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# **H-II Transfer Vehicle-2 (HTV) Mission Operations Readiness Review (MORR)**

**November 30, 2010**  
**BASELINE 12/20/10**

**Presented to:**  
**NASA/Goddard Space Flight Center**  
**Networks Integration Management Office, Code 450.1**



# Agenda

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- Purpose of the Mission Operations Readiness Review
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J. Bangerter

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- Integrated Networks Timeline Summary
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E. Richards

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E. Richards

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- NASA Integrated Services Network (NISN) Operations
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E. Richards

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E. Richards

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- Networks Requirements Verification Results
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R. Kirchoff

M. Virden

R. Zimmerman

E. Richards

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## 8. Backup

E. Richards

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## 8. Acronym List



# Review Board

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- **Scott A. Greatorex, Chairperson, GSFC, Code 450.1, Chief, Networks Integration Management Office**
- **Robert L. Jones, GSFC, Code 599, 450 Senior Technical Authority**
- **Bradford Butts, GSFC, Code 761, Systems Management Branch**
- **Dennis W. Woodfork, GSFC, Code 595, Navigation and Mission Design Branch**
- **Joseph M. Aquino, JSC-DD13, Manager, Space Communications Integration Office**
- **Donald W. Shinnors, GSFC, Code 452, Space Network Project**
- **James A. Bangerter, GSFC, Code 450.1, Human Spaceflight Network Director**



# Purpose of the Mission Operations Readiness Review

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- **To demonstrate that the network has analyzed and tested or verified the requirements**
- **To ensure that all network service providers are ready to provide the required services**



# Rules and Definitions for Requests for Action and Action Items

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- **Requests for Actions (RFA) and Action Items (AI) will be assigned by the Review Board. The Review Board will review and consolidate the list, and classify items as either RFAs or AIs**
- **RFAs:**
  - **Intended to assist HTV-2 in meeting its objectives, and should be limited to items considered significant enough to report to the Management Council**
  - **Submittal due by Close of Business (COB) on day of MORR**
  - **Completion due 2 weeks pre-launch**
- **Als:**
  - **Used to coordinate items that do not rise to the level of issues trackable by RFAs**
  - **Requests that are due post-mission will be classified as Als**
  - **Status is due 1 week after the AI is issued**



# Status of Requests for Action and Open Action Items

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- **RFAs - None**

RFA No.	Action	Response	Status

- **Als - None**

AI No.	Action	Status



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# HTV-2 Mission Overview

**E. Richards**



# Project/Mission Summary

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- **The objectives of this mission are as follows:**
  - **HTV-2 is an unmanned resupply spacecraft developed by Japan Aerospace Exploration Agency (JAXA) to deliver equipment, spare parts and consumables to the International Space Station (ISS)**



# Events

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<b>Mission Time HH:MM:SS</b>	<b>Event</b>	<b>Comments</b>
<b>L-00:20:00</b>	<b>TDRS event start</b>	
<b>T+00:00:00</b>	<b>H-IIB Lift-off</b>	
<b>T+00:05:47</b>	<b>H IIB Main engine cutoff</b>	
<b>T+00:14:16</b>	<b>H-IIB Second stage cutoff</b>	
<b>T+00:15:11</b>	<b>HTV-2 Separation</b>	
<b>7d6h30m</b>	<b>Docking</b>	



# Mission Summary

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- **Launch Date** January 20, 2011
- **DOY/Time** 020/0629 Z
- **Backup Launch Window** January 21, 2011 – February 28, 2011
- **Launch Vehicle/Site** H-IIB, JAXA's Tanegashima Space Center (TnSC) on Tanegashima Island
- **Primary Payload** 6 Tons (Supplies/Scientific Payload)
- **Inclination** 51.6 degrees
- **Docking** January 27, 2011
- **Undocking** February 24, 2011 (27 days docked)
- **Re-entry** February 26, 2011



# ISS Supply Sequence

Date	Flight	Launch Vehicle/Elements
06/14/10	23S Russian Soyuz (Expedition 24)	Crew Transport, Logistics and Re-supply
06/28/10	38P Russian Progress	Logistics and Re-supply
09/10/10	39P Russian Progress	Logistics and Re-supply
10/07/10	24S Russian Soyuz (Expedition 25)	Crew Transport, Logistics and Re-supply
10/27/10	40P Russian Progress	Logistics and Re-supply
<b>12/03/10</b>	<b>ULF5 Space Shuttle (STS-133)</b>	<b>EXPRESS Logistics Carrier 4 (ELC4), Permanent Multi-Purpose Module (PMM)</b>
<b>12/15/10</b>	<b>25S Russian Soyuz (Expedition 26)</b>	<b>Crew Transport, Logistics and Re-supply</b>
<b>01/20/11</b>	<b>HTV-2 Japanese H-II Transfer Vehicle</b>	<b>Logistics and Re-supply</b>
<b>01/28/11</b>	<b>41P Russian Progress</b>	<b>Logistics and Re-supply</b>
<b>02/15/11</b>	<b>ATV 2 (Automated Transfer Vehicle) - <i>Johannes Kepler</i></b>	<b>Logistics and Re-supply</b>
<b>02/27/11</b>	<b>ULF6 Space Shuttle (STS-134)</b>	<b>Alpha Magnetic Spectrometer (AMS-2), ExPRESS Logistics Carrier (ELC3)</b>
<b>03/30/11</b>	<b>26S Russian Soyuz (Expedition 27)</b>	<b>Crew Transport, Logistics and Re-supply</b>
<b>04/27/11</b>	<b>42P Russian Progress</b>	<b>Logistics and Re-supply</b>
<b>05/31/11</b>	<b>27S Russian Soyuz (Expedition 28)</b>	<b>Crew Transport, Logistics and Re-supply</b>
<b>06/21/11</b>	<b>43P Russian Progress</b>	<b>Logistics and Re-supply</b>

**Red Date = Launch Planned**

**Blue Date = Completed Missions**



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# Integrated Networks Requirements

**E. Richards**



# Integrated Networks Requirements

- **Eastern Range (ER)**

DBR ID	Requirements
<ul style="list-style-type: none"><li>• 556069</li></ul>	<ul style="list-style-type: none"><li>• <b>C-BAND RADAR SUPPORT</b><ul style="list-style-type: none"><li>○ NASA and DOD C-band radar will support as required ISS free flyer Visiting Vehicles. Support is currently estimated at approximately 5 passes per mission for ISS Visiting Vehicles</li></ul></li></ul>

- **NASA Integrated Services Network (NISN)**

DBR ID	Requirements
<ul style="list-style-type: none"><li>• 553529</li></ul>	<ul style="list-style-type: none"><li>• <b>HTV S-BAND RETURN FROM WSC TO SSCC (Space Station Control Center)</b><ul style="list-style-type: none"><li>○ The HTV S-band Single Access Return (SSAR) link data rate shall operate at 8 and 2 kbps. The HTV S-band Multiple Access (MA) Return link data rate operates at 2 kbps. The HTV S-band system can be operated coherently or non-coherently. HTV requirement for TDRSS coherent mode operation is for HTV tracking purposes only</li></ul></li></ul>
<ul style="list-style-type: none"><li>• 553539</li></ul>	<ul style="list-style-type: none"><li>• <b>HTV S-BAND FORWARD SUPPORT FROM SSCC TO WSC</b><ul style="list-style-type: none"><li>○ The HTV S-band forward link system shall operate at 250 bps</li></ul></li></ul>
<ul style="list-style-type: none"><li>• 556504</li></ul>	<ul style="list-style-type: none"><li>• <b>DSMC INTERFACE</b><ul style="list-style-type: none"><li>○ Communications interfaces between the SSCC, the HOSC, and the NIC shall be provided</li></ul></li></ul>

