



Space Communications Customer Forum

Space Communications Customer Forum (SCCF)

<http://scp.gsfc.nasa.gov/sccf/>

September 20, 2007

**Building 3 Goett Auditorium
NASA/Goddard Space Flight Center
Greenbelt, Maryland**

Sponsored by:

**Networks Integration Management Office, Code 450.1
(Exploration and Space Communications Projects Division, Code 450)
NASA/Goddard Space Flight Center
Greenbelt, Maryland**



AGENDA

<u>Timeline (approx.)</u>	<u>Subject / Topic</u>	<u>Speaker / Presenter</u>
1:00pm	WELCOME & INTRODUCTIONS	Allen J. Levine/GSFC
1:05pm	OPENING REMARKS	Philip E. Liebrecht/GSFC
1:20pm	ITEMS / NOTES OF INTEREST	Allen J. Levine/GSFC Scott A. Greatorex/GSFC
1:35pm	FEATURED TOPIC	
	<ul style="list-style-type: none"> • Constellation Project 	Robert J. Menrad/GSFC
1:55pm	MISSION / PROJECT UPDATES (Organizational Overviews; Current/Future Missions; Issues & Selected Items of Interest; Areas for More Work)	
	<ul style="list-style-type: none"> • GSFC Mission Model and Networks' Loading Status 	Allen J. Levine/GSFC
	<ul style="list-style-type: none"> • Space Science Mission Operations (SSMO) 	Richard D. Burns/GSFC
	<ul style="list-style-type: none"> • Earth Science Mission Operations (ESMO) 	Chris Wilkinson/GSFC
	<ul style="list-style-type: none"> • Human Space Flight (HSF) Missions 	Fred G. Pifer/HTSI
2:40pm	STATUS UPDATES (Significant activity in ESC offices and our Partners)	
	<ul style="list-style-type: none"> • NASA Integrated Services Network (NISN) 	Gerald R. Zgonc/GSFC Kathleen.M.Poole/GSFC
	<ul style="list-style-type: none"> • Space Network (SN) Project 	Keiji K. Tasaki/GSFC Jon Z. Walker/GSFC
	<ul style="list-style-type: none"> • Deep Space Network (DSN) 	Eugene S. Burke/JPL
	<ul style="list-style-type: none"> • Ground Network (GN) Project 	John T. Jackson/GSFC
	<ul style="list-style-type: none"> • Flight Dynamics Facility (FDF) 	Susan L. Hoge/GSFC
	<ul style="list-style-type: none"> • Space Communications and Navigation Systems Constellation Integration Project (SCIP) 	John J. Hudiburg/GSFC
4:20pm	OPEN FLOOR	Allen J. Levine/GSFC
4:30pm	CLOSING REMARKS	Allen J. Levine/GSFC



Space Communications Customer Forum

Welcome & Introductions

Allen J. Levine
Service Planning Manager
Networks Integration Management Office/Code 450.1
NASA/Goddard Space Flight Center



Space Communications Customer Forum

Opening Remarks

Philip E. Liebrecht
Deputy Associate Director
Explorations and Space Communications Projects Division/Code 450
NASA/Goddard Space Flight Center



Space Communications Customer Forum

Items/Notes of Interest

Allen J. Levine
Service Planning Manager
Networks Integration Management Office/Code 450.1
NASA/Goddard Space Flight Center

Scott A. Greatorex
Chief
Networks Integration Management Office/Code 450.1
NASA/Goddard Space Flight Center



Space Communications Customer Forum

Sample Network Advisory Message (NAM) for ELV Launches

The purpose of this NAM is to inform all Space Network users/projects that back-up launch days for SN supported payload and ELV launches will no longer be scheduled during the Forecast timeframe. This will require Realtime re-scheduling of launch resources in the event of a launch slip, but will provide more efficient utilization of TDRSS resources during nominal launches. Customers should be prepared for possible schedule changes or deletes during the re-scheduling of a launch slip and should avoid planning critical activities during the back-up launch day timeframe.

**THE JAXA H-IIA LAUNCH IS SCHEDULED ON SEPTEMBER 14 2007 DOY
257/012101-022803Z WITH THE FOLLOWING TDRSS EVENTS SCHEDULED:**

PRIME (DOY 257:

257/012101-021241Z F0067LS TDRS-171

257/020329-022803Z F0067LS TDRS-SPARE

**THE B/U LAUNCH ON SEPTEMBER 15, 2007, DOY 258/011651-222353Z, WILL NOT BE SCHEDULED
UNLESS THE PRIME LAUNCH WINDOW SLIPS 24 HOURS:**

BACKUP (DOY 258):

258/011651-020000Z F0067LS TDRS-171

258/015919-022353Z F0067LS TDRS-SPARE

In the event of a launch slip, the back-up events listed above will be coordinated with the conflicting customers as soon as possible.



Near-Earth Communications Networks Integration Customer Satisfaction Questionnaire

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"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Overall, how would you rate your satisfaction with our customer service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<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: _____

Return to Mr. Scott Greatorex, Chief, Networks Integration Management Office (NIMO), Code 450.1, Bldg. 12. For more information or to discuss any of your feedback, please contact Mr. Greatorex at (301) 286-6354 or at Scott.A.Greatorex@nasa.gov

450.1-FORM-0002 (07/07)



Near-Earth Communications Networks Services Customer Satisfaction Questionnaire

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

Mission Name _____ Your Name (optional) _____ Project Role/Title (optional) _____

How satisfied are you ...	VERY SATISFIED	SOMEWHAT SATISFIED	NEITHER SATISFIED NOR DISSATISFIED	SOMEWHAT DISSATISFIED	VERY DISSATISFIED	NOT APPLICABLE/ UNABLE TO ANSWER
1. With the overall ease of scheduling our networks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. With the availability of our networks services?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. With ongoing mission operations support?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. With our integrated networks services capabilities (e.g., bandwidth, antenna selection, voice loops, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. With our data services (e.g., routing, security, reports, recording/playback, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. With the quality and attention given to assisting you with resolution of technical issues ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. That you have received a good value for our services?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Would you recommend our services to another project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Overall, how well have we fulfilled agreed-upon networks services ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please use the space below to provide comments. Please provide details relating to your experience with networks services, 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: _____

Return this form to Mr. Scott Greatorex, Chief Networks Integration Management Office (NIMO), Code 450.1, Bldg. 12. For more information or to discuss any of your feedback, please contact Mr. Greatorex at (301) 286-6354 or at Scott.A.Greatorex@nasa.gov

450.1-FORM-0003 (07/07)



***Briefing to the
16th Space Communications
Customer Forum***

Exploration Systems Projects

**Bob Menrad
NASA Goddard Space Flight Center
September 20, 2007**



Table of Contents

- ▶ Overview
 - Goddard Space Flight Center
 - Exploration Systems Projects
- ▶ Goddard Space Flight Center Activities on Constellation
- ▶ Conclusion



In 1959, Goddard Space Flight Center (GSFC) was established as NASA's first space flight center

- ▶ The center is named after Dr. Robert Hutchings Goddard, widely considered the father of modern rocketry.
- ▶ In 1960, TIROS I, the first weather observation satellite was launched, beginning a long tradition of earth science satellites at Goddard.
- ▶ Goddard has a legacy of responsibility for unmanned spacecraft and sounding rocket experiments in basic applied research:
 - Operated the worldwide Space Tracking and Data Acquisition Network (STADAN)
 - Managed development and launch of the Thor-Delta launch vehicle
 - Led the communications and tracking for all NASA's human vehicles (from Mercury on) including tracking the Apollo astronauts to, on and from the moon and accomplished this in partnership with the JPL (70 meter) and other (such as Parks observatory) network providers
- ▶ The nearby Wallops Flight Facility was consolidated with Goddard in 1982, and quickly became the primary facility for suborbital programs.
- ▶ Today, Goddard is the largest combined organization of scientists and engineers dedicated to increasing knowledge of the Earth, the Solar System, and the Universe via observations from space in the United States.

GSFC Mission

The mission of the Goddard Space Flight Center is to expand knowledge of the Earth and its environment, the solar system and the universe through observations from space.

Source: NASA History Division: <http://history.nasa.gov>



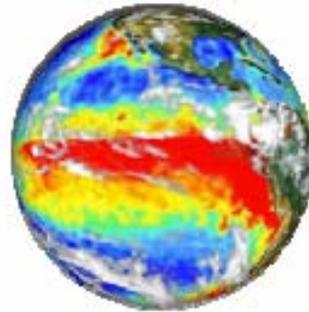
Goddard's traditional portfolio consisted of a variety of projects in support of three areas



**Human
Spaceflight &
Communications**

Example Projects:

- HST Servicing
- NIMO, SCIP
- SN, GN, TDRSS
- Hitchhiker



**Earth
Science**

Example Projects:

- Terra, Aqua & Aura
- TOMS
- UARS
- EOSDIS



**Space
Science**

Example Projects:

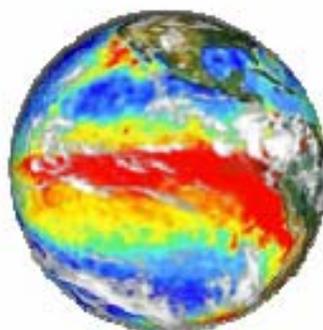
- JWST
- STEREO
- HST
- COBE
- Lunar Surveyor



Goddard has expanded its portfolio to include a fourth element focused on Exploration Systems



Human
Spaceflight &
Communications



Earth
Science



Space
Science

New Focus for Center



Exploration
Systems

Example Projects:

- Architecture System Engineering
- Constellation Program
 - SE&I, SR&QA
 - Orion, Mission OPS
- Commercial Crew and Cargo Program Office



Overview

Exploration Systems Projects (ESP)



Goddard has responded to the nationwide call to implement the President's Vision for Space Exploration

Jan 2004

The President directed NASA to embark on a robust space exploration program.

"This will be a great and unifying mission for NASA"
President George W. Bush



Aug 2004

NASA established the Exploration Systems Mission Directorate (ESMD).

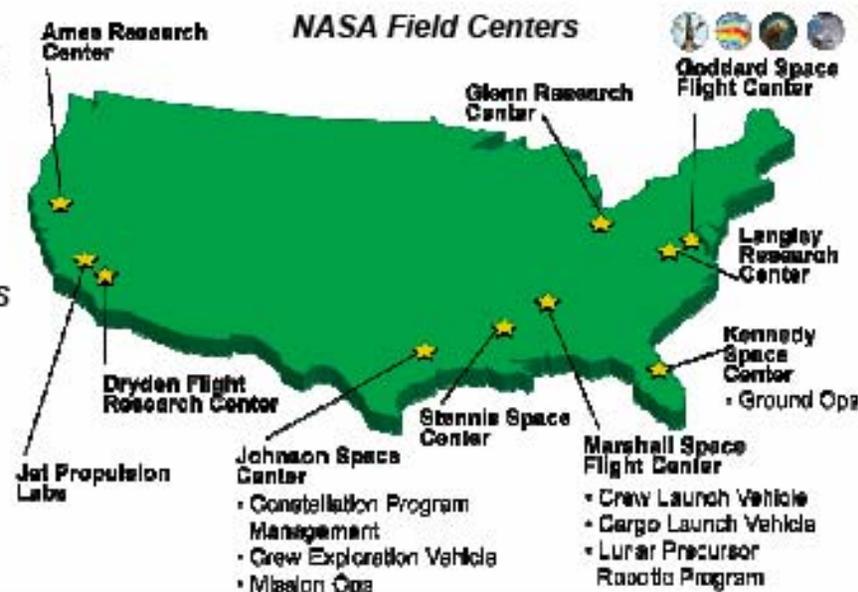
Feb 2006

NASA Administrator Griffin called for "Ten Healthy Centers".

"NASA's civil servants and all NASA field Centers are critical to accomplishment of the Vision."
NASA Administrator Michael Griffin

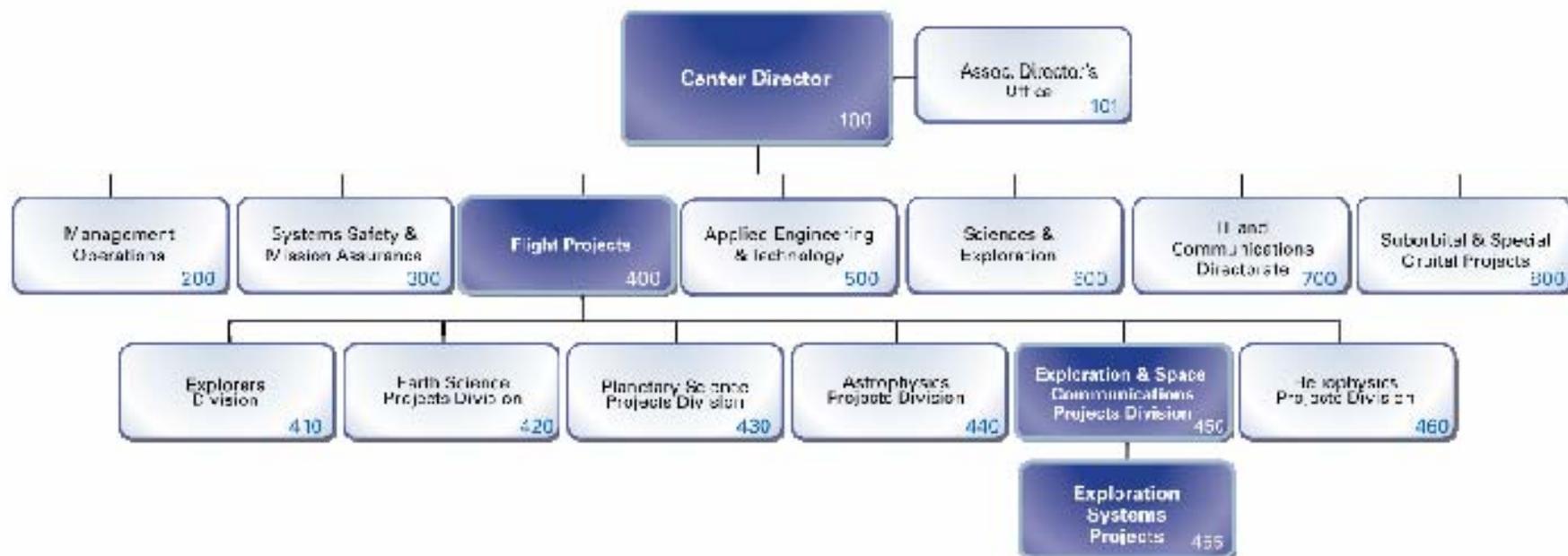
April 2006

Goddard has expanded its portfolio to achieve the nationwide Vision for Exploration.





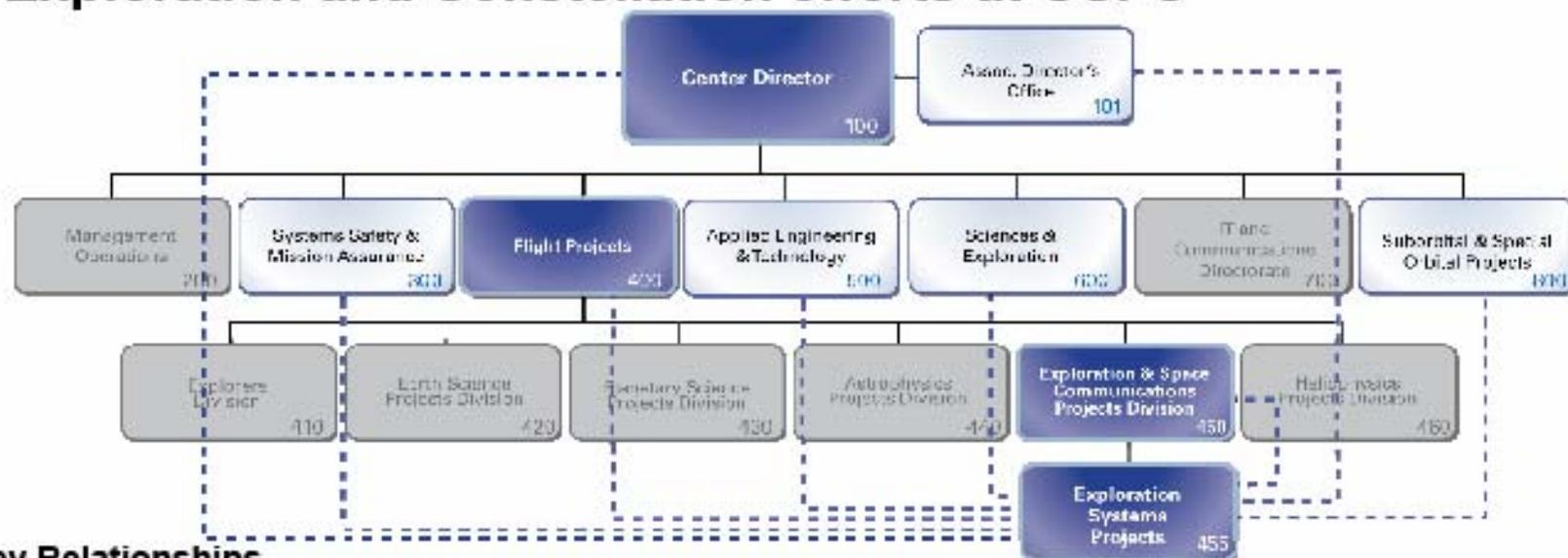
Goddard Space Flight Center is comprised of a system of Directorates



* This presentation represents the planned 455 organization



ESP engages with Center stakeholders to plan and implement Exploration and Constellation efforts at GSFC



Key Relationships

▶ 100 –GSFC Strategic Planning and Direction –Strategic Investments (IRAD) –New Opportunities Office	▶ 300 –System Safety and Mission Assurance	▶ 450 –Management Function and Cross Mission Directorate Integration	▶ 600 –Exploration Objectives Development and Science Integration
	▶ 400 –Programmatics and Management Oversight	▶ 500 –Systems Engineering and Discipline Engineering	▶ 800 –Constellation Flight Hardware Manufacturing and Engineering



Our blend of experience today enables us to contribute to solving the challenges of tomorrow leading to the success of all

ESP Workforce
Core Competencies



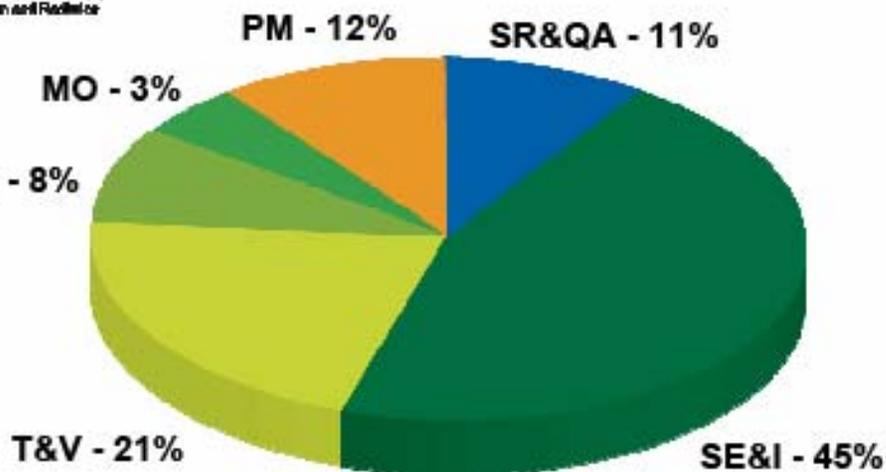
- ▶ We started with a few staff supporting the Constellation efforts and have continued to grow to nearly 50 engineers and scientists providing significant impact and contributions to key project development efforts.
- ▶ Our workforce is recognized for our core competencies in **Project Management, Engineering, Mission Assurance**, and for providing quality services in achieving our Vision. This dedication is rooted in our commitments to uphold NASA's values and ensure technical excellence in all that we do.
- ▶ This is just the start; and as a team, we are enabling Goddard's participation in the Vision of Space Exploration.



