HTV-2 Post Mission Review and Lessons Learned

03/29/11
GSFC/HSF Spaceflight Mission Managers' Report

*****Updated on 5/02/11 to include all post mission data and updates*****

Near Earth Networks Services

Presentation Overview

- Mission Review
- TDRSS Support Overview
- Lessons Learned

Mission Review – Overview

- Visiting Vehicle: H-II Transfer Vehicle (HTV)
- Launch Vehicle: H-IIB
- Launch Site: JAXA's Tanegashima Space Center
- Launch Date/Time: January 22, 2011 (DOY 022/0537:57Z)
- Rendezvous: January 27, 2011 (DOY 027)
  - Hard Mate: 1451Z
- Departure: March 28, 2011 (DOY 087)
  - HTV2 Release: 1546Z
- Reentry: March 29, 2011 (DOY 089/0309Z)

Mission Review – Space Network

- **Space Network Support:**
  - Launch -8 hours (DOY 021/2200Z) thru Rendezvous Ops (DOY 027/1600Z)
  - HTV-2 Nadir to Zenith Node move for STS-133 docking DOY 056-057
  - HTV Departure (DOY 087/1200Z) thru Reentry (DOY 089/0450Z)
  - SN Mission Total Events: 399
  - SN Mission Service Total: 344 hrs 22 minutes

SSAF	SSAR	SMAF	SMAR	MAF	MAR
95:38	95:50	37:40	37:40	38:33	39:01

Mission Review – Space Network (cont'd)

- HTV-2 events were supported at 8 kbps (HDR) on both MA and SMA
- No problems reported
- RFICD has been updated for 8 kbps MA and SMA

