NETWORKS AND MISSION SERVICES DIRECTORATE

STS-88 ISS Assembly Sequence 2A Flight Readiness Review

Networks

AGENDA

- TDRSS Constellation
- Significant Changes
- Russian Voice/Data Circuits
- GN/RTS Utilization
- Configuration Management
- Critical Periods
- Unity Node 1/ECOMM Support
- Readiness Certification

Gary A. Morse
GSFC/Networks
November 1998

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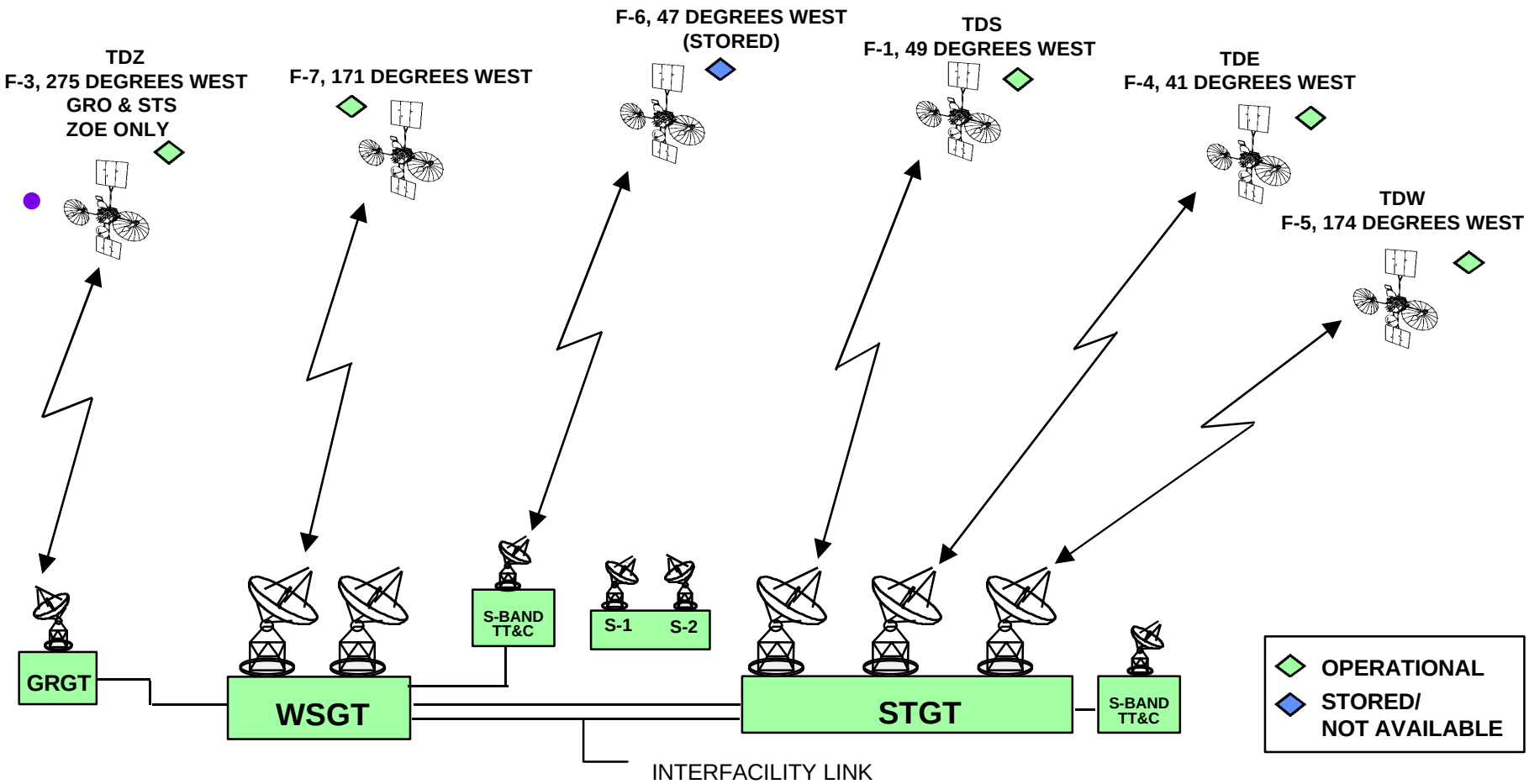
TDRSS Constellation



