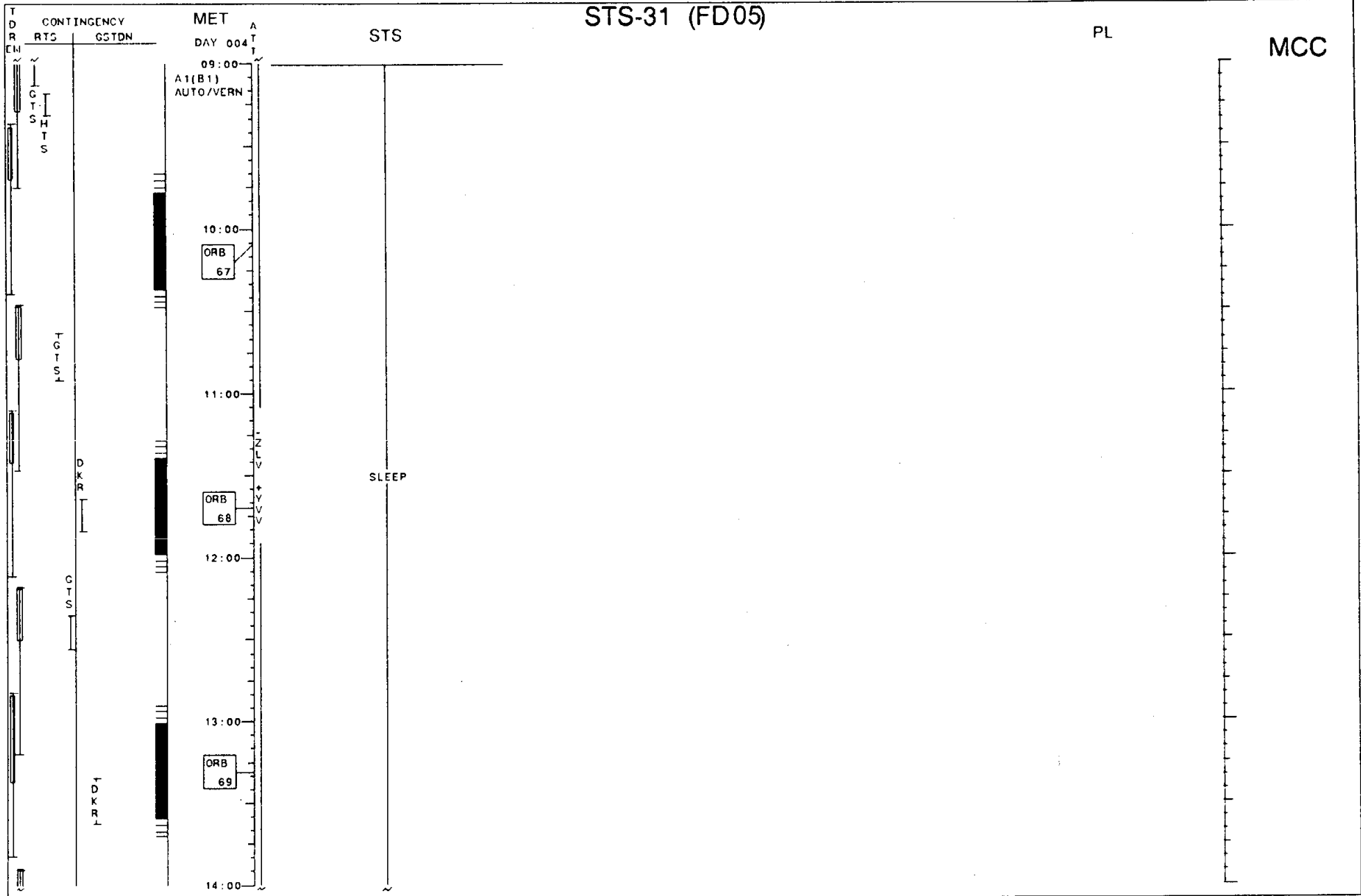
INTRAOCULAR PRESSURE (DSO 472)  
(MED, MED DSO'S)

Note: Consume one  
extra container of  
fluid at meal (DSO 479)

ORB  
66

UPDATE  
H2O SPLY DUMP  
QTY TK A & B

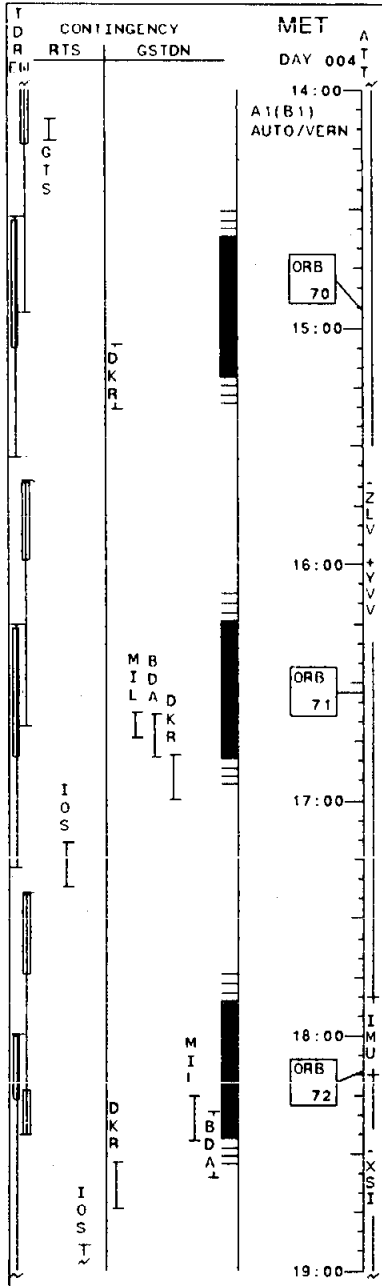
# STS-31 (FD05)



# STS-31 (FD06)

PL

MCC



**EZ ACTIVITIES BEFORE LEAVING FLT PLN:**

AIR SAMPLE  
Rcd MET on bottle

FLUID LOADING PREP  
Fill 4 drink containers with 8 oz H2O each (per person)  
Note: Not required for cmn taking premixed countermeasure for DSO 479

HYPEROSMOTIC FLUID COUNTERMEASURE (DSO 479)  
Pen and Ink NOMINAL DEORBIT PREP:  
Delay BEGIN FLUID LOADING (TIG-1:35) until TIG-1:00  
Replace nominal salt/H2O protocol with appropriate countermeasure as required

MICROBIAL FILTER DTO, Step 2 (ORB OPS, DTO 644)

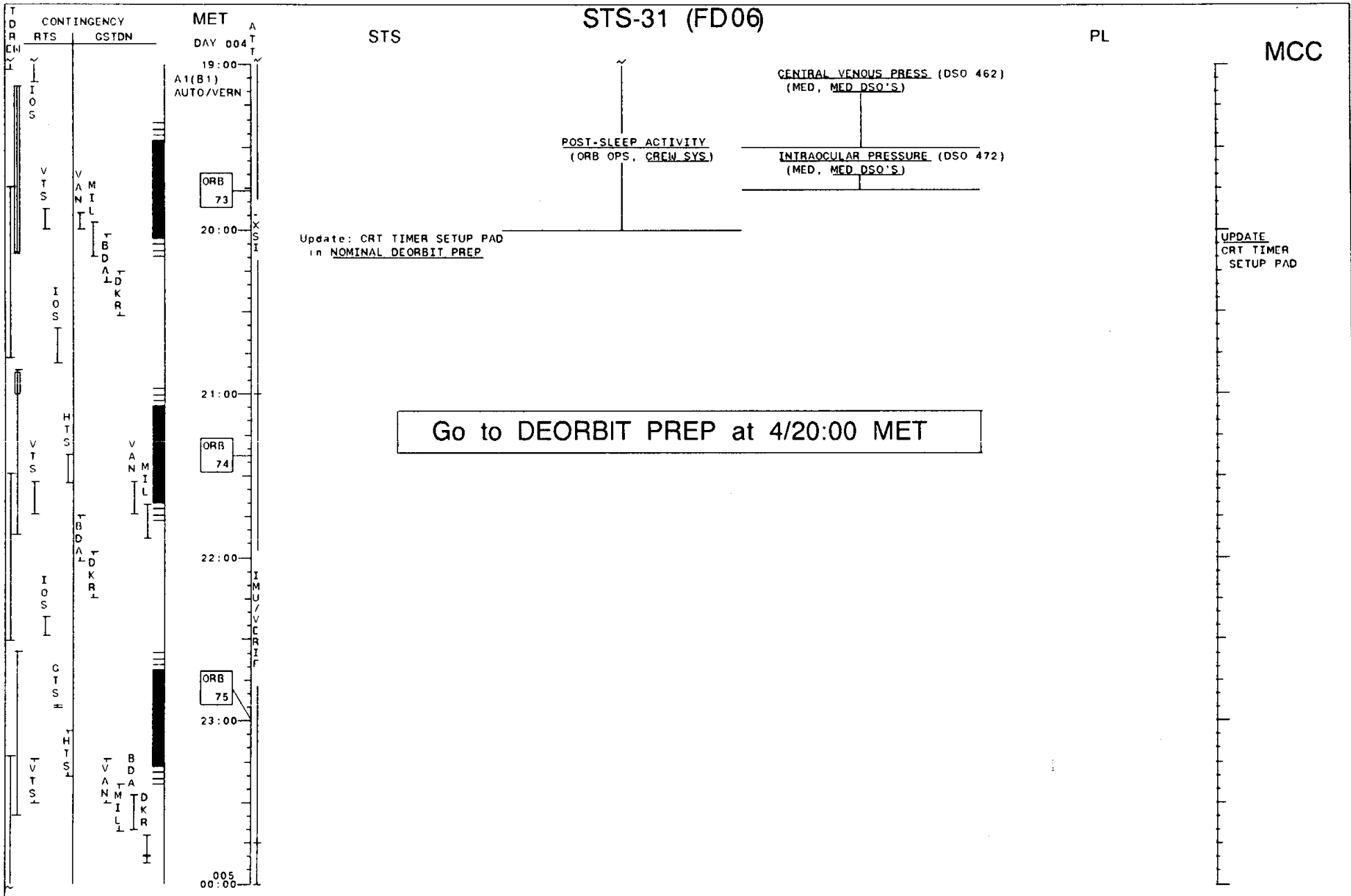
IMU ALIGN LOG  
REOD ID:  
-Y \_\_\_ , -Z \_\_\_ ANG ERR \_\_\_  
1 2 3

ANG:  
ΔX ( ) ( ) ( )  
ΔY ( ) ( ) ( )  
ΔZ ( ) ( ) ( )

EXECUTION TIME:  
\_ / \_ : \_ : \_

**MNVR IMU ALIGN ATT**  
STAR PAIR (A1)  
A/AUTO/VERN Init MNVR at SS  
**IMU ALIGN - S TRK (ORB OPS)**  
**MNVR (TRK) BIASED -XSI**  
TG=4 BV=5  
P=184 Y=0 OM=90  
A/AUTO/VERN (18:10) Init TRK

**POST-SLEEP ACTIVITY**  
(ORB OPS, CREW SYS)  
Do not perform  
FCIS, SUPPLY WATER DUMP



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CONTINGENCY TIMELINES

CONTINGENCY  
TIMELINES



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## SOLAR ARRAY DEPLOY FD2 EVA

The Solar Array Deploy FD2 EVA Timeline is designed to accommodate delaying HST release until Rev 20 following an EVA to manually deploy the solar arrays. The timeline represents a worst case scenario (from a power critical standpoint) in which both solar arrays require manual deployment. An SDM failure was chosen instead of a latch or PDM failure because an SDM failure would occur later in the timeline. While the EVA crewmembers are preparing for the EVA, the aperture door latch is released and the high gain antenna is deployed per the nominal times. The 10.2 psi cabin EVA protocol is used. The 10.2 psi cabin depress and EMU C/O are performed FD1 in the nominal timeline. The nominal timeline also includes part of the EVA preparation activity in which the EVA crewmembers don the liquid cooling ventilation garments (LCVG) in order to expedite preparation in the event the EVA is required on FD2. Additional assumptions are shown on page 4A-2. The timeline is based on the nominal Cycle 2 trajectory.

## FD2 SA DPY EVA

THE FD2 SA DPY EVA TIMELINE MAKES THE FOLLOWING ASSUMPTIONS:

- A GENERIC SDM FAILURE MODE WAS ASSUMED WHICH WOULD AFFECT BOTH SDM'S.
- PER THE NOMINAL TIMELINE, THE EVA CMN WILL PERFORM EVA PREP THROUGH LCVG DOWNING ON THE MORNING OF FD2.
- AT THE FIRST INDICATION OF POSSIBLE FAILURE OF THE SA SDM TO DEPLOY, THE EVA CMN WILL CONTINUE EVA PREP.
- A 50 MINUTE PREBREATHE IN THE EMU WILL BE DONE BEFORE AIRLOCK DEPRESS.
- EVA CMN CAN TRANSLATE DURING ORBITER AND RMS MNVRS.
- THE MANUAL DEPLOY OF BOTH SA SDM'S CAN OCCUR SIMULTANEOUSLY AND WILL TAKE 25 MINUTES.
- EVA CMN WILL REMAIN ON THE HST UNTIL THE STOCC COMMANDING OF OLD RELEASE IS COMPLETE.
- AN ADDITIONAL 15 MIN OF STOCC COMMANDING IS REQUIRED FOLLOWING THE COMPLETION OF EVA ACTIVITIES.
- WHILE THE EVA CMN PREPARE FOR THE EVA, THE REMAINING CMN WILL CONTINUE THE HST DPY ACTIVITIES PER THE NOMINAL SCHEDULED TIMES.
- A/L REPRESS WILL OCCUR AFTER HST RELEASE.

S TRK TARGET ACQ AND RADAR NAV FOR NCI ARE NOT PERFORMED.

IMAX, DSO 462, AND DSO 472 ACTIVITIES ARE NOT ACCOMPLISHED ON FD2.

RETURN TO NOMINAL TIMELINE AT 01/12:00 MET

WITH THE EXCEPTION OF THE FOLLOWING ACTIVITIES:

- VTR SETUP, VTR PLYBCK, FILTER CLEANING, AND IPMP NEED TO BE RESCHEDULED ON FD3.

| GMT (D:H:M)           |  | MET (D:H:M)           |  | CST (D:H:M)           |  | FD/DOY      | BETA  | MOON | HOUSTON DATE   | FLIGHT | EDITION     | PUB. DATE |
|-----------------------|--|-----------------------|--|-----------------------|--|-------------|-------|------|----------------|--------|-------------|-----------|
| 086:13:44 / 087:01:44 |  | 001:00:00 / 001:12:00 |  | 086:07:44 / 086:19:44 |  | 02/ 086 CST | -10.3 |      | MARCH 27, 1990 | STS-31 | FINAL REV A | 03/20/90  |
| CST                   | :086   |                       |  |                       |  |             |       |      |                |        |             |           |
| FD                    | :002   |                       |  |                       |  |             |       |      |                |        |             |           |
| MET                   | :001   |                       |  |                       |  |             |       |      |                |        |             |           |
| STS                   |  |                       |  |                       |  |             |       |      |                |        |             |           |
| PL                    |  |                       |  |                       |  |             |       |      |                |        |             |           |
| DAY/NIGHT             |  |                       |  |                       |  |             |       |      |                |        |             |           |
| ORBIT                 |  |                       |  |                       |  |             |       |      |                |        |             |           |
| CONTINGENCY           |  |                       |  |                       |  |             |       |      |                |        |             |           |
| RTS                   |  |                       |  |                       |  |             |       |      |                |        |             |           |
| TDRS                  |  |                       |  |                       |  |             |       |      |                |        |             |           |
| ATTITUDE              |  |                       |  |                       |  |             |       |      |                |        |             |           |
| HST COMM              |  |                       |  |                       |  |             |       |      |                |        |             |           |
| NOTES:                | <p>           * = GROUND COMMANDED ACTIVITY<br/> <b>FD2 SA DPLY EVA</b><br/>           ● HST CONTINGENCY      ● MNVR HST TO EVA ACCESS      ● -YLV, -ZVV<br/>           ● EVA PREP (EVA, EVA PREP)      ● EVA ACCESS Step 3 (PDRS, OFF-NOM OPS)      ● KU-BD COMM CONF<br/>           ● BIASED +XSI      ● DEPRESS/REPRESS (Cue Card) TG=4 BV=5 P=16 Y=0 OM=358      ● RAD OUT NORM<br/>           ● SA DPLY (EVA, HST EVA PROC)      ● DEPRESS/REPRESS (Cue Card)<br/>           ● MNVR HST TO EVA ACCESS (PDRS, OFF-NOM OPS)<br/>           ● MNVR HST TO EXT PARK      ● POST EVA SUPPORT (EVA, POST EVA)<br/>           ● POST EVA (EVA, POST EVA) FLT PLN/317/IN A         </p> |                       |  |                       |  |             |       |      |                |        |             |           |