HTV-2 Mission TDRSS Overview

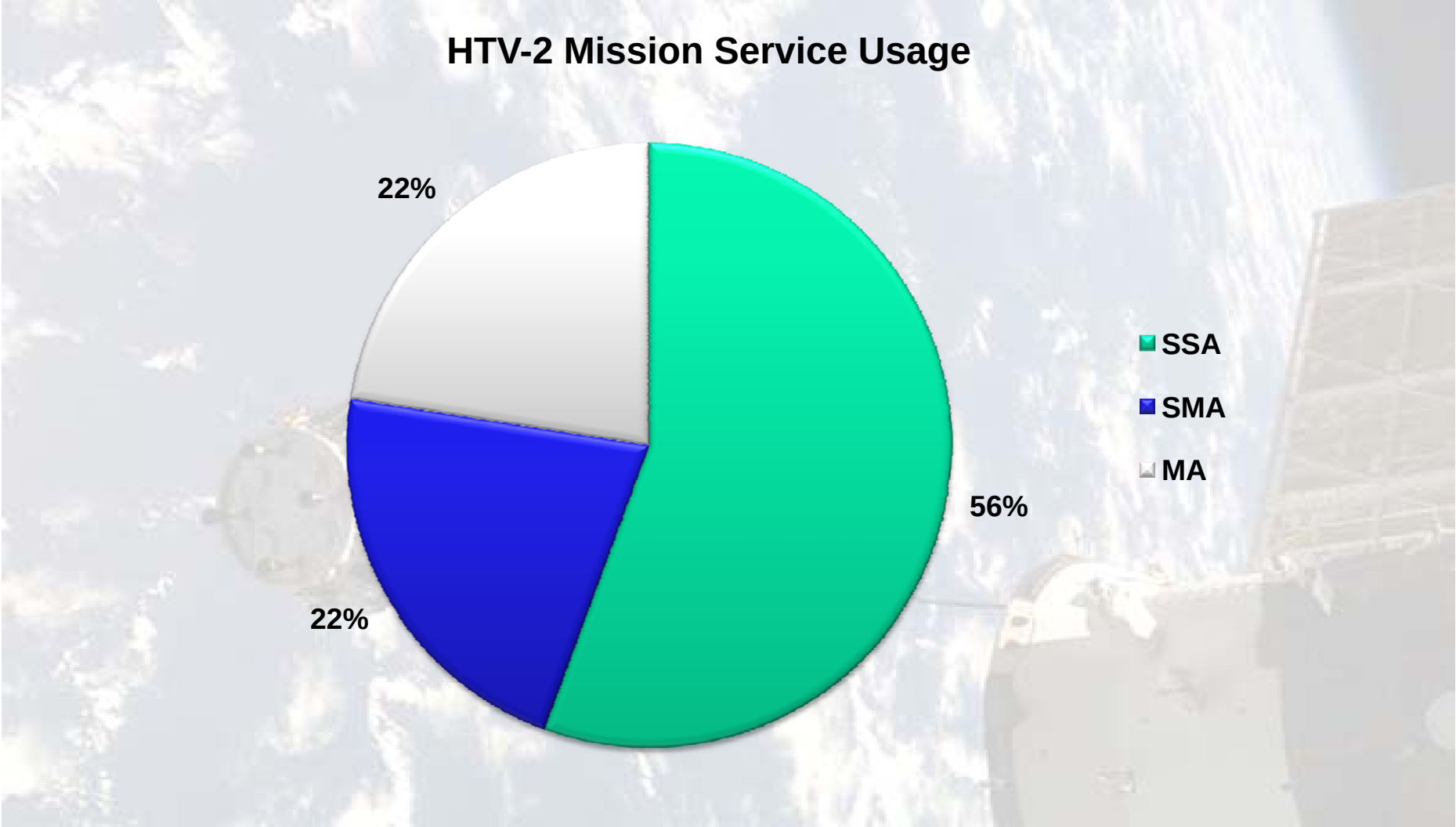
HTV1 TDRSS Mission Totals

		TDE (F-10)					TDS (F-4)				171 (F-5)					TDW (F-6)					275 (F-7)				
(DOY)	Daily Events	Events	SSAF	SSAR	SMAF	SMAR	Events	SSAF	SSAR	MAR	Events	SSAF	SSAR	MAF	MAR	Events	SSAF	SSAR	MAF	MAR	Events	SSAF	SSAR	MAF	MAR
12	1						1	40	40	0															
22	37	9	197	197	105	105	2	68	68		12	399	399			1	17	17			13	197	197	91	91
23	50	16	154	154	318	318	2	6	6		12	356	356			5	61	61	58	58	15	53	53	341	341
24	49	14	37	37	423	423	1	31	31		12	308	308			7	134	134	21	21	15	107	107	291	291
25	50	18	221	221	263	263	0				14	449	449			2	36	36	11	11	16	131	131	275	275
26	51	17	226	226	240	240	1	11	11		15	520	520			0					18			168	168
27	40	13	185	185	51	51	1	5	5		9	296	296			0					17	140	140	128	128
55	18	6			191	191					1	21	21			5	27	27	135	135	6			134	134
57	15	5	11	11	114	114					3	59	59			3	11	11	20	20	4	97	97	167	183
87	27	8	99	99	124	124	1		12	12	7	161	161			3	9	9	20	20	8	31	31	128	128
88	53	15	49	49	418	418					15	404	404			8	94	94	5	5	15	71	71	320	320
89	8	4	98	98	13	13					2	67	67			0					2	44	44		
Totals =>	399	125	21:17	21:17	37:40	37:40	9	2:41	2:53	0:12	102	50:40	50:40	0:00	0:00	34	6:29	6:29	4:30	4:30	129	14:31	14:31	34:03	34:19

