

## FLIGHT DATA FILE

# Flight Plan

## STS-93

(Rotated FRR Trajectory – July 20, 1999  
GMT L/O)

**Mission Operations Directorate  
Operations Division**

**Final, Rev A  
June 25, 1999**

<u>EVENT</u>	<u>CDT</u>		
Launch	23:36	Mon	Jul 19, 1999
IUS/AXAF Deploy	06:53	Tues	Jul 20, 1999
Deorbit Burn	21:32	Sat	Jul 24, 1999
KSC Landing	22:32	Sat	Jul 24, 1999

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A working (unofficial) copy is available through the Internet at URL: <http://www.jsc.nasa.gov/da/shuttle/ftp/in/sts93>

National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas




MISSION OPERATIONS DIRECTORATE

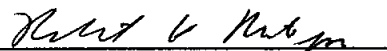
STS-93 FLIGHT PLAN

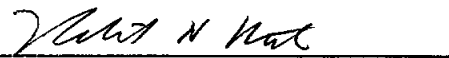
FINAL, REVISION A  
June 25, 1999

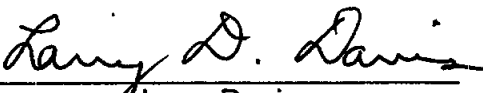
PREPARED BY:

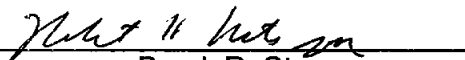
  
F. Fisher Reynolds, III  
Book Manager

APPROVED BY:

  
Jennifer B. Price  
Lead, Flight Planning

  
Robert H. Nute  
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Larry Davis  
Chief, Operations Division

  
Brock R. Stone  
Director of Operations

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Exemption #: 93-1		

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Lead Pointer	DO4/S. Remko	281-244-5658

FLIGHT PLAN  
STS-93

**LIST OF EFFECTIVE PAGES**

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REV A 06/25/99

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3-4 .....	93/FIN A	5-6 .....	* 93/FIN A
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3-8 .....	93/FIN A	6-2 .....	* 93/FIN A
3-9 .....	93/FIN A	6-3 .....	* 93/FIN A
3-10 .....	93/FIN A	6-4 .....	* 93/FIN A
3-11 .....	93/FIN A	6-5 .....	* 93/FIN A
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\* - Omit from flight book

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## INTRODUCTION

The STS-93 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.

This on-orbit timeline satisfies the objectives specified in the Flight Definition and Requirements Directive, and the requirements of the STS-93 Flight Requirements Document.

The Flight Plan, as part of the Flight Data File, meets the specifications of the Rotated FRR version of the STS-93 Flight Initialization Data Pack.

The Rotated FRR profile used for this Flight Plan is for a launch date of July 19, 1999, at 23:26 CDT. Orbiter inertial attitudes are expressed relative to a mean of 1950 (M50) reference frame.

JSC-22359, Crew Scheduling Constraints (Appendix K, CPMP), Basic, Rev B, January 1992, has been used to build the timelines contained in this Flight Plan.

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

The Flight Plan timeline pages, as well as other flight planning information, are available on the Space Shuttle Flight Planning web page at the following address:

[http: //www.jsc.nasa.gov/da/shuttle/fltpln/sts93](http://www.jsc.nasa.gov/da/shuttle/fltpln/sts93)

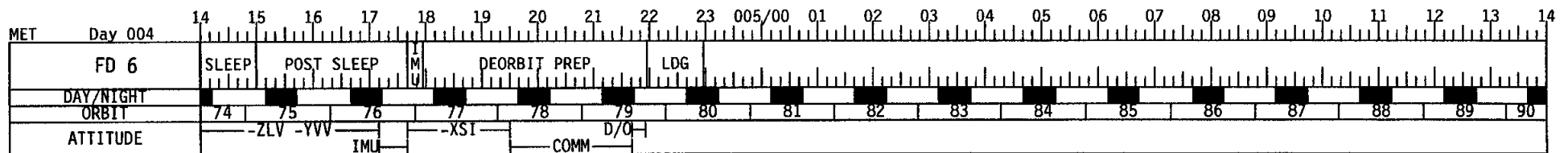
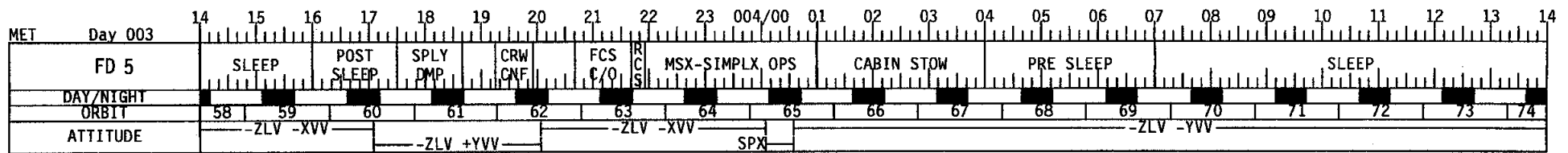
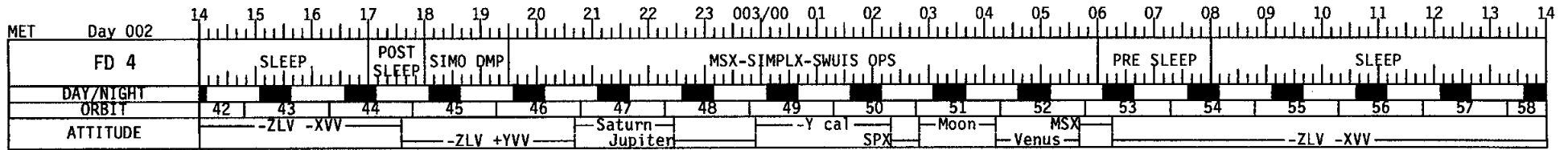
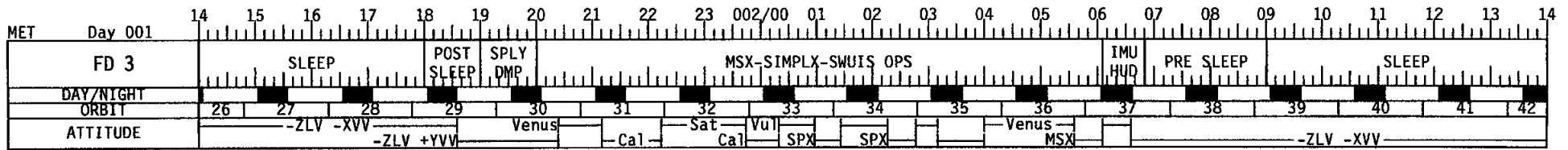
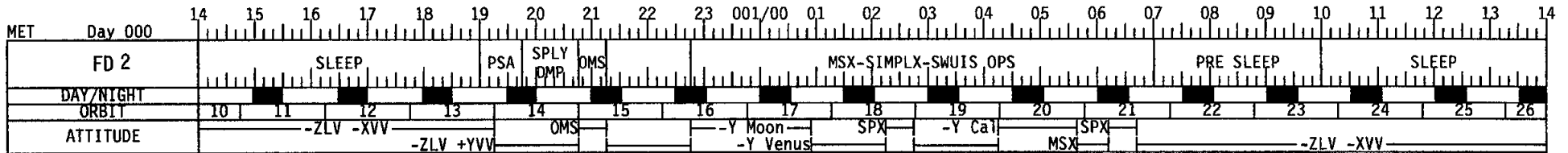
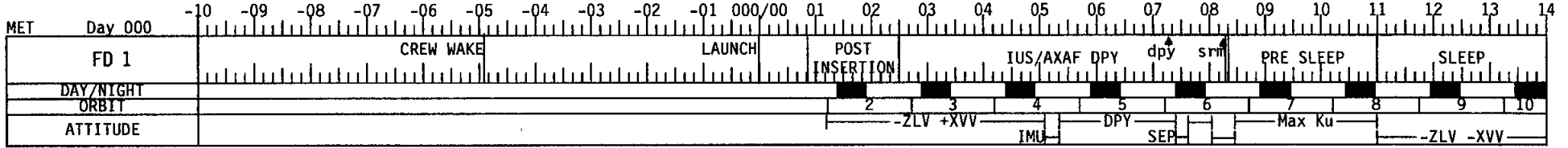
**OVERVIEW TIMELINE**



# OVERVIEW TIMELINE

**STS-93**

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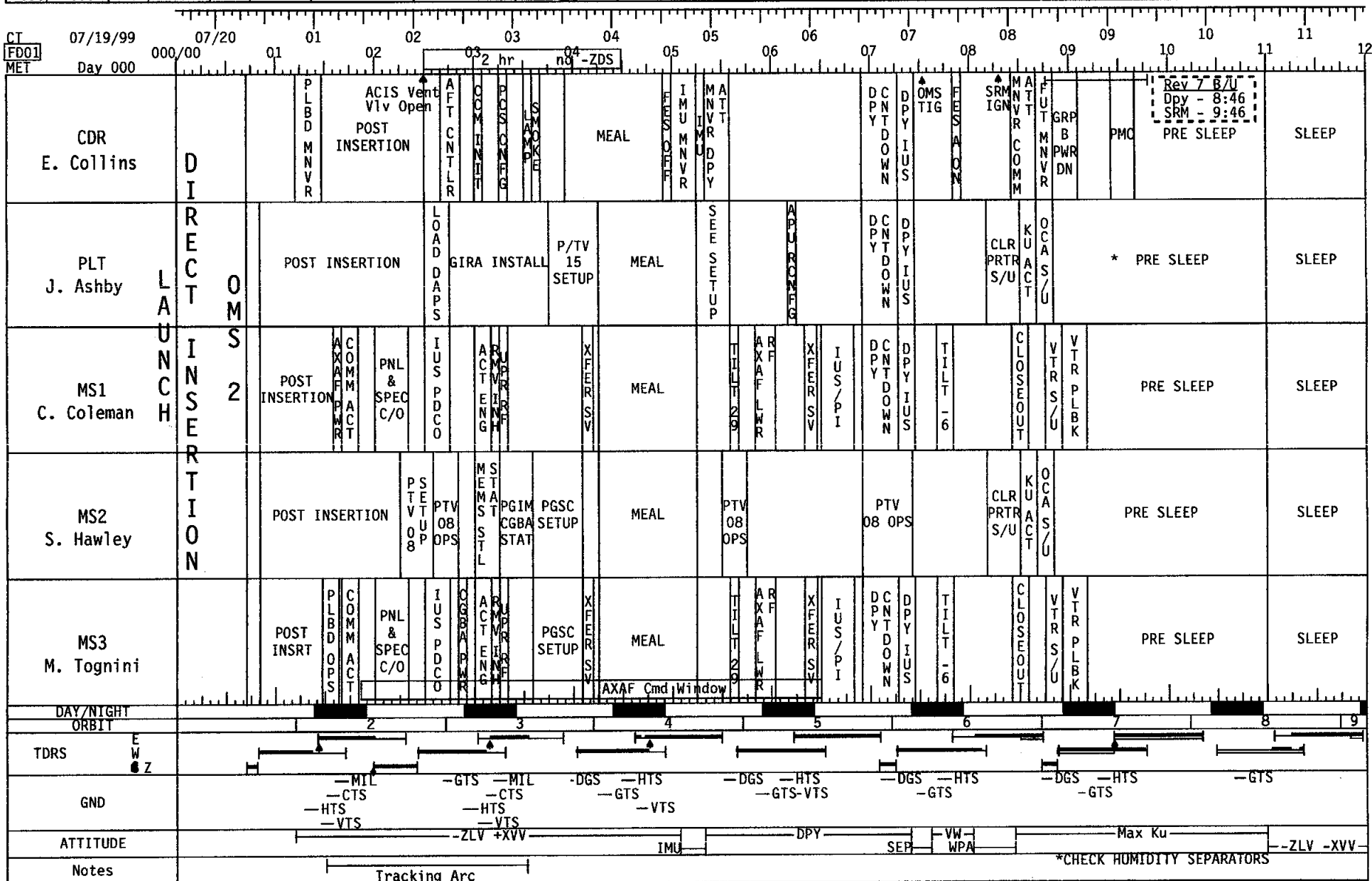


Landing: KSC 80 4/22:56

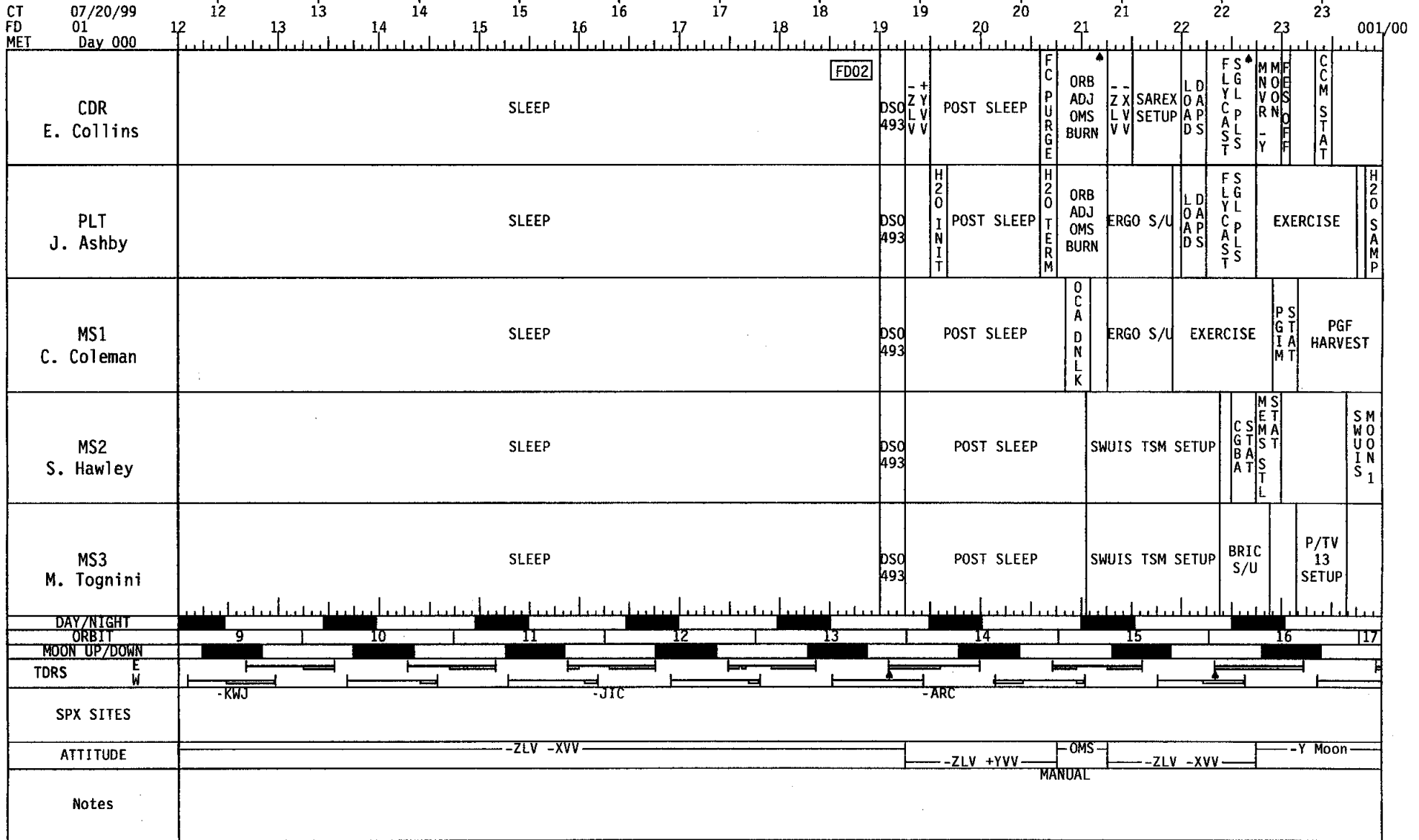
SUMMARY TIMELINE

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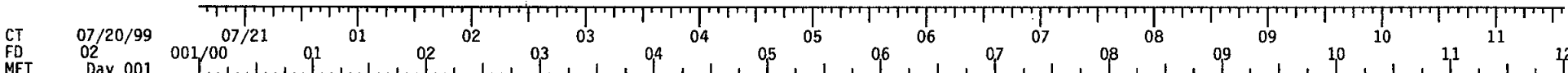
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000/12:00	201/16:36	201/11:36								



MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
000/12:00	201/16:36	201/11:36	201 CT	47.53		1/2	20 Jul 1999	STS-93	FINAL A	06/25/99
001/00:00	202/04:36	201/23:36								



MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
001/00:00	202/04:36	201/23:36	201 CT	46.56		2	20 Jul 1999	STS-93	FINAL A	06/25/99
001/12:00	202/16:36	202/11:36								



CDR E. Collins	STE AR RET X	EXERCISE	MEAL	OMS RAM ALS	M J N U P I T E R	M C A L	C C T M A T	S T I L T A P E	P A O E V E N T	M N V R	M S X	P R C S	O M S W A K E J I C	- Z L V	S S A C H R E O L	P R E S L E E P	P M C	P R E S L E E P	S L E E P
PLT J. Ashby		MEAL	OMS RAM ALS	F I L T E R C L E A N I N G	F C M S O P S	M N V R	M S X	P R C S	O M S W A K E J I C	F S E L I T A P O P E	P R E S L E E P	* P R E S L E E P	S L E E P						
MS1 C. Coleman	P G F H A R V E S T	MEAL	H D T V	P / T V O 4 S E T U P	P A O E V E N T	H D T V	P S T A I M T	P R E S L E E P	O C A D N L K	P R E S L E E P	S L E E P								
MS2 S. Hawley	S M O O I N S 1	S T I L T A P E & T V S / U T	S V E N U S S 1	S T L R C D S /	M E A L	S J U P I S T E R	S W I S C A L 1	T E M P S T O W	E X E R C I S E	M S T M A S T S T L	P R E S L E E P	S L E E P							
MS3 M. Tognini	C G B A T V	C I G N I T A T	D N E K	R A D D P Y	B R I C F R Z	M E A L	E X E R C I S E	P /	C G B A T V	C S T B R I C F R Z 2	P R E S L E E P	S L E E P							

DAY/NIGHT	[Day/Night Cycle]																		
ORBIT	[Orbit Cycle]																		
MOON UP/DOWN	[Moon Cycle]																		
TDRS	[TDRS Cycle]																		
SPX SITES	-ARC -JIC																		
ATTITUDE	-Y Moon -Y Venus -SPX -Y Jup -Y Cal -MSX -SPX -ZLV -XVV																		
Notes	*CHECK HUMIDITY SEPARATORS ⊕ CGBA Overnight TV																		

MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
001/12:00 002/00:00	202/16:36 203/04:36	202/11:36 202/23:36	202 CT	45.41		2/3	21 Jul 1999	STS-93	FINAL A	06/25/99

CT 07/21/99 12 13 14 15 16 17 18 19 20 21 22 23 002/00  
 FD 02 12 13 14 15 16 17 18 19 20 21 22 23 002/00  
 MET Day 001

CDR E. Collins	SLEEP	FD03	DSO 493	POST SLEEP	H20 INIT	H20 TERM	MENUBRIC	SSACHEOXOL	EXERCISE	MEAL	MENUBRIC			
PLT J. Ashby	SLEEP		DSO 493	POST SLEEP	RESERVE	RESERVE	SPARRONAL	STLRCD & TV S/U	MENUBRIC	STLRCD S/U	PTV 15 S/U	MENUBRIC	HDTV	STLRCD S/U
MS1 C. Coleman	SLEEP		DSO 493	POST SLEEP	OCCDNLK	POST SLEEP	CMDS	STLRCD S/U	PTV 15 S/U	HDTV	EXERCISE			
MS2 S. Hawley	SLEEP		DSO 493	POST SLEEP	SWUIS SETUP	SWUIS 2	SWUIS 2	STLRCD S/U	PTV 15 S/U	SWUIS SATURN 1				
MS3 M. Tognini	SLEEP		DSO 493	POST SLEEP	EXERCISE	EXERCISE	CGBAT	BRICFRZ 3	SSACHEOXOL	DTO 631				
DAY/NIGHT ORBIT	[Bar chart showing day/night cycle from 25 to 33]													
MOON UP/DOWN	[Bar chart showing moon up/down cycle from 25 to 33]													
TDRS	[Bar chart showing TDRS activity from 25 to 33]													
SPX SITES														
ATTITUDE	-ZLV -XVV      -ZLV +YVV      Venus      Cal      Sat      Cal													
Notes														

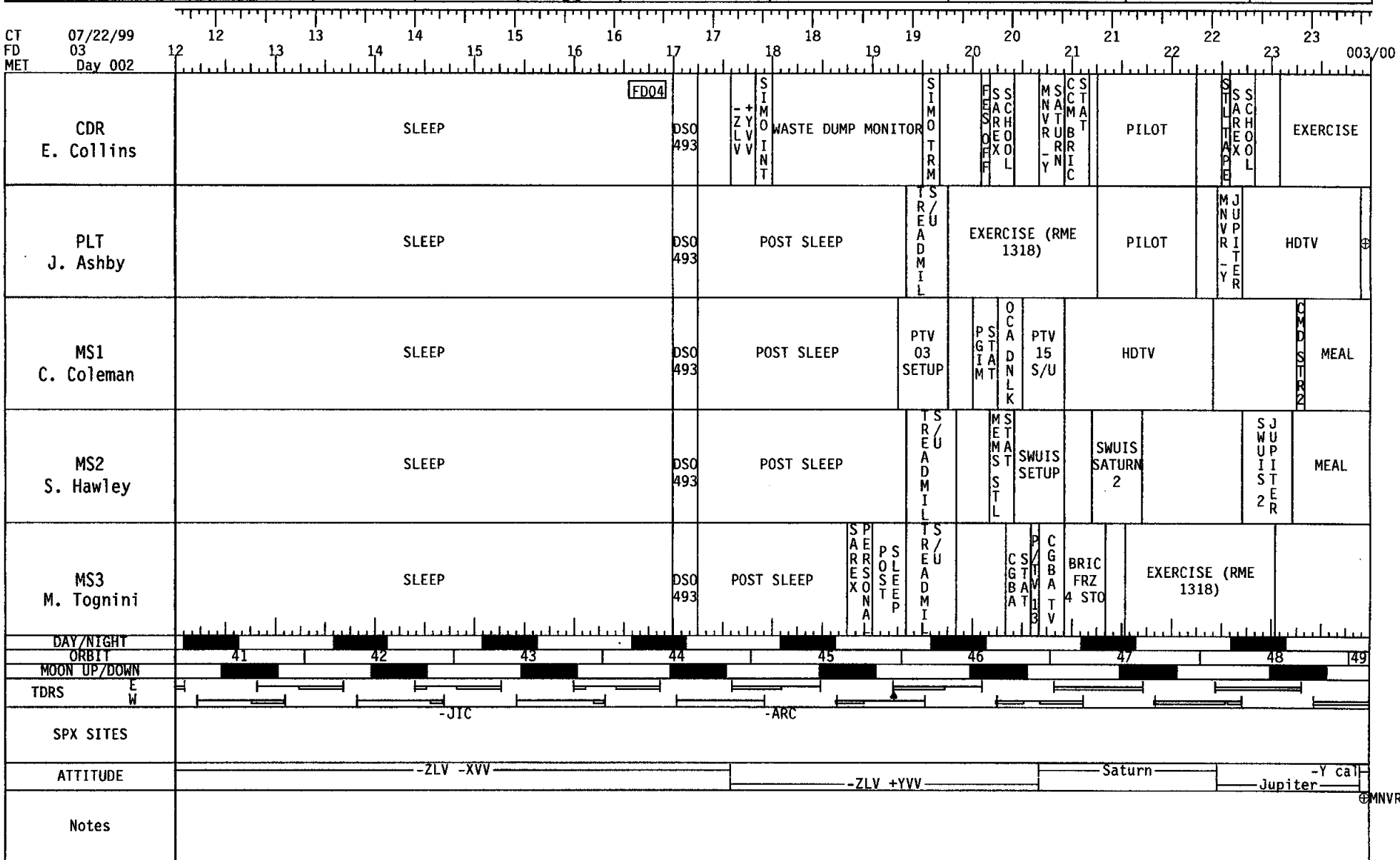
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002/12:00	203/16:36	203/11:36								

