

SUBJECT: HTV-3 Mission Operations Readiness Review (MORR) Minutes

DATE: May 24, 2012

PLACE: GSFC, Building 12/N112

TIME CONVENED: 1300

TIME ADJOURNED: 1400

ATTENDANCE

<i>Last Name</i>	<i>First Name</i>	<i>Organization</i>	<i>E-mail Address</i>	<i>Telephone #</i>
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## **WELCOME/INTRODUCTION**

Mr. Jim Bangerter convened the May 24, 2012, H-II Transfer Vehicle (HTV)-3 Mission Operations Readiness Review (MORR) to assess the readiness of the Integrated Network (IN) to satisfy the requirements for the HTV-3 mission (refer to the presentation package, *H-II Transfer Vehicle-3 [HTV] Mission Operations Readiness Review [MORR]*).

The HTV-3 Review Board members are as follows:

- Ms. Carolyn P. Dent, Chairperson, GSFC, Code 301, Systems Review Office.
- Mr. Scott A. Greatorex, GSFC, Code 450.1, Chief, Networks Integration Management Office.
- Mr. John J. Hudiburg, GSFC, Code 599, 450 Senior Technical Authority.
- Ms. Susan L. Hoge, GSFC, Code 595, Navigation and Mission Design Branch.
- Mr. Bradford Butts, GSFC, Code 761, Systems Management Branch.
- Mr. Joe Aquino, JSC, Manager, JSC DD13, Space Communications Integration Office (Ms. Jewel Hervey signing for).
- Mr. Donald W. Shinnars, GSFC, Code 452, Space Network Project.
- Mr. James A. Bangerter, GSFC, Code 450.1, Human Spaceflight Network Director.

Mr. Jim Bangerter provided a welcome to the attendees. He stated that this is the first in a series of reviews. Mr. Bangerter will report at the Johnson Space Center (JSC) Flight Readiness Review (FRR) after the Goddard Space Flight Center (GSFC) MORR.

## **HTV-3 MISSION OVERVIEW**

Mr. Melvin Calhoun provided an HTV-3 Mission Overview.

- A. Project Mission Summary. Mr. Calhoun reviewed the objectives of the mission. HTV-3 is an unmanned resupply spacecraft developed by the Japanese Aerospace Exploration Agency (JAXA) to deliver equipment, spare parts, and consumables to the International Space Station (ISS).
- B. Mission Summary. Mr. Calhoun provided a mission summary. The launch is currently scheduled for July 21, 2012. The launch time is Day of Year (DOY) 203 at 0205:55Z. The launch vehicle is an H-IIB from JAXA's Tanegashima Space Center (TnSC) on Tanegasima Island. The primary payload is 6 tons of supplies and the Space Communications and Navigation (SCaN) Test Bed. Docking is scheduled for July 27, 2012. Undocking is scheduled for August 26, 2012. HTV-3 will be docked for 30 days. Re-entry is scheduled for August 27, 2012.
- C. ISS Supply Sequence. Mr. Calhoun reviewed the ISS supply sequence.

## **INTEGRATED NETWORKS REQUIREMENTS**

Mr. Calhoun provided the IN requirements.

- A. Requirements Changes. Mr. Calhoun stated that there has been one requirement change since the last HTV mission. The Easter Range (ER) C-band requirements have been changed to provide contingency support only.
- B. IN Requirements. Mr. Calhoun reviewed the Communications Service Office (CSO), Space Network (SN), Flight Dynamics Facility (FDF), Network Integration Center (NIC), and ER requirements. Mr. Hudiburg asked if Virtual Spacecraft support will be used while attached to the International Space Station (ISS). Mr. Bangerter stated that