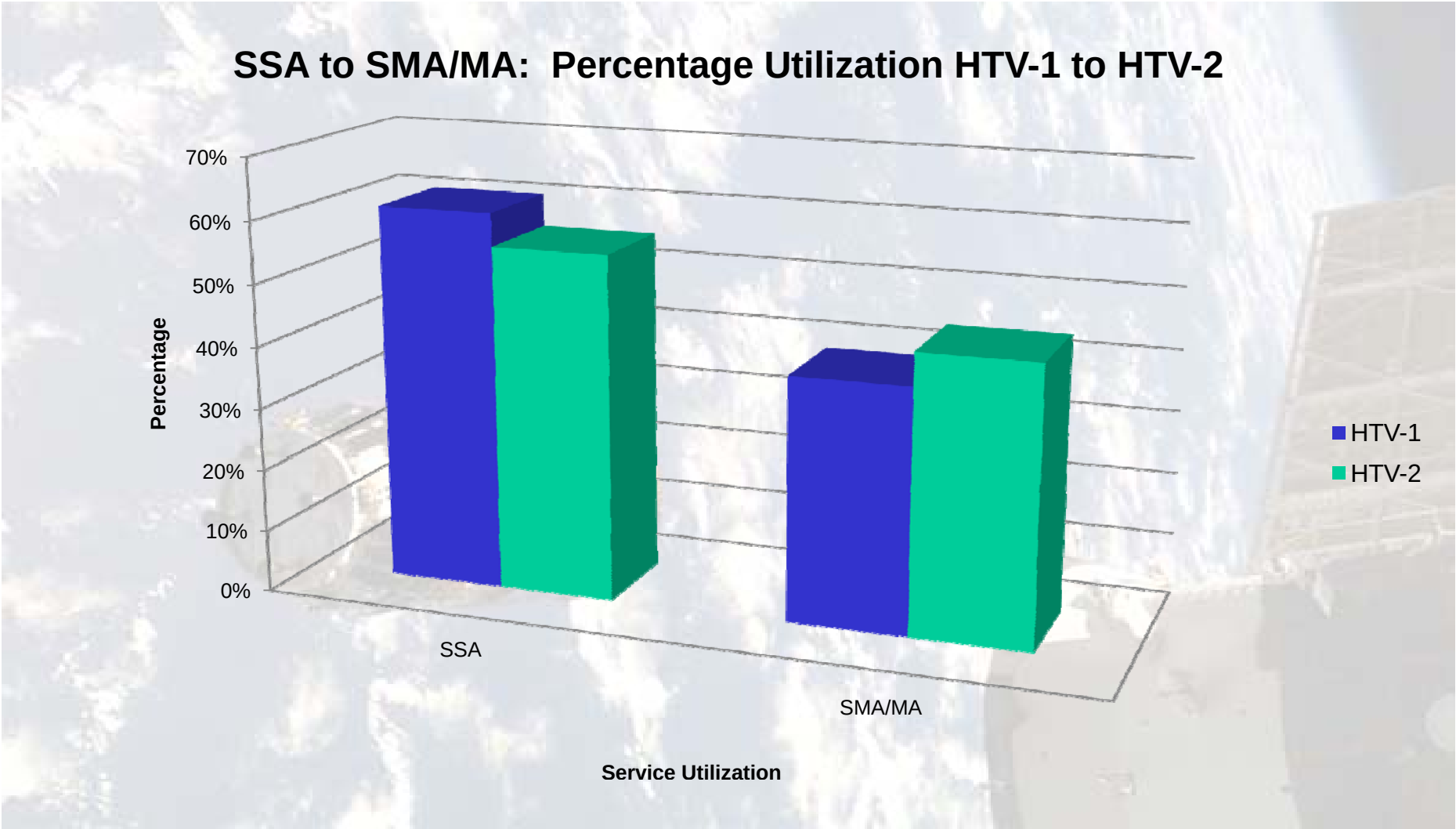
Service Type Totals (HH:MM)					
SSAF	SSAR	SMAF	SMAR	MAF	MAR
95:38	95:50	37:40	37:40	38:33	39:01