● AVAILABLE ON-ORBIT AT INCO DISCRETION

Significant Changes

- Space Network
  - WSC
    - Software release 98003 delivered to WSGT November 11, 1998, and to STGT November 18,1998
      - Enhances displays for IONET (deletes legacy information)
    - One ETN
      - ETN 277 for STS voice processor mode changes. Installed at WSGT only (applies to test mode 6 only)
    - SGLT re-assignments
      - SGLT 4 returned to the LAN and back in operations November 20, 1998
      - SGLT 5 taken off LAN for HIJ hardware mods December 12,1998

Significant Changes (cont)

- Ground Network
  - MILA/PDL MBR work
    - Enhanced switch subsystem controller
      - Improves workstation performance
    - Remote Control Interface Upgrades
      - Provides insight to station switching
    - Tracking Acquisition Processor (TAP) software
      - Corrects INP recognition anomaly
- C-Band Radars
  - ASTC remains down for relocation, ETRO January 1999
  - Two KMR radars down for site visitation, November 22, 1998-January 2, 1999

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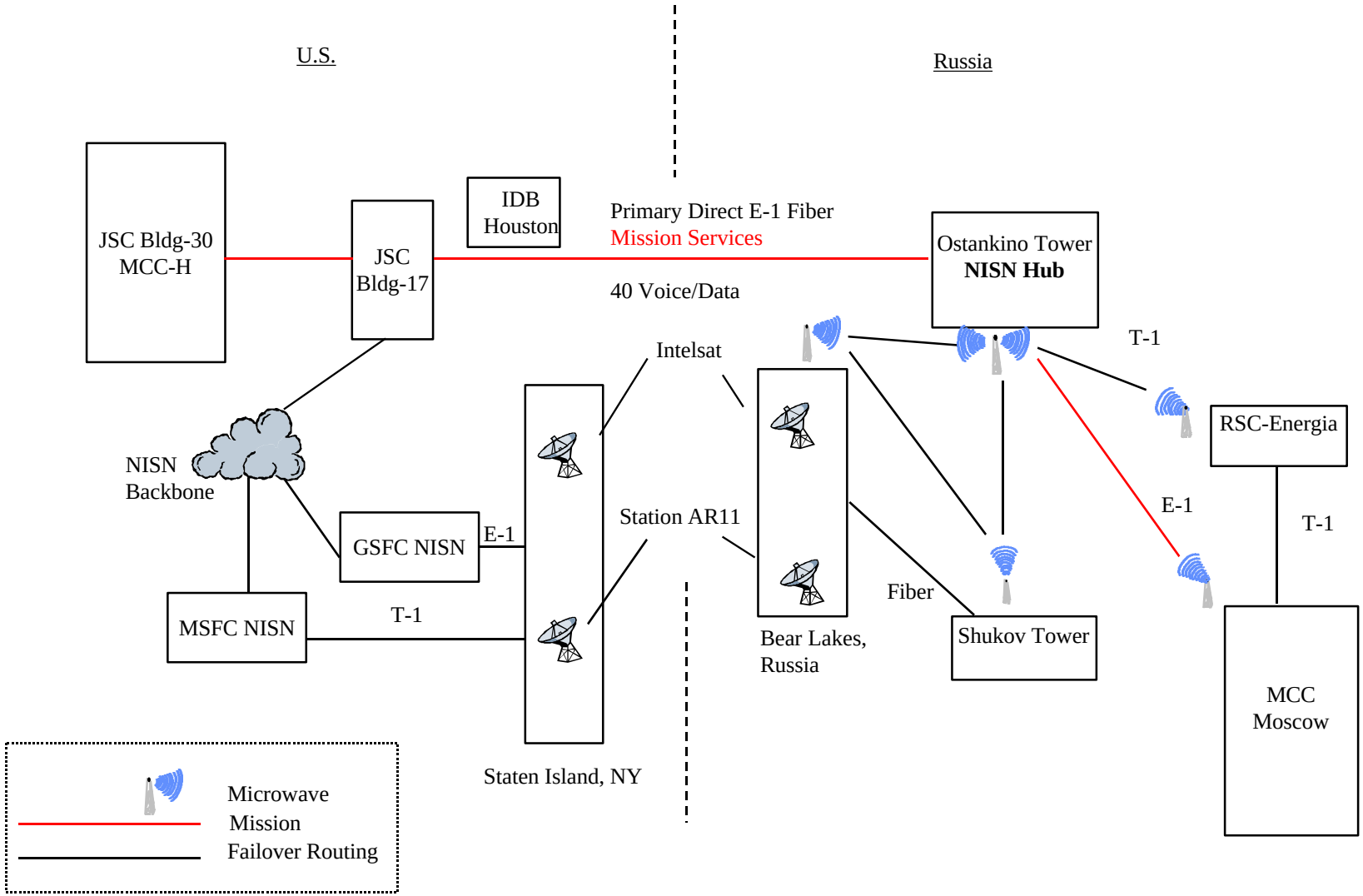
Russian Voice/Data Circuits



