



H-II Transfer Vehicle-3 (HTV) Mission Readiness



04/17/12

Network Support Group (NSG)

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Agenda



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- **Integrated Network (IN) Overview**
- **Mission Profile**
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Mission Overview

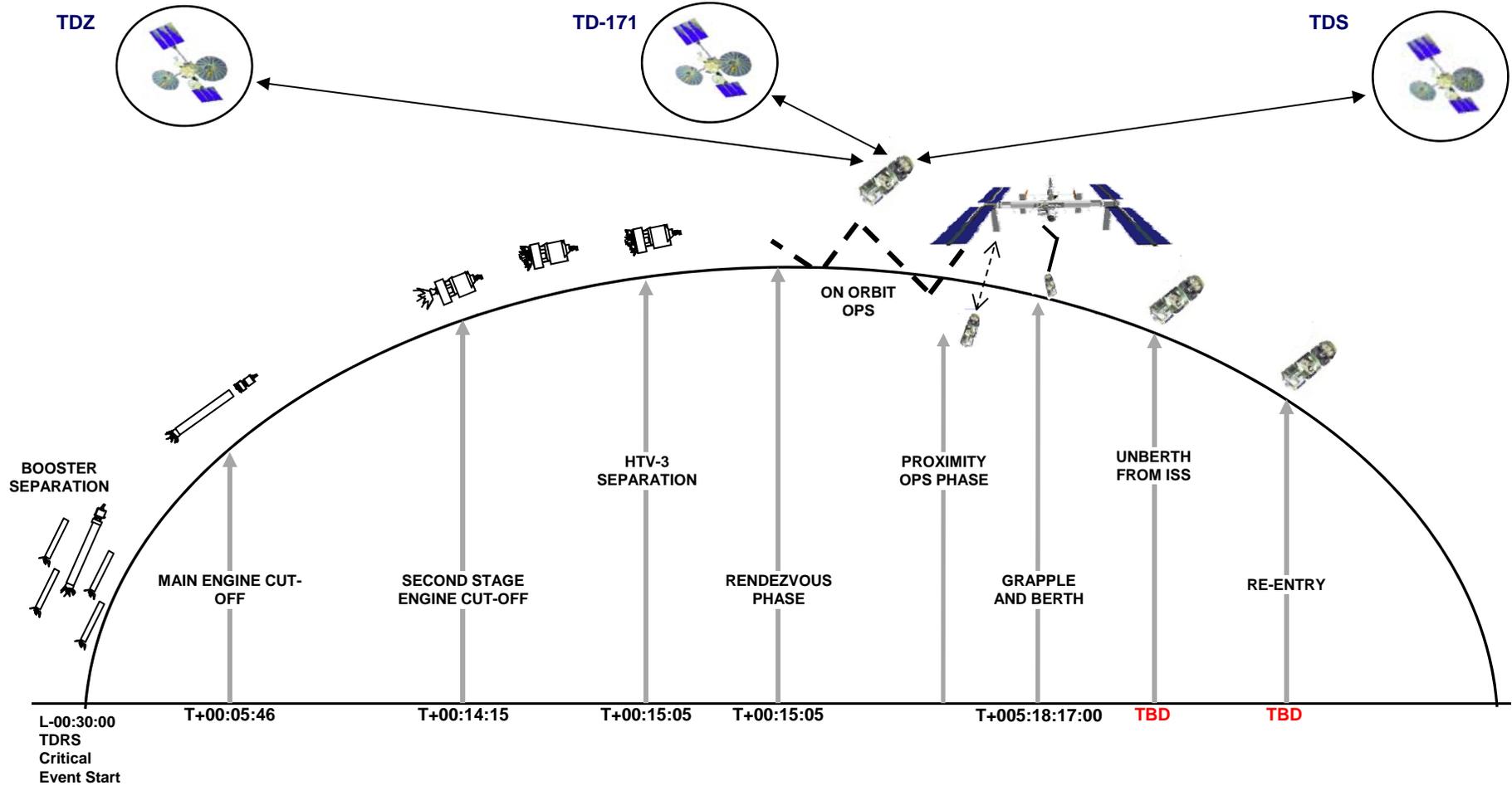


- **Visiting Vehicle (VV):** H-II Transfer Vehicle (HTV)
- **Launch Date/Time:** July 21, 2012 / 0218Z
- **Launch Vehicle:** H-IIB