**NOTE: Failed requirements are marked in red text**



# Integrated Networks Requirements (cont'd)

- **Flight Dynamics Facility (FDF)**

DBR ID	Requirements
<ul style="list-style-type: none"><li>• 533540</li></ul>	<ul style="list-style-type: none"><li>• <b>TDRS STATE VECTORS</b><ul style="list-style-type: none"><li>○ When required, the GSFC FDF shall provide the SSCC and BCC-HOSC (when activated) with Tracking and Data Relay Satellite (TDRS) state vectors for ISS-to-TDRS pointing computations and for Visiting Vehicles –to- TDRS pointing computations to the SSCC. TDRS state vectors for ATV and HTV support will be supplied by the SSCC to the ESA and NASDA gateways as required. The TDRS state vectors accuracy requirement is 200 meters, three sigma. State vector formats are specified in JSC/GSFC Operational Communications ICD for Mission Control Center (MCC) Systems (JSC 11534, Vol. 1, latest revision). Vectors will be transmitted between FDF and SSCC via ISSOnet</li></ul></li></ul>
<ul style="list-style-type: none"><li>• 533541</li></ul>	<ul style="list-style-type: none"><li>• <b>ISS TRANSMITTED FREQUENCY MEASUREMENT</b><ul style="list-style-type: none"><li>○ The GSFC FDF shall process Assembly Contingency Subsystem (ACS) S-band, ATV S-band, HTV S-band, and Ku-band one way Doppler data to be used for determining the operational short and long term stability of the ISS transponders. This processing shall be provided, when scheduled, until transponders frequency shift signatures are established for all S-band services and the Ku-band services. Results shall be provided to the SSCC for use in estimating the required frequency information in the TDRSS scheduling and ground control messages.</li><li>○ The responsible Visiting Vehicle control center shall process appropriate data to be used for determining the operational short and long term stability of the transponders. This processing shall be provided when scheduled until transponder frequency shift signatures are established for S-band services. Results shall be provided to the SSCC, ATVCC, and HTVCC for use in estimating the required frequency information in the TDRSS scheduling and ground control messages</li></ul></li></ul>

**NOTE: Failed requirements are marked in red text**



# Integrated Networks Requirements (cont'd)

- **Flight Dynamics Facility (cont'd)**

DBR ID	Requirements
<ul style="list-style-type: none"><li>• 534319</li></ul>	<ul style="list-style-type: none"><li>• <b>OPERATIONAL CONCEPTS – GENERAL</b><ul style="list-style-type: none"><li>○ Flight Dynamics Facility: Located at GSFC in Greenbelt, Maryland, the FDF will provide state vector data and tracking data evaluation support for the ISS, ATV, and HTV missions. The FDF also has the ability to provide orbit determination support if required. Real-time support is also provided for Space Shuttle missions and Launch Vehicles (ELV). Additional support is provided for TDRSS performance assessment for the STDN/TDRSS System using tracking data from the ISS, Space Shuttle, scientific satellites, and special test. TDRSS support includes state vector generation, orbit determination, tracking data evaluation, spacecraft maneuver support, and testing to verify and improve TDRSS pointing accuracy. The FDF also provides spacecraft planning products to the DSMC and other spacecraft and Launch vehicle control centers</li></ul></li></ul>
<ul style="list-style-type: none"><li>• 551187</li></ul>	<ul style="list-style-type: none"><li>• <b>ISS STATE VECTORS</b><ul style="list-style-type: none"><li>○ The Johnson Space Center (JSC) SSCC and BCC-HOSC (when activated) shall provide, as required ISS, ATV, HTV, and Soyuz acquisition data to the TDRS via GSFC FDF. The ATV and HTV acquisition data shall be provided by the ATV and HTV Control Centers, respectively, to the SSCC. State Vector formats are specified in JSC/GSFC Operational Communications ICD for MCC Systems (JSC 121534, Vol. 1, latest revision). Vectors will be transmitted between FDF and SSCC via ISSOnet</li></ul></li></ul>

**NOTE: Failed requirements are marked in red text**



# Integrated Networks Requirements (cont'd)

- **Space Network (SN)**

DBR ID	Requirements
<ul style="list-style-type: none"> <li>• 533532</li> </ul>	<ul style="list-style-type: none"> <li>• <b>TRACKING AND DATA RELAY SATELLITE SYSTEM</b> <ul style="list-style-type: none"> <li>○ The Tracking and Data Relay Satellite System (TDRSS) Service shall support different ISS S-band systems as required. These systems currently consist of the ACS S-band system, ATV S-band system, HTV S-band system, and commercial entities vying for the COTS contract. One Single Access (SA) service is required to support S and K-band RF link with a second SA service required during critical ISS operations such as rendezvous, EVA, VV Launch, and other critical activities</li> <li>○ The HTV S-band forward link system operates at 250 bps S-band Single Access (SSA) only. No MA forward link is required; however, MA and S-band Multiple Access (SMA) forward at 250 bps may be scheduled and supported on a best-effort basis or for Station Development Test Objective (SDTO) purposes. The HTV S-band return link system operates is SSA at 8 kbps normal, or 2.0 kbps contingency. The HTV MA return link operates at 2.0 kbps normal. The HTV shall require continuous TDRSS forward and return link, including the Zone of Exclusion (ZOE) during critical phases of flight</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• 533542</li> </ul>	<ul style="list-style-type: none"> <li>• <b>WSC RECORDING INTERVAL</b> <ul style="list-style-type: none"> <li>○ The ATV and HTV S-band return links shall be recorded at the White Sands Complex (WSC) for all ISS elements and held for a period of 50 hours or longer if specifically requested. Playback shall be required in the event of communications or facility failures. Playback of S-band data shall occur simultaneously (on a separate channel) with real-time support. Playback of ATV and HTV S-band data shall utilize one common, shared playback channel. <i>NOTE: ACS and Ku-band return links are recorded by ISSOnet equipment located at WSC</i></li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• 534321</li> </ul>	<ul style="list-style-type: none"> <li>• <b>TDRSS GROUND STATION CONFIGURATION</b> <ul style="list-style-type: none"> <li>○ Ground Configuration Message Requests (GCMR) and GCMR acknowledgements for the ISS shall share the same communications interface as the Shuttle messages of the same type. The SSCC shall provide conflict-free GCMRs and TDRSS link management for all ISS elements including ISS, ATV, and HTV</li> </ul> </li> </ul>

**NOTE: Failed requirements are marked in red text**



# Integrated Networks Requirements (cont'd)

- **Network Integration Center (NIC)**

DBR ID	Requirements
• 533534	<ul style="list-style-type: none"><li>• <b>SYSTEM VERIFICATION</b><ul style="list-style-type: none"><li>○ GSFC will support a validation/verification process that demonstrates compatibility, technical performance, capabilities, and operational readiness between ISS elements and the TDRSS, Ground Network (GN), and Very High Frequency (VHF) communication systems</li><li>○ NISN will support a validation/ verification process that demonstrates technical performance, capabilities, and operational readiness of all NISN provided Ground to Ground communications services</li></ul></li></ul>