the data is interleaved in the ISS data stream. There will be no separate Radio Frequency (RF) link and no Virtual Spacecraft support. Mr. Hudiburg asked which radars would be used in a contingency. Mr. Bangerter stated that the radars are selected based on when the contingency occurs. NASA radars will be used if possible. The ER provides a list of available radars in advance. Mr. Hudiburg asked when the radars were last tested. Mr. Bangerter stated that the Wallops Flight Facility (WFF) and Dryden Flight Research Center (DFRC) radars were used for the SpaceX mission. Mr. Warren Mitchell stated that FDF provided acquisition data to the ER recently. Mr. Bangerter stated that 5 C-band passes have been planned for the Dragon, because this is only their second mission. Once it has been determined that the Dragon GPS data is good, C-band radars will not be scheduled in advance, like other Visiting Vehicles (VV). Mr. Hudiburg asked if the Backup Control Center (BCC) will be activated. Mr. Bangerter stated that it will not, the BCC is activated for emergencies only. He noted that the equipment is there and is maintained. An activation test is scheduled for June 20, 2012. Mr. Greator asked for a clarification of FDF requirement 551187 (ISS State Vectors). He stated that the requirement is confusing and asked who is transmitting to whom. Mr. Mitchell replied that the FDF products based on data from JSC. Mr. Bangerter stated that data is provided (by JAXA) to the JSC Trajectory Operations Officers (TOPO) who send it to the FDF. Mr. Mitchell stated that early in the mission, FDF does provide Orbit Determination (OD) data to JSC.

- C. Launch Hold Criteria. Mr. Calhoun reviewed the launch hold criteria. Tracking and Data Relay Satellite (TDRS) is required and mandatory as part of the launch hold criteria for HTV-3. Ms. Dent asked why TDRS is both required and mandatory. Mr. Calhoun responded that that is the way it is documented in the Flight Rules.
- D. Networks Configuration. Mr. Calhoun reviewed the HTV-3 support networks configuration.
- E. Documentation. Mr. Calhoun reviewed the HTV-3 mission documentation. Documentation is up to date. The list includes the Interim Support Instructions (ISI) to be published. Mr. Hudiburg asked how many more HTV missions are planned. Mr. Bangerter stated that there are approximately 7 or 8 HTV missions and approximately 5 Automated Transfer Vehicle (ATV) missions. The communications configuration is holding. Mr. Hudiburg stated that there is a Documentation Change Notice (DCN) listed for the RF ICD in 2009. Mr. Bangerter stated that the DCN provided data rate updates and included the use of Multiple Access (MA) services. There were no system impacts.

## **ANALYSIS AND TESTING**

- A. Radio Frequency (RF) Analysis. Ms. Nancy Huynh provided an RF analysis summary. She noted that DCN 004 is in work for the RF ICD.
  - 1. HTV command may be requested for S-band Single Access (SSA), S-band Multiple Access (SMA), or MA. All forward link margins are positive. She stated that the HTV receiver was not originally required to support SMA or MA forward services. There is risk for SN support of the MA Forward (MAF) and SMA Forward (SMAF). Mr. Hudiburg asked if the SMAF has ever been used. Mr. Bangerter stated that SMAF has been used successfully. Mr. Bangerter stated that the risk is MAR and S-band Multiple Access Return (SMAR).

2. HTV return margins are positive except for the SMAR at 8 kbps.
  3. Ms. Huynh reviewed the RF forward link coverage table. Mr. Hudiburg asked if the only link required is the SSAF and Mr. Bangerter replied that it is. MA and SMAF are not required, but the project does use those links.
  4. Ms. Huynh reviewed the RF return link coverage table.
  5. Ms. Huynh reviewed the RF return link coverage (HTV project requested support on a best-effort basis) table.
- B. Network Feasibility Analysis. Mr. Chris Schwartz provided a network feasibility analysis summary.
1. Evaluations of the Forecast Period HTV post-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 (LEOP) customer using SN SSA service as long as the launch window duration is minimized.
  2. HTV will use TD171, TDS, and TDZ.
  3. The proposed method of scheduling either SSA or MA/enhanced MA (SMA) services (no restrictions on MA/SMA other than not available from TDE) should not cause any impact issues with other customer commitments.
- C. RF Compatibility Testing Results. Mr. Joe Baros provided an RF compatibility testing results summary. Mr. Baros reported that there were no anomalies during testing. Mr. Hudiburg stated that on page 19 of the presentation, the last report is dated 2007. This needs to be updated. Mr. Baros agreed and stated that this flight is with the Mitsubishi Electric Corporation (MELCO) unit. Mr. Hudiburg stated that the communications configuration had been broken and re-tested. Mr. Bangerter stated that the communications configuration has not changed since HTV-2. A MELCO unit was flown on that mission.