GN/RTS Utilization

NETWORK	GN				RTS
SITES	MIL	PDL	WLP	DFRC	
Launch/Orbit Insertion	X	X	X	X	X
Node Berthing					X
Rendezvous/Docking	X		X	X	X
EVAs	X		X		X
FGB Ing/ECOMM Install	X				X
UnDock Fly Around					X
Deployments	X		X	X	X
L-1 Day Checkout	X			X	
After K-Band Stow	X			X	X
Landing	X			X	

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STS-88/ISS-2A NETWORKS

ECOMM Verification Program Test Phases

Unit-Level Testing @ GSFC & JSC

- **Vendor Acceptance Test**
- Box-Level Spec/ Requirement Verification
- Acceptance Testing
- Functional & Performance Test
  - GSFC (Transceiver)
  - JSC (EMI, Thermal)
  - Indiana Univ (radiation)
  - White Sands (toxicity)

System Integration Tests @ JSC

- System Integration
- Detailed Performance
- ESTL End-to-End with Testbed
- **ESTL End-To-End with TDRSS**
- HSI Testing at ESTL

Cargo Element Tests @ KSC

- Fit Check (Astronaut Installation)
- Power Up Tests
- CTP/MDM Checkout
- Radiation Test (Hat Coupler)
  - View RF Spectrum in LDR/HDR
- **RF End-To-End with TDRSS**
  - **Send Commands from MCC**
  - **Radiate TLM from ECOMM to MCC**
  - **Command to HDR and verify two-way videotelecon**

On-Orbit Checkout

- No STS DTO's are Planned
- Antennas Installed FD7 on EVA 2
- Internal Node Elements and cabling installed FD8 (Node Ingress)
- System Powered up and Checked out
- **Functional HDR Checks**
- **Functional LDR Checks**
- **Antenna Characterization after crew departs Node**
- System Left in LDR Mode

GSFC/SN Involvement

ECOMM Network Support

- GSFC Support Interfaces (Staffed 24 hours per day, 7 days per week)
  - Technical Manager (TM) - Senior Network and NCC Point-of-Contact
  - Performance Analyst (PA) - Realtime Operations Interface for Monitoring and Control
  - Scheduling Operator (SO) - Scheduling Interface for SN Elements
  - Communications Manager (COMM MGR) - Fault Isolation for Communications outages
- Augmented Support Interfaces
  - Dedicated SO during three hour Ops Planning Shift each day (M-F)
  - Duty STDN Mission Manager (SMM) four hours a day, five days a week for the first month of ECOMM operations following STS-88 Landing
  - On-call SMM - 24 hours per day, 7 days per week for ECOMM support between STS missions
- ECOMM Voice Circuit Interfaces - 24 hours per day, 7 days per week
  - SHO Time Scheduling Circuit
  - TN Coordination Circuit
  - GC/NOM Interface
  - FDF Coordination Circuit

