



STS-121/ULF1.1

FD 07 Execute Package

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053A	15 - 17	FD06 MMT Summary (pdf)

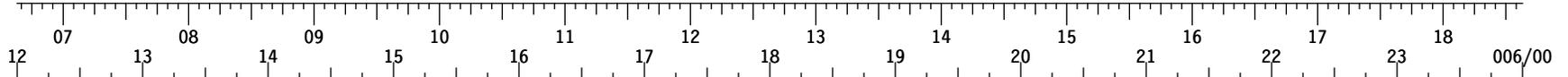
Approved by FAO: L. Eadie

Last Updated: Jul 10 2006 3:50AM GMT

JEDI (Joint Execute package Development and Integration), v2.04.0003

GMT 07/10/06 (191)

MET Day 005



S T S - 1 2 1	FD07 CDR LINDSEY	POST SLEEP	PMC A/G	POST SLEEP	I W I F	C I N I T U	P O N H D	P/TV 07 S/U	C T W E R M	PWR 1	PWR 2	PWR XFER (2)	P/TV 07 EVA	MEAL	P/TV 07 EVA	C I W N C I 1 0	EXERCISE	C T W R C M 1 0	CWC XFER (2)	P/TV 07 EVA	
	PLT KELLY	POST SLEEP	E M U - T	EVA PREP W/ ISS 02	E P M U R G E	EMU PREBREATHE	C_LK DPRS	EVA 2 IVA SUPPORT													
	MS1 FOSSUM	POST SLEEP	EVA PREP W/ ISS 02	E P M U R G E	EMU PREBREATHE	C_LK DPRS	E G R S	A P F R S /U	P M *	F G B ^	P R M T R V L	A P F R R C N F G & T U S S /U	T U S *	P U M P M O D U L E I N S T A L L	NADIR TUS R&R					TUS CBL ROUTE	*
	MS2 NOWAK	POST SLEEP		EXERCISE	MPLM XFER	DOUG S/U	P M P R E G R P L	P M G R P L	MNVR PM TO ESP-2	P M U N G R P L	TUS R M V L	MNVR TO ICC	TUS S W A P	MNVR TO SO	TUS I N S T L	M P N A V R R K	M N V R ^				
	MS3 WILSON	POST SLEEP	EVA PREP W/ ISS 02	E P M U R G E	EMU PREBREATHE	C_LK DPRS	P M P R E G R P L	P M G R P L	MNVR PM TO ESP-2	P M U N G R P L	TUS R M V L	MNVR TO ICC	TUS S W A P	MNVR TO SO	TUS I N S T L	M P N A V R R K	M N V R ^				
	MS4 SELLERS	POST SLEEP	EVA PREP W/ ISS 02	E P M U R G E	EMU PREBREATHE	C_LK DPRS	E G R S	F G B R T R V L	F G B ^	P R M T R V L	NADIR IUA R&R	T U S *	P U M P M O D U L E I N S T A L L	NADIR TUS R&R					TUS CBL ROUTE	⊕	
I S S	ISS CDR	POST SLEEP	EVA PREP W/ ISS 02	E P M U R G E	EMU PREBREATHE	♦	VELO + HC	MIDDAY-MEAL	MPLM XFER		TVIS										
	FE-1	POST SLEEP	DPC	MORN PREP WK	C O X	RED	TVIS	MPLM XFER	MIDDAY-MEAL	MPLM XFER											
	FE-2 Reiter	POST SLEEP	DPC	MORN PREP WK	X R F E W R	MPLM XFER	V + E L C	MPLM XFER	MIDDAY-MEAL	MPLM XFER											
S T S	DAY/NIGHT ORBIT	Timeline bars for Day/Night and Orbit																			
	TDRS	W -171	Timeline bars for TDRS																		
S T S	ORB ATT	Timeline bars for ORB ATT																			
	NOTES	@HAM P/D ^ACT ▼SSC-FSRVR-REBOOT ♦C_LK DPRS *SETUP ^INSTL *CABLE RETRACT ^MPLM VIEW ♦A/L INGRS ⊕A/L INGRS MT XLATE WS4 TO WS5																			

GMT 07/10/06 (191)

MET Day 006

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STS	DAY/NIGHT ORBIT	96												97												98												99												100												101												102												103												104																																																											
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ORB ATT																																																																																																																																																													
NOTES		*EVA 2 IVA SUPPORT												A/L INGRS ^CNFG												A/L INGRS												^DEACT *STATUS CK																																																																																																																							

MSG 049 - FD07 FLIGHT PLAN REVISION

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MSG INDEX

<u>MSG NO.</u>	<u>TITLE</u>
49	FD07 Flight Plan Revision
50	FD07 Mission Summary (13-0643)
51	FD07 Transfer Message (13-0644)
52	FD07 Water Summary
53	FD06 MMT Summary
54	FD07 Summary Timeline

1. WLES STATUS WORDS

The WLES System continues to function well. With the completion of ascent data collection, the starboard wing units were used for on-orbit monitoring. The first group went into on-orbit mode at about MET 2/15:50 and ran for about 7 hours. By the time group 5 was put into on-orbit mode, the starboard units were largely too cold to conduct operations, although we continue to get health and status data from them. There were no indications of an MMOD impact observed during operations completed on the starboard wing. As of this writing, one unit in the 5th starboard group continues to operate. The port wing units are now being used for on-orbit mode.