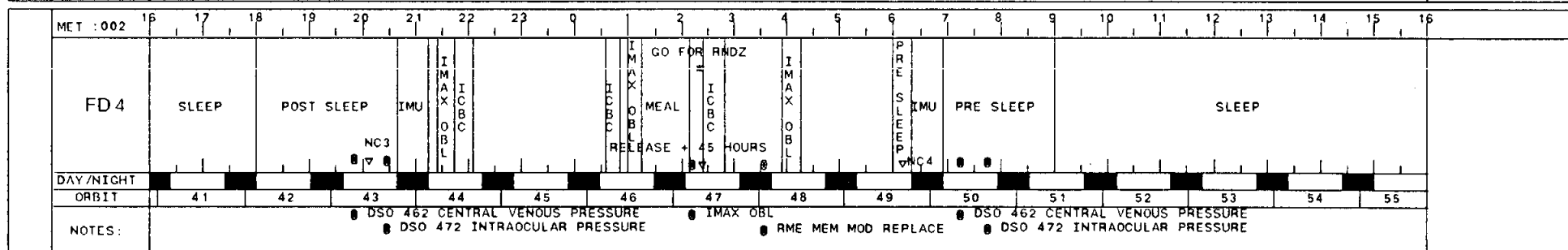
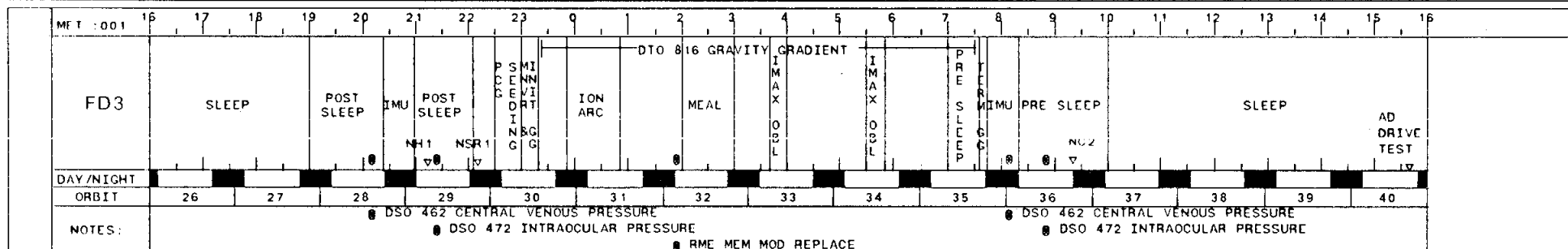
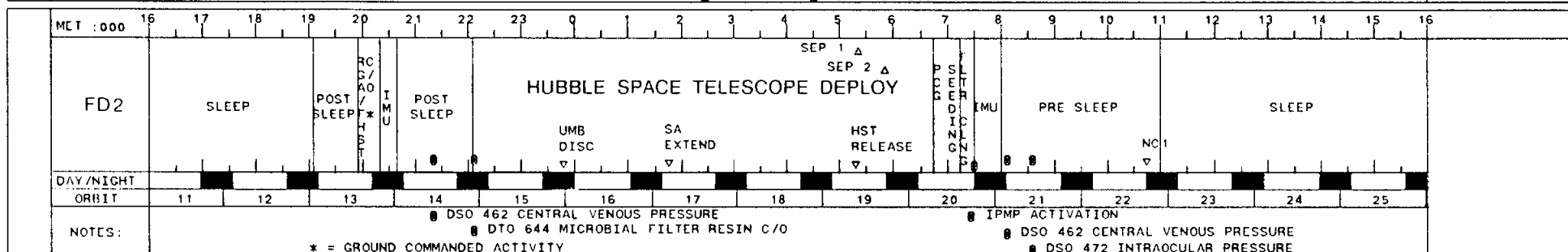
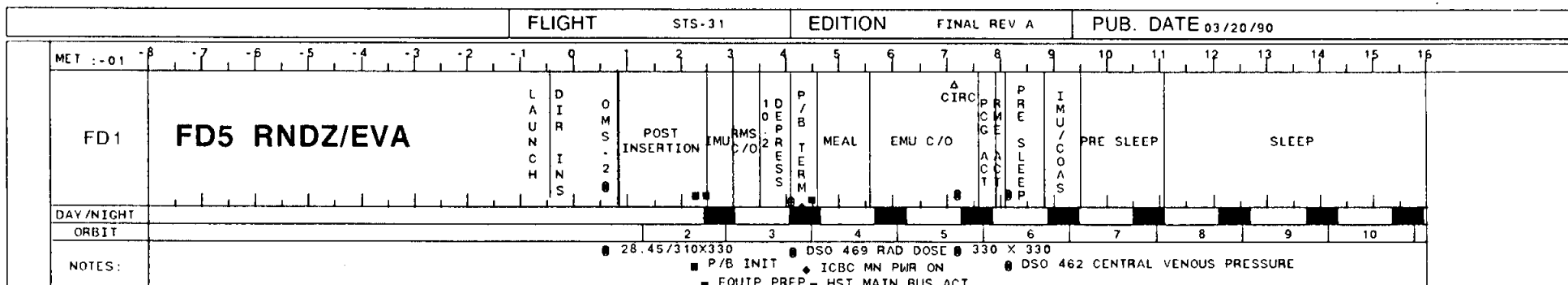
RETURN TO NORMAL TIME

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## FD5 RENDEZVOUS/EVA

The FD5 Rendezvous/EVA Timeline is designed to accommodate a FD5 rendezvous with the HST and an EVA to manually open the aperture door. If the GO for rendezvous is received after crew wakeup on FD4, rendezvous will be planned for FD5 and this timeline will be used. The request for rendezvous can be made as late as HST release +45 hrs. The 10.2 psi cabin EVA protocol is used. The 10.2 psi cabin depress and EMU C/O are performed on FD1 in the nominal timeline. Additional assumptions are shown on page 4B-4. This contingency timeline is based on the nominal Cycle 2 trajectory. This trajectory does not include the rendezvous burns, therefore the day and night passes on the contingency timeline are approximate.

FD5 RNDZ  
EVA



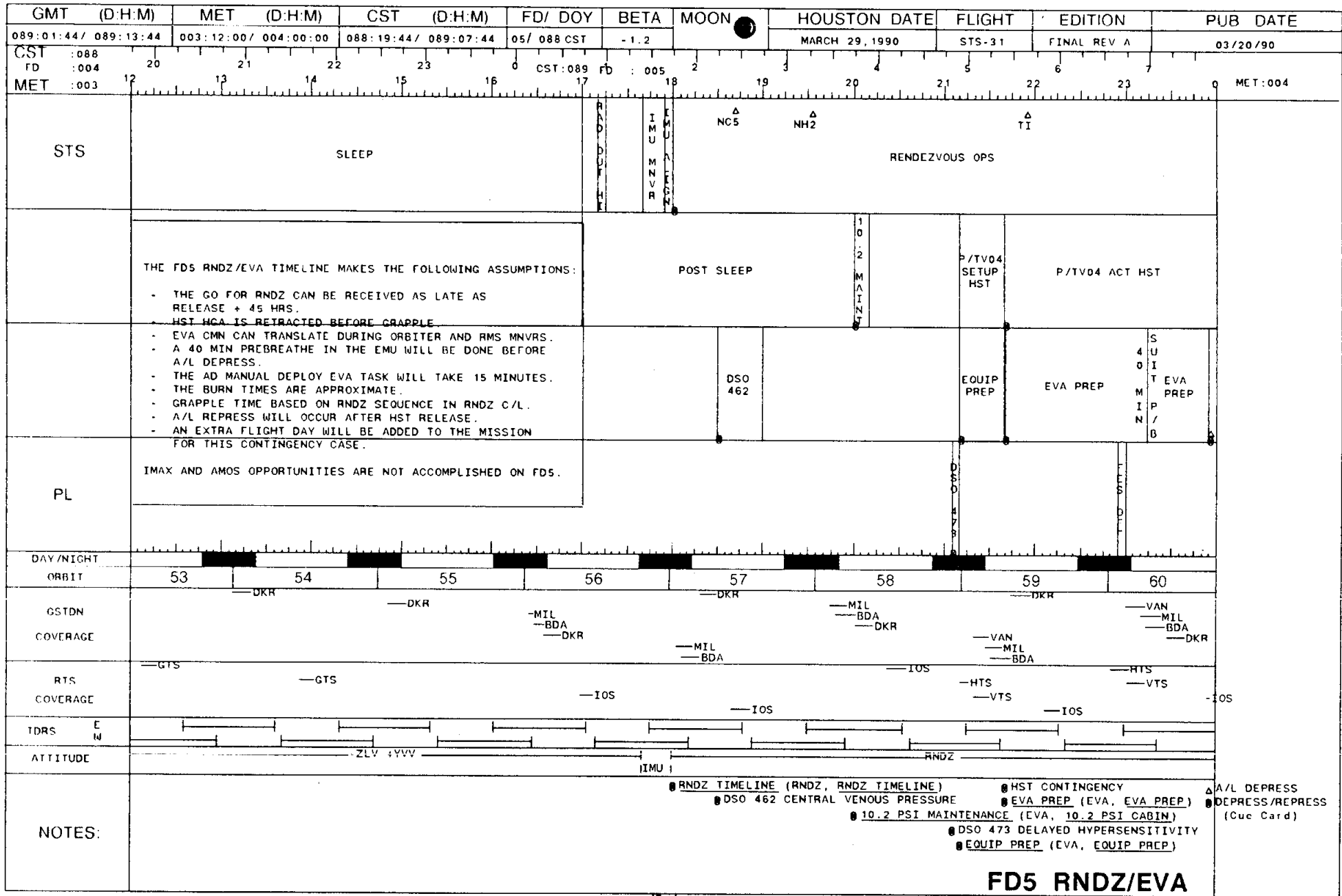
|           |   |            |     |            |    |    |          |         |    |                |             |         |         |           |          |           |   |   |    |    |    |       |    |    |    |  |
|-----------|---|------------|-----|------------|----|----|----------|---------|----|----------------|-------------|---------|---------|-----------|----------|-----------|---|---|----|----|----|-------|----|----|----|--|
| MET :003  | 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 |  |
| FD5       | SLEEP   | POST SLEEP | IMU | POST SLEEP |    |    | EVA PREP | GRAPPLE |    | SA AD SLEW DPY | SA SLEW DPY | HGA DPY | HST RLS | SEP3 SEP4 | IMU/COAS | PRE SLEEP |   |   |    |    |    | SLEEP |    |    |    |  |
| DAY/NIGHT |   |            |     |            |    |    |          |         |    |                |             |         |         |           |          |           |   |   |    |    |    |       |    |    |    |  |
| ORBIT     | 56  | 57         | 58  | 59         | 60 | 61 | 62       | 63      | 64 | 65             | 66          | 67      | 68      | 69        | 70       |           |   |   |    |    |    |       |    |    |    |  |
| NOTES:    | ● DSO 462 CENTRAL VENOUS PRESSURE<br>● DSO 473 DELAYED HYPERSENSITIVITY |            |     |            |    |    |          |         |    |                |             |         |         |           |          |           |   |   |    |    |    |       |    |    |    |  |

|           |  |            |     |            |    |         |          |           |           |      |    |    |            |           |     |           |   |   |    |    |    |       |    |    |    |  |
|-----------|--|------------|-----|------------|----|---------|----------|-----------|-----------|------|----|----|------------|-----------|-----|-----------|---|---|----|----|----|-------|----|----|----|--|
| MET :004  | 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 |  |
| FD6       | SLEEP  | POST SLEEP | IMU | POST SLEEP |    | FCS C/O | HOT TIRE | PCG DEACT | CREW COOL | MEAL |    |    | CABIN STOW | PRE SLEEP | IMU | PRE SLEEP |   |   |    |    |    | SLEEP |    |    |    |  |
| DAY/NIGHT |  |            |     |            |    |         |          |           |           |      |    |    |            |           |     |           |   |   |    |    |    |       |    |    |    |  |
| ORBIT     | 71   | 72         | 73  | 74         | 75 | 76      | 77       | 78        | 79        | 80   | 81 | 82 | 83         | 84        | 85  |           |   |   |    |    |    |       |    |    |    |  |
| NOTES:    | ● DSO 462 CENTRAL VENOUS PRESSURE<br>● DSO 472 INTRAOCULAR PRESSURE<br>● DSO 462 CENTRAL VENOUS PRESSURE<br>● DSO 472 INTRAOCULAR PRESSURE |            |     |            |    |         |          |           |           |      |    |    |            |           |     |           |   |   |    |    |    |       |    |    |    |  |

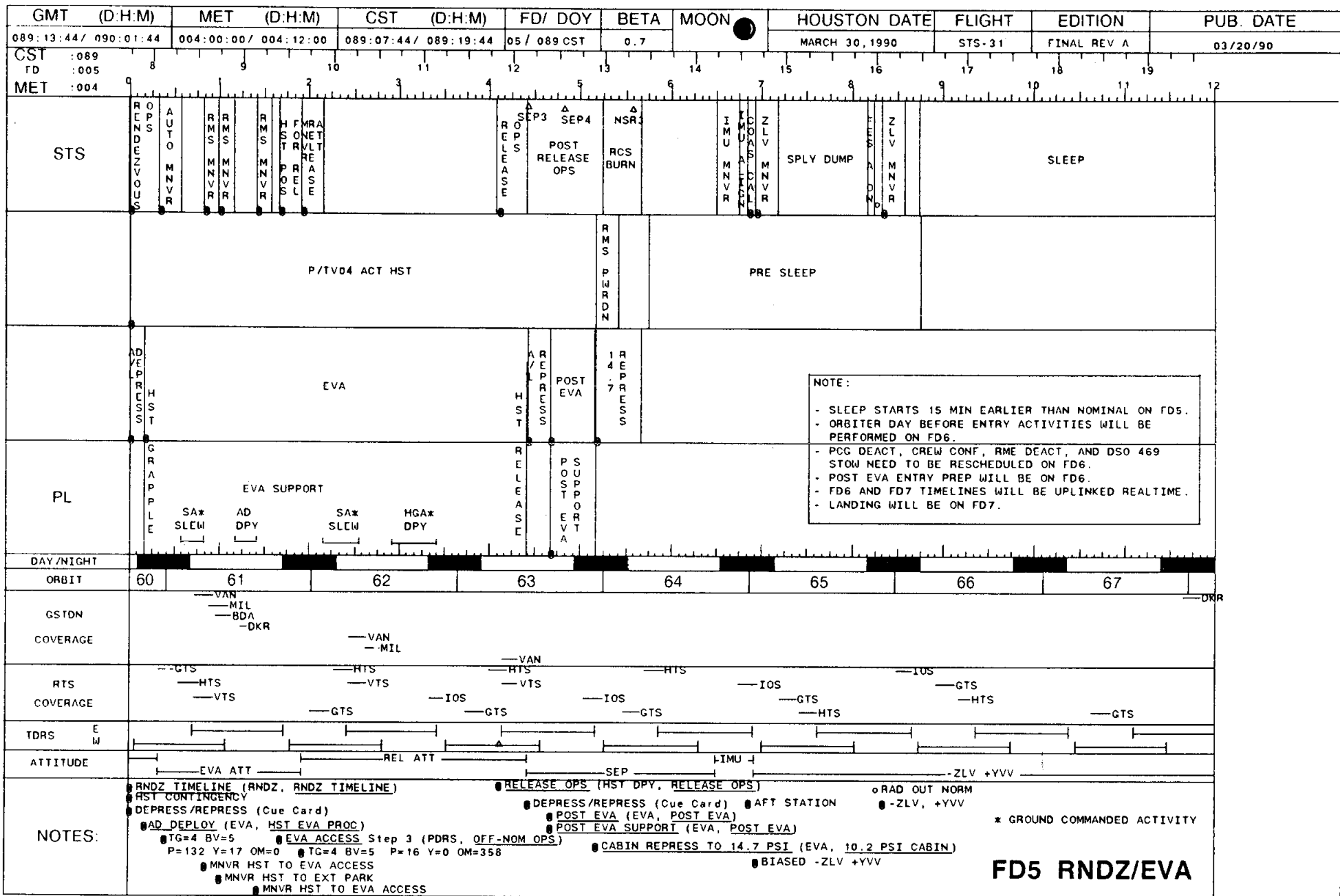
|           |   |     |    |    |              |    |         |     |         |    |    |    |    |    |    |   |   |   |    |    |    |    |    |    |    |  |
|-----------|---|-----|----|----|--------------|----|---------|-----|---------|----|----|----|----|----|----|---|---|---|----|----|----|----|----|----|----|--|
| MET :005  | 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 |  |
| FD7       | POST SLEEP  | IMU |    |    | DEORBIT PREP |    | DEORBIT | EDW | LANDING |    |    |    |    |    |    |   |   |   |    |    |    |    |    |    |    |  |
| DAY/NIGHT |   |     |    |    |              |    |         |     |         |    |    |    |    |    |    |   |   |   |    |    |    |    |    |    |    |  |
| ORBIT     | 85  | 86  | 87 | 88 | 89           | 90 | 91      | 92  | 93      | 94 | 95 | 96 | 97 | 98 | 99 |   |   |   |    |    |    |    |    |    |    |  |
| NOTES:    | ● DSO 462 CENTRAL VENOUS PRESSURE<br>● DSO 472 INTRAOCULAR PRESSURE<br>● DSO 479 FLUID COUNTERMEASURE |     |    |    |              |    |         |     |         |    |    |    |    |    |    |   |   |   |    |    |    |    |    |    |    |  |

|           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |   |   |    |    |    |    |    |    |    |  |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|---|----|----|----|----|----|----|----|--|
| MET :006  | 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 |  |
| FD8       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |   |   |    |    |    |    |    |    |    |  |
| DAY/NIGHT |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |   |   |    |    |    |    |    |    |    |  |
| ORBIT     | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 |   |   |   |    |    |    |    |    |    |    |  |
| NOTES:    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |   |   |    |    |    |    |    |    |    |  |