**NOTE: Failed requirements are marked in red text**



# Launch Hold Criteria

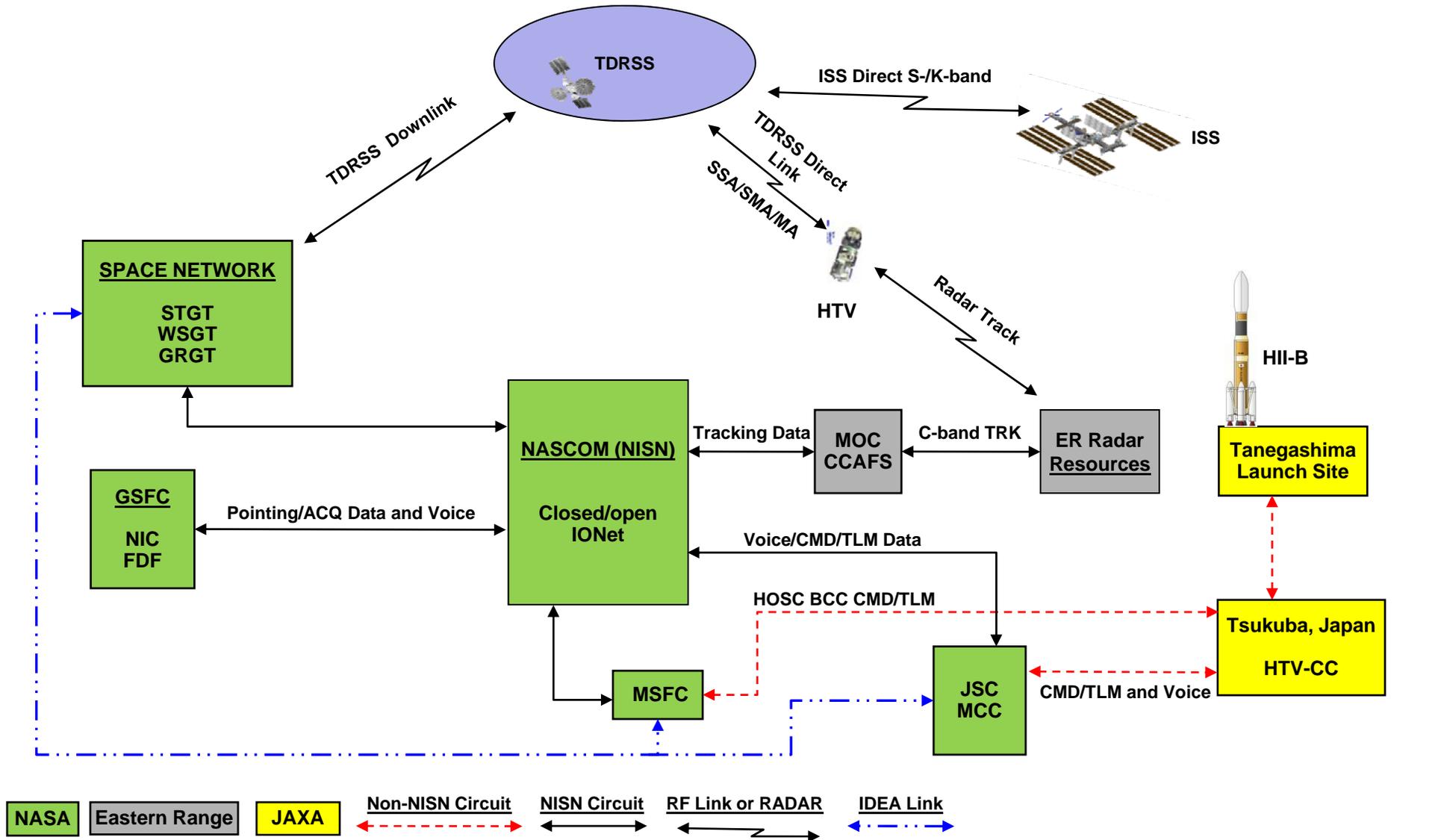
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Requirement	Interval
Mandatory	N/A
Required	N/A
HTV-ISS Joint Flight Rules	Flight Rule (F2-1 B.2) states that TDRS support is required as part of the Launch criteria for HTV



# Networks Configuration





# Documentation

Document Title	Document Number/Version	Effective Date	Future Issue Date
H-II Transfer Vehicle (HTV) Annex to the TNOSP for the International Space Station (ISS)	450-TNOSP-ISS, HTV Annex Original	11/12/09	
ISS Network Program Requirements Document (NPRD)	Rev K	10/2008	Rev L in Review
ISS Program Requirements Document (PRD)	Volume I	Active Database	
Test Plan for HTV IOS Transponder/TDRSS Compatibility Tests	451-PLAN-HTV/ISS/TDRSS, Original	06/2008	
RF Compatibility Test Report	451-RPT-HTV/CAT-1 & 2	06/2006 & 07/2007	
Radio Frequency Interface Control Document (RFICD) between HTV and TDRSS	450-RFICD-HTV/TDRSS, Original w/DCN 003	11/2003 & 05/2009	
HTV-ISS Joint Flight Rules	NSTS-12820 Vol F, Final	07/28/09	
Launch Schedule Request			
ISI 001 – Pre-Mission Status		L-30	
ISI 001 – Mission Status		L-10	
ISI 002 – Launch Count		L-7	
ISI 003 – Critical Mission Period Restrictions		L-7	
ISI 004 – Hardware/Software Freeze		L-7	
ISI 005 – TDRS Support Total		L-7	
ISI 006 – Meet Me Number		L-7	
ISI 007 – C-band Schedule		L-7	
ISI 008 – Mission Termination		Upon release from JSC	
Waivers (If applicable)	N/A		
Lessons Learned Review		03/23/11	
Post-Mission Report	HTV-2 PMR	Post Mission	



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# Analysis and Testing



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# Radio Frequency Analysis

R. Kirchoff



# Radio Frequency Analysis Summary

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- **Forward Services through the SN (nominal frequency of 2106.4 MHz):**
  - The HTV command (250 bps) may be requested for SSA, SMA, or MA
  - For critical operations or in case of an emergency in which the HTV loses attitude, SSA or SMA services are used for the forward link
  - The HTV Project has stated that Multiple Access Forward (MAF) and S-band Multiple Access Forward (SMAF) services are requested on a best-effort basis
  - All forward link margins are positive



# Radio Frequency Analysis Summary (cont'd)

- **Return Services through the SN (nominal frequency of 2287.5 MHz):**

HTV Mode	HTV Transmit Antenna	Data Rate	SN Return Services that may be Requested by HTV Project
Normal Ops	Zenith	8 kbps	SSA, SMA, or MA
Critical Ops	Zenith	8 kbps	SMA or SSA
Off-Nominal or Contingency Ops	Zenith	2 kbps	SSA, SMA, or MA
Emergency Ops	Zenith and Nadir	8 kbps (preferred) or 2 kbps	SMA or SSA

- **Multiple Access Return (MAR) and S-band Multiple Access Return (SMAR) 8 kbps support may be requested by the HTV Project on a best-effort basis**
- **All other return service margins result in positive values using specified values, except for SMAR 2 kbps support through both the Zenith and Nadir antennas (previously only required for SSAR; however, link margin is positive using compatibility test measurement data**
- **Radio Frequency Interface Control Document (RFICD) is in the process of being updated to reflect additional potential support modes. These support modes have been considered in this summary**



# Radio Frequency Forward Link Coverage

Service	Data Rate (kbps)	Modulation	Coding	S/C Receiving Antenna	S/C G/T (dB/K)	Elevation Angle (Note 2)	On-orbit Link Margin (dB) (BER=10 <sup>-5</sup> )
SSAF (Normal Power Mode)	0.250	UQPSK	None (Note 1)	Zenith and Nadir	-32.7	0 deg	9.2
SMAF (Note 1)						0 deg	7.6
MAF (Note 1)						30 deg	0.3