SN Total => 344:22

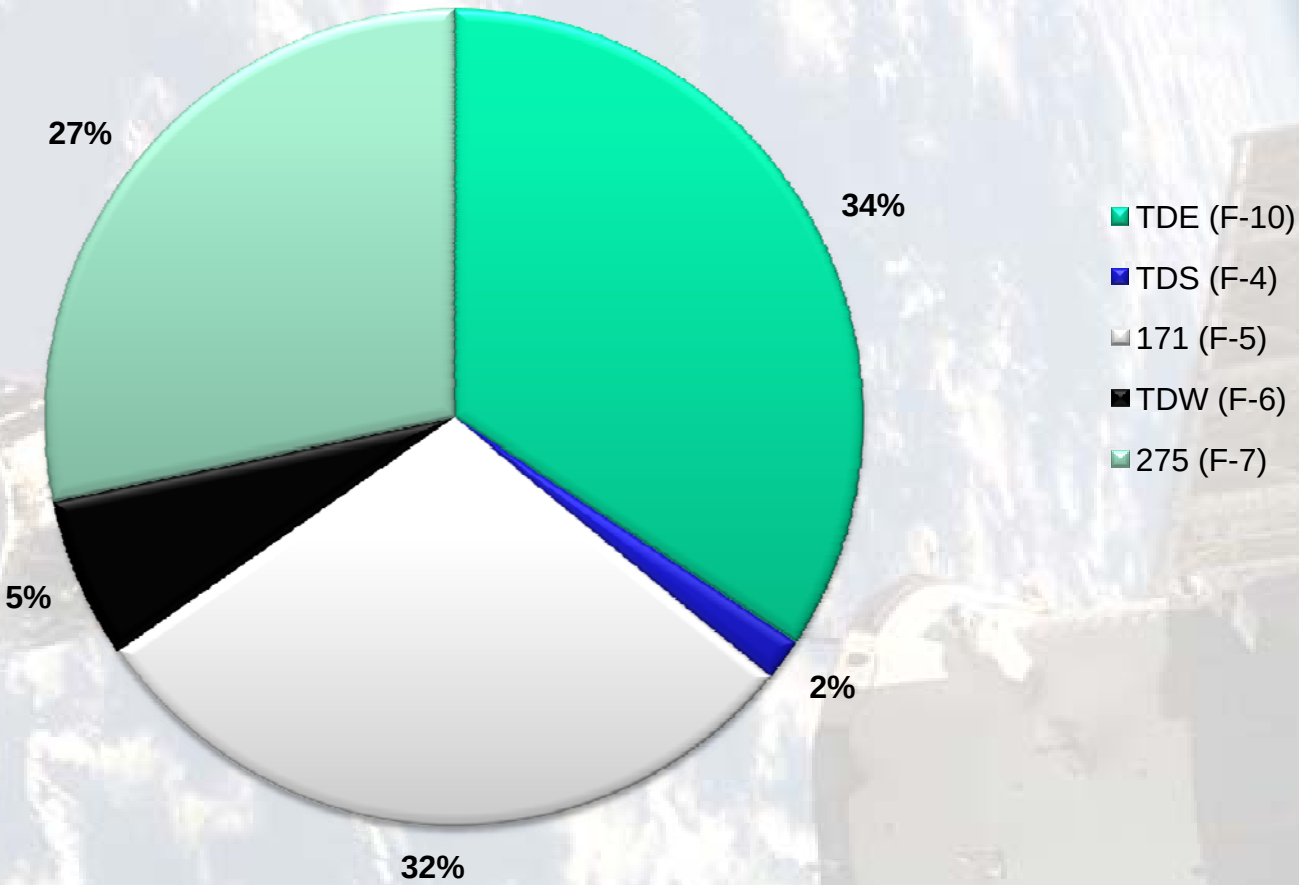
HTV-2 TDRSS Service Usage



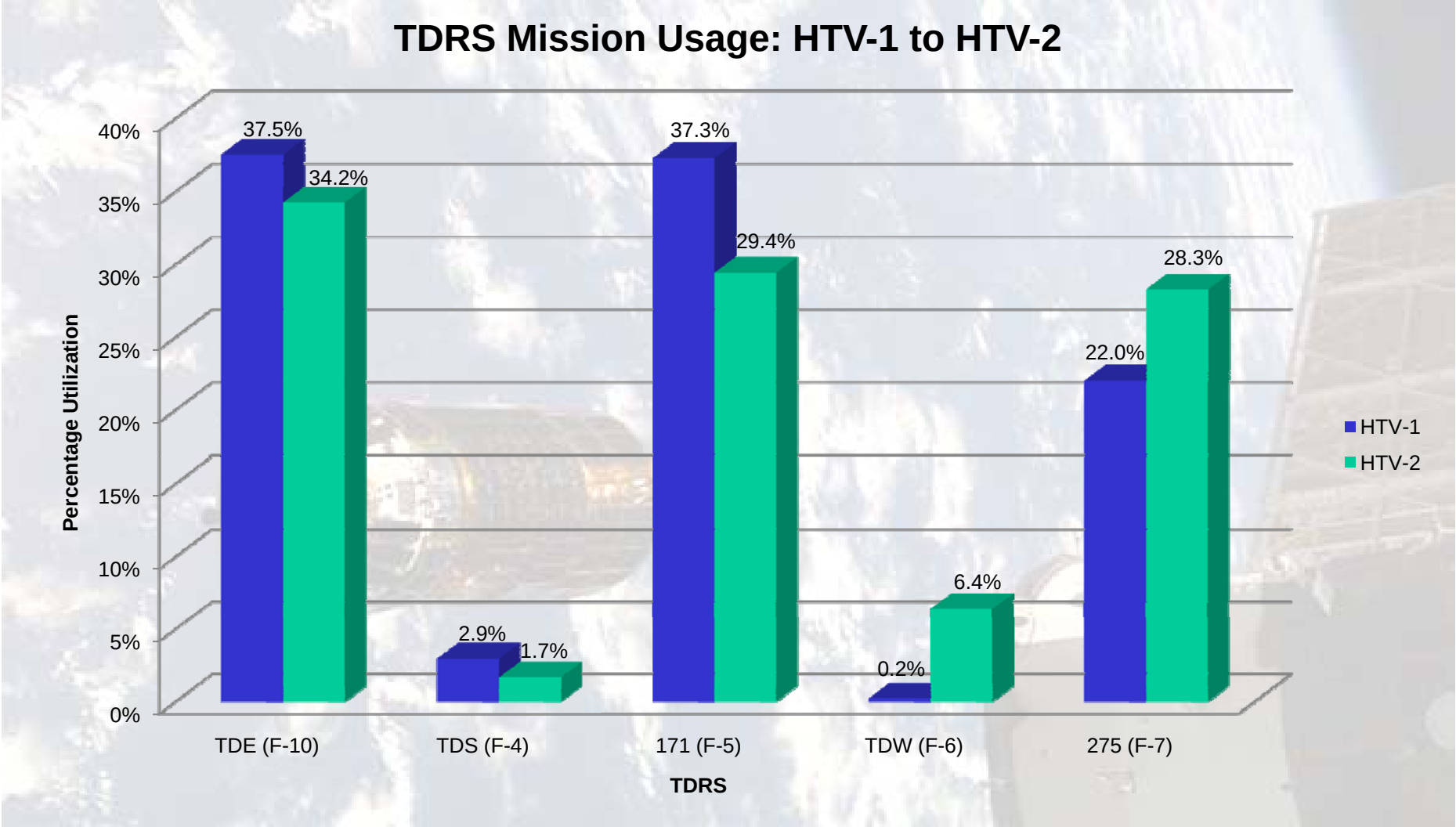
HTV-1 / HTV-2 Service Usage (cont'd)