CT	07/21/99	07/22	01	02	03	04	05	06	07	08	09	10	11	12				
FD	03	002/00	01	02	03	04	05	06	07	08	09	10	11	12				
MET	Day 002																	
CDR E. Collins	MNVRCAN -Y	OMS RAM BURN KWJ	MNVRCAN -Y	OMS WAKE BURN ALS	MNOVRN -Y	PHTRCNS CNFG	CABIN TEMP	MVNRUS -Y	CS T M A T B R I C	PE A V E N T	MSX 90 DEG BURN	I M M U N I T Y	H U D C A L	-X L V V	PMC	S P E R R E S O N A L	PRE SLEEP	SLEEP
PLT J. Ashby	MEAL	OMS RAM BURN KWJ	HDTV	OMS WAKE BURN ALS	MNVRCAN -Y	PHTRCNS CNFG	EXERCISE		PE A V E N T	MSX 90 DEG BURN	H E A D O N	PRE SLEEP	PRE SLEEP	PRE SLEEP	SLEEP			
MS1 C. Coleman	MEAL	LFSAH	HDTV	P/TV 04 SETUP	STILL TAPE	PRE SLEEP	O C A D N L K	PRE SLEEP	SLEEP									
MS2 S. Hawley	SWUIS CAL 3	MEAL	SWUIS CAL 4	SWUIS MOON 2	SWUIS CAL 3	SWUN UIS 3	TEMP STOW	MS T M A S T S T L	PRE SLEEP	SLEEP								
MS3 M. Tognini	MEAL	P/TV 11 SETUP	LFSAH	DTO 631	P D O T W N L I N K	P T V 1 3	C G B A T T Y	C S T B A T	PRE SLEEP	SLEEP								
DAY/NIGHT		33	34	35	36	37	38	39	40	41								
ORBIT																		
MOON UP/DOWN																		
TDRS	E																	
W																		
SPX SITES		-KWJ	-ARC					JIC		-KWJ								
ATTITUDE		-Vu1	-SPX	-Ca1	-SPX	-Moon	-Vu1	-Venus	-MSX	-HUD				-ZLV	-XVV			
Notes	CABIN TEMP CNTL RECONFIG																	



MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
002/12:00	203/16:36	203/11:36	203 CT	42.64		3/4	22 Jul 1999	STS-93	FINAL A	06/25/99
003/00:00	204/04:36	203/23:36								



MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
003/00:00	204/04:36	203/23:36	203 CT	41.06		4	22 Jul 1999	STS-93	FINAL A	06/25/99
003/12:00	204/16:36	204/11:36								

CT	07/22/99	07/23	01	01	02	02	03	03	04	04	05	05	06	06	07	07	08	08	09	09	10	10	11	11	12
FD	04	003/00	01																						
MET	Day 003																								

CDR E. Collins	DTO 631	MEAL	OMS 90 DEG ALS	PAO EVENT	MV NVR RUS	PE AV ENT	CM ST AT	PRE SLEEP	MSX WAKE BURN	ZLV XV V	PMC	PRE SLEEP	SLEEP											
PLT J. Ashby	MEAL	OMS 90 DEG ALS	HDTV	TRDMLL STOW	PE AV ENT	MS ET MA ST ST L	PRE SLEEP	MSX WAKE BURN	PRE SLEEP	SLEEP														
MS1 C. Coleman	MEAL	PGF HARVEST	EXERCISE	PGF HARVEST	CG BA TV	OC AD NL K	PRE SLEEP	SP ER SO NA L	PRE SLEEP	SLEEP														
MS2 S. Hawley	MEAL	EXERCISE (RME 1318)	SWUIS MOON 3	SV WE UN IS S 4	TEMP STOW	PRE SLEEP	SLEEP																	
MS3 M. Tognini	SWUIS CAL 5	MEAL	SWUIS CAL 6	P/TV 04 SETUP	PAO EVENT	TRDMLL STOW	CS GT BA AT	PRE SLEEP	SLEEP															
DAY/NIGHT																								
ORBIT																								
MOON UP/DOWN																								
TDRS																								
SPX SITES	-ARC -KWJ -JIC KWJ																							
ATTITUDE	-Y cal -SPX -Moon -Venus -MSX -ZLV -XVV																							
Notes	•MNVR -Y CAL ⊕ CGBA OVERNIGHT TV																							

MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
003/12:00 004/00:00	204/16:36 205/04:36	204/11:36 204/23:36	204 CT	39.37		4/5	23 Jul 1999	STS-93	FINAL A	06/25/99

CT 07/23/99 12 12 13 14 15 16 17 18 19 20 21 22 23 004/00  
 FD 04  
 MET Day 003

CDR E. Collins	SLEEP	DSO 493	POST SLEEP	CCT M B R I C	F U T U R E	C R E W P H O T O	C R E W C O N F	- Z L V	P I L O T	F C S C / O	R C I S E H O T	F M L U L T I P L E A S T S	L C - K C O M M	M E A L	FD05
PLT J. Ashby	SLEEP	DSO 493	POST SLEEP	H 2 O I N I T	H 2 O T E R M	C R E W P H O T O	C R E W C O N F	S T I L T A P E	P I L O T	F C S C / O	R C I S E H O T	S T I L T A P E	F M L U L T I P L E A S T S	M E A L	F L E E D C E L L
MS1 C. Coleman	SLEEP	DSO 493	POST SLEEP	O C A D N L K	P / T V 0 4 S E T U P	C R E W P H O T O	C R E W C O N F	P S T I A M	P T V 0 7 D P S	E X E R C I S E	D S O 6 3 1 ( E O M - 1 )	M E A L	C A B I N S T O W		
MS2 S. Hawley	SLEEP	DSO 493	POST SLEEP	S P A R R E S O N A L	C R E W P H O T O	C R E W C O N F	M S T A S T	F C S C / O	E X E R C I S E	R C I S E H O T	M E A L				
MS3 M. Tognini	SLEEP	DSO 493	POST SLEEP	P S H O T O P	C R E W P H O T O	C R E W C O N F	E X E R C I S E	C S T B A T	P / T V 1 3	C G B A T V	D S O 6 3 1 ( E O M - 1 )	M E A L	S S A T R O W E X		
DAY/NIGHT															
ORBIT															
MOON UP/DOWN															
TDRS															
SPX & GSTDN	-JIC -MIL -ARC -MIL -MIL -DFR -MIL -DFR														
ATTITUDE	-ZLV -XVV -ZLV +YVV -ZLV -XVV														
Notes	WEST & EAST COAST PASS CGBA video thru Middeck														

06/25/99 14:03:37

MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
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004/12:00	205/16:36	205/11:36								

CT	FD	MET	07/23/99	07/24	01	02	03	04	05	06	07	08	09	10	11	12
05	05	Day 004	004/00	01	02	03	04	05	06	07	08	09	10	11	12	
CDR E. Collins			OMS BURN ARC	EXERCISE	CCM ST AT	LB - / U COMM	D/O PREP REVIEW	OST AOCW	RCS BURN	-- ZYLVV	PRE SLEEP	PMC	PRE SLEEP	SLEEP		
PLT J. Ashby			OMS BURN ARC	EXERCISE			D/O PREP REVIEW	ERGO CABIN STOW	RCS BURN		PRE SLEEP		SLEEP			
MS1 C. Coleman			CABIN STOW	CABIN STOW	PC A D N L K	MS ET M ST	D/O PREP REVIEW	ERGO CABIN STOW	OST AOCW	CABIN STOW	PRE SLEEP		SLEEP			
MS2 S. Hawley			CABIN STOW		SE N T R Y	OC A D N L K	D/O PREP REVIEW	CS LT R O P W	CABIN STOW		PRE SLEEP		SLEEP			
MS3 M. Tognini			CABIN STOW		CG BA T	CG BA T	D/O PREP REVIEW	CABIN STOW	H S A M P L E		PRE SLEEP		SLEEP			
DAY/NIGHT			[Bar chart showing day/night cycle]													
ORBIT			[Bar chart showing orbit parameters]													
MOON UP/DOWN			[Bar chart showing moon phases]													
TDRS			[Bar chart showing TDRS contacts]													
SPX & GSTDN			[Bar chart showing SPX and GSTDN events]													
ATTITUDE			[Bar chart showing attitude changes]													
Notes			@SAREX STOW WEST & EAST COAST PASS CGBA video thru Middeck													

MET	GMT	CT	DOY	BETA	MOON	FLIGHT DAY	HOUSTON DATE	IDENTIFIER	EDITION	PUB. DATE
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005/00:00	206/04:36	205/23:36								

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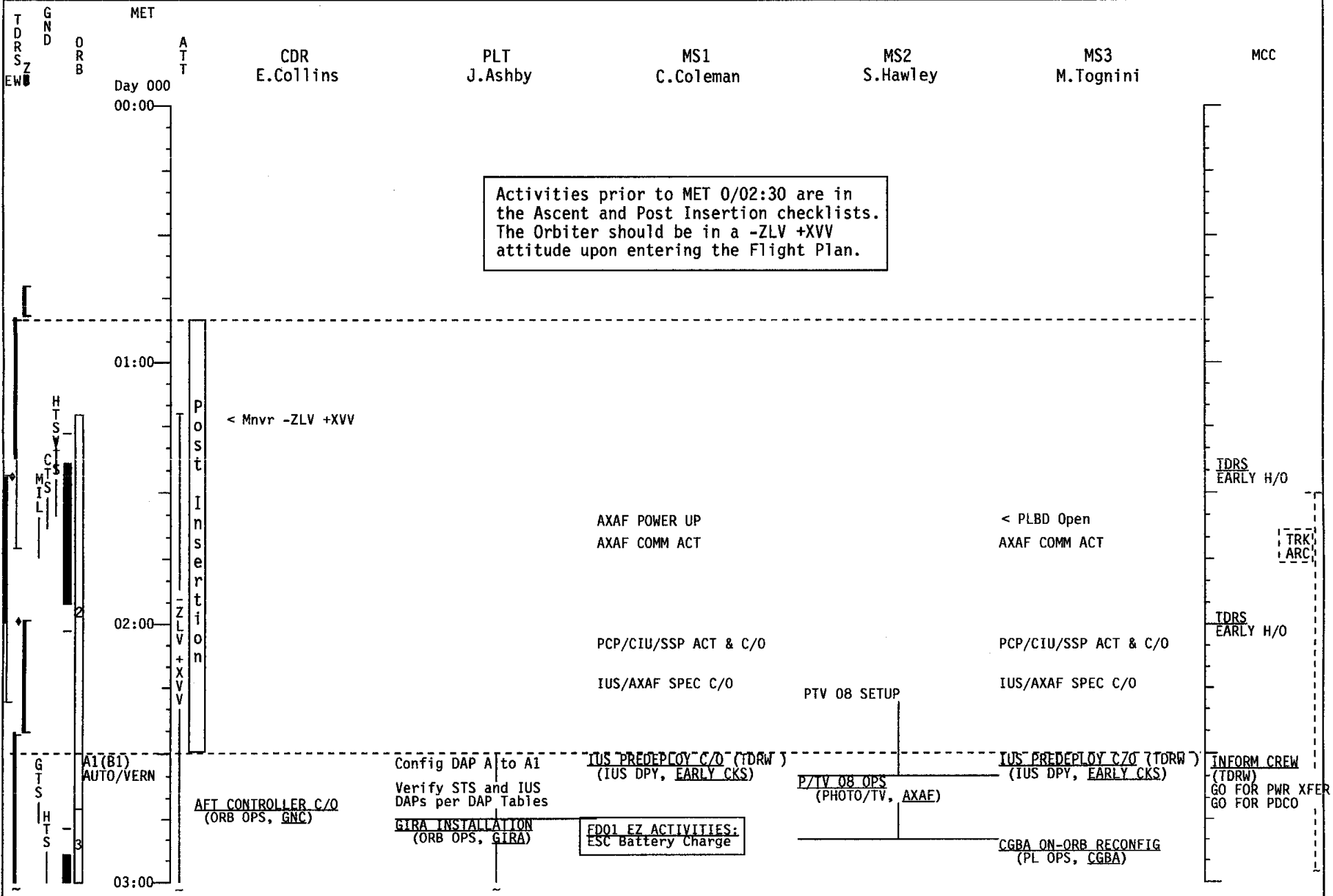
CDR E. Collins	SLEEP	FD06	DSO 493	POST SLEEP	PC RO IN F M E D	PWR UP GRP B	IMU ALIGN & VERIF	M- N X S I	DEORBIT PREP		
PLT J. Ashby	SLEEP		DSO 493	POST SLEEP				T A N K C	DEORBIT PREP		L A N D I N G
MS1 C. Coleman	SLEEP		DSO 493	POST SLEEP	DSO 631	POST SLEEP	C A S I M P L E		DEORBIT PREP		
MS2 S. Hawley	SLEEP		DSO 493	POST SLEEP			DSO 331 PREP		DEORBIT PREP		
MS3 M. Tognini	SLEEP		DSO 493	POST SLEEP	DSO 631		DSO 331 PREP		DEORBIT PREP		
DAY/NIGHT	[Bar chart showing day/night cycle]										
ORBIT	[Bar chart showing orbit parameters]										
MOON UP/DOWN	[Bar chart showing moon up/down cycle]										
TDRS	[Bar chart showing TDRS coverage]										
SPX SITES	-JIC -ARC -KWJ										
ATTITUDE	-ZLV -YVV -IMU -XSI -COMM D/O										
Notes	Isolate Tank C										Landing: 4/22:56

DETAILED TIMELINE

DETAILED  
TIMELINE

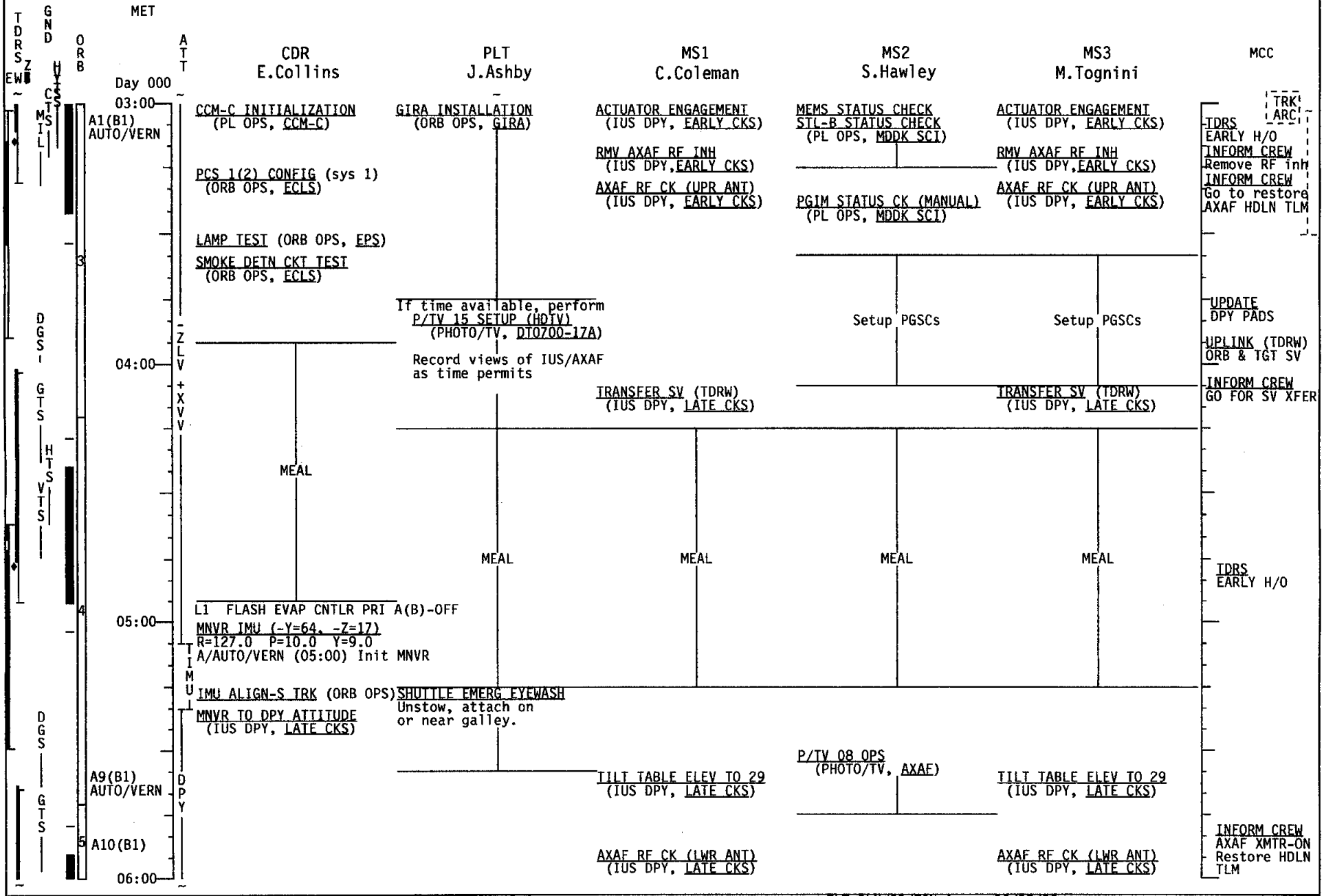
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# STS-93 (FD01)





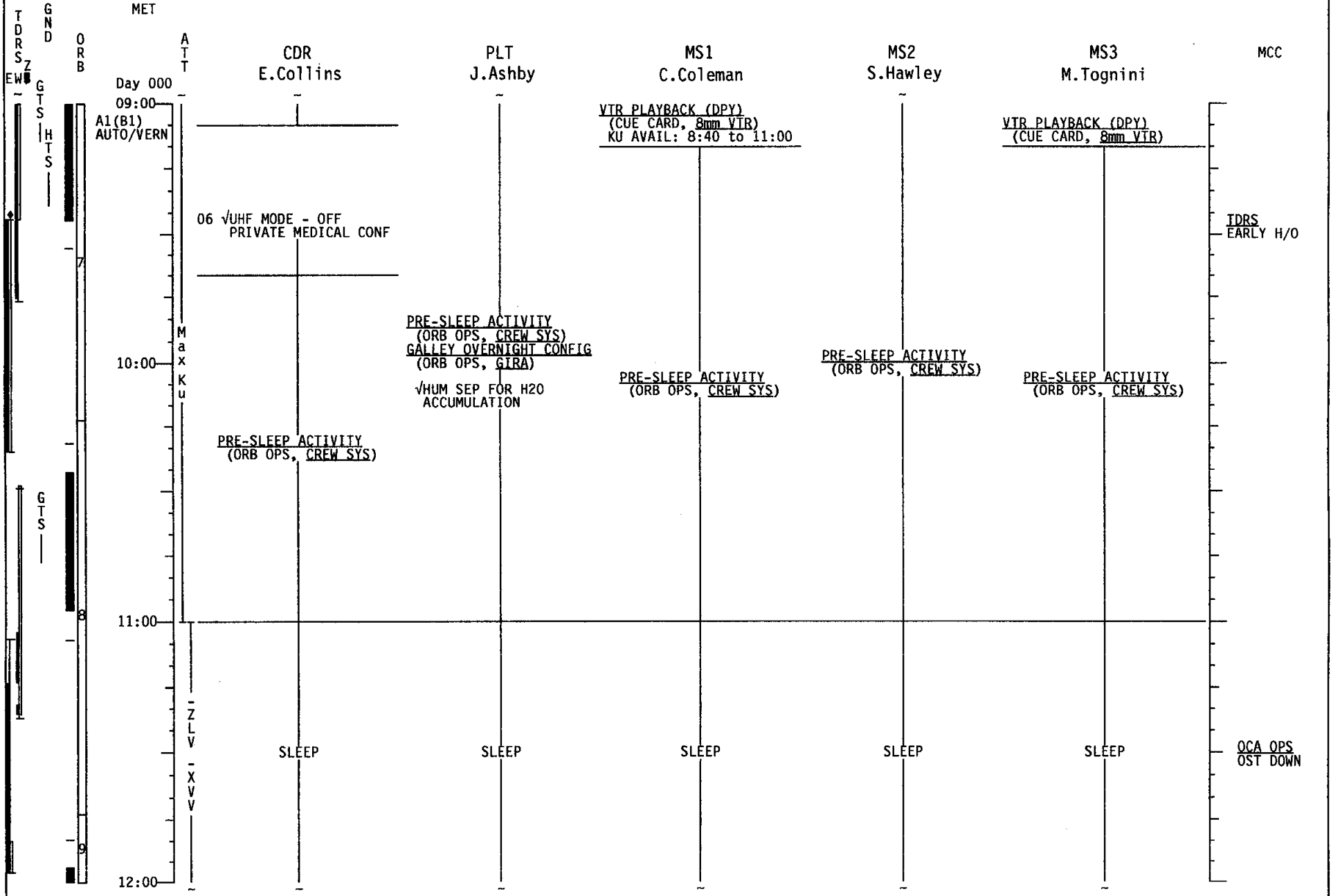
# STS-93 (FD01)



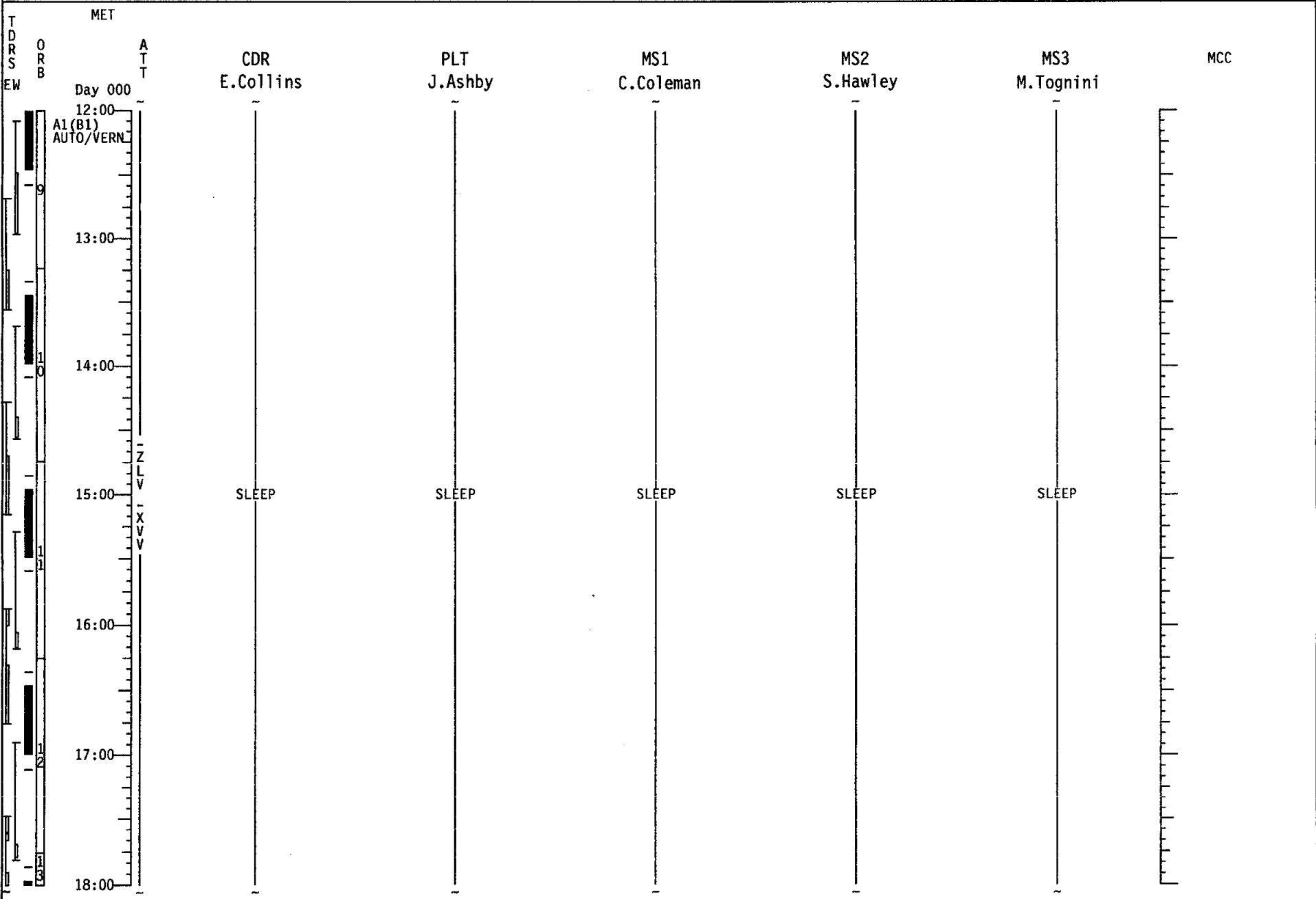
STS-93 (FD01)