2. UPDATE TO EVA INHIBIT PADS

Due to the loss of VERNs, EVA 2 and 3 Inhibit Pads need to be changed as follows:

In the RCS block, step 1, change

√DAP: VERN, FREE, LO Z

to

√DAP: ALT, FREE, LO Z

Inhibit Pads may be found on the following pages of the EVA Checklist FS:

EVA 2 pg FS 7-53

EVA 3 pg FS 7-90

3. SSRMS OVERNIGHT PARK POSITION MODIFICATION

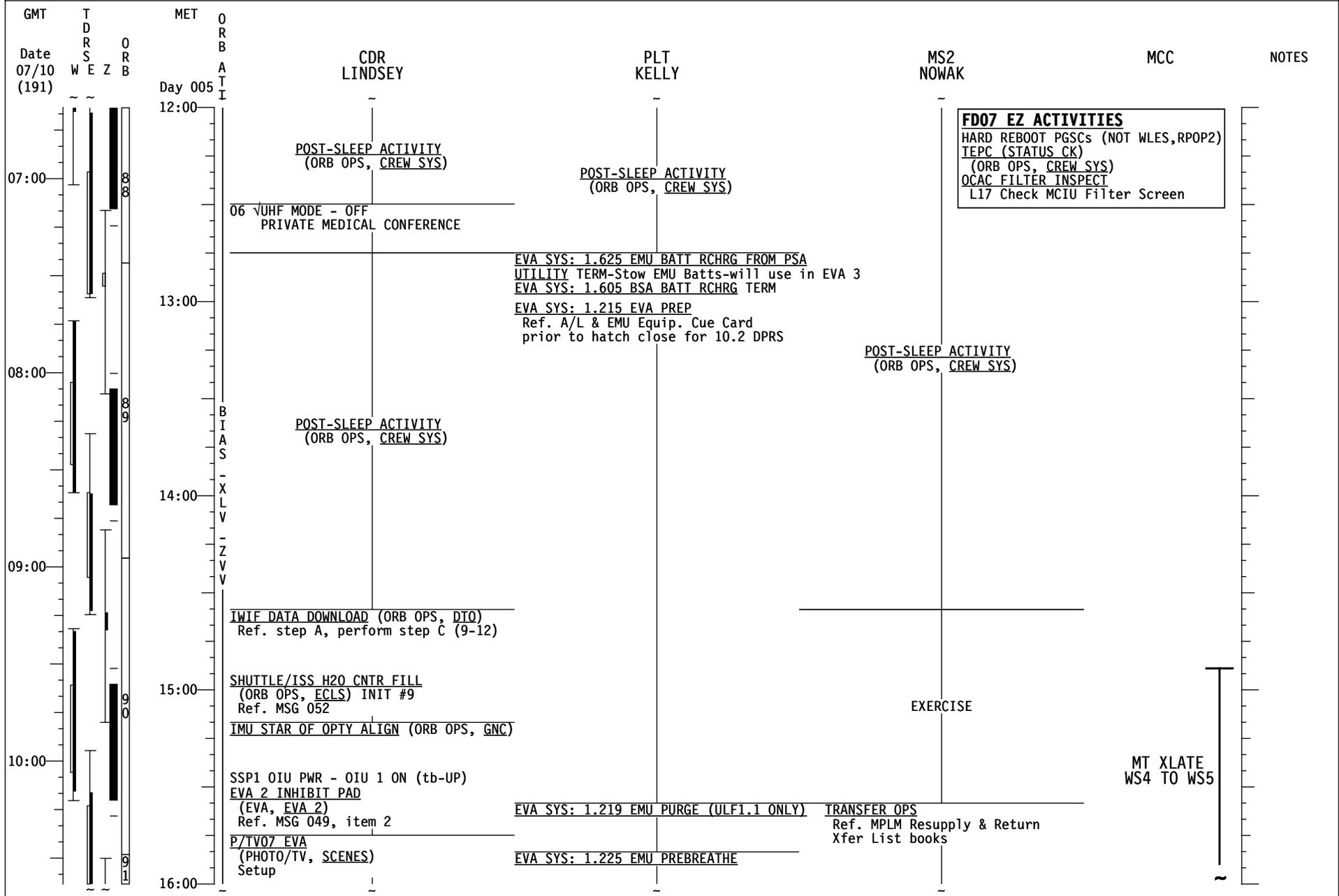
FE1, MS2, MS3:

Due to the Orbiter's loss of verns, the SSRMS overnight park position at the end of EVA 2 has to be modified to protect for camera contamination from the ISS thrusters. Today's timeline was updated to park the SSRMS at the end of step 2 of 1.420 Maneuver to EVA 2 Park Position. This position will protect the SSRMS TIP LEE camera from possible ISS thruster contamination. Step 3 of 1.420 will be completed on FD9 prior to EVA 3 support.

4. REPLACE PAGES 3-68 THROUGH 3-75.

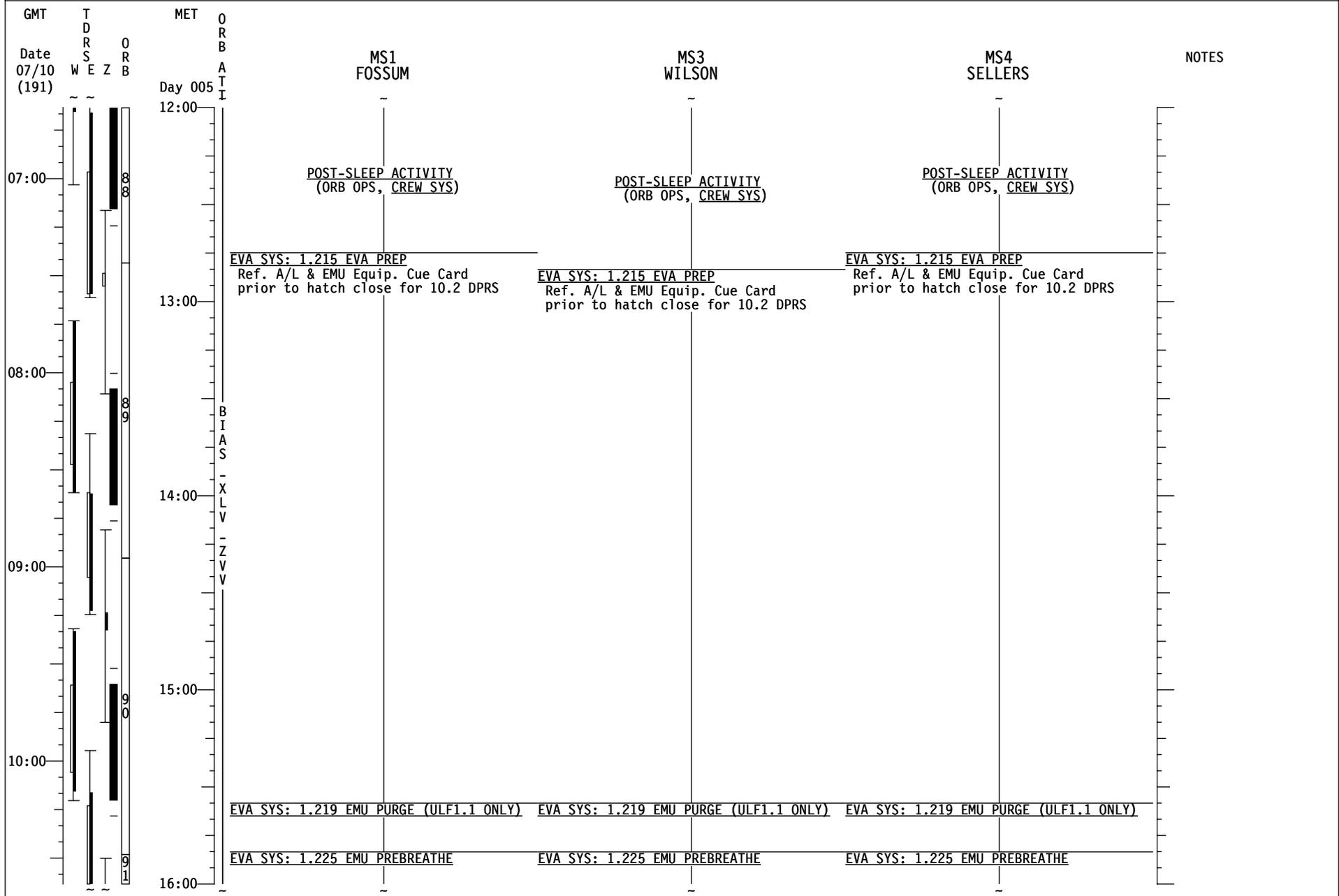
STS-121/ULF 1.1 (FD 07)