- **Launch Site:** JAXA's Yoshinobu Launch Complex at the Tanegashima Space Center on Tanegashima Island
- **HTV Control Center (HTVCC):** Tsukuba Space Center (TKSC)
- **Trajectory**
 - **Apogee:** 346 km
 - **Perigee:** 336 km
 - **Inclination:** 51.6
- **Rendezvous and Dock:** To Be Determined (TBD)
- **Time Docked with ISS:** Maximum 30 days
- **Cargo Capacity:** 6 Tons (Supplies/Waste)
- **Payload:** GSFC Space Communications and Navigation (SCAN) Testbed



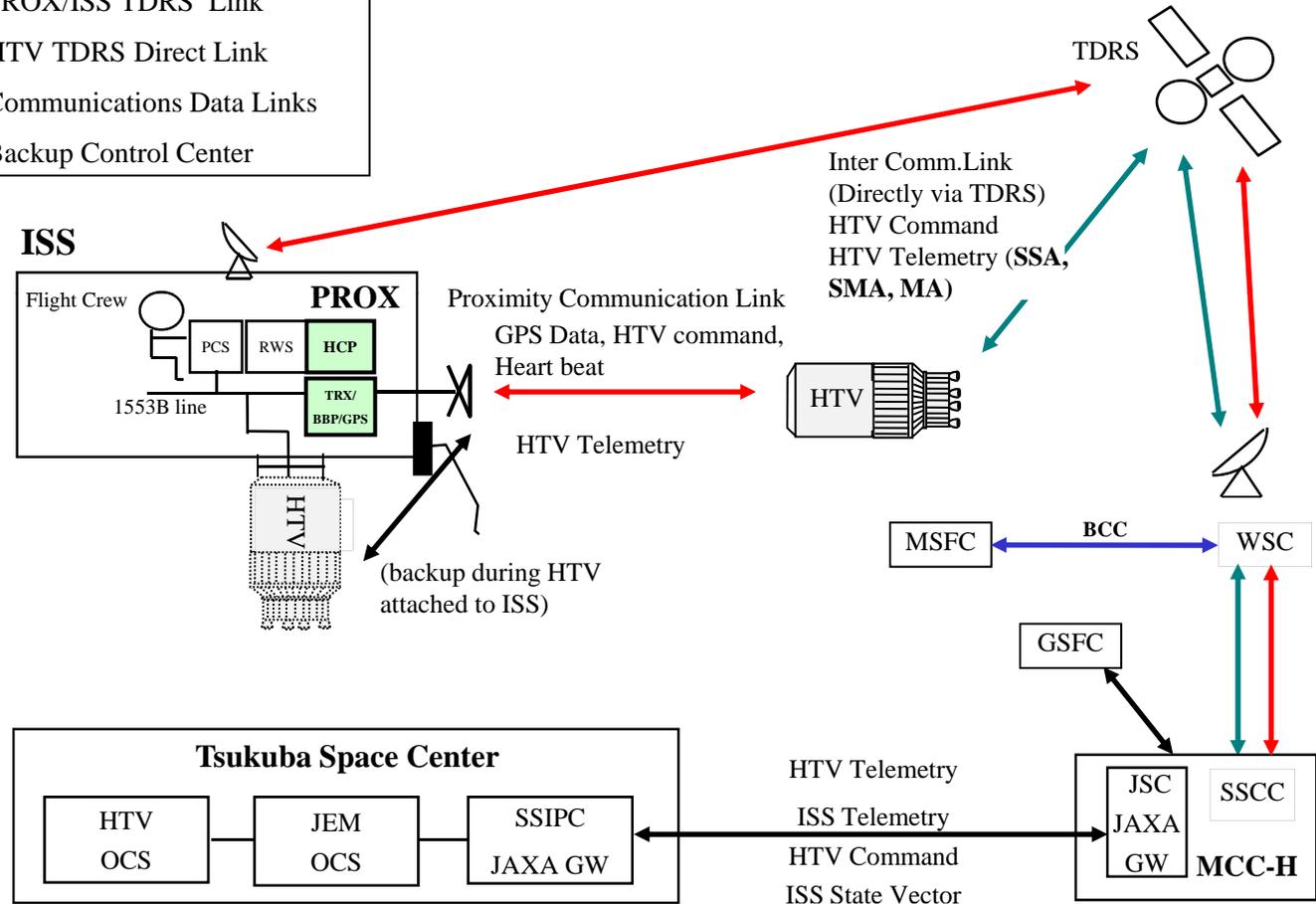
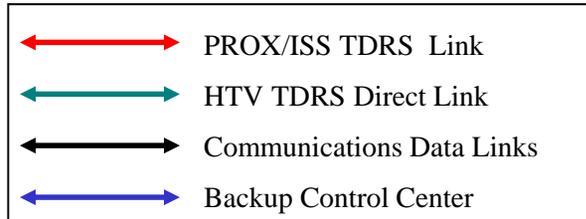