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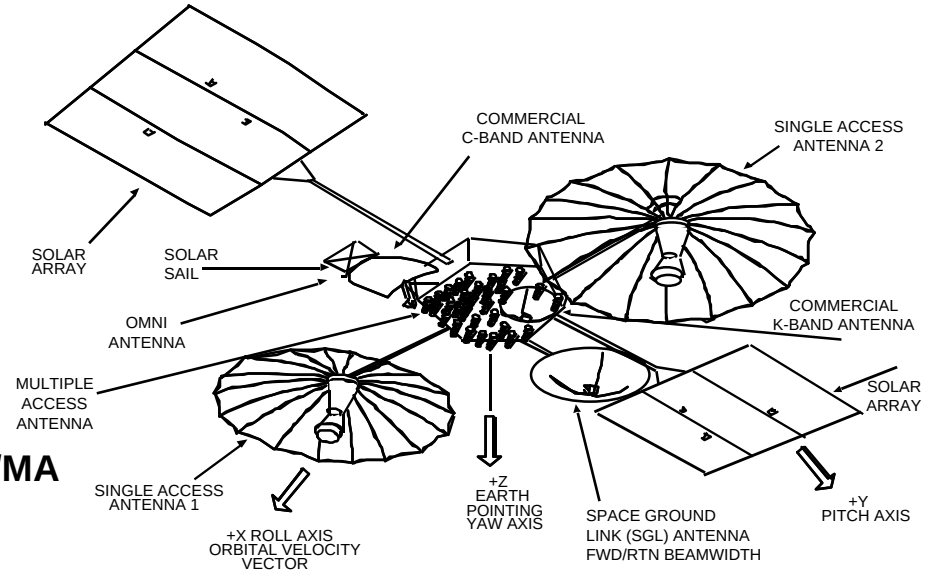
ECOMM Network Support (cont)

- TDRS Coverage during STS-88 mated Ops
  - FD 8 MET 6/12:45-6/17:00 SA
  - FD 8/9 MET 6/21:00-7/10:00 SA
  - FD 9 MET 7/10:00-10:30 SA
  - FD 9/10 MET 7/20:30-8/10:00 SA
  - FD 10/11 MET 8/19:30-9/08:00 SA/MA
  - FD 11 MET 9/08:00 - Undock SA



- TDRS Coverage from Undock + 48 Hours
  - Continuous SA Forward and Return Required
- TDRS Coverage for On-Orbit ECOMM Operations
  - Total of three 40 minute events per day during JSC daily ops planning shift
  - Minimum of one 10 minute event on all remaining orbits each day
  - Additional coverage may be requested using TDRS Unscheduled Time (TUT) displays or MA return services during realtime schedule period

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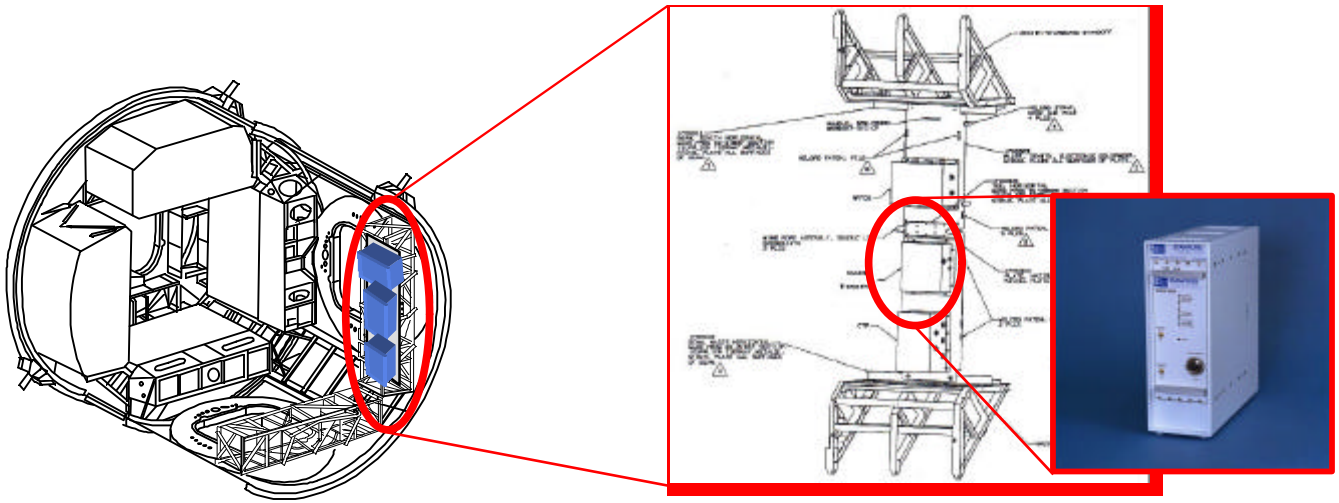
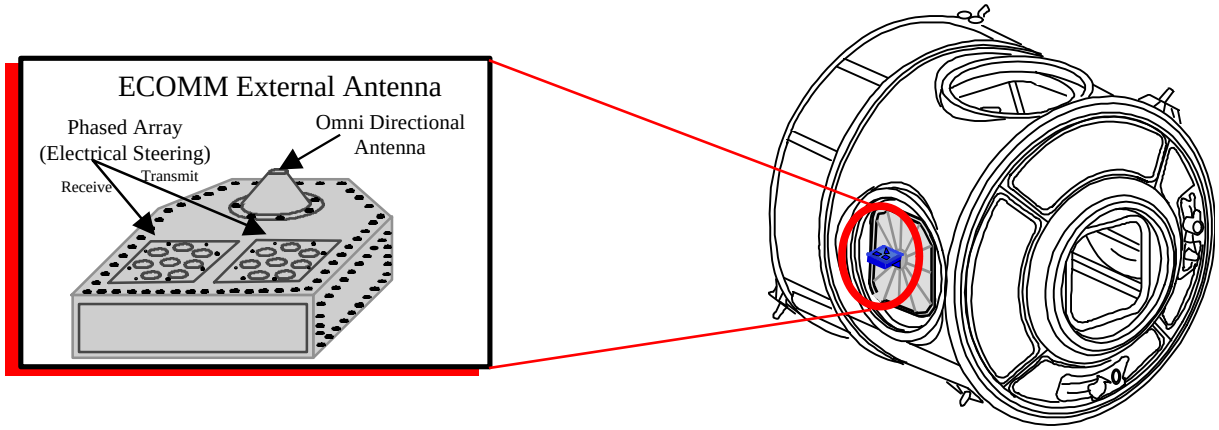
ISS Unity Node 1 Outfitting