### FD5 RNDZ/EVA



NOTE:

- SLEEP STARTS 15 MIN EARLIER THAN NOMINAL ON FD5.
- ORBITER DAY BEFORE ENTRY ACTIVITIES WILL BE PERFORMED ON FD6.
- PCG DEACT, CREW CONF, RME DEACT, AND DSO 469 STOW NEED TO BE RESCHEDULED ON FD6.
- POST EVA ENTRY PREP WILL BE ON FD6.
- FD6 AND FD7 TIMELINES WILL BE UPLINKED REALTIME.
- LANDING WILL BE ON FD7.

**FD5 RNDZ/EVA**

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IMAX OPPORTUNITIES

## IMAX IN-CABIN CAMERA EARTH SCENE TARGETS OF OPPORTUNITY - SCHEDULE REAL TIME

| SUBJECT/SITE OR AREA   | PRIORITY | PREFERRED METHOD | LENS        | COMMENTS                  |
|--|----------|------------------|-------------|---------------------------|
| Highly visible large scale ocean feature (e.g., plankton bloom or current)                         | H        | CREW CHOICE      | 60/100      |                           |
| Highly visible man-made pollution of ocean, land, or atmosphere                                    | H        | CREW CHOICE      | CREW CHOICE |                           |
| Large scale volcanic eruption  | H        | CREW CHOICE      | 60          |                           |
| Sunset   | H        | OBL              | 100         | Use interior film at f4.5 |
| Moonrise or moonset or planet on Earth horizon   | H        | OBL              | 100         | Remove beam splitter      |
| Crew choice beautiful view of Earth with Moon in frame   | H        | OBL              | 40          |                           |
| Moving Earth as seen during orbiter maneuver (e.g., maneuver to or from gravity gradient attitude) | L        | CREW CHOICE      | 40          |                           |

IMAX IN-CABIN CAMERA EARTH SCENE OPPORTUNITIES

| ORBIT # | AOS (MET)** | SITE OR AREA                     | PRIORITY | PREFERRED METHOD | LENS | ORBIT # OF NEXT OPP | COMMENTS  |
|---------|-------------|----------------------------------|----------|------------------|------|---------------------|---|
| 13      | 0/19:55:18  | Approach West Coast of Australia | H        | OBL              | 40   | 42,56,57            |   |
| 21      | 1/08:07:57  | All of Japan                     | H        | OBL              | 60   | 36,51               |   |
| 29      | 1/21:26:01  | Congo River                      | L        | OBL              | 40   | 44,58               |   |
| 30      | 1/23:06:05  | Mouths of Niger River            | L        | OBL              | 40   | 44,59               |   |
| 32      | 2/02:16:17  | French Guiana (Kourou)           | L        | -ZLV             | 40   | 47                  |   |
| 32      | 2/02:17:08  | Mouths of Amazon                 | L        | Low OBL          | 40   | 47                  | Look southwest  |
| 33      | *2/03:51:50 | Isthmus of Panama                | H        | -ZLV             | 40   | 47,48,62            | Use OBL method  |
| 33      | 2/03:55:23  | Virgin Rainforest: Brazil        | H        | OBL              | 40   | 34,48,62,63         | Look southwest  |
| 34      | *2/05:40:21 | Virgin Rainforest: Brazil        | H        | OBL              | 40   | 48,62,63            | With Andes in foreground. May not be able to view Andes |
| 36      | 2/08:22:49  | All of Japan                     | H        | OBL              | 60   | 51                  |   |
| 42      | 2/18:41:59  | Approach West Coast of Australia | H        | OBL              | 40   | 56,57               |   |
| 44      | *2/21:36:41 | Mouths of Niger River            | L        | OBL              | 40   | 59                  |   |
| 44      | *2/21:41:34 | Congo River                      | L        | -ZLV or OBL      | 40   | 58                  |   |
| 46      | *3/01:09:14 | Southern Tip of Africa           | H        | OBL              | 40   | 60,61               |   |
| 47      | *3/02:22:39 | Isthmus of Panama                | H        | OBL              | 40   | 48,62               |   |

\*Scheduled in Flight Plan

\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.

IMAX IN-CABIN CAMERA EARTH SCENE OPPORTUNITIES (CONT'D)

| ORBIT # | AOS (MET)** | SITE OR AREA  | PRIORITY | PREFERRED METHOD | LENS      | ORBIT # OF NEXT OPP | COMMENTS                        |
|---------|-------------|---|----------|------------------|-----------|---------------------|---------------------------------|
| 47      | *3/02:31:43 | French Guiana                                       | L        | Low OBL          | 40        | 61                  | Look northeast from orbit track |
| 47      | *3/02:32:33 | Mouths of Amazon River                              | L        | -ZLV             | 40        | 61                  |                                 |
| 48      | *3/04:07:13 | Isthmus of Panama                                   | H        | OBL              | 40        | 62                  |                                 |
| 48      | *3/04:10:54 | Virgin Rainforest: Brazil                           | H        | OBL              | 40        | 62,63               |                                 |
| 51      | 3/08:37:24  | All of Japan  | H        | OBL              | 60        |                     |                                 |
| 56      | 3/17:00:23  | Sri Lanka and India                                 | L        | OBL              | 40        |                     |                                 |
| 56      | 3/17:14:00  | Approach West Coast of Australia (80 Mile Beach)    | H        | OBL              | 40        | 57                  |                                 |
| 57      | 3/18:54:57  | Approach West Coast of Australia (Hammerslay Range) | H        | OBL              | 40        |                     |                                 |
| 58      | *3/20:11:27 | Congo River   | L        | OBL              | 40        |                     | Look southwest of orbit track   |
| 59      | *3/21:51:21 | Mouths of Niger River                               | H        | -ZLV             | 40        |                     |                                 |
| 60      | 3/23:38:43  | Southern Tip of Africa                              | H        | OBL              | 40        | 61                  |                                 |
| 61      | 4/01:01:25  | French Guiana (Kourou)                              | L        | Low OBL          | 40        |                     |                                 |
| 61      | 4/01:23:17  | Southern Tip of Africa                              | H        | OBL              | 40        |                     |                                 |
| 62      | *4/02:36:54 | Isthmus of Panama                                   | H        | -ZLV             | 40/<br>60 |                     |                                 |
| 62      | *4/02:41:26 | Virgin Rainforest: Brazil                           | H        | OBL              | 40        | 63                  |                                 |
| 63      | 4/04:24:38  | Virgin Rainforest: Brazil                           | H        | OBL              | 40        |                     | With Andes in foreground        |

\*Scheduled in Flight Plan

\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.

### IMAX IN-CABIN CAMERA EARTH SCENE OPPORTUNITIES (CONT'D)

| ORBIT # | AOS (MET)** | SITE OR AREA | PRIORITY | PREFERRED METHOD | LENS | ORBIT # OF NEXT OPP | COMMENTS |
|---------|-------------|--------------|----------|------------------|------|---------------------|----------|
|         |             |              |          |                  |      |                     |          |
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|         |             |              |          |                  |      |                     |          |

\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.



IMAX IN-CABIN CAMERA EARTH SCENE OPPORTUNITIES (CONT'D)

| ORBIT # | AOS (MET)** | SITE OR AREA | PRIORITY | PREFERRED METHOD | LENS | ORBIT # OF NEXT OPP | COMMENTS |
|---------|-------------|--------------|----------|------------------|------|---------------------|----------|
|         |             |              |          |                  |      |                     |          |
|         |             |              |          |                  |      |                     |          |
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|         |             |              |          |                  |      |                     |          |
|         |             |              |          |                  |      |                     |          |

\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.

5-6  
 FLT PLN/31/FIN A

IMAX IN-CABIN CAMERA EARTH SCENE OPPORTUNITIES (CONT'D)

| ORBIT # | AOS (MET)** | SITE OR AREA | PRIORITY | PREFERRED METHOD | LENS | ORBIT # OF NEXT OPP | COMMENTS |
|---------|-------------|--------------|----------|------------------|------|---------------------|----------|
|         |             |              |          |                  |      |                     |          |
|         |             |              |          |                  |      |                     |          |
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|         |             |              |          |                  |      |                     |          |
|         |             |              |          |                  |      |                     |          |

\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.

5-7  
FLT PLN/31/FIN A

## ICBC EARTH SCENE TARGETS OF OPPORTUNITY

| SUBJECT/SITE OR AREA       | PRIORITY | COMMENTS |
|----------------------------|----------|----------|
| Snow-capped mountain       | H        |          |
| Earth scene of crew choice | H        |          |

## ICBC EARTH SCENE OPPORTUNITIES

| ORBIT # | AOS (MET)** | SITE OR AREA   | PRIORITY | ORBIT # OF NEXT OPP | COMMENTS |
|---------|-------------|--|----------|---------------------|----------|
| 32      | 2/02:09:18  | Whole Caribbean Sea (include Cuba, Jamaica, W. Indies) | L        | 46,47,61            |          |
| 44      | *2/21:49:51 | Whole Island of Madagascar                             | H        | 45,59,60            |          |
| 45      | 2/23:34:02  | Whole Island of Madagascar                             | H        | 59,60               |          |
| 46      | *3/00:40:31 | Whole Caribbean Sea (include Cuba, Jamaica, W. Indies) | L        | 47,61               |          |
| 47      | *3/02:24:30 | Whole Caribbean Sea (include Cuba, Jamaica, W. Indies) | L        | 61                  |          |
| 59      | 3/22:04:21  | Whole Island of Madagascar                             | H        | 60                  |          |
| 60      | 3/23:48:05  | Whole Island of Madagascar                             | H        |                     |          |
| 61      | 4/00:54:37  | Whole Caribbean Sea (include Cuba, Jamaica, W. Indies) | L        |                     |          |

\*Scheduled in Flight Plan

\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.

ICBC EARTH SCENE OPPORTUNITIES (CONT'D)

| ORBIT # | AOS (MET)** | SITE OR AREA | PRIORITY | ORBIT # OF NEXT OPP | COMMENTS |
|---------|-------------|--------------|----------|---------------------|----------|
|         |             |              |          |                     |          |
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FLT PLN/31/FIN A

\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.

ICBC EARTH SCENE OPPORTUNITIES (CONT'D)

| ORBIT # | AOS (MET)** | SITE OR AREA | PRIORITY | ORBIT # OF NEXT OPP | COMMENTS |
|---------|-------------|--------------|----------|---------------------|----------|
|         |             |              |          |                     |          |
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\*\*AOS is the acquisition of site (5 deg elevation above the horizon) of the western-most point of the ground area.

