Contingency EVA 6 and Deploy Scenarios

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NASASpaceflight.com

Agenda

- Background
- Options to Minimize Time for Nominal Deploy
  - Eliminate of Pre-release Battery Charge Task
  - Back-away Deploy of HST
  - Deploy HGA post-EVA 5
- Selected EVA 6+Deploy Scenarios
  - RMS Deploy with Aperture Door Open
  - Back-away Deploy with Aperture Door Closed
  - Back-away Deploy with Aperture Door Open
- Conclusions
- Summary of Open Work

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Background

- New SM4 EVA scenario dictated by Shuttle Requirement for TPS surveys and late inspections
  - HST must deploy on Flight Day 9 (FD9)
  - HST will only be allotted 5 scheduled EVA days
    - » Contingency EVA 6 time *may* be available on FD9 depending on deploy scenario
- Eight-hour "EVA6+Deploy"
  - Crew Egress
  - Daily Set-up
  - Contingency EVA 6 tasks
  - HST deploy with possible EVA assist
    - » HST Mission Success tasks include
      - Manual HGA deploy
      - Manual aperture door open
    - » Shuttle Safety tasks include
      - EVA override (retraction) of either the FSS Main Umbilical, or FSS Back-up umbilical
      - EVA override (opening) of a FSS Berthing Latch
      - EVA override of either the BAPS pivoter or rotator
  - Final close-out
  - Crew Ingress
- **<u>Implication for SM4 planning</u>: Optimize nominal SM4 deploy day (FD9) timeline to maximize time for contingency EVA 6 activities <u>and</u> protect for EVA-assisted deploy**

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Background

- SMIT was analyzed to determine activities that have the largest impact on Flight Day 9 timeline
  - Move pre-release battery charge
    - » Reduces overhead associated with SA slew and Orbiter maneuver for battery charge attitude
    - » Need to assess if battery charging is required with mission SOC profile
  - Perform Back-away Deploy
    - » Provides options for removing prep activities associated with RMS deploy
      - RMS Grapple, SADE power cycle, RMS maneuver, Aperture door open
    - » Assumes deploy in +V3 Sunpoint attitude
  - Move final close-out to deploy day and delay HGA deployment to post-EVA5
    - » Opens up additional EVA time at end of EVA 5
  - Protect for HST deploy anomalies
    - » Limits amount contingency EVA 6 time
    - » EVA-assist for aperture door anomaly is most prohibitive
    - » Times estimates are not currently well understood

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Options to Minimize Time for Nominal Deploy

Eliminate Pre-release Battery Charge Task

- Without pre-release battery charge, HST meets SM3B minimum release SOC during nominal deploy with 19 Ah of margin
  - SM3B minimum release SOC = 235 Ah
    - Limit may be adjusted following assessment of required safing margin
  - Estimated SOC at release = 254 Ah, based on:
    - Post-battery FT SOC
    - SOC loss due to self-discharge
    - SOC loss due to Battery Load-share Test
    - System SOC loss during 2-hour discharge between transfer to HST internal power and release
  - Assumes no battery charging during FD9
    - Some battery charging may occur once HST is in release attitude
- Additional discharge at 43A load for 26 min results in loss of 19 Ah margin
- Pre-FD9 battery charge may be used to acquire additional SOC margin
  - May be implemented after battery FT during post-EVA, Crew Sleep, Pre- or Post-Sleep

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Options to Minimize Time for Nominal Deploy

Deploy HST via back-away instead of RMS release

- Assumes deploy in +V3 sunpoint and Low Z thruster firings and VRCS
- HST Project preference has historically been to perform back-away with aperture closed
  - Mitigates issues associated with potential high tip-off rates (>0.1°/sec) and high attitude uncertainty (>5°)
    - » Refer to STS-109 Flight Rule for “Aperture Door Open Requirements”
    - » Prevents violation of bright earth avoidance (BEA) constraints and passing sunlight into HST optics
      - Contamination risk with aperture door open is considered acceptable as long as thruster firings are constrained to Low Z (away from HST)
    - » Prevents trigger of Bright Object Detection (BOD)
  - SM3B back-away attitude is not compatible with BEA
  - Does not protect for any anomalies during nominal opening of aperture door with MCU
  - Planning for back-away with aperture open requires additional analysis into acceptable levels of bright earth exposure due to tip-off rates
- SCM Impacts
  - “Guide plate” added to protect sill-plate hardware and FSS harnessing from possible contact with SCM during nominal RMS deploy and contingency re-berth reduces clearances for back-away
  - Impact loads are still under analysis as guide plate design evolves

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Options to Minimize Time for Nominal Deploy

- Delay EVA Final Close-out until FD9 and deploy HGAs post-EVA5
  - Substitutes 30-min Daily Close-out for 60-min Final Close-out on EVA5
  - We now have ~45 min EVA time following nominal EVA 5 activities
  - Avoids allotting time for HGA deploy on FD9
  - Introduces clearance issues during contingency EVA 6
    - » Clearance between crew and HGA masts under assessment by EVA team
    - » JSC would likely perform pre-EVA RMS clearance checks
      - Refer to clearance checks performed during SM2 pre-EVA5
    - » I&C can maneuver dishes to assist in EVA, RMS, and vertical stabilizer clearance

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Selected EVA6 + Deploy Scenarios

Overview

- RMS Deploy with AD Open
  - No EVA6 task time available, accounting for ~3 hr 45 min EVA-assisted aperture door opening
- Back-away deploy with Aperture Door Closed
  - ~ 3 hrs, 45 min EVA 6 task time, accounting for ~1 hr EVA-assisted umbilical de-mate
- Back-away deploy with Aperture Door Open
  - ~ 1 hr, 35 min EVA 6 task time, accounting for ~2 hrs 34 min EVA-assisted aperture door opening

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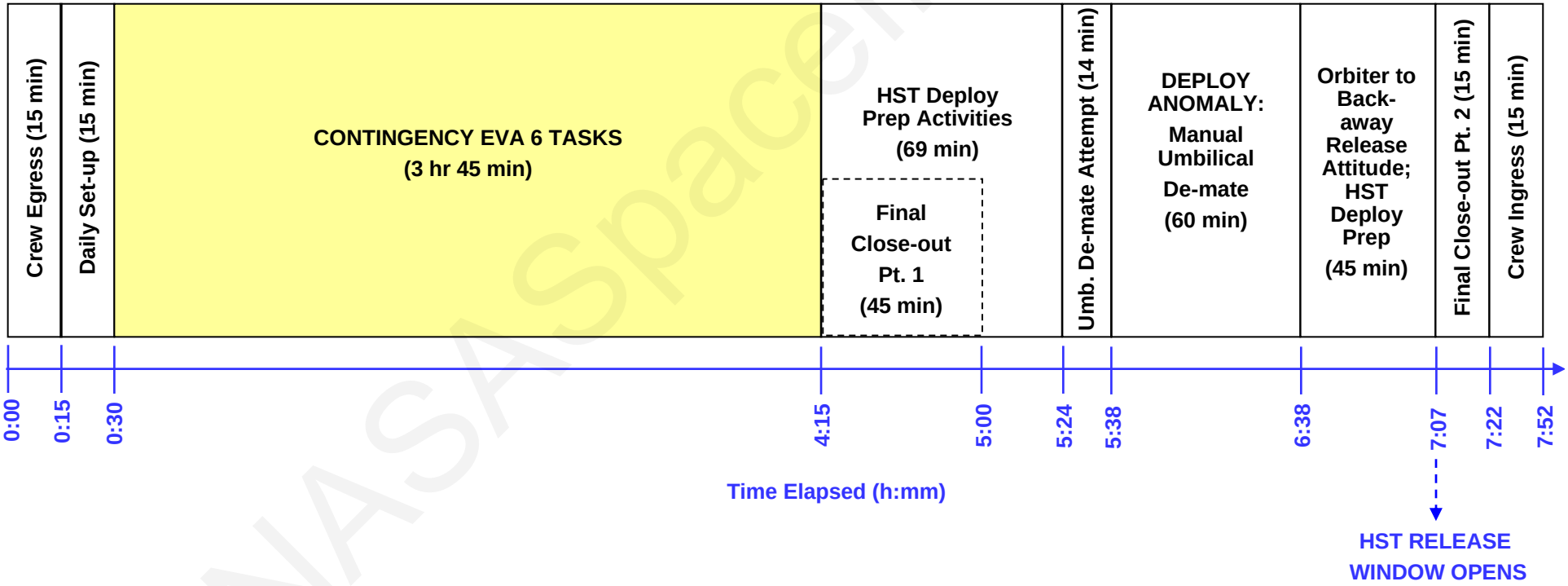
Selected EVA6 + Deploy Scenarios

- Back-away Deploy with Aperture Door Closed
  - **Provides ~ 3 hrs, 45 min EVA 6 task time**
  - Accounts for ~1 hr EVA assist for a manual de-mate of the umbilical
  - Does not account for restoring inhibits prior to EVA activity for assistance with deploy (e.g. Zero-ing SMACS)



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SERVICING MISSION INTEGRATED TIMELINE: EVA-6 BACKAWAY DEPLOY [AD CLOSED]

SHEET 59 OF 74 | 442 / 441 | DATE Mar 1, 2007

TIME GMT: 262 / MET: 07	2300 / 1500	2330 / 1530	0000 / 1600	0030 / 1630	0100 / 1700	0130 / 1730	0200 / 1800
ORBIT# (ascend node ▽)	116			▽	117		
DAY / NIGHT							
SAA							
HST ATTITUDE	HST TO BERTHING POSITION (-V3 AXIS FWD)						
ORBITER ATT	-ZLV/+XVV						
CREW SCHED	POST SLEEP					AL DEPR	EVA - 6