REPLANNED



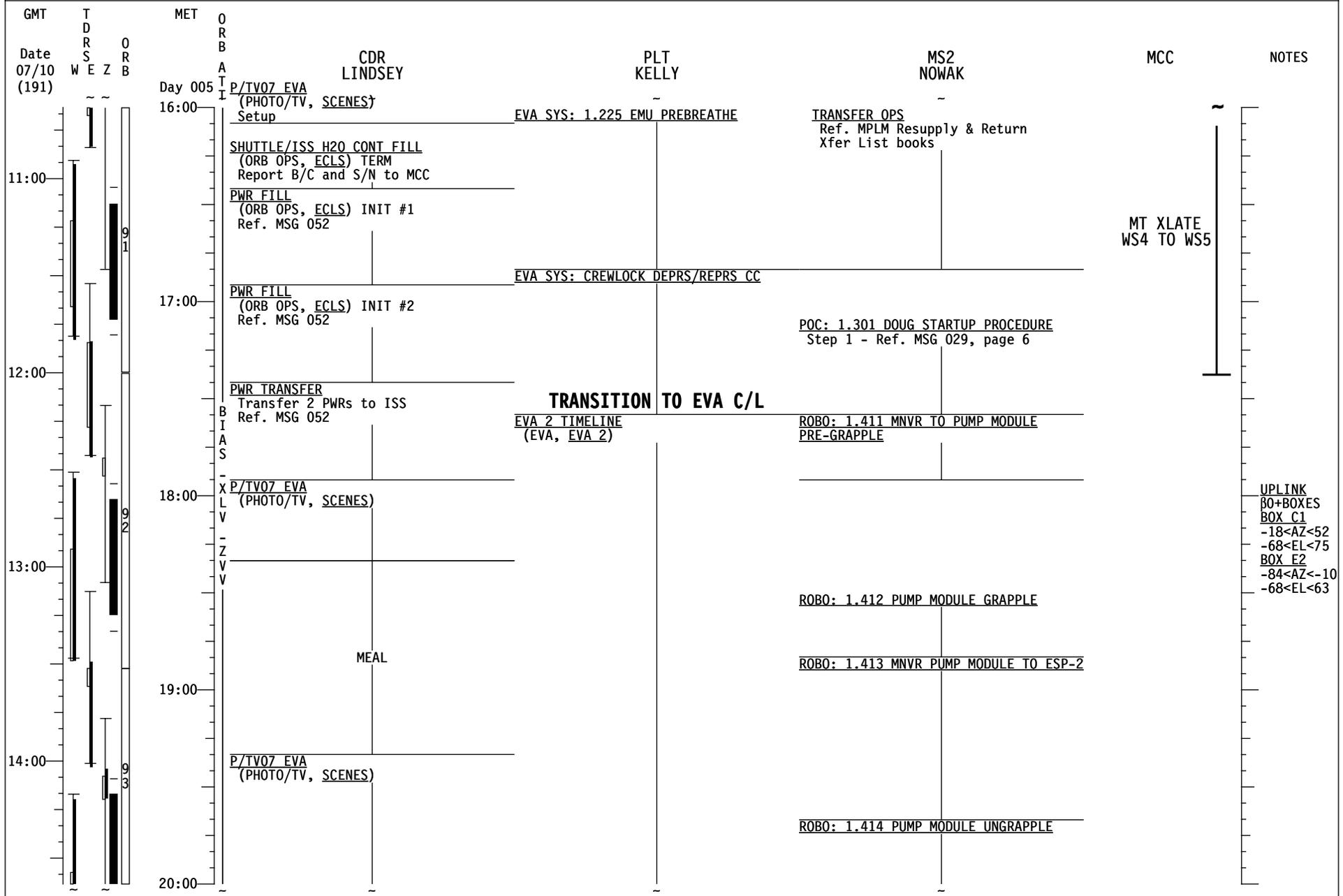
STS-121/ULF 1.1 (FD 07)

REPLANNED



STS-121/ULF 1.1 (FD 07)

