



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



10/19/11

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Agenda



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Mission Overview

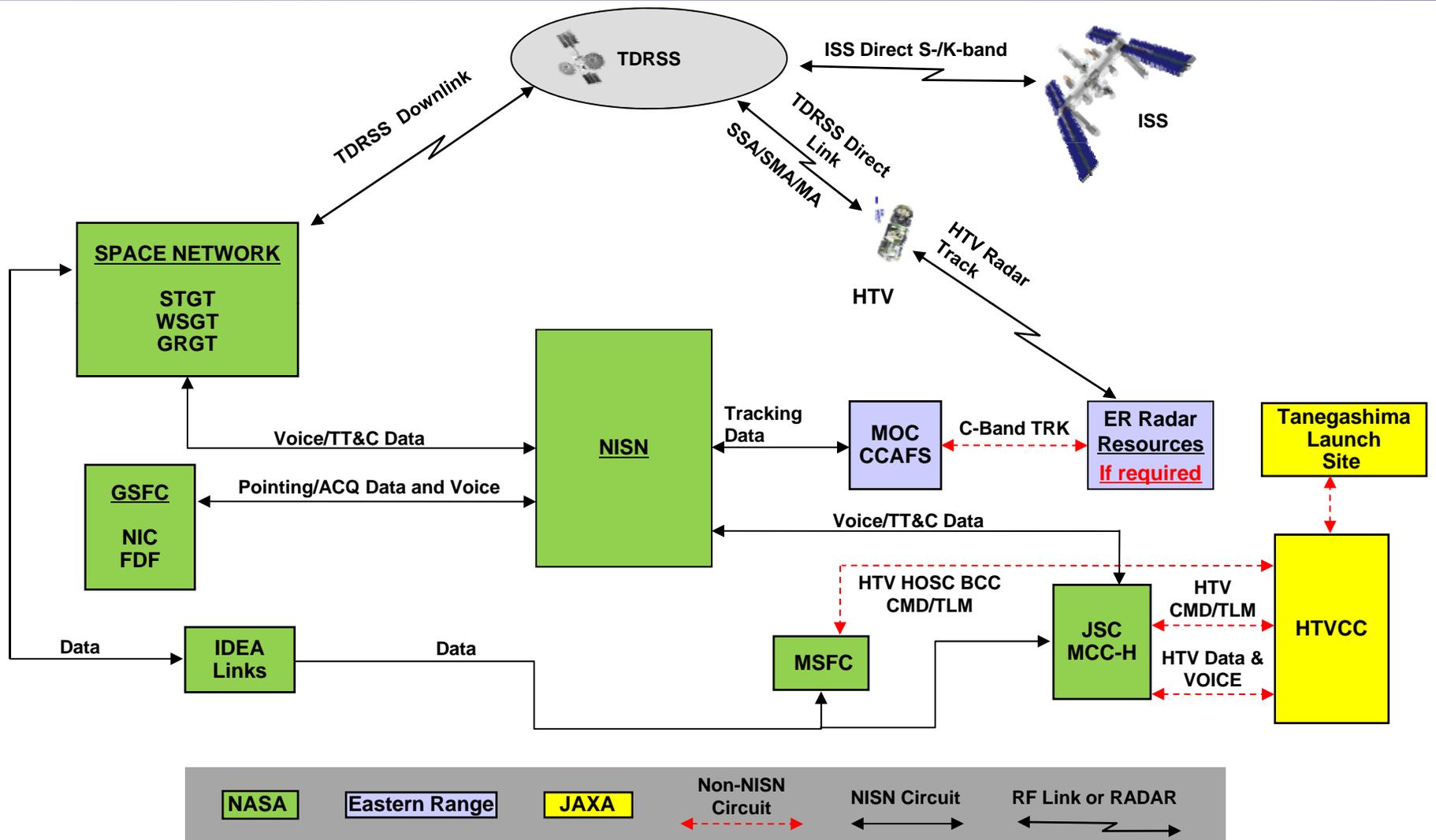


- **Visiting Vehicle (VV):** H-II Transfer Vehicle (HTV)
- **Launch Date:** No Earlier than (NET) February 18, 2012
- **Launch Vehicle:** H-IIB
- **Launch Site:** JAXA's Tanegashima Space Center (TNSC) on Tanegashima Island
- **HTV Control Center (HTVCC):** Tsukuba Space Center (TKSC)
- **Trajectory**
 - **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