ECOMM Network Support Requirements

- Space-to-Ground
  - S-Band Forward 128 / 6 Kbps Uplink
  - S-Band Return 128/ 20.48 Kbps Downlink
- Data Communications - Synchronous, Serial Bitstream Data and Clock
  - 256 / 12 Kbps from JSC to WSC for Spacecraft Uplink Data (Rate 1/2 Convolutional Encoded)
  - 128 / 20.48 Kbps from WSC to JSC for S-Band Telemetry
  - 128 / 20.48 Kbps from WSC to JSC for Recorded S-Band Telemetry (Line-Outage)
- Tracking
  - S-Band one-way Doppler (via TDRSS for Center Frequency Determination)
- FDF TDRS Pointing Vectors and Orbit Determination

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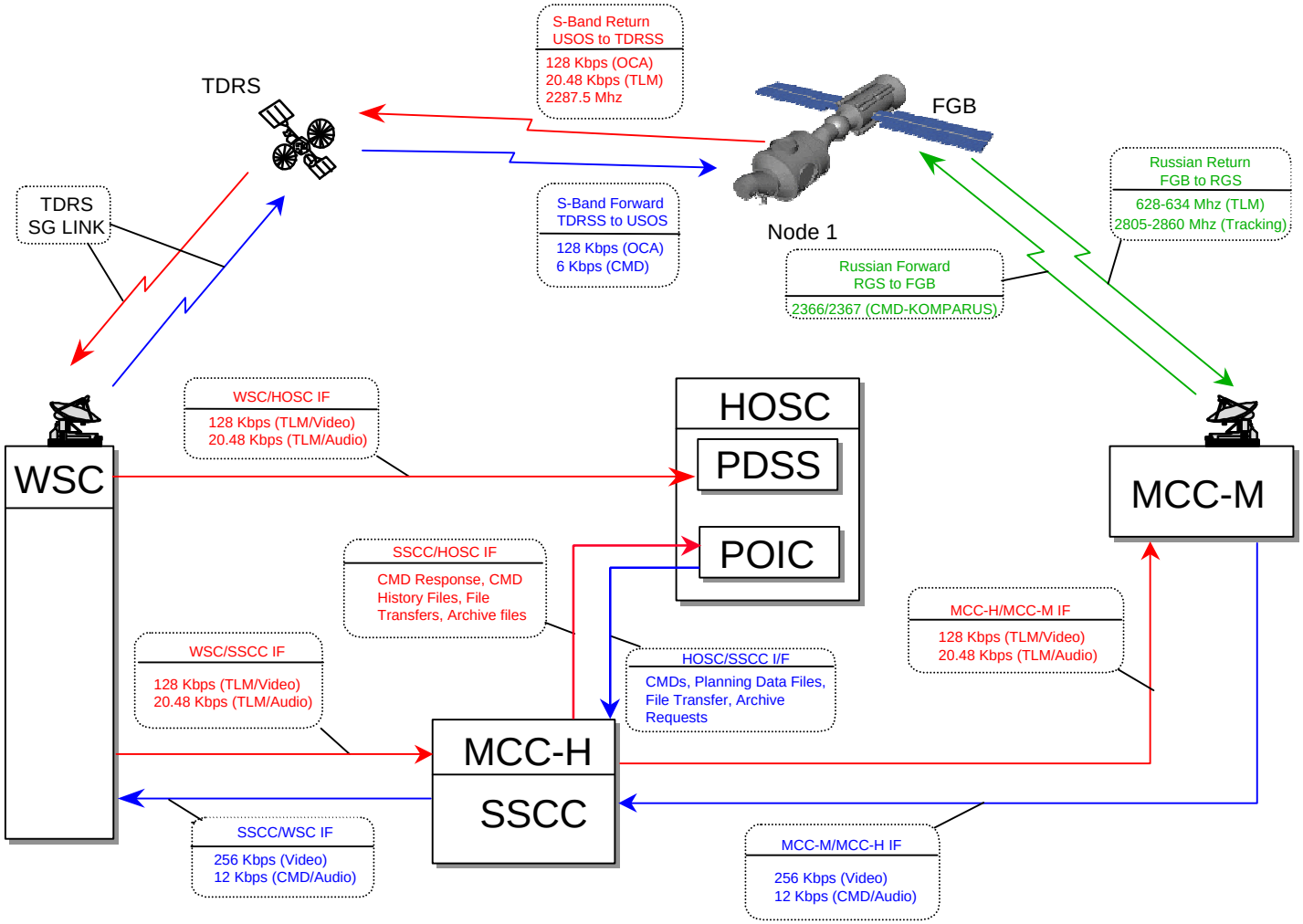
Unity Node 1/ECOMM
Network Communications Support Configuration