Starting with a small team, we have grown to a workforce of over fifty professionals, supporting six areas within Constellation

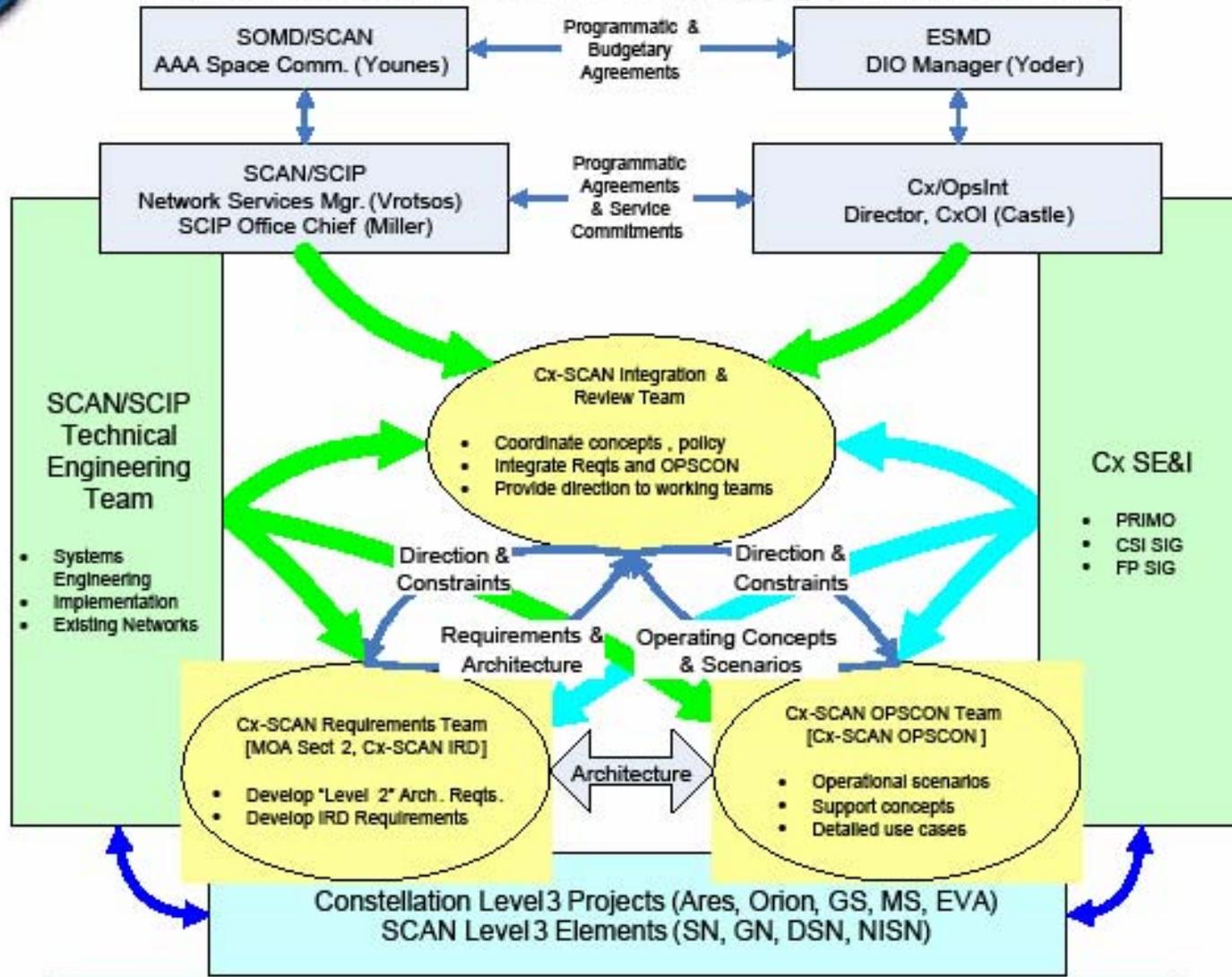


ESP Workforce Distribution
Constellation Program
Level II/III, May 2007





Notional CxP-SCAN Working Relationship





Overview

Goddard Space Flight Center activities on Constellation

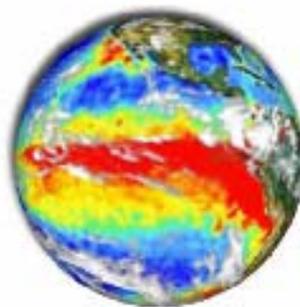


Goddard Space Flight Center's portfolio consists of a variety of projects in support of four areas

**Human
Spaceflight &
Communications**



**Earth
Science**



**Space
Science**

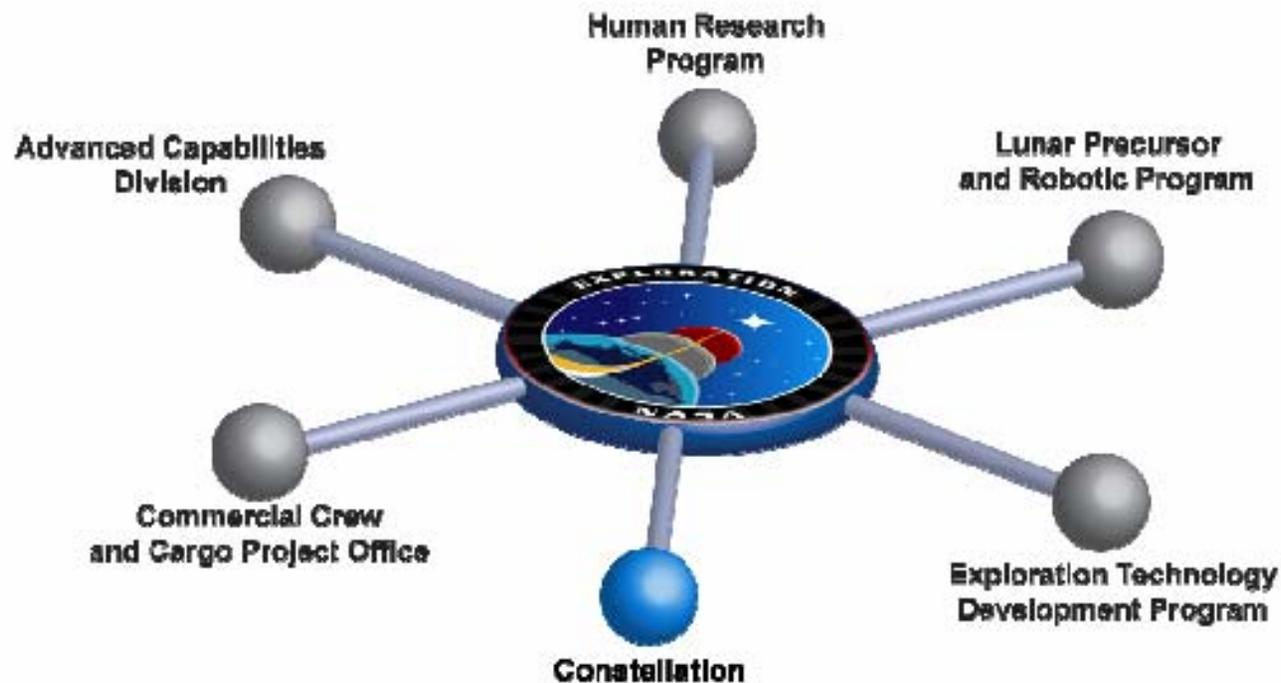


**Exploration
Systems**





GSFC supports the majority of divisions within ESMD



Today, we will focus the remainder of our conversation on our efforts within the Constellation Program



GSFC is a member of the Constellation Program's "nationwide" team implementing the Vision for Exploration



Allocation of work as of April 2007



GSFC brings its own set of unique set of core competencies and resources/capabilities to the nationwide team



- ▶ “Cradle to grave” engineering expertise
- ▶ Systems engineering, fabrication, integration, operations and mission safety
- ▶ Our facilities in Greenbelt, MD and Wallops Island, VA support all phases of mission engineering including design, production, fabrication, test and verification (spanning vibration, acoustics, EMI/EMC and thermal vacuum capabilities)
- ▶ Mission Operations Center provide user communities access to payload data during on-orbit operations



GSFC's "baseline" activities within Constellation include Systems Engineering and Integration and Communications



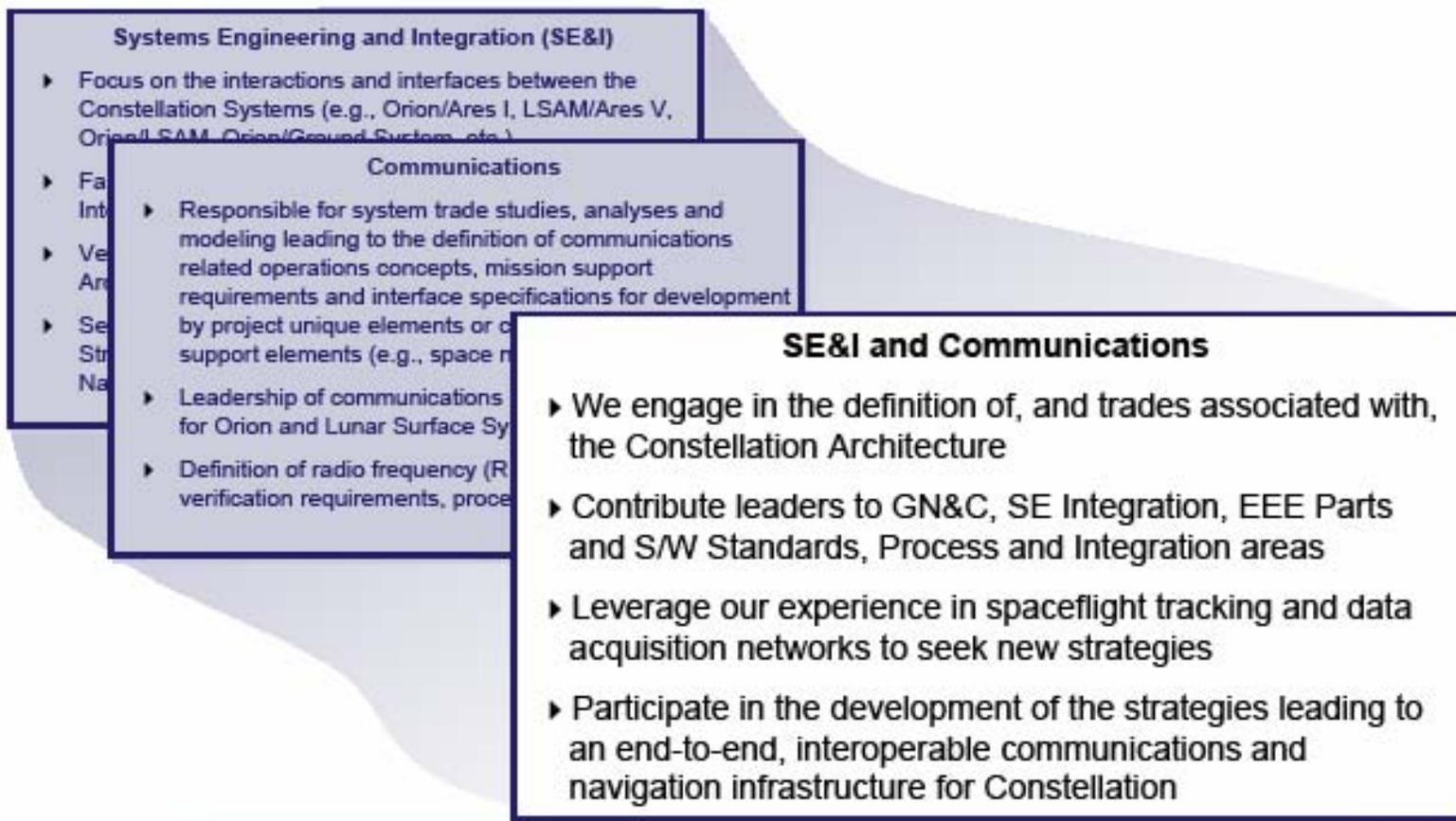
Goddard Space Flight Center

"Baseline" Activities

- Systems Engineering and Integration (SE&I)
- Communications



Goddard is recognized for its involvement in SE&I and Communications for Constellation





GSFC's "baseline" activities within Constellation are just a portion of the total contributions being made



Goddard Space Flight Center

"Baseline" Activities

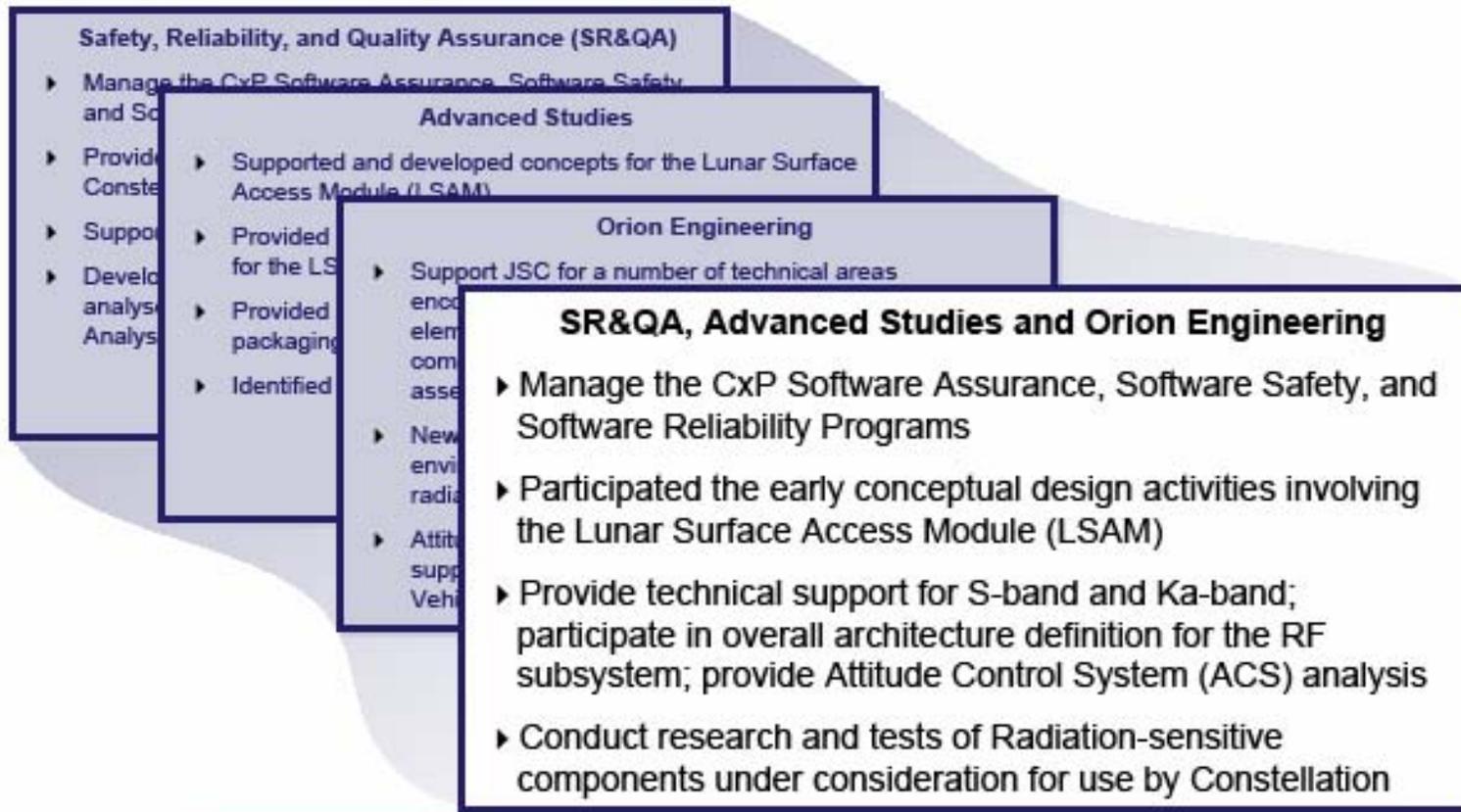
- Systems Engineering and Integration (SE&I)
- Communications

Expanded Participation

- Safety Reliability & Quality Assurance (SR&QA)
- Advanced Studies
- Orion Engineering
- Mission Operations
- Low Impact Docking System (LIDS)
- Manufacturing
- Exploration Navigation
- Distributed System of Integrated Labs
- Communications Adaptor Set (DSILCAS)

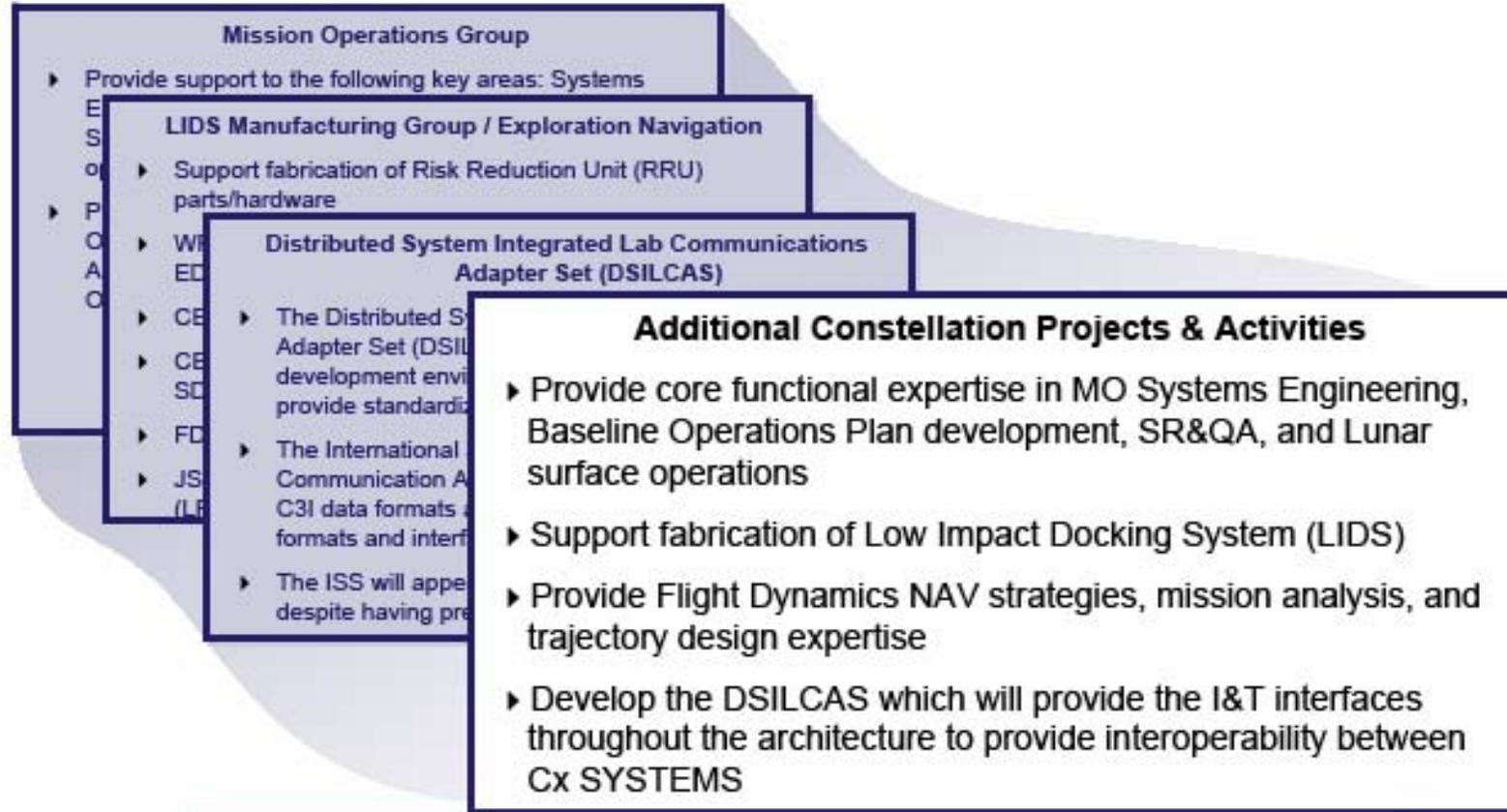


Goddard participates in Constellation activities above the “baseline” including SR&QA, Advanced Studies and Orion Engineering