		MET		CDR	PLT	MS1	MS2	MS3	MCC	
				E.Collins	J.Ashby	C.Coleman	S.Hawley	M.Tognini		
TDRSZ GND ORB A10(B1) AUTO/VERN Day 000 06:00 A11(B1) AUTO/VERN 07:00 (A11)B1 (A11)B1 INRTL/VERN 08:00 A1(B1) AUTO/VERN 09:00	HTS VTS DGS GTS HTS WPA Max KU	06:00			<u>APU RECONFIG</u> R2 BLR PWR (three) - OFF A12 APU HTR GG/FU (three) -A AUTO	<u>TRANSFER SV (TDRW)</u> (IUS DPY, LATE CKS)  <u>IUS/PI LOCK</u> (IUS DPY, LATE CKS)		<u>TRANSFER SV (TDRW)</u> (IUS DPY, LATE CKS)  <u>IUS/PI LOCK</u> (IUS DPY, LATE CKS)	<u>UPDATE</u> <u>DPY/BURN PADS</u> <u>UPLINK (TDRW)</u> <u>ORB &amp; TGT SV</u>  <u>INFORM CREW</u> Go for SV XFER	
		DPY								

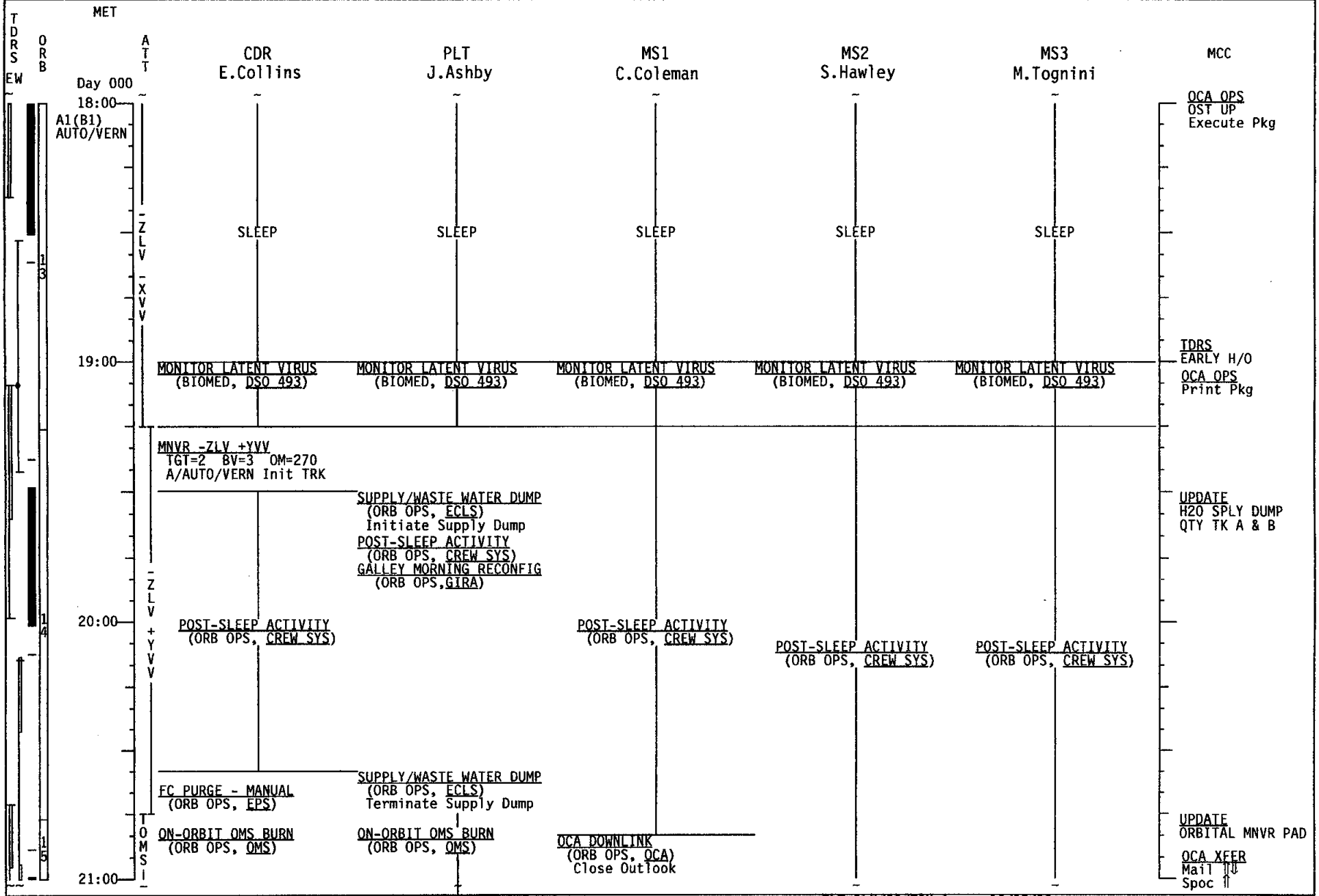
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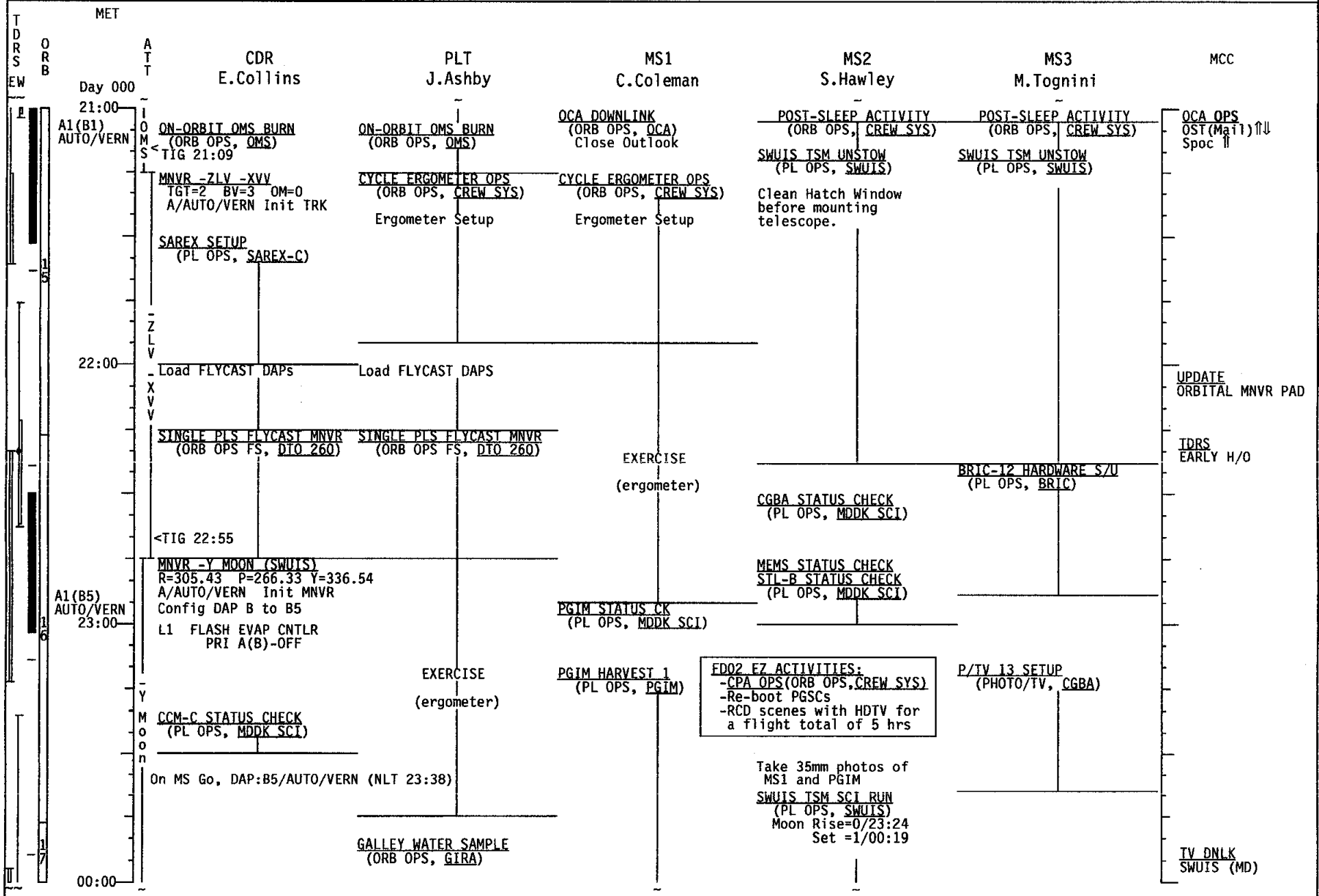
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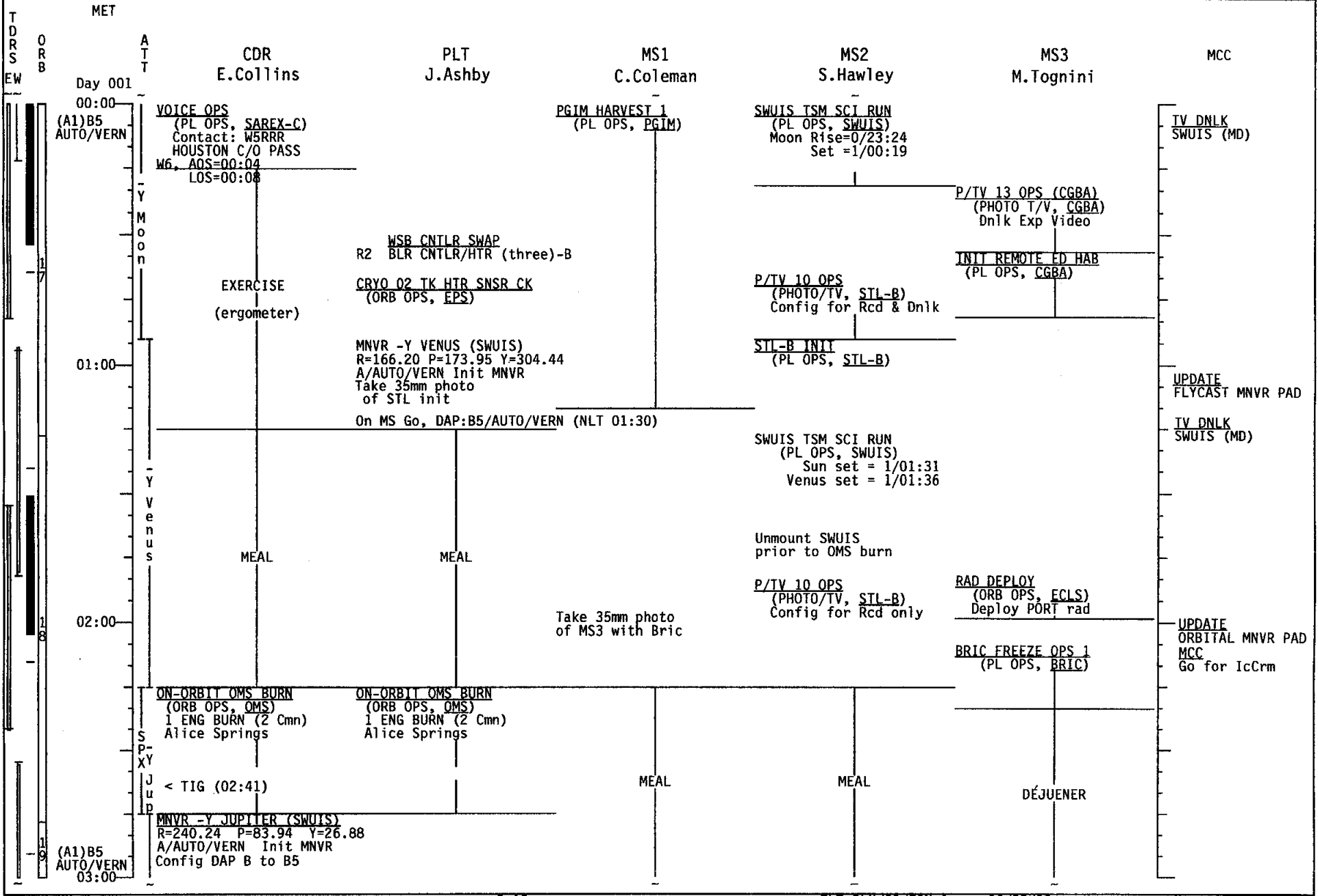
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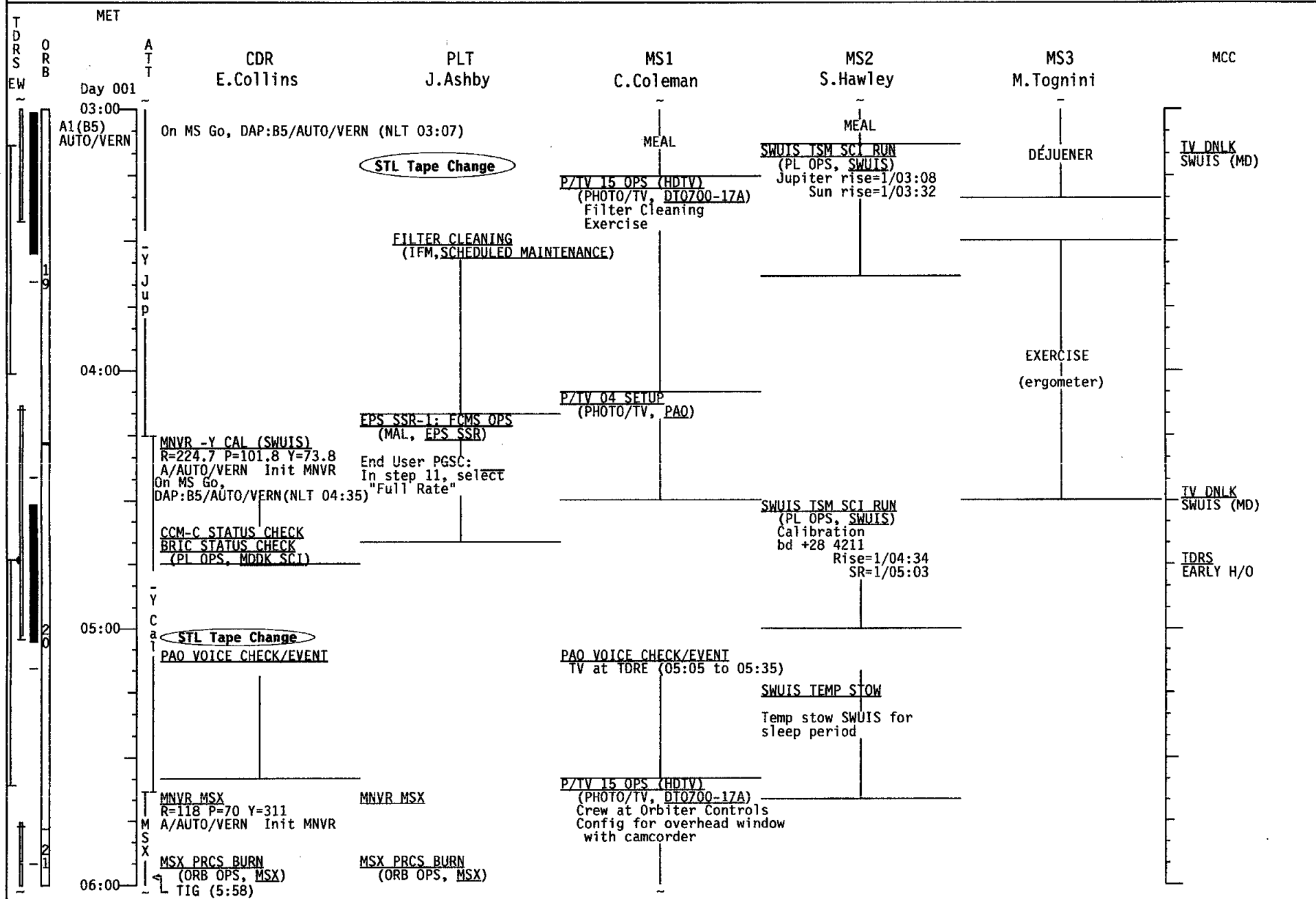
# STS-93 (FD02)



# STS-93 (FD02)

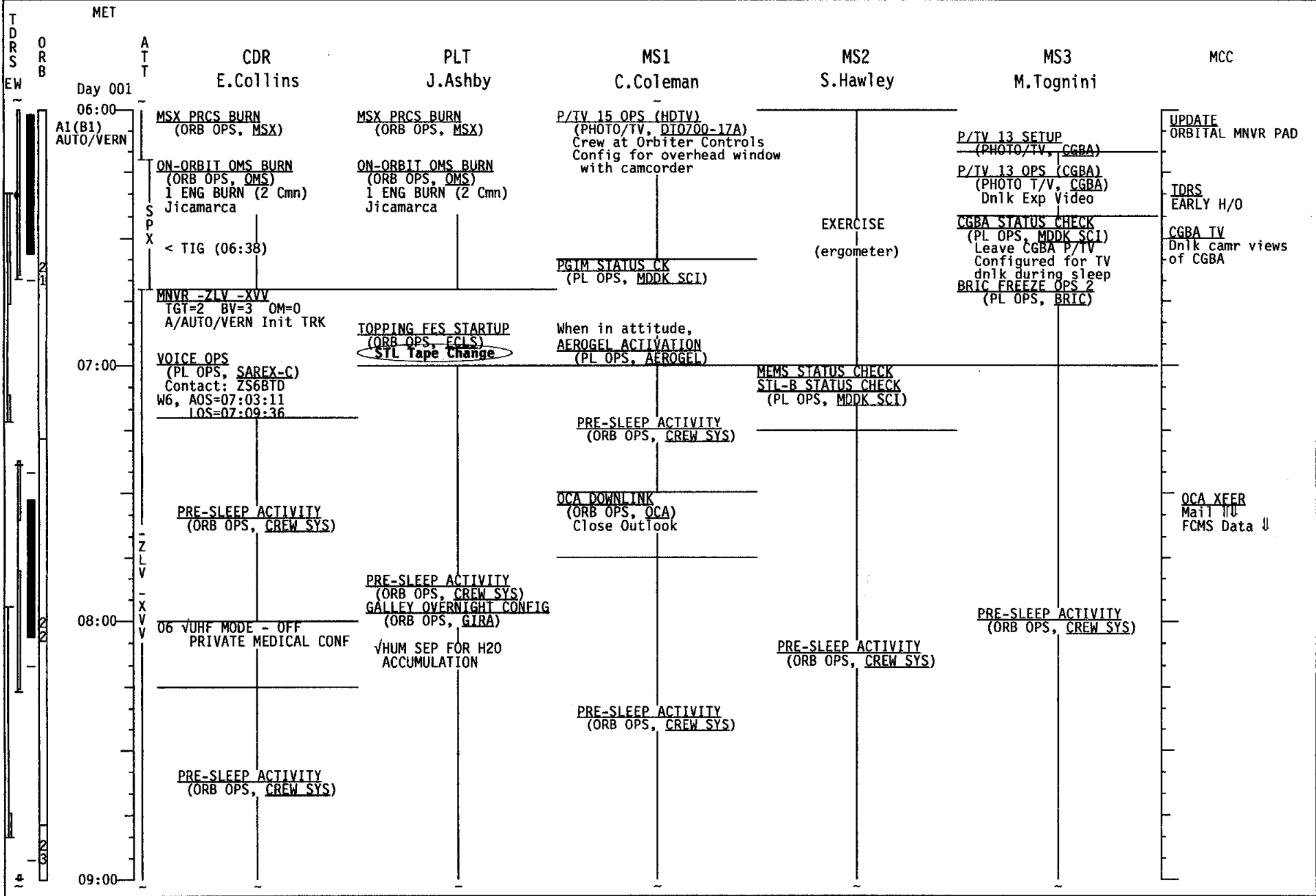


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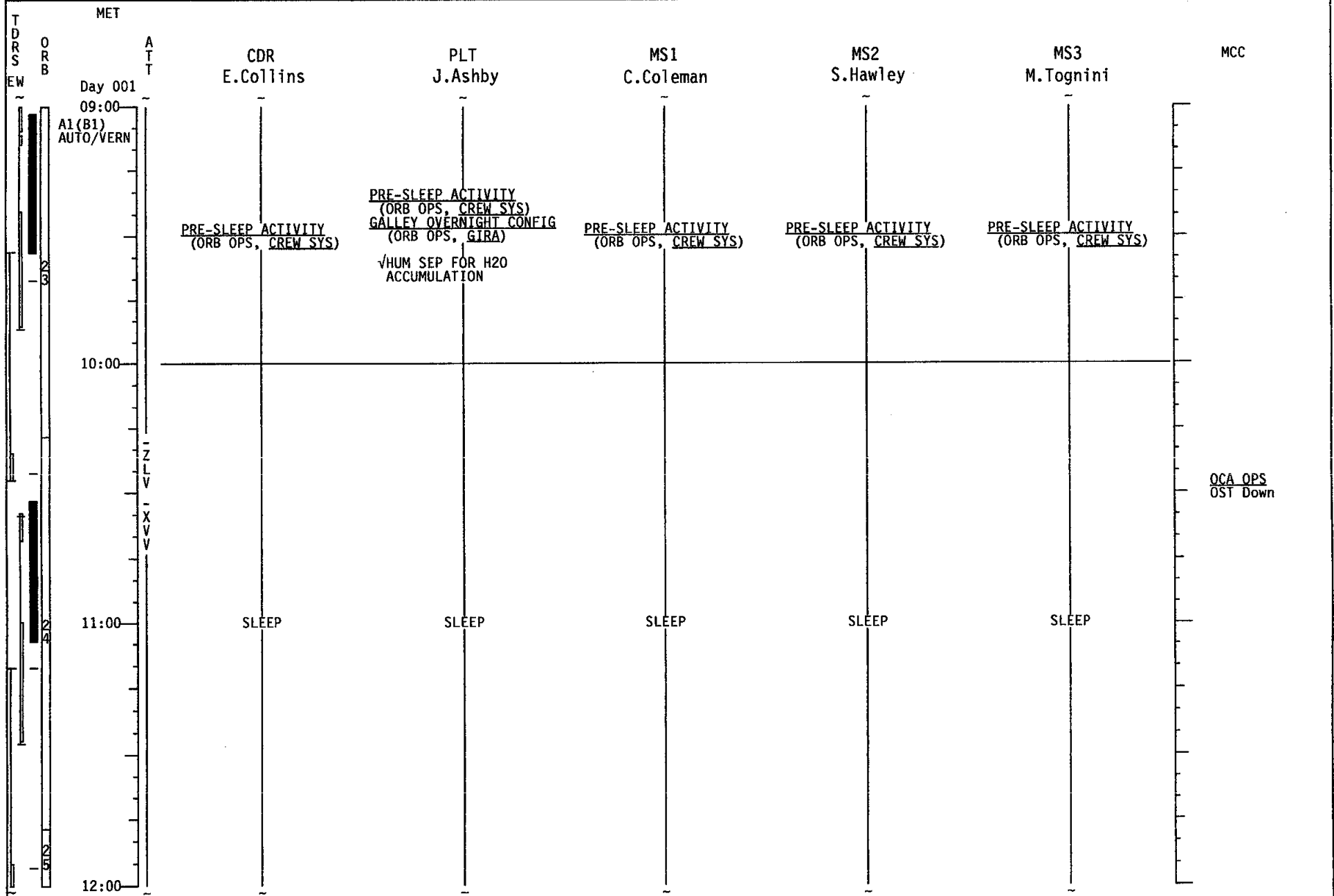