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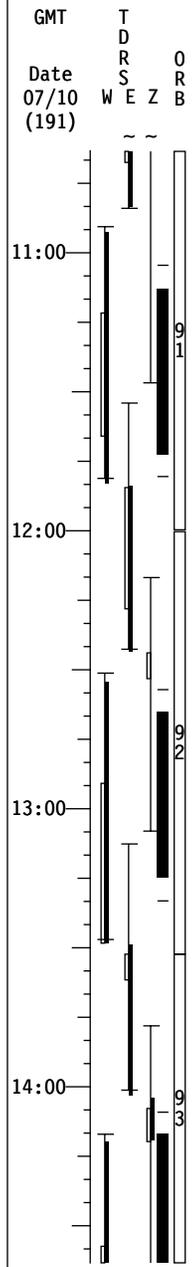


UPLINK
 80+BOXES
 BOX C1
 -18<AZ<52
 -68<EL<75
 BOX E2
 -84<AZ<-10
 -68<EL<63

STS-121/ULF 1.1 (FD 07)

REPLANNED

GMT	T D R S E Z	O R B	MET	O R B	MS1	MS3	MS4	NOTES
Date	W E Z	ORB	Day 005	A T I	FOSSUM	WILSON	SELLERS	
16:00					EVA SYS: 1.225 EMU PREBREATHE	EVA SYS: 1.225 EMU PREBREATHE	EVA SYS: 1.225 EMU PREBREATHE	
17:00					EVA SYS: CREWLOCK DEPRS/REPRS CC	EVA SYS: CREWLOCK DEPRS/REPRS CC	EVA SYS: CREWLOCK DEPRS/REPRS CC	
18:00					TRANSITION TO EVA C/L		TRANSITION TO EVA C/L	
				B I A S	POST DEPRESS & A/L EGRESS	ROBO: 1.411 MNVR TO PUMP MODULE PRE-GRAPPLE	POST DEPRESS & A/L EGRESS	
				X L V	APFR SETUP		FGB RETRIEVAL	
19:00				Z V	PUMP MODULE SETUP		FGB INSTALL	
				V	FGB INSTALL		PUMP MODULE RETRIEVAL	
					PUMP MODULE RETRIEVAL	ROBO: 1.412 PUMP MODULE GRAPPLE		
					APFR RECONFIG & TUS S/U	ROBO: 1.413 MNVR PUMP MODULE TO ESP-2	NADIR IUA R&R	
20:00					NADIR TUS CABLE RETRACT		NADIR TUS CABLE RETRACT	
					PUMP MODULE INSTALL	ROBO: 1.414 PUMP MODULE UNGRAPPLE	PUMP MODULE INSTALL	



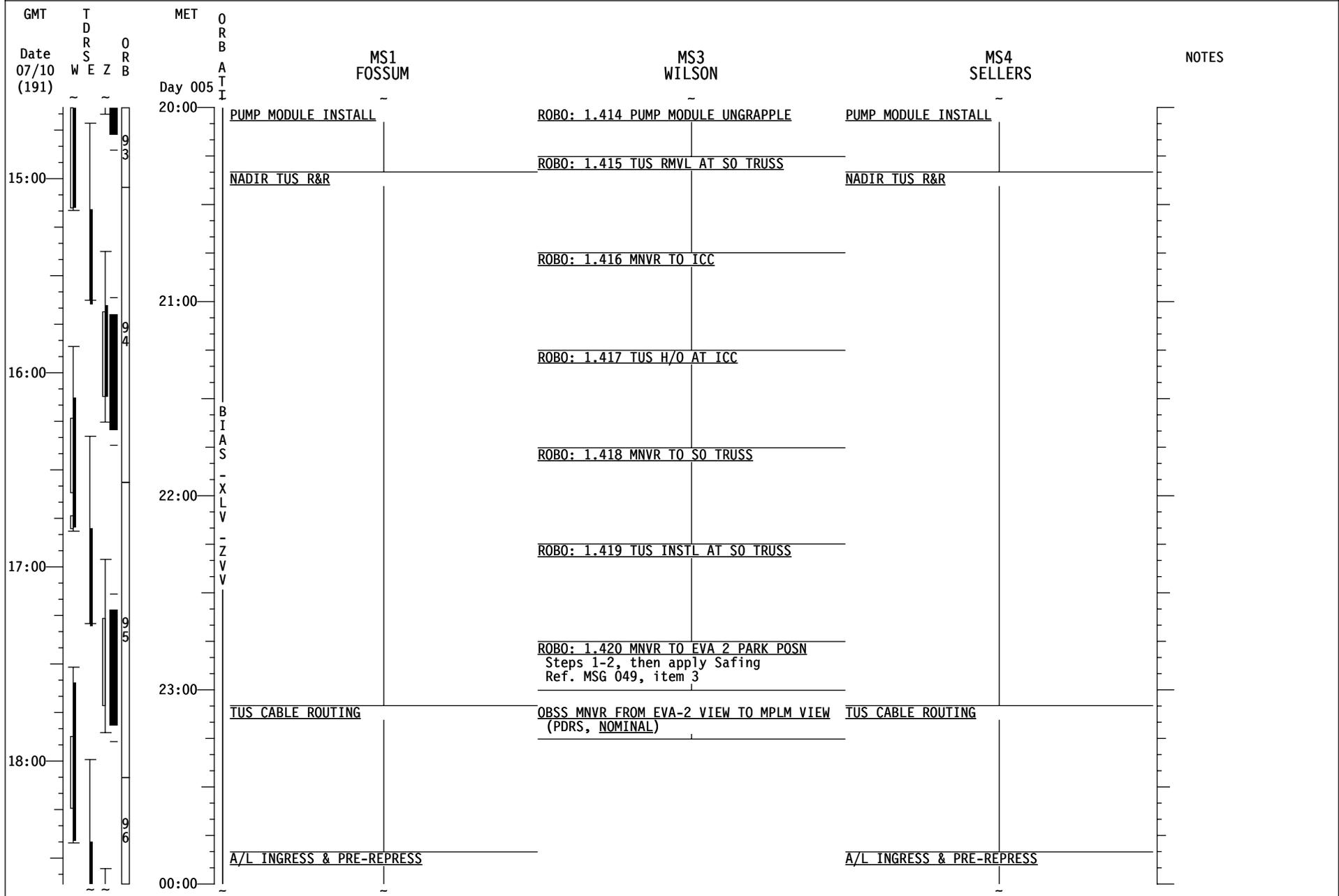
STS-121/ULF 1.1 (FD 07)