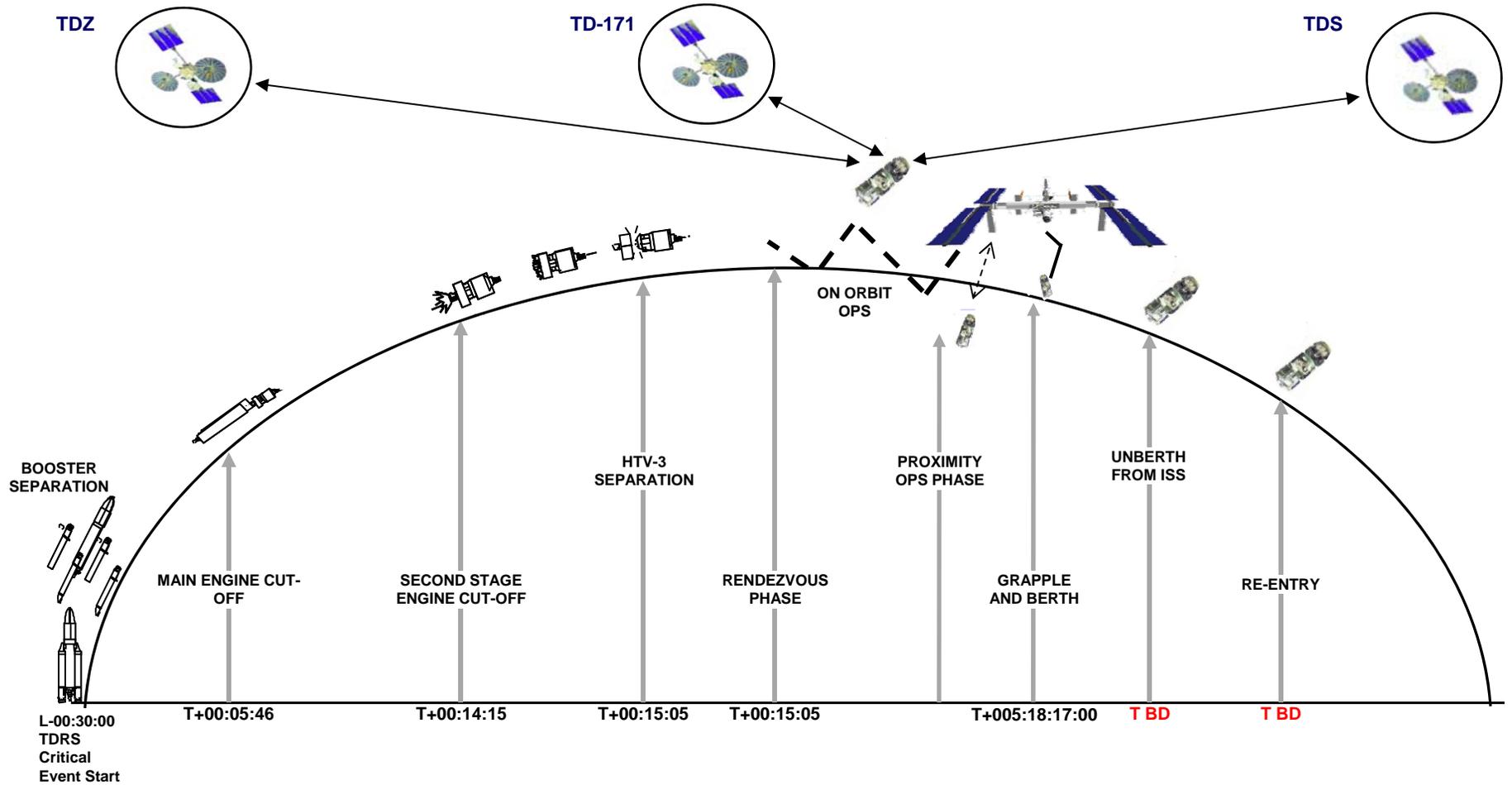


IN Overview