CONSUMABLES CURVES

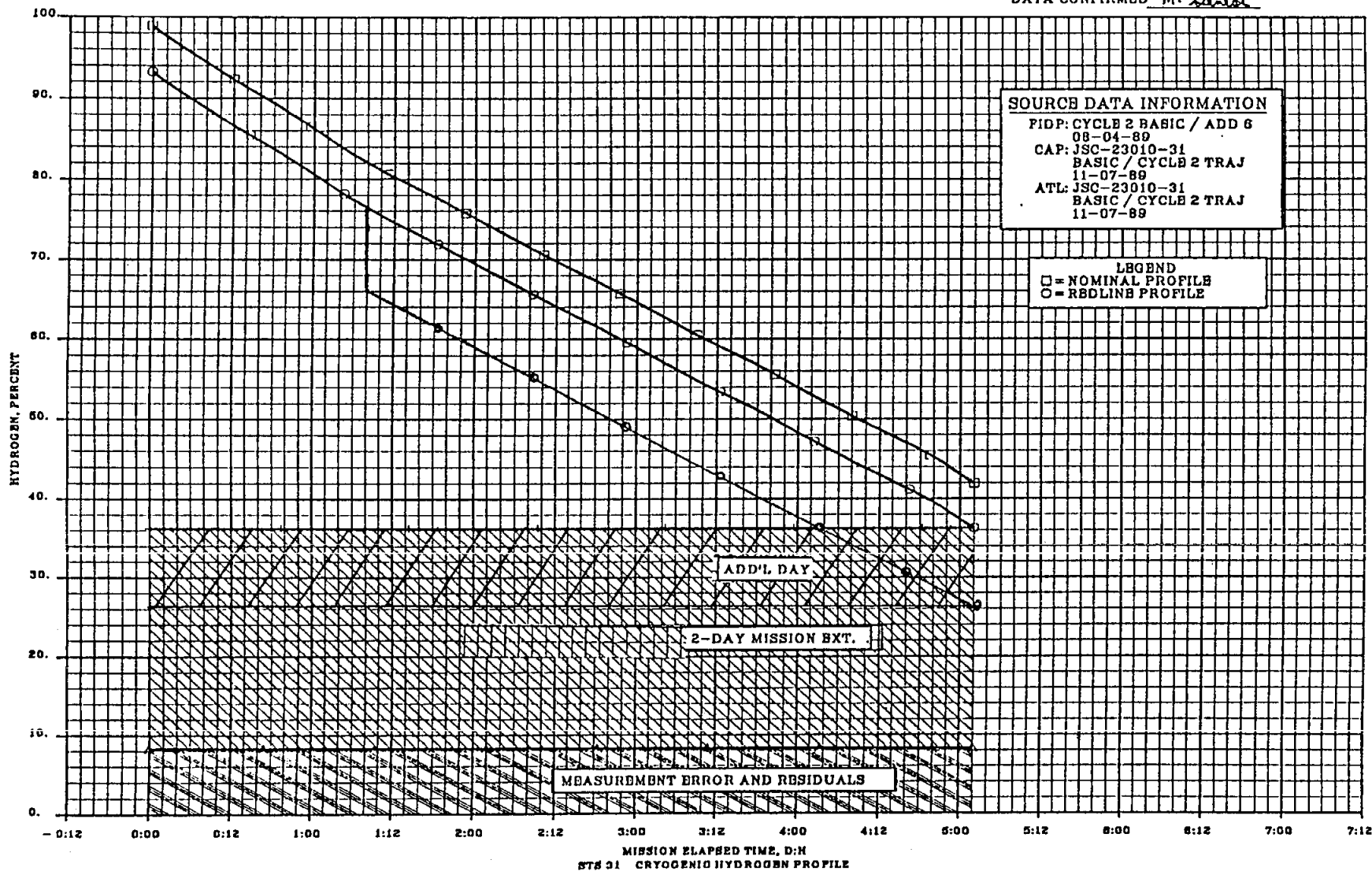
CONSUMABLES  
CURVES

# CONSUMABLES CURVES

MICHAEL GENEST  
ANALYSIS DATE: 01-04-90  
TRAJ CYCLE: 2

MISSION OPERATIONS DIRECTORATE  
SYSTEMS DIVISION

DATA CONFIRMED *M. Genest*



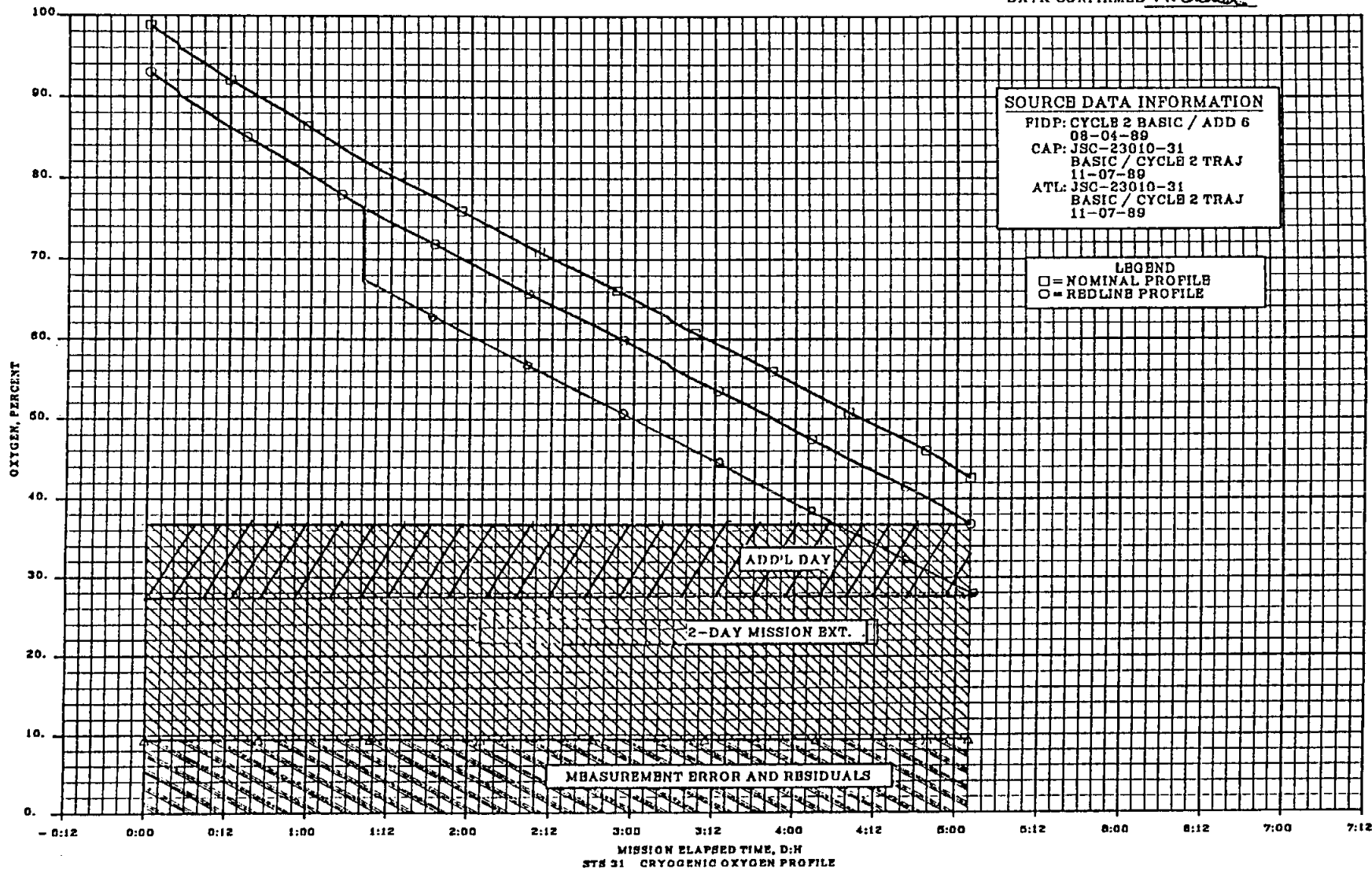
6-2

FLT PLN/31/FIN A

MICHAEL GENBST  
 ANALYSIS DATE: 01-04-90  
 TRAJ CYCLE: 2

MISSION OPERATIONS DIRECTORATE  
 SYSTEMS DIVISION

DATA CONFIRMED *M. Genbst*



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FLT PLN/31/FIN A



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will not be included in flight copies.

STS-31  
FLIGHT PLAN NOTES

FLIGHT PLAN NOTES  
(CONSTRAINTS AND GUIDELINES)

A. FLIGHT DESCRIPTION

The STS-31 (OV-103) launch from KSC on March 26, 1990 (Cycle 2) will be into a 310 x 330 nm orbit at an inclination of 28.5 degrees. The orbital altitude is later circularized at 330 nm on orbit 5 via an RCS burn. The mission duration will be 5 days. Nominal landing occurs at EDW on March 31, 1990.

Landing opportunities are:

|             |              | <u>Landing</u><br><u>Orbit No.</u> | <u>Site</u> | <u>Local Time</u> |
|-------------|--------------|------------------------------------|-------------|-------------------|
| Nominal     | Primary      | 76                                 | EDW         | 6:59              |
|             | Backup       | 76                                 | NOR         | 8:02              |
|             | Weather Alt. | 76                                 | KSC         | 10:08             |
| 1 Day Late  | Primary      | 90                                 | EDW         | 5:30              |
|             | Weather Alt. | 90                                 | NOR         | 6:32              |
| 2 Days Late | Primary      | 105                                | EDW         | 5:43              |
|             | Weather Alt. | 105                                | NOR         | 6:46              |

MAJOR EVENTS

|                |                |
|----------------|----------------|
| LAUNCH (KSC)   | March 26, 1990 |
| MET (DD/HH:MM) | (0/00:00)      |
| Day of year    | 85             |
| CST/GMT        | 7:44/13:44     |

|                  |            |
|------------------|------------|
| <u>OMS-2</u>     |            |
| MET (DD/HH:MM)   | (00/00:48) |
| DV (fps)         | 494.7      |
| ORBIT ha/hp (nm) | 311/331    |

|                  |            |
|------------------|------------|
| <u>RCS BURN</u>  |            |
| MET (DD/HH:MM)   | (00/07:11) |
| DV (fps)         | 32.2       |
| ORBIT ha/hp (nm) | 330/331    |

|                    |            |
|--------------------|------------|
| <u>HST RELEASE</u> |            |
| MET (DD/HH:MM)     | (01/05:23) |

|                      |            |
|----------------------|------------|
| <u>SEP 1 (LOW Z)</u> |            |
| MET (DD/HH:MM)       | (01/05:24) |
| DV (fps)             | 0.6        |
| ORBIT ha/hp (nm)     | 330/332    |

SEP 2 (MINUS X)  
MET (DD/HH:MM) (01/05:51)  
DV (fps) 1.0  
ORBIT ha/hp (nm) 331/332

NH2 (SEP)  
MET (DD/HH:MM) (03/06:17)  
DV (fps) 2.0  
ORBIT ha/hp (nm) 329/330

DEORBIT BURN  
MET (DD/HH:MM) (05/00:00)

LANDING (EDW)  
MET (DD/HH:MM) (05/01:12)  
Day of year 90  
CST/GMT 08:59/14:59

## B. CREW

1. The 5 crewmembers flying this mission are:

CDR - Loren J. Shriver  
PLT - Charles F. Bolden  
MS1 - Bruce McCandless  
MS2 - Steven A. Hawley  
MS3 - Kathryn D. Sullivan

2. The crewmembers responsible for performing an EVA, should one become necessary, are: MS1 will be EV1, MS3 will be EV2, and PLT will be IV1.

## C. ORBITER SYSTEMS

1. Communications and Instrumentation

- a. The Operational Instrumentation (OI) system will nominally be managed from the ground through uplink real-time commands (RTCs) coordinated with the crew.
- b. TDRS coverage is supported by TDRS-E (41 degrees W) and TDRS-W (171 degrees W) and is the prime mode of communication coverage.
- c. TDRS Ku-band is the prime mode of real-time TV. There are also 3 GSTDN sites available for contingency TV support: GDS(GDX), MIL(MLX), and VAN.
- d. TDRS-E and TDRS-W are available to support Ku-band uplink (e.g., TAGS).

- e. HDR uplink (e.g., Teleprinter) is available through TDRS-E and TDRS-W.
- f. There are seven sites available for launch support: MIL(MLX), GDS(GDX), DFR, VAN, BDA, and IOS.
- g. There are five GSTDN sites available for on-orbit contingency support: VAN, MIL(MLX), BDA(BDX), DKR, and DFR. (Note: DFR is not shown in the FLT PLN.)
- h. There are five sites available for landing support: MIL(MLX), GDS(GDX), DFR, VAN, and IOS.
- i. RTS sites are available for contingency support (4-hour lead time required): HTS, GTS, VTS, and IOS.

## 2. Guidance and Navigation

- a. The orbiter state vector must be uplinked whenever downtrack error in the on-board vector becomes greater than 20 nm, but is usually uplinked when errors are greater than 5 nm. These are real-time calls. In addition, state vectors must be uplinked for specified targets when utilizing an orbiting vehicle as a TGT ID with Universal Pointing.
- b. IMU alignments occur approximately every 12 hours in the pre-sleep and post-sleep activities and prior to major events requiring low navigation uncertainty.

## 3. Environmental Control and Life Support Subsystem (ECLSS)

- a. Two CO<sub>2</sub> absorbers are installed prior to launch. On-orbit, the canisters are alternately replaced as required per the cue card.
- b. There are four supply water tanks and one waste water tank which are loaded for launch with volumes sufficient to meet an orbit 3 launch day deorbit with payload bay doors (PLBDs) failed closed. The water management plan for STS-31 has been designed to minimize contamination of the HST while still maintaining the capability to support deorbit. Prior to each dump, the crew will be informed of the dump quantity. Tanks A and B will be dumped to a level that will allow the tanks to be full prior to the next daily group of deorbit opportunities.

## 4. DC Utility Power Usage

The following table is the DC Utility Power Outlet Schedule. This table shows the times of outlet reconfigurations during the mission.

STS-31 DC UTILITY POWER OUTLET SCHEDULE

| MET<br>OUTLET    |       | PRELAUNCH | POST<br>INSERTION | ON-ORBIT |         | DEORBIT<br>PREP |
|------------------|-------|-----------|-------------------|----------|---------|-----------------|
|                  |       |           | 0/1:46            | 0/07:35  | 0/22:20 |                 |
| MNA              | 019   | PLT*      | --                | --       | --      | PLT*            |
|                  | M052J | MS3*      | --                | --       | --      | MS3*            |
| MNB              | F1    | --        | --                | --       | --      | --              |
|                  | M013Q | PCG       | PCG               | PCG      | PCG     | PCG             |
| MNC              | A11   | MS1*,MS2* | --                | --       | --      | MS1*,MS2*       |
|                  | A15   | CDR*      | TPR               | TPR      | TPR     | CDR*            |
|                  | M030F | --        | --                | --       | --      | --              |
| MNA<br>OR<br>MNB | L15   | --        | --                | --       | IMAX    | --              |

NOTES: \*Crewmember suit fan

D. TEXT UPLINK SYSTEM

1. The Text and Graphics System (TAGS) is a high-resolution facsimile system that scans text or graphics material and converts the analog SCAN data into serial digital data. This data is transmitted via a telemetry link to the cathode-ray tube hardcopier. Transmission time for an 8-1/2 by 11-inch page can vary from just over 1 minute to just over 16 minutes depending on the hardcopy resolution desired. The TAGS can only uplink images using Ku-band. This Flight Plan assumes Ku-band forward link is available for both TDRS-E and TDRS-W, and TAGS is the primary mode of text uplink. Instrumentation has the capability to uplink onboard hardcopier control commands via S-band or Ku-band for power on, advance, ready, standby, and off.
2. The teleprinter (TPR) will provide a backup on-orbit capability to receive and reproduce text-only data from MCC. The TPR uses S-band and is not dependent on TDRS Ku-band. TPR requires 1 to 2.5 minutes per message, depending on the number of lines (up to 66).

E. TELEVISION/PHOTOGRAPHY

1. The CCTV systems provide two color, wide-angle cameras for in-cabin coverage. There will also be five PLB TV cameras, (A,B,C,D and a keel camera) and two RMS cameras (elbow and end effector). 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.
2. There is a video tape recorder available with 30-minute cassettes.
3. Three camera systems are available: 35mm, 16mm, and 70mm.

## F. PAYLOADS

### 1. Hubble Space Telescope (HST)

The HST is an optical observatory system designed for extended orbital operating life. The HST will be maintained by orbiter revisit flights and EVA replacement of scientific instruments and components. The HST is composed of three major elements: the Optical Telescope Assembly (OSA), the Support System Module (SSM), and the Scientific Instruments (SIs). The SSM includes all external structure and provides HST interface with the STS. The HST is removed from the payload bay and released using the RMS. The HST will perform systems checkout after release, during which time the orbiter will maintain revisit capability should a contingency arise.

### 2. IMAX Cargo Bay Camera (ICBC)

The ICBC is a 70mm color motion picture camera system, consisting of a camera, lens assembly and a film magazine containing approximately 2000 feet of film. The camera is housed in an insulated pressurized enclosure with a movable lens window cover. This container is mounted on the port side of the aft payload bay on an extended adaptive payload carrier. The payload is controlled from the Aft Flight Deck with the Autonomous Payload Controller (APC). Scene opportunities will be provided to the crew both pre-flight and real time, and shall include the HST deployment and Earth viewing.

### 3. IMAX

The IMAX payload is a 70mm motion picture camera system. The camera and supporting equipment are stowed in the middeck. On this flight, IMAX will be used to photograph HST deploy activities and various Earth features. Earth view opportunities will be provided to the crew pre-flight and in real time.

### 4. SE 82-16 (Investigations of Arc and Ion Behavior in Microgravity)

The experiment will observe the effects of microgravity on an electric arc. The absence of convection currents in a weightless environment will keep the arc from rising. This experiment will also study the effect of a magnetic field on an arc without correction. An Arriflex 16mm camera will be used to photograph the experiment on-orbit.

### 5. IPMP (Investigations into Polymer Membrane Processing)

The primary goal of IPMP is to study the fundamentals of making membranes for industrial separation applications. Studying the role of convection-driven currents in transport processes may help determine the influences of these processes on membrane morphology. It is anticipated that the resulting pores of the polymeric material will have a more uniform configuration than that possible on Earth. The two IPMP units that will be flown do not require any power or data interfaces. A crewmember is only required to open the valves on each unit.



6. PCG-III (Protein Crystal Growth III)

The PCG payload is designed to conduct experiments which will supply information to the scientific methods and commercial potential for growing large high quality protein crystals in microgravity. The PCG will be installed and operated on the orbiter middeck. The crew is required to activate PCG and to record the resulting crystals on film.

7. RME-III (Radiation Monitor Experiment III)

The RME measures the radiation at different locations throughout the orbiter. The equipment contains a Liquid Crystal Display (LCD) for real-time data display and a keyboard for controlling its functions.

8. AMOS (Air Force Maui Optical Site)

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

G. ON-ORBIT DTOs

1. Microbial Filter Resin Checkout (DTO 0644)

The purpose of DTO 0644 is to verify that the new resin in the orbiter water system's microbial filter introduces the proper concentrations of iodine into the potable water produced by the fuel cells. In order to verify this, the temporary microbial filters installed in line at the galley, where water temperatures are lower, must be disconnected inflight. Iodine concentration measurements are then taken on each flight day.

2. Gravity Gradient (GG) Attitude Control (DTO 0816)

The purpose of DTO 0816 is to find a precise GG attitude which balances aerodynamic, angular momentum and GG forces so that attitude oscillations are minimized compared to steady state ones. The second objective is to determine steady state attitude oscillations and the sensitivity of these oscillations to attitude and rate errors at GG initiation. Data shall be used to refine the computer models used to predict release attitudes.

H. ON-ORBIT DSOs

1. Noninvasive Estimation of Central Venous Pressure (DSO 462)

The objective of this investigation is to measure the physiological adaptation to the headward fluid shift that occurs in microgravity. The noninvasive technique of determining CVP uses a mouthpiece with varying resistance and a probe that utilizes doppler flowmetry. The specified crewmember will begin measurements as early as possible on FD1 and as often as possible during pre- and post-sleep periods.