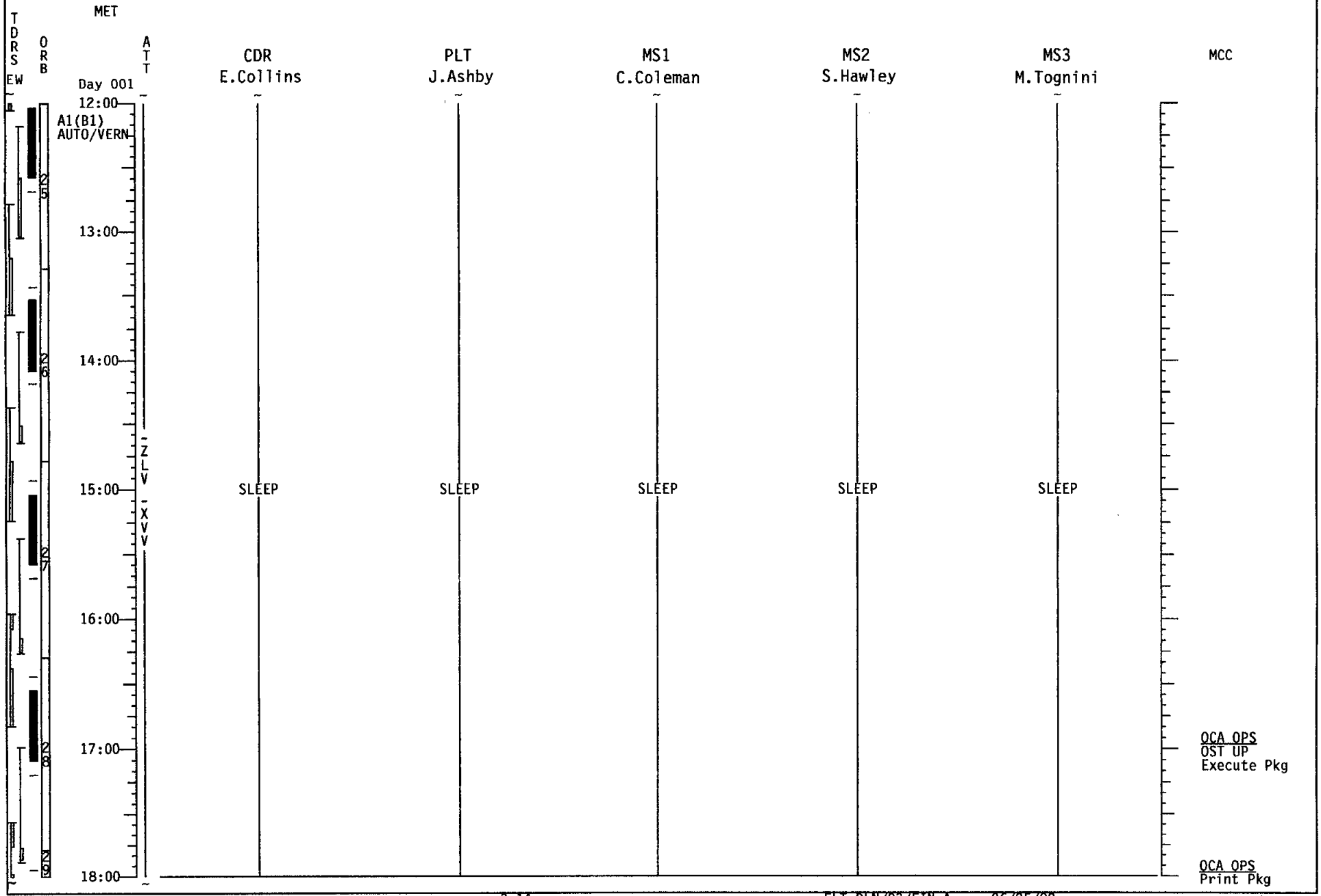
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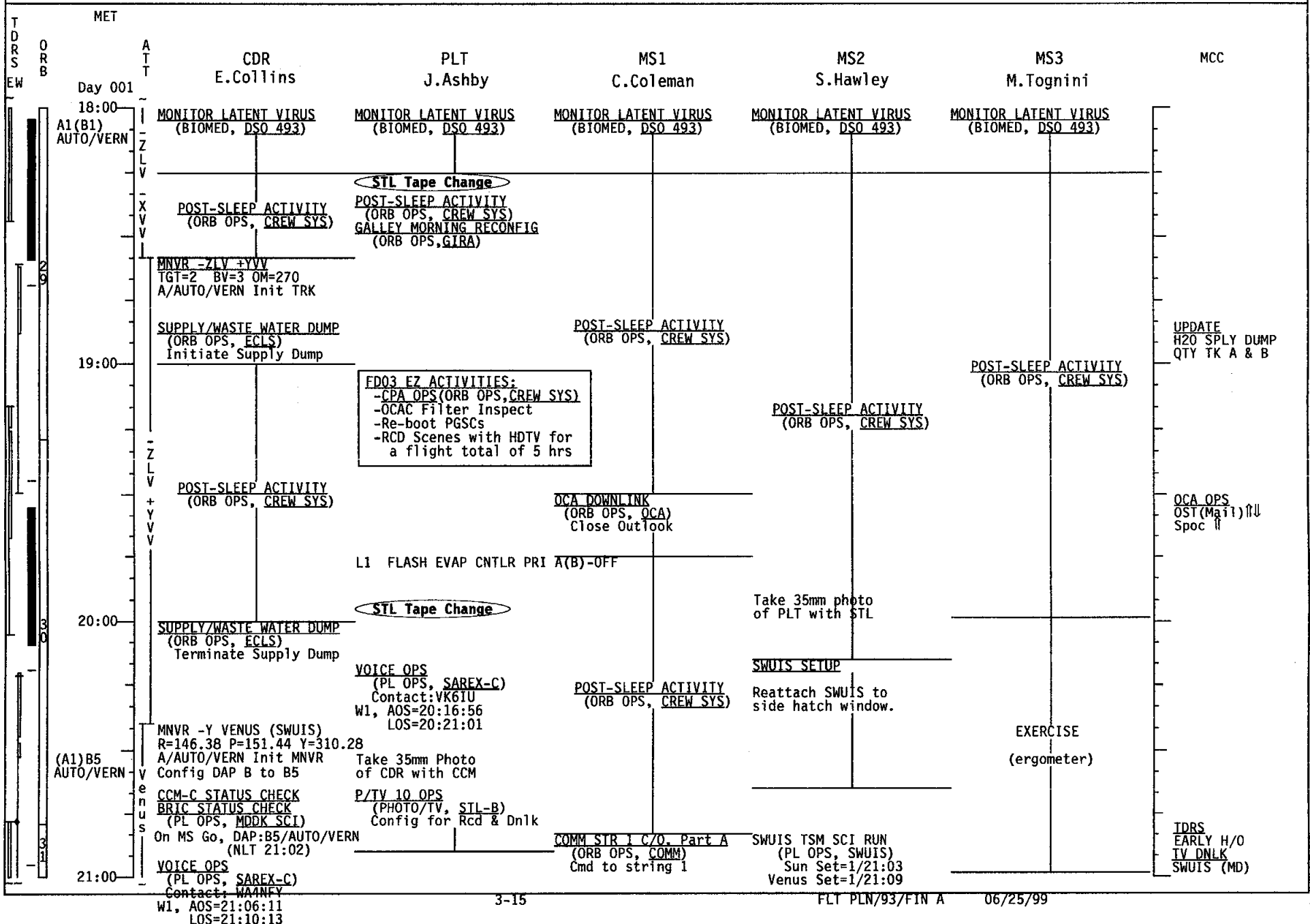
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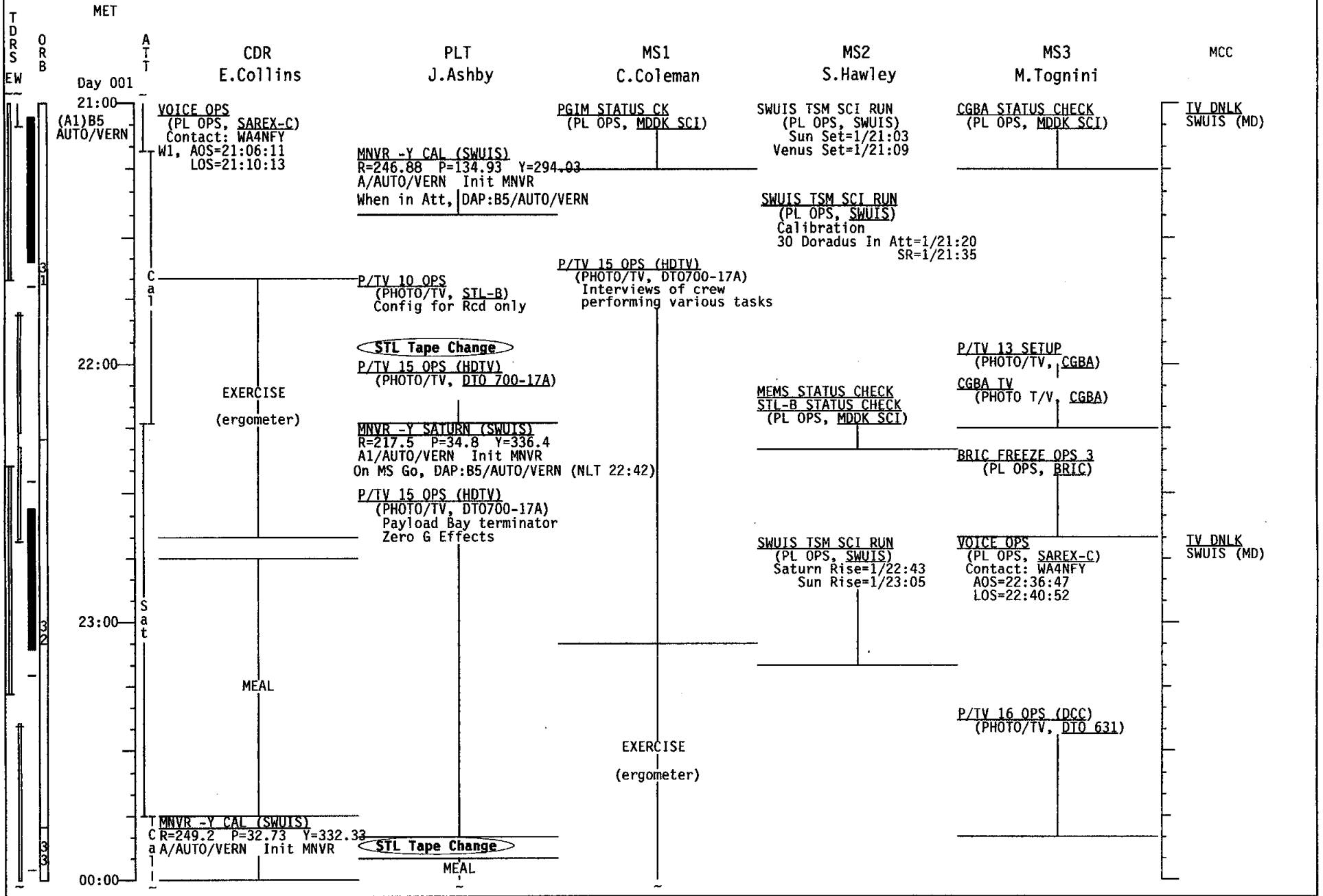
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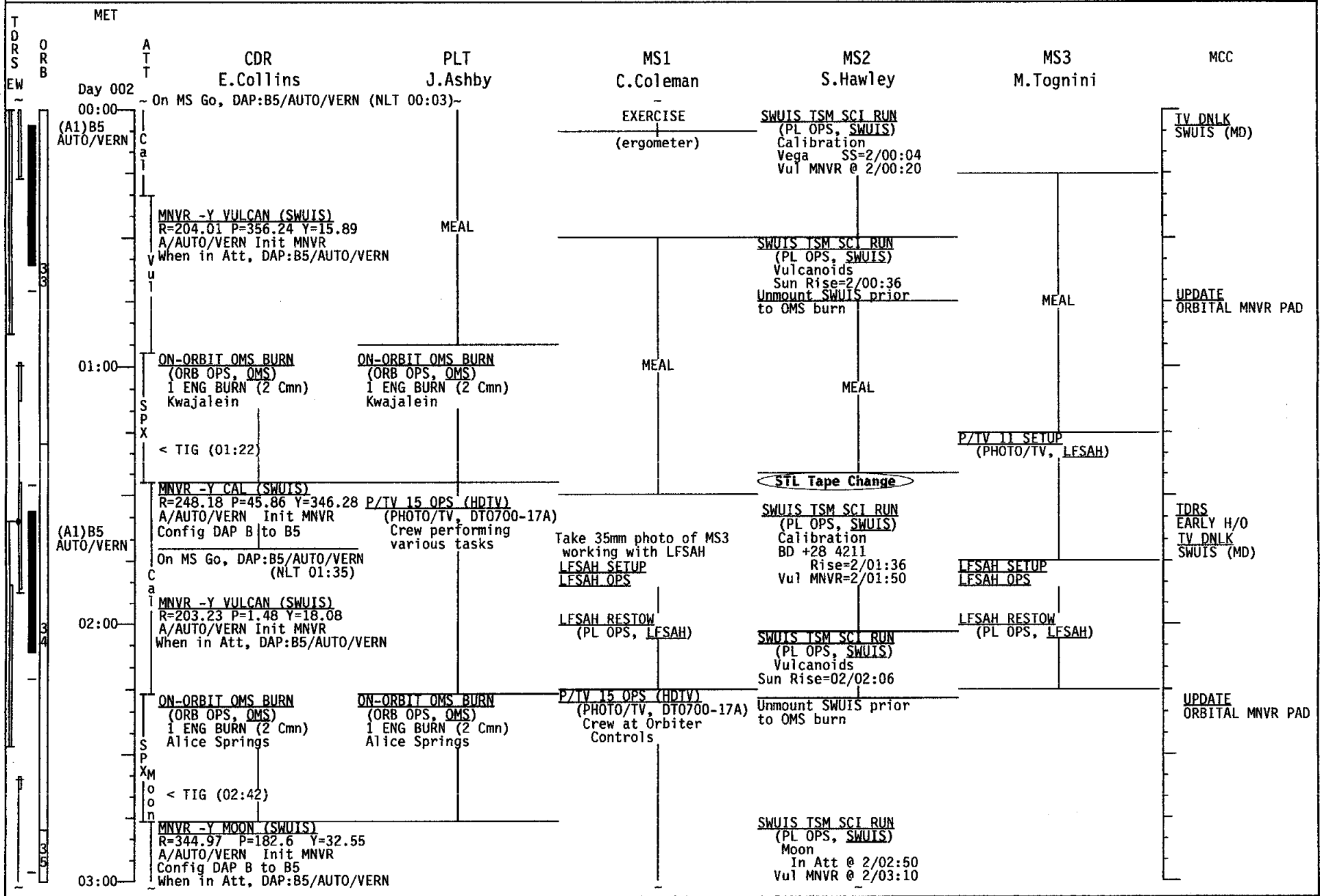
# STS-93 (FD03)



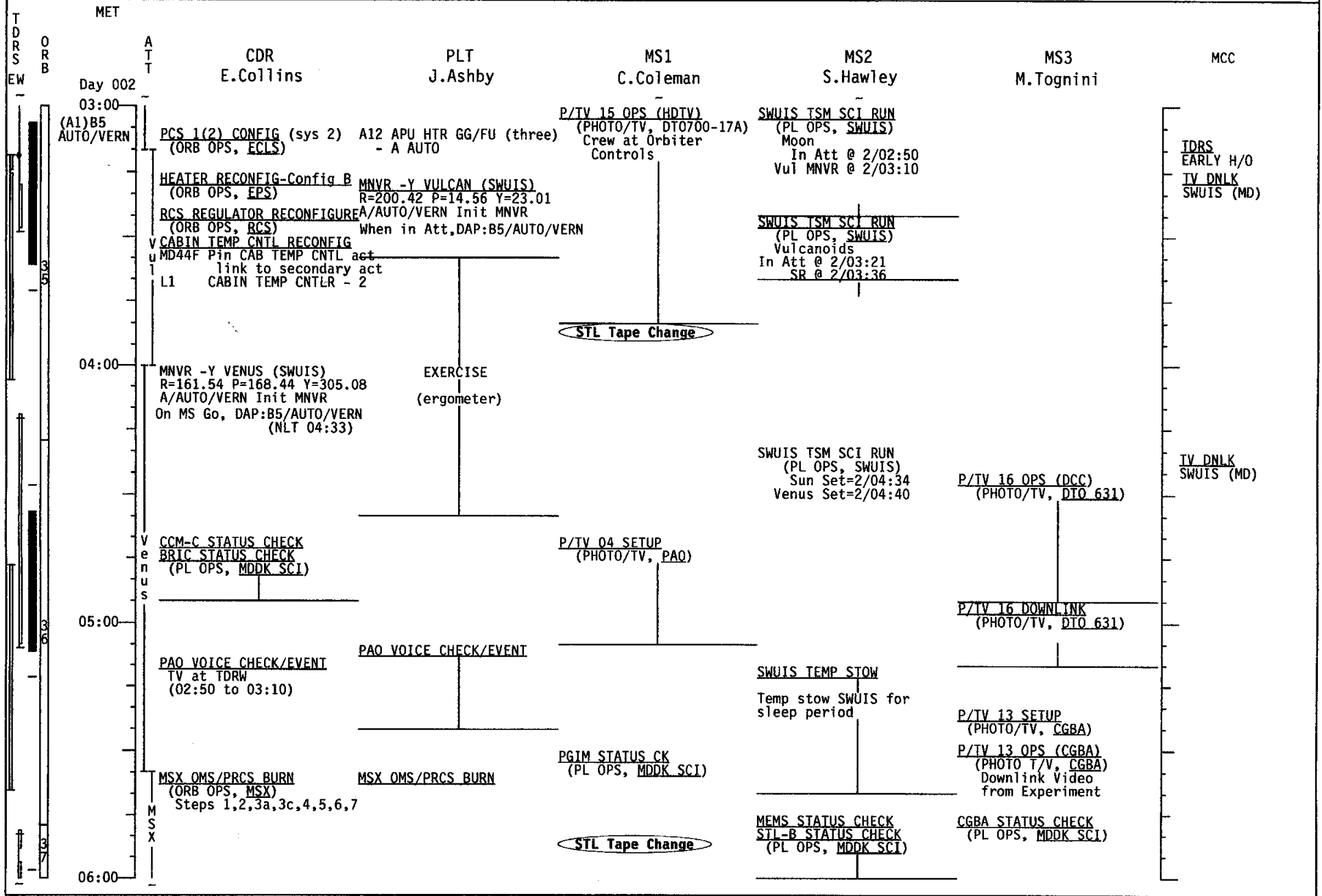
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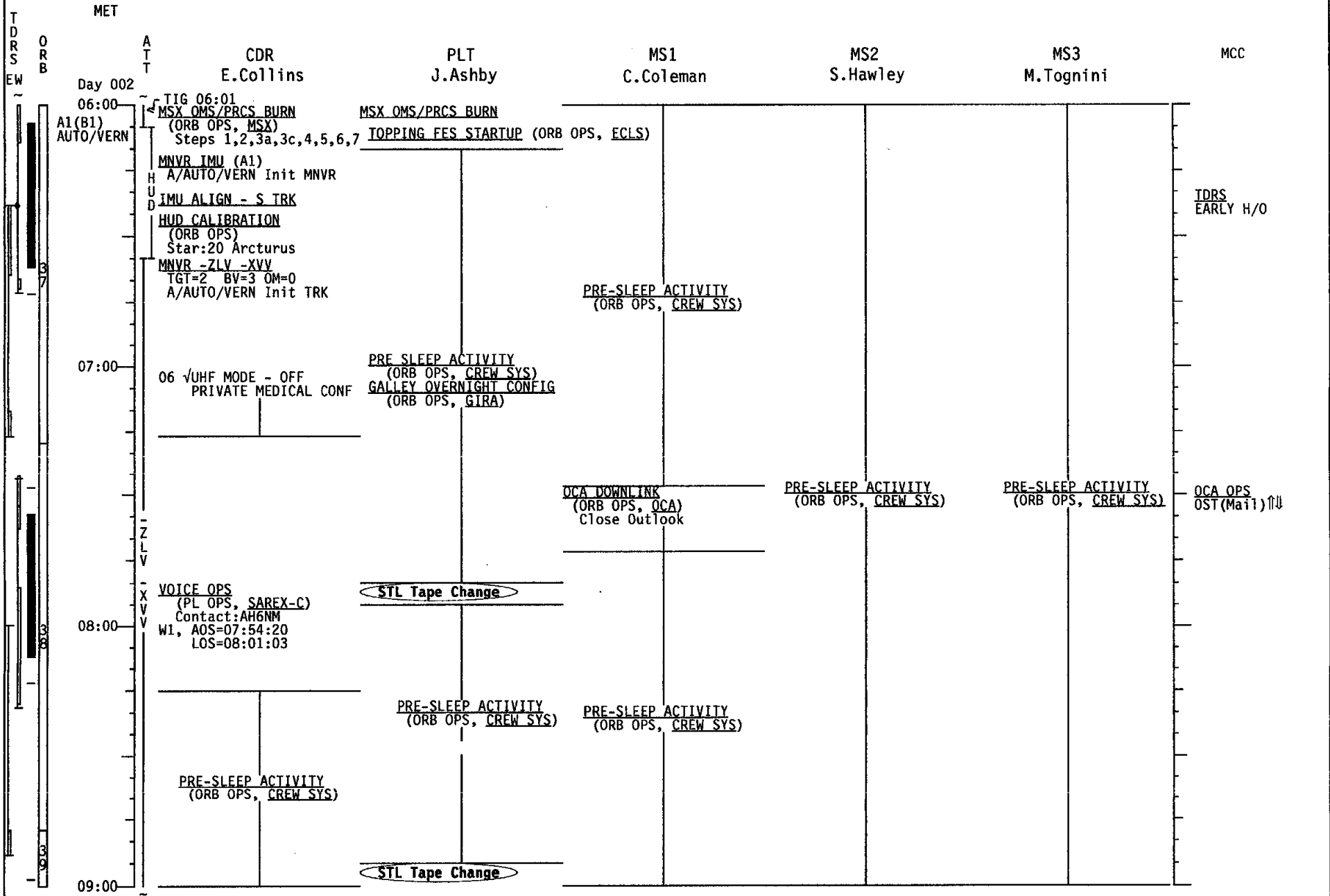
STS-93 (FD03)