Mission Profile





Communication Paths





Documentation



Document Title	Comments	Published Date
NASA / 450-RFICD-HTV/TDRSS	Document Control Number (DCN)-003	May 2009
NASA / 450-TNOSP-ISS, HTV Annex	Original	May 2012
Draft Launch Count	Will need inputs from Johnson Space Center (JSC)	L-60 days
ISI XXX Critical/Super Critical Mission Period	Will need inputs from JSC	L-21 days*
ISI XXX Mission Status		L-10 days
ISI XXX Launch Count		L-10 days
ISI XXX Hardware (HW)/Software (SW) Freeze		L-10 days
ISI XXX Requirements for HTV-3 Daily Support Totals		L-10 days
ISI XXX C-Band Contingency Plan		L-10 days
ISI XXX Vector Management After Undock		L-10 days
ISI XXX TDRS Accountability		L-10 days
ISI XXX Mission Termination		Upon release from JSC
<i>*WSC Scheduling has requested that this ISI is generated in the forecast period (L-21 days) to prevent conflicts with other users. Super Critical ISIs must have Network Director (ND) approval</i>		





Network Testing



Test Title	Date	Comments
NASA/JAXA HTV-3 BCC-HOSC ETE Test	01/18/12	Objectives not met. Marshall Space Flight Center (MSFC) was tasked with investigation of their systems. CDS 010855 refers
HTV-3/ATV-3 BCC-HOSC Command Checkout	01/24/12	Objectives met. MSFC implemented fixes
NASA/JAXA HTV-3 BCC-HOSC ETE Test	01/30/12	Objectives were partially met. 19 seconds delay in the commands due to a buffering problem with the MSFC SCD software. Telemetry was nominal. CDS 010881 refers
HTV/TDRSS/Ground Segment (GS) End to End Checkout & HOSC Verification	03/15-16/12	Completed. BCC-HOSC telemetry tested nominal. Command was not tested due to buffering problem
HTV-3 BCC-HOSC Test	Early 05/2012	Will be performed once the MSFC SCD S/W upgrade has been completed and tested
HTV-3 BCC-HOSC Test	Early 06/2012	Beginning of JSC hurricane season
Vector Verification	TBD	FDF and WSC software will be in a freeze
L-4 Day Circuit C/O	07/2012	
WSC SN Mission Readiness Test (MRT)	TBD	WSC hardware will be in a freeze after this test
Pre-mission Voice Circuit	L-1 day or earliest date prior to launch	Ensure all HTV mission voice circuits are configured. GSFC/JSC/WSC will participate
NASA/JAXA TDRSS Link End-to-End Undocking Preparation Checkout*	TBD	
<i>*This test will be performed prior to HTV-3 undocking for verification of the TDRS link</i>		





Network Testing (cont'd)