2. Inflight Radiation Dose Distribution (DSO 469)

This DSO will establish, evaluate, and verify analytical and measurement methods for assessing and managing health risks from exposure to space radiation. The radiation environment will be measured inside the orbiter with a tissue equivalent phantom of the human head. This phantom head will be mounted at a thinly shielded region of the starboard middeck wall. Characterization of the neutron components and of heavy ions from stopping protons will be accomplished.

3. Inflight Intraocular Pressure (DSO 472)

Pressure measurements observed in bedrest studies during zero gravity on the KC-135 and on the D-1 Shuttle Mission were 20-25% above normal preflight levels. The possible deleterious effects of sustained deviations in intraocular pressure (IOP) are difficult to predict since no statistically valid in-flight data exists. Even though a few days or weeks of elevated IOP would be harmless, months or years of sustained high pressure due to microgravity could cause ocular disturbances. The purpose of this DSO is to collect baseline data to define normal IOP ranges in microgravity and to determine the magnitude of pressure rises to be expected in crewmembers. A tonop-pen will be used to measure the IOP of each crewmember.

4. Delayed-Type Hypersensitivity (DSO 473)

The purpose of this DSO is to detect immunological alterations in the human system resulting from spaceflight. Delayed-type hypersensitivity (DTH) will also assess the impairment of in vivo cell mediated immunity and the medical significance of immune dysfunction events.

5. Hyperosmotic Fluid Countermeasure (DSO 479)

The purpose of this DSO is to compare different concentrations of salt and water in order to determine which concentration provides optimum protection against orthostatic stresses when returning to Earth. When the osmolality is greater, protection against orthostatic intolerance lasts longer. Each crewmember will drink one extra container of fluid at each meal or the day before entry. On entry day, each crewmember will take an appropriate countermeasure.

6. Documentary Television (DSO 0901)

The purpose of DSO 0901 is to provide live television or VTR dumps of crew activity, orbiter operations, payload deployment/retrieval and operations, Earth views, rendezvous and proximity operations. Telecasts are planned for communication periods with seven or more minutes of uninterrupted viewing time. The broadcast is accompanied with operational air-to-ground and/or operational intercom audio. VTR recording may be used when live television is not possible.

7. Documentary Motion Picture Photography (DSO 0902)

The purpose of DSO 0902 is to provide documentary and public affair motion picture photography of the orbiter's basic capabilities and key flight objectives. Documentation shall include launch, crew activities, HST deployment, landing and unscheduled items of interest.

8. Documentary Still Photography (DSO 0903)

The purpose of DSO 0903 is to provide 35mm and 70mm still photography of crew activities, orbiter operations, HST deployment/retrieval and operations, Earth views and unscheduled items of interest. Exterior photography requires the 70mm format and interior photography requires the 35mm.

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STS-31 DAP BOOK

## DAP A CONFIGURATIONS

|                    | A1*   | A2    | A3    | A4    | A5    | A6    | A7 | A8    | A9    | A10   | A11 | A12   | A13   |
|--------------------|-------|-------|-------|-------|-------|-------|----|-------|-------|-------|-----|-------|-------|
| <u>TRANSLATION</u> |       |       |       |       |       |       |    |       |       |       |     |       |       |
| PULSE ft/sec       | 0.10  | 0.10  | 0.10  | 0.10  | 0.10  | 0.10  |    | 0.10  | 0.10  | 0.05  |     | 0.10  | 0.10  |
| <u>ROTATION</u>    |       |       |       |       |       |       |    |       |       |       |     |       |       |
| DSC RT NORM °/sec  | 0.200 | 0.400 | 0.200 | 0.200 | 0.200 | 0.200 |    | 0.500 | 0.200 | 0.200 |     | 0.2   | 0.2   |
| VERN °/sec         | 0.200 | 0.400 | 0.200 | 0.008 | 0.200 | 0.200 |    | 0.200 | 0.200 | 0.200 |     | 0.2   | 0.2   |
| PULSE NORM °/sec   | 0.10  | 0.10  | 0.30  | 0.10  | 0.10  | 0.10  |    | 0.10  | 0.10  | 0.10  |     | .04   | .04   |
| VERN °/sec         | 0.010 | 0.010 | 0.010 | 0.010 | 0.050 | 0.010 |    | 0.010 | 0.010 | 0.010 |     | 0.010 | 0.010 |
| COMP NORM °/sec    | .00   | .00   | .00   | .00   | .00   | .00   |    | .00   | .00   | .00   |     | .00   | .00   |
| VERN °/sec         | .000  | .000  | .000  | .000  | .000  | .000  |    | .000  | .000  | .000  |     | .00   | .00   |
| <u>DEADBAND</u>    |       |       |       |       |       |       |    |       |       |       |     |       |       |
| ATT NORM (deg)     | 5.00  | 1.00  | 5.00  | 1.00  | 5.00  | 5.00  |    | 3.00  | 2.00  | 2.00  |     | 2.0   | 5.0   |
| VERN (deg)         | 1.000 | 1.000 | 1.000 | 0.070 | 1.000 | 1.000 |    | 1.000 | 1.000 | 1.000 |     | 2.0   | 2.0   |
| RATE NORM °/sec    | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  |    | 0.20  | 0.20  | 0.20  |     | 0.2   | 0.2   |
| VERN °/sec         | .020  | .020  | .020  | .010  | .020  | .020  |    | .020  | .020  | .020  |     | .05   | .05   |
| <u>JET OPT</u>     |       |       |       |       |       |       |    |       |       |       |     |       |       |
| P                  | 1     | 1     | 3     | 1     | 1     | 3     |    | 1     | 1     | 1     |     | 1,3   | 1,3   |
| Y                  | 1     | 1     | 3     | 3     | 1     | 3     |    | 1     | 1     | 1     |     | 1,3   | 1,3   |
| <u>CNTL ACCEL</u>  |       |       |       |       |       |       |    |       |       |       |     |       |       |
|                    | 0     | 0     | 0     | 0     | 0     | 0     |    | 0     | 0     | 0     |     | 0-5   | 0-3,5 |

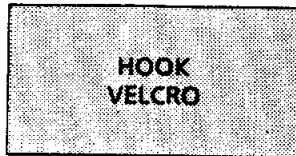
\*I-LOADED OPS-2 DAP Configuration

DAP B CONFIGURATIONS

|                    | B1*   | B2    | B3    | B4    | B5    | B6    | B7    | B8   | B9   |
|--------------------|-------|-------|-------|-------|-------|-------|-------|------|------|
| <u>TRANSLATION</u> |       |       |       |       |       |       |       |      |      |
| PULSE ft/sec       | 0.02  | 0.02  | 0.02  | 0.02  | 0.02  | 0.05  | 0.01  | 0.1  | 0.1  |
| <u>ROTATION</u>    |       |       |       |       |       |       |       |      |      |
| DSC RT NORM °/sec  | 0.500 | 0.200 | 0.200 | 0.200 | 0.200 | 0.500 | 0.200 | 0.2  | 0.2  |
| VERN °/sec         | 0.200 | 0.200 | 0.200 | 0.008 | 0.016 | 0.200 | 0.200 | 0.2  | 0.2  |
| PULSE NORM °/sec   | 0.04  | 0.04  | 0.04  | 0.04  | 0.04  | 0.04  | 0.04  | .04  | .04  |
| VERN °/sec         | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | .005 | .005 |
| COMP NORM °/sec    | .00   | .00   | .00   | .00   | .00   | .00   | .00   | .00  | .00  |
| VERN °/sec         | .000  | .000  | .000  | .000  | .000  | .000  | .000  | .00  | .00  |
| <u>DEADBAND</u>    |       |       |       |       |       |       |       |      |      |
| ATT NORM (deg)     | 3.00  | 3.00  | 3.00  | 0.30  | 3.00  | 2.00  | 2.00  | 2.0  | 0.5  |
| VERN (deg)         | 1.000 | 1.000 | 1.000 | 0.100 | 0.033 | 1.000 | 1.000 | 2.0  | 1.0  |
| RATE NORM °/sec    | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | .2   | .2   |
| VERN °/sec         | .020  | .020  | .020  | .010  | .020  | .020  | .020  | .08  | .02  |
| <u>JET OPT</u>     |       |       |       |       |       |       |       |      |      |
| P                  | 1     | 3     | 1     | 3     | 3     | 1     | 1     | 1,3  | 1,3  |
| Y                  | 1     | 3     | 1     | 3     | 3     | 1     | 1     | 1,3  | 1,3  |
| <u>CNTL ACCEL</u>  |       |       |       |       |       |       |       |      |      |
|                    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 4    | 5    |

\*I-LOADED OPS-2 DAP Configuration

# DAP BOOK



FLT PLN/31/0/BAS

| UNIV PTG                 |                                 |
|--------------------------|---------------------------------|
| TGT ID = 1               | Orbiting Vehicle                |
| = 2                      | Earth ctr                       |
| = 3                      | Earth tgt                       |
|                          | Input LAT ( $\pm 90$ )          |
|                          | LON ( $\pm 180$ , + = East)     |
|                          | ALT (-3444.0 to 20000.0 nm)     |
| = 4                      | Sun ctr                         |
| = 5                      | Celestial tgt                   |
|                          | Input RA (0-359.99)             |
|                          | DEC ( $\pm 90$ )                |
| = 11-110                 | Nav Stars                       |
| BODY VECT = 1            | +X*                             |
| = 2                      | -X*                             |
| = 3                      | -Z*                             |
| = 4                      | PTC ( $\sim 2^\circ$ below +X)* |
| = 5                      | Optional                        |
|                          | Input P (0-359.99)              |
|                          | Y (270-359.99, 0-90)            |
| * input OM $\rightarrow$ | OM (0-359.99)                   |
| MON AXIS = 1             | +X                              |
| 2                        | -X                              |

FLT PLN/31/0/BAS

| G20 DAP CONFIG |                                    |             |           |
|----------------|------------------------------------|-------------|-----------|
| CNTL ACCEL = 0 | Orbiter alone                      | JET OPT = 1 | Normal    |
| = 1            | Extended park                      | = 2         | Nose only |
| = 2            | Low hover, 90 deg roll, EVA access | = 3         | Tail only |
| = 3            | High hover, recapture              |             |           |
| = 4            | 90 deg pitch                       |             |           |
| = 5            | Appedage deploy, release           |             |           |



TOP



DAP                      PURPOSE

- A1 - NOMINAL  
IMU ALIGN  
LOSS OF VERN  
(NOSE & TAIL)
- A2 - PTC
- A3 - RCS HOT FIRE
- A4 - GG
- A5 - IMU ROTATION
- A6 - LOSS OF VERN  
(TAIL ONLY)
- A7 - (Blank)
- A8 - PRE/POST DEPLOY
- A9 - RENDEZVOUS
- A10 - PROX OPS
- A11 - (Blank)
- A12 - HST
- A13 - HST LOSS OF VERN

FLT PLN/31/0/FIN



A1



TOP



**DAP A1**

PURPOSE:

- NOMINAL
- IMU ALIGN
- LOSS OF VERN  
(NOSE & TAIL)

A1

|         |    |                         |
|---------|----|-------------------------|
| 0.1 0   | 1  | TRANSLATION<br>PULSE    |
| 0.2 0 0 | 2  | ROTATION<br>DSC RT NORM |
| 0.2 0 0 | 3  | VERN                    |
| 0.1 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<br>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/31/0/BAS



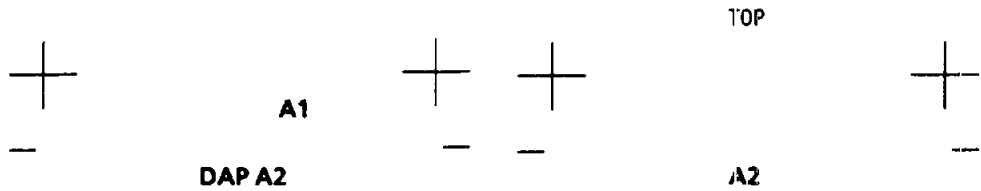
FLT PLN/31/0/BAS



A2



TOP

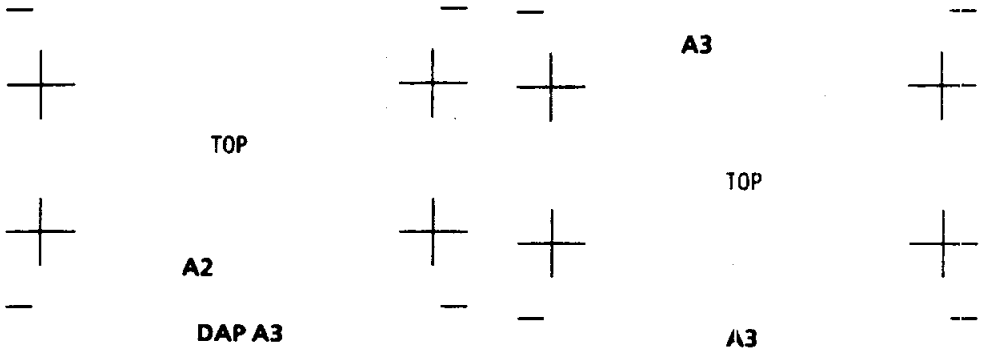


PURPOSE:  
PTC

- |          |    |                   |
|----------|----|-------------------|
| 0.1 0    | 1  | TRANSLATION PULSE |
| ROTATION |    |                   |
| 0.4 0 0  | 2  | DSC RT NORM       |
| 0.4 0 0  | 3  | VERN              |
| 0.1 0    | 4  | PULSE NORM        |
| 0.0 1 0  | 5  | VERN              |
| .0 0 0   | 6  | COMP NORM         |
| .0 0 0   | 7  | VERN              |
| DEADBAND |    |                   |
| 1.0 0    | 8  | 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/31/0/BAS

FLT PLN/31/0/BAS

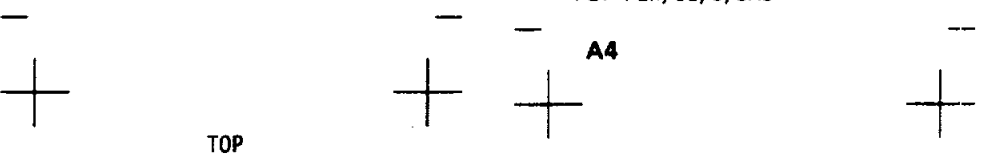


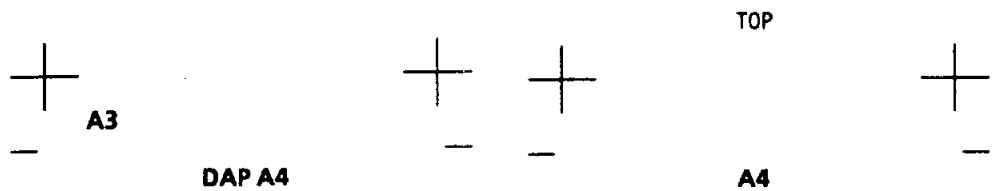
PURPOSE:  
RCS HOT FIRE

- |          |    |                   |
|----------|----|-------------------|
| 0.1 0    | 1  | TRANSLATION PULSE |
| ROTATION |    |                   |
| 0.2 0 0  | 2  | DSC RT NORM       |
| 0.2 0 0  | 3  | VERN              |
| 0.3 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         |
| 3        | 13 | Y                 |
| 0        | 14 | CNTL ACCEL        |