JSC

ORBITER, CREW, SSE

- P/TV 17
- PHOTO/TV DOCUMENT ENTIRE HST RELEASE OPS
- EVA CREW EGRESS [15 min]

FREE DRIFT

HST

ACTIVITIES AND COMMANDS

Δ REAL-TIME COMMAND

• COMMENT/ EVENT

Ⓒ SPC

⊗HAZARDOUS

- 118 • LOAD EPHEMERIS TABLES
- 118 Δ D032a-DMS: LOAD EPHEMERIS DATA [1min]
- 118 Δ D753-CLEAR EPHEMERIS DELTA TIME LIMIT EXCEED FLAG [1min]
- SAC DELIVER TABLES TO CORE

COMM	ENG	TN
	EAST	
	WEST	

MAJOR EVENTS:

- BEGIN EVA-6 [TBD]
- STOCC GO FOR EVA-6 [TBD] CHANGEOUT
- FOLLOWING PREP FOR CHANGEOUT

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SERVICING MISSION INTEGRATED TIMELINE: EVA-6 BACKAWAY DEPLOY [AD CLOSED]

SHEET 60 OF 74 | 442 / 441 | DATE Mar 1, 2007

TIME GMT: 263 / MET: 07	0200 / 1800	0230 / 1830	0300 / 1900	0330 / 1930	0400 / 2000	0430 / 2030	0500 / 2100
ORBIT# (ascend. node)	117		118		119		
DAY / NIGHT							
SAA							
HST ATTITUDE	HST TO BERTHING POSITION (-V3 AXIS FWD)						
ORBITER ATT	-ZLV-XVV						
CREW SCHED	EVA - 6						
JSC ORBITER, CREW, SSE	• EVA CREW EGRESS [15 min] (CONT.) • EVA CREW PREP FOR EVA-6 [15 min] (INCLUDES BSP CENTER PIP-PINS INSERT) • BSP SETUP [5 min] • MFR SETUP [15 min]						
FREE DRIFT							
HST ACTIVITIES AND COMMANDS Δ REAL-TIME COMMAND • COMMENT/ EVENT @ SPC ⊗ HAZARDOUS							
COMM ENG	TN						
COMM EAST / WEST							
MAJOR EVENTS:							

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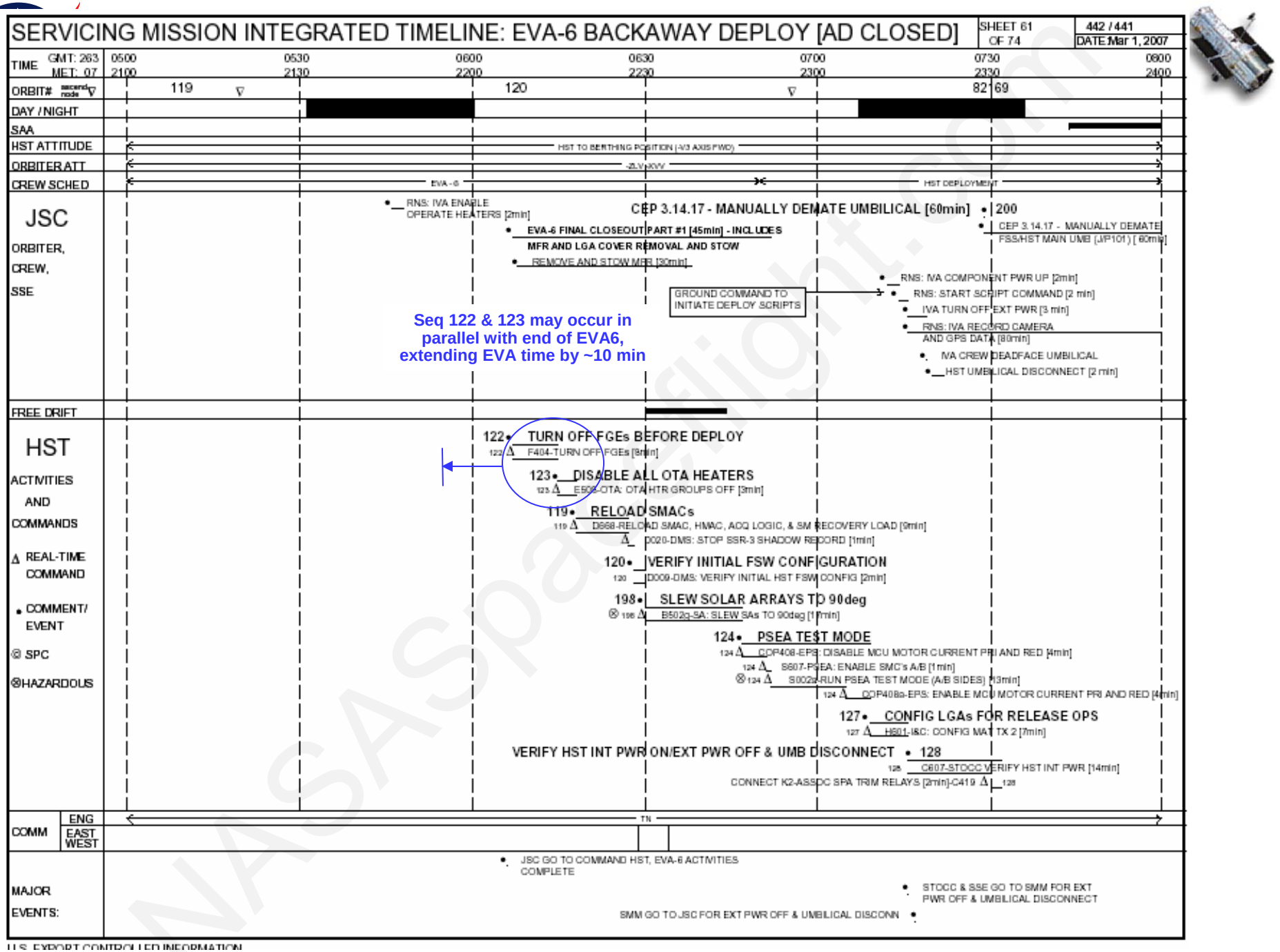

U.S. EXPORT CONTROLLED INFORMATION

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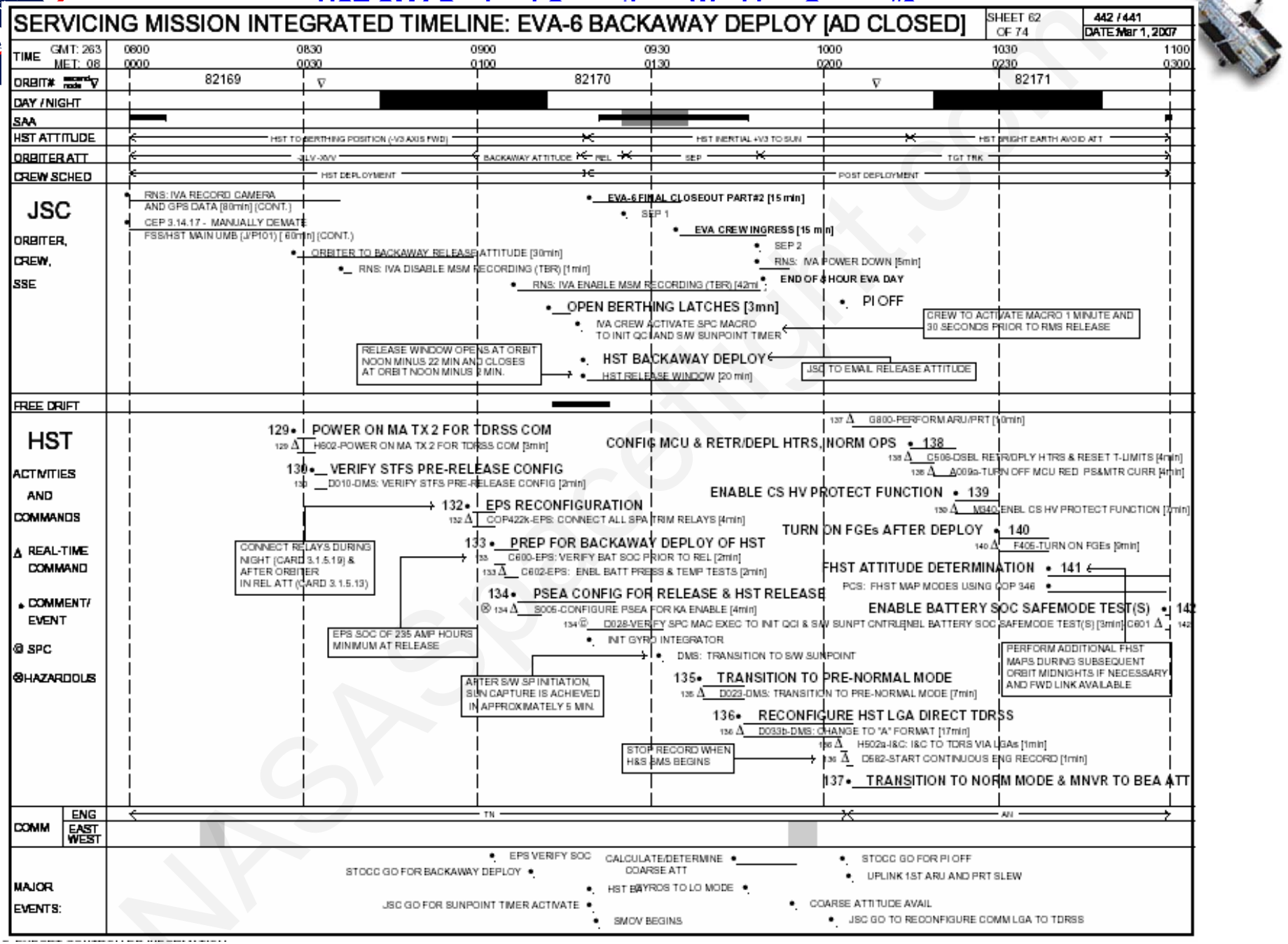