REPLANNED

GMT	T D R S W E Z	O R B	MET	O R B	CDR LINDSEY	PLT KELLY	MS2 NOWAK	MCC	NOTES
Date 07/10 (191)	W E Z	O R B	Day 005	A T I					
15:00		93	20:00		P/TV07 EVA (PHOTO/TV, SCENES)	EVA 2 TIMELINE (EVA, EVA 2)	ROBO: 1.414 PUMP MODULE UNGRAPPLE		
							ROBO: 1.415 TUS RMVL AT S0 TRUSS		
							ROBO: 1.416 MNVR TO ICC		
16:00		94	21:00		SHUTTLE/ISS H2O CNTR FILL (ORB OPS, ECLS) INIT #10 Ref. MSG 052		ROBO: 1.417 TUS H/O AT ICC		
				B I A S	EXERCISE		ROBO: 1.418 MNVR TO S0 TRUSS		
				X L			ROBO: 1.419 TUS INSTL AT S0 TRUSS		
17:00		95	22:00		SHUTTLE/ISS H2O CONT FILL (ORB OPS, ECLS) TERM Report B/C and S/N to MCC		ROBO: 1.420 MNVR TO EVA 2 PARK POSN Steps 1-2, then apply Safing Ref. MSG 049, item 3		
				V	CWC TRANSFER Transfer 2 CWCs to ISS Ref. MSG 052		OBSS MNVR FROM EVA-2 VIEW TO MPLM VIEW (PDRS, NOMINAL)		
18:00		96	23:00		P/TV07 EVA (PHOTO/TV, SCENES)				
00:00									

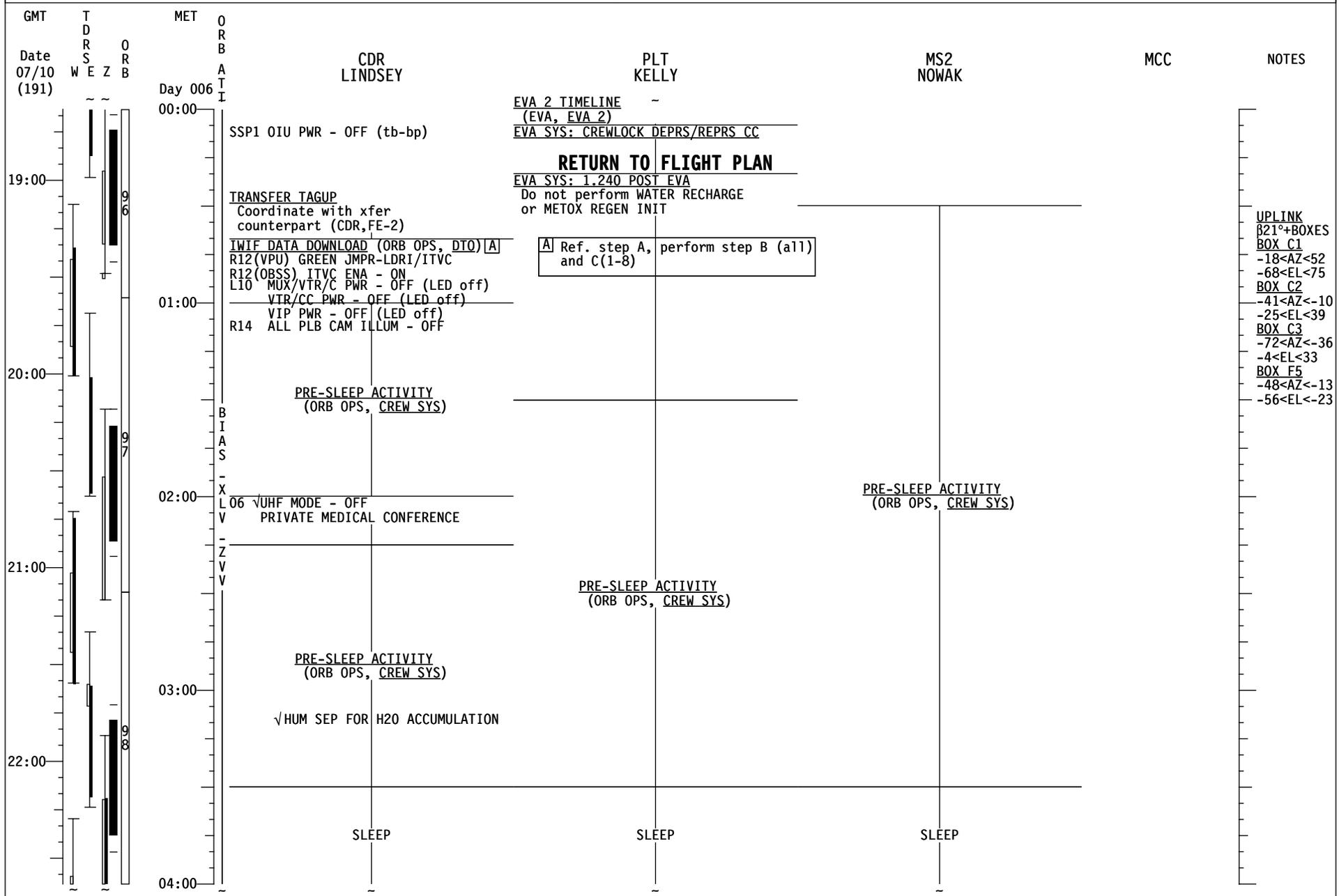
STS-121/ULF 1.1 (FD 07)