FLT PLN/31/0/BAS

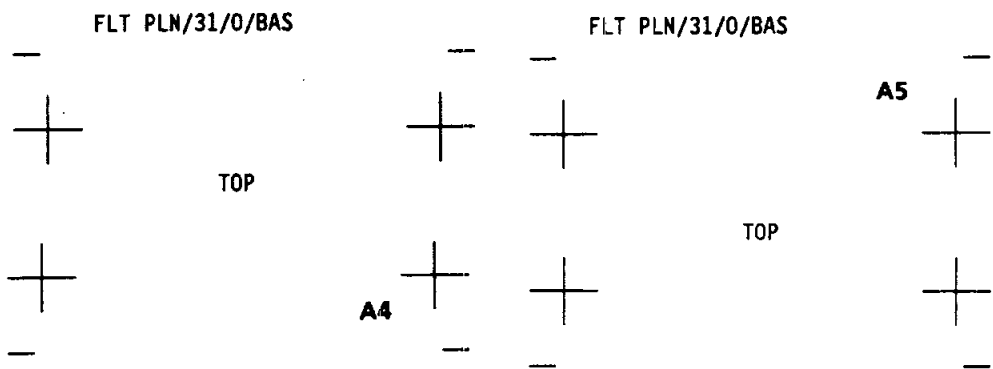
FLT PLN/31/0/BAS





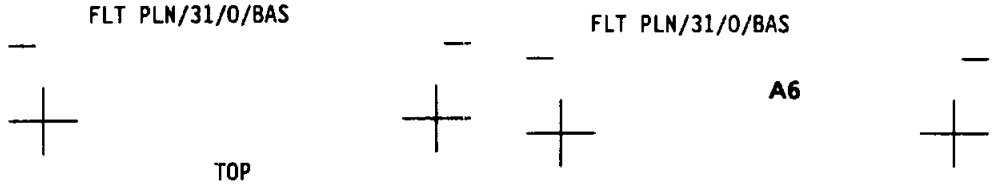
PURPOSE:  
GG

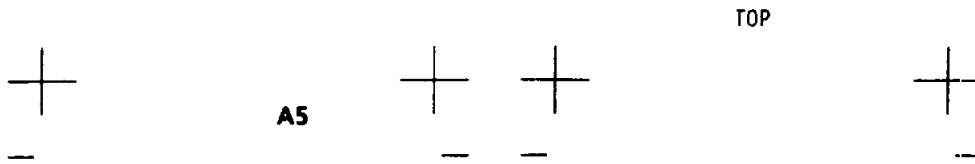
- |          |    |                   |
|----------|----|-------------------|
| 0.1 0    | 1  | TRANSLATION PULSE |
| ROTATION |    |                   |
| 0.2 0 0  | 2  | DSC RT NORM       |
| 0.0 0 8  | 3  | VERN              |
| 0.1 0    | 4  | PULSE NORM        |
| 0.0 1 0  | 5  | VERN          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



PURPOSE:  
IMU ROTATION

- |          |    |                   |
|----------|----|-------------------|
| 0.1 0    | 1  | TRANSLATION PULSE |
| ROTATION |    |                   |
| 0.2 0 0  | 2  | DSC RT NORM       |
| 0.2 0 0  | 3  | VERN              |
| 0.1 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 0  | 9  | VERN              |
| 0.2 0    | 10 | RATE NORM         |
| 0.0 2 0  | 11 | VERN              |
| 1        | 12 | JET OPT P         |
| 1        | 13 | Y                 |
| 0        | 14 | CNTL ACCEL        |





**DAP A6**

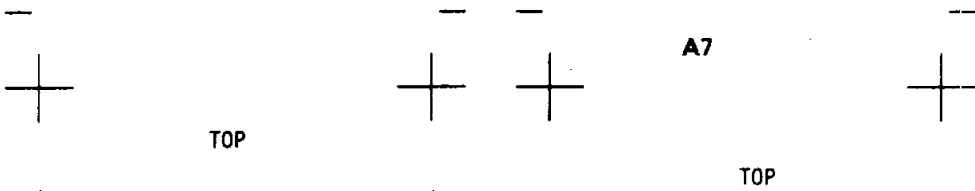
PURPOSE:

LOSS OF VERN  
(TAIL ONLY)

- |          |    |             |      |
|----------|----|-------------|------|
| 0.1 0    | 1  | TRANSLATION |      |
|          |    | PULSE       |      |
| ROTATION |    |             |      |
| 0.2 0 0  | 2  | DSC RT      | NORM |
| 0.2 0 0  | 3  |             | VERN |
| 0.1 0    | 4  | PULSE       | NORM |
| 0.0 1 0  | 5  |             | VERN |
| .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    |
| 3        | 13 |             | Y    |
| 0        | 14 | CNTL ACCEL  |      |

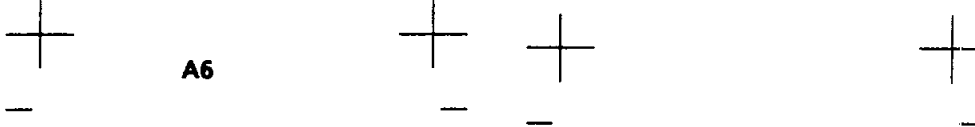
FLT PLN/31/0/BAS

FLT PLN/31/0/BAS



TOP

TOP



**A6**

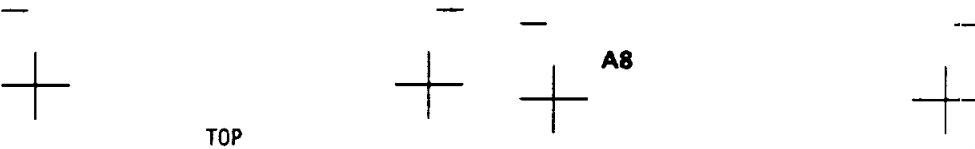
**DAP A7**

PURPOSE: (Blank)

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

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS



TOP

**A8**



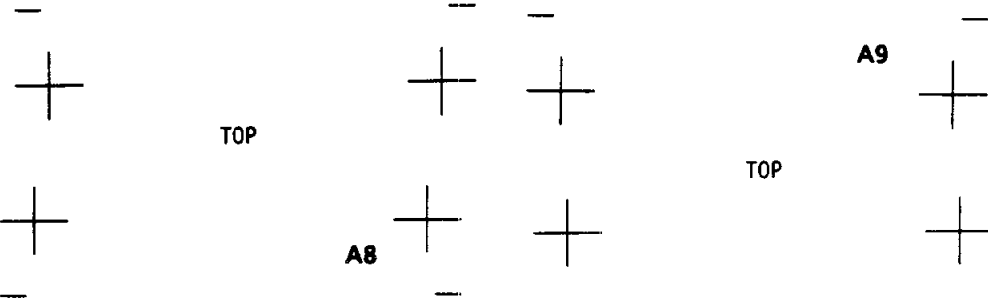
**DAP A8**  
 PURPOSE:  
 PRE/POST DEPLOY

**A8**

|         |    |             |      |
|---------|----|-------------|------|
| 0.1 0   | 1  | TRANSLATION |      |
|         |    | PULSE       |      |
|         |    |             |      |
| 0.5 0 0 | 2  | ROTATION    |      |
|         |    | DSC RT      | NORM |
| 0.2 0 0 | 3  |             | VERN |
|         |    | PULSE       | NORM |
| 0.0 1 0 | 4  |             | VERN |
|         |    | COMP        | NORM |
| 0.0 0 0 | 5  |             | VERN |
|         |    | COMP        | NORM |
| .0 0 0  | 6  |             | VERN |
|         |    | DEADBAND    |      |
| 3.0 0   | 8  | ATT         | NORM |
| 1.0 0 0 | 9  |             | VERN |
|         |    | RATE        | NORM |
| 0.2 0   | 10 |             | VERN |
| .0 2 0  | 11 |             |      |
|         |    | JET OPT     | P    |
| 1       | 12 |             |      |
| 1       | 13 |             | Y    |
|         |    | CNTL ACCEL  |      |
| 0       | 14 |             |      |

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS



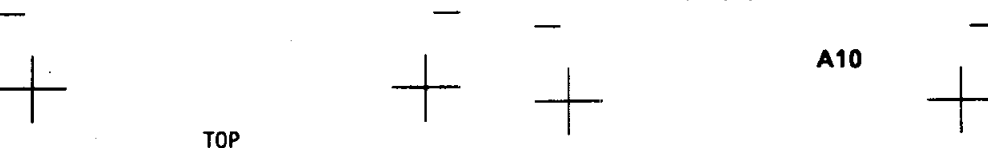
**DAP A9**  
 PURPOSE:  
 RENDEZVOUS

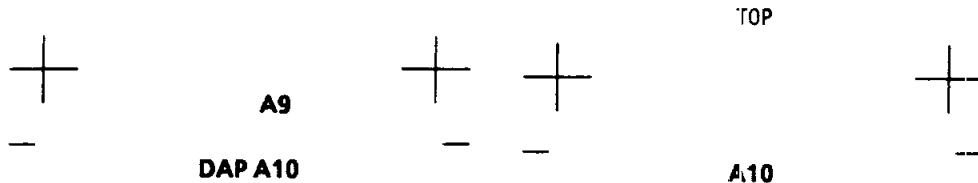
**A9**

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

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS





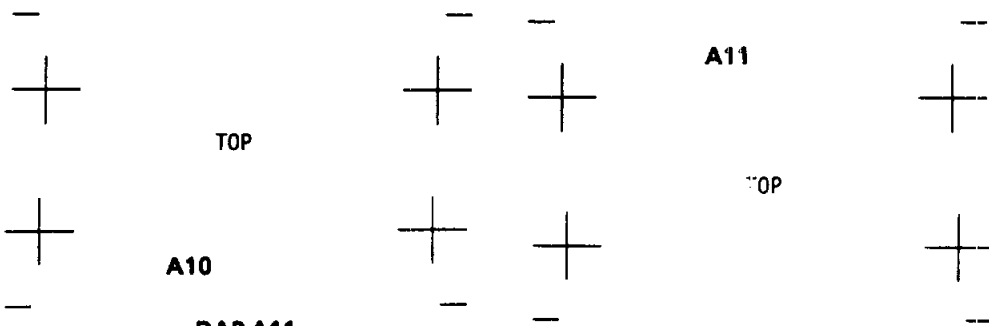
PURPOSE:

PROX OPS

|         |    |             |      |
|---------|----|-------------|------|
| 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  | 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       | 12 | JET OPT     | P    |
| 1       | 13 |             | Y    |
| 0       | 14 | CNTL ACCEL  |      |

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS



TOP

TOP

A10

A11

DAP A11

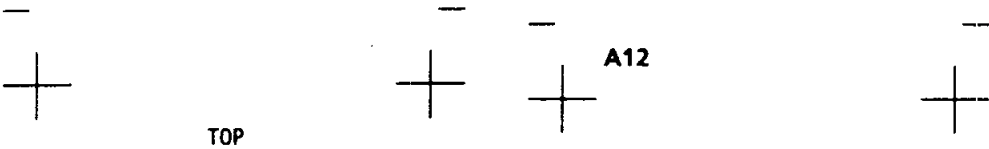
A11

PURPOSE: (Blank)

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

FLT PLN/31/0/FIN

FLT PLN/31/0/FIN



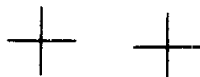
TOP

A12

TOP



A11



DAP A12

A12

PURPOSE:

HST

0.1 0

1 TRANSLATION PULSE

ROTATION

0.2 0 0

2 DSC RT NORM

0.2 0 0

3 VERN

0.0 4

4 PULSE NORM

0.0 7 0

5 VERN

.0 0 0

6 COMP NORM

.0 0 0

7 VERN

DEADBAND

2.0 0

8 ATT NORM

2.0 0 0

9 VERN

0.2 0

10 RATE NORM

.0 5 0

11 VERN

1,3

12 JET OPT P

1,3

13 Y

0-5

14 CNTL ACCEL

FLT PLN/31/0/FIN

FLT PLN/31/0/FIN A



TOP



A13



A12



TOP



DAP A13

A13

PURPOSE:

HST LOSS OF VERN

0.1 0

1 TRANSLATION PULSE

ROTATION

0.2 0 0

2 DSC RT NORM

0.2 0 0

3 VERN

0.0 4

4 PULSE NORM

0.0 7 0

5 VERN

.0 0 0

6 COMP NORM

.0 0 0

7 VERN

DEADBAND

5.0 0

8 ATT NORM

2.0 0 0

9 VERN

0.2 0

10 RATE NORM

.0 5 0

11 VERN

1,3

12 JET OPT P

1,3

13 Y

0-3,5

14 CNTL ACCEL

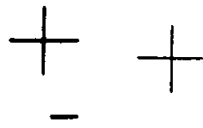
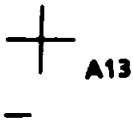
FLT PLN/31/0/FIN

FLT PLN/31/0/FIN



TOP





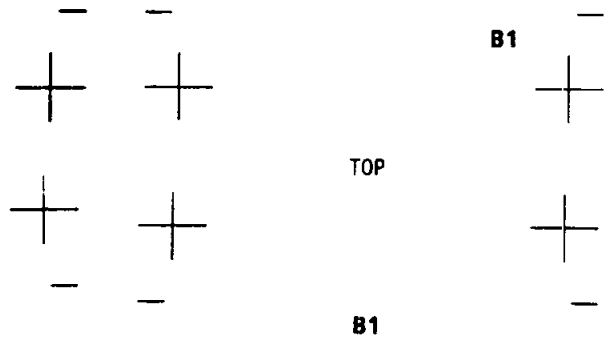
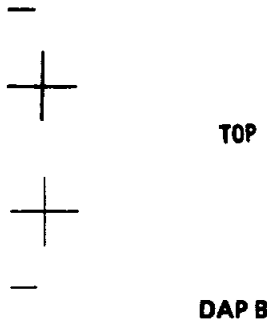
TOP



- | <u>DAP</u> | <u>PURPOSE</u>                                 |
|------------|--|
| B1         | - NOMINAL<br>PRCS IMU ALIGN<br>OMS & RCS BURNS |
| B2         | - LOSS OF VERN<br>(TAIL ONLY)                  |
| B3         | - LOSS OF VERN<br>(NOSE & TAIL)<br>GG MNVR     |
| B4         | - SSUS DEPLOY                                  |
| B5         | - COAS CAL                                     |
| B6         | - RENDEZVOUS                                   |
| B7         | - PROX OPS                                     |
| B8         | - HST<br>90 DEG PITCH                          |
| B9         | - HST RELEASE                                  |

FLT PLN/31/0/BAS

FLT PLN/31/0/FIN



PURPOSE:  
NOMINAL  
PRCS IMU ALIGN  
OMS & RCS BURNS

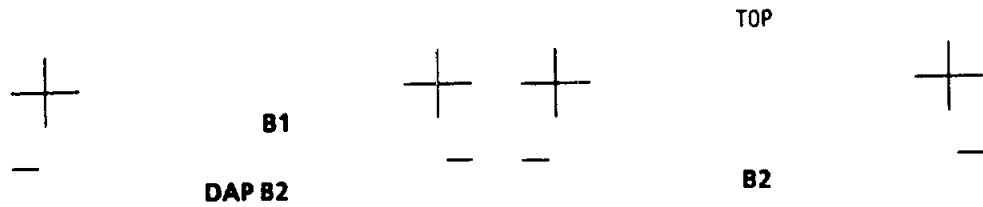
|                 |         |     |     |
|-----------------|---------|-----|-----|
| TRANSLATION     |         |     |     |
| PULSE           | 15      | 0.0 | 2   |
| ROTATION        |         |     |     |
| DSC RT          | NORM 16 | 0.5 | 0 0 |
|                 | VERN 17 | 0.2 | 0 0 |
| PULSE           | NORM 18 | 0.0 | 4   |
|                 | VERN 19 | 0.0 | 0 2 |
| COMP            | NORM 20 | .0  | 0 0 |
|                 | VERN 21 | .0  | 0 0 |
| DEADBAND        |         |     |     |
| ATT             | NORM 22 | 3.0 | 0   |
|                 | VERN 23 | 1.0 | 0 0 |
| RATE            |         |     |     |
|                 | NORM 24 | 0.2 | 0   |
|                 | VERN 25 | .0  | 2 0 |
| JET OPT         |         |     |     |
|                 | P 26    |     | 1   |
|                 | Y 27    |     | 1   |
| CNTL ACCEL 28 0 |         |     |     |

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS







PURPOSE:

LOSS OF VERN  
(TAIL ONLY)

TRANSLATION  
PULSE 15 0.0 2

ROTATION  
DSC RT NORM 16 0.2 0 0  
VERN 17 0.2 0 0  
PULSE NORM 18 0.0 4  
VERN 19 0.0 0 2  
COMP NORM 20 .0 0 0  
VERN 21 .0 0 0