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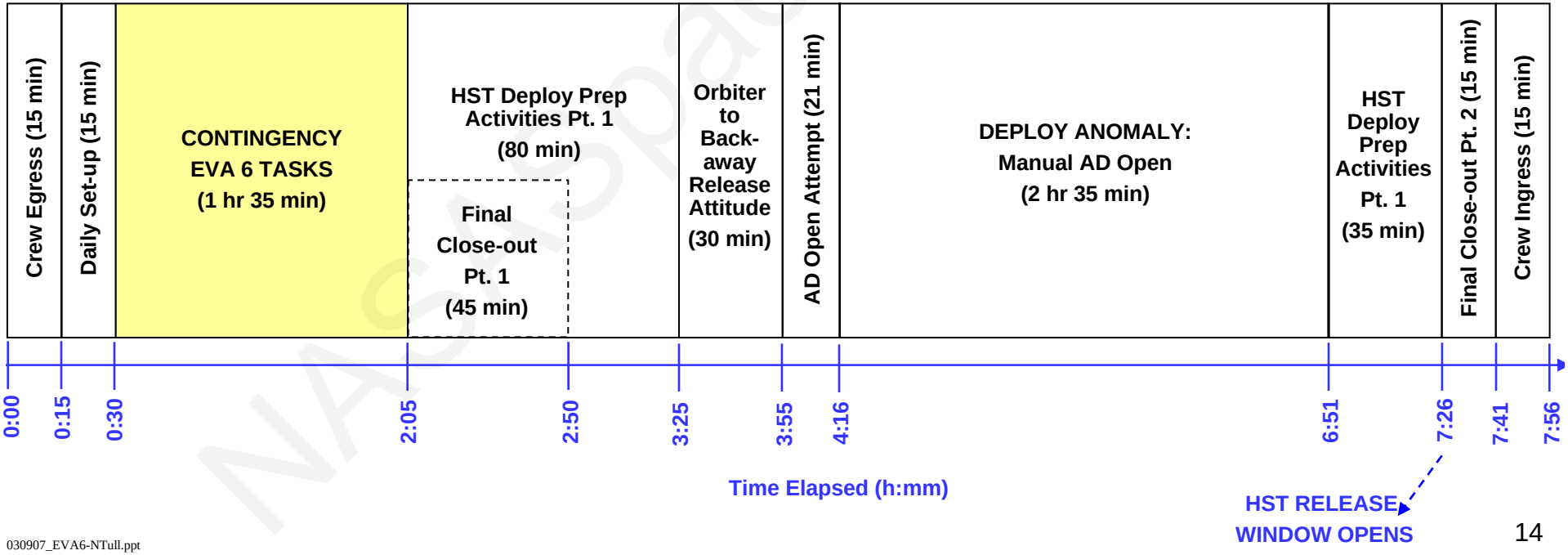
Selected EVA6 + Deploy Scenarios

- Back-away Deploy with Aperture Door Open
  - **Provides ~1 hr 35min EVA 6 task time**
  - Accounts for ~2 hr 34 min EVA assist to open aperture door
    - Contamination risk with aperture door open is acceptable since thruster firing is constrained to Low Z (away from HST)
  - Assumes HST is deployed in a sun-pointing attitude
  - Does not account for:
    - Restoring inhibits prior to EVA activity for assistance with deploy (Zero-ing SMACS, etc)
    - Return to Orbiter external power during manual AD open task to prevent excessive SOC rundown
      - May be mitigated by nominally delaying umbilical de-mate until after AD open



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Conclusions

- Back-away deploy is required to guarantee any significant contingency EVA 6 task time if protecting for longest duration EVA-assisted deploy scenario on FD9
- Loss of one full unscheduled EVA day for SM4 requires extensive pre-mission planning to characterize protection for deploy anomalies requiring EVA assistance
  - Recommend development of HST contingency products to document EVA-HST choreography for different deploy scenarios
- Additional detailed analysis must be undertaken in order to develop hierarchy of feasible FD9 scenarios

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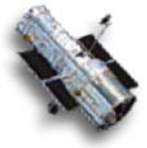

Summary of Open Work

- HST Project needs to determine how much risk it is willing to accept with respect to deploy day anomalies
- Determine durations for deploy anomalies that require EVA assistance
- Resolve issues with EVA and RMS clearance if HGAs are deployed prior to contingency EVA 6
- Define impact loads with SCM+guide plate
- Assess tip-off rates, BEA and BOD requirements to determine feasibility for back-away deploy with aperture door open
  - Determine if BEA-compatible back-away attitude may be developed
  - Investigate possibility of refining back-away procedure such that tip-off rates are sufficiently reduced
  - Quantify acceptable levels of BEA violation with respect to contamination
- Safing to investigate legacy of minimum SOC requirement for HST Release and assess margin
- Determine expected SOC post-battery FT for hybrid battery case (one original module + one replacement module)
- Identify impacts of nominal back-away deploy to planned RNS data collection

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Back-up Charts

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HST Estimated 6-battery SOC at SM4 Release

- Estimated SOC at release = 254 Ah
  - 6-battery SOC post-battery change-out = 372 Ah (per MSFC 1042/FSB SM4 simulation test)
  - System SOC loss due to self-discharge in 90 hrs = -18 Ah (per MSFC 1042/FSB SM4 simulation test)
  - System SOC loss due to Battery Load-share Test = -14 Ah
    - Based on 15 min discharge on HST internal power with 56 A load (SM4 load with safed SIs)
  - System SOC loss during 2-hour discharge between transfer to HST internal power and release = -86 Ah
    - Based on 43 A load (SM4 load with safed SIs, FGEs and OTA heaters off)

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DRAFT SMIT 2:
EVA-5 Daily Close-out and Delayed HGA Deploy

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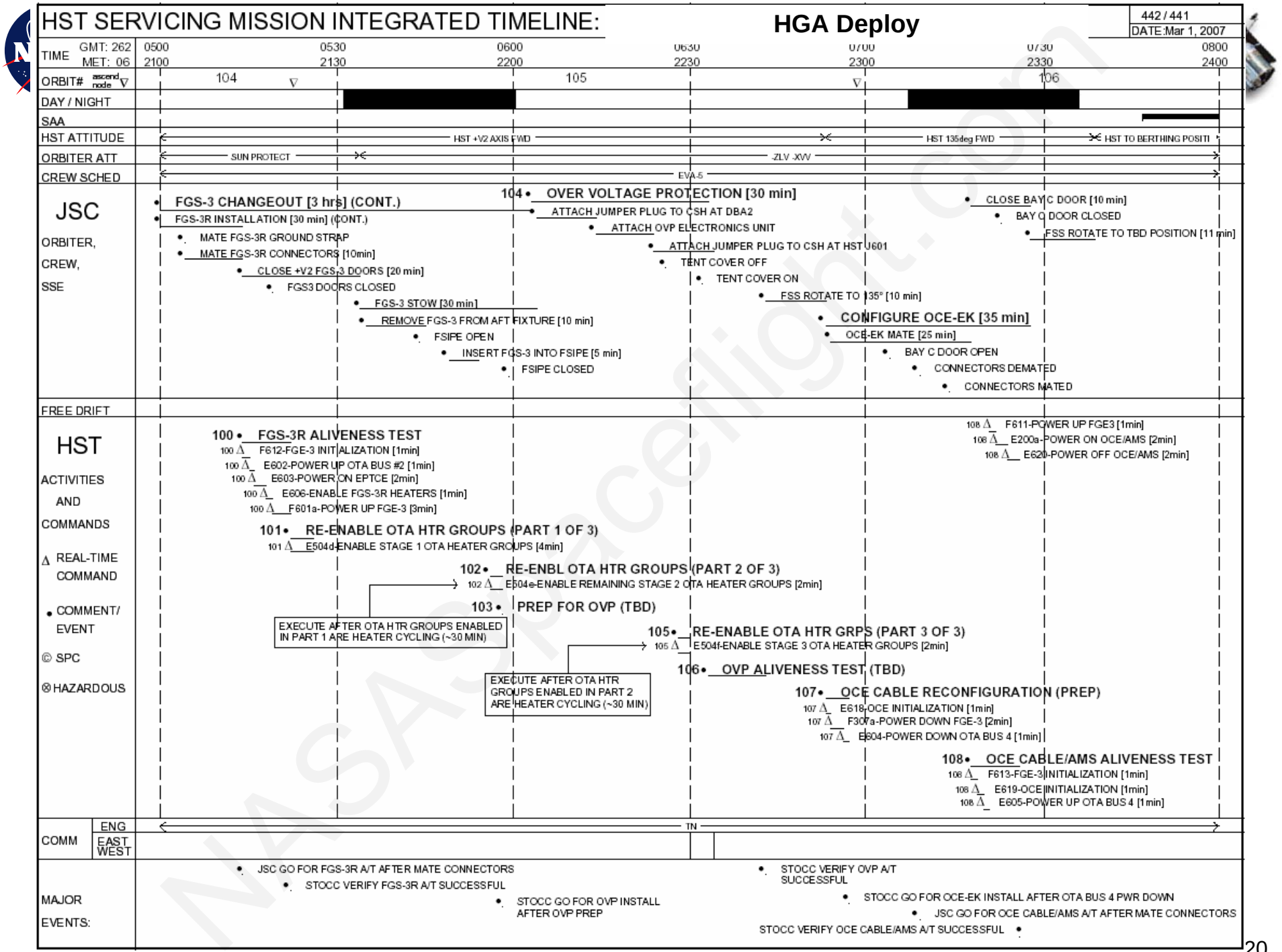