Critical Periods

EVENT	*START*	*STOP*
LAUNCH RENDEZVOUS MISSION	LAUNCH -4 HOURS	LAST RENDEZVOUS BURN ON FD1
LAUNCH NON-RENDEZVOUS MISSION	LAUNCH -4 HOURS	"GO FOR ORBIT OPS"
PAYLOAD DEPLOY	DEPLOY -3 HOURS	FINAL SEP BURN (+1 ORBIT DELAY)
RENDEZVOUS/DOCKING	2 HOURS PRIOR TO FIRST DAY OF RENDEZVOUS BURN (~CREW WAKEUP)	HATCH OPENING (+1 ORBIT DELAY FOR CONTINGENCY)
RENDEZVOUS GRAPPLE/RETRIEVE	2 HOURS PRIOR TO FIRST DAY OF RENDEZVOUS BURN (~CREW WAKEUP)	PAYLOAD BERTHING (+1 ORBIT DELAY FOR CONTINGENCY)
EVA	EVA EGRESS - 1 HOUR	EVA INGRESS + 1 HOUR
UNDOCKING	UNDOCKING - 3 HOURS	FINAL SEP BURN (+1 ORBIT DELAY
LANDING	TD - 5 HOURS	WOW

Identifies Critical Periods

Configuration Management

- Hardware/Software Freeze
  - Integrated networks freeze will be imposed prior to the Space Network Verification/Validation or launch minus 7 days; whichever comes first
  - Exemptions are approved by the Network Director
- Critical period restrictions
  - Critical periods have been identified
  - Maintenance and testing restrictions are imposed on space and ground network elements during critical mission periods

Goddard Space Flight Center

Certificate Of Flight Projects Directorate Networks Readiness

This is to certify that with successful completion of flight readiness preparations and closure of associated action items, all integrated networks and mission services elements are ready to support the STS-88 ISS Assembly Sequence 2A mission.