DEADBAND  
ATT NORM 22 3.0 0  
VERN 23 1.0 0 0

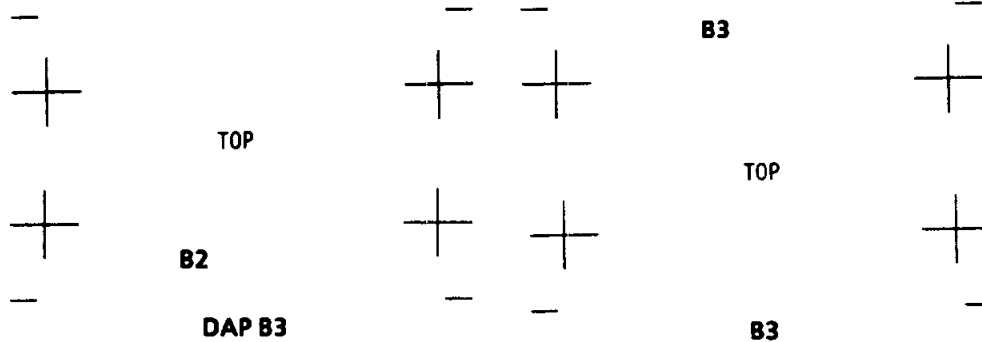
RATE NORM 24 0.2 0  
VERN 25 .0 2 0

JET OPT P 26 3  
Y 27 3

CNTL ACCEL 28 0

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS



PURPOSE:

LOSS OF VERN  
(NOSE & TAIL)  
GG MNVR

TRANSLATION  
PULSE 15 0.0 2

ROTATION  
DSC RT NORM 16 0.2 0 0  
VERN 17 0.2 0 0  
PULSE NORM 18 0.0 4  
VERN 19 0.0 0 2  
COMP NORM 20 .0 0 0  
VERN 21 .0 0 0

DEADBAND  
ATT NORM 22 3.0 0  
VERN 23 1.0 0 0

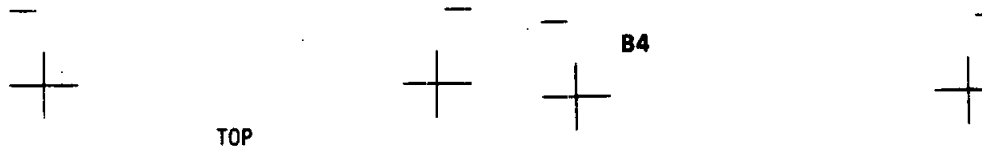
RATE NORM 24 0.2 0  
VERN 25 .0 2 0

JET OPT P 26 1  
Y 27 1

CNTL ACCEL 28 0

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS



+

**B3**

+

+

TOP

+

**DAP B4**

**B4**

PURPOSE:  
SSUS DEPLOY

TRANSLATION  
PULSE 15 0.0 2

ROTATION  
DSC RT NORM 16 0.2 0 0  
VERN 17 0.0 0 8  
PULSE NORM 18 0.0 4  
VERN 19 0.0 0 2  
COMP NORM 20 .0 0 0  
VERN 21 .0 0 0

DEADBAND  
ATT NORM 22 0.3 0  
VERN 23 0.1 0 0

RATE NORM 24 0.2 0  
VERN 25 .0 1 0

JET OPT P 26 3  
Y 27 3

CNTL ACCEL 28 0

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS

+

+

+

**B5**

+

TOP

TOP

+

**B4**

+

+

+

**DAP B5**

**B5**

PURPOSE:  
COAS CAL

TRANSLATION  
PULSE 15 0.0 2

ROTATION  
DSC RT NORM 16 0.2 0 0  
VERN 17 0.0 1 6  
PULSE NORM 18 0.0 4  
VERN 19 0.0 0 2  
COMP NORM 20 .0 0 0  
VERN 21 .0 0 0

DEADBAND  
ATT NORM 22 3.0 0  
VERN 23 0.0 3 3

RATE NORM 24 0.2 0  
VERN 25 .0 2 0

JET OPT P 26 3  
Y 27 3

CNTL ACCEL 28 0

FLT PLN/31/0/BAS

FLT PLN/31/0/BAS

+

+

+

**B6**

+

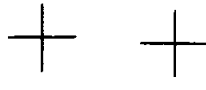
TOP

TOP

|                        |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|------------------------|---------|---|-------------|--|--|-------|----|-------|----------|--|--|--------|---------|---------|--|---------|---------|-------|---------|-------|--|---------|---------|------|---------|------|--|---------|--------|----------|--|--|-----|---------|-------|--|---------|---------|------|---------|-------|--|---------|--------|---------|------|---|--|------|---|------------|----|---|
| +                      | +       | +   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| B5                     |         | B6  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| DAP B6                 |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| PURPOSE:<br>RENDEZVOUS |         | <table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">TRANSLATION</td> <td></td> </tr> <tr> <td>PULSE</td> <td>15</td> <td style="text-align: right;">0.0 5</td> </tr> <tr> <td colspan="3">ROTATION</td> </tr> <tr> <td>DSC RT</td> <td>NORM 16</td> <td style="text-align: right;">0.5 0 0</td> </tr> <tr> <td></td> <td>VERN 17</td> <td style="text-align: right;">0.2 0 0</td> </tr> <tr> <td>PULSE</td> <td>NORM 18</td> <td style="text-align: right;">0.0 4</td> </tr> <tr> <td></td> <td>VERN 19</td> <td style="text-align: right;">0.0 0 2</td> </tr> <tr> <td>COMP</td> <td>NORM 20</td> <td style="text-align: right;">.0 0</td> </tr> <tr> <td></td> <td>VERN 21</td> <td style="text-align: right;">.0 0 0</td> </tr> <tr> <td colspan="3">DEADBAND</td> </tr> <tr> <td>ATT</td> <td>NORM 22</td> <td style="text-align: right;">2.0 0</td> </tr> <tr> <td></td> <td>VERN 23</td> <td style="text-align: right;">1.0 0 0</td> </tr> <tr> <td>RATE</td> <td>NORM 24</td> <td style="text-align: right;">0.2 0</td> </tr> <tr> <td></td> <td>VERN 25</td> <td style="text-align: right;">.0 2 0</td> </tr> <tr> <td>JET OPT</td> <td>P 26</td> <td style="text-align: right;">1</td> </tr> <tr> <td></td> <td>Y 27</td> <td style="text-align: right;">1</td> </tr> <tr> <td>CNTL ACCEL</td> <td>28</td> <td style="text-align: right;">0</td> </tr> </table> | TRANSLATION |  |  | PULSE | 15 | 0.0 5 | ROTATION |  |  | DSC RT | NORM 16 | 0.5 0 0 |  | VERN 17 | 0.2 0 0 | PULSE | NORM 18 | 0.0 4 |  | VERN 19 | 0.0 0 2 | COMP | NORM 20 | .0 0 |  | VERN 21 | .0 0 0 | DEADBAND |  |  | ATT | NORM 22 | 2.0 0 |  | VERN 23 | 1.0 0 0 | RATE | NORM 24 | 0.2 0 |  | VERN 25 | .0 2 0 | JET OPT | P 26 | 1 |  | Y 27 | 1 | CNTL ACCEL | 28 | 0 |
| TRANSLATION            |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| PULSE                  | 15      | 0.0 5   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| ROTATION               |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| DSC RT                 | NORM 16 | 0.5 0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                        | VERN 17 | 0.2 0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| PULSE                  | NORM 18 | 0.0 4   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                        | VERN 19 | 0.0 0 2   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| COMP                   | NORM 20 | .0 0  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                        | VERN 21 | .0 0 0  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| DEADBAND               |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| ATT                    | NORM 22 | 2.0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                        | VERN 23 | 1.0 0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| RATE                   | NORM 24 | 0.2 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                        | VERN 25 | .0 2 0  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| JET OPT                | P 26    | 1   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                        | Y 27    | 1   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| CNTL ACCEL             | 28      | 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| FLT PLN/31/0/BAS       |         | FLT PLN/31/0/BAS  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |

|                      |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|----------------------|---------|---|-------------|--|--|-------|----|-------|----------|--|--|--------|---------|---------|--|---------|---------|-------|---------|-------|--|---------|---------|------|---------|------|--|---------|--------|----------|--|--|-----|---------|-------|--|---------|---------|------|---------|-------|--|---------|--------|---------|------|---|--|------|---|------------|----|---|
| +                    | +       | +   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| TOP                  |         | B7  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| B6                   |         | TOP   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| DAP B7               |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| PURPOSE:<br>PROX OPS |         | <table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">TRANSLATION</td> <td></td> </tr> <tr> <td>PULSE</td> <td>15</td> <td style="text-align: right;">0.0 1</td> </tr> <tr> <td colspan="3">ROTATION</td> </tr> <tr> <td>DSC RT</td> <td>NORM 16</td> <td style="text-align: right;">0.2 0 0</td> </tr> <tr> <td></td> <td>VERN 17</td> <td style="text-align: right;">0.2 0 0</td> </tr> <tr> <td>PULSE</td> <td>NORM 18</td> <td style="text-align: right;">0.0 4</td> </tr> <tr> <td></td> <td>VERN 19</td> <td style="text-align: right;">0.0 0 2</td> </tr> <tr> <td>COMP</td> <td>NORM 20</td> <td style="text-align: right;">.0 0</td> </tr> <tr> <td></td> <td>VERN 21</td> <td style="text-align: right;">.0 0 0</td> </tr> <tr> <td colspan="3">DEADBAND</td> </tr> <tr> <td>ATT</td> <td>NORM 22</td> <td style="text-align: right;">2.0 0</td> </tr> <tr> <td></td> <td>VERN 23</td> <td style="text-align: right;">1.0 0 0</td> </tr> <tr> <td>RATE</td> <td>NORM 24</td> <td style="text-align: right;">0.2 0</td> </tr> <tr> <td></td> <td>VERN 25</td> <td style="text-align: right;">.0 2 0</td> </tr> <tr> <td>JET OPT</td> <td>P 26</td> <td style="text-align: right;">1</td> </tr> <tr> <td></td> <td>Y 27</td> <td style="text-align: right;">1</td> </tr> <tr> <td>CNTL ACCEL</td> <td>28</td> <td style="text-align: right;">0</td> </tr> </table> | TRANSLATION |  |  | PULSE | 15 | 0.0 1 | ROTATION |  |  | DSC RT | NORM 16 | 0.2 0 0 |  | VERN 17 | 0.2 0 0 | PULSE | NORM 18 | 0.0 4 |  | VERN 19 | 0.0 0 2 | COMP | NORM 20 | .0 0 |  | VERN 21 | .0 0 0 | DEADBAND |  |  | ATT | NORM 22 | 2.0 0 |  | VERN 23 | 1.0 0 0 | RATE | NORM 24 | 0.2 0 |  | VERN 25 | .0 2 0 | JET OPT | P 26 | 1 |  | Y 27 | 1 | CNTL ACCEL | 28 | 0 |
| TRANSLATION          |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| PULSE                | 15      | 0.0 1   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| ROTATION             |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| DSC RT               | NORM 16 | 0.2 0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                      | VERN 17 | 0.2 0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| PULSE                | NORM 18 | 0.0 4   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                      | VERN 19 | 0.0 0 2   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| COMP                 | NORM 20 | .0 0  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                      | VERN 21 | .0 0 0  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| DEADBAND             |         |   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| ATT                  | NORM 22 | 2.0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                      | VERN 23 | 1.0 0 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| RATE                 | NORM 24 | 0.2 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                      | VERN 25 | .0 2 0  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| JET OPT              | P 26    | 1   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
|                      | Y 27    | 1   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| CNTL ACCEL           | 28      | 0   |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |
| FLT PLN/31/0/BAS     |         | FLT PLN/31/0/BAS  |             |  |  |       |    |       |          |  |  |        |         |         |  |         |         |       |         |       |  |         |         |      |         |      |  |         |        |          |  |  |     |         |       |  |         |         |      |         |       |  |         |        |         |      |   |  |      |   |            |    |   |

|     |   |    |
|-----|---|----|
| +   | + | +  |
| TOP |   | B8 |



B7

TOP

DAP B8

B8

PURPOSE:

HST  
90 DEG PITCH

TRANSLATION  
PULSE 15 0.1 0

ROTATION  
DSC RT NORM 16 0.2 0 0  
VERN 17 0.2 0 0  
PULSE NORM 18 0.0 4  
VERN 19 0.0 0 5  
COMP NORM 20 .0 0 0  
VERN 21 .0 0 0

DEADBAND  
ATT NORM 22 2.0 0  
VERN 23 2.0 0 0

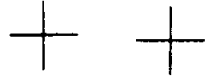
RATE NORM 24 0.2 0  
VERN 25 .0 8 0

JET OPT P 26 1,3  
Y 27 1,3

CNTL ACCEL 28 4

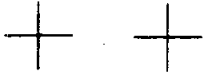
FLT PLN/31/0/BAS

FLT PLN/31/0/FIN



TOP

B9



B8

TOP

DAP B9

B9

PURPOSE:

HST RELEASE

TRANSLATION  
PULSE 15 0.1 0

ROTATION  
DSC RT NORM 16 0.2 0 0  
VERN 17 0.2 0 0  
PULSE NORM 18 0.0 4  
VERN 19 0.0 0 5  
COMP NORM 20 .0 0 0  
VERN 21 .0 0 0

DEADBAND  
ATT NORM 22 0.5 0  
VERN 23 1.0 0 0

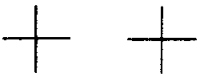
RATE NORM 24 0.2 0  
VERN 25 .0 2 0

JET OPT P 26 1,3  
Y 27 1,3

CNTL ACCEL 28 5

FLT PLN/31/0/BAS

FLT PLN/31/0/FIN



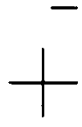
TOP



B9

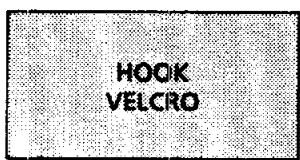


FLT PLN/31/0/BAS



TOP

TOP  
BACK COVER 'DAP BOOK'



FLT PLN/31/0/BAS



(reduced copy)



FLT PLN/31/FIN A

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STS-31  
ATTITUDE TIMELINE

ATTITUDE  
TIMELINE

Attitude Timeline

| MET                       | MNVR OPTION                                    |                    | DAP                                   | E/S                    | REMARKS                        | EVENT                                    |
|---------------------------|--|--------------------|---------------------------------------|------------------------|--------------------------------|--|
| 1<br>0/01:12:00<br>20:38  | TRK TGT=2<br>BV=5( 90.00, 345.00)<br>OM=270.00 | A1<br>AUTO<br>NORM | DSC 0.200<br>DB AT 5.00<br>DB RT 0.20 | EARTH<br>T 90<br>P 345 | LVLH R+195<br>P+ 0<br>Y+ 90    | PLBD OPENING                             |
| 2<br>0/02:25:00<br>35:23  | MNVR R+281.00<br>P+322.00<br>Y+323.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 54<br>P 123   | STAR PR A1<br>-Y: 29<br>-Z: 30 | IMU ALIGN                                |
| 3<br>0/02:45:00<br>59:29  | TRK TGT=2<br>BV=5( 90.00, 345.00)<br>OM=270.00 | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 345 | LVLH R+195<br>P+ 0<br>Y+ 90    | BIASED -ZLV<br>NOSE SOUTH                |
| 4<br>0/06:45:00<br>56:40  | MNVR R+295.00<br>P+173.00<br>Y+334.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 159<br>P 322  |                                | RCS BURN<br>330 x 330 nm                 |
| 5<br>0/07:15:00<br>22:39  | TRK TGT=2<br>BV=5( 90.00, 345.00)<br>OM= 90.00 | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 345 | LVLH R+195<br>P+ 0<br>Y+270    | BIASED -ZLV<br>NOSE NORTH                |
| 6<br>0/08:50:00<br>57:58  | MNVR R+281.00<br>P+322.00<br>Y+323.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 54<br>P 123   | STAR PR A1                     | IMU ALIGN                                |
| 7<br>0/09:04:00<br>06:40  | MNVR R+252.00<br>P+281.00<br>Y+310.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 86<br>P 122   | +X: 14                         | +X COAS CAL                              |
| 8<br>0/09:24:00<br>38:10  | TRK TGT=2<br>BV=5( 90.00, 345.00)<br>OM= 90.00 | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 345 | LVLH R+195<br>P+ 0<br>Y+270    | BIASED -ZLV<br>NOSE NORTH                |
| 9<br>0/19:40:00<br>48:50  | MNVR R+281.00<br>P+322.00<br>Y+323.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 54<br>P 124   | STAR PR A1                     | IMU ALIGN<br>FHST C/O                    |
| 10<br>0/20:35:00<br>48:24 | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=270.00   | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+ 90    | SUPPLY WATER<br>DUMP ATT<br>(RETROGRADE) |
| 11<br>0/22:45:00<br>57:59 | TRK TGT=4<br>BV=5( 32.00, 40.00)<br>OM= 30.00  | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 49<br>P 58    | INRTL R+279<br>P+313<br>Y+ 33  | SA DEPLOY ATT                            |
| 12<br>1/02:40:00<br>47:20 | TRK TGT=4<br>BV=5( 32.00, 0.00)<br>OM=310.00   | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 32<br>P 0     | INRTL R+189<br>P+ 29<br>Y+ 13  | APPENDAGE<br>DEPLOY ATT                  |