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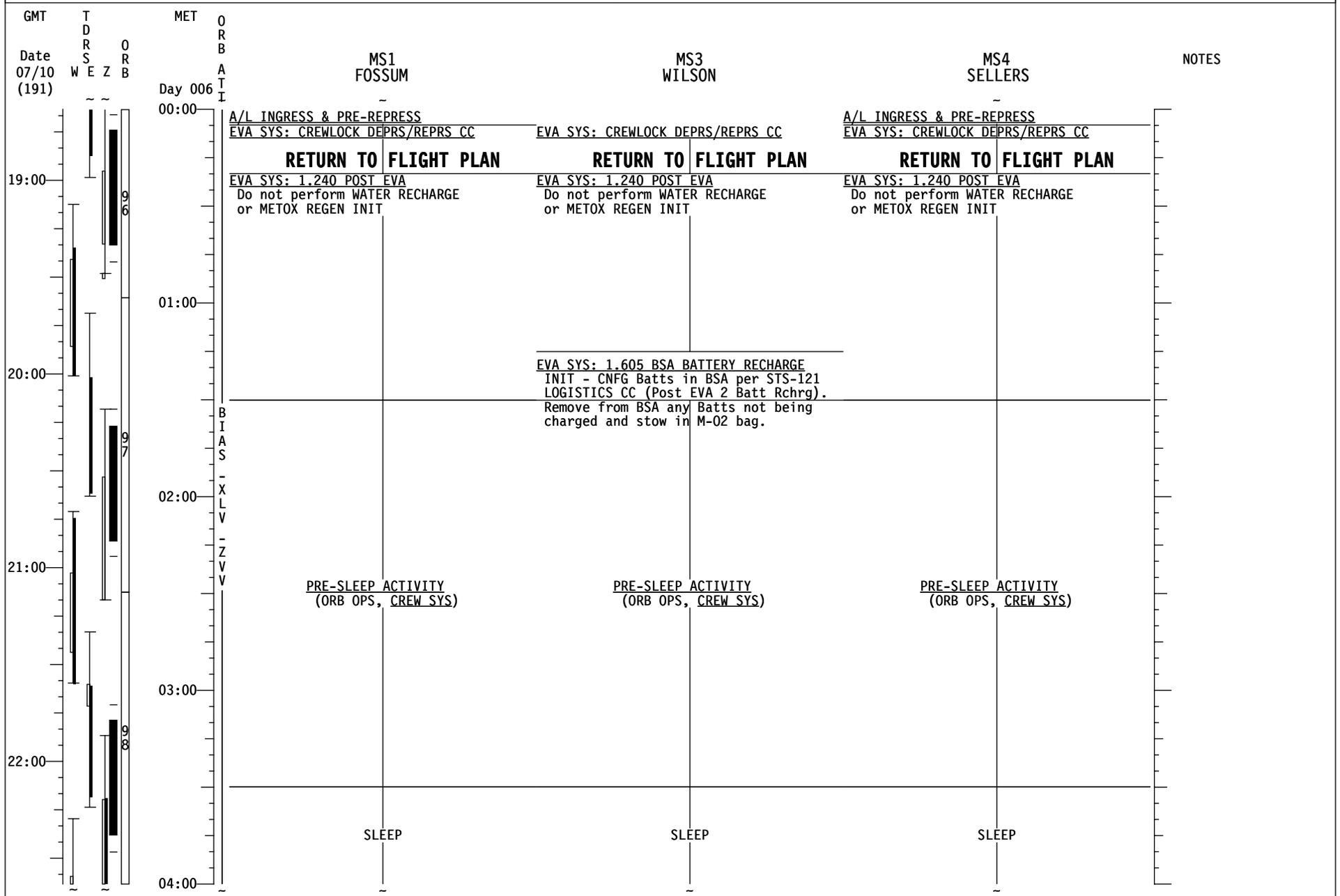
STS-121/ULF 1.1 (FD 07)

REPLANNED



STS-121/ULF 1.1 (FD 07)

REPLANNED



MSG 050 (13-0643) - FD07 MISSION SUMMARY

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Good morning, Discovery.

You're in space, the TPS is clear, transfer is going well, and today is another EVA – life is great. Enjoy!

YOUR CURRENT ORBIT IS: 191 X 177 NM

NOTAMS:

- CHERRY POINT (NKT) - RWY 32 CLOSED FOR MAINTENANCE
- KING KHALID- VORTAC CHAN 92X OPERATIONAL BUT CAUTION ADVISED DUE TO NO MONITORING
- LAJES – TACAN 45X OUT OF SERVICE TILL 10 JUL
- GUAM (GUA) – RWY 06L/24R CLOSED
- AMBERLEY (AMB) – CLOSED
- OCEANA (NTU) - RWY 23L/05R CLOSED
- RIO GALLEGOS (AWG) - NOT APPROVED
- ISTRES (FMI) – 33 RWY REMAINING MARKERS AVAIL ARE 300,600,900M

NEXT 2 PLS OPPORTUNITIES:

- EDW22 ORB 95 – 5/22:46 (FEW150 FEW250, 200@7P10)
- EDW22 ORB 111 – 6/23:09 (FEW080 FEW250, 210@10P15)

OMS TANK FAIL CAPABILITY:

- L OMS FAILS: NO
- R OMS FAILS: NO

LEAKING OMS PRPLT BURN:

- L OMS LEAK: ALWAYS BURN RETROGRADE
- R OMS LEAK: ALWAYS BURN RETROGRADE

OMS QUANTITIES(%)

- L OMS OX = 34.6 R OMS OX = 37.2
- FU = 35.1 FU = 37.9

SUBTRACT I'CNCT COUNTER FOR CURRENT OMS QUANTITIES

DELTA V AVAILABLE:

OMS	363 FPS
<u>ARCS (TOTAL ABOVE QTY1)</u>	<u>26 FPS</u>
TOTAL IN THE AFT	389 FPS
ARCS (TOTAL ABOVE QTY2)	59 FPS
FRCS (ABOVE QTY 1)	36 FPS

MSG 051 (13-0644) - FD07 TRANSFER MESSAGE

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Good morning Thomas, Stephanie, and Steve,

Kudos to everyone! Thanks so much for the transfer work. We are trying hard to come up with something challenging for Steve!

Information for crew:

Thomas, you included item 205 (1.0 CTB of ITCS fluid) in your calldown as complete. We did not mark it as complete in the TL Excel file because Jeff called down that it did not fit in the LAB1S5_D1 and was temp stowed on the S5 Rack Front. We think the ITCS PWR in this CTB will fit in S5_D1 if it is removed from the 1.0 CTB and stowed alone in this volume. The empty CTB can be stowed at NOD1D1 and the foam can return in the MPLM in A4_K1. Your transfer list updates today show these changes.