Additionally, Goddard is integrated into Mission Operations, LIDS Manufacturing, Exploration Navigation and I&T strategies





We're identifying intersections between ESMD, SOMD and SMD to leverage similar activities and enable new partnerships



We constantly seek to use the Mission validated experience from one activity to the betterment of the others



GSFC's experience and capabilities align well with the needs of Constellation newest projects

Lunar Surface Systems

Lunar Lander Summary

- General**
 - Support Element (SE) provides a few types of data over the link to the SE (B&K)
 - Not compatible with existing Space Data Protocol (SDP) standards
- Bands and Rates**
 - Bandwidth for voice and telemetry
 - Nominal Rates of 24Mbps, 10Mbps and 1Mbps
 - Asynchronous to Earth for high rate telemetry and data
 - Nominally 150 Mbps to Earth, 25 Mbps from Earth
 - Continuous communications of 24 kbps in any attitude at any range
- Links**
 - Earth Direct to Earth (E2E) and Lunar relay satellite
 - Either "best path" or "store and forward" modes
 - CEV Direct Communications
 - Not an Compatibility with CEV Communications System
 - Lunar Surface**
 - Communications with users on the EVA and provide relay to Earth
 - Provide "Stay-Station" Communications for Descent
 - W-7 (IEEE 802.16) Protocol for Lunar Surface Ops

Recent New Additions

- ▶ GSFC has been invited to join the Lunar Surface Systems (LSS) Project
- ▶ For LSS we will lead the Comm./NAV discipline engineering activity
- ▶ GSFC has been invited to join the Lunar Surface Access Module (LSAM) Project
- ▶ On LSAM we will be joining the avionics discipline engineering activity



GSFC is channeling its existing technical initiatives to facilitate new collaborative approaches for addressing near term challenges to Cx

Cryogenic Propellant Storage Executive Summary

Lightweight Composite Structures Cargo Offload

Avionics C&DH - Approach

Decision Systems

GSFC Strengths Align to CxP needs

- ▶ **Cryogenic Propellant Storage:** Smaller-scale, long-duration on-orbit experience
- ▶ **Lightweight Composite Structures:** S/C composites, large-scale expertise
- ▶ **Avionics:** Digital and RF comm., C&DH, software; Spacecraft avionics, s/c autonomous ops.; Spacecraft health monitoring
- ▶ **Decision Systems:** Science data fusion and decision support



GSFC is preparing for future challenges by integrating Exploration into our Internal Research and Development (IRAD) process

GSFC's Exploration Investments 2007

- Dust Characterization & Mitigation
 - Lunar, Earth-orbit, and Ejecta Environment density, solubility, plasma, dust effects
 - Large-Depth-Of-Field Particle Image Velocimetry (large dust flux characterization)
 - Dusty Environments: ENVIRO Particles (DEEP) test chamber
 - SPARCIE (electrostatic sensor)
 - Dust Mitigation Vehicle (DMV) (compactized solar energy to self-sterilize)
 - Ultra-Cleaning (for satellite instruments, etc.) (space dust)
- Integrated Lunar Information Architecture for Decision Support (ILIADS)
 - Lunar Geographical Information Systems (GIS) for engineering analysis
 - Orbit-propulsion storage
 - Ability to store liquid hydrazine to power in space without additional loss
- Autonomous Rendezvous & Docking
 - Autonomous rendezvous for lunar & lunar orbit
 - Autonomous rendezvous, camera, high resolution
 - Autonomous rendezvous
 - Autonomous rendezvous
- Water, Hydrogen, Oxygen Per



Lunar & Planetary

- If your targeted future is to "Exploration"
- If your targeted future is to "LSSO", propose to "LSSO"
- Dust
 - Dust mitigation probably goes to Exploration; dust property characterization probably goes to Lunar & Planetary; dust effect characterization probably goes to Exploration
 - Dust "program" will be developed & managed across all programs
 - Use your judgment or ask us, and we will re-bin if needed

Exploration Technology Development Program (ETDP) Summary

- Structures, Materials & Mechanisms (LARC)
- Thermal Protection Systems (ARC, LARC, JSC)
 - Adaptive Thermal Protection for CEV & Dust Mitigation
- Non-toxic Propulsion (ARC, WSPF)
 - Green Propulsion & Cryogenic Fluid Management
- Energy Storage & Power Systems (LARC)
- Thermal Control for Surface Systems (JSC, GRC)
- Avionics & Software (ARC, LARC, JPL, JSC, WSPF)
 - High-Rate & Low-Power Electronics, Integrated System Health, Reliability Software, Auto-Feasible
- Environmental Monitoring & Control (ARC, GRC, GSC)
- Life Support (JSC, LPL, ARC)
- Logistics Assessment (LARC)

► The Center has now added an Exploration "Line of Business"

► We have infused CxP needs into the selection process

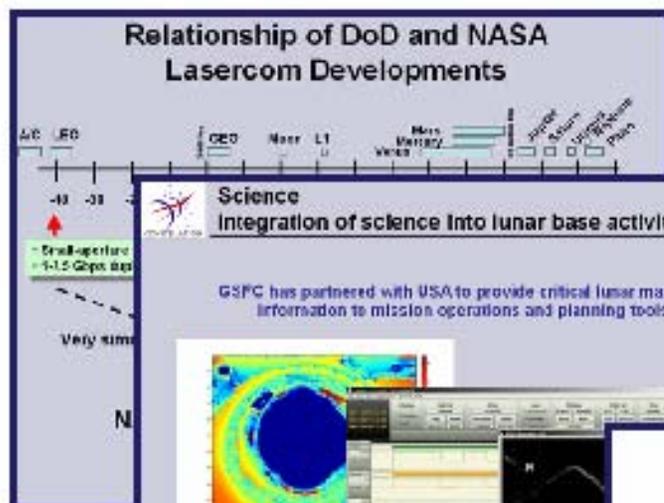
► The results of today's activities focusing on ESMD, SMD and SOMD will be available for all tomorrow

Selection Criteria

- potential follow-on funding.
- Near-term focus will be the primary selection criterion. We will carve out a portion of the funding for long-term, high-impact.
- We encourage you to talk to us early for guidance.



We are seeking collaborative opportunities in cross-cutting areas such as laser-based communications and cutting-edge science



Science
Integration of science into lunar base activities

GSFC has partnered with USA to provide critical lunar mapping information to mission operations and planning tools

Very sim

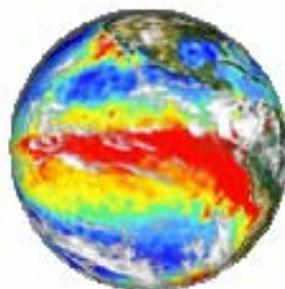
N

- Cross-Cutting Capabilities**
- ▶ Developments in laser-based comm systems and techniques are bringing break-through performance increases within reach
 - ▶ GSFC's distinguished Science discipline expertise, world-class staff, and computational capabilities provide an opportunity to collaborate/lead the science discovery for a lunar outpost and future phases of Exploration

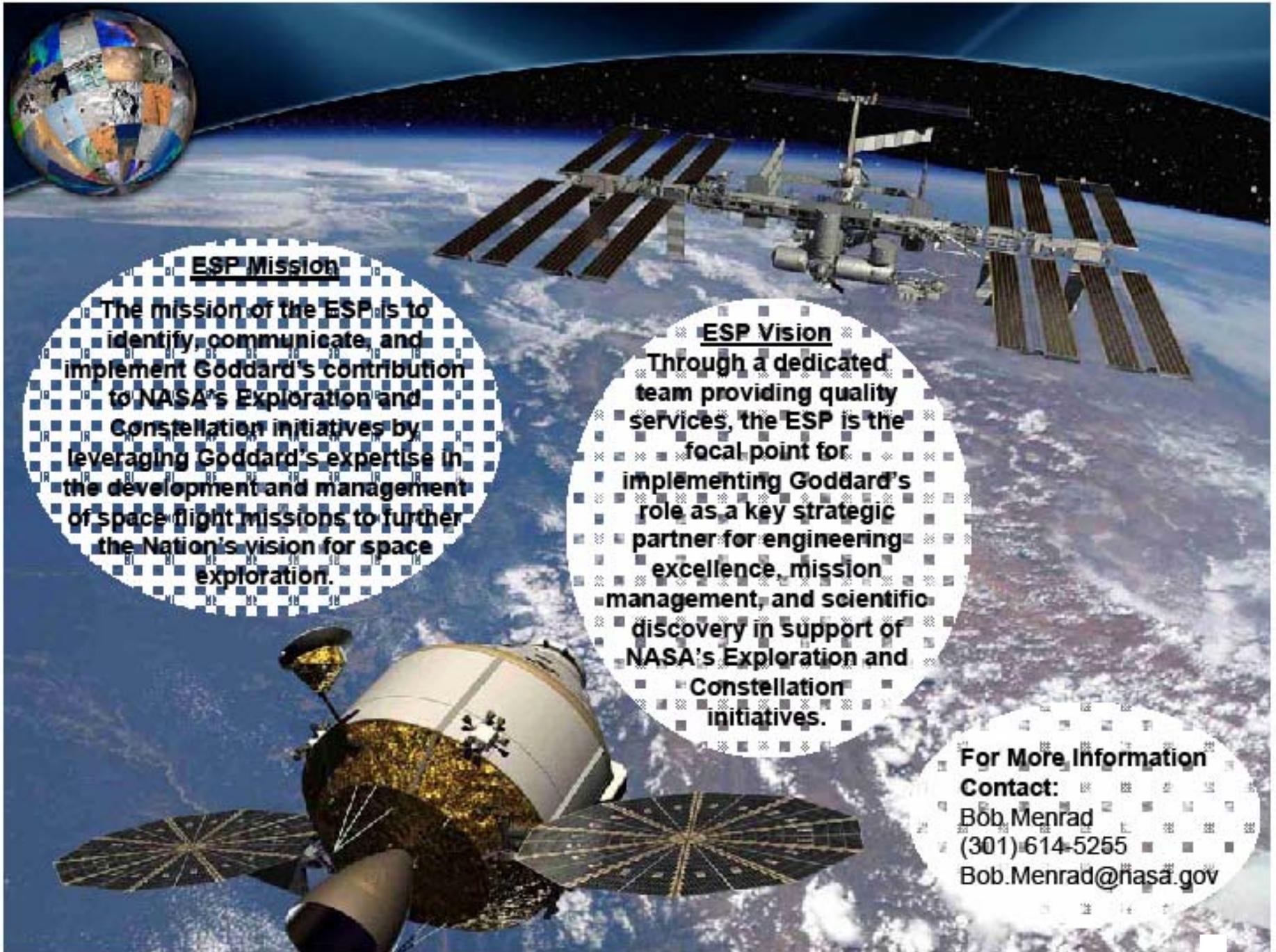


This is just the beginning...

- ▶ Through our collective efforts, we are working hard to ensure that Goddard is a key strategic partner in achieving the goals of ESMD and the Constellation Program.
- ▶ We have a balanced approach to find matches between the needs of Constellation and the remainder of the Center-wide portfolio.
- ▶ We will continue to utilize our strategically-aligned and repeatable processes as the environment changes, enabling us to achieve our near-, mid- and long-term commitments.
- ▶ Our efforts help ensure that the Goddard Space Flight Center remains a healthy and vibrant member of the NASA family.



As we advance our understanding of the Moon, Mars and beyond, our workforce celebrates their involvement on one of NASA's most vital programs.



ESP Mission

The mission of the ESP is to identify, communicate, and implement Goddard's contribution to NASA's Exploration and Constellation initiatives by leveraging Goddard's expertise in the development and management of space flight missions to further the Nation's vision for space exploration.

ESP Vision

Through a dedicated team providing quality services, the ESP is the focal point for implementing Goddard's role as a key strategic partner for engineering excellence, mission management, and scientific discovery in support of NASA's Exploration and Constellation initiatives.

For More Information

Contact:
Bob Menrad
(301) 614-5255
Bob.Menrad@nasa.gov



GSFC Mission Model and Networks' Loading Status

Allen J. Levine
Service Planning Manager
NIMO/Code 450.1
NASA/Goddard Space Flight Center



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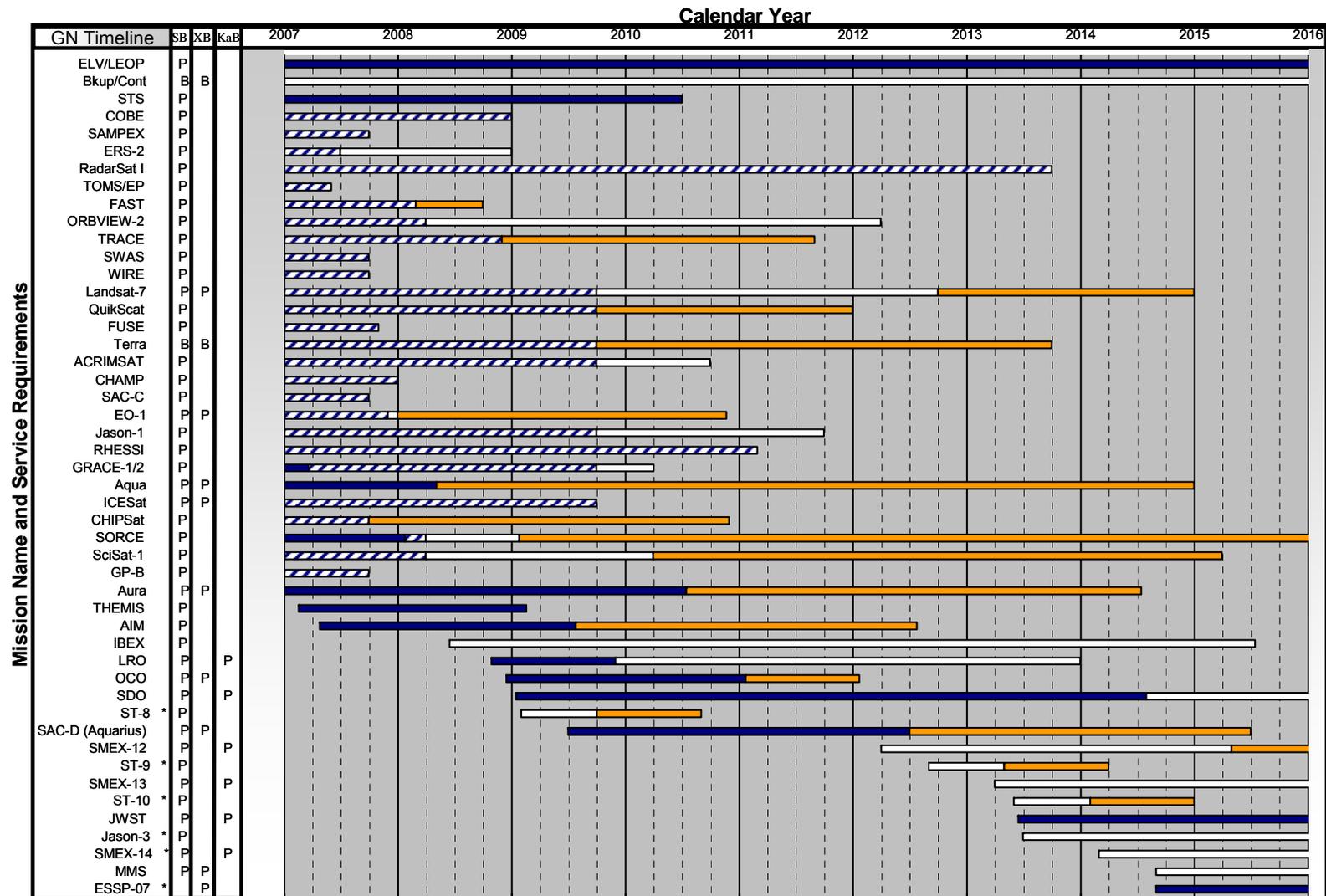
GSFC Mission Model

- **GSFC Mission Model is derived from the Space Communications Mission Model (SCMM)**
 - **SCMM is maintained and updated weekly by working group, composed of NASA HQ's, GSFC & JPL members, that support the NASA Requirements Working Group and HQ's Code SOMD**
 - All approved missions, NASA (including cooperative: international , commercial, or other agency) or non-NASA (reimbursable: international , commercial, or other agency), spacecraft or non-spacecraft (balloons, crewed or uncrewed aircraft, sounding rockets, ground-based terminals, etc.), supported by resources managed by SCan
 - All approved NASA spacecraft missions, even if not supported by SCan resources
 - Planned missions from formal planning documents
 - Predicted missions based on historical trends
 - **GSFC Mission Model is a subset of the SCMM; filtered to include only SN & GN supporting missions**



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Ground Network Mission Set



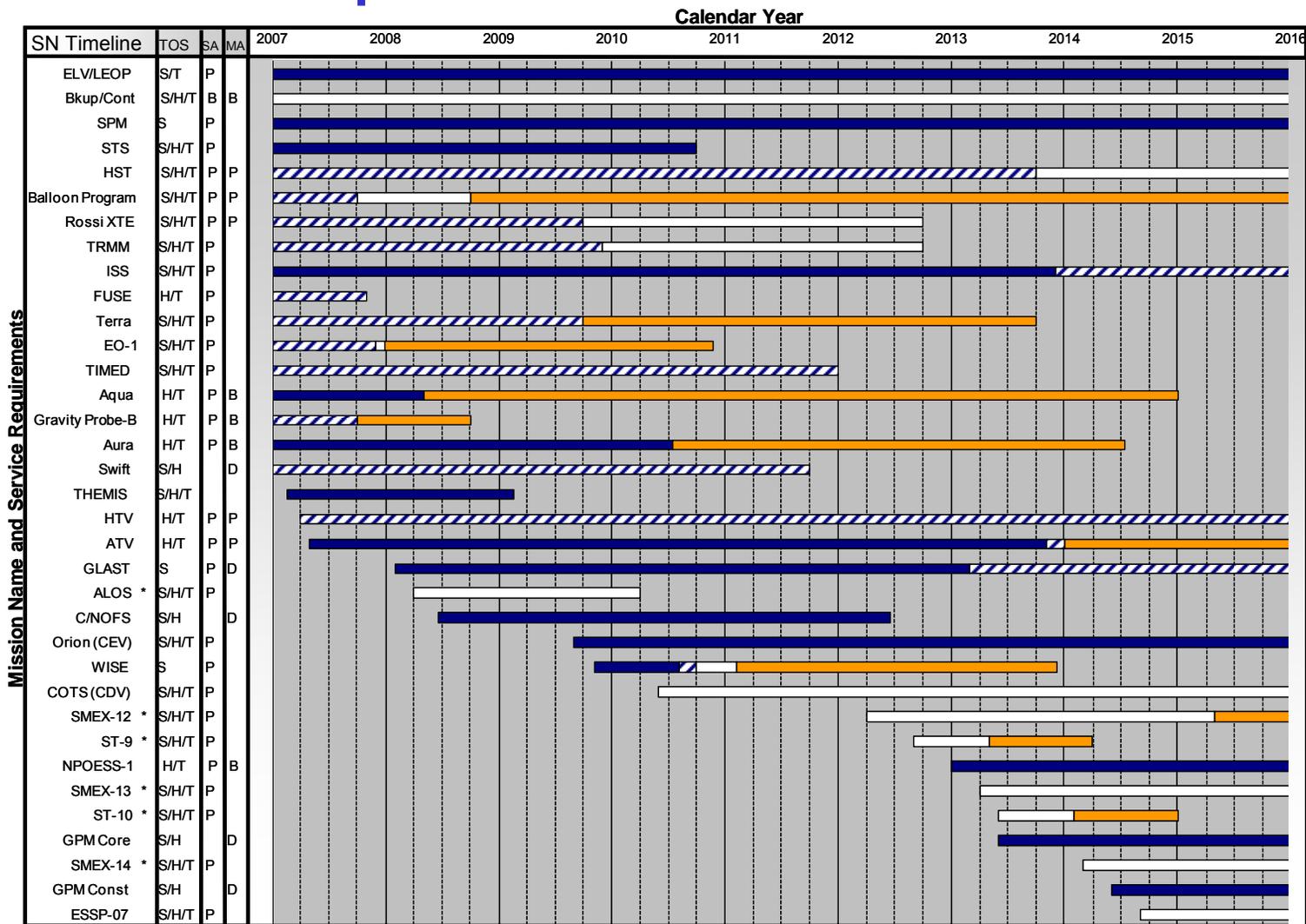
P = Prime Support, B = Backup Support, * = Not in Approved GSFC Mission Set
 SB = S-Band, XB = X-Band, KaB = Ka-Band