HTV-2 TDRSS Usage



HTV-1 / HTV-2 TDRS Usage



HTV-2 TDRSS Critical Requests

	Event	GMT Start		GMT End	
		DOY	HH:MM:SS	DOY	HH:MM:SS
1	Launch/Separation	20	6:05:00	20	14:35:00
2	M1 & PM1d Maneuvers	20	14:35:00	20	16:47:00
3	MD1 Maneuver	22	9:51:00	22	11:30:00
4	MD2 Maneuver	24	3:59:00	24	5:32:00
5	PCM1 Maneuver	25	14:33:00	25	17:45:00
6	HAM1 & PM2 Maneuvers	25	20:29:00	26	0:18:00
7	MD3 Maneuver	26	9:20:00	26	11:03:00
8	PCM2 & MC1 Maneuvers	26	12:44:00	27	1:10:00
9	Rendezvous OPS	27	1:10:00	27	13:50:00
10	RGPS Evaluation	27	1:30:00	27	5:40:00
11	SSRMS Ops to support HTV	27	6:00:00	27	19:45:00
12	HTV-2 Departure	87	14:06:00	87	17:11:00
13	Super Critical - Period 1	87	14:47:34	87	14:52:34
14	Super Critical - Period 2	87	16:20:49	87	16:27:37
15	Reentry Maneuvers	88	19:44:00	88	22:42:00
16	Reentry Monitoring	89	0:14:00	89	4:49:00

WSC Requested Services

Media Hold Requests:

DOY/Time Frame	SN HOLD Number	Tape Number	Activity
254/0354Z – 0408Z 255/2113Z – 2122Z	0196 0197	925501 925601	End to End Testing
022/0517Z – 0618Z 022/0619Z – 0656Z 022/0659Z – 0712Z	0240 0241 0242 0243	1102201 1102202 1102301 1102302	Launch
027/0000Z – 1149Z	0245	1102801 (STGT) 1102802 (WSGT)	Rendezvous Operations

WSC Requested Services (cont'd)

Performance Data Request:

DOY/Time	TDRS	Activity	WSC provided
022/0522Z – 0648Z	171	Launch	01/22/11
022/0619Z – 0656Z	TDE	Launch	01/22/11
022/0659Z – 0712Z	275	Launch	01/22/11
023/0625Z – 0704Z	TDE	IOS checkout	01/28/11
023/0707Z – 0732Z	275	Transmitter switch A to B & B to A	01/28/11
027/1015Z – 1200Z	275/171/TDE	HTV-2 approach from 250m Capture point	01/29/11
055/1136Z – 1203Z	TDW	ATV-2 Docking	02/24/11
055/1210Z – 1241Z	TDE	ATV-2 Docking	02/24/11
055/1241Z – 1312Z	TDZ	ATV-2 Docking	02/24/11
055/1313Z – 1350Z	TDW	ATV-2 Docking	02/24/11

WSC Requested Services (cont'd)

Performance Data Request (cont'd):