# STS-93 (FD03)

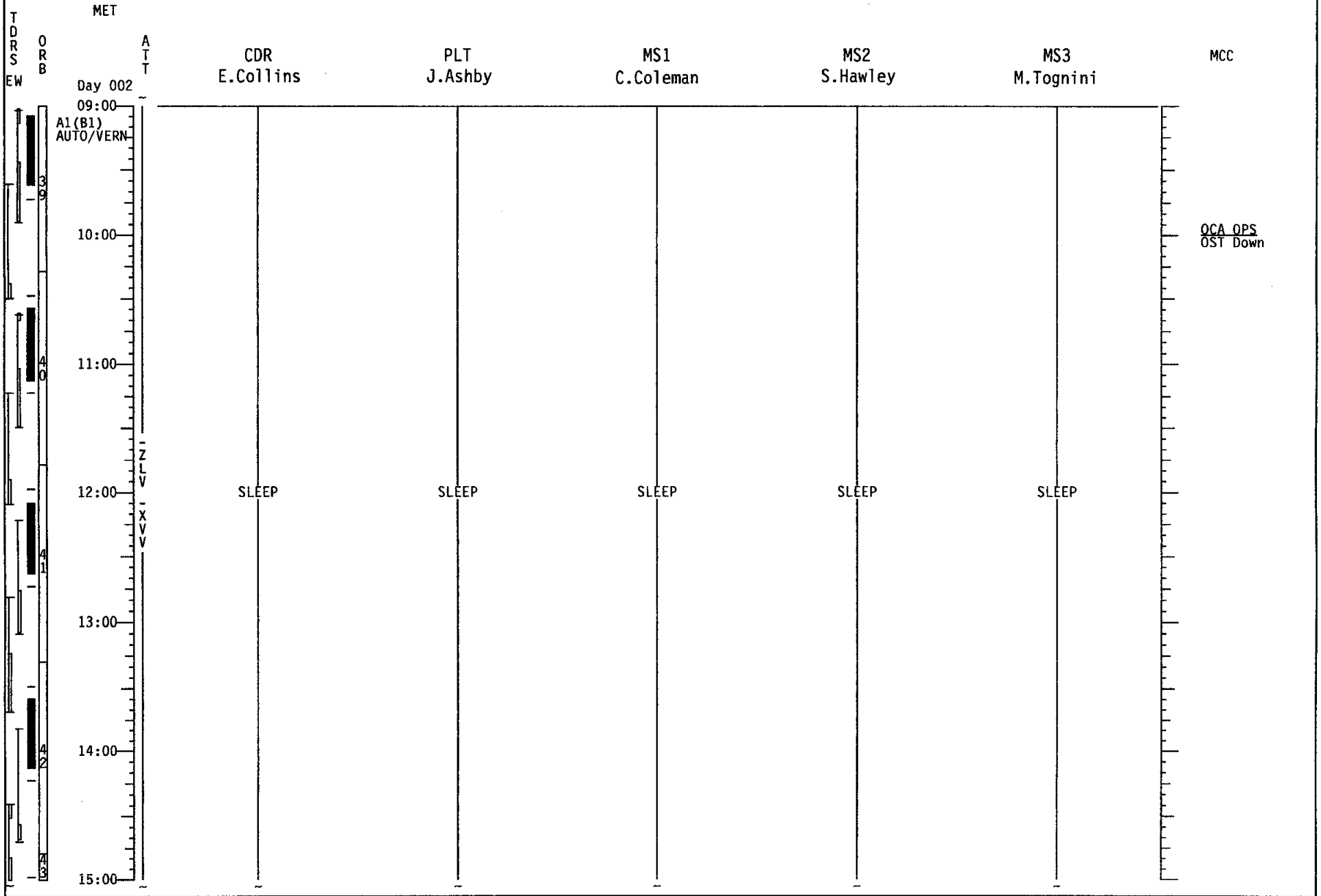


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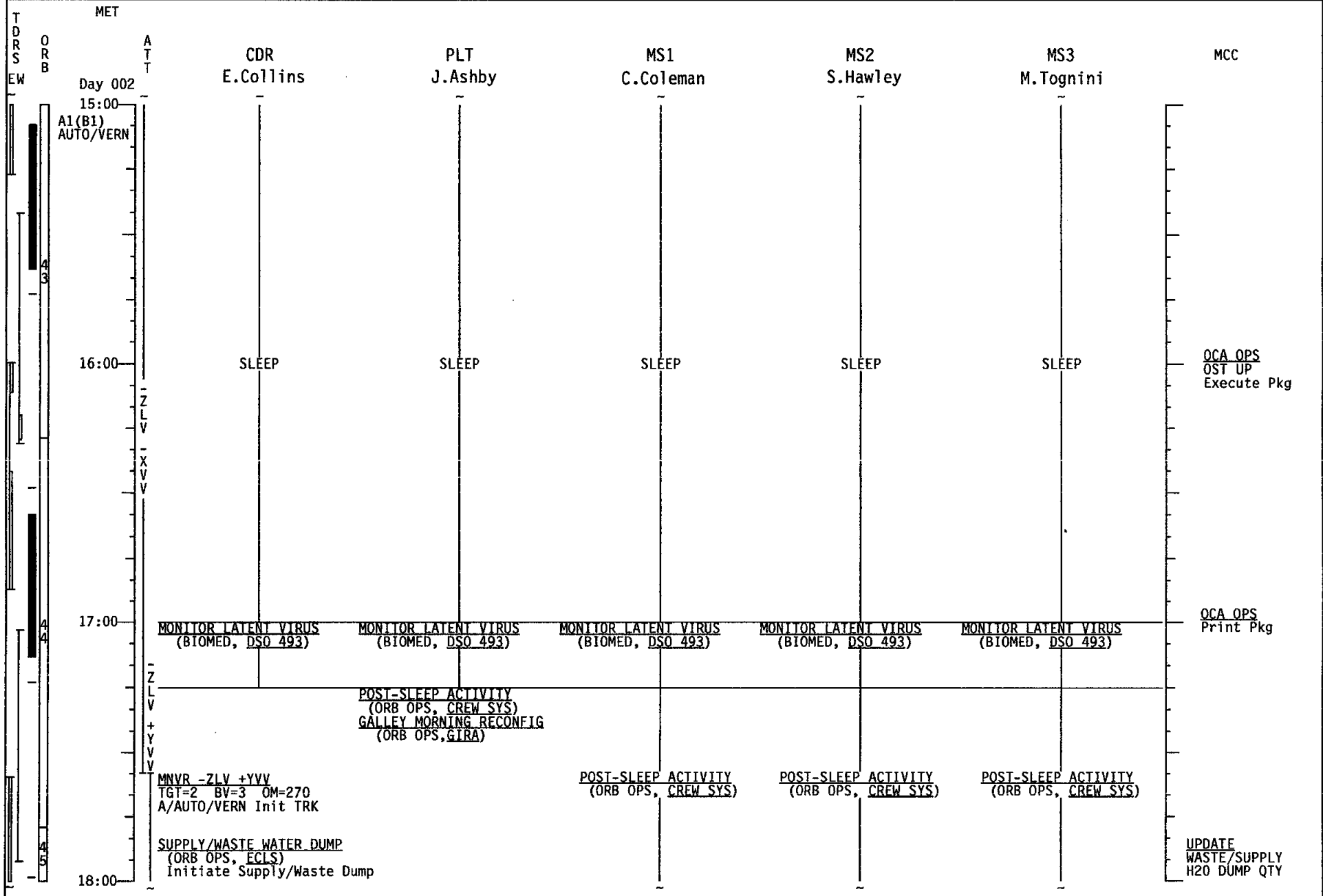




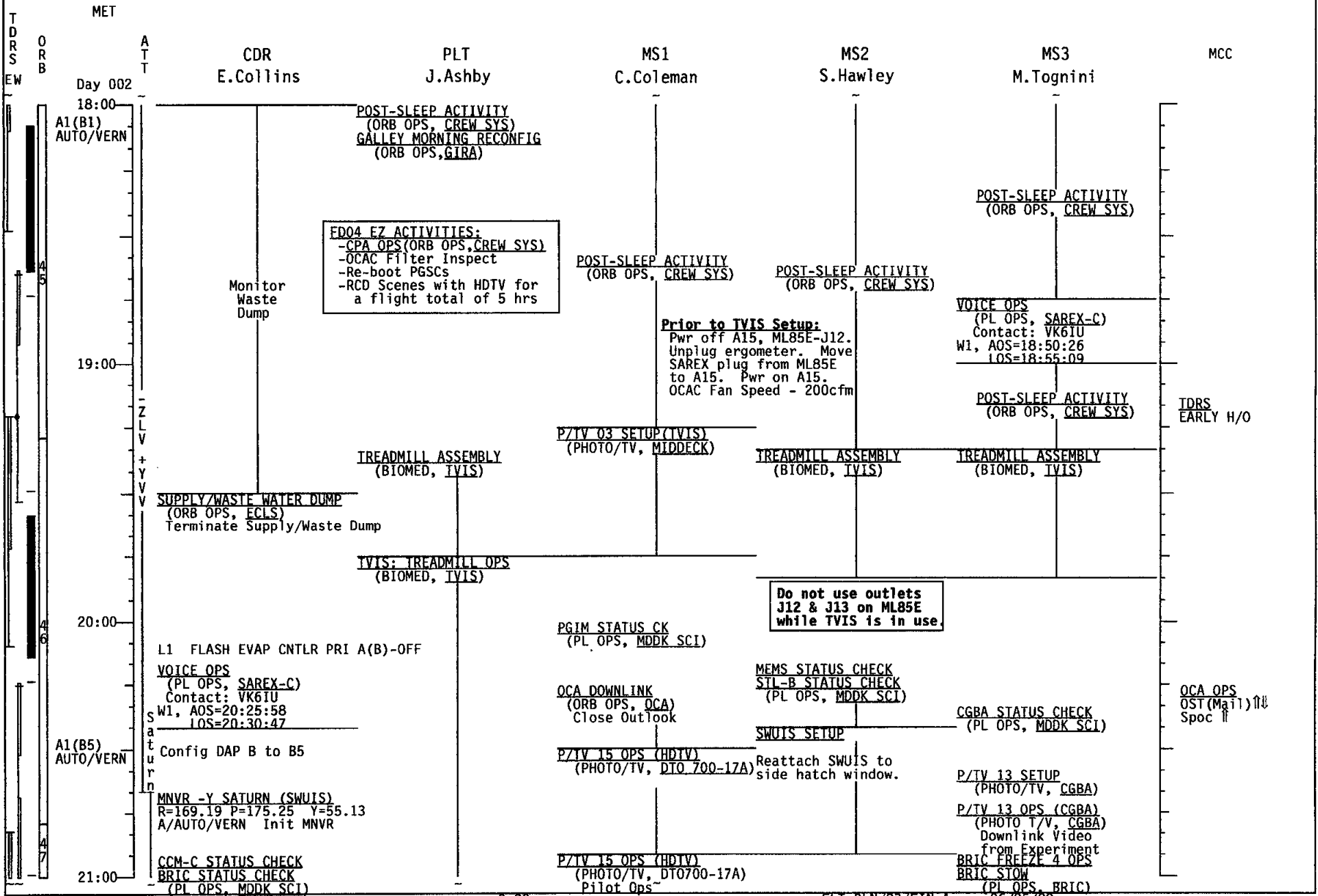
# STS-93 (FD03)



# STS-93 (FD04)



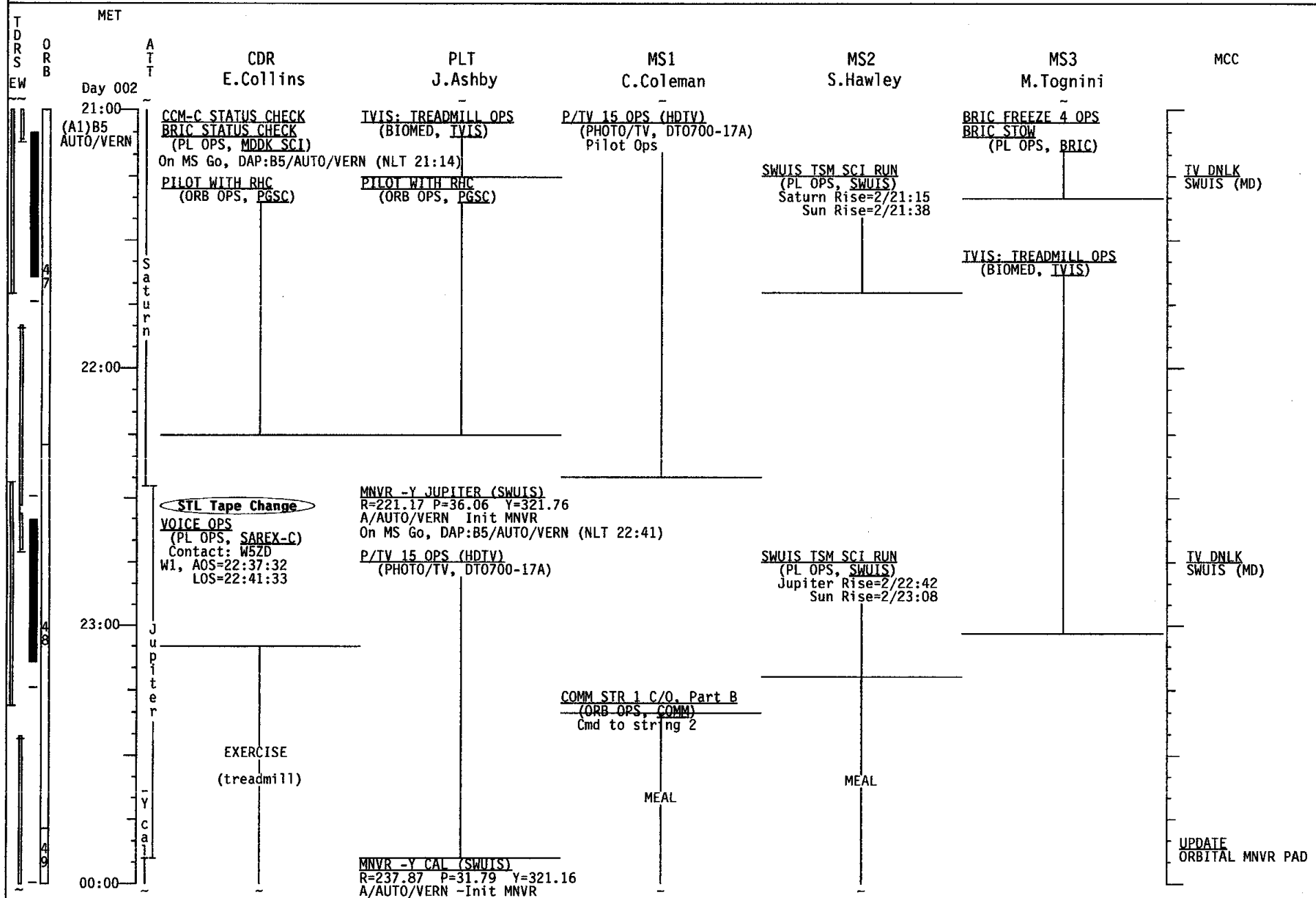
# STS-93 (FD04)



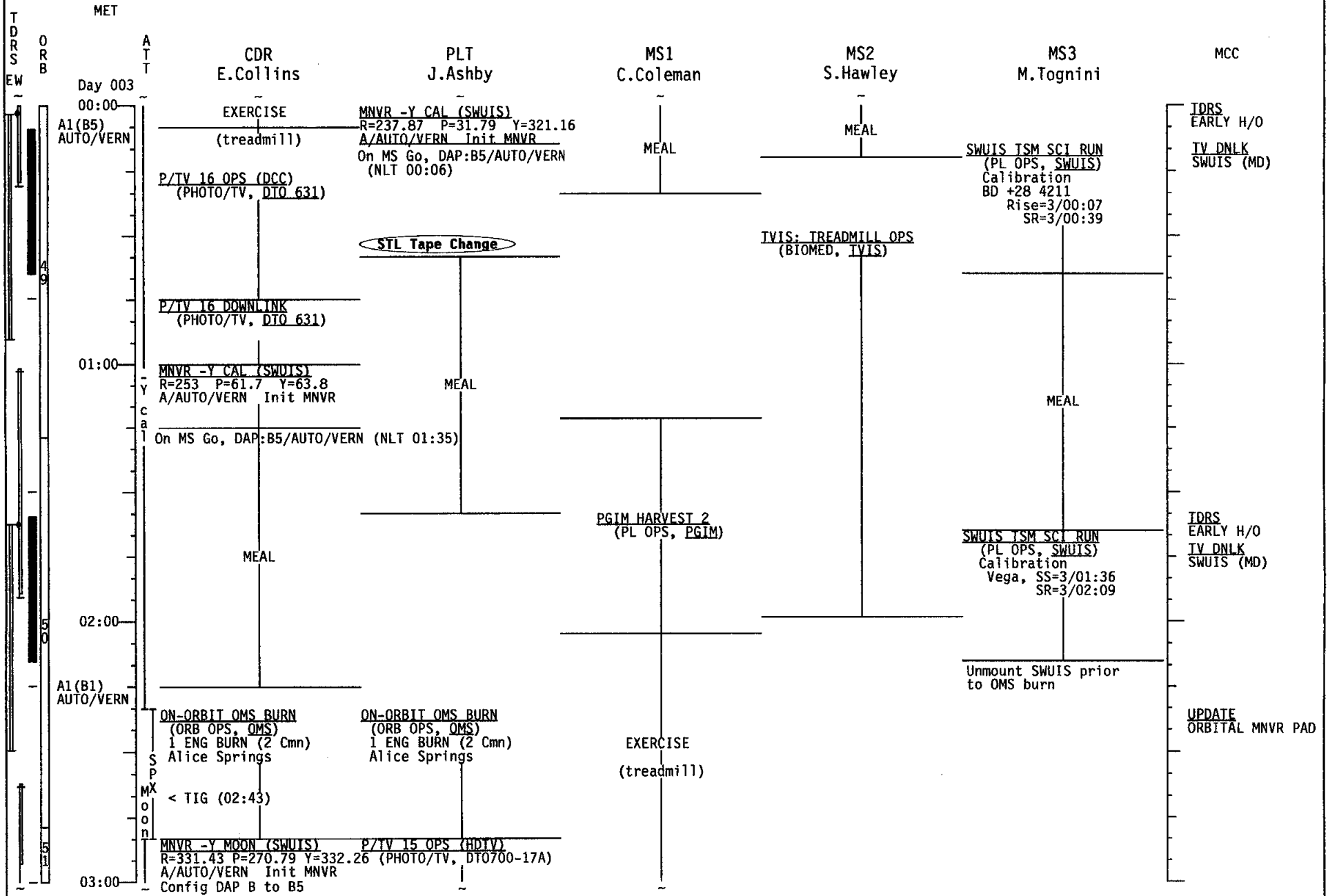
**FD04 EZ ACTIVITIES:**  
 -CPA OPS (ORB OPS, CREW SYS)  
 -OCAC Filter Inspect  
 -Re-boot PGSCs  
 -RCD Scenes with HDTV for a flight total of 5 hrs

**Do not use outlets J12 & J13 on ML85E while TVIS is in use.**

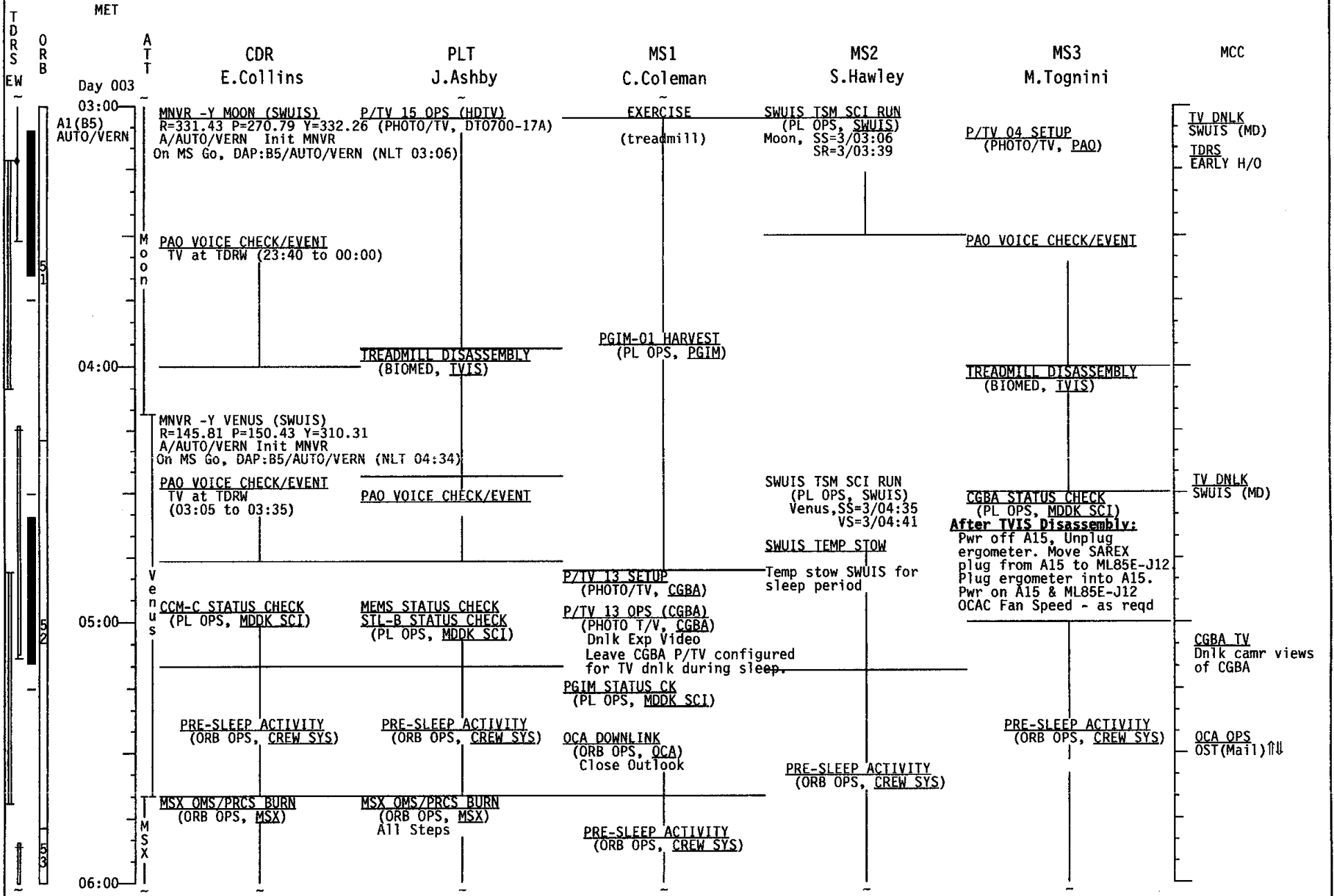
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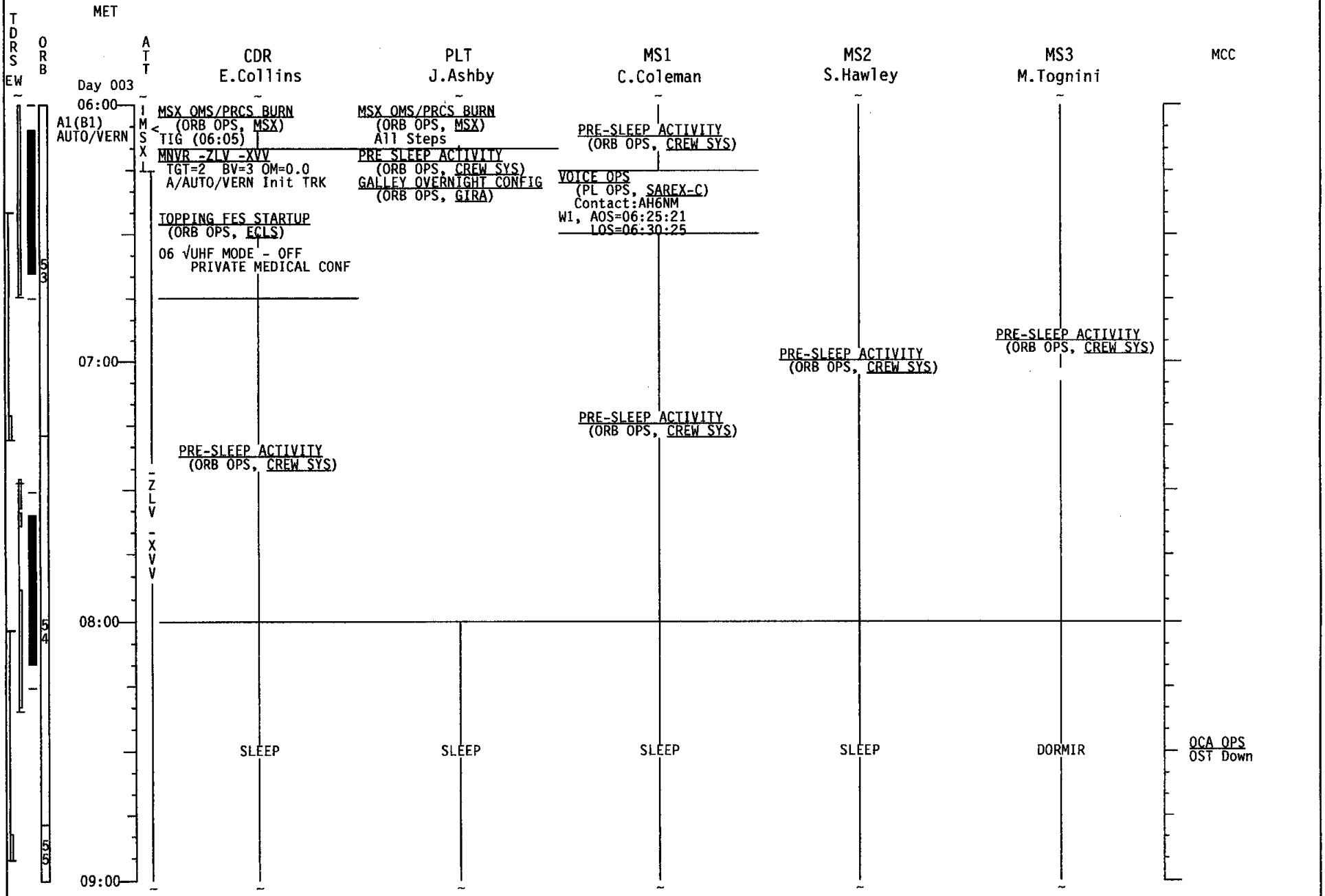
# STS-93 (FD04)