## **NETWORKS REQUIREMENTS VERIFICATION RESULTS**

Mr. Calhoun provided a networks requirements verification results summary. An HTV-3 TDRS Link Dataflow via the BCC - Hunstville Operations Support Center (HOSC) was conducted on January 18, 2012 and the objectives were not met. The purpose of this test was to verify the new Data Distribution Switch (DDS) installed at the Marshall Space Flight Center (MSFC). There were problems with both command and telemetry. MSFC was tasked with investigating their systems, especially the new DDS for a possible cause. MSFC's investigation revealed that there was a cabling issue with the ports on the MSFC Small Conversion Devices (SCD) 3, 4 and 5. There were also clock/data problems on the SCD interfaces. MSFC corrected these problems. An HTV-3 BCC-HOSC Command Test was conducted on January 24, 2012 and the objectives were met. An HTV-3 TDRS Link Dataflow via BCC - HOSC #2 was conducted on January 30, 2012 with the JAXA and the objectives were partially met. Commands experienced a 19-second delay due to a buffering problem. Mr. Bangerter stated that the command delay will be decreased from 19 seconds to 2 seconds with the new SCD release. Mr. Hudiburg asked when the re-test is scheduled and Mr. Calhoun stated that a re-test is scheduled for May 29. Mr. Calhoun reviewed the HTV-3 test matrix. Mr. Calhoun stated that JAXA has agreed to the 2-second delay. Testing with the vehicle was conducted in March.

## LAUNCH ACTIVITIES

Mr. Calhoun reviewed launch activities. Mr. Calhoun reviewed the launch day sequence of events (launch count). Spaceflight Mission Manager (SMM) staffing and activities were outlined. Mr. Calhoun reviewed the IN timeline summary. All mark events are shown on the timeline. Mr. Calhoun reviewed the IN Freeze Plan.

## NETWORKS STATUS

Representatives from the IN elements provided an element status and support readiness statement.

- A. CSO Operations. Ms. Claudette Wiley provided a CSO operations status. Ms. Wiley provided a list of voice and data services. The standard voice loops will be provided. There have been no software changes since the last VV mission. The keysets have all been retrofitted. There are no NASA Integrated Communications Services (NICS) Information Technology Service Management (NITSM) tickets. NITSM replaces the Problem Management and Dispatch System (PMDS). The Nortel Router Replacement Project (NRRP) Transition Readiness Review (TRR) was held in April. NO new routers have been connected to the operational network. Project completion is scheduled for April or May 2013. The IDEA network is scheduled to be turned down on July 1, 2012. CSO is waiting to hear from MSFC that the SCD with release 7.0 has been installed and is operational. There are no outstanding documentation items. Staffing is sufficient to meet all requirements. All required personnel are trained and certified. Ms. Wiley stated that CSO is ready to support the HTV-3 mission.
- B. SN Operations. Mr. Richards provided an SN operations status. A Data Interface System (DIS) firmware delivery was made. A Network Control Center Data System (NCCDS) software delivery was made. A DIS software delivery was made. There were no issues. WSC has 261 keysets and 155 have been retrofitted. There are no hardware issues. There are no open Discrepancy Reports (DR). There are no outstanding documentation items. Staffing is sufficient to meet all requirements. All required personnel are trained and certified. Mr. Richards stated that the SN is ready to support the HTV-3 mission.
- C. FDF Operations. Mr. Mitchell provided an FDF operations status. There have been no software or hardware changes since the last VV mission. There are no open DRs. There are no outstanding documentation items. Staffing is sufficient to meet all requirements. All required personnel are trained and certified. Mr. Mitchell stated that the FDF is ready to support the HTV-3 mission. Mr. Hudiburg asked if HTV has been supported yet with the new FDF software. Mr. Mitchell stated that the new software has supported ATV and SpaceX; this will be the first time with HTV.
- D. Network Integration Center (NIC) Operations. Mr. Eric Mount provided a NIC operations status. There have been no software changes since the last mission. Console equipment is being relocated in the NIC. No hardware changes are being done. There are no open Discrepancy Reports (DR). There are no outstanding documentation items. There is one FER that has been approved. Facilities are GREEN. Staffing is sufficient to meet all requirements. All required personnel are trained. Mr. Mount stated that the NIC is ready to support the HTV-3 mission.
- E. ER Operations. Mr. George Fulford provided an ER status. As discussed earlier in the meeting, ISS VVs are no longer routinely supported by the Department of Defense (DoD)