**Notes**

1. HTV Project requested support be provided on a “Best-Effort Basis”
2. 30 deg elevation angle applicable for normal operations. 0 deg elevation angle applicable for off-nominal, contingency or emergency operations. If link margins are positive at 0 deg elevation angle, the 30 deg elevation angle case is not included as the link will provide a 10<sup>-5</sup> Bit Error Rate (BER)



# Radio Frequency Return Link Coverage

Service	Data Rate (kbps)	Modulation	Coding	HTV Transmit Antenna	S/C EIRP (dBW)	Minimum Elevation Angle (deg) (Note 1)	On-orbit Link Margin (dB) (BER=10 <sup>-5</sup> )
SSAR	8	SQPN	Rate ½ Conv.	Zenith	6.7	0	4.2
SSAR	2			Zenith and Nadir	3.7	0	7.3
SSAR	8			Zenith and Nadir	3.7	0	1.3
SMAR	2			Zenith	6.7	0	2.5
SMAR	2			Zenith and Nadir	3.7	0	-0.5 (WSC Spec)
SMAR	2			Zenith and Nadir	3.7	0	2.5 (Compat Test)
MAR	2			Zenith	6.7	0	0.7

## Notes

- 30 deg elevation angle is applicable for normal operations. 0 deg elevation angle is applicable for off-nominal, contingency or emergency operations. If link margins are positive at 0 deg elevation angle, the 30 deg elevation angle case is not included as the link will provide a 10<sup>-5</sup> BER
- HTV Zenith Only Transmit Antenna is applicable for normal, critical, off-nominal, or contingency operations. HTV Zenith and Nadir Transmit Antennas are applicable for emergency operations (HTV loses attitude)
- Any negative link margin will be supported by the SN on a "Best-Effort Basis"
- Compat Test margins are based on compatibility test results, where implementation loss 1.5 dB and no additional user constraint loss is considered



# RF Return Link Coverage

## (HTV Project Requested Support on a Best-Effort Basis)

Service	Data Rate (kbps)	Modulation	Coding	HTV Transmit Antenna	S/C EIRP (dBW)	Minimum Elevation Angle (deg)	On-orbit Link Margin (BER=10 <sup>-5</sup> )
SMAR	8	SQPN	Rate 1/2 Conv.	Zenith	6.7	30	-2.8 (WSC Spec)
SMAR	8			Zenith	6.7	30	0.2 (Compat Test)
SMAR	8			Zenith	6.7	0	-3.5 (WSC Spec)
SMAR	8			Zenith	6.7	0	-0.6 (Compat Test)
SMAR	8			Zenith and Nadir	3.7	0	-6.5 (WSC Spec)
SMAR	8			Zenith and Nadir	3.7	0	-3.6 (Compat Test)
MAR	8			Zenith (NEW)	6.7	30	-4.6

### Notes

1. 30 deg elevation angle is applicable for normal operations. 0 deg elevation angle is applicable for off-nominal, contingency or emergency operations. If link margins are positive at 0 deg elevation angle, the 30 deg elevation angle case is not included as the link will provide a 10<sup>-5</sup> BER
2. HTV Zenith Only Transmit Antenna is applicable for normal, critical, off-nominal, or contingency operations. HTV Zenith and Nadir Transmit Antennas are applicable for emergency operations (HTV loses attitude)
3. Any negative link margin will be supported by the SN on a "Best-Effort Basis"
4. Compat Test margins are based on compatibility test results, where implementation loss 1.5 dB and no additional user constraint loss is considered



# Networks Feasibility Analysis

**M. Virden**



# Networks Feasibility Analysis Summary

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- **Evaluations of Forecast Period HTV Launch requirements indicate no additional impacts should be expected than is currently experienced in scheduling for any other Expendable Launch Vehicle (ELV) or Launch and Early Orbit Phase (LEOP) customer as long as the Launch window duration is minimized**
- **Proposed method of scheduling either SSA or MA support should not cause any additional loading issues**



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# Radio Frequency Compatibility Testing Results

R. Zimmerman



# RF Compatibility Testing Results

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- **HTV Category-II RF compatibility test was conducted at the Compatibility Test Laboratory (CTL) from April 17-26, 2007**
  - **Tested MDA Proto-Flight Model Transponder (MDA Flight Transponder is prime on HTV-2 and was flown successfully on HTV-1)**
  - **No anomalies were found during the RF compatibility test**
- **Summary: HTV Proto-Flight Model Transponder (MDA) is RF compatible with SN**
- **HTV Category-II RF compatibility test was conducted at CTL from March 03-12, 2010**
  - **Tested MELCO Proto-Flight Transponder (MELCO Flight Transponder is backup on HTV-2)**
  - **No anomalies were found during the RF compatibility test**
- **Summary: HTV Proto-Flight Model Transponder (MELCO) is RF compatible with SN**



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# **Networks Requirements Verification Results**

**E. Richards**



# Networks Requirements Verification Summary

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- **Testing Summary**
  - Participated in End-to-End (ETE) testing. Met all test objectives

Pending Test Efforts	Test Date
WSC Mission Readiness Test (MRT)	L-7
FDF Vector Verification Tests	L-7
Circuit checkout	L-3



# HTV-2 Test Matrix

<b>HTV-2 Networks Service Requirements Test Matrix</b>  Green - Successfully Completed Green A - Done by Analysis Yellow - Partially Successful Red - Failed Black - Not Applicable White - To Be Tested		HTV CAT2 Antenna Calibration Test (02/25/10)	HTV CAT2 Compatibility Test (03/09/10 – 03/12/10)	HTV-2 End to End Test September 2010 (09/23/10 – 09/24/10)	HTV-2 GCMR Pre-test (10/20/10)	HTV-2 GCMR Pre-test #2 (10/21/10)	HTV-2 GCMR with GSFC/RFSOC/SOC WSC JSC (10/27/10)	Vector Verification (L-7 days)	WSC MRT (L-7 days)	Circuit Checkout (L-3 days)	Verified by Analysis	Current Status
		<b>Eastern Range (ER) Requirements</b>										
DBR # 556069	C-BAND RADAR SUPPORT											
<b>Flight Dynamics Facility (FDF) Requirements</b>												
DBR # 533540	TDRS STATE VECTORS											
DBR # 533541	ISS TRANSMITTED FREQUENCY MEASUREMENT											
DBR # 534319	OPERATIONAL CONCEPTS – GENERAL											
DBR # 551187	ISS STATE VECTORS											
<b>NASA Integrated Services Network (NISN) Requirements</b>												
DBR # 553529	HTV S-BAND RETURN FROM WSC TO SSCC (Space Station Control Center)											
DBR # 553539	HTV S-BAND FORWARD SUPPORT FROM SSCC TO WSC											
DBR # 556504	DSMC INTERFACE											



# HTV-2 Test Matrix (cont'd)

<b>HTV-2 Networks Service Requirements Test Matrix</b>  Green - Successfully Completed Green A - Done by Analysis Yellow - Partially Successful Red - Failed Black - Not Applicable White - To Be Tested		HTV CAT2 Antenna Calibration Test (02/25/10)	HTV CAT2 Compatibility Test (03/09/10 – 03/12/10)	HTV-2 End to End Test September 2010 (09/23/10 – 09/24/10)	HTV-2 GCMR Pre-test (10/20/10)	HTV-2 GCMR Pre-test #2 (10/21/10)	HTV-2 GCMR with GSFC/RFSOC/SOC WSC JSC (10/27/10)	Vector Verification (L-7 days)	WSC MRT (L-7 days)	Circuit Checkout (L-3 days)	Verified by Analysis	Current Status
		<b>Space Network (SN) Requirements</b>										
DBR # 533532	TRACKING AND DATA RELAY SATELLITE SYSTEM	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
DBR # 533542	WSC RECORDING INTERVAL	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
DBR # 534321	TDRSS GROUND STATION CONFIGURATION	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
<b>Network Integration Center (NIC)</b>												
DBR # 533534	SYSTEM VERIFICATION	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green