\*\*\*ALL ATTITUDES IN MEAN OF 1950\*\*\*

ATTITUDE  
TIMELINE



## Attitude Timeline

| MET                         | MNVR OPTION   |                     | DAP                                   | E/S                    | REMARKS                      | EVENT   |
|-----------------------------|---|---------------------|---------------------------------------|------------------------|------------------------------|---|
| 1<br>1/04:25:00<br>29:14    | TRK TGT=4<br>BV=5( 16.00, 0.00)<br>OM=358.00<br>RELEASE 1/05:23 | A12<br>AUTO<br>VERN | DSC 0.200<br>DB AT 2.00<br>DB RT 0.05 | SUN<br>T 16<br>P 359   | INRTL R+241<br>P+ 5<br>Y+ 20 | HST RELEASE<br>ATTITUDE                         |
| 2<br>1/05:40:00<br>43:21    | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM= 0.00                     | A9<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+ 0<br>P+180<br>Y+ 0   | SEP 2 ATT                                       |
| 3<br>1/06:00:00<br>07:05    | TRK TGT=1<br>BV=3( 90.00, 0.00)<br>OM= 0.00                     | A9<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 5<br>P 0    | LVLH R+ 0<br>P+265<br>Y+ 0   | -Z TGT TRACK                                    |
| 4<br>1/07:30:00<br>33:40    | MNVR R+281.00<br>P+322.00<br>Y+323.00                           | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 54<br>P 124   | STAR PR A1                   | IMU ALIGN                                       |
| 5<br>1/07:50:00<br>08:00:55 | TRK TGT=2<br>BV=5( 0.00,270.00)<br>OM=270.00                    | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 270 | LVLH R+ 0<br>P+270<br>Y+ 90  | LVLH<br>-Z TGT TRACK                            |
| 6<br>1/20:25:00<br>33:04    | MNVR R+281.00<br>P+322.00<br>Y+323.00                           | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 55<br>P 125   | STAR PR A1                   | IMU ALIGN                                       |
| 7<br>1/20:45:00<br>52:21    | TRK TGT=2<br>BV=1( 0.00, 0.00)<br>OM=110.00                     | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 0<br>P 180  | LVLH R+110<br>P+270<br>Y+ 0  | +XLV<br>SUPPLY WATER<br>DUMP ATT<br>(POSIGRADE) |
| 8<br>1/23:00:00<br>13:15    | TRK TGT=2<br>BV=5(358.00, 0.00)<br>OM=269.00                    | B3<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 2<br>P 181  | LVLH R+269<br>P+270<br>Y+358 | GG ATTITUDE<br>+XLV<br>BAY NORTH                |
| 9<br>2/07:45:00<br>56:29    | MNVR R+281.00<br>P+322.00<br>Y+323.00                           | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 55<br>P 125   | STAR PR A1                   | IMU ALIGN                                       |
| 10<br>2/08:05:00<br>15:59   | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM= 90.00                    | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+270  | -ZLV<br>NOSE NORTH                              |
| 11<br>2/18:25:00<br>26:40   | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=110.00                    | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+290  | SUPPLY WATER<br>DUMP ATT<br>(POSIGRADE)         |
| 12<br>2/20:40:00<br>48:26   | MNVR R+281.00<br>P+322.00<br>Y+323.00                           | A1<br>AUTO<br>VERN  | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 55<br>P 126   | STAR PR A1                   | IMU ALIGN                                       |

## Attitude Timeline

| MET                       | MNVR OPTION                                    |                    | DAP                                   | E/S                    | REMARKS                        | EVENT                                    |
|---------------------------|--|--------------------|---------------------------------------|------------------------|--------------------------------|--|
| 1<br>2/21:00:00<br>13:34  | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=270.00   | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+ 90    | --ZLV<br>NOSE SOUTH                      |
| 2<br>3/05:50:00<br>59:57  | MNVR R+243.00<br>P+355.00<br>Y+ 9.00           | B1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 2<br>P 85     | TIG<br>3/06:17                 | NH2<br>BURN ATT                          |
| 3<br>3/06:20:00<br>25:57  | MNVR R+281.00<br>P+322.00<br>Y+323.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 55<br>P 125   | STAR PR A1<br>-Y: 29<br>-Z: 30 | IMU ALIGN<br>-Z COAS CAL                 |
| 4<br>3/06:45:00<br>56:03  | MNVR R+117.00<br>P+174.00<br>Y+352.00          | B1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 178<br>P 59   | TIG<br>3/07:05                 | NSR2<br>BURN ATT                         |
| 5<br>3/07:10:00<br>17:30  | TRK TGT=2<br>BV=5( 90.00, 340.00)<br>OM=270.00 | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 340 | LVLH R+200<br>P+ 0<br>Y+ 90    | SUPPLY WATER<br>DUMP ATT<br>(RETROGRADE) |
| 6<br>3/09:00:00<br>01:40  | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=270.00   | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+ 90    | --ZLV<br>NOSE SOUTH                      |
| 7<br>3/19:15:00<br>27:13  | MNVR R+281.00<br>P+322.00<br>Y+323.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 56<br>P 127   | STAR PR A1                     | IMU ALIGN                                |
| 8<br>3/19:35:00<br>48:38  | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=270.00   | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+ 90    | --ZLV<br>NOSE SOUTH<br>FCS C/O           |
| 9<br>3/22:05:00<br>16:48  | MNVR R+202.00<br>P+110.00<br>Y+313.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 113<br>P 350  |                                | PCG TV/<br>CREW CONF                     |
| 10<br>4/00:15:00<br>20:34 | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=180.00   | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+ 0     | --ZLV NOSE FWD<br>AMOS RCS<br>TESTS      |
| 11<br>4/02:30:00<br>37:30 | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=270.00   | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0   | LVLH R+180<br>P+ 0<br>Y+ 90    | --ZLV<br>NOSE SOUTH                      |
| 12<br>4/06:30:00<br>41:46 | MNVR R+281.00<br>P+322.00<br>Y+323.00          | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 56<br>P 127   | STAR PR A1                     | IMU ALIGN                                |

\*\*\*ALL ATTITUDES IN MEAN OF 1950\*\*\*

Attitude Timeline

| MET                         | MNVR OPTION                                  |                    | DAP                                   | E/S                   | REMARKS                       | EVENT                                    |
|-----------------------------|--|--------------------|---------------------------------------|-----------------------|-------------------------------|--|
| 1<br>4/06:50:00<br>07:04:09 | TRK TGT=2<br>BV=3( 90.00, 0.00)<br>OM=270.00 | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | EARTH<br>T 90<br>P 0  | LVLH R+180<br>P+ 0<br>Y+ 90   | SUPPLY WATER<br>DUMP ATT<br>(RETROGRADE) |
| 2<br>4/17:50:00<br>18:02:17 | MNVR R+281.00<br>P+322.00<br>Y+323.00        | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 56<br>P 128  | STAR PR A1                    | IMU ALIGN                                |
| 3<br>4/18:10:00<br>23:27    | TRK TGT=4<br>BV=5(184.00, 0.00)<br>OM= 90.00 | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 176<br>P 174 | INRTL R+ 27<br>P+172<br>Y+349 | TAIL SUN ATT                             |
| 4<br>4/21:00:00<br>12:45    | MNVR R+202.00<br>P+219.00<br>Y+312.00        | A1<br>AUTO<br>VERN | DSC 0.200<br>DB AT 1.00<br>DB RT 0.02 | SUN<br>T 127<br>P 126 | -Y: 25<br>-Z: 15              | DEORBIT IMU<br>ALIGN                     |
| 5<br>4/21:20:00<br>22:22    | MNVR R+281.00<br>P+322.00<br>Y+323.00        | B1<br>AUTO<br>NORM | DSC 0.500<br>DB AT 3.00<br>DB RT 0.20 | SUN<br>T 56<br>P 128  | -Y: 29<br>-Z: 30              | IMU VERIF                                |
| 6<br>4/23:45:00<br>47:07    | MNVR R+241.40<br>P+351.30<br>Y+351.10        | *<br>AUTO<br>*     | DSC 0.500<br>DB AT 3.50<br>DB RT 0.30 | SUN<br>T 19<br>P 195  | TIG<br>4/23:59:31             | DEORBIT BURN<br>ATTITUDE                 |

\*\*\*ALL ATTITUDES IN MEAN OF 1950\*\*\*

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| FLIGHT DATA FILE<br>CORE DISTRIBUTION | FLIGHT PLAN<br>CORE DISTRIBUTION |                           |                              |                              |
|---------------------------------------|----------------------------------|---------------------------|------------------------------|------------------------------|
| 02/26/90                              | 2/6/90                           |                           |                              |                              |
| <u>JSC</u>                            | <u>JSC</u>                       |                           |                              |                              |
| AP/H. S. Stall                        | AC/Associate Director            | EH3/Support (2)           | Kennedy Space Center         | Bendix-Houston               |
| AP3/Support (2)                       | AC/Dep. Director                 | EH421/D. Siner            |                              |                              |
| DF24/INCO (4)                         | CA/D. R. Puddy                   | EH6/L. W. McFadin (2)     | CV-PSD-1/J. Zeman            | B31A/J. O. Barnes            |
| DF4/Crew Sys. (2)                     | CA4/O. J. Bertrand               | EL14/B. Kilpatrick        | MDAC-F224/R. Zohler          | B33B/OSD Doc. Cntl (5)       |
| DH43/Flt. Act Br (11)                 | CB/Family Escort Mgr             | ES32/L. D. Palmer         | MK/R. L. Crippen             | DC2/B. C. Conner (3)         |
| DH6/Library (7)                       | DA/Library                       | ES32/R. J. Maraia         | TP-VPD-1/R. Phelps           |                              |
| EC6/Chief (2)                         | DA62/Action Center (2)           | GA/Deputy Director        | TV-GDS-23/R. Clements        |                              |
| EH3/Library/Support                   | DA8/Flt. Tech.                   | JL3/R. Slater             |                              |                              |
| JM2/Technical Library (3)             | DC2/B. C. Conner (3)             | JL4/Support (2)           | Goddard Space Flight Center  | Marshall Space Flight Center |
| NS5/W. V. Bates (2)                   | DC23/G. Stromme                  | MJ/S. A. Liebergot        |                              |                              |
| SP44/J. Bohannon                      | DF24/Head                        | MJ/H. A. Loden            | 501/P. M. Janoski            | CT21/D. B. Channell          |
| TM2/Manager                           | DF4/R. W. Fitts                  | MJ-DDMS/J. Larson         | 519.1/SPIF (2)               | ED44/K. Hill                 |
| VF3/D. W. Camp (2)                    | DF62/Acting Sect. Head           | MJ-DDMS/W. Smith          | 530/G. Morse                 | EL55/S. D. Rose              |
| ZR12/J. A. Yannie                     | DF7/Chief                        | NS2/S. M. Luczkowski      | 553.1/W. Mitchell            | EL15/A. Dorries              |
|                                       | DF7/Environ. Sect. (2)           | SD24/Surgeon Support (3)  | 742.2/S. Olden               | EO24/K. Smith                |
|                                       | DF7/Elect. Sect. (2)             | SD5/T. Watson             | Attn: J. Ryan (5)            | EL22/J. D. Weiler            |
|                                       | DG47/COMM/INST. (2)              | SD5/M. A. Bowman          |                              | EO32/Chief Data Mgmt         |
|                                       | DG48/System Sect.                | SN15/W. J. Daley          | White Sands Test Facility    | EO34/NTI/E. Hendrickson      |
|                                       | DG49/COMM/PL                     | SN15/M. R. Heifert        |                              | EO43/Branch Chief            |
|                                       | DG6/Chief                        | SN3/A. C. Hardy           | RD/R. Tillet                 | JA41/M. A. Horst             |
|                                       | DG66/CNTL/PROP Sect (6)          | SP33/Head                 | RD2/A. Paczynski             | NTI/I. H. Abril              |
|                                       | DG67/DPS/NAV Sect (6)            | SP34/F. McAllister        |                              | CN22D/Tech Doc Repos         |
|                                       | DH/Chief                         | TA/Mgr.                   | HQ US SPACE COM/J3S0S        |                              |
|                                       | DH13/OPS Safety Office           | TC/C. H. Lambert          |                              | NOAA-NEDIS                   |
|                                       | DH4/Book Manager (50)            | TC12/Customr Supt. Spec.  | Cheyenne Mtn A.F.S.          |                              |
|                                       | DH41/Deputy Chief                | TE/Support                | CO 80914-5601                | FB4, Room 1069               |
|                                       | DH43/Head                        | TM2/Manager (2)           | Attn: Shuttle Launch Officer | Code E\SP                    |
|                                       | DH44/Head                        | TM2/FIM Support           |                              | Suitland, MD 20233           |
|                                       | DH45/Head                        | TM3/R. Hoover             | Rockwell International Hst   | Attn: Dr. Russell Koffler    |
|                                       | DH45/E. B. Pippert Jr.           | TN/Support (2)            |                              | National Research Council    |
|                                       | DH46/Head                        | VE3/J. D. Norris          | ZC01/H. H. Battley           | Of Canada                    |
|                                       | DM/Chief                         | VE4/W. H. Taylor          | ZC01/G. M. Korb              |                              |
|                                       | DM31/Head                        | VF2/Support (2)           | ZC01/P. A. Porter            | Space Technology Program     |
|                                       | DM32/Head                        | VF3/Chief (2)             | ZC01/J. T. Taylor            | Bldg. M-60, Room B-21        |
|                                       | DM35/Head                        | VF3/Manager (5)           | ZC01/L. A. Francis           | Montreal Road                |
|                                       | DM36/Head                        | VP/Flt. Support Equip (3) | ZC01/R. L. Winkler           | Ottawa, Ontario, Canada      |
|                                       | DM4/Chief                        | VP12/D. Fitts (3)         |                              | K1A OR6                      |
|                                       | DM42/Head (8)                    | WG/W. J. Moon             | Rockwell International Dwny  | Attn: B A. Aikenhead         |
|                                       | DM43/Orbit Analysis (5)          | ZS8/SMG                   |                              | Nasa White Sands STDN        |
|                                       | DM44/Head (2)                    | ZR1/Dual Library          | 12214 Lakewood Blvd.         |                              |
|                                       | DM45/CALC Bk Mgr                 |                           | Downey, CA 90241             | Las Cruces, NM 88004         |
|                                       | DP/Chief                         | NASA Headquarters         | 841-FB81/M. J. Malagon (38)  | P. O. Drawer G.S.C.          |
|                                       | DP2/R. J. Yowell                 | EBM/P. D. McCormack       | RSOC-Houston                 | Aerospace Corporation        |
|                                       | EE2/Support (2)                  | EM-8/R. H. Benson         |                              |                              |
|                                       | EE33/Antenna Sys. Mgr            | EZ/B. Bastedo             | R12A/Q. B. Hawkins           | P. O. Box 92957              |
|                                       | EE6/A. L. Leonard (2)            | EZ/D. Broome              | R12A/W. E. Smith             | Los Angeles, CA 90009        |
|                                       | EF/Library                       | LM/J. W. McCulla          | R10B/Flt. Mgr. Off.          | MI/058                       |
|                                       | EH2/SAIL Testing                 | LT/R. Shafer              | R16C/D. J. Harshman          |                              |
|                                       |                                  | M/R. H. Truly             | R16C/D. P. Dannemiller       | Contel                       |
|                                       |                                  | MC/R. Tucker (2)          | R16E/D. H. Cooper            |                              |
|                                       |                                  | MOJ/C. Perry (2)          | R16E/A. D. Wylie             |                              |
|                                       |                                  |                           | R16E/Traj Ops Support (5)    | P. O. Box 235                |
|                                       |                                  |                           | R16G/Consumables Lib.        | Las Cruces, NM 88004         |
|                                       |                                  |                           | R16H/J. S. French            | Attn: J. Gregory             |
|                                       |                                  |                           | R21D/C. D. Lodge             |                              |
| Subtotal: 51                          |                                  |                           |                              |                              |