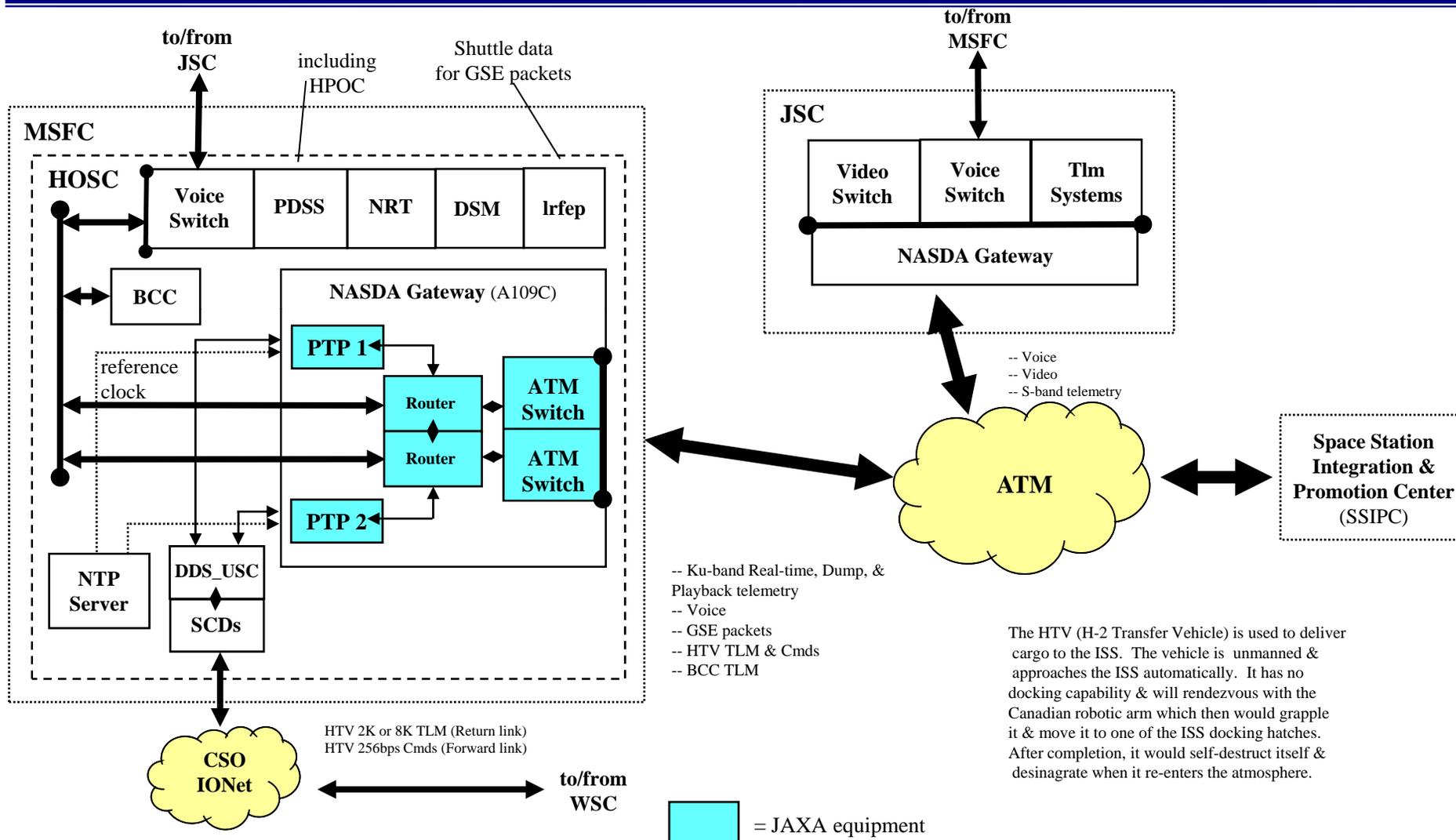


- **BCC-HOSC Command anomaly**
 - **Command problem was due to a buffering issue in the Small Conversion Device (SCD) software**
 - **The buffering anomaly caused a 19 seconds delay**
 - **GSFC CSO/NISN will deliver a new SCD with the upgraded software 7.0 to Marshall Space Flight Center (MSFC)**
 - **This software is reputed to reduce the delay from 19 seconds to 2 seconds**
 - **The delivery of the upgraded SCD to MSFC will occur No Later Than (NLT) 04/30/12**
 - **The new SCD will be tested and certified by the network. Once that is completed, a second SCD will be delivered**
 - **Back-up plan :**
 - **If the SCD software 7.0 does not reduce the command delay, MSFC personnel will configure the older SCDs with the AVTEC board**
 - » **This will be for command only. Telemetry will be supported with the newer SCDs with the FASTCOMM boards**





BCC-HOSC/JAXA Interface



The HTV (H-2 Transfer Vehicle) is used to deliver cargo to the ISS. The vehicle is unmanned & approaches the ISS automatically. It has no docking capability & will rendezvous with the Canadian robotic arm which then would grapple it & move it to one of the ISS docking hatches. After completion, it would self-destruct itself & desinagrate when it re-enters the atmosphere.