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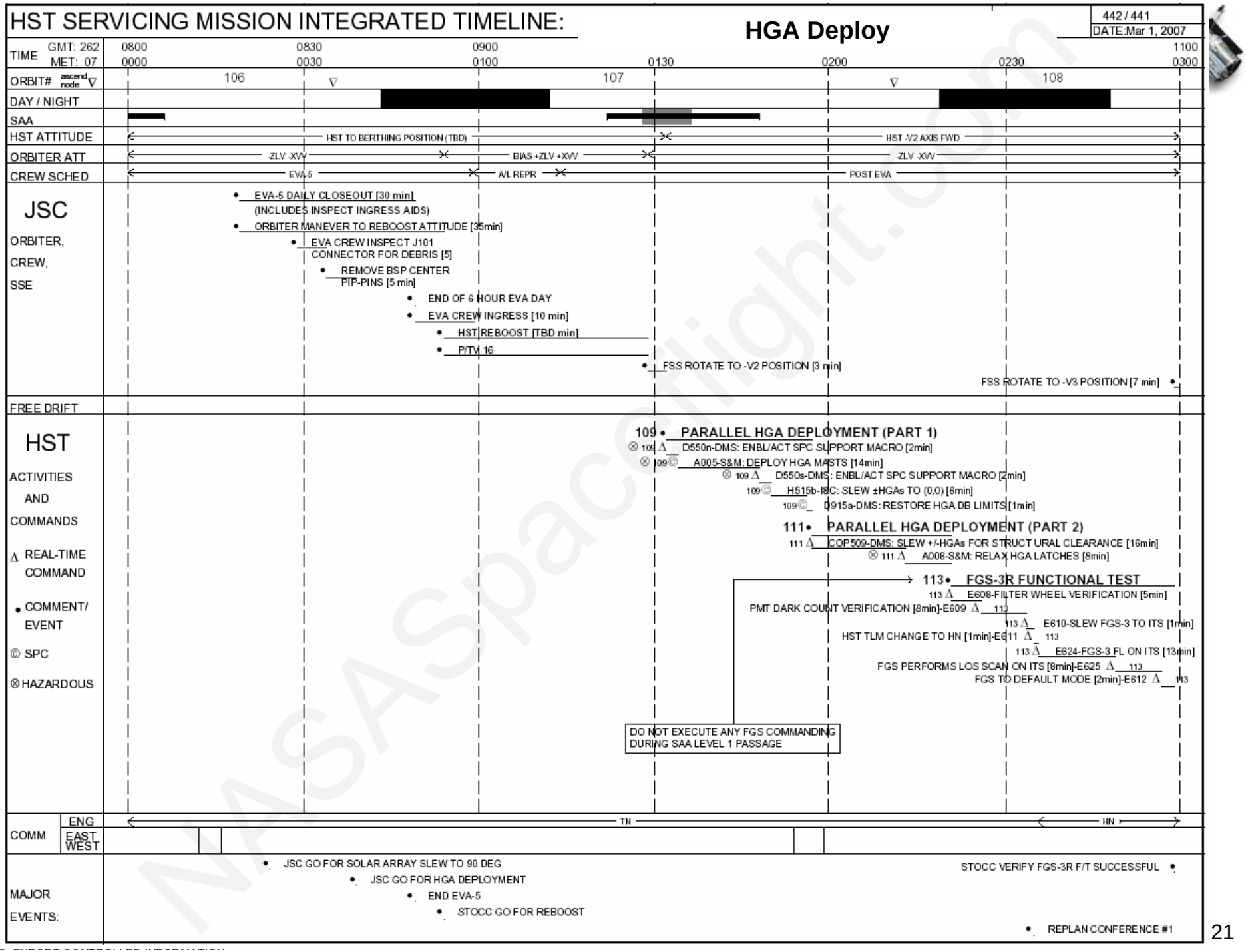

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DRAFT SMIT 3:
EVA-6 Back-away Deploy with AD Open

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HST SERVICING MISSION INTEGRATED TIMELINE: EVA-6 BACKAWAY DEPLOY [AD OPEN]

SHEET 59 OF 74 | 442 / 441 | DATE: Mar 1, 2007

TIME — GMT: 262 / MET: 07

2300 1500 | 2330 1530 | 0000 1600 | 0030 1630 | 0100 1700 | 0130 1730 | 0200 1800

ORBIT# (ascend. node) 116 117

DAY / NIGHT

SAA

HST ATTITUDE: HST TO BERTHING POSITION (-V3 AXIS FWD)

ORBITER ATT: -ZLV, -XVV

CREW SCHED: POST SLEEP | AL DEPR | EVA - 6

JSC

ORBITER, CREW, SSE

- P/TV 17
- EVA CREW EGRESS [15 min]

PHOTO/TV DOCUMENT ENTIRE HST RELEASE OPS

FREE DRIFT

HST

ACTIVITIES AND COMMANDS

Δ REAL-TIME COMMAND

• COMMENT/ EVENT

@ SPC

⊗ HAZARDOUS

118 • LOAD EPHEMERIS TABLES

118 Δ D032a-DMS: LOAD EPHEMERIS DATA [1min]

118 Δ D753-CLEAR EPHEMERIS DELTA TIME LIMIT EXCEED FLAG [1min]

SAC DELIVER TABLES TO CORE

COMM — ENG / EAST / WEST: TN

MAJOR EVENTS:

- BEGIN EVA-6 [TBD]
- STOCC GO FOR EVA-6 [TBD] CHANGEOUT
- FOLLOWING PREP FOR CHANGEOUT

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HST SERVICING MISSION INTEGRATED TIMELINE: EVA-6 BACKAWAY DEPLOY [AD OPEN]

SHEET 60 OF 74 | 442 / 441 | DATE Mar 1, 2007

TIME GMT: 263 / MET: 07 — 0200/1800 | 0230/1830 | 0300/1900 | 0330/1930 | 0400/2000 | 0430/2030 | 0500/2100

ORBIT# (ascend node) — 117 | 118 | 119

DAY / NIGHT

SAA

HST ATTITUDE — HST TO BERTHING POSITION (-V3 AXIS FWD)

ORBITER ATT — -ZLV/-XVV

CREW SCHED — EVA - 6 | HST DEPLOYMENT

JSC
ORBITER, CREW, SSE

- EVA CREW EGRESS [15 min] (CONT.)
- EVA CREW PREP FOR EVA-6 [15 min] (INCLUDES BSP CENTER PIP-PINS INSERT)
- BSP SETUP [5 min]
- MFR SETUP [15 min]
- EVA-6 FINAL CLOSEOUT PART #1 [45min] - INCLUDES MFR AND LGA REMOVAL AND STOW
- REMOVE AND STOW MFR [30min]

FREE DRIFT

HST
ACTIVITIES AND COMMANDS

Δ REAL-TIME COMMAND

• COMMENT/ EVENT

Ⓢ SPC

⊗HAZARDOUS

122 • TURN OFF FGEs BEFORE DEPLOY
122 Δ F404-TURN OFF FGEs [8min]

123 • DISABLE ALL OTA HEATERS
123 Δ E508-OTA: OTA HTR GROUPS OFF [3min]

119 • RELOAD SMACs
RELOAD SMAC, HMAC, ACQ LOGIC, & SM RECOVERY LOAD [3min] D668Δ 119
Δ D020-DMS: STOP SSR-3 SHADOW RECORD [1min]

120 • VERIFY INITIAL FSW CONFIGURATION
120 D009-DMS: VERIFY INITIAL HST FSW CONFIG [2min]

198 • SLEW SOLAR ARRAYS TO 90deg
Ⓢ 126 Δ B502g-SA: SLEW SAs TO 90deg [17min]

124 • PSEA TEST MODE
EPS: DISABLE MCU MOTOR CURRENT PRI AND RED [4min]-COP408 Δ 124
PSEA: ENABLE SMC's A/B [1min]-S607 Δ 124
RUN PSEA TEST MODE (A/B SIDES) [13min]-S002a Δ 124⊗
EPS: ENABLE MCU MOTOR CURRENT PRI AND RED [4min]-COP408a Δ 124

CONFIG LGAs FOR RELEASE OPS • 127
I&C: CONFIG MAT TX 2 [7min]-H601 Δ 127

COMM — ENG / EAST / WEST — TN

MAJOR EVENTS:

- JSC GO TO COMMAND HST, EVA-6 ACTIVITIES COMPLETE

Ⓢ EXPORT CONTROLLED INFORMATION

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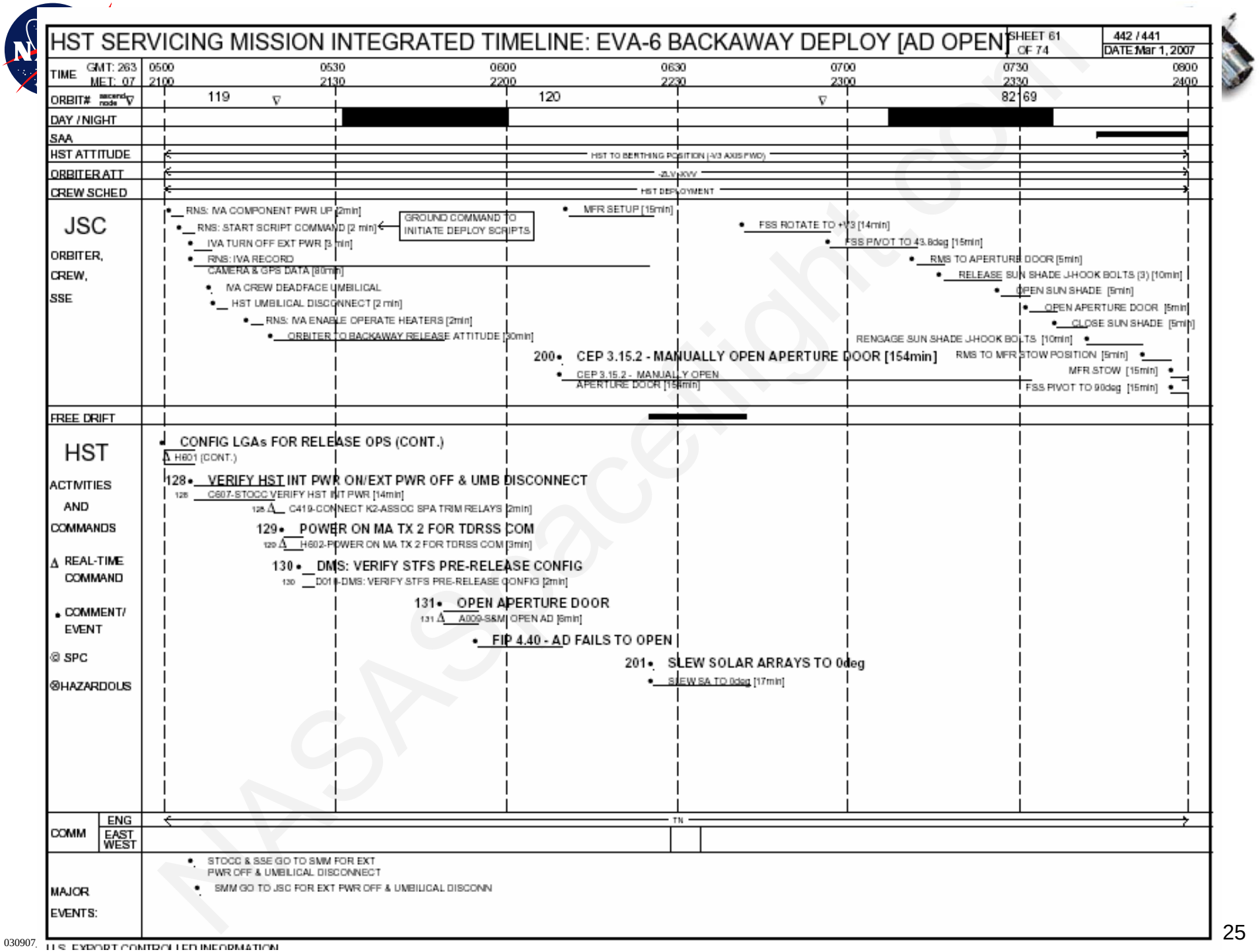

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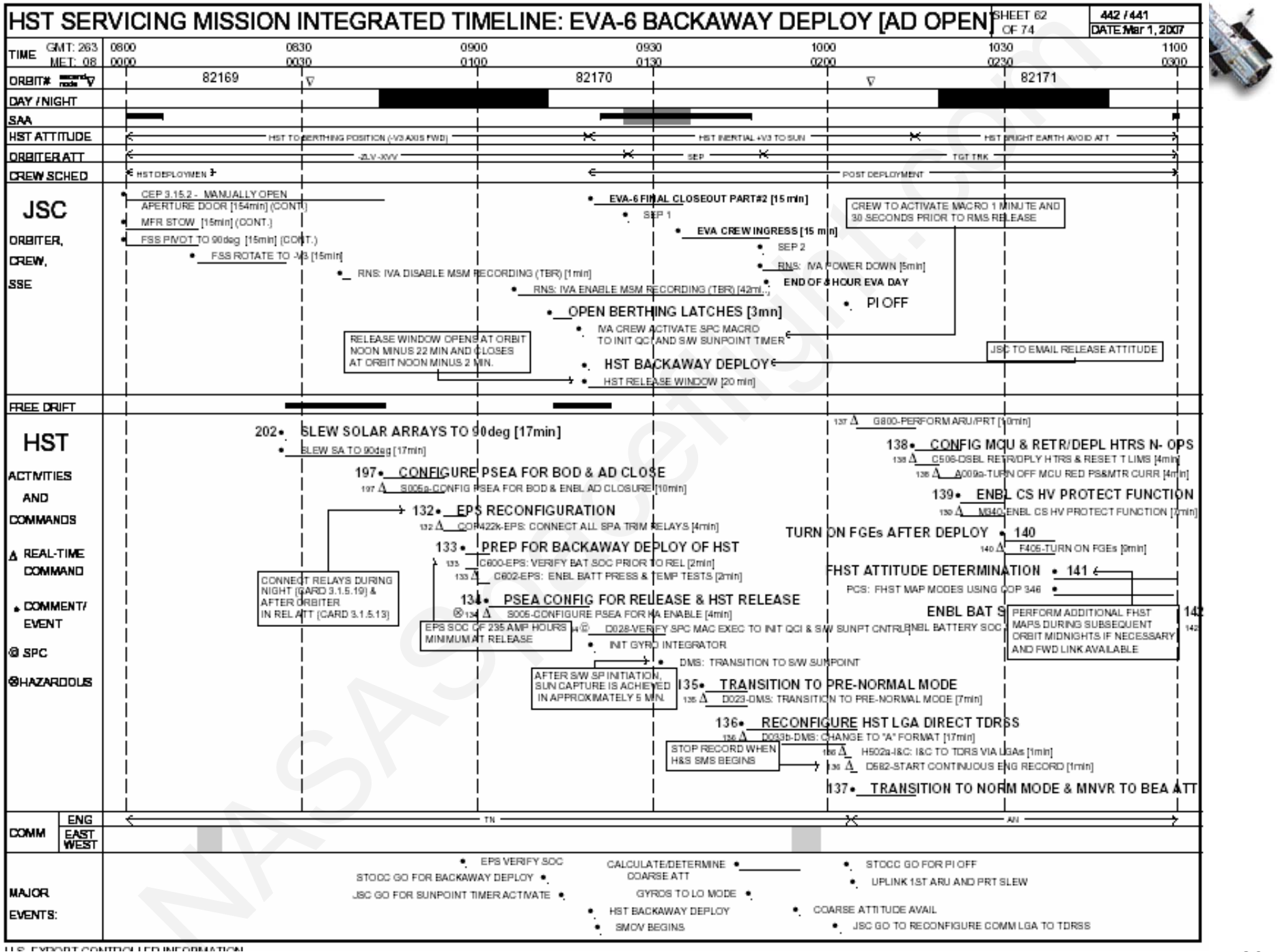
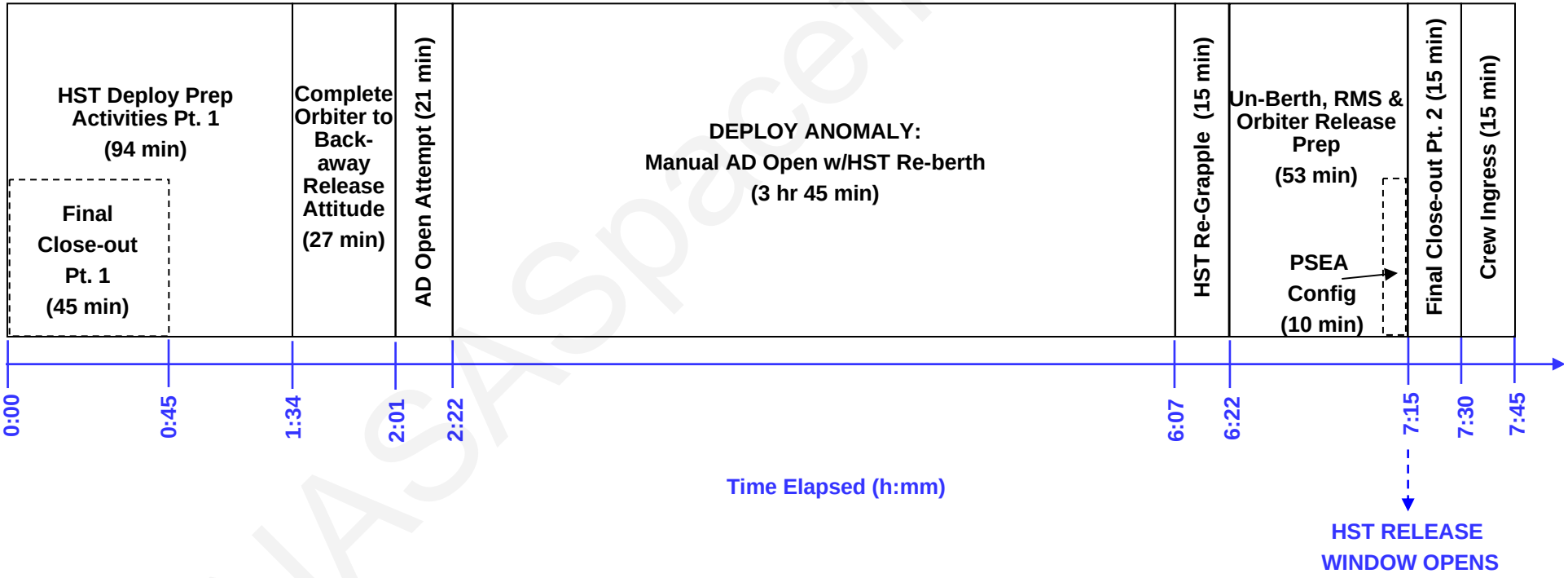


U.S. EXPORT CONTROLLED INFORMATION

RMS Deploy with Aperture Door Open

- **No contingency EVA 6 task time available**
  - Accounts for ~3 hr 45 min EVA assist to open aperture door
    - » Anomaly duration longer (in comparison to back-away) due to HST re-grapple and re-berth, etc, for EVA-assisted AD opening



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DRAFT SMIT 4:
RMS Deploy with AD Open (No EVA6)

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HST SERVICING MISSION INTEGRATED TIMELINE: SM4 EVA 6 [RMS DEPLOY-AD OPEN]