C-band radars. The ISS GC can declare a contingency/emergency. The ranges have agreed C-band radars VV contingency support within the agreed call-up times. An ISI for C-band contingency call-up will be distributed prior to the mission. Mr. Fulford stated the ER is ready to support the HTV-3 mission. Mr. Hudiburg asked when the last contingency was declared. Mr. Bangerter stated that there has never been one. The procedure to call up contingency support has been in place for approximately 1.5 years. The procedure has been rehearsed. Ms. Blizzard stated that the ER was called up during Space Shuttle missions and was very responsive.

### **PONTS-OF-CONTACT**

Mr. Calhoun reviewed the Points-of-Contract (POC) list. Mr. Hudiburg stated that there have been hurricane events and asked if special procedures are in place. Mr. Bangerter stated that there are procedures and all required personnel are badged to get on center. The plans would be the same as exercised during the blizzards.

### **INTEGRATED NETWORK SUMMARY**

- A. Risks. Mr. Calhoun reviewed the network risks. There is one risk on the HTV-3 SMAR 8-kbps support. If TDRS SSAR resources are not available for HT-3 8-kbps supports, then the 8-kbps support will have to be supported on TDRS MAR and SMAR links. Compatibility testing indicates that data drops may occur due to a negative link margin. This is a known risk and is a low risk. Mr. Greatorrex asked if testing has been conducted. Mr. Bangerter stated that onorbit engineering tests were conducted. Ver/Vals were conducted and there were no issues. The links have been used for two operational missions. The project is not carrying this as risk. Network Integration and Management Office (NIMO) procedure requires that it be carried as a risk.
- B. Standard open work includes WSC MRT, FDF Vector Verification, and L-1 day circuit checkout as well as the BCC – HOSC test prior to the hurricane season. The BCC – HOSC test with JAXA is the one non-standard open work item.
- C. Mr. Greatorrex asked what support is being provided for re-entry. Mr. Bangerter replied that TDRSS support will be provided until loss of lock on the signal. Mr. Hudiburg asked when the blackout is expected to occur. Mr. Bangerter replied that he did not know. Three action items were assigned to Messrs. Harrison Booker, Tom Russell, and Melvin Calhoun to determine when (at what altitude) SpaceX (H. Booker), ATV (T. Russell), and HTV (M. Calhoun) blackouts occur.
- D. The 19-second command transmission delay is the one concern. If the updated SCD software does not work, MSFC will configure the older SCDs with the AVTEC boards. Mr. Hudiburg asked why it is believed that the software upgrade will work. Mr. Bangerter stated that CSO did bench mark testing.
- E. The IN is ready to support the HTV-3 mission.

### **REVIEW BOARD CERTIFICATION**

The HTV-3 MORR Review Board signed the Certificate of Flight Projects Directorate Networks Readiness certifying that, with successful completion of flight readiness preparations and closure of associated action items, all integrated network elements are ready to support the HTV-3 mission. All board members stated that the IN was ready to support with the closure of the open items.

**RFA REVIEW**

No RFAs were assigned at the May 24, 2012, HTV-3 MORR.

**ACTION ITEM REVIEW**

Three action items were assigned at the May 24, 2012, HTV-3 MORR.

<b>AI No.</b>	<b>Assignee</b>	<b>Action</b>	<b>Status</b>
052412- HTV3- MORR-01	Melvin Calhoun/ GSFC/HSF	Determine when (at what altitude) HTV blackouts occur.	<b>Open</b>
052412- HTV3- MORR-02	Harrison Booker/ GSFC/HSF	Determine when (at what altitude) SpaceX blackouts occur.	<b>Open</b>
052412- HTV3- MORR-03	Tom Russell/ GSFC/HSF	Determine when (at what altitude) ATV blackouts occur.	<b>Open</b>

(Original Approved By)  
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