SN Mission Support



- **WSC will provide support of the HTV mission as required**
 - **SN Resources: S-band Single Access (SSA), S-band Multiple Access (SMA), Multiple Access (MA)**
 - **SN Services: S-band Telemetry and Commanding**

Command and Telemetry Rates	
Command	250 bps*
SN SSA	2 kbps and 8 kbps
SN SMA/MA	2 kbps and 8 kbps**
<i>*If SMA forward service is available, HTV can schedule the service. The HTV receiver was not originally required to support SMA forward service. SMA forward service to HTV will be provided on a best-effort basis</i>	
<i>**SMA return support to HTV at 8000 bps will be provided on best effort basis</i>	





SN Mission Support (cont'd)



- **TDRS support requirements:**
 - Events need to be submitted in the forecast period
 - Critical TDRS time to be submitted L-21 days
- **The HTV personnel at Mission Control Center-Houston (MCC-H) will be providing all Ground Configuration Message Request (GCMR)s and TDRS link management**
- **HTV S-Band return links shall be recorded at WSC and held for a period of 50 hours or longer if specifically requested via the Media Hold Request**
- **Launch minus 30 day Forecast Scheduling Telecon**
 - **WSC, Spaceflight Mission Manager (SMM), and JSC Ground Controller (GC) discuss launch, critical periods and WSC activity schedule**





TDRS Constellation



- May through September 2012

SGLT	TDRS	NAME	LONGITUDE
SGLT-1	TDRS-10	West	174
SGLT-2	TDRS-3	Spare	049
SGLT-3*	TDRS-9	East	40.9
SGLT-4	TDRS-5	171	167.5
SGLT-5	TDRS-3	Spare	49
SGLT-6	TDRS-7	275	275

TDRS-171 SGLT-4 to SGLT-5 Antenna handover 05/21/12 – to allow for TDRS-K SGLT-4 Modification 5/12/12 to 7/11/12

TDRS-Spare SGLT-2 to SGLT-4 Antenna handover 07/16/12

TDRS-East SGLT-3 to SGLT-4 Antenna handover 07/16/12 – to allow for TDRS-K SGLT-3 Modification 7/16/12 to 9/6/12

* SGLT-3 has no MA capabilities





WSC Major Activities July 2012 - August 2012



- **Launches/Critical activities**

- **Soyuz/ISS-31S** **07/15/12**
- **Sealaunch/INTELSAT-19** **07/TBD/12**
- **Soyuz/ISS-48P** **07/31/12**
- **Atlas-V/NROL-36** **08/02/12**
- **Falcon-9/CRS/SPACEX/01** **08/18/12**
- **Atlas V/RBSP** **08/30/12**





HTV Integrated TDRS Communications Requirements



- For non-critical periods, 30 minutes coverage per orbit is required. One TDRS is preferable
- HTV requires SSA for the following critical periods:
 - Capture Point (CP) arrival and Capture
 - Release and descending maneuver 1 (DSM1)
 - When ISS and HTV needs TDRS 275, a super critical period will be required
- HTV is able to use MA FWD/RTN for TDRS 275 if TDRS East and West are maximized





ER Support



- **C-band Contingency Support Plan**
 - HTV missions will not be routinely scheduled for C-Band support
 - If a contingency is declared by the ISS Ground Controller (GC) during a VV mission, the Ranges have agreed that C-band radars will provide VV contingency support within agreed upon call-up times for Nominal and Off-duty hours
 - A HTV-3 ISI for C-Band Radar Contingency Call-up procedures will be published prior to the mission
- **Prior to L-10 days the ER will send any updates for Point of Contact's (POC)**
- **ER will provide radar status prior to the mission to the Human Spaceflight (HSF) Network Director (ND) and Spaceflight Mission Manager (SMM)**