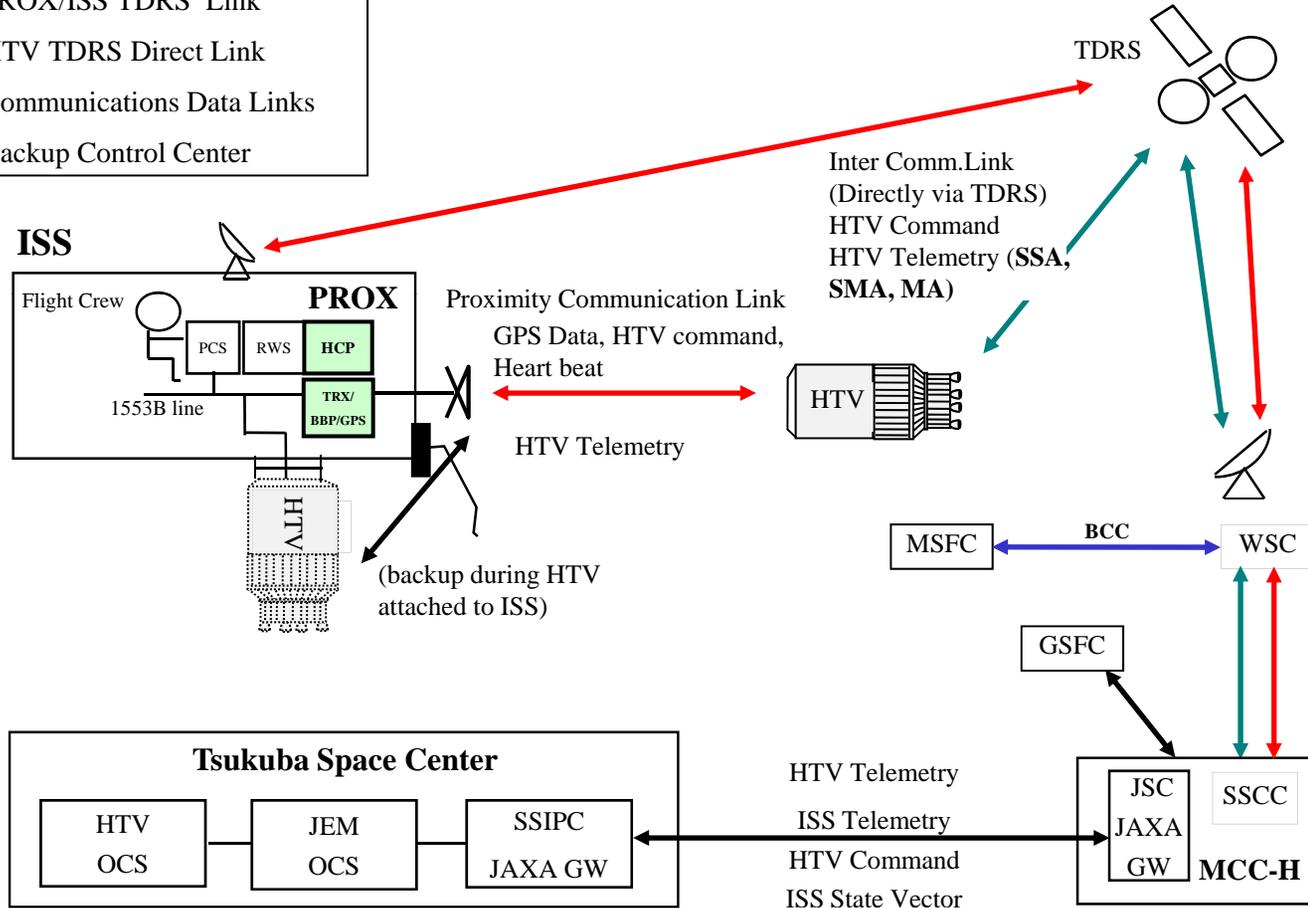
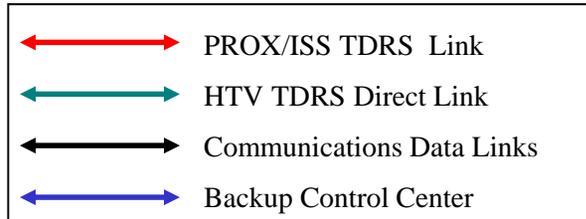