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# Launch Activities

**E. Richards**



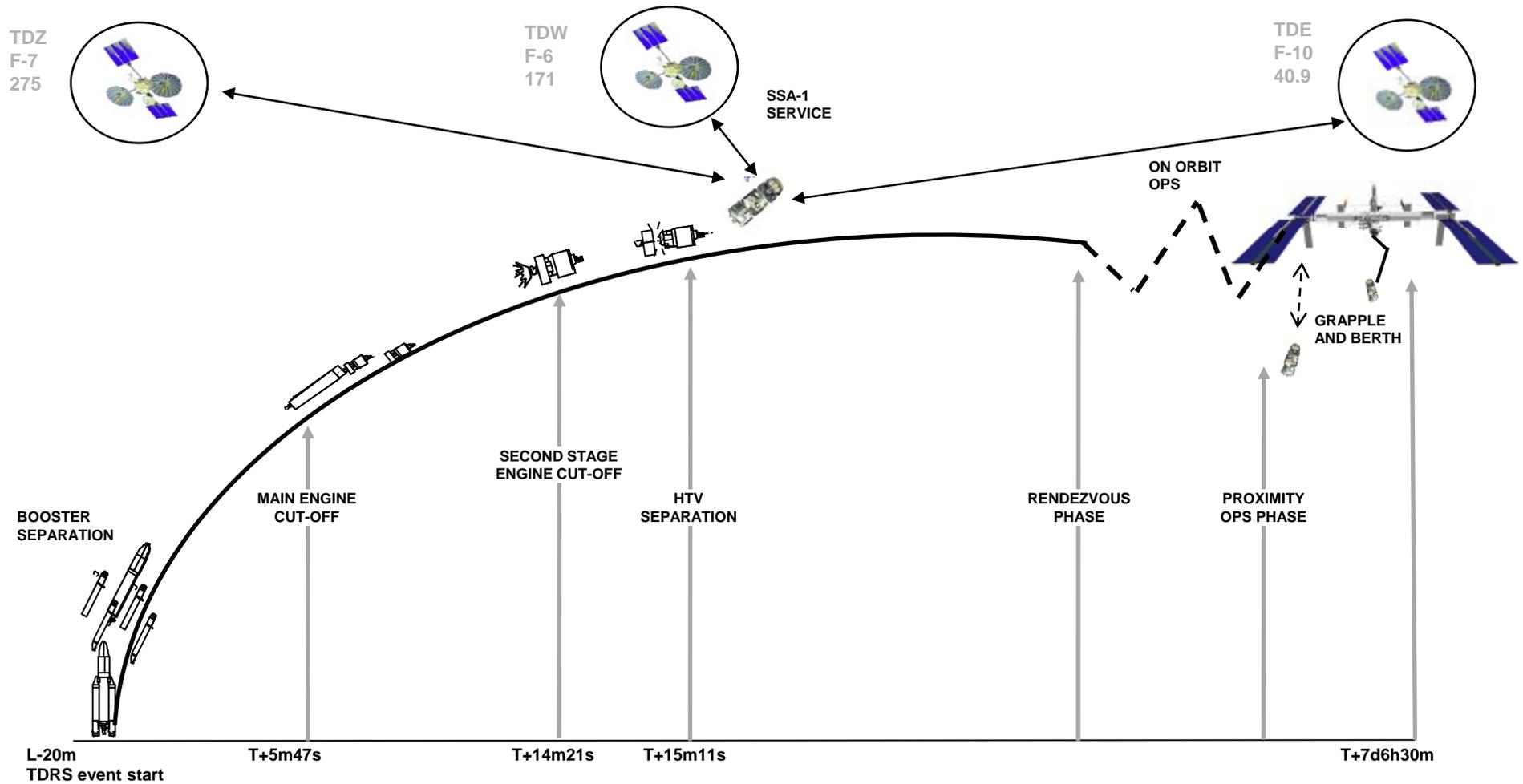
# Launch Day Sequence of Events (Launch Count)

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- **Spaceflight Mission Manager (SMM) Launch Activities**
  - L-8:00:00 start of Launch support
  - L-6:30:00 WSC tape playback and command check
  - L-0:30:00 through on-orbit phase
- **SMM Mission Staffing**
  - TDRSS critical periods
  - Docking
  - 3 hours prior to undocking through re-entry



# Integrated Networks Timeline Summary





# Freeze Plan

- **Hardware/Software freeze will be implemented for the IN resources as follows:**

Network Service	Freeze Duration
Space Network	L-7 days or MRT
Flight Dynamics Facility	L-7 days
Network Integration Center	L-7 days
NASA Integrated Services Network	L-5 days
Eastern Range	L-1 day

- **Exemptions shall be approved prior to implementation**
- **Maintenance and testing restrictions are imposed for all network elements during mission-critical periods**
- **The Network Director (ND) coordinates all freeze waivers for necessary work in accordance with the Configuration Management Freeze Policy, 450-CMFP-HSF/ELV**



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# Networks Status



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# Eastern Range Operations

**M. Gawel**



# ER Operations

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- **ER configuration changes since the last mission**

Type	System	Significant Changes
Software	None	•None
Hardware	None	•None

- **Open Discrepancy Reports (DR)**
  - None
- **Documentation**
  - There are no outstanding documentation items



# ER Operations (cont'd)

---

- **Staffing**
  - Staffing is sufficient to meet all requirements
- **Training**
  - All required personnel are trained and certified
- **ER is ready for the Launch**



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# Space Network Operations

**M. Rios**



# SN Operations

- **SN configuration changes since the last mission**

Type	System	Significant Changes
Software	S/W delivery 1000102	<ul style="list-style-type: none"> <li>• TDRS-K specific deliveries</li> <li>• Completed 07/28/10</li> </ul>
	S/W delivery 1000104	<ul style="list-style-type: none"> <li>• Range zero set fix for the MA Automatic Data Processing Equipment (ADPE)</li> <li>• Delivered 10/06/10</li> </ul>
	Space Network Access System (SNAS) release 4	<ul style="list-style-type: none"> <li>• Transition will start 01/19/11</li> <li>• This includes updating the servers at White Sands and the MCC clients</li> </ul>
	S/W delivery 10006	<ul style="list-style-type: none"> <li>• TDRS-K and maintenance delivery – 01/18/11</li> </ul>
Hardware	Mission Operations Voice Enhancement (MOVE)	<ul style="list-style-type: none"> <li>• Replaces obsolete Multi-Conference Digital Switch (MDS) system at the WSC</li> <li>• Integration and testing phase ongoing at STGT</li> <li>• Cutover to NTR T-1s – early 01/2011</li> <li>• WSGT and GRGT installs to follow in 2011</li> </ul>
	Antenna Sub-System Controller (SSC) Replacement	<ul style="list-style-type: none"> <li>• Replace obsolete 286 based Central Processing Unit (CPU) chassis with Pentium/Linux architecture. Replace obsolete Input/Output (I/O) boards</li> <li>• Complete STGT installation – late 01/2011</li> </ul>
	Guam Data Interface System (GDIS)-R	<ul style="list-style-type: none"> <li>• Individual circuit transition starts 07/2010</li> <li>• Complete transition to Internet Protocol Encapsulator (IPE) was completed 09/20/10</li> <li>• Operational Readiness Review (ORR) accepted on 09/30/10</li> </ul>
	TDRSS Operations Control Center (TOCC) Upgrade	<ul style="list-style-type: none"> <li>• All controller positions now located at STGT - 09/10/10</li> </ul>