We've also accommodated LHA foam and MCA Spectrometer foam. They are shown as realtime additions to MPLM Return in your transfer list updates today.

Steve, I forgot to come back to you with completed EVA transfer items for FD6. Item 16 was the only item we were expecting to be complete per FD6 EVA procedures. This was Reiter's EMU and EVA confirmed it was completed, so we've marked it as complete on the ground and in the TL Excel file onboard.

Steve, regarding the relocations required to make space for Return Bag 488:

- Return Bag 488 1.0 CTB will return in MF71H
- Color Printer CTB which launched in MF71H will return in MF57O.
- PBA/EVA items 1.0 CTB which launched in MF57O will return in 5MLE Bag F in the Port Ceil 2 location
- Also the Ergometer Shoe bag which launched in Vol F will return in 5MLE Bag E in Port Ceil 1 location.

All these moves for return are due to the late addition of TRAD. The relocations of the Color Printer CTB, PBA/EVA CTB and Ergometer Shoe Bag will not show up in the Transfer List because they are not transfer items.

Question for Thomas:

Thomas, you called down item 183 (2 empty triple CTBs) as complete. One should have been stowed in NOD1O4_G and the other in LAB1O5_G. **Did you happen to record which CTB (serial number) was stowed in each location?**

FD07 Choreography

- Continue packing return bags/items in RSPs & RSRs.

The Transfer List Excel file, FD07_TransferList_STS121.xls, is located on the KFX machine in **C:\OCA-up\transfer**.

For ISS, the Transfer List Excel file, FD07_TransferList_STS121.xls, is located in **K:\OCA-up\transfer**.

(continued on next page)

MSG 051 (13-0644) - FD07 TRANSFER MESSAGE

Page 2 of 2

- 1
- 2 Please incorporate uplink pages as follows (call us with any questions!):
- 3
- 4 In the MDDK Transfer List Book
- 5 **RESUPPLY** tab
- 6 Replace the following pages:
- 7 Page Resupply 2
- 8 Page Resupply 4
- 9 **MDDK RSPLY REALTIME ADDITIONS** tab
- 10 Replace Page Resupply 9
- 11 **SWAP** tab
- 12 Replace the following pages:
- 13 Page Swap 4
- 14 Page Swap 24
- 15 **RETURN** tab
- 16 Replace Page Return 3
- 17 **MDDK RTN REALTIME ADDITIONS** tab
- 18 Replace Page Return 8
- 19
- 20 In the MPLM Resupply Transfer List Book
- 21 **P3 RSR** tab
- 22 Replace Page Resupply 25
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- 24 In the MPLM Return Transfer List Book
- 25 **MPLM RTN REALTIME ADDITIONS** tab
- 26 Replace Page Return 32
- 27
- 28 -The Transfer Team-
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MSG 052 - FD07 WATER SUMMARY

1
2 Today there will be 2 PWR fills and 2 CWC fills.
3
4 The Shuttle/ISS H2O Container Fill initiation scheduled for CDR at MET 5/14:55 should
5 contain the following details:
6
7 SHUTTLE/ISS H2O CONT FILL INIT #9
8 (ORB OPS, ECLS)
9 Ag Biocide is req'd.
10 Sample is not req'd.
11 Fill Duration: ~50 minutes
12 Report Serial Number and Barcode to MCC.
13
14 Following fill #9, at MET 5/16:25 and MET 5/16:55 CDR should perform:
15
16 PWR FILL (ORB OPS, ECLS) p5-43. Retrieve PWR S/N1018 temp stowed on Middeck and
17 PWR S/N 1011 from A/L1D1_A2 for today's fills. Report Serial Number and Barcode to
18 MCC prior to initiating each fill.
19
20 Perform CWC fill #10 at MET 5/20:50. The following fill details apply:
21
22 SHUTTLE/ISS H2O CONT FILL INIT #10
23 (ORB OPS, ECLS)
24 Ag Biocide is req'd.
25 Sample is req'd.
26 Fill Duration: ~50 minutes
27 Report Serial Number and Barcode to MCC.
28
29 Per the flight plan, transfer PWR S/N 1011 to A/L1D1_A2 and PWR S/N 1018 to A/L1D1_B1
30 at MET 5/17:25. Transfer the CWCs to the water wall (NOD1P2) at MET 5/22:20. If there is
31 insufficient room for the CWC bags at this ISS location, store CWCs on the FGB Floor and
32 report to MCC.
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FD6 MMT Crew Summary

The primary focus of the FD6 MMT was a review of TPS analysis for the three areas that had not been previously cleared including the starboard ET door gap filler and the two thermal blankets (one forward of the CDR window just aft of the up firing thrusters and the other on the port side of the FRCS module). The good news is that the MMT cleared all three of these items, the entire Discovery TPS is now good for entry, and no modifications to EVA #3 will be required to retrieve the gap filler or remove the slightly protruding thermal blanket patches. The details of this assessment and analysis will be discussed in the TPS summary below.

The MMT also reviewed the detailed SRB, RSRM, SSME, ET, and PAD B GSE performance. In general ET-119 performed very well and there were no debris items that exceeded the allowables.

Finally, the ISS and SSP Programs have agreed to retain the requirements to transfer 15 CWCs. Even though there are 15 CWCs, due to the additional docked day, FD8 will need a simo dump. In terms of the Node 1 Nadir CBM center disk cover straps, the plan is to cut/fold and tape the straps leaving a 4"-5" tail and after that procedure there will be no further concerns with interference during mating ops.

TPS Summary:

a) Tile/RCC/ ET Doors – There is no new data on the tile, RCC, or ET doors . All have been cleared for entry.