Mission Profile





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	November 2009
Draft Launch Count	Will need inputs from Johnson Space Center (JSC)	L-60 days
Interim Support Instruction (ISI) 001 Pre Mission Status		L-30 days
ISI XXX Critical/Super Critical Mission Period	Will need inputs from JSC	L-21 days*
ISI 001 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		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>*White Sands Complex (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
HTV/TDRSS/Ground Segment (GS) End to End Checkout & HOSC Verification	November 3-5	
JSC/HTV-3 GCMR Testing with GSFC/RF SOC and WSC	TBD	
Vector Verification	TBD	
WSC SN Mission Readiness Test (MRT)	TBD	WSC will be in a freeze after this test
NASA/JAXA TDRSS Link End-to-End Undocking Preparation Checkout*	TBD	

**This test will be performed prior to HTV-3 undocking for verification of the Tracking and Data Relay Satellite (TDRS) link*





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 and critical period schedule





HTV Integrated TDRS Communications Requirements



HTV Specific Requirements

For GMT Days 049 to 054 (18 FEB 2012 to 23 FEB 2012)

Event Details	S-band (HDR)		TDRS Critical	MCC	
	GMT Start	GMT End		Complex	Critical
	(DDD/HH:MM)	(DDD/HH:MM)			
HTV SEPARATION FROM H-IIB	049/15:29	049/23:49	Y		
HTV MANEUVERS (M1, PM1d)	049/23:49	050/02:06	Y		
HTV MANEUVERS (MD1)	050/23:16	051/00:56	Y		
HTV MANEUVERS (MD2)	051/22:15	051/23:45	Y		
HTV MANEUVERS (PCM1)	052/15:19	052/18:20	Y		
HTV MANEUVERS (HAM1 to PM2)	052/21:10	053/01:13	Y		
HTV MANEUVERS (MD3)	053/10:10	053/11:38	Y		
HTV MANEUVERS (PCM2)	053/13:50	053/16:40	Y		
HTV MANEUVERS (M3 to CM2)	053/17:50	053/20:56	Y		
HTV MANEUVERS (PCM3)	053/21:24	054/00:10	Y		
HTV MANEUVERS (MC1)	054/00:30	054/02:02	Y		
HTV RENDEZVOUS OPERATIONS	054/02:02	054/14:45	Y		





HTV Integrated TDRS Communications Requirements (cont'd)



- For the HTV non-critical periods, 30 minutes coverage per orbit is required. One TDRS is preferable
- Coherent mode will start from an AOS (around 049/17:06) and end at a LOS (around 054/07:48)
- A TDRS handover timing of TDRS link should not be scheduled at the same time of ISS link handover timing
- HTV requires SSA (Super Critical) between:
 - Capture Point (CP) arrival (around 054/12:30) and Capture (around 054/12:45)
 - Release around TBD and descending maneuver 1 (DSM1) around TBD
- HTV is able to use MA FWD/RTN for TDRS-Z in the other periods of TDRS Super Critical phase, if AOS of TDRS East and West are maximized





ER Support - Contingency



- **C-band Contingency Support Plan**
 - HTV missions will not be routinely scheduled for C-Band support
 - C-Band contingency support plan is currently being finalized
 - Once the plan has been finalized, it will be added to the 450-TNOSP-ISS, HTV Annex
 - A HTV-3 ISI for C-Band Radar Contingency Call-up procedures will be published prior to mission