SHEET 70 OF 96 | 442 / 441 | DATE Mar 1, 2007

TIME GMT: 262 / MET: 07

2300 1500 | 2330 1530 | 0000 1600 | 0030 1630 | 0100 1700 | 0130 1730 | 0200 1800

ORBIT# (ascend node) 116 117

DAY / NIGHT

SAA

HST ATTITUDE: HST -V3 AXIS FWD

ORBITER ATT: -ZLV-XVV

CREW SCHED: POST SLEEP — AL REPR — HST DEPLO

JSC

ORBITER, CREW, SSE

RMS: IVA ENABLE OPERATE HEATERS [2min]

EVA-6 FINAL CLOSEOUT (PART I)-INCLUDES REMOVAL & STOW OF LGA COVER & MFR [45 min]

REMOVE MFR [30 MIN]

PHOTO/TV DOCUMENT ENTIRE HST RELEASE OPS — P/TV 17

FREE DRIFT

HST

ACTIVITIES AND COMMANDS

Δ REAL-TIME COMMAND

• COMMENT/ EVENT

@ SPC

⊗HAZARDOUS

118 • LOAD EPHEMERIS TABLES

118 Δ D032a-DMS: LOAD EPHEMERIS DATA [1min]

118 Δ D753-CLEAR EPHEMERIS DELTA TIME LIMIT EXCEED FLAG [1min]

TURN OFF FGEs BEFORE DEPLOY • 122

122 Δ F404-TURN OFF FGEs [8min]

DISABLE ALL OTA HEATERS • 123

OTA: OTA HTR GROUPS OFF [3min]-E508 Δ 123

RELOAD SMACs • 119

RELOAD SMAC, HMAC, ACQ LOGIC, & SM RECOVERY LOAD [9min]-D668 Δ 119

DMS: STOP SSR-3 SHADOW RECORD [1min]-D020 Δ 119

VERIFY INITIAL FSW CONFIGURATION • 120

DMS: VERIFY INITIAL HST FSW CONFIG [2min]-C009 120

SLEW SOLAR ARRAYS TO 90deg • 198

SA: SLEW SAs TO 90deg [17min]-B502g Δ 198 ⊗

SAC DELIVER TABLES TO CORE

COMM: ENG — TN; EAST; WEST

MAJOR EVENTS:

JSC GO TO COMMAND HST, EVA-6 ACTIVITIES COMPLETE •

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U.S. EXPORT CONTROLLED INFORMATION

HST SERVICING MISSION INTEGRATED TIMELINE: SM4 EVA 6 [RMS DEPLOY-AD OPEN]

TIME GMT: 263 / MET: 07 — 0200 1800 | 0230 1830 | 0300 1900 | 0330 1930 | 0400 2000 | 0430 2030 | 0500 2100

ORBIT# (ascend node) — 117 | 118 | 119

DAY / NIGHT

SAA

HST ATTITUDE — HST -V3 AXIS FWD | HST ON RMS (+V3 SUNPOINT)

ORBITER ATT — -ZLV -XVV | REL | -ZLV -XVV

CREW SCHED — HST DEPLOYMENT

JSC (ORBITER, CREW, SSE)

- EVA-6 FINAL CLOSEOUT (PART I) INCLUDES REMOVAL & STOW OF LGA COVER & MFR [45 min] (CONT.)
- REMOVE MFR [30 MIN] (CONT.)
- VERIFY HST POSITION FOR GRAPPLE
- HST GRAPPLE [15 min]
- HST UNBERTH [3 min]
- RMS MNVR HST TO RELEASE POSITION [20 min]
- ORBITER TO RELEASE ATTITUDE [30 min]
- MANUAL APERATURE DOOR OPEN [3 hr 45 min]
- 200
- CEP 3.15.2: MANUALLY OPEN AD [3hr 45 min]
- IVA TURN OFF EXT PWR [3 min]
- RNS: IVA COMPONENT PWR UP [2min]
- IVA CREW DEADFACE UMBILICAL
- RNS: START SCRIPT COMMAND [2 min]
- HST UMBILICAL DISCONNECT [2 min]
- RNS: IVA RECORD CAMERA & GPS DATA [80min]

GROUND COMMAND TO INITIATE DEPLOY SCRIPTS

FREE DRIFT

HST ACTIVITIES AND COMMANDS

Δ REAL-TIME COMMAND

• COMMENT/ EVENT

Ⓢ SPC

Ⓗ HAZARDOUS

- SLEW SOLAR ARRAYS TO 90deg (CONT.)
- Ⓗ Δ B502g (CONT.)

124 • PSEA TEST MODE
- 124 Δ COP408-EPS: DISABLE MCU MOTOR CURRENT PRI AND RED [4min]
- 124 Δ S607-PSEA: ENABLE SMC's A/B [1min]
- Ⓗ 124 Δ S002a-RUN PSEA TEST MODE (A/B SIDES) [13min]
- 124 Δ COP408a-EPS: ENABLE MCU MOTOR CURRENT PRI AND RED [4min]

126 • POWER OFF SADE
- 126 Δ B505a-SA: TURN OFF SADE [4min]

127 • CONFIG LGAs FOR RELEASE OPS
- 127 Δ H601-I&C: CONFIG MAT TX 2 [7min]

128 • VERIFY HST INT PWR ON/EXT PWR OFF & UMB DISCONNECT
- 128 C607-STOCC: VERIFY HST INT PWR [14min]
- 128 Δ C419-CONNECT K2-ASSOC SPA TRIM RELAYS [2min]

129 • POWER ON MA TX 2 FOR TDRSS COM
- 129 Δ H602-POWER ON MA TX 2 FOR TDRSS COM [3min]

130 • DMS: VERIFY STFS PRE-RELEASE CONFIGURATION
- 130 D610-DMS: VERIFY STFS PRE-RELEASE CONFIG [2min]

ORBITER MUST BE AT RELEASE ATTITUDE

131 • OPEN APERTURE DOOR
- Ⓗ 131 Δ A004-S&M: OPEN AD [6min]

• FIP 4.40-AD FAILS TO OPEN [15 min]

COMM — ENG: TN | EAST | WEST

MAJOR EVENTS:
- GRAPPLE HST
- END EVA-6
- STOCC & SSE GO TO SMM FOR EXT PWR OFF & UMBILICAL DISCONNECT
- SMM GO TO JSC FOR EXT PWR OFF & UMBILICAL DISCONN
- APERTURE DOOR OPEN

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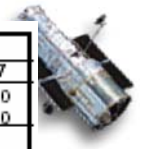

HST SERVICING MISSION INTEGRATED TIMELINE: SM4 EVA 6 [RMS DEPLOY-AD OPEN]

SHEET 72 OF 96 | 442 / 441 | DATE Mar 1, 2007

TIME GMT: 263 MET: 07	0500 2100	0530 2130	0600 2200	0630 2230	0700 2300	0730 2330	0800 2400
ORBIT# ascend node ∇	119 ∇		120		∇	82169	
DAY / NIGHT							
SAA							
HST ATTITUDE	HST ON RMS (+V3 SUNPOINT)						
ORBITER ATT	-ZLV-XVV						
CREW SCHED	HST DEPLOYMENT						
JSC ORBITER, CREW, SSE	MANUAL APERATURE DOOR OPEN [3 hr 45 min] (CONT.) CEP 3.15.2: MANUALLY OPEN AD [3hr 45 min] (CONT.)					VERIFY HST POSITION FOR GRAPPLE HST RE-GRAPPLE [15 min]	
FREE DRIFT							
HST ACTIVITIES AND COMMANDS Δ REAL-TIME COMMAND • COMMENT/ EVENT © SPC ⊗HAZARDOUS							
COMM ENG	TN						
COMM EAST WEST							
MAJOR EVENTS:							

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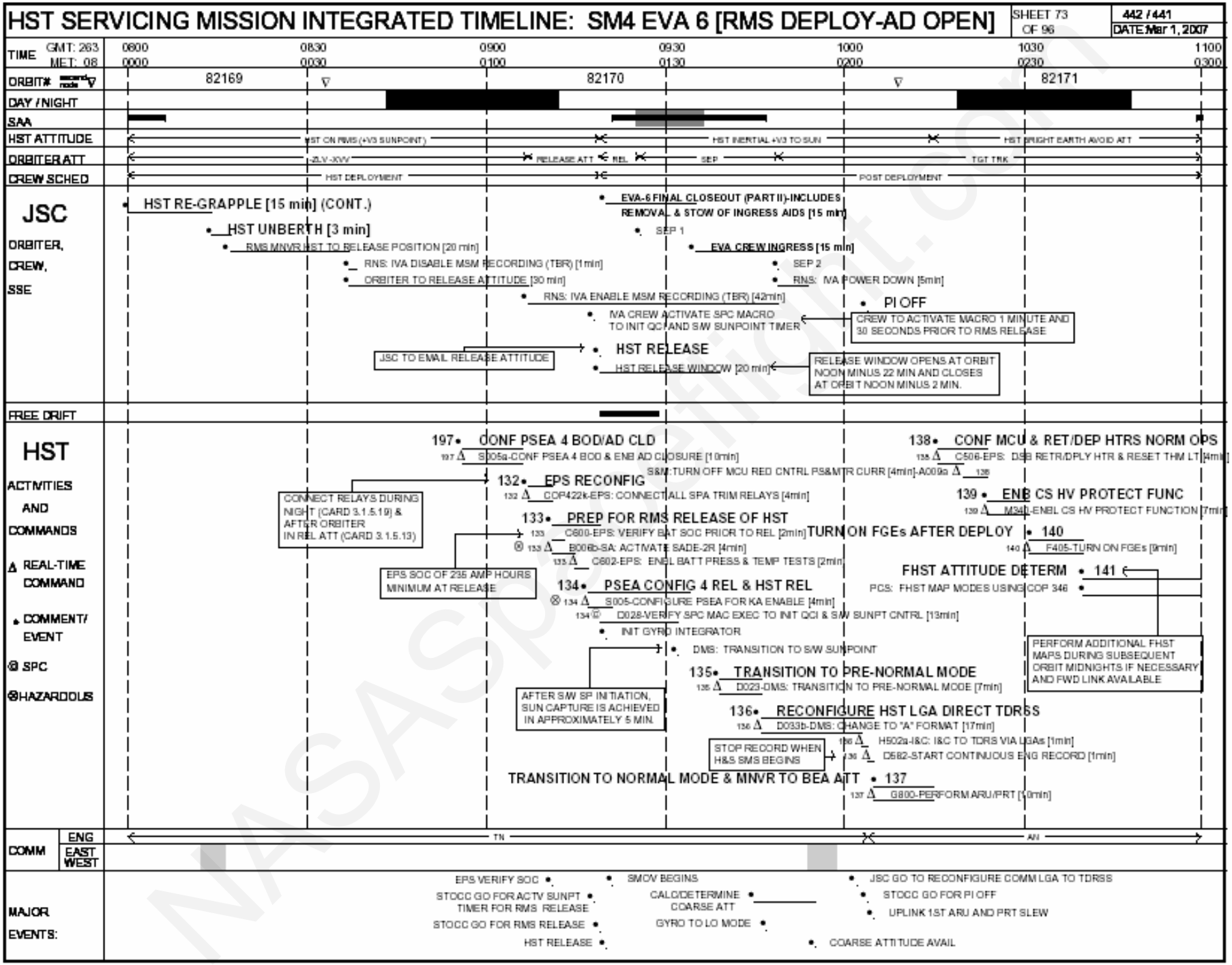