# SN Operations (cont'd)

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- **TDRS Fleet Management Status**
  - **TDRS-4 (TDS)**
    - **Power System**
      - Battery 1 failed. No battery issues during last eclipse season (07/24/10 – 09/25/10)
      - Next eclipse season 01/21/11 – 03/23/11
    - **Telemetry Errors**
      - TDRS-4 downlink experiencing irregular, apparently random telemetry errors (hits)
      - Spare Traveling Wave Tube Amplifier (TWTA) available
    - **Ku-band Single Access (KSA-2) forward power below specification**
      - The KSA-02 forward service is 5.7 dB below specification for normal power operations and 4.8 dB below specification for high power operations
      - A spare TWTA is available for this service – corrective action will be performed on GSFC Code 452 direction



# SN Operations (cont'd)

---

- **Open DRs**
  - None
- **Documentation**
  - There are no outstanding documentation items
- **Staffing**
  - Staffing is sufficient to meet all requirements
- **Training**
  - All required personnel are trained and certified
- **SN is ready for the Launch**



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# Flight Dynamics Facility Operations

**P. Powers**



# FDF Operations

- **FDF configuration changes since the last mission**

Type	System	Significant Changes
Software	ISSONet (FEPR)	<ul style="list-style-type: none"><li>• Uses Internet Protocol (IP) for vector transfers between FDF and JSC/ISS Trajectory Operations Officer (TOPO)</li><li>• Operational since 06/2010</li></ul>
Hardware	None	<ul style="list-style-type: none"><li>• None</li></ul>

- **Open DRs**
  - None
- **Documentation**
  - There are no outstanding documentation items



# FDF Operations (cont'd)

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- **Staffing**
  - Staffing is sufficient to meet all requirements
- **Training**
  - All required personnel are trained and certified
- **FDF is ready for the Launch**



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# **NASA Integrated Services Network Operations**

**C. Wiley**



# NISN Operations

- NISN Operations

Voice	Participants
ISS Site Coord	JSC, NIC, FDF, WSC, MSFC
IP/GC-1	JSC, NIC, WSC, MSFC
ISS TN Coord	JSC, NIC, FDF, WSC, MSFC
LEAD RANGE COORD	NIC, FDF, KSC-CD&SC/ER
Track Coord	JSC, NIC, FDF, KSC-CD&SC/ER
Data	Participants
SSA or MA Telemetry: 8 kbps / 2 kbps	WSC  JSC/NIC/MSFC
Command and Command Echo 250 bps	JSC/JAXA  JSC
HOSC/BCC COMMAND	MSFC  JSC/NIC
2.4 kbps LTAS Data (C-band)	ER via CD&SC to FDF
Notes	



# NISN Operations (cont'd)

- **NISN configuration changes since the last mission**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Open PMDS Tickets**
  - None
- **Documentation**
  - There are no outstanding documentation items



# NISN Operations (cont'd)

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- **Staffing**
  - Staffing is sufficient to meet all requirements
- **Training**
  - All required personnel are trained and certified
- **NISN will process all Freeze Exemption Requests (FER) during mission in accordance with NISN SOP-002, published 10/2009**
- **NISN is ready for the Launch**



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# Networks Integration Center Operations

**E. Mount**



# NIC Operations

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- **NIC configuration changes since the last mission**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Open DRs**
  - None
- **Documentation**
  - There are no outstanding documentation items



# NIC Operations (cont'd)

- Freeze Exemption Requests

Item	Status	Comments
GSFC Main Security Gate Renovation/ Replacement	Approved through 01/03/11	Replace canopy, guard house, curb/slab and sidewalks; dig footers for canopy supports, new bollards and security fencing; and trenching for the installation of new conduit for power and telecomm underground between Buildings 9 & 9A. Area of work is the main gate. No work permitted during critical periods
GSFC Building 35 Construction	Approved through 02/29/12	Construction of new Logistics Facility. Separate FERs will be submitted when efforts involve critical zones 1, 2, and/or 3

- Facilities Overview

Item	Status	Comments
Commercial Power	G	
Mission Management Area (MMA)	G	
Uninterruptible Power Supply (UPS)	G	
Heating, Ventilating and Air Conditioning (HVAC)	G	



# NIC Operations (cont'd)

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- **Staffing**
  - Staffing is sufficient to meet all requirements
  - NIC personnel will be on-site from L-8 hours until released from Launch support
  - NIC personnel will also be on-site for critical events and on an as needed basis as required
- **Training**
  - All required personnel are trained
- **NIC is ready for the Launch**



# Points of Contact

Position	Name(s)	Location	Launch Service	Contact Information
ND	Jim Bangerter	GSFC	L-4:00 hrs	(C) 301-286-1819 (O) 301-286-7306; <a href="mailto:James.A.Bangerter@nasa.gov">James.A.Bangerter@nasa.gov</a>
Network Manager (NM)	Melissa Blizzard	GSFC	L-4:00 hrs	(C) 301-286-1820 (O) 301-805-3097; <a href="mailto:Melissa.Blizzard@Honeywell.com">Melissa.Blizzard@Honeywell.com</a>
Mission Ground Control (GC)	Thomas Holmes	JSC	L-8:00 hrs	(C) 281-244-5279 (O) 281-483-6876; <a href="mailto:Thomas.F.Holmes@nasa.gov">Thomas.F.Holmes@nasa.gov</a>
Alt. GC	Jacqulyne Trahan	JSC	L-8:00 hrs	(C) 281-244-5279 (O) 281-483-0749; <a href="mailto:Jacqulyne.M.Trahan@Nasa.gov">Jacqulyne.M.Trahan@Nasa.gov</a>
Lead Mission Spaceflight Mission Manager (SMM)	Erik Richards	GSFC	L-8:00 hrs	(C) 301-286-1824 (O) 301-805-3275; <a href="mailto:Erik.Richards@Honeywell.com">Erik.Richards@Honeywell.com</a>
Alt. Mission SMM	Liz Clark	GSFC	L-8:00 hrs	(C) 301-286-1824 (O) 301-805-3261; <a href="mailto:EClark@Hammers.com">EClark@Hammers.com</a>
Facility Operations Manager (FOM)	Eric Mount	GSFC	L-8:00 hrs	(O) 301 286-0601; <a href="mailto:Eric.S.Mount@nasa.gov">Eric.S.Mount@nasa.gov</a>
SN - WSC	Manny Rios	WSC	L-8:00 hrs	(C) 575-527-7137 (O) 575-527-7120; <a href="mailto:mrios@mail.wsc.nasa.gov">mrios@mail.wsc.nasa.gov</a>
FDF	Pepper Powers	GSFC	L-8:00 hrs	(C) 301-286-8191 (O) 301-286-7637; <a href="mailto:pepper.p.powers@nasa.gov">pepper.p.powers@nasa.gov</a>
NISN Communications Manager	Claudette Wiley	GSFC	L-8:00 hrs	(C) 301-286-6141 (O) 301-286-1807; <a href="mailto:claudette.s.wiley@nasa.gov">claudette.s.wiley@nasa.gov</a>
ER	Michael Gawel	Cape Canaveral/KSC	L-2:00 hrs	(C) 321-853-8118 (O) 321-853-8326; <a href="mailto:Michael.Gawel@patrick.af.mil">Michael.Gawel@patrick.af.mil</a>

O – Office      C – Console



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# Integrated Networks Summary