■ Committed □ Extended □ Potential ■ Estimated



Space Communications Customer Forum

Space Network Mission Set



P = Prime Support, B = Backup Support, D = DAS; * = Not in Approved GSFC Mission Set
 TOS = Type of Service: S = Science, H = Housekeeping, T = Tracking

■ Committed ▨ Extended □ Potential ■ Estimated



Space Communications Customer Forum

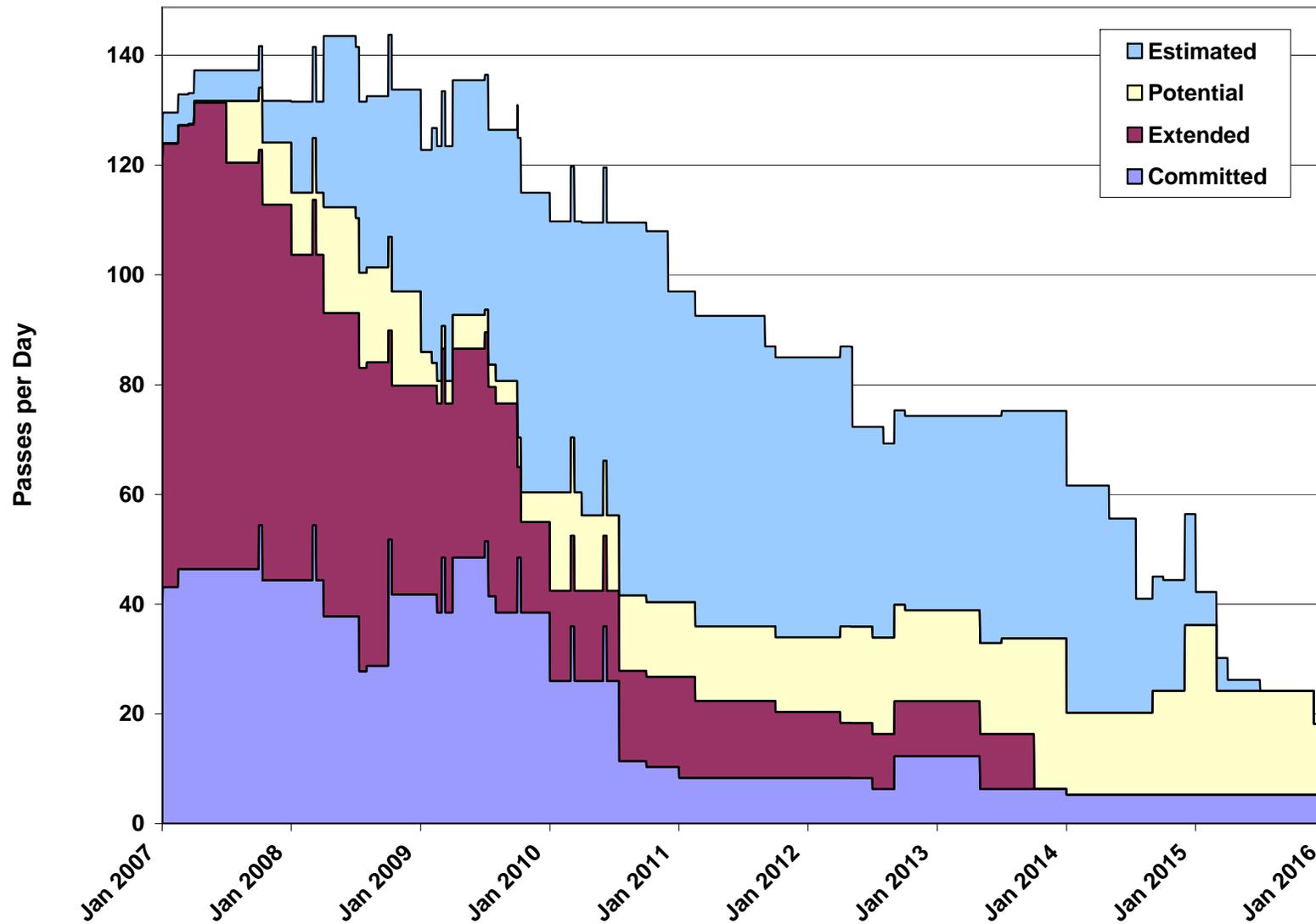
GSFC Networks Loading

- **Networks loading is performed on the GN and SN with customer sets populated by the appropriate mission model**
 - Loading models assume the GN and SN Project's defined architecture and planned modifications
 - Analysis is at least 8 years into the future
 - Output is workload trending and determination of the capability to service the entire customer community, and to pinpoint shortfalls
 - Product is designed for use by the GN and SN projects in their planning and budget cycle
 - These analyses serve as the baseline for performing new mission requirements feasibility and commitment analyses



Space Communications Customer Forum

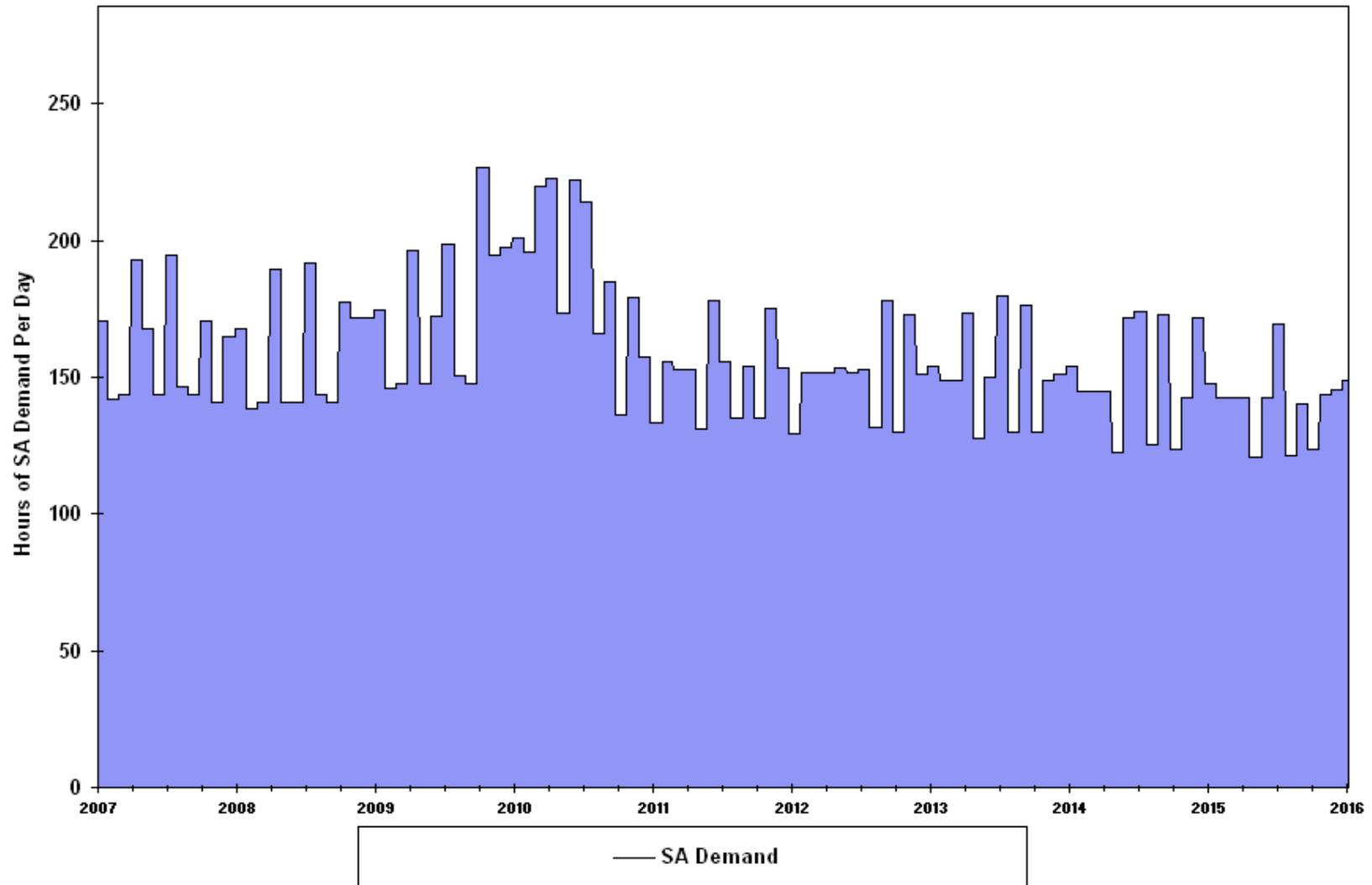
Ground Network Loading





Space Communications Customer Forum

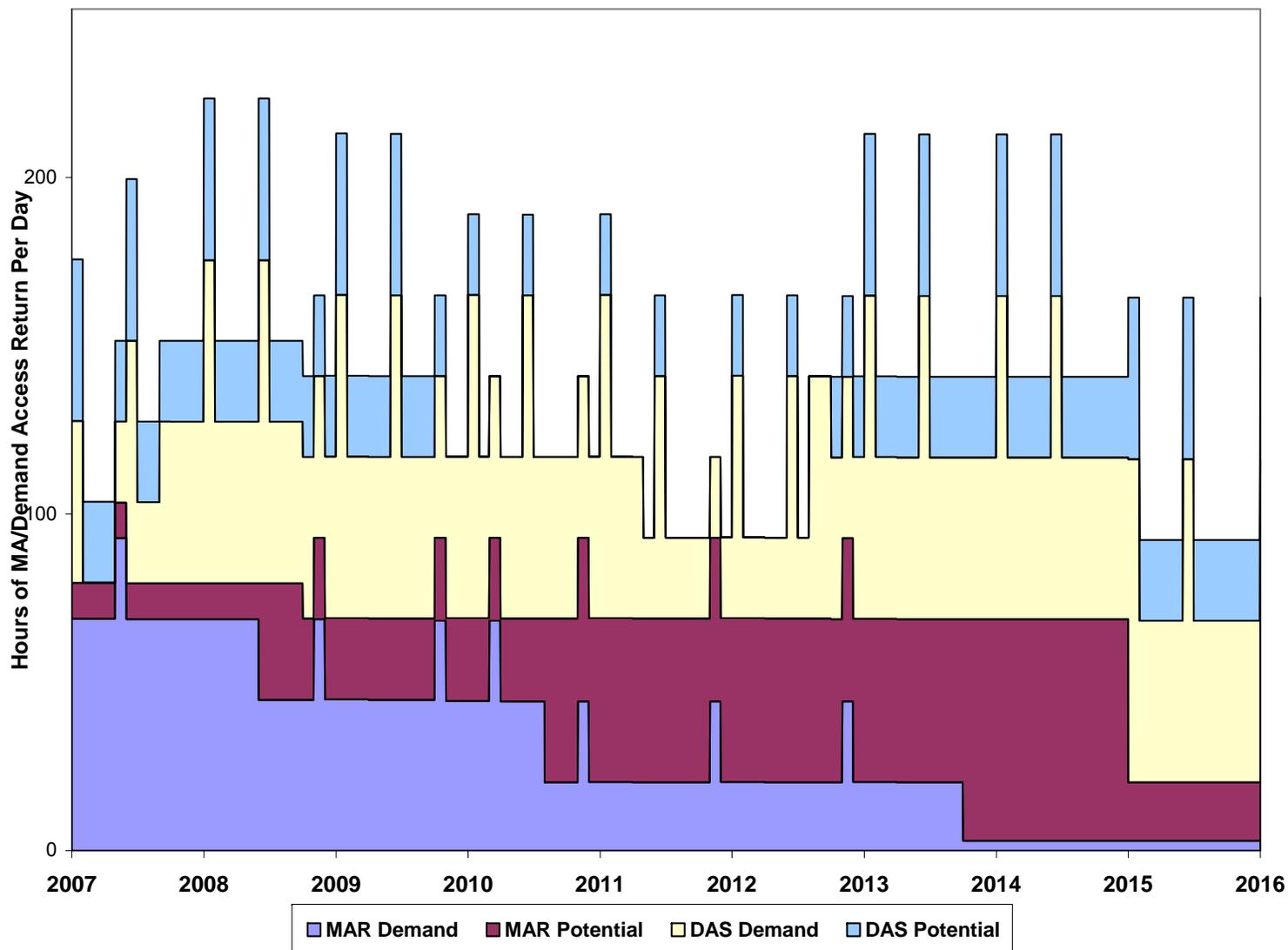
Space Network Single Access Loading





Space Communications Customer Forum

Space Network Multiple/Demand Access Loading





Space Communications Customer Forum



Space Science Mission Operations Project (Code 444)

Patrick Crouse

Project Manager

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Deputy Project Manager

Barbara Vargo

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Senior Project Scientist

September 20, 2007



SSMO TOPICS

- **Mission Set Activities**
 - **COMINGS**
 - **AIM, THEMIS**
 - **GOINGS**
 - **FUSE, IMP-8, Polar**
 - **SPECIAL CIRCUMSTANCES**
 - **IMAGE, SAMPEX, WIRE, SWAS, CHIPS**
- **Senior Science Review**
- **Upcoming Launches**

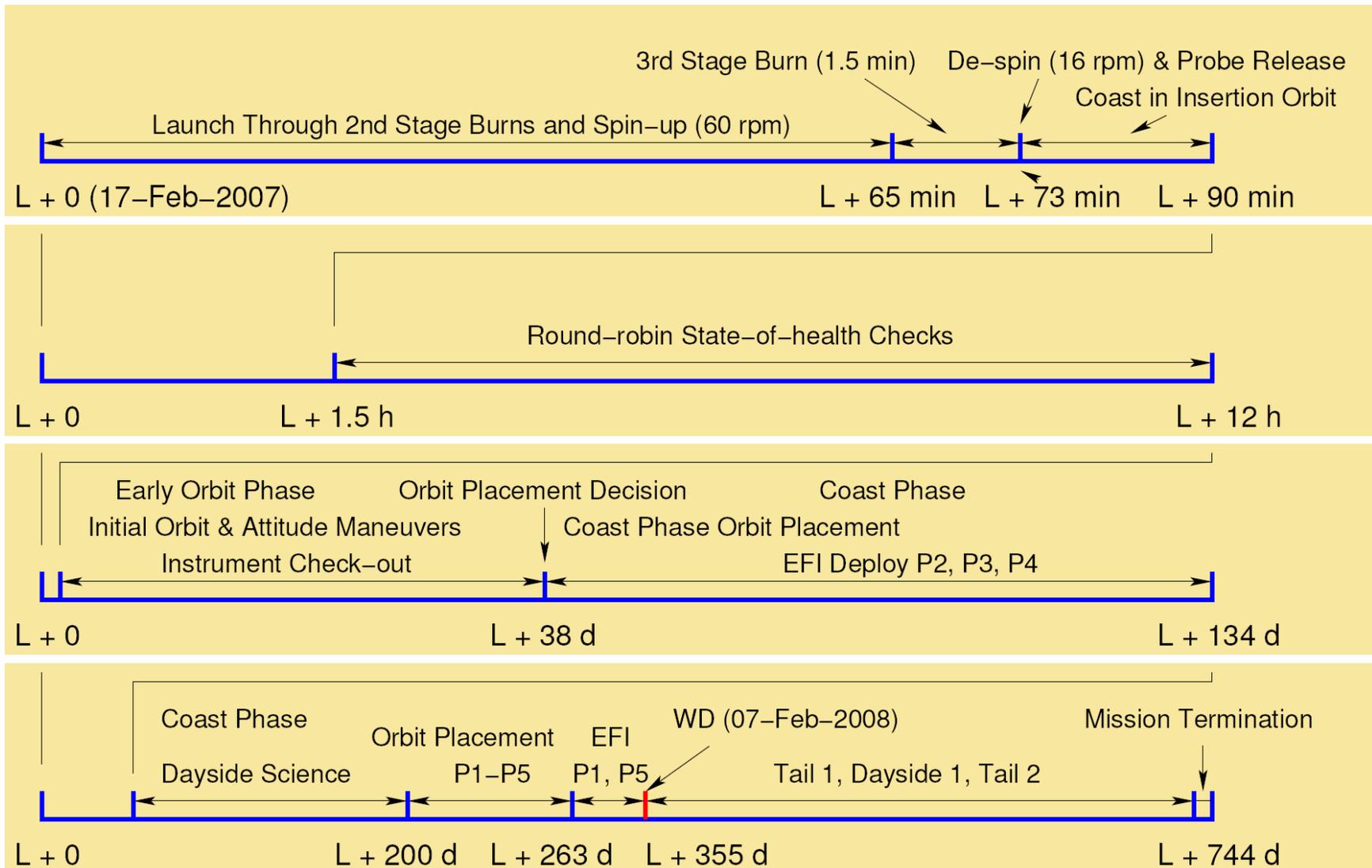


Comings

- **Time History of Events and Macroscale Interactions during Substorms (THEMIS)**
 - THEMIS consists of five small satellites which carry identical suites of electric, magnetic, and particle detectors, that will be put into coordinated orbits to create co-aligned observations (periods of 4 days, 2 days, 1 day, and 2 at ~0.8 days) to determine the causes of global reconfigurations of the Earth's magnetosphere.
 - Launched February 17, 2007.
 - After initial nominal contact, the Berkeley Ground Station (BGS) conducted a round robin support of all 5 probes shortly after separation and noticed lower than expected signal levels. A spacecraft emergency was declared at approximately 0330Z on February 19 after negative acquisitions of all 5 probes at WGS, HBK, AGO, and BGS.
 - Additional support was requested from SN and GN stations. Request for support by the DSN 26 meter stations at Madrid and Canberra was granted by JPL with very short turn-around. FDF was able to update vector, and reliable contact was re-established on February 20.
 - The operation of all five probes are nominal and all probes are in a good state of health.
 - There is a lower (2 - 4 dB) signal strength than expected, attributed to the patch antenna coatings and the superposition of antenna patterns of the six patches per antenna per probe
 - BGS has taken steps to improve performance and will be able to support all probes at their apogees