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DRAFT SMIT 5:
Nominal Deploy with AD Open (No EVA6)

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HST SERVICING MISSION INTEGRATED TIMELINE: NOMINAL DEPLOY-AD FAILS TO OPEN

SHEET 70 OF 96 | 442 / 441 | DATE:Mar 1, 2007

TIME GMT: 262 / MET: 07
2300 / 1500 | 2330 / 1530 | 0000 / 1600 | 0030 / 1630 | 0100 / 1700 | 0130 / 1730 | 0200 / 1800

ORBIT# (ascend node) ▽ — 116 — ▽ — 117

DAY / NIGHT

SAA

HST ATTITUDE: HST -V3 AXIS FWD

ORBITER ATT: -ZLV, -XVV

CREW SCHED: POST SLEEP — A/L REPR — HST DEPLO

JSC

ORBITER, CREW, SSE

- RNS: IVA ENABLE OPERATE HEATERS [2min]
- P/TV 17

PHOTO/TV DOCUMENT ENTIRE HST RELEASE OPS

FREE DRIFT

HST

ACTIVITIES AND COMMANDS

Δ REAL-TIME COMMAND

• COMMENT/ EVENT

© SPC

⊗ HAZARDOUS

118 • LOAD EPHEMERIS TABLES
118 Δ D032a-DMS: LOAD EPHEMERIS DATA [1min]
118 Δ D753-CLEAR EPHEMERIS DELTA TIME LIMIT EXCEED FLAG [1min]

122 • TURN OFF FGEs BEFORE DEPLOY
122 Δ F404-TURN OFF FGEs [8min]

123 • DISABLE ALL OTA HEATERS
123 Δ E508-OTA: OTA HTR GROUPS OFF [3min]

119 • RELOAD SMACs
RELOAD SMAC, HMAC, ACQ LOGIC & SM RECOVERY LOAD [9min]-D668 Δ 119
DMS: STOP SSR-3 SHADOW RECORD [1min]-D020 Δ 119

VERIFY INITIAL FSW CONFIGURATION • 120
DMS: VERIFY INITIAL HST FSW CONFIG [2min]-D009 120

SLEW SOLAR ARRAYS TO 90deg • 198
SA: SLEW SAs TO 90deg [17min]-B502g Δ 198⊗

SAC DELIVER TABLES TO CORE

COMM: ENG — TN; EAST / WEST

MAJOR EVENTS:

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HST SERVICING MISSION INTEGRATED TIMELINE: NOMINAL DEPLOY-AD FAILS TO OPEN

SHEET 71 OF 96 | 442 / 441 | DATE: Mar 1, 2007

TIME — GMT: 263 / MET: 07

0200 1800 | 0230 1830 | 0300 1900 | 0330 1930 | 0400 2000 | 0430 2030 | 0500 2100

ORBIT# (ascend node) 117 118 119

DAY / NIGHT

SAA

HST ATTITUDE: HST -V3 AXIS FWD | HST ON RMS (+V3 SUNPOINT)

ORBITER ATT: -ZLV -XVV | RELEASE ATTITUDE

CREW SCHED: HST DEPLOYMENT

JSC — ORBITER, CREW, SSE

- VERIFY HST POSITION FOR GRAPPLE
- **HST GRAPPLE [15 min]**
- IVA TURN OFF EXT PWR [3 min]
- RNS: IVA COMPONENT PWR UP [2min]
- IVA CREW DEADFACE UMBILICAL
- RNS: START SCRIPT COMMAND [2 min] ← GROUND COMMAND TO INITIATE DEPLOY SCRIPTS
- HST UMBILICAL DISCONNECT [2 min]
- RNS: IVA RECORD CAMERA & GPS DATA [80min]
- **HST UNBERTH [3 min]**
- RMS MNVR HST TO RELEASE POSITION [20 min]
- ORBITER TO RELEASE ATTITUDE [30 min]
- **200 MANUAL APERTURE DOOR OPEN [3 hr 45 min]**
- CEP 3.15.2: MANUALLY OPEN AD [3hr 45 min]
- HST TO BERTHING ATTITUDE [60min]
- HST BERTHED [15min]

FREE DRIFT

HST — ACTIVITIES AND COMMANDS

Δ REAL-TIME COMMAND · • COMMENT/EVENT · © SPC · ⊗ HAZARDOUS

- **SLEW SOLAR ARRAYS TO 90deg (CONT.)**
- ⊗ Δ B502g (CONT.)
- **124 PSEA TEST MODE**
- 124 Δ COP408-EPS: DISABLE MCU MOTOR CURRENT PRI AND RED [4min]
- 124 Δ S607-PSEA: ENABLE SMC's A/B [1min]
- ⊗ 124 Δ S002a-RUN PSEA TEST MODE (A/B SIDES) [13min]
- 124 Δ COP408a-EPS: ENABLE MCU MOTOR CURRENT PRI AND RED [4min]
- **126 POWER OFF SADE**
- 126 Δ B505a-SA: TURN OFF SADE [4min]
- **127 CONFIG LGAs FOR RELEASE OPS**
- 127 Δ H601-I&C: CONFIG MAT TX 2 [7min]
- **128 VERIFY HST INT PWR ON/EXT PWR OFF & UMB DISCONNECT**
- 128 C607-STOCC VERIFY HST INT PWR [14min]
- 128 Δ C419-CONNECT K2-ASSOC SPA TRIM RELAYS [2min]
- **129 POWER ON MA TX 2 FOR TDRSS COM**
- 129 Δ H602-POWER ON MA TX 2 FOR TDRSS COM [3min]
- **130 DMS: VERIFY STFS PRE-RELEASE CONFIGURATION**
- 130 D010-DMS: VERIFY STFS PRE-RELEASE CONFIG [2min]
- **131 OPEN APERTURE DOOR** ← ORBITER MUST BE AT RELEASE ATTITUDE
- ⊗ 131 Δ A009-S&M: OPEN AD [6min]
- **FIP 4.40-AD FAILS TO OPEN [15 min]**

COMM — ENG / EAST / WEST: TN

MAJOR EVENTS:

- GRAPPLE HST
- STOCC & SSE GO TO SMM FOR EXT PWR OFF & UMBILICAL DISCONNECT
- SMM GO TO JSC FOR EXT PWR OFF & UMBILICAL DISCONN
- APERTURE DOOR OPEN