11/2/98	11/2/98	11/2/98
G. A. Morse/NASA **Date**	**L. Holmesly** **Date**	**W. Mack/NASA** **Date**
Space Shuttle Network Director	**JSC ISS Operations Planning**	**Office Of Flight Assurance**
11/2/98	11/2/98	11/2/98
W. Watson/NASA **Date**	**R. N. Harris/NASA** **Date**	for **W. Friedman/ATSC** **Date**
GSFC Center Data Services Manager	**GSFC Center Mission Services Manager**	**Vice President GSFC Programs**
11/2/98	11/2/98	11/2/98
R. Flaherty/NASA **Date**	**S. Currier/NASA** **Date**	**T. Sobchak/NASA** **Date**
Space Network Project	**Ground Network Project**	**Space Shuttle Networks Test Manager**

Backup

NASA Integrated Service Network
ISS Phase 2
Bandwidth Allocation for Mission Transatlantic Circuit

Bandwidth Allocation MCC-H to MCC-M

84.00 kbps	Network Multiplexer
256.00 kbps	Critical Mission TCP/IP Data
224.00 kbps	Critical Mission Voice Loops (Combination of 32k and 16k)
896.00 kbps	Non-Critical Mission TCP/IP Data
496.00 kbps	Non-Critical Mission Voice Loops (Combination of 32k and 16k)
1956.00 kbps	Total
2048.00 kbps	Total Bandwidth
1956.00 kbps	Total Used
92.00 kbps	Remaining Bandwidth

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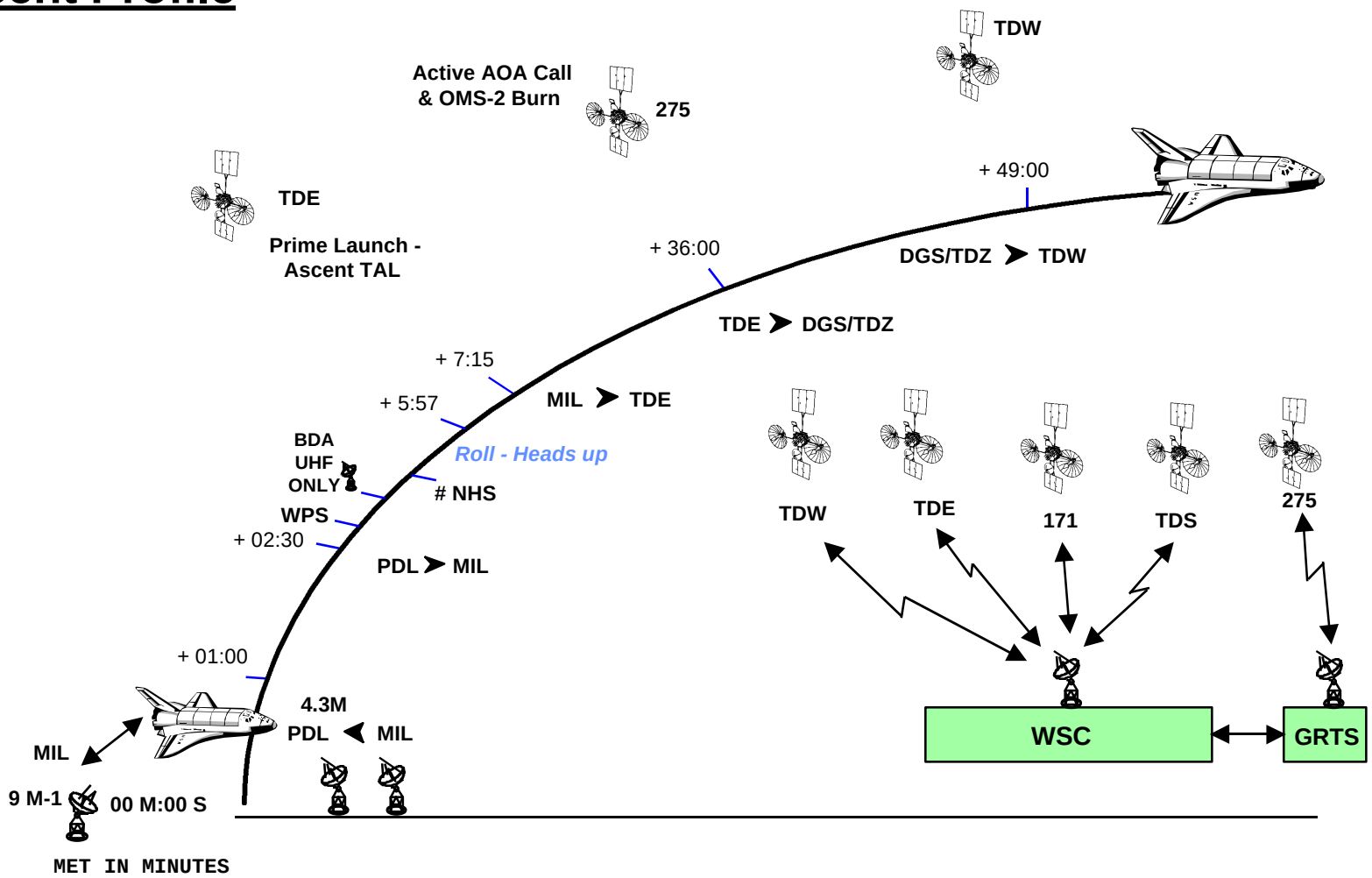
Ascent Profile