DOY/Time	TDRS	Activity	WSC provided
057/1656Z - 1712Z	TDZ	STS-133 Docking SSA 8 kbps	02/28/11
057/1712Z - 1720Z	TDZ	STS-133 Docking MA 2 kbps	02/28/11
057/1720Z - 1735Z	TDW	STS-133 Docking SSA 8 kbps	02/28/11
057/1745Z - 1756Z	TDW	STS-133 Docking SSA 8 kbps	02/28/11
057/1756Z - 1846Z	TDE	STS-133 Docking SMA 8 kbps	02/28/11
057/1900Z - 1931Z	TDW	STS-133 Docking SSA 8 kbps	02/28/11
057/1938Z - 1951Z	TDW	STS-133 Docking MA 2 kbps	02/28/11
057/1955Z - 2006Z	TDE	STS-133 Docking SSA 8 kbps	02/28/11
057/2013Z - 2028Z	TDE	STS-133 Docking SMA 8 kbps	03/01/11

Mission Review

SN Discrepancy Reports:

CDS Number	Description	Impact/Resolution	Mission Impact	Status
60580	The low data rate of the HTV forward (250 bps) causes a buffer overflow	Local nuisance display alarm on local interface.	No	Open
60593	The low data rate of the HTV forward (250 bps) causes a buffer overflow	Local nuisance display alarm on local interface.	No	Closed
60594	A and B side ITU identification is backwards on system display	This is a non-issue as far as customer support	No	Open
60899	Late lockup on MA, MAR-1	GCMR sent for correct mode	Yes	Closed
61208	Late lockup on SMA, MAR-1, 8 kbps	SMAR-3 was automatically brought online. 1 min 58 sec data loss	Yes	Closed

FDF Requested Services

- **FDF**
  - **Provided pre-mission analysis of C-band and TDRS coverage of HTV**
  - **Provided Orbit Determination support using TDRS and/or C-band tracking data after insertion, prior to/after maneuvers, and daily during non-maneuver periods prior to berthing. FDF solution vectors were provided to HTV-CC via JSC**
  - **Provided acquisition data support to C-band sites and the Space Network. Acquisition data based on HTV vectors received from HTV-CC via JSC or on FDF orbit determination solutions**
  - **Provided TDRS vector support to the Johnson Space Center and HTV-CC**
  - **Evaluated HTV tracking data and the HTV local oscillator frequency**
  - **No problems**

Mission Review

- NIC
  - SMM console support:
    - Launch -8 hours through M1 & PM1D Maneuvers 021/2200Z - 022/1600Z
    - L-4 hours prior to Rendezvous OPS through docking 026/2110Z - 027/1400Z
    - L-2 hours prior to undocking through critical period 087/1200Z – 1730Z
    - L-2 hours prior to reentry phase through JSC release 088/1744Z
  - Provided assistance in conflict resolutions
  - No problems reported

Mission Review

- **NISN**
  - **Provided voice and data circuits**
  - **No problems reported**

Mission Review

- **C-Band Radar Support: No problems reported**

RADAR	Orbit Number	DOY/Time
KM2F	1	022/0550 - 0556Z
JDIQ	5	022/1111 - 1118Z
WLPQ	5	022/1113 - 1121Z
WLPQ	6	022/1246 -1254Z

Issues

- **Issues/Concerns Reported**

		Issue	Comment
1	Minor	HTV IOS Radio Interference- A strong signal interference on TDRS-041 (TDS)/046 (TDE) over Europe	HTV signal bandwidth is 6 MHz and HTV AGC is open to 12 MHz. Possible source was identified and being mitigated

Lessons Learned

- **End-to-End testing October 2010**
  - **GSFC NIC/SMM viable backup to JSC GCs for Visiting Vehicle testing**
    - **Network wide SNAS outage**
    - **Houston GC unable to send GCMRs**
    - **GCMRs successfully sent by SMM at GSFC via X-terminal**
    - **ODMs were monitored and reported to JSC**
    - **JS line site status for GCMR troubleshooting**
    - **Testing successfully executed**

Lessons Learned (cont'd)

- **Scheduling Launch Event**
  - **Originally schedule on launch vehicle view time – not expected AOS**
  - **Launch event needs to be a single event on AOS TDRS**
    - **Allows all prelaunch GCMR testing on launch event**
    - **Eliminated TDRS handover during powered flight**

Lessons Learned (cont'd)

- **MSFC 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 SCD was not passing data**
    - **Goddard Comm Control (GCC) confirmed data – reason unknown**
    - **Logical Port Address (LPA) for BCC command at WSC was misconfigured**
  - **BCC checkout should always be included in permission testing.**