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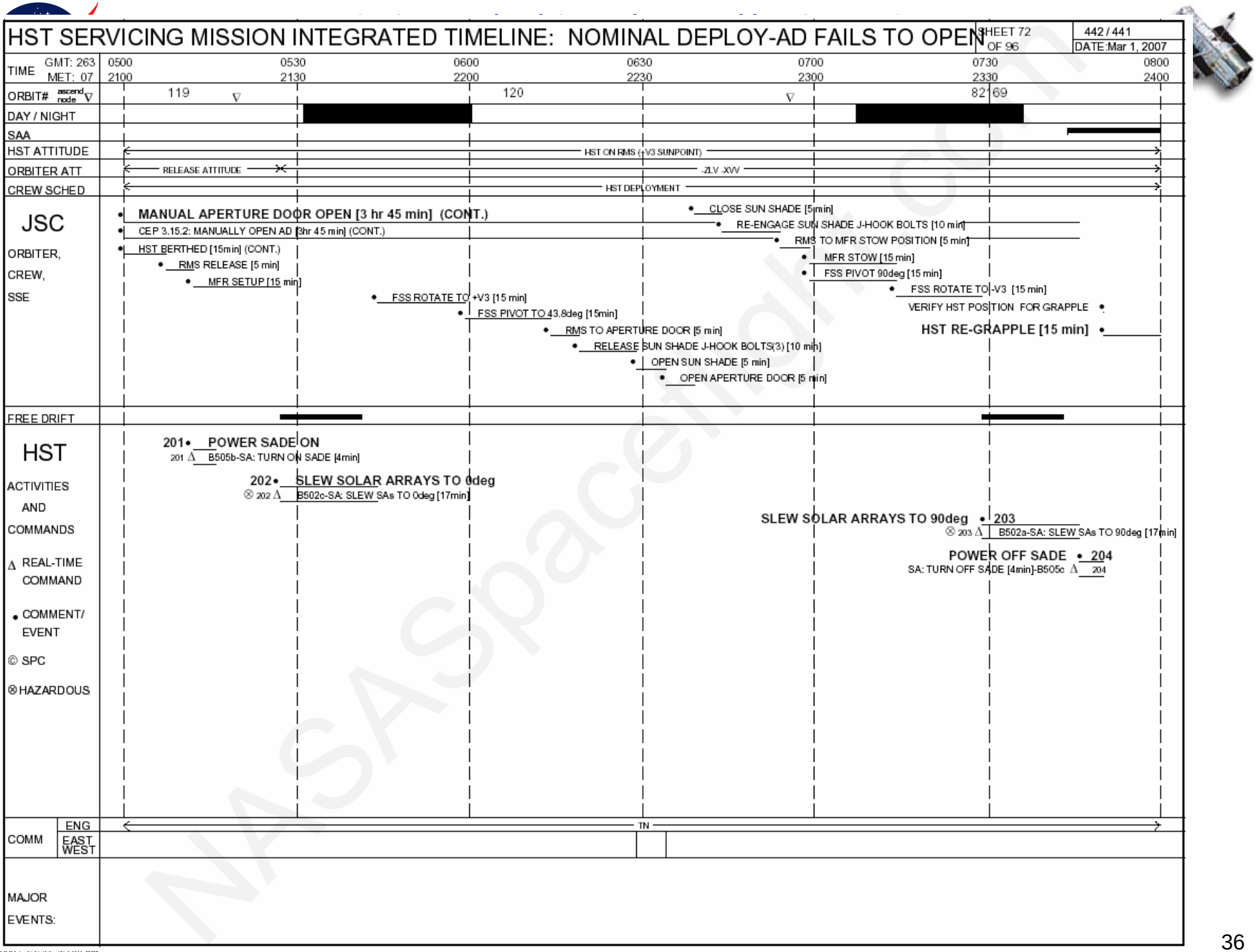

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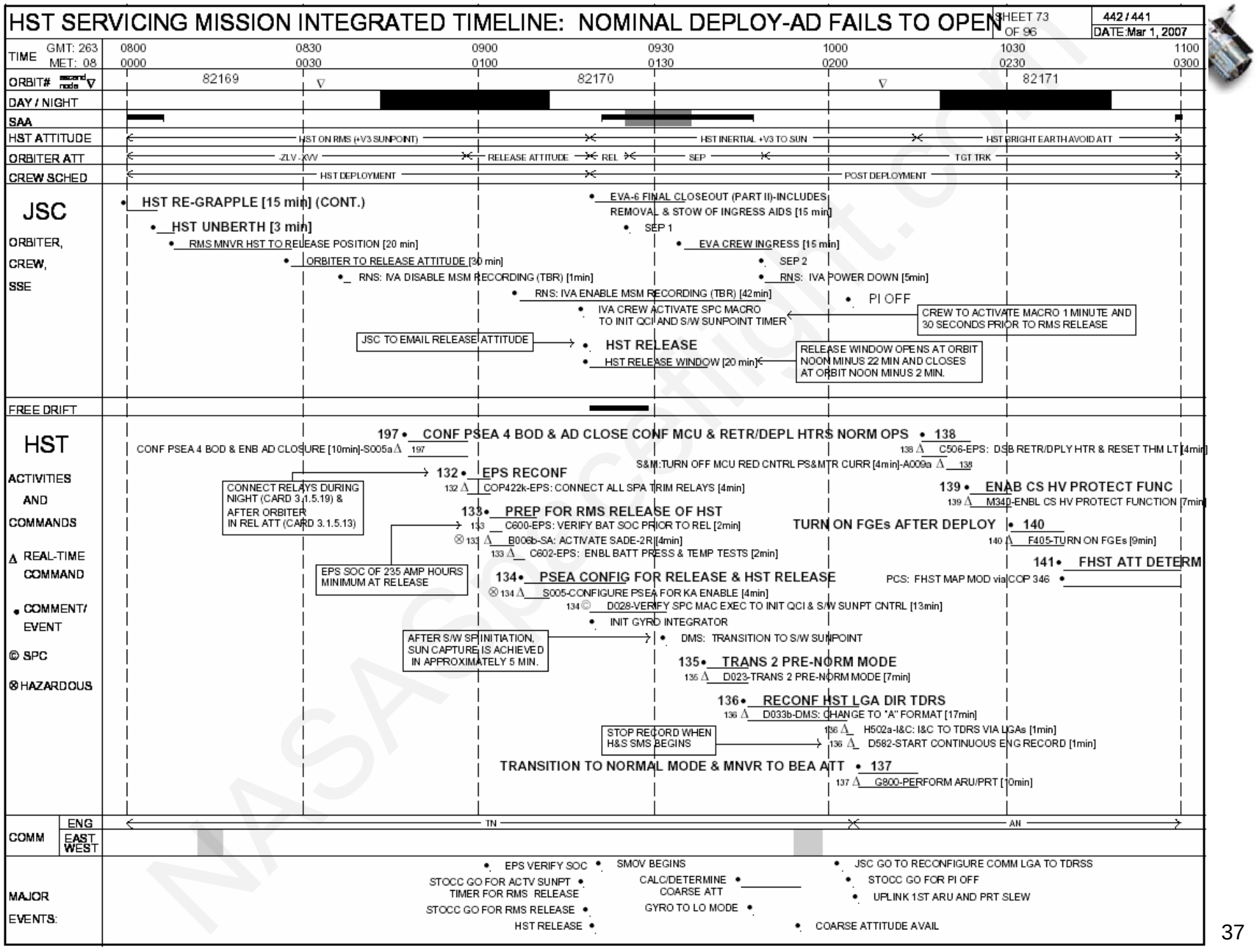

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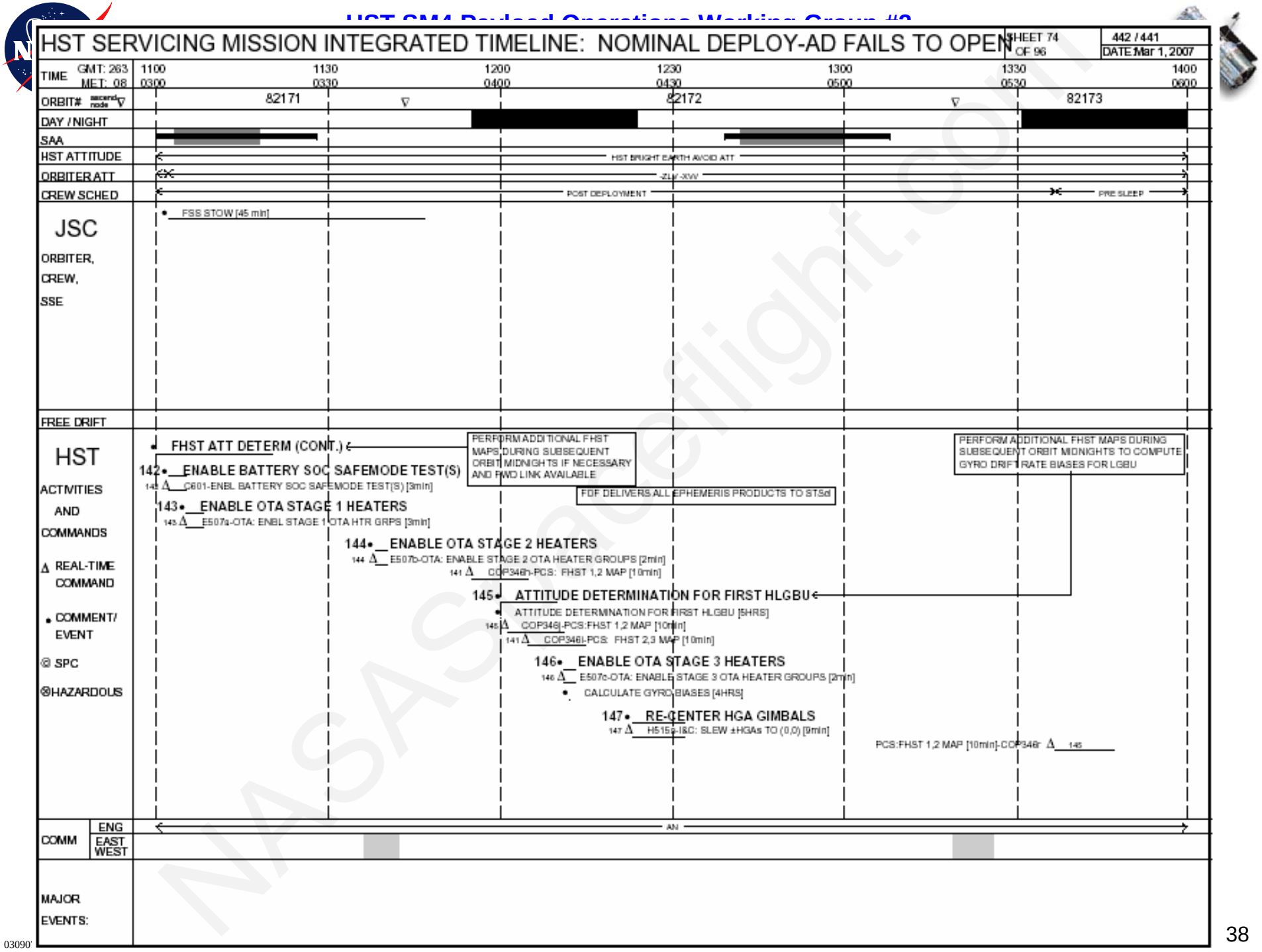

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