GSFC FDF Support



- **FDF support for the HTV-3**
 - **Pre-mission analysis of TDRS coverage of HTV-3**
 - **Orbit determination**
 - **Tracking and Data Relay Satellite System (TDRSS)**
 - After insertion, prior to/after maneuvers, and daily during non-maneuver periods prior to berthing
 - FDF solution vectors will be provided to HTV-CC via JSC
 - **Acquisition data support**
 - Acquisition data based on HTV-3 vectors from HTV-CC via JSC or on FDF orbit determination solutions
 - **TDRS vector support to the JSC and HTV-CC**
 - **Evaluation of HTV-3 tracking data and local oscillator frequency**





GSFC NISN Support



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

Voice
ISS Site COORD
ISS TN COORD
ISS IP/GC 1
Lead Range COORD
Track COORD

Data	
Command	FM: JSC/JAXA - LPA 0409 To : WSC - LPA 0409
Command Echo	FM: WSC - LPA 0262 To: JSC - LPA 0262
Telemetry	FM: WSC - LPA 0247 To: JSC - LPA 0247
HOSC/BCC Command (If Needed)	FM: MSFC - LPA 0111 To: JSC - LPA 0111
2.4 KBPS LTAS Data	FM: ER via CD&SC To: FDF TBD





Second Generation Transponder

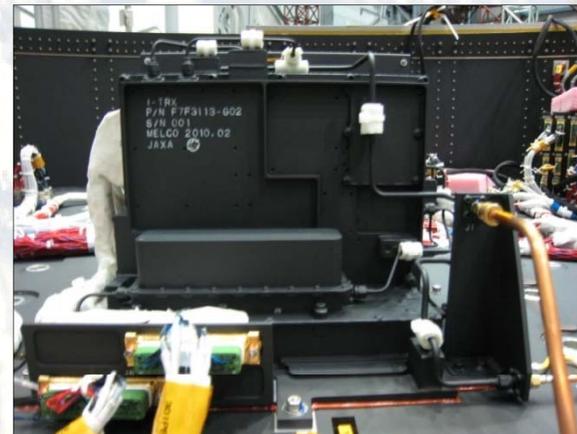


- In the Avionics Module, there will be a new MELCO transponder for the HTV-3 mission which will be prime for this mission
- The new transponder was tested March 09-12, 2010 with the Compatibility Test Laboratory (CTL) and WSC
 - Command and Telemetry was successfully tested
- This transponder was installed as backup during the HTV-2 mission
- This transponder addresses the false-lock anomaly that occurred during the earlier HTV-1 mission

MDA Xpdr. on HTV2 (IOS)



MELCO Xpdr. on HTV3 (IOS)





Lessons Learned from HTV-2 mission



- **Problem**
 - Two late acquisitions on TDRS East (TDE)
- **Impact**
 - 088/1604Z and 088/1740Z: Total reported data loss 3 min 53 sec
- **Resolution**
 - New vector was delivered by FDF
 - 088/1921Z TDE event locked up as expected
 - Reason unknown for anomaly. GSFC SMM, JSC GC and Trajectory Operations Officer (TOPO) are working on an ISI to work-around this anomaly
 - This will be further discussed at a Network Support Group (NSG) Splinter Group meeting titled “TDRS Visiting Vehicle Vector Support” 10/19/11 at 3:00pm Central Time





Lessons Learned from HTV-2 mission (cont'd)



- **Marshall Space Flight Center (MSFC) (Huntsville Operations Support Center (HOSC) – Backup Control Center (BCC) Testing**
 - **TDRSS Ground Link checkup prior to undocking**
 - HTV-2 command data via MSFC BCC not received at WSC
 - MSFC Small Conversion Device (SCD) was not passing data
 - Goddard Comm Control (GCC) confirmed data
 - Logical Port Address (LPA) for BCC command at WSC was misconfigured
 - **BCC checkout should always be included in premission testing**
 - **There will be an End-to-End test just prior to undocking in order to verify the TDRS link**





Open Work



- **JSC GC is currently working on the configuration codes for the upcoming mission. Many of the configuration codes are new which will cut down on the number of GCMRs that are generated**
- **Updating the HTV Annex to the ISS TNOSP which is expected to be completed no later than mid November 2011**





HTV-3 IN Team Members



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Open Discussion