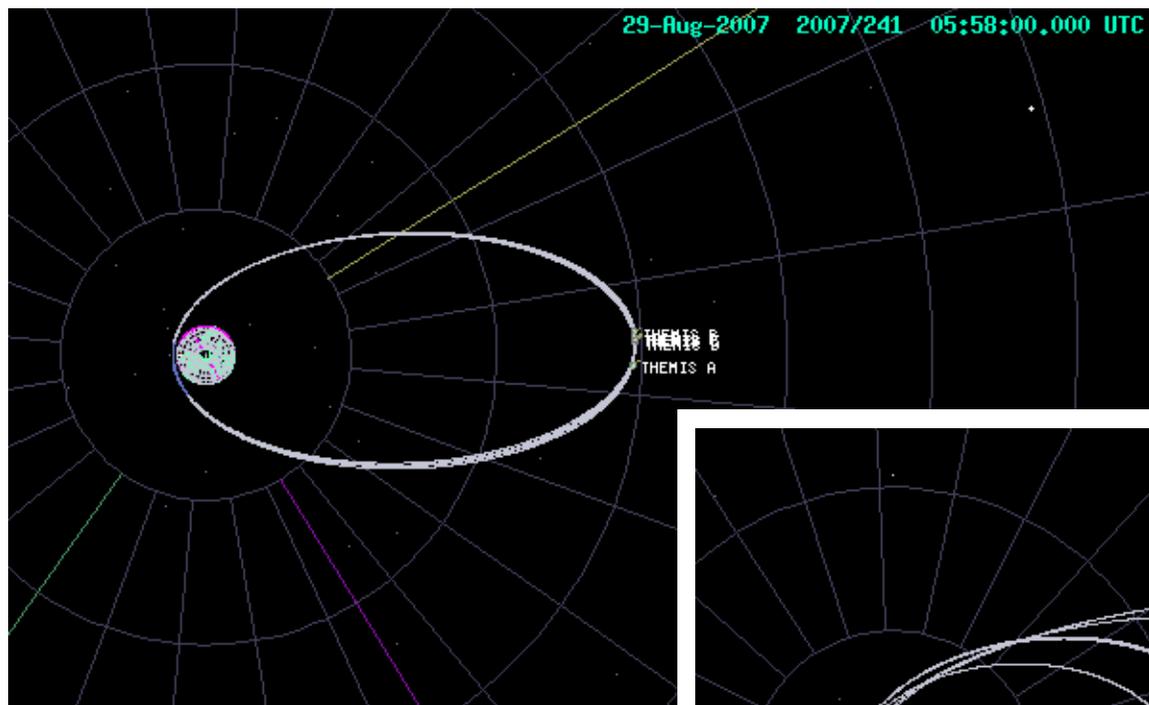


THEMIS Mission Profile Update



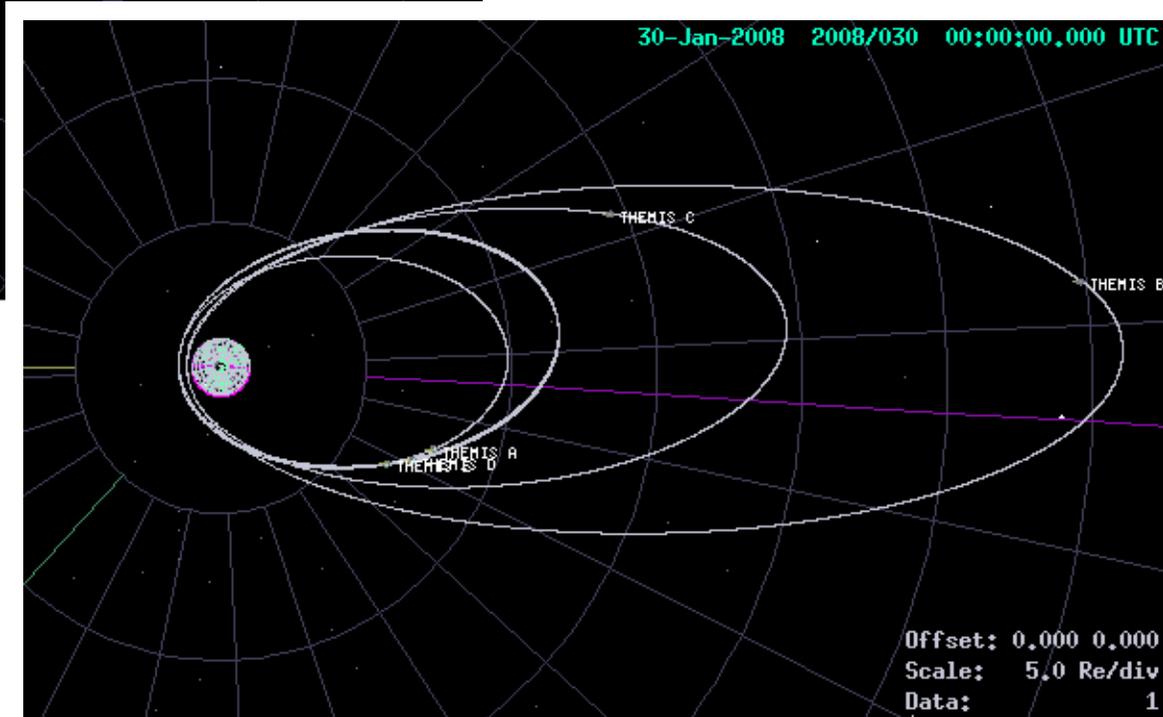


THEMIS Orbit Placement September 2007 to January 2008



Coast Phase Orbits

Tail Season 1 Orbits



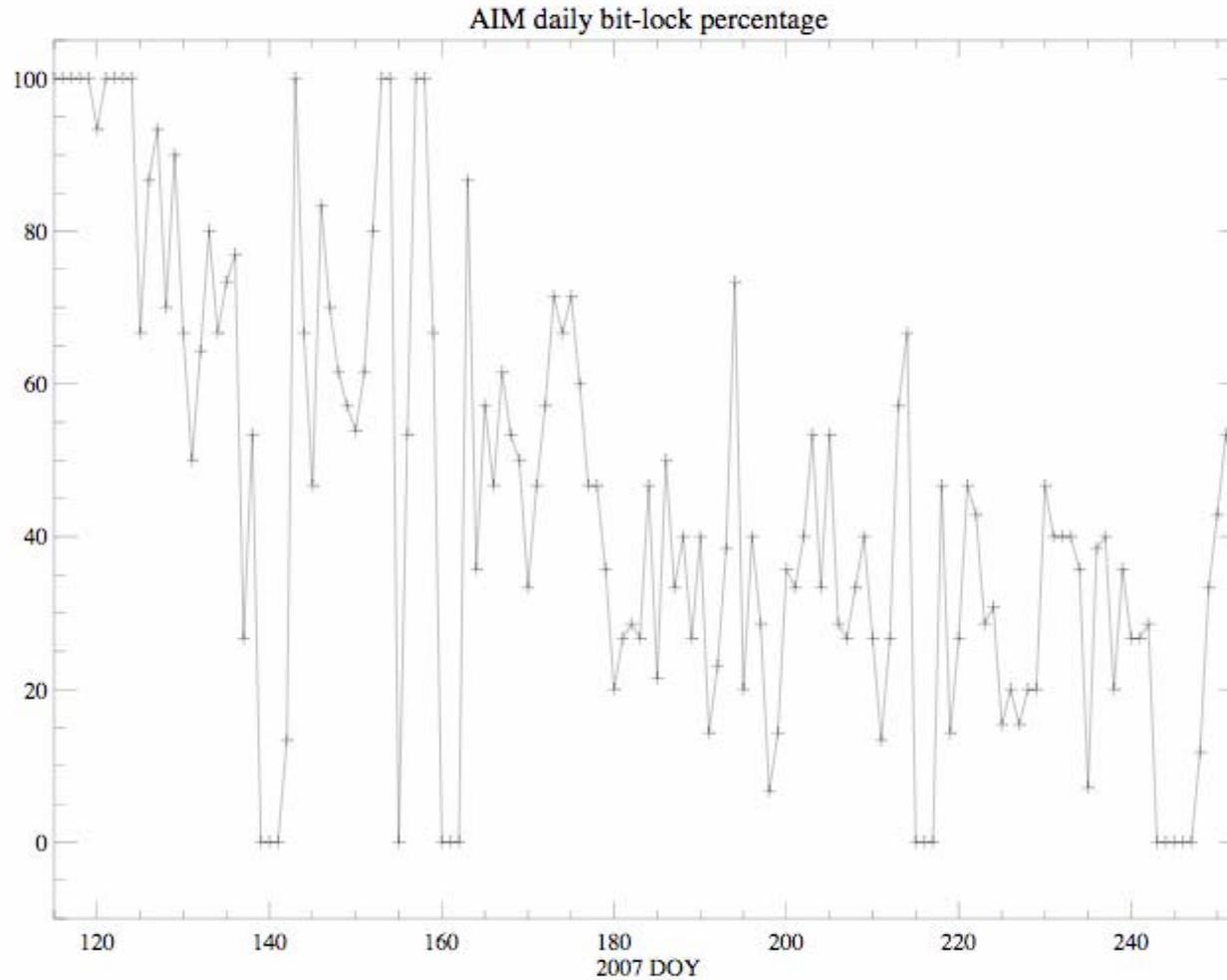


Space Communications Customer Forum

- **Aeronomy of Ice in the Mesosphere (AIM)**
 - The AIM satellite mission will explore Polar Mesospheric Clouds (PMCs) and the environment in which they form in order to determine the connection between PMCs and the meteorology of the polar mesosphere. The increased appearance of noctilucent, or Night Shining Clouds (NLC), which are a manifestation of PMCs, has been suggested as an indicator of global climate change.
 - AIM launched on a Pegasus from VAFB on April 25, 2007
 - After nominal launch and early orbit, the mission began to experience intermittent commanding problems about 10 days into the mission
 - Carrier lock present
 - Downlink present
 - 16 Khz Subcarrier Bitlock Intermittent (have experienced outages > 5 days)
 - Implemented extended 24 day commanding and autonomous instrument operations
 - Evaluating an onboard state update process based on eclipse entrance
 - A review is scheduled for 9/25 for additional autonomy to be captured by a flight software modification
 - Initial PMC season completed meeting minimum science (4 required for full)
 - Continuing to schedule frequent SN support and GN support at PMC frequency



AIM Bit Lock Performance





Goings

- **FUSE**
 - On May 8, the final working reaction wheel stopped spinning
 - After some intermittent successes, the wheel was successfully restarted on May 24.
 - Science observations resumed June 12
 - The wheel experienced a “hard” stop on July 12 and has not resumed
 - SMD approved the decision to decommission the spacecraft and passivate by October 31
- **Polar**
 - Operations was authorized to extend through April 2008 to coincide with THEMIS first prime campaign
 - A 180 degree maneuver planned for February 2008 to enable observations in March and April. There is a possibility that there is insufficient fuel to complete the burn.
- **IMP-8**
 - Efforts to establish contact with IMP-8 have been terminated and all final close out activities are underway



Special Circumstances

- **IMAGE**

- Acquisition data from Two Line Elements (TLEs) has been generated
- 34m DSN time, every orbit, starting 10/16 thru 10/27 has been scheduled
- First shadow is 10/15 and the deepest shadow that may cause the spacecraft to reset is on 10/22
- Data flows with DTF-21 the week of 10/1 are planned

- **SAMPEX**

- Continue operations from Bowie State University
- Providing “hands on” experience for students in a professional setting
- Providing space weather products to the broader community in conjunction with Aerospace
- Lone reaction wheel failed on 8/17/2007
- Plan to spin the spacecraft up from 0.4 RPM to 1.0 RPM rate which was used for science operations for about 2.5 years in the mission prior to 2000



Special Circumstances

- **SWAS**
 - The IV&V Facility has initiated a partnership with SSMO, Bowie State University, and West Virginia University to facilitate a student exchange about operations and software IV&V processes
 - LCROSS mission has expressed interest in SWAS observing the Lunar impact in 2009, but no agreement is in place
- **WIRE**
 - WIRE currently being used to verify the SDO ground system
 - Expect tests to continue through October 2007
 - Steps continue to capture commands and make available to the GN for future use by the GN to use WIRE as a test satellite
- **CHIPS**
 - SSMO to contact AMES to understand their plans for partnering with UCB



Senior Review

- **Heliophysics and Astrophysics Senior Review Spring 2008**
- **Formal guidance would be expected by July 2008**
- **TRACE is not invited to Heliophysics Sr. Review, but anticipate 4-6 month overlap with SDO for calibration**



Upcoming Launches

- **The Gamma-ray Large Area Space Telescope (GLAST)**
 - GLAST is a next generation high-energy gamma-ray observatory designed for making observations of celestial gamma-ray sources in the energy band. GLAST will afford astronomers a superior tool to study how black holes pull matter in and accelerate jets of gas outward at fantastic speeds, Physicists the ability to study subatomic particles at energies far greater than those seen in ground-based particle accelerators, and cosmologists will gain valuable information about the birth and early evolution of the Universe.
 - Anticipate a GLAST launch between January – April 2008



Earth Science Mission Operations (ESMO) Status

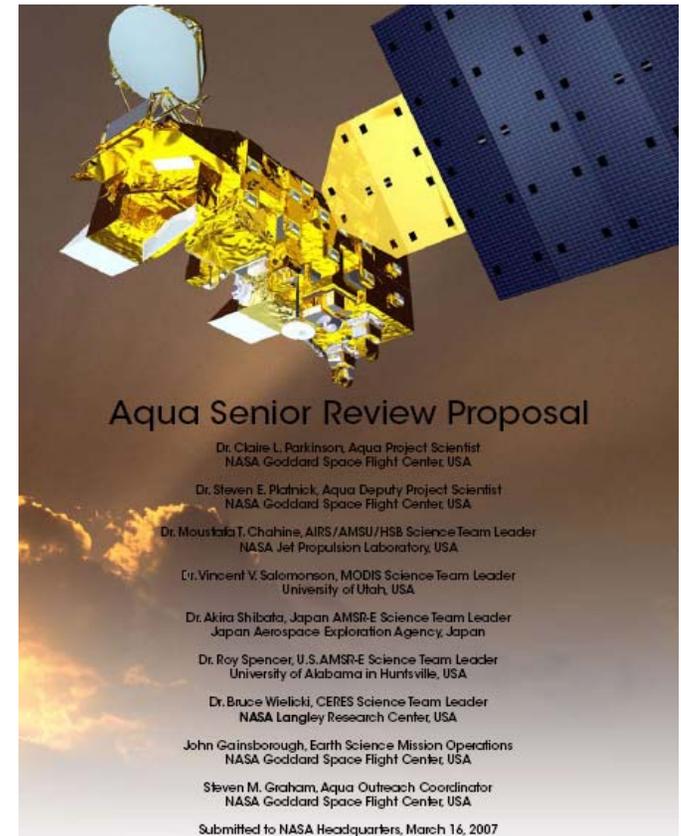
Chris Wilkinson
Deputy Project Manager
Earth Science Mission Operations/428
NASA/Goddard Space Flight Center



Space Communications Customer Forum #16

EOS Aqua Summary

- **March 15, 2007: Aqua Senior Review Proposal Submitted to NASA HQ**
 - Received Extension through FY11
 - Next Senior Review in March 2009
 - Consumables through 2015+
- **April – May: Aqua completed Spring 2007 Inclination Adjust Maneuvers**
 - Next inclination adjustment Spring 2009
- **May 4, 2007 Aqua 5-Year Anniversary**
- **June 12, 2007: EOS Flight Operations Status Review**





Space Communications Customer Forum #16

EOS Aura Summary

- April – May: Completed Spring 2007 Inclination Adjust Maneuvers
- June 12, 2007: EOS Flight Operations Status Review
- July 15, 2007: Aura 3-Year Anniversary
- July 17 – Aug 16: Tropical Composition Cloud and Climate Coupling (TC4) Campaign

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
July	1	2	3	4	5	6	7
		NATIVE arrive PAN DC-8 Test Flight 3	DART arrive PAN DC-8 ORR ESPO in CR DC-8 Pack for shipment				DC-8 GSE to DFRC DC-8 Trucks to DFRC
	ER-2 Integration		WB-57 Integration				ER-2 Pack WB-57 Test Flight
	8	9	10	11	12	13	14
	NPOL arrive PAN -->	MRR ER-2 Test Flight DC-8 Pallet Build		Labs Open DC-8 PIs to McC	PAN Ops	DC-8 Transit ER-2 Transit	
	WB-57 Test Fit ER-2 Pallet Build		WB-57 Pack		C-5 to DFRC; load WB-57 Pallet Build	C-5 to CR; unload C-5 to TX; load	C-5 CR; unload WB-57 Transit
	15	16	17	18	19	20	21
	DC-8 Down Day C-5 departs CR	ALL HANDS					
	Science Flights						
	22	23	24	25	26	27	28
					ALL Down Day	DC-8 No Fly Day OPEN HOUSE	
	Science Flights						
	29	30	31				
		CR Holiday					last updated 6/21/07
Science Flights							
August	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Notes:			1	2	3	4
	Science Flights						
	5	6	7	8	9	10	11
				DC-8 Pack	DC-8 Pallet Build	DC-8 Down Day	WB-57 Transit DC-8 Transit
	Science Flights		ER-2 Pack		WB-57 Pack	ER-2 Pallet Build	WB-57 Pallet Build C-5L to CR
	12	13	14	15	16	17	18
	Ticosonde stop C-5L Load-TX C-5D unload; depart	CR Holiday All Unpack DC-8 Pack Trucks C-5L unload & depart Panama Ops Stop	DC-8 Trucks to McC	ESPO & ER2 SHIPMENT DC-8 Trucks Unpack		DC-8 PIs Pack Equipment	C-5D to CR C-5D Load; to DFRC