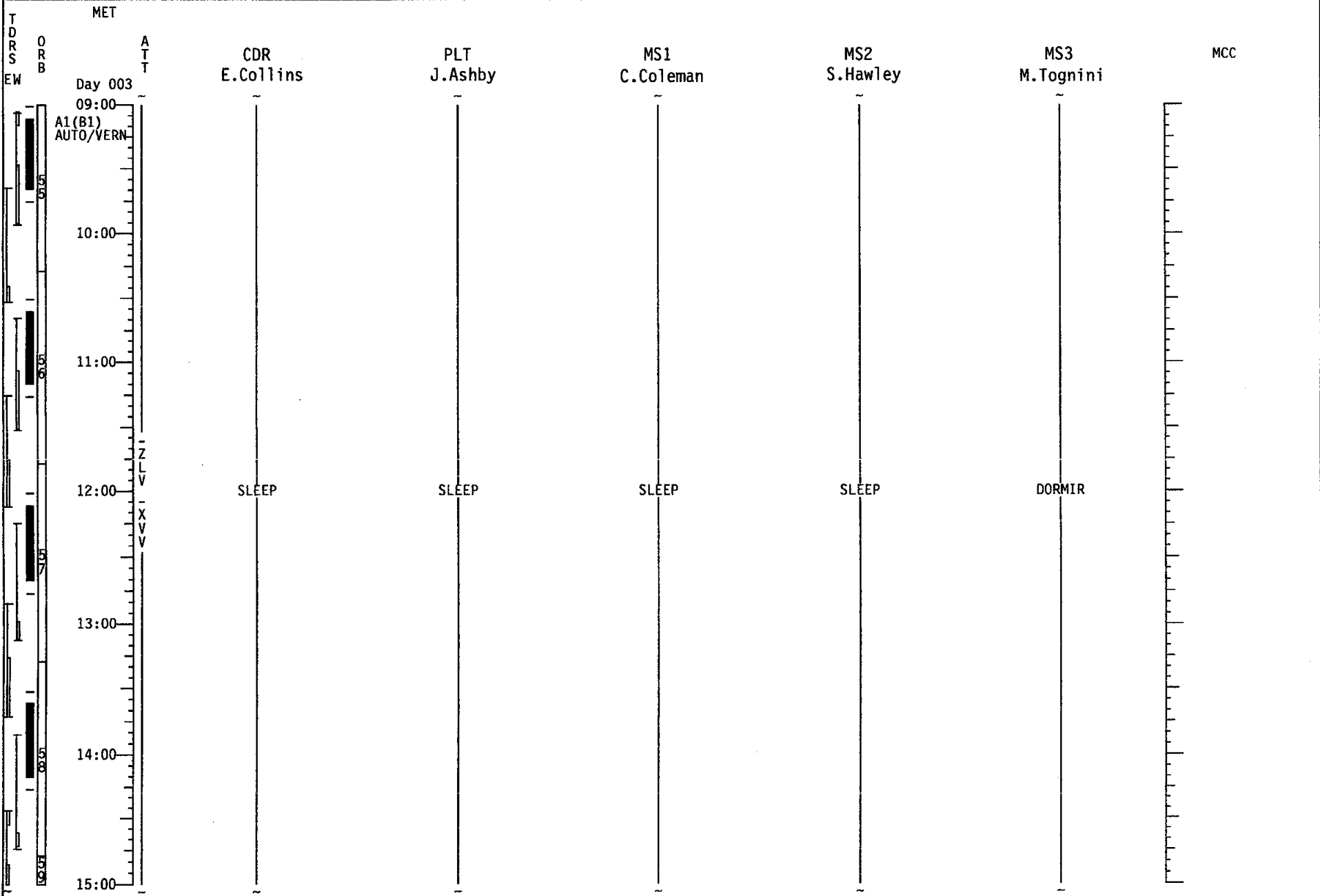
# STS-93 (FD04)



# STS-93 (FD04)

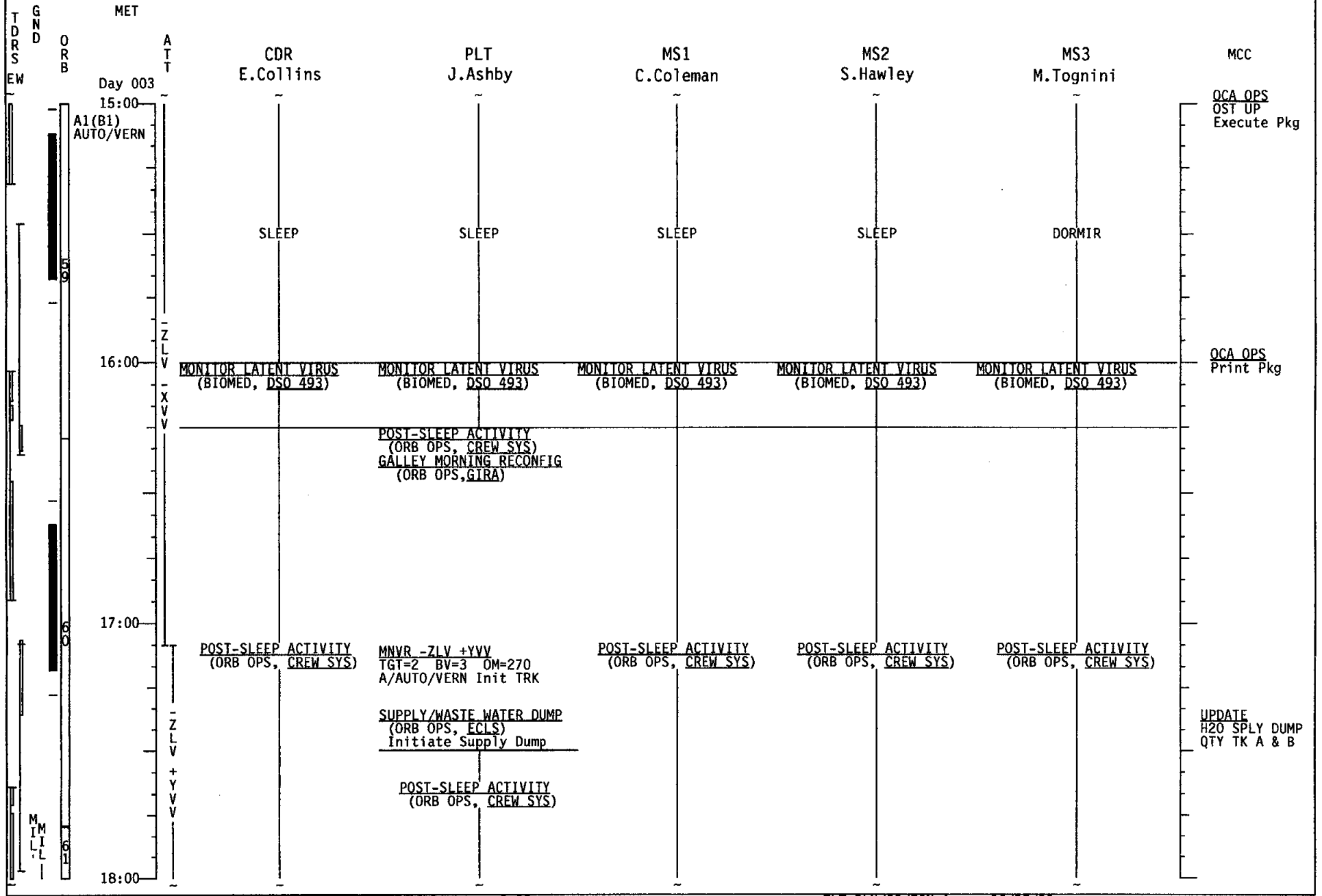


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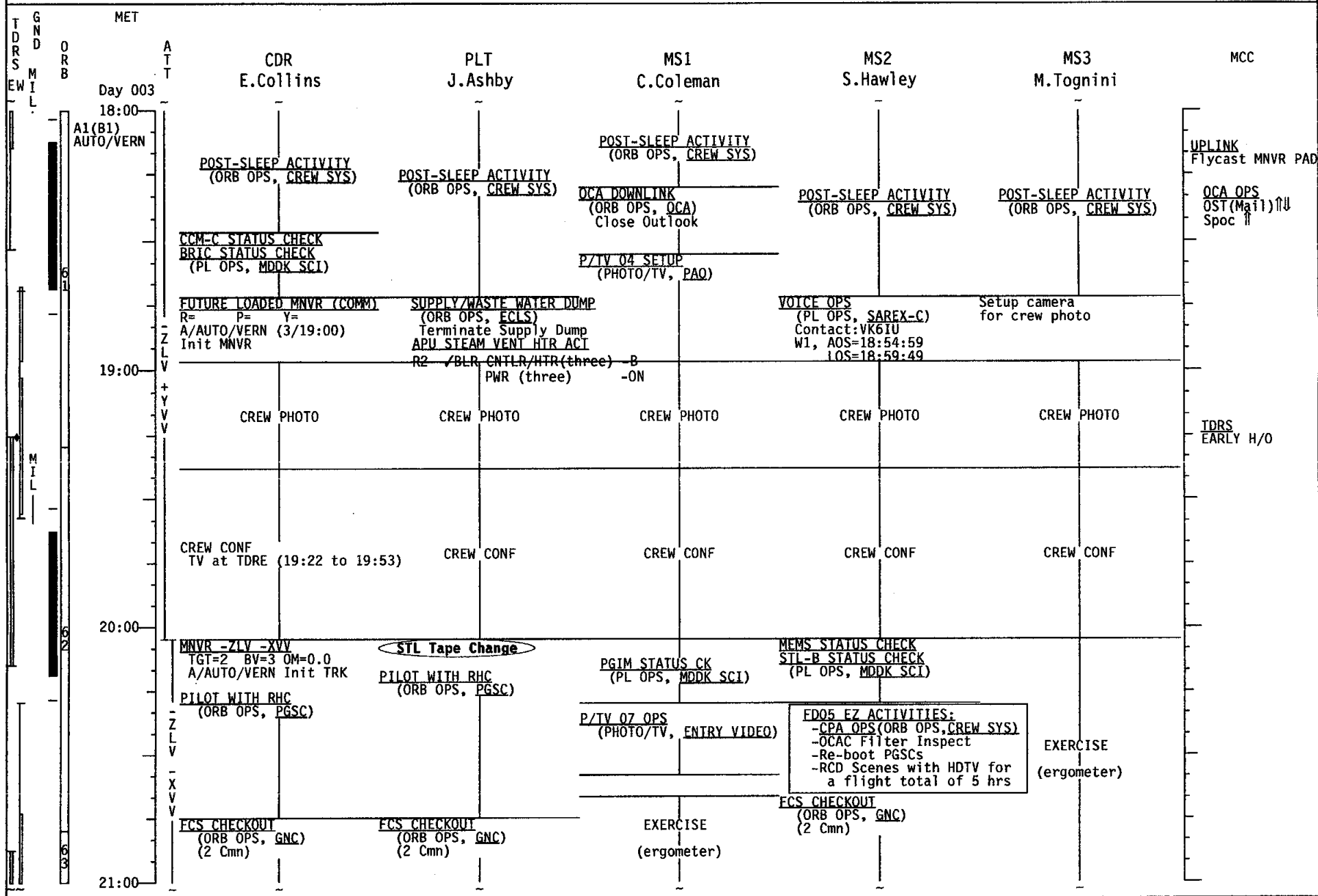




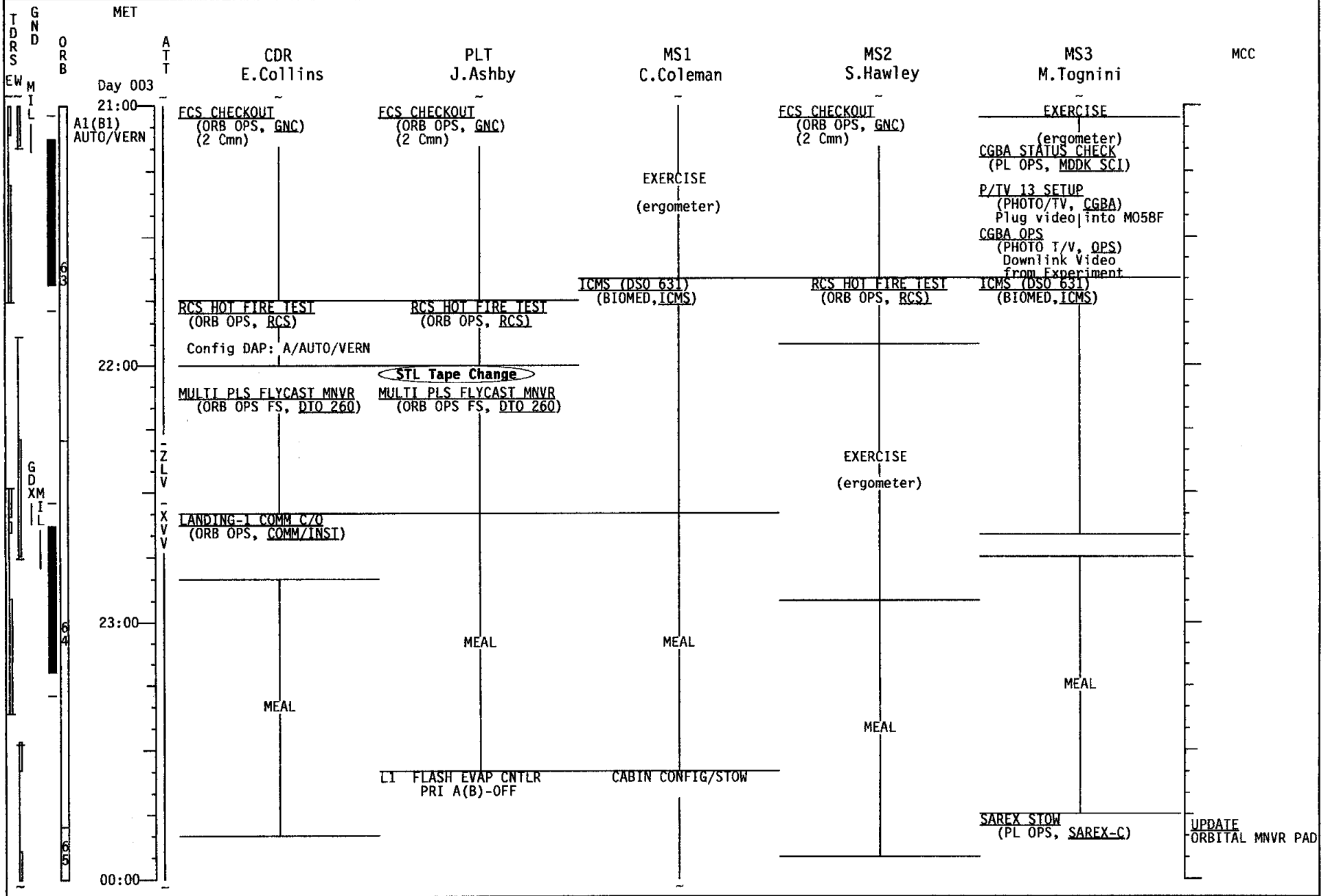
# STS-93 (FD05)



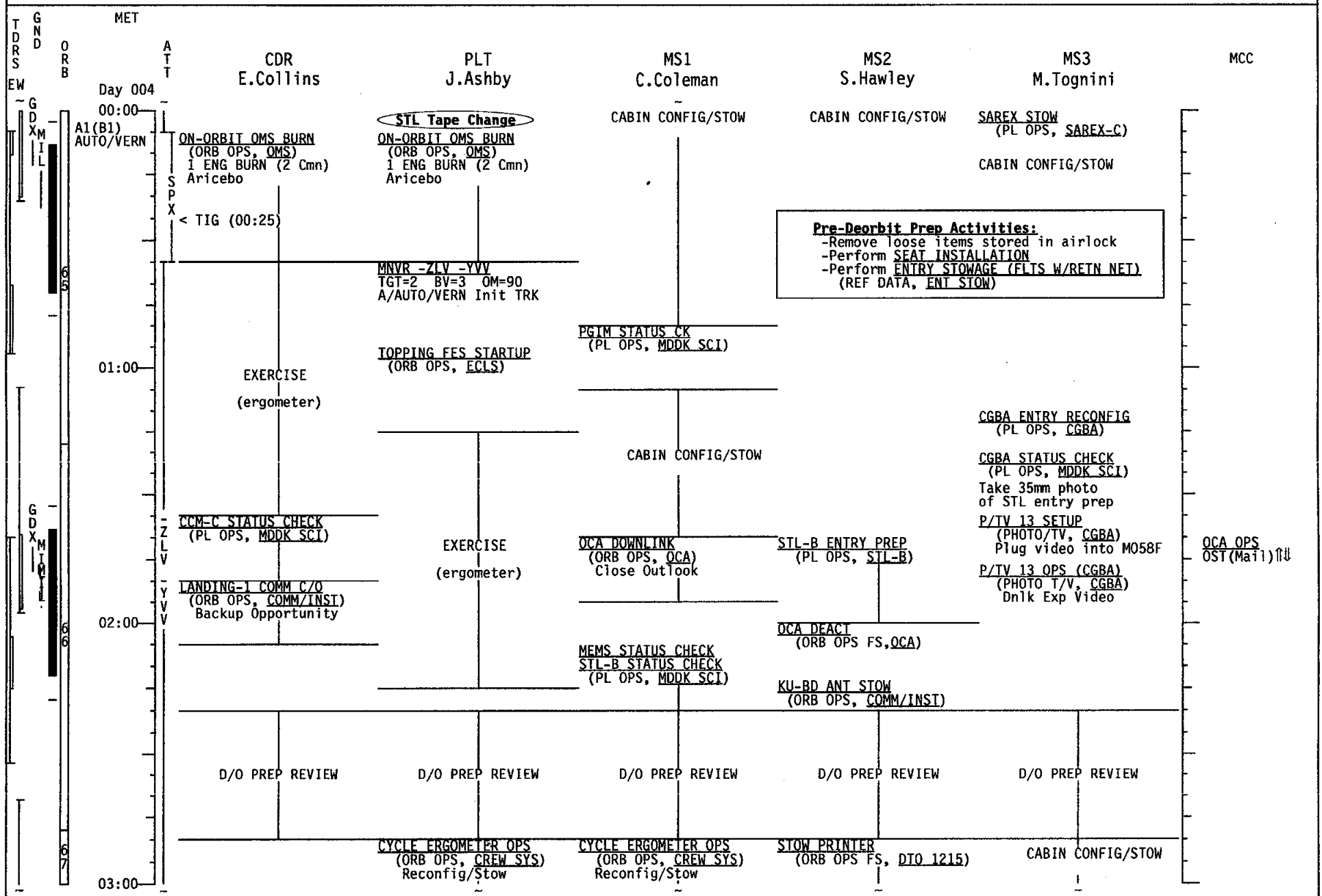
# STS-93 (FD05)



# STS-93 (FD05)

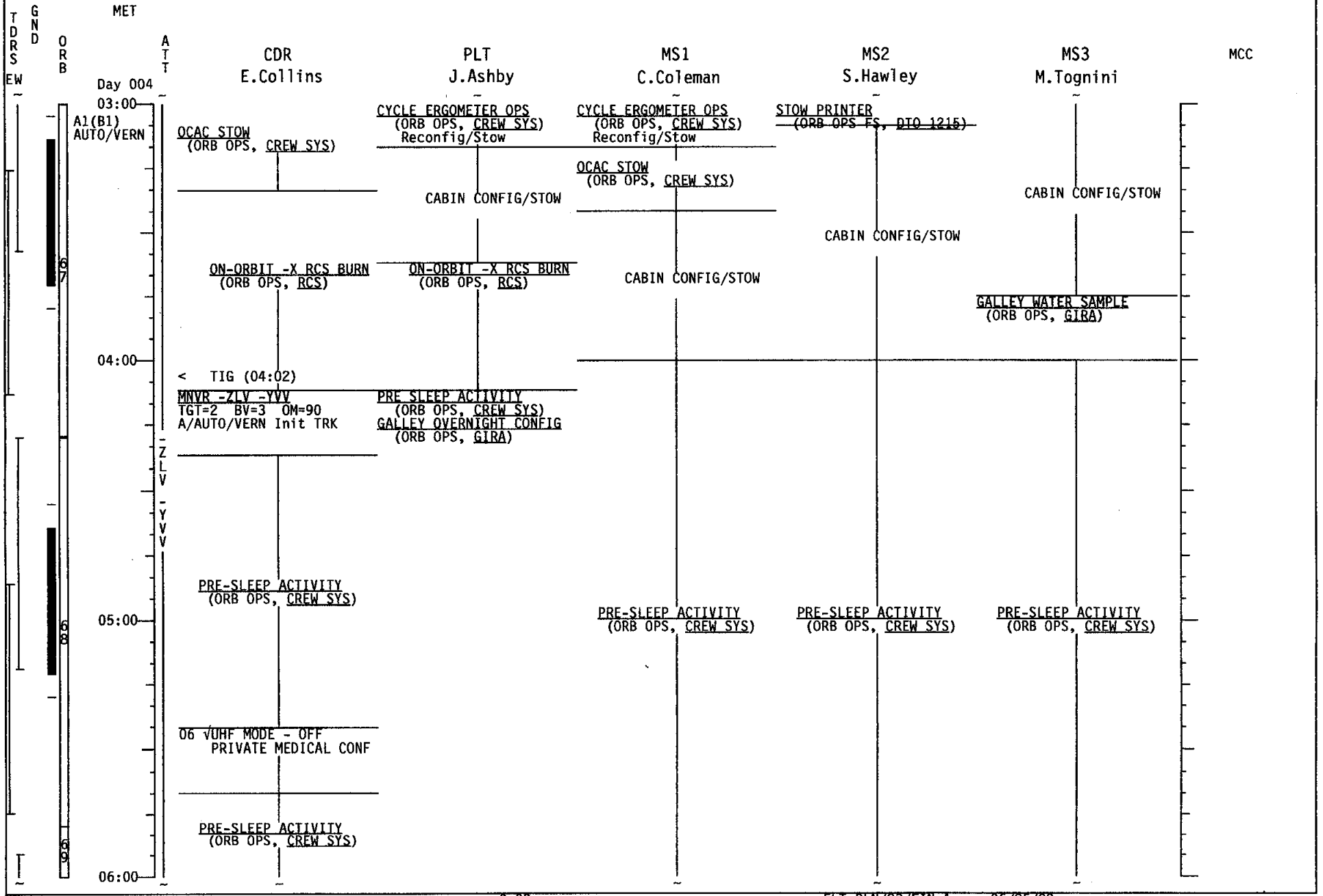


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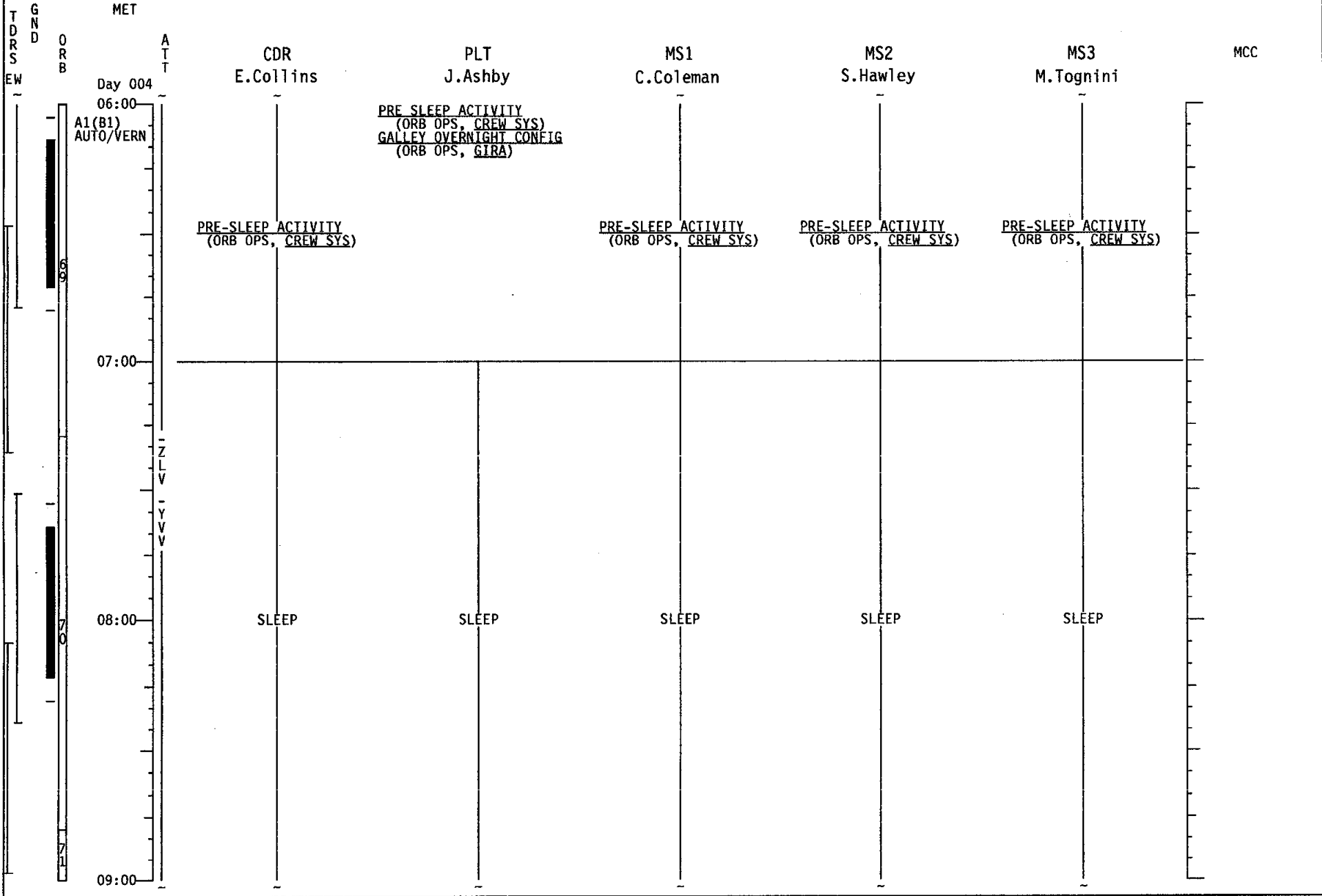