**E. Richards**

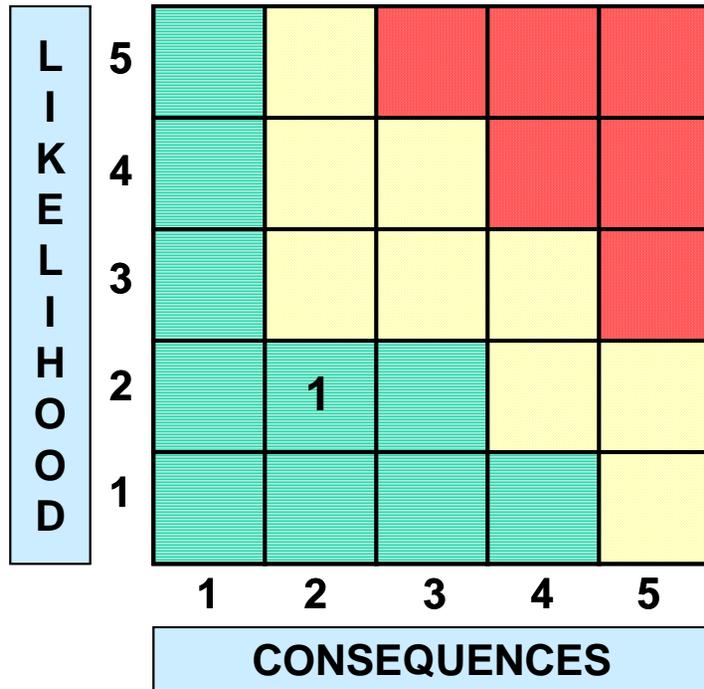


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# Risks and Issues



# Risks



LxC Trend	Rank	Approach	Risk Title
➡	1	M	NISN MOVE Failure

<u>Criticality</u>	<u>L x C Trend</u>	<u>Approach</u>
<b>High</b>	⬇ Decreasing (Improving)	M – Mitigate
<b>Med</b>	⬆ Increasing (Worsening)	W – Watch
<b>Low</b>	➡ Unchanged	A – Accept
	* New since last mission	R – Research



# Risks (cont'd)

## NISN MOVE Failure

Rank	Risk Statement	Approach & Plan	Comments
1 	If the MOVE System Switch experienced a failure at the connection point to the system interface cards, then the switch would fail which would impact GSFC local elements and the NIC who will lose voice contact with their customers and supporting elements	Mitigate <ul style="list-style-type: none"><li>Meet me numbers or direct black phone numbers will be provided for all missions that have critical voice requirements</li></ul>	The prime MOVE switch has some internal redundancy, however there is no MOVE backup switch to provide overall redundancy. In the event the prime switch suffers a failure of the system interface card connection (for which there is no redundancy) – then the prime switch would fail and voice services would be lost

Risk Criticality   



# Open Work

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- **Standard Open Work**
  - **WSC MRT (L-7)**
  - **FDF Vector Verification Test (L-7)**
  - **Circuit checkout (L-3)**
  - **2 days prior to undocking circuit checkout**
- **Non-Standard Open Work**
  - **None**



# Issues and Concerns

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- **None**



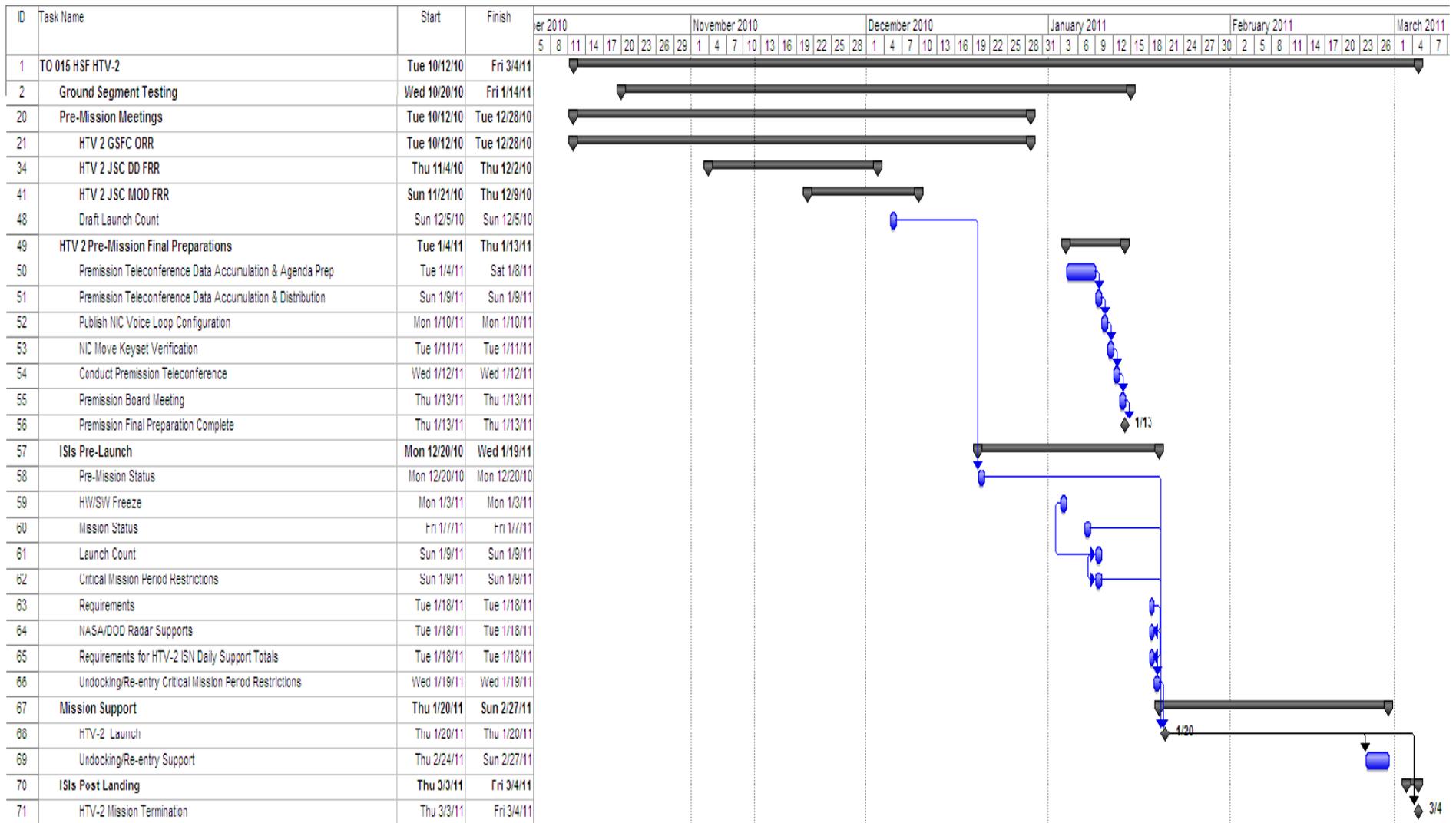
# Summary

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- **The Integrated Network is ready to support the HTV-2 mission**



# Remaining Mission Activities





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# Backup





# Launch Hold Criteria Definitions

Requirement Level	Definition	Launch Hold Impact	SCaN Implementation Response
<b>Mandatory</b>	The service is mission critical and thus mandatory for Launch	A Launch hold <u>cannot</u> be waived for failure of a <b>MANDATORY</b> service	Two independent diverse system paths, the second as a hot backup capability, tested and ready for immediate service
<b>Required</b>	The service could significantly affect the mission and thus required for Launch	A Launch hold <u>can</u> be waived for failure of a <b>REQUIRED</b> service, if all conditions are optimal	Two independent diverse system paths, the second as a cold backup capability, tested and available for service once switched on
<b>Desired</b>	The service is desired, but is not required for Launch	A Launch hold will <u>not</u> be imposed for failure of a <b>DESIRED</b> service	Assets will be supplied on an as-available basis. No additional backup resources will be provided



# Review Process

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- **JSC DD Flight Readiness Review (FRR)** **11/16/10**
- **Goddard Space Flight Center (GSFC)  
Mission Operations Readiness Review  
(MORR)** **11/30/10**
- **JSC MOD Flight Readiness Review (FRR)** **12/09/10**



# Networks Integration Customer Satisfaction Survey

Please take a moment to let us know how well we, the Networks Integration Management Office (NIMO)/ Code 450.1 have met your networks integration expectations. We welcome your input on how we can improve our services. Thank you!