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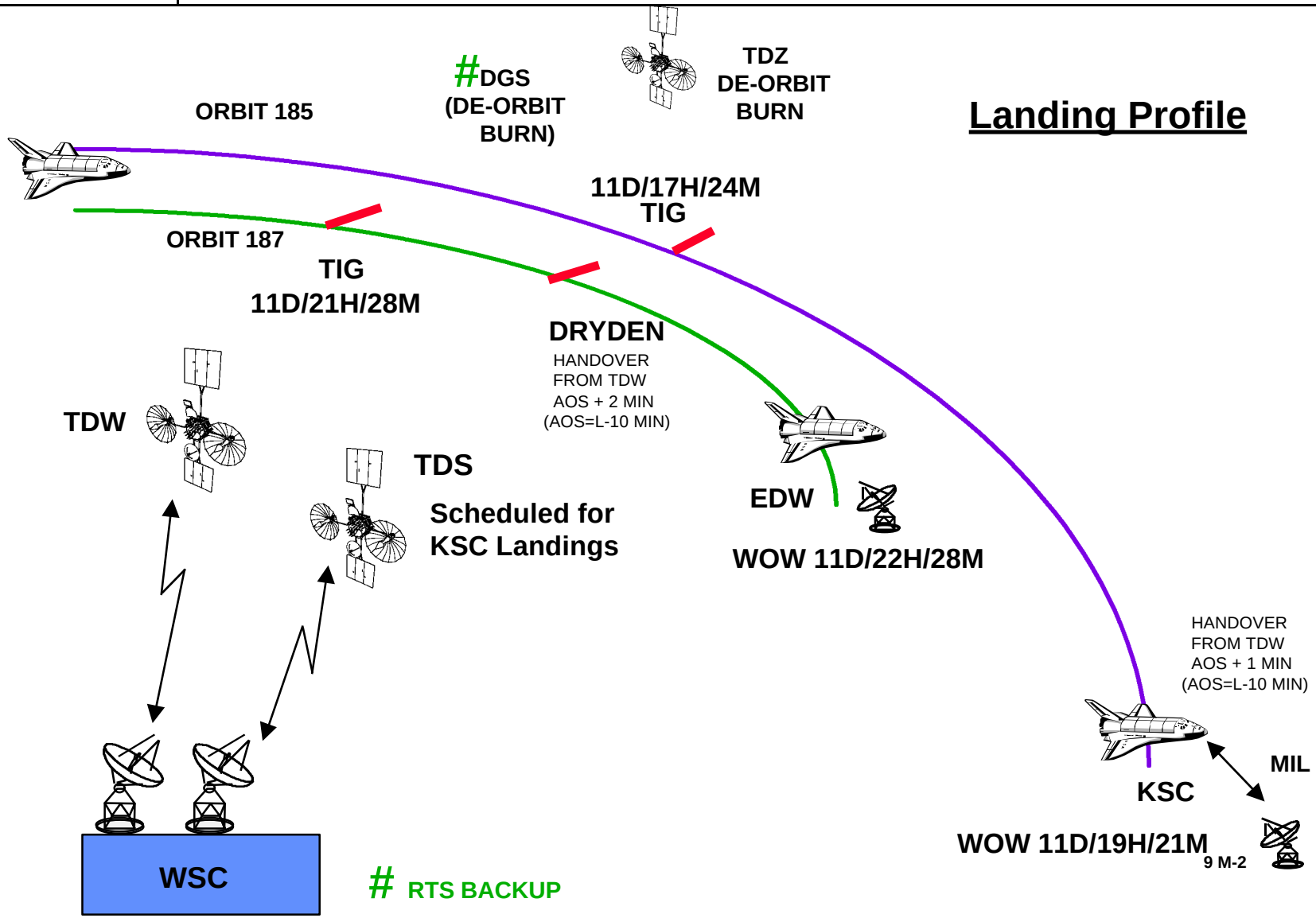
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