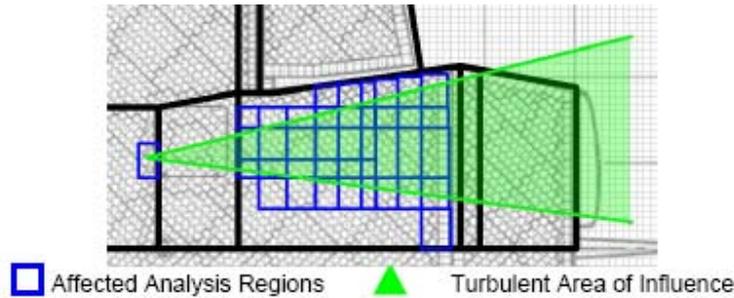
b) Gap Fillers – The only remaining gap filler -the one forward of the starboard ET door was cleared for entry via a very conservative analysis that assumed a 1.04 inch protuberance height and a Mach 25 transition in a 20 degree cone aft of the gap filler. This results in worst case heating in the area aft of the gap filler (See Figure 1). Even with the worst case heating analysis, there is no tile coating loss, tile RTV bondline violation, or structural temperature exceedence. All structural margins including those for the ET doors and the thermal seals are positive with at least a 1.5 factor of safety. Additionally, an orbiter subsystems review including the aft structure, body flap and mechanisms, MPS, Hydraulics, ET Door actuators, wiring, active thermal control system, ET attach hardware and pyros was conducted to verify the higher structural temperatures did not negatively influence any systems. After a complete review each subsystem was cleared for the predicted higher structural temperatures.

Even though this conservative analysis was determined to result in an acceptable entry, the focused inspection data was utilized to determine what was likely to occur with the actual STS-121 gap filler during entry. A gap filler was modified on the ground to mimic the configuration of the actual gap filler obtained in the imagery. Testing of gap fillers with STS-121 type defects showed that extremely low loads (.03 lbs) are required to bend over the gap filler. CFD analysis was utilized to predict the entry loads and stress analysis indicates that only 0.03 psi dynamic pressure is required to bend the gap filler over. This analysis shows that the gap filler will bend over by Mach 25 which reduces the effective protuberance height from 1.04 inches to 0.37 inches. In this case the prediction is that transition in this region will occur at approximately Mach 18. Again in this case there is no TPS or structure over temperature conditions and peak temperatures were reduced significantly from the

MSG 053A (13-0646A) - FD06 MMT SUMMARY

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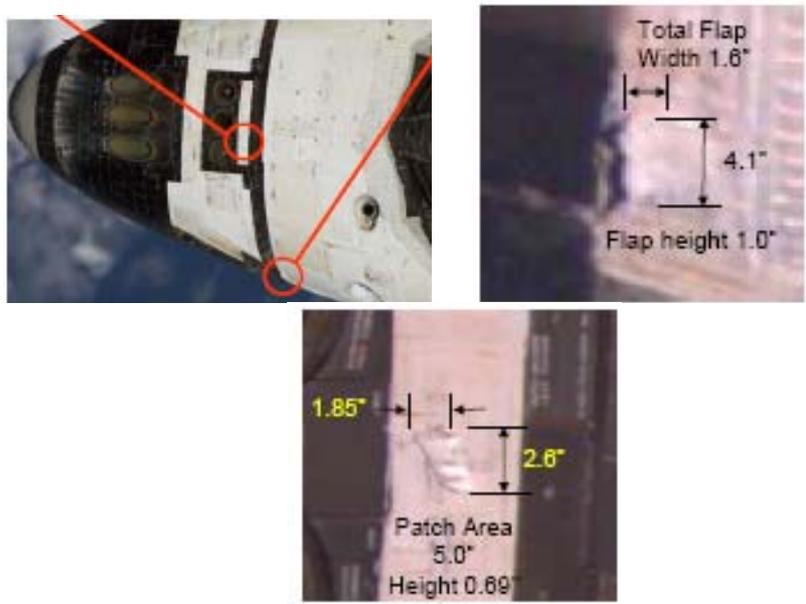
1 more conservative Mach 25/1.04 inch height analysis. RTV bondline temperatures were
2 reduced approximately 85° F and structure temperatures were reduced by approximately
3 55° F. Previous flight data has been reviewed and there have been two prior flights with
4 protruding gap fillers in this area, including STS-114 which had a .25 inch protruding gap
5 filler in a similar location. Once the gap filler bends over during entry the resulting
6 environment will be very close to that experienced during STS-114 which showed good TPS
7 performance aft of the gap filler upon post landing inspection.
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Figure 1 -Affected region of early transition for Starboard Gap Filler

c) Thermal Blankets – The two blanket patches on the upper surface just aft of the F1U and F3U thrusters and the blanket on the port side just forward of the -Y star tracker were cleared for entry by the MMT. Figure 2 show the locations of two blanket patches



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Figure 2 Overall Location followed by Port Patch and then Patch new F1U and F3U Thrusters

MSG 053A (13-0646A) - FD06 MMT SUMMARY

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The port blanket was installed in 1995 and the patch identified in the photography was installed after STS-114 to protect eroded fabric. The forward side of this patch was not stitched per normal procedures because it is on a blanket edge. On this patch at least 28 to 56 stitches are still remaining and there is no evidence of patch body lifting. The mass of this entire patch is estimated to be .018 lbm. The predicted maximum load during entry for this patch based on CDF analysis is 0.9 lbs for the port blanket. Pull testing performed at Huntington Beach and at KSC on OV-105 indicate that the minimum load to remove a similar patch is 3.7 lbs which is three times greater than the maximum entry load which occurs below Mach 0.5. Since the patch did not release during ascent, where the ascent dynamic pressure was at least three times larger than peak entry dynamic pressure loads, it is not expected that it will release during entry.

The blanket near F1U and F3U forward of the CDR window was installed in 1994 and the patch was installed after STS-114 to protect damage on the OML edge. The patch is folded over 3" and the mass is very low at 0.008 lbm. In this area the maximum entry load is 0.6 lbs based on CFD analysis. Again the average pull load to remove was on the order of 5.4 lbs with a minimum of 3.7 lbs which is at least six times greater than the maximum entry load. And again ascent loading was on the order of three times larger on this patch, so this patch is not expected to be liberated during entry either.

The analysis for both patches is consistent with wind tunnel testing performed in support of the billowing thermal blanket observed on STS-114. Figure 3 shows the location of that blanket relative to these patches. Additionally, several other flights have re-entered with similar patches that were observed in very good condition on the runway. And finally even if the entire patch was liberated for either of these areas it is predicted that there will be no critical damage to the windows or any other orbiter structure.



Figure 3 STS-114 Blanket relative to STS-121 Damaged Patches

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