Mission Name \_\_\_\_\_ Your Name (optional) \_\_\_\_\_ Project Role/Title (optional) \_\_\_\_\_

How well has the Space and Ground Communications Networks organization...	VERY SATISFIED	SOMEWHAT SATISFIED	NEITHER SATISFIED NOR DISSATISFIED	SOMEWHAT DISSATISFIED	VERY DISSATISFIED	NOT APPLICABLE/ UNABLE TO ANSWER
1. Provided you with the information you needed to use our services?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Provided technical support to your mission?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Provided services in a timely manner?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Met your mission objectives and requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Provided a good value for our services?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Would you recommend our services to another project?	<input type="checkbox"/>					
7. Overall, how would you rate your satisfaction with our customer service?	<input type="checkbox"/>					

Please use the space below to provide comments. Please provide details relating to your experience with networks integration, so that we may improve our services.

[Enter comments here]

Would you like to discuss your responses with someone independent of networks integration?

Yes  No

If "yes", please let us know how to contact you. Be sure you have provided your name (above the table).

Phone: \_\_\_\_\_ Email: \_\_\_\_\_



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# CoFR Signature Sheet





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# Acronym List



# Acronym List

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<b>ACS</b>	<b>Assembly Contingency Subsystem</b>	<b>HVAC</b>	<b>Heating, Ventilating, and Air Conditioning</b>
<b>ADPE</b>	<b>Automatic Data Processing Equipment</b>	<b>I/O</b>	<b>Input/Output</b>
<b>AI</b>	<b>Action Item</b>	<b>IN</b>	<b>Integrated Network</b>
<b>AMS</b>	<b>Alpha Magnetic Spectrometer</b>	<b>IP</b>	<b>Internet Protocol</b>
<b>ATV</b>	<b>Automated Transfer Vehicle</b>	<b>IPE</b>	<b>Internet Protocol Encapsulator</b>
<b>BER</b>	<b>Bit Error Rate</b>	<b>ISI</b>	<b>Interim Support Instruction</b>
<b>COB</b>	<b>Close of Business</b>	<b>ISS</b>	<b>International Space Station</b>
<b>CPU</b>	<b>Central Processing Unit</b>	<b>JAXA</b>	<b>Japan Aerospace Exploration Agency</b>
<b>CTL</b>	<b>Compatibility Test Laboratory</b>	<b>JSC</b>	<b>Johnson Space Center</b>
<b>ELC</b>	<b>ExPRESS Logistics Carrier</b>	<b>KSA</b>	<b>Ku-band Single Access</b>
<b>ELV</b>	<b>Expendable Launch Vehicle</b>	<b>LEOP</b>	<b>Launch and Early Orbit Phase</b>
<b>ER</b>	<b>Eastern Range</b>	<b>MA</b>	<b>Multiple Access</b>
<b>FER</b>	<b>Freeze Exemption Requests</b>	<b>MAF, R</b>	<b>Multiple Access Forward, Return</b>
<b>FOM</b>	<b>Facility Operations Manager</b>	<b>MCC</b>	<b>Mission Control Center</b>
<b>FRR</b>	<b>Flight Readiness Review</b>	<b>MDS</b>	<b>Multi-Conference Digital Switch</b>
<b>GC</b>	<b>Ground Control</b>	<b>MMA</b>	<b>Mission Management Area</b>
<b>GCMR</b>	<b>Ground Configuration Message Requests</b>	<b>MORR</b>	<b>Mission Operations Readiness Review</b>
<b>GDIS</b>	<b>Guam Data Interface System</b>	<b>MOVE</b>	<b>Mission Operations Voice Enhancement</b>
<b>GN</b>	<b>Ground Network</b>	<b>MRT</b>	<b>Mission Readiness Test</b>
<b>GRGT</b>	<b>Guam Remote Ground Terminal</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>GSFC</b>	<b>Goddard Space Flight Center</b>	<b>NASA</b>	<b>National Aeronautics and Space Administration</b>
<b>HTV</b>	<b>H-II Transfer Vehicle</b>	<b>ND</b>	<b>Network Director</b>

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# Acronym List (cont'd)

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<b>NIC</b>	<b>Network Integration Center</b>	<b>SSC</b>	<b>Sub-System Controllers</b>
<b>NISN</b>	<b>NASA Integrated Services Network</b>	<b>SSCC</b>	<b>Space Station Control Center</b>
<b>NM</b>	<b>Network Manager</b>	<b>STGT</b>	<b>Second TDRSS Ground Terminal</b>
<b>NPRD</b>	<b>Network Program Requirements Document</b>	<b>S/W</b>	<b>Software</b>
<b>ORR</b>	<b>Operational Readiness Review</b>	<b>TDE</b>	<b>TDRS East</b>
<b>POC</b>	<b>Point of Contact</b>	<b>TDRS</b>	<b>Tracking and Data Relay Satellite</b>
<b>PMM</b>	<b>Permanent Multi-Purpose Module</b>	<b>TDRSS</b>	<b>Tracking and Data Relay Satellite System</b>
<b>PMR</b>	<b>Post-Mission Review</b>	<b>TDS</b>	<b>TDRS Spare</b>
<b>PRD</b>	<b>Program Requirements Document</b>	<b>TDW</b>	<b>TDRS West</b>
<b>RF</b>	<b>Radio Frequency</b>	<b>TDZ</b>	<b>TDRS ZOE</b>
<b>RFA</b>	<b>Requests for Action</b>	<b>TnSC</b>	<b>Tanegashima Space Center</b>
<b>RFICD</b>	<b>Radio Frequency Interface Control Document</b>	<b>TOCC</b>	<b>TDRSS Operations Control Center</b>
<b>SA</b>	<b>Single Access</b>	<b>TOPO</b>	<b>Trajectory Operations Officer</b>
<b>SDTO</b>	<b>Station Development Test Objective</b>	<b>TWTA</b>	<b>Traveling Wave Tube Amplifier</b>
<b>SGLT-3</b>	<b>Space-to-Ground Link Terminal-3</b>	<b>UPS</b>	<b>Uninterruptible Power Supply</b>
<b>SMA</b>	<b>S-band Multiple Access</b>	<b>VHF</b>	<b>Very High Frequency</b>
<b>SMAF, R</b>	<b>S-band Multiple Access Forward, Return</b>	<b>WSC</b>	<b>White Sands Complex</b>
<b>SMM</b>	<b>Spaceflight Mission Manager</b>	<b>WSGT</b>	<b>White Sands Ground Terminal</b>
<b>SN</b>	<b>Space Network</b>	<b>Z</b>	<b>Zulu</b>
<b>SNAS</b>	<b>Space Network Access System</b>	<b>ZOE</b>	<b>Zone of Exclusion</b>
<b>SSA</b>	<b>S-band Single Access</b>		
<b>SSAF, R</b>	<b>S-band Single Access Forward, Return</b>		

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