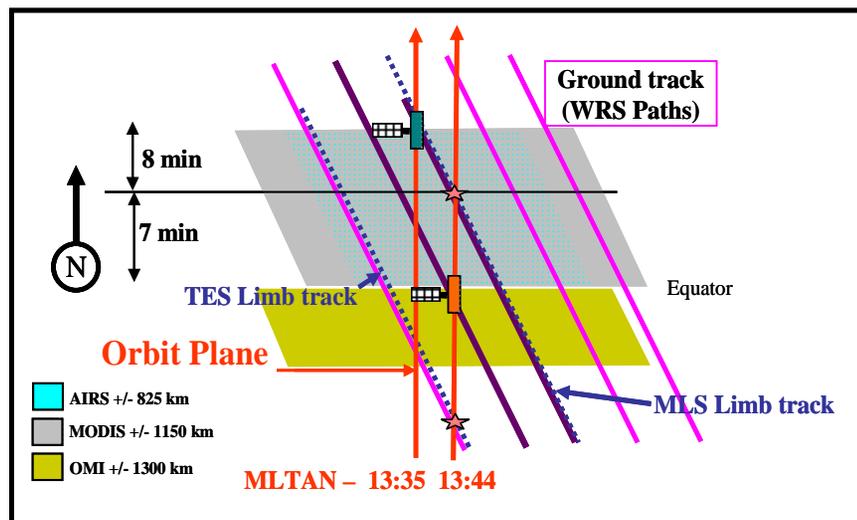


Space Communications Customer Forum #16

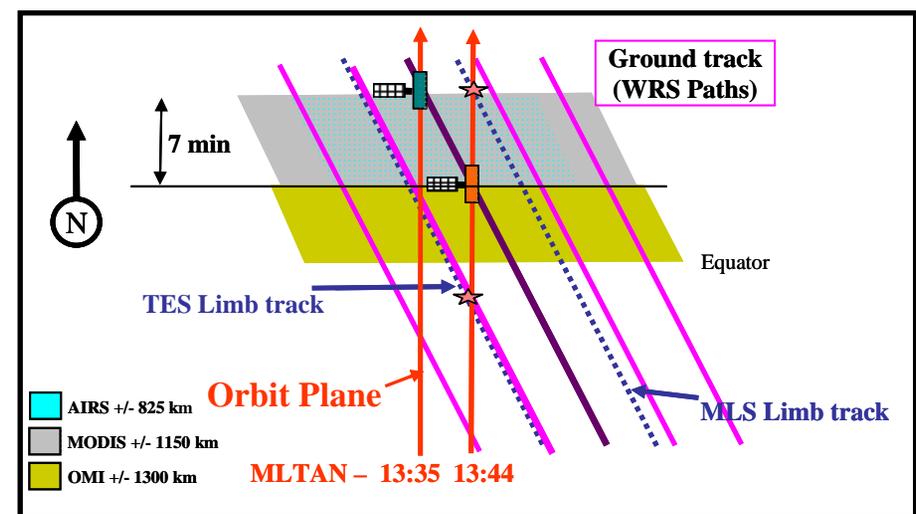
EOS Aura Relocation

- A proposed re-location of EOS Aura is currently under review
- Currently Aura maintains a phasing of 15-22 minutes in along track separation behind Aqua
- Proposal is to move Aura forward approximately 8 minutes closer to Aqua

Current Location



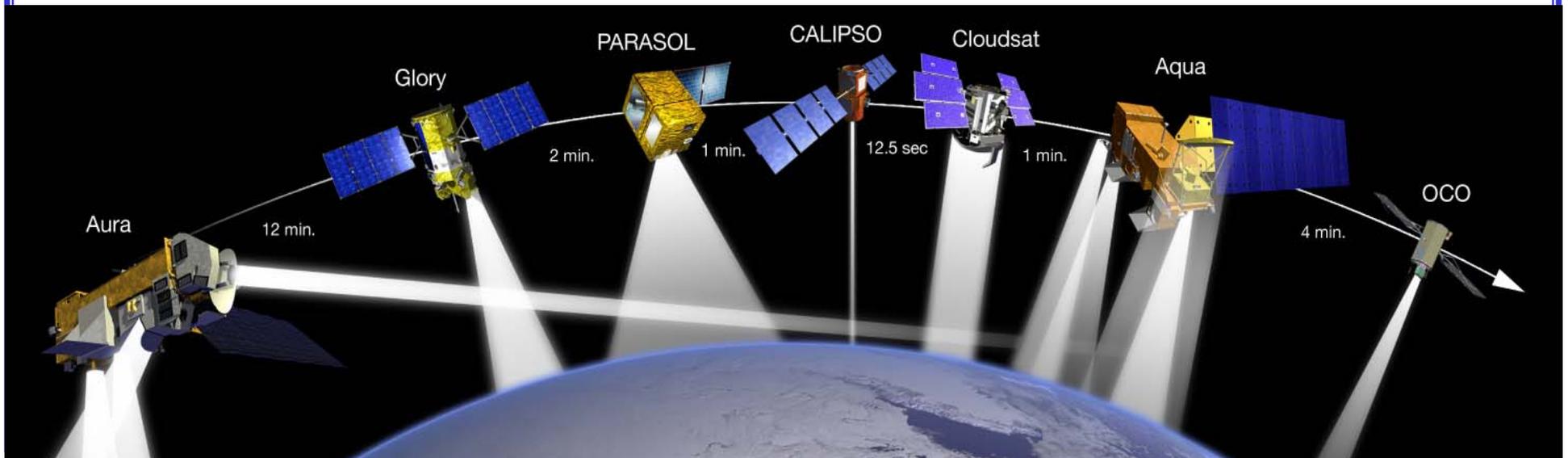
Proposed Location





The Afternoon Constellation

- All 5 missions (Aqua, Aura, PARASOL, CALIPSO, and CloudSat) successfully completed inclination adjust maneuvers in spring 2007.
- All 5 missions participated in the Tropical Composition, Cloud and Climate Coupling (TC-4) science campaign which started July 17 and ended August 16.
- OCO and Glory are potential new members of the Constellation





Terra 2007 Summary

Spacecraft Subsystem Status:

EPS – Nominal CDH – Nominal
 TCS – Nominal COMM – Nominal
 GNC – Nominal FSW – Nominal

Instrument Status:

ASTER – SWIR Temp Increasing
 CERES – Nominal
 MODIS – Nominal
 MISR – Nominal
 MOPITT – Nominal

Maneuvers:

MODIS Roll Maneuvers (Qty: 10)

1/8/07, 2/6/07, 6/5/07, 7/4/07,
 8/3/07, 9/1/07, 9/30/07

Estimated Dates:

10/30/07, 11/28/06, 12/27/07

Drag Make-Up Maneuvers (Qty: 2)

5/23/07, Dec 2007

Risk Mitigation Maneuver (Qty: 1)

6/22/07

Inclination Maneuvers (Qty: 2)

10/10/07, 10/16/07

Anomalies (through 9/15/07):

MDA BITE Failure (Qty: 100)
 SSR/ASTER Missed EDU (Qty: 1)
 SSR Command Bit Flip (Qty: 26)
 SSR PWA Failure (Qty: 1)
 X-Band SSPA Failure (Qty: 1)

Special Activities Performed:

SWIR CPHTS Set-point reduction 1/24/07
 SWIR Cooler Stroke
 7mm Attempt – 5/17/07
 6mm Restart – 5/18/07
 SWIR Power Cycle (6mm) – 10/3/07
 SSR DMU Swap – 6/7/07
 X-Band Recovery – 8/16/07
 DDL Testing – 10/24/07
 Terra Automation Testing – Sept 2007
 Terra Automation Shadow – Oct 2007
 Configure NAV to use TDE or TDS instead
 of 275 during reduced TDRS availability

Ground System Updates:

EMOS Build 15.02.66
 OPS – 4/5/07, SUP – 5/7/07,
 BEOC – 7/9/07
 CRP Replacement
 Backup – 5/7/07, Primary – 5/21/07
 TMPT
 Backup – 4/5/07, Primary – 6/13/07
 SSIM
 Bus Monitor 1 & 2 Failed – Feb '07
 Borrowed EFM Bus Monitor – April '07
 Hard Drives Replaced – May '07
 (Force02,FSTB03, & SSIM1 Sim-svr)
 CD-ROM Replaced – May '07
 Recovered Bus Monitor 1 – Sept '07
 Returned EFM Bus Monitor – Sept '07
 GMSEC
 I&T – 6/25/07, OPS – 9/19/07,
 SUP – Oct '07

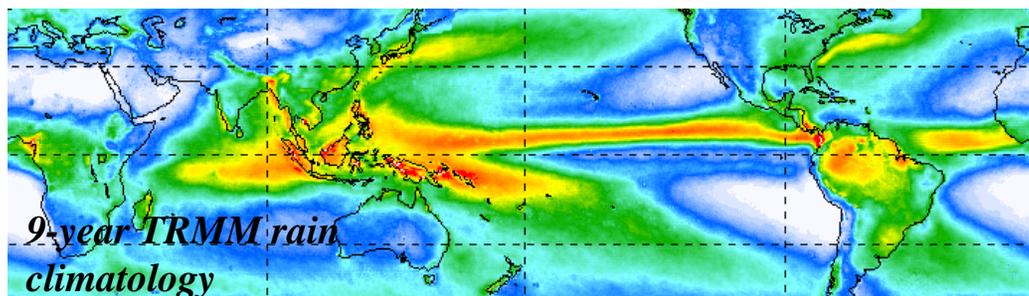
2007	Jan	Feb	Mar	Apr	May	June	July	Aug	Total
TDRSS	1064	880	1136	914	1130	841	949	821	7735
EPGN	9	27	11	10	15	10	15	8	105
Total	1073	907	1147	924	1145	851	964	829	7840
Data Loss	1	3	3	1	1	2	0	1	12
Ops Errors	0	1	1	1	0	1	0	0	4
MIRs	20	28	34	14	38	47	42	47	270

Month	Logged Tbits	Tbits/Day	% Captured	Cause of Significant Loss
1/1 – 1/21	29.6	1.35	99.99%	ASTER Missed EDU
1/22 – 2/18	37.5	1.34	99.91%	TDW S/C Emrg/MDA2 (x2)
2/19 – 3/25	46.8	1.34	99.93%	Ops Error/AGS/ASTER Missed EDU
3/26 – 4/22	37.3	1.33	99.85%	PWA Failure/AGS Rcvr
4/23 – 5/27	45.9	1.31	99.94%	Failed AGS Support
5/28 – 6/24	36.7	1.31	99.95%	WSC H/W Issue
6/25 – 7/22	36.4	1.30	100.00%	No Loss
7/23 – 8/22	40.6	1.31	99.99%	WSC H/W Issue



Tropical Rainfall Measuring Mission (TRMM)

Science Objective: Advance knowledge of global water and energy cycles through observed time and space distributions of tropical rainfall, hydrometeor structure and latent heating.



TRMM 2007 SUMMARY

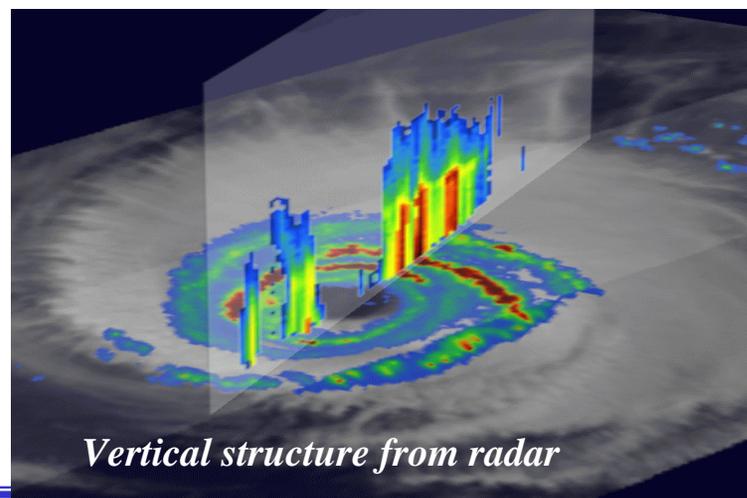
2007	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TDRSS	549	499	545	529	551	532	531	527	0	0	0	0
Problem SN	1	1	0	0	0	0	1	0	0	0	0	0
Event Reports	1	1	1	0	0	1	1	0	0	0	0	0

Spacecraft Subsystem Status:

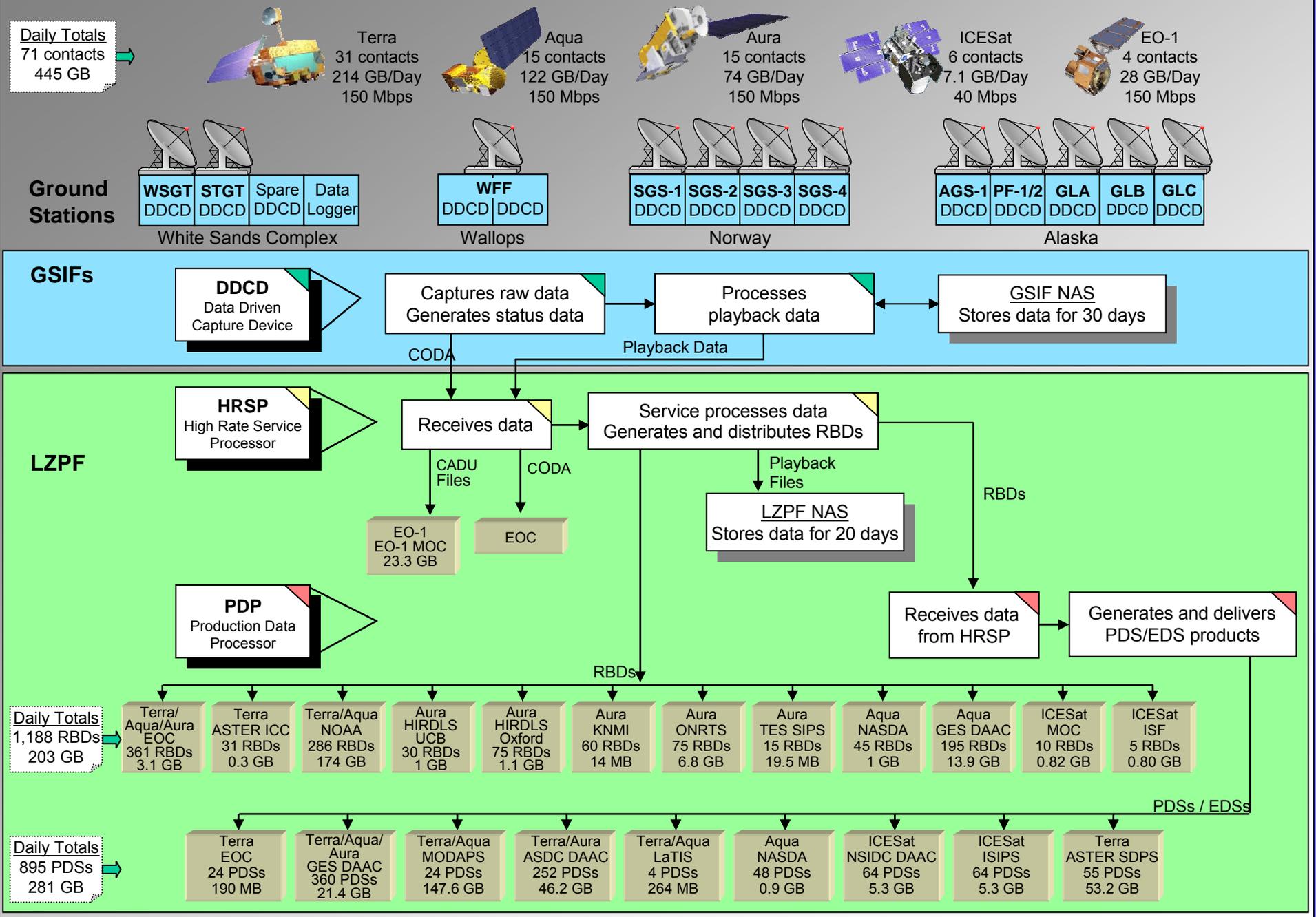
CDH	Nominal		RF	Nominal
ACS	Nominal		Thermal	Nominal
Electrical	Nominal		RCS	Nominal
Power	Nominal		Deployables	Nominal

Instrument Status:

CERES	Powered off :5/2001	
TMI	Nominal	
VIRS	Nominal	
PR	Nominal	
LIS	Nominal	



EDOS Ground System Functions Today (9/07)





EOS Data and Operations System (EDOS) Products Requirements

- **Rate Buffered Data (RBD) sets to users**
 - **Within 3 hours of observation (initiate transfers within 5 minutes after data receipt at LZPF)**
 - **Goal: Within 1 hour from LOS at the GSIF**
- **Production Data Set (PDS) to users**
 - **Within 24 hours of data receipt at GSFC, 99% of the time**
- **Expedited Data Set (EDS) to users**
 - **Goal: Within 1 hour after data receipt at LZPF**
- **Customer Operations Data Accounting (CODA) reports to users**
 - **Within 1 second of data receipt, then continue transfers at 5 second intervals**



Space Communications Customer Forum #16

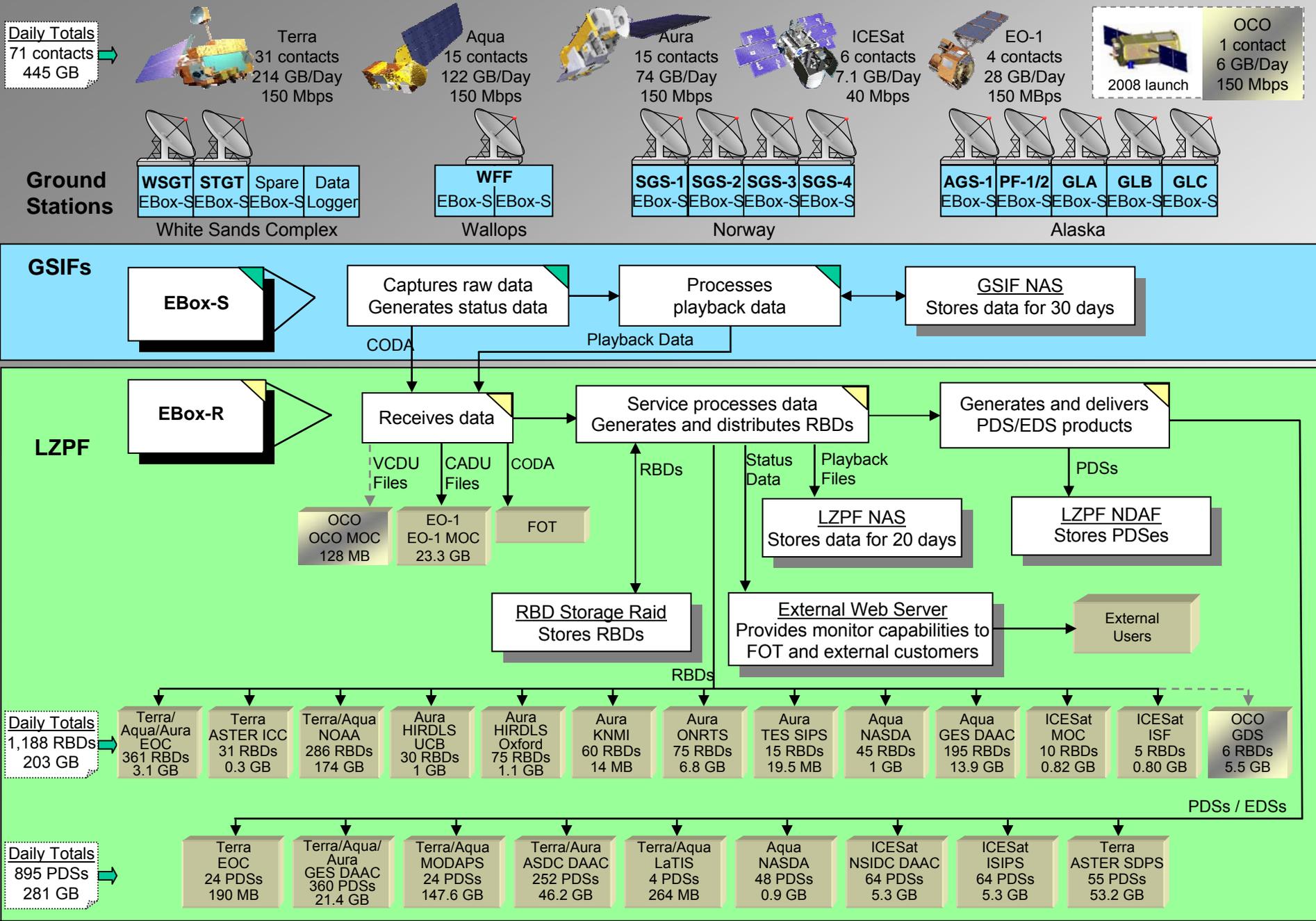
EDOS DATA-DRIVEN Developments 2007

Key design goals guiding the current effort...