GSFC FDF Support



- **Receive predicted HTV insertion and maneuver vectors from JSC TOPO**
 - Provide pre-mission C-band (for contingency purposes) and Space Network (SN) acquisition data based on these vectors
 - Provide a pre-mission line summary product based on the predicted vectors
- **Provide orbit determination (OD) for the HTV spacecraft after insertion, and prior to and after maneuvers. Update the SN based on these OD solutions**
- **Provide the HTV Control Center (HTV-CC) via JSC with HTV vectors and ephemeris data during the early orbit phase based on the FDF OD solutions**





GSFC FDF Support (cont'd)



- **Perform metric tracking data evaluation of the HTV tracking data**
- **Provide an HTV local oscillator frequency (LOF) report, as requested**
- **After docking, provide the SN with HTV acquisition data updates on a M/W/F basis based on the FDF International Space Station (ISS) OD solutions**
- **Provide the HTV-CC via JSC with TDRS vectors**
- **Provide emergency spacecraft support, if required**





GSFC CSO/NISN Support



- **CSO/NISN Support**
 - Provide voice communications and data transport
 - Assist in IN fault-isolation as needed
 - Voice and data circuits that will be scheduled for HTV support:

Voice	Data	
ISS Site COORD	Command	FM: JSC/JAXA - LPA 0409 To : WSC - LPA 0409
ISS TN COORD	Command Echo	FM: WSC - LPA 0262 To: JSC - LPA 0262
ISS IP/GC 1	Telemetry	FM: WSC - LPA 0247 To: JSC - LPA 0247
Lead Range COORD	HOSC/BCC Command (If Needed)	FM: MSFC - LPA 0111 To: JSC - LPA 0111
Track COORD	Track (If needed)	FM: ER via CD&SC To: FDF TBD

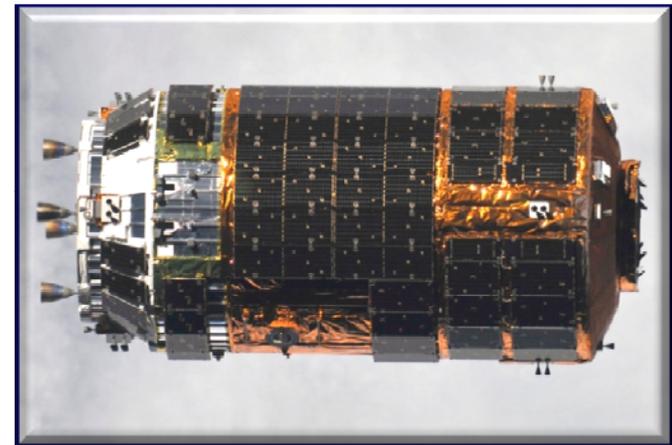




Network Staffing Plan



Network Staffing Plan	
GSFC Network Integration Center (NIC) and WSC Technical Operations and Analysis (TO&A) Support	Launch -5 hours through berthing (SMMs)
	Launch -5 hours through ascent phase (TO&A)
	On-call for Tracking and Data Relay Satellite (TDRS) critical periods
	Critical period for unberthing and for reentry/recovery phase
FDF	Launch -5 hours, berthing (docking), undock and re-entry
CSO/NISN	Mission Comm Manager: L-5 hours until release
	Comm Manager 24x7
ER (C-Band Radar) – Contingency support only	The ER will be called up in the event of an emergency in accordance with the call up times in the HTV-3 ISI





Open Work



- **GSFC CSO/NISN to deliver a new SCD with the upgraded software 7.0 to MSFC**
 - Re-test of the BCC-HOSC test with JSC/MCC, GSFC and JAXA
- **ISS GC provide the backup launch day scenario**
- **HTV TNOSP**
 - Completion NLT 05/2012
- **Finalize the Vector Management ISI**
 - SMM will be working with the JSC TOPO
- **HTV Integrated TDRS Communications Requirements**
 - ISS Pointing will be providing the information (expected NLT 06/29/12)





HTV-3 IN Team Members



Team Members	Location	Role	Contact Information
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Open Discussion