**Pre-Deorbit Prep Activities:**  
 -Remove loose items stored in airlock  
 -Perform SEAT INSTALLATION  
 -Perform ENTRY STOWAGE (FLTS W/RETN NET)  
 (REF DATA, ENT STOW)

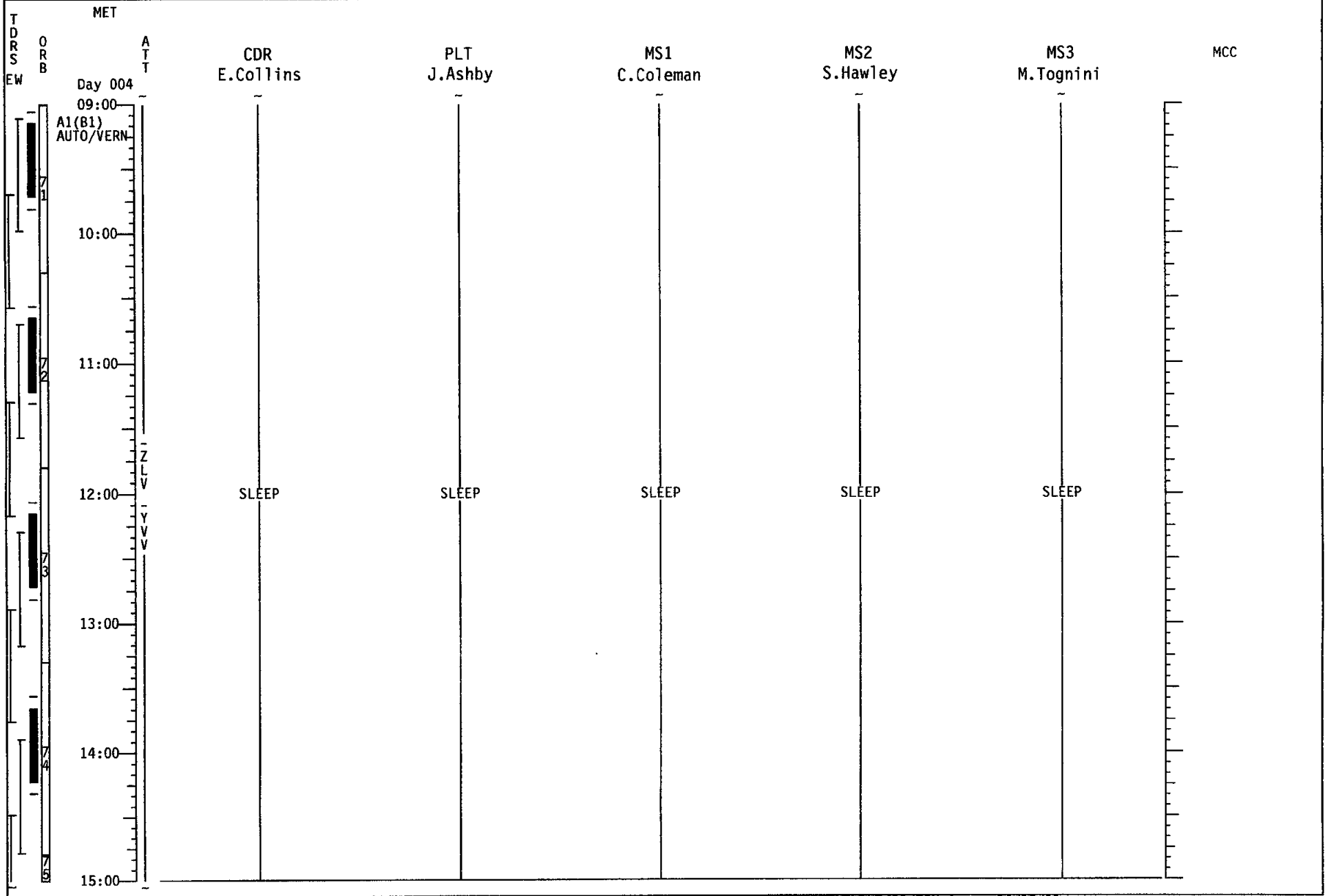
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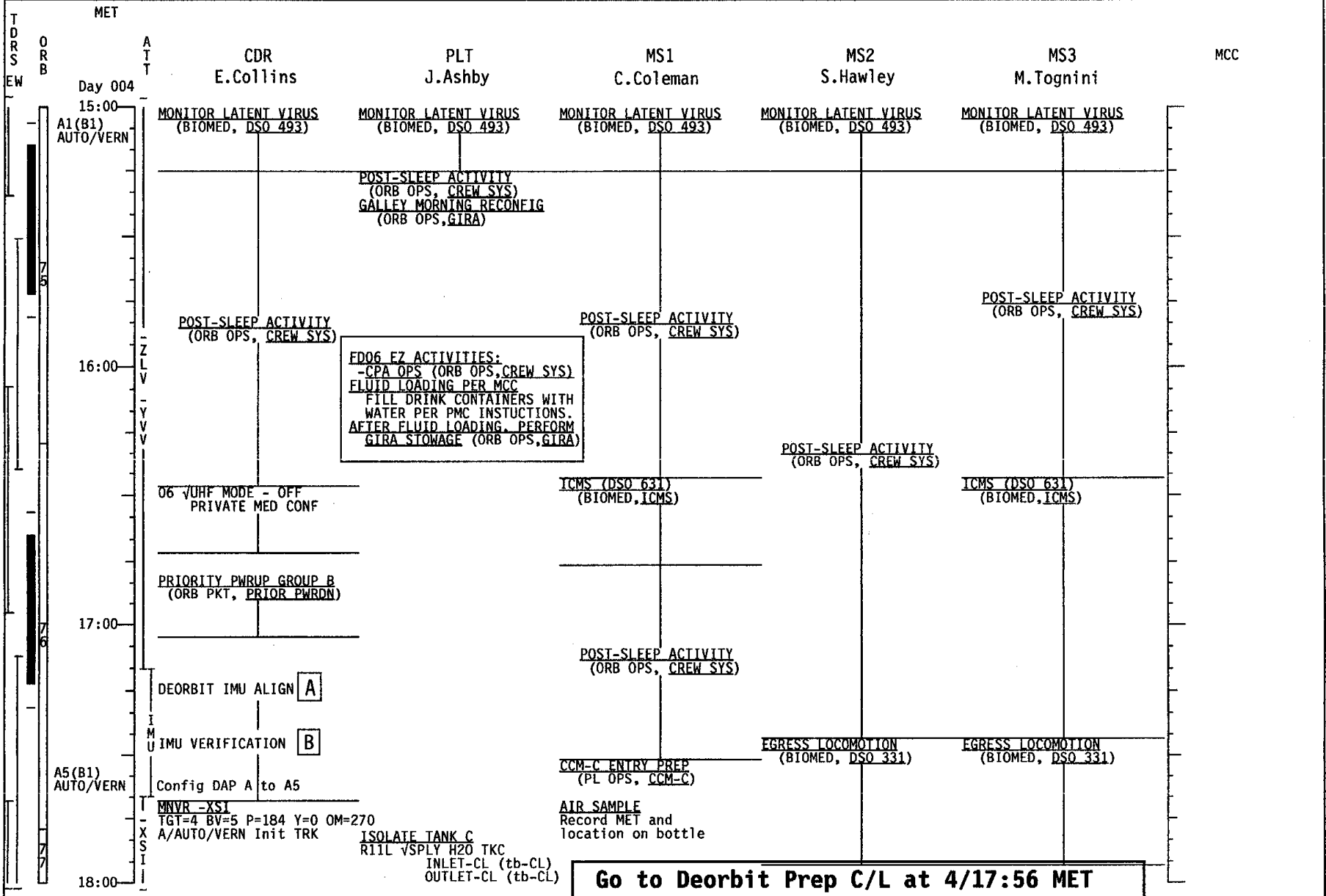
# STS-93 (FD05)



# STS-93 (FD05)



STS-93 (FD06)





# STS-93 (FD06)

T D R S  E W	O R B	MET  Day 004 18:00 A1(B1) AUTO/VERN	CDR E.Collins	PLT J.Ashby	MS1 C.Coleman	MS2 S.Hawley	MS3 M.Tognini	MCC	
A	<p><b>IMU STAR ALIGN:</b></p> <p><u>MNVR TO DUAL S TRK ALIGN ATT</u> R=172 P=151 Y=16 A/AUTO/VERN Init MNVR</p> <p>Perform <u>IMU ALIGN-S TRK</u> (ORB OPS, GNC)</p> <p>Star Pair B1 ID: -Y: 23, BETELGEUSE MET: 4/17:03-17:51</p> <p style="padding-left: 20px;">-Z: 16, ACHERNAR MET: 4/16:51-17:39</p> <p>ANG DIFF: 82.9</p> <p>2nd Attitude (Single S TRK)</p> <p>-Z: 23    -Y: 16 R=86      R=258 P=162    P=140 Y=6       Y=6</p>			B	<p><b>IMU ALIGN VERIFICATION:</b></p> <p><u>MNVR TO DUAL S TRK ALIGN ATT</u> R=115 P=133 Y=299 A/AUTO/VERN Init MNVR</p> <p>Perform <u>IMU ALIGN-S TRK</u> (ORB OPS, GNC) Step 5</p> <p>Star Pair C2 ID: -Y: 41, DENEbola MET: 4/17:31-18:18</p> <p style="padding-left: 20px;">-Z: 50, AVIOR MET: 4/17:05-17:54</p> <p>ANG DIFF: 84.9</p> <p>2nd Attitude (Single S TRK)</p> <p>-Z: 41    -Y: 50 R=24      R=179 P=126    P=108 Y=285    Y=305</p>				
7	<p>REQD ID:</p> <p>-Y: _____, -Z: _____, ANG ERR _____, _____</p> <p>ANG:            1                            2                            3</p> <p><math>\Delta X</math> ( ) _____, _____ ( ) _____, _____ ( ) _____</p> <p><math>\Delta Y</math> ( ) _____, _____ ( ) _____, _____ ( ) _____</p> <p><math>\Delta Z</math> ( ) _____, _____ ( ) _____, _____ ( ) _____</p> <p>EXECUTION TIME: __/ __:__:__ MET</p>			8	<p>REQD ID:</p> <p>-Y: _____, -Z: _____, ANG ERR _____, _____</p> <p>ANG:            1                            2                            3</p> <p><math>\Delta X</math> ( ) _____, _____ ( ) _____, _____ ( ) _____</p> <p><math>\Delta Y</math> ( ) _____, _____ ( ) _____, _____ ( ) _____</p> <p><math>\Delta Z</math> ( ) _____, _____ ( ) _____, _____ ( ) _____</p> <p><b>If any <math>\Delta X</math>, <math>\Delta Y</math>, or <math>\Delta Z</math> &gt; 0.1 Check MCC</b></p> <p>EXECUTION TIME: __/ __:__:__ MET</p>				
9	<p>19:00</p> <p style="text-align:center;">X S I</p>			<p>20:00</p> <p style="text-align:center;">C O M M</p>			<p>21:00</p>		

STS-93 DAP TABLE

STS-93  
DAP TABLE

**STS-93  
DAP TABLE**

<u>DAP</u>	<u>PURPOSE</u>
A1	- NOMINAL
A2	- PTC
A3	- GG
A4	- PRE/POST DEPLOY
A5	- LOSS OF VERN (NOSE & TAIL)
A6	- LOSS OF VERN (TAIL ONLY)
A7	- RENDEZVOUS
A8	- PROX OPS
A9	- IUS AT 0 DEG
A10	- IUS AT 29 DEG
A11	- IUS AT 58 DEG
A14	- FLYCAST SINGLE PULSE
A15	- FLYCAST MULTI PULSE

<u>DAP</u>	<u>PURPOSE</u>
B1	- NOM OMS & RCS BURNS
B2	- LOSS OF VERN (TAIL ONLY)
B3	- LOSS OF VERN (NOSE & TAIL ALT)
B4	- SSUS DEPLOY
B5	- COAS CAL SWUIS OBS
B7	- RENDEZVOUS
B8	- PROX OPS
B9	- IUS AT 0 DEG
B10	- IUS AT 29 DEG
B11	- IUS AT 58 DEG
B14	- FLYCAST SINGLE PULSE
B15	- FLYCAST MULTI PULSE

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 -Y Star Tracker* = 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

CNTL ACC = 0 NOMINAL OPS  
 = 1 IUS AT 0 DEG (UNLATCHED)  
 = 2 IUS AT 29 DEG  
 = 3 IUS AT 58 DEG  
 = 4,5 NOT USED  
 = 6-9 FLYCAST

STS-93 DAP A - GENERIC

	ITEM #	A1	A2	A3	A4	A5	A6	A7	A8
<b>PRI</b>									
ROT RATE	10(50)	0.2000	0.4000	0.2000	0.5000	0.2000	0.2000	0.2000	0.2000
ATT DB	11(51)	5.00	1.00	1.00	3.00	5.00	5.00	2.00	2.00
RATE DB	12(52)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
ROT PLS	13(53)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
COMP	14(54)	.000	.000	.000	.000	.000	.000	.000	.000
P OPTION	15(55)	ALL	ALL	ALL	ALL	ALL	TAIL	ALL	ALL
Y OPTION	16(56)	ALL	ALL	TAIL	ALL	ALL	TAIL	ALL	ALL
TRAN PLS	17(57)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.05
<b>ALT</b>									
RATE DB	18(58)	0.200	0.200	0.200	0.200	0.070	0.070	0.200	0.020
JET OPT	19(59)	ALL	ALL	ALL	ALL	ALL	TAIL	ALL	ALL
# JETS	20(60)	2	2	2	2	1	1	2	2
ON TIME	21(61)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
DELAY	22(62)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>VERN</b>									
ROT RATE	23(63)	0.2000	0.4000	0.0080	0.2000	0.2000	0.2000	0.2000	0.2000
ATT DB	24(64)	1.000	1.000	0.070	1.000	1.000	1.000	1.000	1.000
RATE DB	25(65)	.020	.020	.010	.020	.020	.020	.020	.020
ROT PLS	26(66)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
COMP	27(67)	.000	.000	.000	.000	.000	.000	.000	.000
CNTL ACC	28(68)	0	0	0	0	0	0	0	0
PURPOSE		NOMINAL	PTC	GG	PRE/POST DEPLOY	LOSS OF VERN (N/T)	LOSS OF VERN (TAIL ONLY)	RNDZ	PROX OPS

STS-93 DAP A CONFIGURATIONS

	ITEM #	A9	A10	A11	A14	A15
<b>PRI</b>						
ROT RATE	10(50)	0.1000	0.1000	0.1000	0.2000	0.2000
ATT DB	11(51)	3.00	3.00	3.00	<b>3.00</b>	<b>3.00</b>
RATE DB	12(52)	0.20	0.20	0.20	0.20	0.20
ROT PLS	13(53)	0.05	0.05	0.05	<b>0.76</b>	<b>0.76</b>
COMP	14(54)	.000	.000	.000	0.000	0.000
P OPTION	15(55)	TAIL	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
Y OPTION	16(56)	TAIL	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
TRAN PLS	17(57)	0.25	0.25	0.25	0.10	0.10
<b>ALT</b>						
RATE DB	18(58)	0.10	0.10	0.10	0.200	0.200
JET OPT	19(59)	TAIL	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
# JETS	20(60)	2	2	2	2	2
ON TIME	21(61)	0.08	0.08	0.08	<b>1.68</b>	<b>1.68</b>
DELAY	22(62)	10.00	10.00	10.00	<b>1.68</b>	<b>1.68</b>
<b>VERN</b>						
ROT RATE	23(63)	0.2000	0.2000	0.2000	0.2000	0.2000
ATT DB	24(64)	1.000	1.000	1.000	1.000	1.000
RATE DB	25(65)	0.010	0.010	0.010	0.020	0.020
ROT PLS	26(66)	0.010	0.010	0.010	0.010	0.010
COMP	27(67)	.000	.000	.000	0.000	0.000
CNTL ACC	28(68)	1	2	3	<b>6</b>	<b>8</b>
PURPOSE		IUS AT 0 DEG	IUS AT 29 DEG	IUS AT 58 DEG	FLYCAST SINGLE PULSE (DTO 260)	FLYCAST MULTI PULSE (DTO 260)

Note: **BOLD-ITALIC** indicate a change from I-load

STS-93 DAP B - GENERIC

	ITEM #	B1	B2	B3	B4	B5	B7	B8
<b>PRI</b>								
ROT RATE	30	0.5000	0.2000	0.2000	0.2000	0.2000	0.5000	0.2000
ATT DB	31	3.00	3.00	3.00	0.30	3.00	2.00	2.00
RATE DB	32	0.20	0.20	0.20	0.20	0.20	0.20	0.20
ROT PLS	33	0.04	0.04	0.04	0.04	0.04	0.04	0.04
COMP	34	.000	.000	.000	.000	.000	.000	.000
P OPTION	35	ALL	TAIL	ALL	TAIL	TAIL	ALL	ALL
Y OPTION	36	ALL	TAIL	ALL	TAIL	TAIL	ALL	ALL
TRAN PLS	37	0.10	0.02	0.02	0.02	0.02	0.05	0.01
<b>ALT</b>								
RATE DB	38	0.200	0.070	0.070	0.200	0.200	0.200	0.200
JET OPT	39	ALL	TAIL	ALL	ALL	ALL	ALL	ALL
# JETS	40	2	1	1	2	2	2	2
ON TIME	41	0.08	0.08	0.08	0.08	0.08	0.08	0.08
DELAY	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>VERN</b>								
ROT RATE	43	0.2000	0.2000	0.2000	0.0080	0.0160	0.2000	0.2000
ATT DB	44	1.000	1.000	1.000	0.100	0.033	1.000	1.000
RATE DB	45	.020	.020	.020	.010	.020	.020	.020
ROT PLS	46	0.002	0.002	0.002	0.002	0.002	0.002	0.002
COMP	47	.000	.000	.000	.000	.000	.000	.000
CNTL ACC	48	0	0	0	0	0	0	0
PURPOSE		NOM OMS & RCS BURNS	LOSS OF VERN (TAIL ONLY)	LOSS OF VERN (N & T)	SSUS DEPLOY	COAS CAL SWUIS OBS	RNDZ	PROX OPS

STS-93 DAP B CONFIGURATIONS

	ITEM #	B9	B10	B11	B14	B15
<b>PRI</b>						
ROT RATE	30(50)	0.1000	0.1000	0.1000	<b>0.2000</b>	<b>0.2000</b>
ATT DB	31(51)	3.00	3.00	3.00	3.00	3.00
RATE DB	32(52)	0.20	0.20	0.20	0.20	0.20
ROT PLS	33(53)	0.05	0.05	0.05	<b>0.76</b>	<b>0.76</b>
COMP	34(54)	.000	.000	.000	0.000	.000
P OPTION	35(55)	TAIL	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
Y OPTION	36(56)	TAIL	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
TRAN PLS	37(57)	0.25	0.25	0.25	<b>0.10</b>	<b>0.10</b>
<b>ALT</b>						
RATE DB	38(58)	0.10	0.10	0.10	0.200	<b>0.200</b>
JET OPT	39(59)	TAIL	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
# JETS	40(60)	2	2	2	2	2
ON TIME	41(61)	0.08	0.08	0.08	<b>1.68</b>	<b>1.68</b>
DELAY	42(62)	10.00	10.00	10.00	<b>1.68</b>	0.00
<b>VERN</b>						
ROT RATE	43(63)	0.2000	0.2000	0.2000	0.2000	0.2000
ATT DB	44(64)	1.000	1.000	1.000	1.000	1.000
RATE DB	45(65)	0.010	0.010	0.010	0.020	0.020
ROT PLS	46(66)	0.010	0.010	0.010	<b>0.010</b>	<b>0.010</b>
COMP	47(67)	.000	.000	.000	0.000	0.000
CNTL ACC	48(68)	1	2	3	<b>7</b>	<b>9</b>
PURPOSE		IUS AT 0 DEG	IUS AT 29 DEG	IUS AT 58 DEG	FLYCAST SINGLE PULSE (DTO 260)	FLYCAST MULTI PULSE (DTO 260)

Note: **BOLD-ITALIC** indicate a change from I-load

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



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ATTITUDE TIMELINE

Attitude Timeline

MET/GMT	MNVR OPTION	DAF	E/S	REF ATT/REMARKS	EVENT
1 000/00:40:00 MET 201/05:16:00 GMT	INRTL R=297.00 MNVR P=168.00 Y= 8.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 123 P 62		OMS-2 00/00:43:20 TIG
2 000/01:12:00 MET 21:40 201/05:48:00 GMT 57:40	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=180.00	A1 AUTO DB AT 5.000 ALT DB RT 0.200	RATE 0.2000 EARTH R 360 P 90	LVLH R=180.00 P= 0.00 Y= 0.00	-ZLV, +XVV PLBD OPENING
3 000/05:00:00 MET 10:08 201/09:36:00 GMT 46:08	INRTL R=127.00 MNVR P= 10.00 Y= 9.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 340 P 112	-Y: 12 CANOPUS -Z: 83 THETA AURIGAE	IMU ALIGN Special Pair
4 000/05:20:00 MET 30:31 201/09:56:00 GMT 10:06:31	TGT=4 RA= 118.605 BV=5 DEC= 20.844N P=237.00 Y= 0.00 OM= 90.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 180 P 123	INRTL R=236.98 P= 91.57 Y=344.95	DEPLOY ATT
5 000/07:17:28 MET 201/11:53:28 GMT					IUS/CHANDRA DEPLOY 000/07:17:28
6 000/07:18:23 MET 201/11:54:23 GMT	INRTL BV=5 ROTR P= 0.00 Y=270.00	B1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.8240 SUN R 180 P 53	INRTL R=236.73 P= 91.88 Y=344.73	-X SEP1 RCS -70 degree pitch
7 000/07:19:48 MET 201/11:55:48 GMT		B1 INRT DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 180 P 53	INRTL R=224.66 HOLD P=135.75 Y= 41.93	Pitch = 70 deg INRTL HOLD
8 000/07:27:00 MET 30:59 201/12:03:00 GMT 06:59	INRTL R=332.00 MNVR P= 10.00 Y=359.00	B1 AUTO DB AT 3.000 PRI DB RT 0.20	RATE 0.5000 SUN R 137 P 121		NOM SEP 00/07:32:28 TIG
9 000/07:35:00 MET 38:12 201/12:11:00 GMT 14:12	TGT=1 BV=3 P= 90.00 Y= 0.00 OM= 0.00	B1 AUTO DB AT 3.000 PRI DB RT 0.20	RATE 0.5000 SUN R 137 P 121	RNDZ NAV must be enabled	MNVR TO VIEWING ATTITUDE
10 000/08:03:00 MET 07:20 201/12:39:00 GMT 43:20	TGT=1 BV=5 P=320.00 Y= 0.00 OM= 0.00	B1 AUTO DB AT 3.000 PRI DB RT 0.20	RATE 0.5000 SUN R 137 P 121	RNDZ NAV must be enabled	MNVR TO WINDOW PROTECT
11 000/08:17:00 MET 201/12:53:00 GMT		B1 INRT DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 301 P 60	INRTL R=118.20 HOLD P=167.84 Y= 10.14	DAP TO INERTIAL FOR SRM-1 IGN
12 000/08:25:00 MET 39:48 201/13:01:00 GMT 15:48	INRTL R= 0.00 MNVR P= 0.00 Y= 0.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 113 P 117		COMM ATT