- EDOS operator screens standardized and accessed via a web browser
 - External Web server provides status to remote users
- Operation intervention is only required on system anomalies
- New front end processing design:
 - Increases EDOS spacecraft capture rate to 500 Mbps, and
 - Allows flexible reconfiguration/upgrades via FPGA image file
- HRSP and the PDP hardware consolidation
- Ground Station hardware upgrade using the latest technology
- Traffic prioritization on the high rate lines between the GSIFs and the LZPF
- Archive data storage now based on disks (no longer on tapes)

Planned operational deployment: February 1st 2008

EDOS Data-Driven – Phase 2 (2/08)





Space Communications Customer Forum #16

Samples of EDOS Web-based Monitoring

The screenshot shows the EDOS web-based monitoring interface with four main panels: MISSION 1, MISSION 2, PROCESSING, and DISTRIBUTION. The MISSION 1 panel displays 'Icesat' with a satellite icon and status 'State: Sync'. The MISSION 2 panel displays 'BOV' with a satellite icon and status 'State: Sync'. The PROCESSING panel shows a list of data links with 'ENABLE' and 'DISABLE' buttons. The DISTRIBUTION panel shows a similar list with 'ENABLE' and 'DISABLE' buttons.

Norway
 Detailed Event Status
 CADUS Received: 1053404
 Data Transfer Start Time: 2006-044-20:15:37.178
 Data Transfer Stop Time: 2006-044-20:48:19.179

SCS ID: T1549510604420122800
 SCID: 154
 HWName: EBox3

CCSDS Path Service Status

VCD	Playback VCDUs	VCDU Sequence Discontinuities	SDU Fragments Discarded
5	217073	0	0
3	15922	0	0
10	14909	0	0
15	14310	0	0
20	2951	0	0
25	1475	0	0
30	440365	0	0
35	176086	0	0
Total:	882502	0	0

VCD	APD	Packets	Pkts Disc	Pkts w/ Fill	First Packet Time	SSC	Last Packet Time	SSC
3	957	11580	0	0	2006-044-17:01:56	7840	2006-044-20:13:08	2828
3	958	2895	0	0	2006-044-17:01:56	6054	2006-044-20:13:08	882
3	959	1447	0	0	2006-044-17:02:01	3030	2006-044-20:13:13	8464
10	141	1787	0	0	2006-044-16:58:24	16227	2006-044-20:14:06	1622
15	157	1788	0	0	2006-044-16:58:23	9837	2006-044-20:14:11	11717
20	261	18657	0	0	2006-044-	15490	2006-044-20:13:58	574
20	262	18658	0	0	2006-044-16:58:22	15490	2006-044-20:14:06	574
40	342	1024	0	0	2006-044-16:58:14	15275	2006-044-20:14:06	360
25	290	6782	0	0	2006-044-16:58:15	4260	2006-044-20:13:58	14673
45	402	5967	0	0	2006-044-16:58:18	10503	2006-044-20:14:05	3028
30	64	1800	0	0	2006-044-17:08:15	11544	2006-044-17:24:38	12153
35	404	16	0	0	2006-044-17:08:17	10241	2006-044-17:24:38	10585
35	406	1802	0	0	2006-044-17:08:18	13562	2006-044-17:24:38	15034
35	407	1604	0	0	2006-044-17:08:18	11583	2006-044-17:24:38	11851
35	405	1808	0	0	2006-044-17:08:18	11583	2006-044-17:24:38	11851
35	414	3588	0	0	2006-044-17:08:15	10172	2006-044-17:24:38	10540
35	415	3590	0	0	2006-044-17:08:15	10172	2006-044-17:24:38	10540

Norway Event Status

Queue Order	SCS ID	Total CADUs	Frame Loss	Unc VCDU	Cor VCDU	SCS PBK CADUS	Event Status	Detailed Event Status
1	T2045 G306030021000000	1,500,000	6	12	18	1,000,000	<input type="checkbox"/>	<input type="checkbox"/>
2	T2045 G306030021000000	7,800,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
3	T2045 G306030021000000	7,900,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
	T2045 G306030021000000	6,750,000	5	8	8	6,800,000	<input type="checkbox"/>	<input type="checkbox"/>

SGS1 FBOX1

Queue Order	SCS ID	Total CADUs	Frame Loss	Unc VCDU	Cor VCDU	SCS PBK CADUS	Event Status	Detailed Event Status
1	T2045 G306030021000000	1,500,000	6	12	18	1,000,000	<input type="checkbox"/>	<input type="checkbox"/>
2	T2045 G306030021000000	7,800,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
3	T2045 G306030021000000	7,900,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
	T2045 G306030021000000	6,750,000	5	8	8	6,800,000	<input type="checkbox"/>	<input type="checkbox"/>

SGS2 FBOX2

Queue Order	SCS ID	Total CADUs	Frame Loss	Unc VCDU	Cor VCDU	SCS PBK CADUS	Event Status	Detailed Event Status
1	T2045 G306030021000000	1,500,000	6	12	18	1,000,000	<input type="checkbox"/>	<input type="checkbox"/>
2	T2045 G306030021000000	7,800,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
3	T2045 G306030021000000	7,900,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
	T2045 G306030021000000	6,750,000	5	8	8	6,800,000	<input type="checkbox"/>	<input type="checkbox"/>

SGSn FBOXn

Queue Order	SCS ID	Total CADUs	Frame Loss	Unc VCDU	Cor VCDU	SCS PBK CADUS	Event Status	Detailed Event Status
1	T2045 G306030021000000	1,500,000	6	12	18	1,000,000	<input type="checkbox"/>	<input type="checkbox"/>
2	T2045 G306030021000000	7,800,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
3	T2045 G306030021000000	7,900,000	0	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
	T2045 G306030021000000	6,750,000	5	8	8	6,800,000	<input type="checkbox"/>	<input type="checkbox"/>

Print screen Close



Other Initiatives for 2008

- **Products Server**
 - Push all products to a central server and let the users pull their own data. The data would remain available on the server for 10 days. This reduces the workload on the EBox-R servers.
- **Data Quality Assurance Tools**
 - Automate “quality assurance” processes to detect and report on product anomalies using inference engines tools
- **New Mission Support Insertion for OCO and ALOS**
- **X-Band real-time Virtual Channel data extraction and forwarding**
- **Overlap to mitigate packet loss for Aqua and Aura in Auto-Ops mode of operations**



Human Space Flight (HSF) Integrated Network Status

September 20, 2007

**Fred Pifer
Human Space Flight
Honeywell / NENS
Goddard Space Flight Center**



Integrated Networks

- **Major Elements**
 - **Space Network (SN)**
 - **Ground Network (GN)**
 - **NASA Integrated Services Network (NISN)**
 - **Flight Dynamics Facility (FDF)**
 - **KSC Communications Distribution & Switching Center (CD&SC)**
 - **Dryden Western Aeronautical Test Range (WATR)**
 - **Eastern Range (ER)/Western Range (WR)**
 - **Air Force Satellite Control Network (AFSCN)**

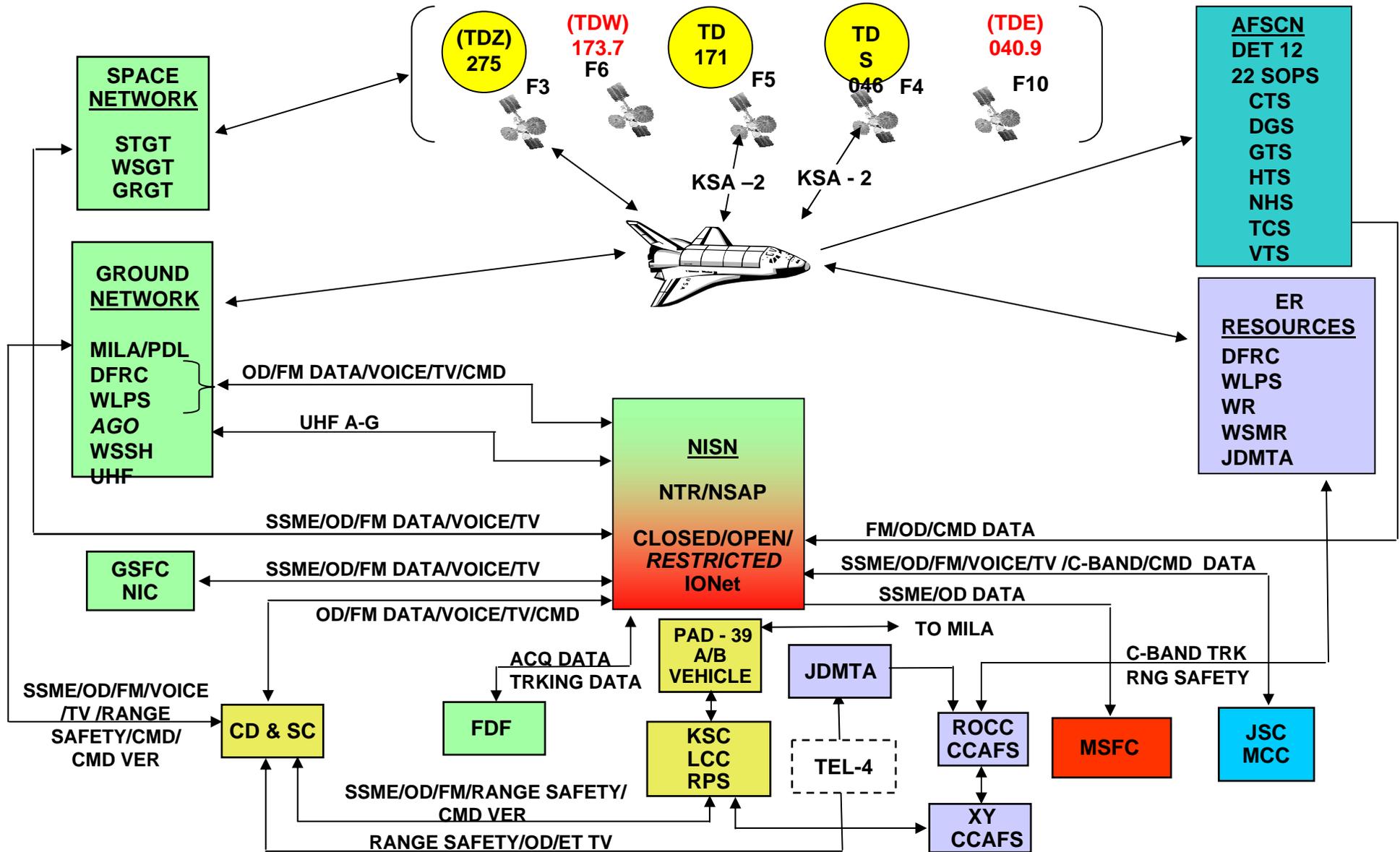


NENS Human Space Flight (HSF) Team

- **GSFC Support Functions:**
 - **STDN Mission Managers (SMM)**
 - **Ground Network Operations Managers (GNOM)**
 - **Advanced Mission Planning**
 - **Requirements Management**
 - **Mission Documentation Development/Maintenance**
 - **Mission Support Planning**
 - **Mission Integration, Test, and Verification**
 - **Sustaining Engineering Services**
 - **Operations and Maintenance**



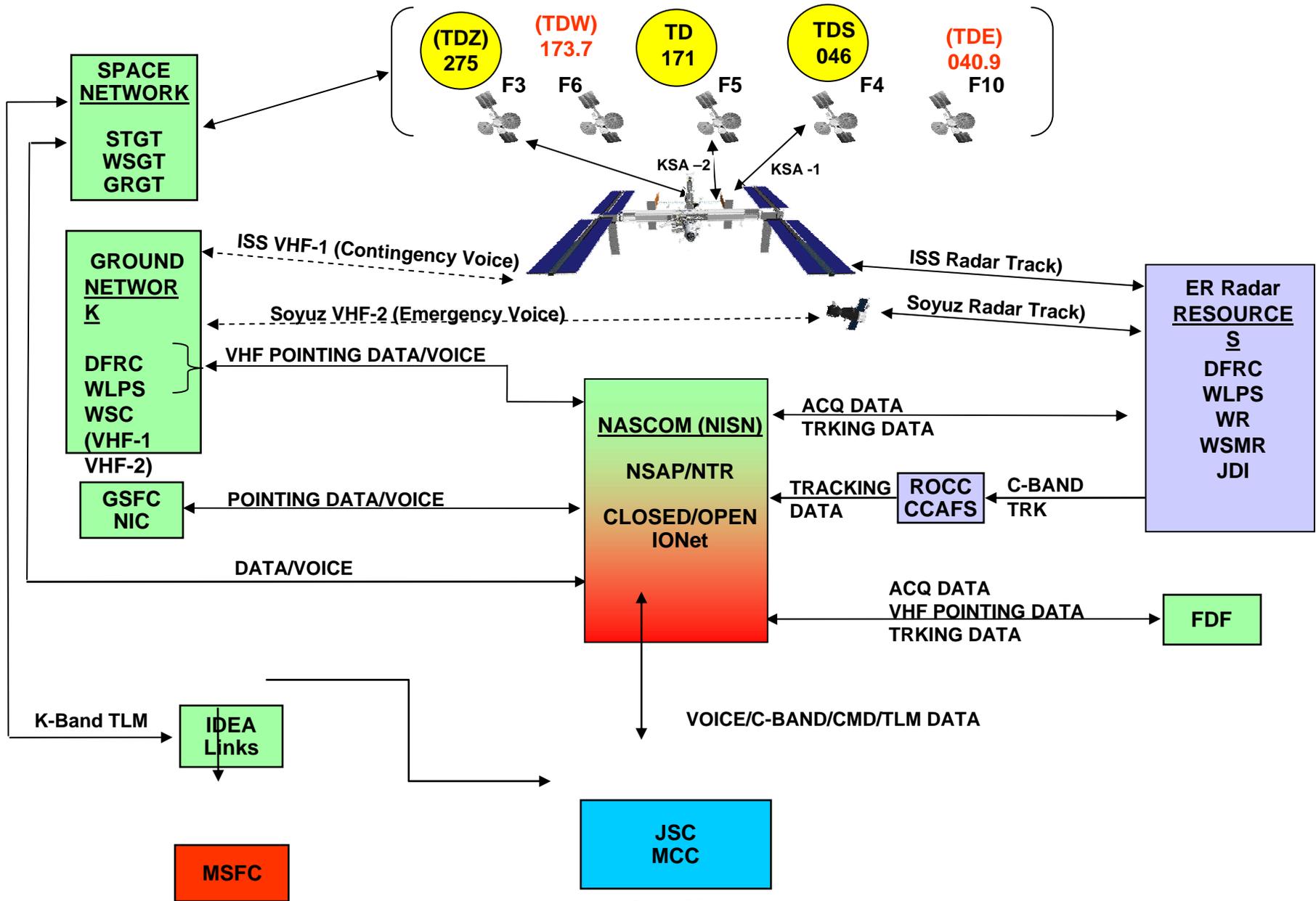
Space Shuttle Integrated Networks Overview



TEL-4 bypassed

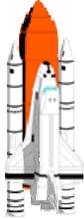
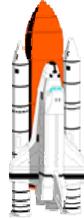


ISS Integrated Network Support





Upcoming Human Spaceflight Mission Activities

2007			2008		
October	November	December	January	February	March
 STS-120 10/23/07	 ISS EVA 10 11/13/07	 STS-122 12/06/07	 ATV "Jules Verne" 01/31/08	 STS-123 02/14/08	
 Soyuz 15 10.10/07	 ISS EVA 11 11/17/07	 Progress 27P 12/12/07		 Progress 27P 2/12/08	



Recent Changes

- **NISN has migrated a majority of their STS/ISS Services from NSAP to NTR backbone**
 - **Transition of remaining links will be in progress up to the TCDT**
 - **Onizuka Air Station (OAS) will support STS-120 on NTR pending successful testing**
 - **KSC NTR transition in progress**
 - **MILA forward link will remain NSAP for STS-120**
 - **All Services transitioned are working well**



Recent Changes (cont'd)

- **Dryden (DFRC) ATF-2 and ATF-3 antenna systems have been upgraded and certified**
 - **ATF-2 verified during STS-118, will be prime for STS-120; ATF-3 backup (landing/emergency support only); ATF-1 (Engineering passes will be used for validation)**
- **Cheyenne Mountain Operations transitioned to VAFB (includes NORAD COORD)**
- **DFRC Backup Satellite Circuit**
 - **Implementing a satellite backup capability to protect against terrestrial line single point of failure**
 - **STS-120 critical voice conferences identified, will be configured prior to mission**
 - **Long term plan will include backup capability for the command and telemetry interfaces**



Recent Changes (cont'd)

- **Transponder 5C Digitalization Transition**
 - **Conversion from analog service to digital service for STS-120 and subsequent flights is in progress**
 - **Analog service will be available for fail back, if needed**
 - **Acceptance testing in progress (09/11-12 and 09/20/07)**
- **Wallops 11M has replaced the receive/transmit system with an ENERTEC unit**
 - **Transmit system supported STS-118 launch phase, experienced downlink data anomalies during on-orbit engineering test passes**
 - **Planned to support uplink for STS-120 with downlink engineering test passes; Microdyne receivers will be prime for support**



Recent Changes (cont'd)

- **ISS/Soyuz VHF Emergency Communications Services**
 - **Upgraded to improve frequency response and audio clarity**
 - **Pre-emphasis/de-emphasis modifications installed and tested**
 - **WPS NME VHF computers installed**
 - **Tested on station; ISS VHF verification pass requested**
 - **WSC VHF computers received 09/07, installation date is TBD**



Upcoming Changes

- **ISS Front End Processor Replacement (FEP-R)**
- **Kennedy Forward/Return Link (KFRL) will replace MILA command and telemetry processing**
- **Transition of data interface for AFSCN services from Onizuka Air Station to Schriever Air Force Base in works**



Visiting Vehicle Status

- **European Space Agency (ESA) Automated Transfer Vehicle (ATV)**
 - **Launch scheduled for NET 01/31/08**
- **Japanese Space Exploration Agency's (JAXA) H-II Transfer Vehicle (HTV)**
 - **Launch scheduled for NET 02/09**
- **Constellation Program ARES 1X Vehicle**
 - **Two-stage ELV for crew exploration vehicle Orion**
 - **Launch scheduled for 04/15/09**



STS-125 *Atlantis (OV-104) HST-SM4*

- **Hubble Space Telescope Servicing**
 1. **Berthing of HST onto the Flight Support System**
 2. **Five Eva's - Upgrade and enhance Hubble's capabilities**
 3. **Re-boost & Release**
- **STS-400 Rescue Flight planning in progress**



Flight Profile

Launch Date: 08/07/08

Window ~ 60 Minutes

Orbit 28.5 Degrees @ 320 NM

KSC Landing 08/18/08



STS-125 *Atlantis (OV-104) HST-SM4 (cont'd)*

- **Plans and schedules**
 - **STS-125/SM 4 Network working group identified**
 - **Focal point for integrating planned activities/schedules**
 - **Coordination of interface configurations and documentation**
 - **Requirements**
 - **HST communications for STS-125 essentially unchanged from mission template used for SM-2, SM-3A, and SM-3B**
 - **TDE & TDW (assumes STS on TDS & 171)**
 - **HST in nominal science mission operations at STS launch**
 - **Day-by-day science scheduling through launch week**
 - **Transition to HST Low-Gain Antennas at MET 01/0700**
 - **HST Communications through Orbiter PI**
 - **HST communications through Orbiter until release at MET 07/1715**
 - » **Extended 2-Way track requirement post-release**



STS-125 *Atlantis (OV-104) HST-SM4 (cont'd)*

- **Requirements – cont'd**
 - **No planned GN requirements for HST during STS-125**
 - **Contingency role only**
 - **Station set expanded over the last two years:**
 - **MILA, WGS, AGO, USN Hawaii, USN Dongara, CAN, RID**
 - **Mission Readiness Test**
 - » **HST GN proficiency supports plus selected ground data flows**