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

Attitude Timeline

MET/GMT	MNVR OPTION	DAP	E/S	REF ATT/REMARKS	EVENT
13 000/11:00:00 MET 10:37 201/15:36:00 GMT 46:37	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y= 0.00	-ZLV, -XVV (FUTURE LOADED)
14 000/19:15:00 MET 22:30 201/23:51:00 GMT 58:30	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV, +YVV SUPPLY H2O DUMP
15 000/20:50:00 MET 58:03 202/01:26:00 GMT 34:03	INRTL R=115.00 MNVR P=162.00 Y=359.00	B1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 305 P 72		ORB ADJ BURN (Lowering) 00/21:08:36 TIG
16 000/21:15:00 MET 18:33 202/01:51:00 GMT 54:33	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y= 0.00	-ZLV, -XVV
17 000/22:15:00 MET 30:00 202/02:51:00 GMT 03:06:00	INRTL R=298.00 MNVR P=178.00 Y=355.00	B1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 129 P 68		DTO 260 Flycast
18 000/22:45:00 MET 52:21 202/03:21:00 GMT 28:21	INRTL R=305.43 MNVR P=266.33 Y=336.54	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 170 P 89	RISE 0/23:24 SET 1/00:18	SWUIS Moon
19 001/00:50:00 MET 58:05 202/05:26:00 GMT 34:05	INRTL R=166.20 MNVR P=173.95 Y=304.44	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 257 P 116	RISE 1/00:42 SET 1/01:36	SWUIS Venus
20 001/02:20:00 MET 33:47 202/06:56:00 GMT 07:09:47	INRTL R=238.00 MNVR P= 22.00 Y= 60.00	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 222 P 65		SIMPLEX BURN (OMS, RAM) 01/02:41 TIG
21 001/02:45:00 MET 50:54 202/07:21:00 GMT 26:54	INRTL R=240.24 MNVR P= 83.94 Y= 26.88	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 185 P 89	RISE 1/03:09 SET 1/04:02	SWUIS Jupiter
22 001/04:15:00 MET 18:59 202/08:51:00 GMT 54:59	INRTL R=224.70 MNVR P=101.80 Y= 73.80	A1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 177 P 45	RISE 1/04:34 SET 1/05:28	SWUIS Cal BD +28 4211
23 001/05:45:00 MET 57:48 202/10:21:00 GMT 33:48	INRTL R=118.00 MNVR P= 70.00 Y=311.00	B1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 270 P 159		MSX PRCS BURN (RAM & WAKE) BIASED +YVV NS
24 001/06:20:00 MET 29:51 202/10:56:00 GMT 11:05:51	INRTL R=149.00 MNVR P=122.00 Y= 57.00	B1 AUTO VERN RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 251 P 49		SIMPLEX BURN (DUAL, WAKE) 01/06:38 TIG

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

Attitude Timeline

MET/GMT	MNVR OPTION		DAF	E/S	REF ATT/REMARKS	EVENT
25 001/06:40:00 MET 53:13 202/11:16:00 GMT 29:13	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y= 0.00	-ZLV, -XVV
26 001/18:35:00 MET 42:30 202/23:11:00 GMT 18:30	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV, +YVV
27 001/20:25:00 MET 38:44 203/01:01:00 GMT 14:44	INRTL R=146.38 MNVR P=151.44 Y=310.28	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 267 P 117	RISE 1/20:15 SET 1/21:09	SWUIS Venus
28 001/21:10:00 MET 19:38 203/01:46:00 GMT 55:38	INRTL R=246.88 MNVR P=134.93 Y=294.03	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 148 P 135	RISE 1/21:16 SET 1/22:15	SWUIS Cal 30 Doradus
29 001/22:15:00 MET 22:23 203/02:51:00 GMT 58:23	INRTL R=217.50 MNVR P= 34.80 Y=336.40	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 235 P 150	Rise 1/22:43 Set 1/23:38	SWUIS Saturn
30 001/23:45:00 MET 47:44 203/04:21:00 GMT 23:44	INRTL R=249.20 MNVR P= 32.73 Y=332.33	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 206 P 154	Rise 2/00:03 Set 2/00:59	SWUIS Cal Vega
31 002/00:20:00 MET 25:43 203/04:56:00 GMT 05:01:43	INRTL R=204.01 MNVR P=356.24 Y= 15.89	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 269 P 102	V-Rise 2/00:28 S-Rise 2/00:36	SWUIS Vulcanoids
32 002/01:05:00 MET 12:43 203/05:41:00 GMT 48:43	INRTL R=173.00 MNVR P= 98.00 Y= 61.00	B1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 238 P 55		SIMPLEX BURN (DUAL, RAM) 02/01:22 TIG
33 002/01:25:00 MET 32:57 203/06:01:00 GMT 08:57	INRTL R=248.18 MNVR P= 45.86 Y=346.28	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 193 P 139	Rise 2/01:36 Set 2/02:31	SWUIS Cal BD +28 4211
34 002/01:50:00 MET 55:52 203/06:26:00 GMT 31:52	INRTL R=203.23 MNVR P= 1.48 Y= 18.08	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 267 P 102	V-Rise 2/01:59 S-Rise 2/02:06	SWUIS Vulcanoids
35 002/02:25:00 MET 39:38 203/07:01:00 GMT 15:38	INRTL R=350.00 MNVR P=263.00 Y=311.00	B1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 127 P 110		SIMPLEX BURN (SE OMS, WAKE) 02/02:42 TIG
36 002/02:45:00 MET 54:04 203/07:21:00 GMT 30:04	INRTL R=344.97 MNVR P=182.60 Y= 32.55	A1 AUTO VERN	RATE 0.2000 DB AT 1.000 DB RT 0.020	SUN R 67 P 32	Rise 2/02:30 Set 2/03:24	SWUIS Moon

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

Attitude Timeline

MET/GMT	MNVR OPTION	DAF	E/S	REF ATT/REMARKS	EVENT
37 002/03:10:00 MET 20:58 203/07:46:00 GMT 56:58	INRTL R=200.42 MNVR P= 14.56 Y= 23.01	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 262 P 101	V-Rise 2/03:29 S-Rise 2/03:36	SWUIS Vulcanoids
38 002/04:00:00 MET 14:16 203/08:36:00 GMT 50:16	INRTL R=161.54 MNVR P=168.44 Y=305.08	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 259 P 116	RISE 2/03:45 SET 2/04:39	SWUIS Venus
39 002/05:45:00 MET 57:46 203/10:21:00 GMT 33:46	INRTL R=303.00 MNVR P= 87.00 Y=312.00	B1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 87 P 148		MSX OMS BURN (CONJ RELATIVE)
40 002/06:05:00 MET 11:49 203/10:41:00 GMT 47:49	INRTL R= 25.00 MNVR P=230.00 Y=295.00	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 74 P 119	-Y: 58 Deneb Algeidi -Z: 38 Navi	IMU ALIGN Star Pair A1
41 002/06:20:00 MET 22:57 203/10:56:00 GMT 58:57	INRTL R= 5.25 MNVR P=208.35 Y=327.64	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 80 P 86	+X: 20 Arcturus	HUD CAL
42 002/06:35:00 MET 46:07 203/11:11:00 GMT 22:07	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y= 0.00	-ZLV, -XV
43 002/17:35:00 MET 42:30 203/22:11:00 GMT 18:30	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV, +YV SUPPLY H2O DUMP
44 002/20:40:00 MET 49:08 204/01:16:00 GMT 25:08	INRTL R=169.19 MNVR P=175.25 Y= 55.13	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 203 P 23	Rise 2/21:15 Set 2/22:09	SWUIS Saturn
45 002/22:25:00 MET 37:20 204/03:01:00 GMT 13:20	INRTL R=221.17 MNVR P= 36.06 Y=321.76	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 227 P 165	Rise 2/22:42 Set 2/23:36	SWUIS Jupiter
46 002/23:55:00 MET 56:38 204/04:31:00 GMT 32:38	INRTL R=237.87 MNVR P= 31.79 Y=321.16	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 221 P 165	Rise 3/00:07 Set 3/01:02	SWUIS Cal BD +28 4211
47 003/01:00:00 MET 08:58 204/05:36:00 GMT 44:58	INRTL R=253.00 MNVR P= 61.70 Y= 63.80	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 179 P 61	Rise 3/01:33 Set 3/02:30	SWUIS Cal Vega
48 003/02:25:00 MET 34:47 204/07:01:00 GMT 10:47	INRTL R=201.00 MNVR P= 84.00 Y=314.00	B1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 190 P 148		SIMPLEX BURN 03/02:43 TIG

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

Attitude Timeline

MET/GMT	MNVR OPTION	DAF	E/S	REF ATT/REMARKS	EVENT
49 003/02:50:00 MET 59:47 204/07:26:00 GMT 35:47	INRTL R=331.43 MNVR P=270.79 Y=332.26	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 148 P 94	RISE 3/02:35 SET 3/03:30	SWUIS Moon
50 003/04:10:00 MET 19:48 204/08:46:00 GMT 55:48	INRTL R=145.81 MNVR P=150.43 Y=310.31	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 267 P 116	RISE 3/03:48 SET 3/04:40	SWUIS Venus
51 003/05:50:00 MET 06:02:16 204/10:26:00 GMT 38:16	INRTL R=242.00 MNVR P=345.00 Y=351.00	B1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 240 P 120		MSX BURN (WAKE & RAM) +XVV BIASED
52 003/06:10:00 MET 24:13 204/10:46:00 GMT 11:00:13	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y= 0.00	-ZLV, -XVV
53 003/17:00:00 MET 07:30 204/21:36:00 GMT 43:30	TGT=2 BV=3 P= 90.00 Y= 0.00 OM=270.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y= 90.00	-ZLV, +YVV H2O Dump
54 003/19:00:00 MET 04:55 204/23:36:00 GMT 40:55	INRTL R=300.00 MNVR P=100.00 Y= 20.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 116 P 88		Crew Conf Att
55 003/20:00:00 MET 13:05 205/00:36:00 GMT 49:05	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 0.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y= 0.00	-ZLV, -XVV
56 004/00:10:00 MET 12:54 205/04:46:00 GMT 48:54	INRTL R=119.00 MNVR P=196.00 Y=344.00	B1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 319 P 70		SIMPLEX BURN (DUAL OMS, RAM) 04/00:25 TIG
57 004/00:35:00 MET 43:54 205/05:11:00 GMT 19:54	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 EARTH R 0 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV, -YVV
58 004/03:35:00 MET 43:41 205/08:11:00 GMT 19:41	INRTL R=303.00 MNVR P=168.00 Y= 33.00	B1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 102 P 38		FRCS BURN (Lowering)
59 004/04:05:00 MET 13:45 205/08:41:00 GMT 49:45	TGT=2 BV=3 P= 90.00 Y= 0.00 OM= 90.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 EARTH R 360 P 90	LVLH R= 0.00 P=180.00 Y=270.00	-ZLV, -YVV
60 004/17:10:00 MET 21:20 205/21:46:00 GMT 57:20	INRTL R=172.00 MNVR P=151.00 Y= 16.00	A1 AUTO DB AT 1.000 VERN DB RT 0.020	RATE 0.2000 SUN R 239 P 61	-Y: 23 Betelgeuse -Z: 16 Achernar	IMU ALIGN STAR PAIR B1

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

Attitude Timeline

MET/GMT	MNVR OPTION	DAF	E/S	REF ATT/REMARKS	EVENT
61 004/17:25:00 MET 32:29 205/22:01:00 GMT 08:29	INRTL R=115.00 MNVR P=133.00 Y=299.00	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 283 P 130	-Y: 41 Denebola -Z: 50 Avior	IMU VERIF STAR PAIR C2
62 004/17:40:00 MET 44:49 205/22:16:00 GMT 20:49	TGT=4 RA= 123.106 BV=5 DEC= 19.965N P=184.00 Y= 0.00 OM=270.00	A1 RATE 0.2000 AUTO DB AT 1.000 VERN DB RT 0.020	SUN R 180 P 176	INRTL R=354.89 P= 27.16 Y=308.24	Tail-Sun Att
63 004/19:30:00 MET 33:00 206/00:06:00 GMT 09:00	INRTL R=345.00 MNVR P= 40.20 Y=337.90	A5 RATE 0.2000 AUTO DB AT 5.00 ALT DB RT 0.070	SUN R 97 P 150		COMM ATT (OM=290)
64 004/21:46:00 MET 49:06 206/02:22:00 GMT 25:06	INRTL R=240.00 MNVR P=356.00 Y=332.00	B1 RATE 0.5000 AUTO DB AT 3.00 PRI DB RT 0.20	SUN R 249 P 143		D/O BURN KSC LDG 004/22:56

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



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FLIGHT PLAN NOTES

FLIGHT PLAN NOTES  
(CONSTRAINTS AND GUIDELINES)

FLIGHT PLAN NOTES

A. FLIGHT DESCRIPTION

Orbiter: OV102/Columbia  
 Inclination: 28°  
 Insertion Altitude: 153 circular  
 Duration: 5 + 2 days

B. MAJOR EVENTS

<u>EVENT</u>	<u>MET</u>	<u>DATE</u>	<u>CDT</u>	<u>GMT</u>	<u>ΔV</u> (fps)	<u>HP/HA</u> (nm)
Launch	0/00:00	7/19/99	23:36	201/04:36	--	--/--
OMS-2	0/00:43	7/20/99	00:19	201/05:19	199	153/156
IUS/AXAF Deploy	0/07:17	7/20/99	06:53	201/11:53	--	153/156
OMS-3 (Sep)	0/07:32	7/20/99	07:08	201/12:08	31	153/173
OMS-4	0/21:10	7/20/99	20:46	202/01:46	26	153/158
Deorbit Burn	4/21:56	7/24/99	21:32	206/02:32	254	--/--
Landing	4/22:56	7/24/99	22:32	206/03:32	--	--/--

C. LANDING OPPORTUNITIES

		<u>Landing Orbit</u>	<u>Site</u>	<u>Local Time</u>	<u>MET</u>
		<u>No.</u>			
Nominal	Primary	80	KSC	Jul 24/23:32	04/22:56
	1 Rev Late	81	KSC	Jul 25/01:07	05/00:31
1 Day Late	Primary	96	KSC	Jul 25/23:34	05/22:58
	1 Rev Late	97	KSC	Jul 26/01:09	06/00:33
2 Days Late	Primary	111	KSC	Jul 26/22:00	06/21:24
	1 Rev Late	112	KSC	Jul 26/23:35	06/22:59

D. CREW

STS-93  
 CDR - Eileen Collins  
 PLT - Jeff Ashby (IVA)  
 MS1 - Cady Coleman (EV2)  
 MS2 - Steve Hawley (Dpy Ops if IUS/AXAF EVA reqd)  
 MS3 - Michel Tognini (EV1)

E. COMMUNICATIONS

TDRS Support: East (41° W), West (174° W), Spare (49° W), Z (85° E)  
 Backup Real-Time TV: Dryden (DFRC), Merritt Island - (MIL/MLX)  
 Contingency GSTDN: Merritt Island (MIL/MLX), Dryden (DFRC), and Wallops (WLP)  
 Contingency RTS: Hawaii (HTS), Guam (GTS), Vandenberg (VTS),  
 Diego Garcia (DGS), Colorado Springs (CTS)

Lead time for site callup: GSTDN - 2 hr, RTS - 4 hr

## F. PAYLOADS

### 1. Advanced X-Ray Astrophysics Facility (AXAF)

The AXAF is the third of NASA's "great observatories" (the Compton Gamma Ray Telescope and Hubble Space Telescope being the first and second observatories). The AXAF will be deployed from the orbiter and placed in a highly elliptical orbit by the Inertial Upper Stage (IUS) and the AXAF Integrated Propulsion System (IPS) motors. The AXAF will conduct comprehensive imaging and spectrometric observations of the x-rays emitted by astrophysical processes in the energy range from 0.1 to 10 keV.

### 2. Midcourse Space Experiment (MSX)

Orbiter PRCS/OMS firings will be used as a sensor calibration and evaluation target for the space based ultraviolet and visible sensors on the MSX spacecraft.

### 3. Shuttle Ionospheric Modification with Pulsed Local Exhaust (SIMPLEX)

The SIMPLEX experiment will utilize orbiter OMS thruster firings to create ionospheric disturbances for observation by ground based radar sites. One radar site (Arecibo) will also use a low-level laser to observe thruster firings. The objective of SIMPLEX is to determine the source of Very High Frequency (VHF) radar echoes.

### 4. Southwest Ultraviolet Imaging System (SWUIS)

SWUIS is a small astronomical facility designed to gather ultraviolet and visible light data in two observational setup modes: Telescope Science Mode (TSM) and Camera Science Mode (CSM). The TSM (mounted in the side hatch window only) is designed for high magnification imaging. The CSM (mounted in any orbiter window) is designed for wide-field imaging.

The SWUIS will be used to perform UV astronomy, planetary and cometary imaging, terrestrial airglow and atmospheric background imaging, auroral imaging, and/or studies of shuttle glow and vehicle plume evaluations and orbital debris.

### 5. Aerogel

The Aerogel payload is a middeck experiment that investigates the effects of microgravity on the microstructures of gels obtained by sol-gel processing. Microgravity production of the alcogel precursor of aerogel should generate more uniform structures with superior physical properties. The presence of microgravity during the gelation process will reduce solutal flows that result due to density gradients during the formation process, thus reducing the incidence of defects such as large pores in the gel microstructure and nonuniformities in refractive index.

### 6. Space Tissue Loss - B (STL-B)

The STL-B experiment is used to validate models for muscle, bone, and endothelial cell biochemical and functional loss induced by microgravity stress; evaluate cytoskeleton, metabolism, membrane integrity and protease activity in target cells; and test tissue loss pharmaceuticals for efficacy. The focus of STL-B is direct video observation of cells in culture through the use of a video microscope imaging system with the objective of demonstrating near real-time interactive operations to detect and induce cellular responses.

### 7. Lightweight Flexible Solar Array Hinge (LFSAH)

The LFSAH consists of several hinges fabricated from shape memory alloys. This type of hinge offers controlled shockless deployment of solar arrays and other spacecraft

appendages. The LFSAH experiment demonstrates this deployment capability for a number of hinge configurations.

#### 8. Cell Culture Module, Configuration C (CCM)

The objectives of the payload are to validate models for muscle, bone, and endothelial cell biochemical and functional loss induced by microgravity stress; evaluate cytoskeleton, metabolism, membrane integrity and protease activity in target cells; and test tissue loss pharmaceuticals for efficacy.

Experiment activities can be performed without any crew intervention other than initiation of the experiment at the beginning of on-orbit payload operations and termination of the experiment prior to deorbit preparation.

#### 9. Shuttle Amateur Radio Experiment II (SAREX), Configuration C-Q

SAREX allows a crewmember with an amateur radio license to communicate with various ground amateur radio operators. Configuration C-Q consists of a handheld transceiver, interface module, PGSC, spare battery set, window antenna, packet module, headset, tape recorder, digital signal processor, and the necessary cables.

#### 10. Earth Knowledge Acquired for Middle Schools (EarthKAM)

The EarthKAM payload will conduct Earth observations using the Electronic Still Camera (ESC) installed in the overhead starboard window of the Aft Flight Deck (AFD). The ESC will interface with the OCA PGSC via a Personal Computer Memory Card International Association (PCMCIA)/Small Computer System Interface (SCSI) card with integral cable. During the operating periods, camera control files will be uplinked to the onboard OCA PGSC. These files will be used to operate the ESC at the proper times. ESC photos will then be downlinked (via OCA) and distributed to the customer.

#### 11. Plant Growth Investigations in Microgravity (PGIM)

The PGIM payload will investigate the effects of microgravity on the plant *Arabidopsis thaliana*. Plant specimens are stowed in six plant growth chambers. Some of the plants in the chambers will be chemically fixed or frozen at various times during the mission to preserve the stress effects on the plants due to the microgravity environment.

#### 12. Commercial Generic Bioprocessing Apparatus (CGBA), Configuration D

The CGBA payload consists of three separate experiments. The first experiment investigates the effects of a microgravity environment on the predatory capabilities of *Eriopsis Connexa* in controlling *Ropalosiphum Padi*. The second experiment investigates the effects of spaceflight on *Drosophila* neural development. The third experiment investigates the effects of spaceflight on microbial organisms and mammalian cells.

#### 13. MicroElectroMechanical Systems (MEMS)

The MEMS payload examines the performance of a suite of MEMS devices (accelerometers, gyros, and environmental and chemical sensors) under launch, microgravity, and reentry conditions.

#### 14. Biological Research in Canisters (BRIC)

The BRIC payload will investigate the effects of microgravity on nuclear migration, early polar development, and gene expression in gametophytes of the fern *Ceratopteris*.

#### G. ON-ORBIT RMEs

##### 1. Treadmill Vibration Isolation and Stabilization System (TVIS), Configuration B (RME 1318)

The TVIS will be used onboard the ISS to isolate treadmill vibrations from the ISS structure. STS-93 will be used to evaluate an upgraded harness for the TVIS.

#### H. ON-ORBIT DTOs

##### 1. Shuttle Radar Topography Mission (SRTM) Flycast Maneuver (DTO 260)

The SRTM (currently manifested on STS-99) will utilize a 60-meter extendible boom antenna to record topographical data of the earth's surface. The SRTM Flycast technique is a hybrid auto/manual piloting technique designed to minimize structural loading of this boom antenna during periodic orbiter trim burns using the shuttle's primary thrusters. This DTO will be used to verify the on-orbit feasibility of this unique orbital raise technique using the orbiter Alternate (ALT) Digital Autopilot (DAP) with the pilot in the loop.

##### 2. Digital Video Camcorder Demonstration (DTO 631)

This DTO will demonstrate the state-of-the-art digital camcorder technology that can complement or replace the existing analog camcorders currently used on the shuttle program.

##### 3. High Definition Digital Television (HDTV) (DTO 700-17a)

The U.S. is in the process of transitioning its television format from analog to digital. This DTO will investigate the resources needed to provide HDTV capability to the shuttle. On STS-93, a standalone battery-powered HDTV camcorder will be flown to document various mission objectives and scenes in the HDTV format. Some of these scenes will also be recorded using the standard orbiter equipment so that a side-by-side comparison of the two video formats may be made postflight. The HDTV video that is recorded will also be made available to the news media postflight for the initial U.S. HDTV broadcast.

## I. ON-ORBIT DSOs

### 1. Interaction of Space Shuttle Launch and Entry Suit and Sustained Weightlessness on Egress Locomotion (DSO 331)

DSO 331 will identify the impact of the Launch Entry Suit/Advanced Crew Escape Suit (LES/ACES) and sustained weightlessness on egress locomotion mechanical efficiency as measured by oxygen consumption and gait alteration.

### 2. Monitoring Latent Virus Reactivation and Shedding in Astronauts (DSO 493)

DSO 493 will be used to determine the frequency of induced reactivation of latent viruses, latent virus shedding, and clinical disease after exposure to the physical, physiological, and psychological stressors associated with space flight.

### 3. Integrated Measurement of the Cardiovascular Effects of Space Flight (DSO 631)

DSO 631 will be used to assess the stroke volume changes during early exposure to microgravity; assess the flow redistribution through the body during the acceleration phases of launch and quantify the peripheral vasomotor response during the launch and entry into microgravity phase; evaluate arterial tone (vascular resistance) after several days in microgravity, which will be achieved by taking a resting measurement prior to deorbit burn; and study the peripheral response (cerebral and femoral) of the fluid shifts toward the legs during reentry.

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