STS-400 Endeavour (OV-105) Rescue Flight

– Mission Objectives Crew Rescue Mission

- Endeavour (OV-105) on Launch Pad 39B ready to pickup countdown**
- Launches if damage prevents safe Atlantis (OV-104) re-entry**
- Countdown begins with launch 7 – 10 days after OV-104 Launch**
 - Mission duration 7 days**
 - Crew Size: 4 on launch**
 - Rendezvous with Atlantis**
 - SSRMS and Atlantis grapple fixture used for docking / proximity operations**
 - Atlantis Crew EVA transfer to Endeavour**
 - Crew Size: 11 Return**



STS-400 Endeavour (OV-105) Rescue Flight (cont'd)

- **Ground Station Configuration & Support Assumptions**
 - **Ground Network Station Pass - Configuration & Support Assumptions**
 - **During concurrent / overlapping passes**
 - **Ground Station will be scheduled for either OV-104 or OV-105**
 - **Only one FM Downlink will be on (OV-104 or OV-105) – RFI**
 - **Only one UHF Downlink will be on (OV-104 or OV-105) – RFI**
- **Program Requirements Documents (PRD) Summary**
 - **For Shuttle dual operations, simultaneous support of two Orbiters may occasionally be required**
 - **Capability required:**
 - **Support 2 Shuttle-on-orbit**
 - **Shuttle on orbit plus a pad or network test**
 - **S-band ground stations to provide FM and PM downlink and PM up-linking support**
 - **TDRSS for relay of S-band and Ku-band forward and return links**



Space Communications Customer Forum

NASA Integrated Services Network (NISN) & GSFC Code 731 Status Updates

NISN Customer Interface Group (CIG) Points-Of-Contact

GSFC/Code 731 Customer Support Office

NISN Mission Communications Working Group (MCWG)

NSAP Technology Refresh (NTR)

Mission Operations Voice Enhancement (MOVE) Project
Katie Poole – GSFC MOVE Site lead

Jerry Zgonc
NISN Service Manager (NSM)
Code 731
NASA/Goddard Space Flight Center



Space Communications Customer Forum

NISN Customer Interface Group (CIG) NISN Service Manager (NSM)

Jerry Zgonc, 301-286-7160
Gerald.R.Zgonc@nasa.gov
- (Science Directorate/Earth) WSC, GSFC (Institutional)
- CIG co-lead

Elizabeth Sudderth 256-544-2856
Elizabeth.Sudderth@nasa.gov
(Exploration Systems Directorate) - Constellation
- (Aeronautics Research Directorate) DFRC, GRC, LaRC, NSSC
- CIG co-lead

Mike Richter, 301-286-6376
Mike.Richter@nasa.gov
- (Science Directorate/Space) JPL, GSFC Re-imbursable Projects

Seaton Norman, 301-286-8676
Seaton.B.Norman@nasa.gov
- (Space Operations Mission Directorate) STS, ISS, JSC, KSC, MAF/WSTF, SSC
- MSFC, DFRC (Shuttle), ELV's (KSC & VAFB)

Stan Rubin (301)286-4230
Stanley.D.Rubin@nasa.gov
- (Exploration Systems Directorate) - Space Communications and Navigation Systems (SCAN)
- HECC, BCTC



Space Communications Customer Forum

GSFC UNITEs CIG TEAM

- **MICHAEL BRADLEY, 256.961-9492: GOES, POES, and Re-imbursables**
michael.j.bradley@nasa.gov
- **ANGELA CULLEY, 301.902-6033: Space Operations Mission Directorate (previously Code M) & Exploration** **Angela.M.Culley@nasa.gov**
- **MICHAEL EDER, 301.902-6014: Office Of Science Mission Directorate (previously Code S)** **michael.j.eder@nasa.gov**
- **TRISH PERROTTO, 301.805-3106: Office of Science Mission Directorate (previously Code Y)** **perrotto_trish@bah.com**
- **WANDA NORWOOD, NISN/UNITES CUSTOMER SERVICE MGR., 256.961-9331:**
Wanda.O.Norwood@nasa.gov



Space Communications Customer Forum

GSFC/Code 731 Customer Support Office

- Obtain administrative and mission requirements for all GSFC projects and Codes
- Includes Mission Voice/Data/Video, Administrative Voice/Data (CNE) Wireless, Pagers, Cell Phones, Two-Way Radio Systems, Common Carrier Services, Cable Plant (Fiber/Copper)
- Coordinates requirements for implementations internally at GSFC and/or with NISN/GSFC for Wide Area Network (WAN) services
- Points-of-Contact;
Brad Butts (301)286-3266
Diane Teets (301)286-5535
Tammy Tuttle (301)286-4883



Space Communications Customer Forum

NISN MISSION COMMUNICATIONS WORKING GROUP(MCWG)

The NISN Mission Communications Working Group (MCWG) Forum is tentatively scheduled for the Kennedy Space Center (KSC) in the mid-Nov/2007 time frame.

Please visit the NISN website at <http://www.nisn.nasa.gov> under "What's New!" for additional information and to complete the pre-registration form



Space Communications Customer Forum

NSAP Technology Refresh (NTR)

- **AT&T NTR installations began October/2005**
- **Transition of Mission services began October 2, 2006, with the major focus on Human Space Flight (HSF) services.**
- **All IONeT services have been successfully transitioned to the new mission backbone**
- **As of September 6--83% of NSAP services have been transitioned to NTR.**
- **The new mission network has supported STS-117, STS-118 and will continue with STS-120.**
- **Transition is tentative scheduled for completion by September, 2007.**
- **NTR project manager: Vicki Stewart (NISN/GSFC Code 731)**
- **NTR Project Engineer: Scott Douglas (NISN/GSFC Code 722)**



Space Communications Customer Forum

Mission Operations Voice Enhancement (MOVE)

Katie Poole
GSFC MOVE Lead
Code 731
NASA/Goddard Space Flight Center



Space Communications Customer Forum

MOVE Background

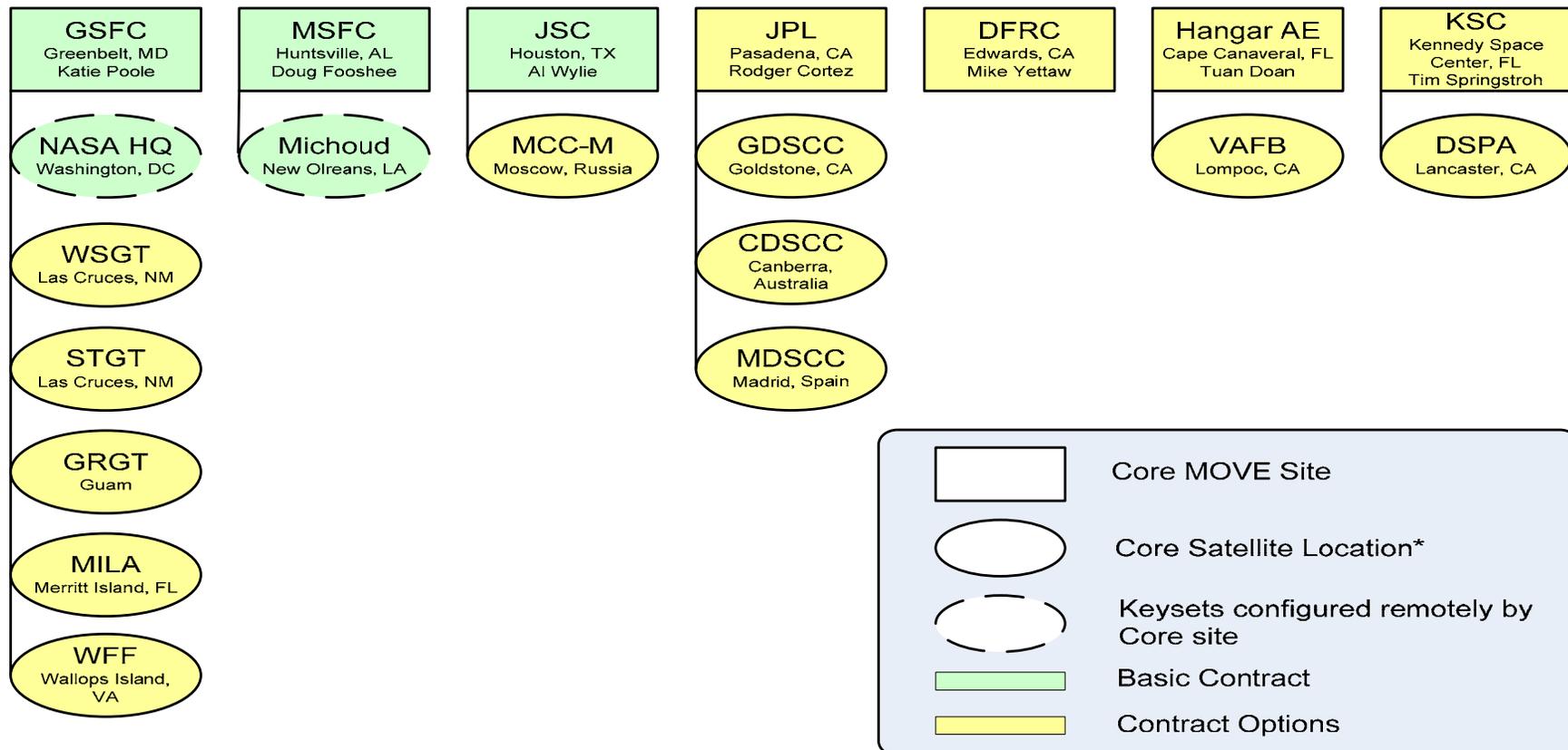
- The purpose of the Mission Operations Voice Enhancement (MOVE) Project is to replace existing mission voice systems with Commercial Off-the-Shelf (COTS) products suitable to meet the mission voice conferencing and voice recording requirements at NASA Centers and locations. The project is funded by the Space Operations Mission Directorate (SOMD) at HQs. The basic portion of the contract includes GSFC, MSFC and JSC. There are also 15 optional sites included.
- Frequentis USA (FUSA), Columbia, MD was awarded the contract in September 2006. The official contract start date is February 1, 2007.
 - Period of performance of 15 years
 - 5 years Basic sites plus Option Sites
 - 10 years of maintenance per Site
 - Indefinite Delivery Indefinite Quantity (IDIQ)
- Go to <http://move.nasa.gov> for more information.



Space Communications Customer Forum

MOVE Locations

Project Manger: Dan Duffy
Contracting Officer: Geoff Sage
Business Manager: Tereda Frazier



* Satellite locations have management and/or a funding relationship with Core sites



Space Communications Customer Forum

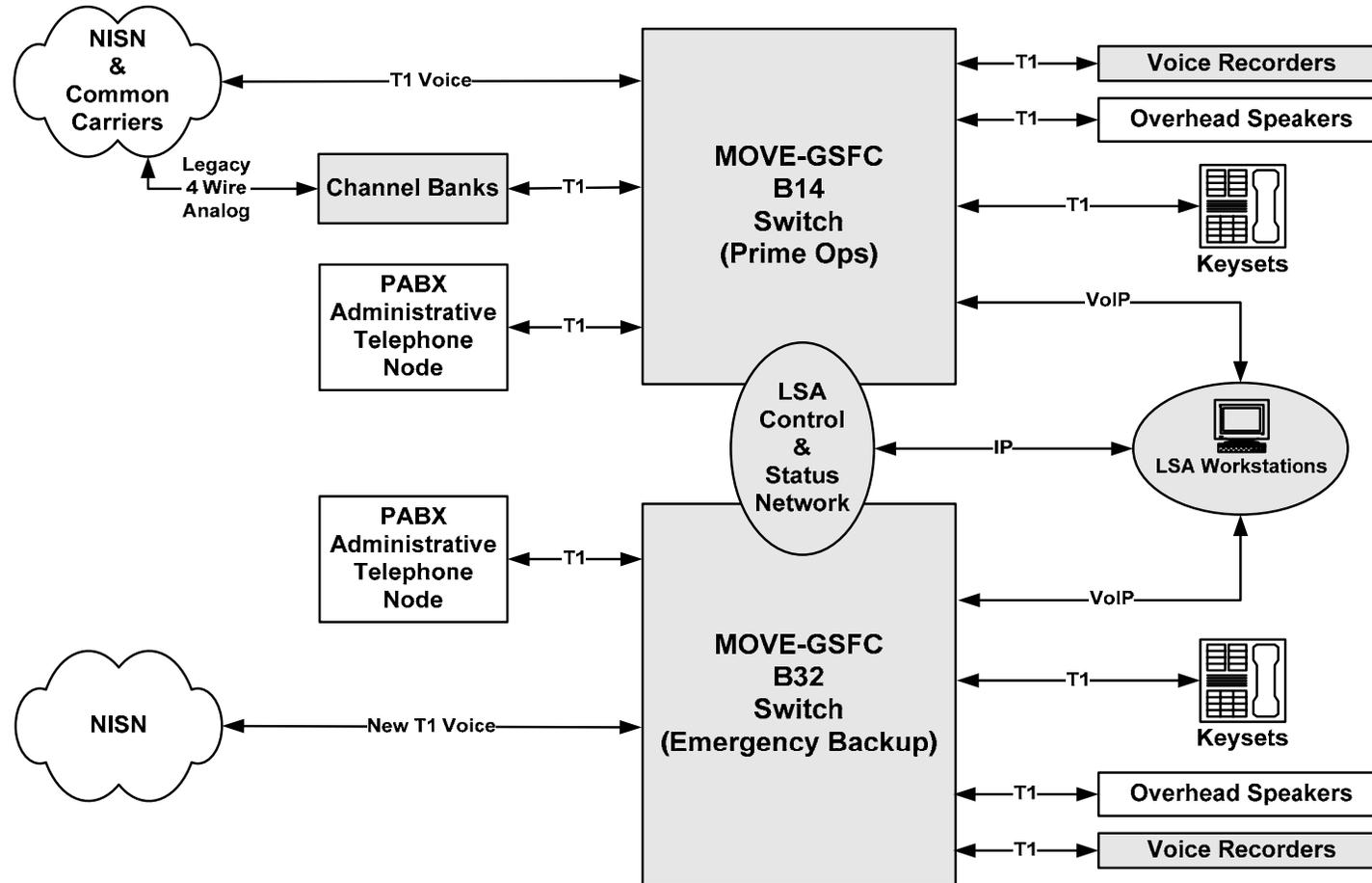
MOVE Project Status

- The Critical Design Review (CDR) Review Item Disposition (RID) cycle was completed on September 6, 2007. FUSA was given the Authority to Proceed (ATP) with the building of the MOVE equipment for GSFC, JSC and MSFC (basic sites) on September 11, 2007.
- The FUSA GSFC Site Survey was held on September 17, 2007.
- The GSFC projects have been given the MOVE keyset equipment costs and projected end-to-end costs (i.e. cabling and installation). Projects have been asked to provide anticipated keyset needs (types and quantities).
- GSFC MOVE keyset funds need to be provided to the MOVE Business Manager by the projects by January 2008.
- Hand/headsets will need to be furnished by the projects. Existing units will work with the new MOVE equipment.
- Based on the current FUSA schedule, the GSFC switch installations are scheduled for mid-June 2008.
 - GSFC Keyset Transition is scheduled to begin late December 2008 thru August 2009 after the following are completed:
 - Site Acceptance Testing (SAT)
 - GSFC Operational Readiness Tests
 - Transition Readiness Review (TRR) Operational Readiness Review (ORR)
 - T1 Transition
 - Removal of GSFC legacy system
 - Begins early September 2009



Space Communications Customer Forum

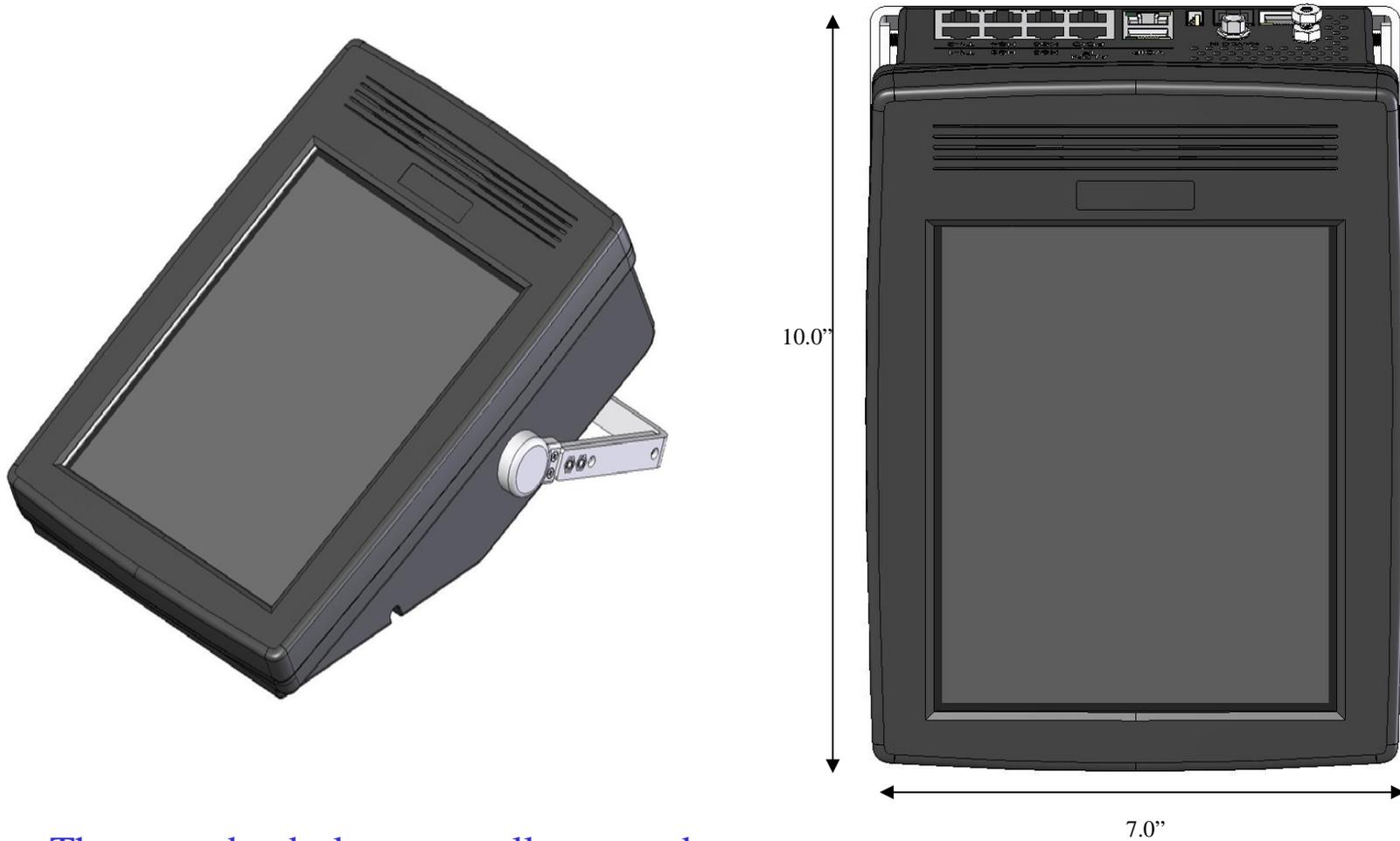
MOVE/GSFC Architecture





Space Communications Customer Forum

Type D Desktop



These can be desktop or wall mounted.



Space Communications Customer Forum

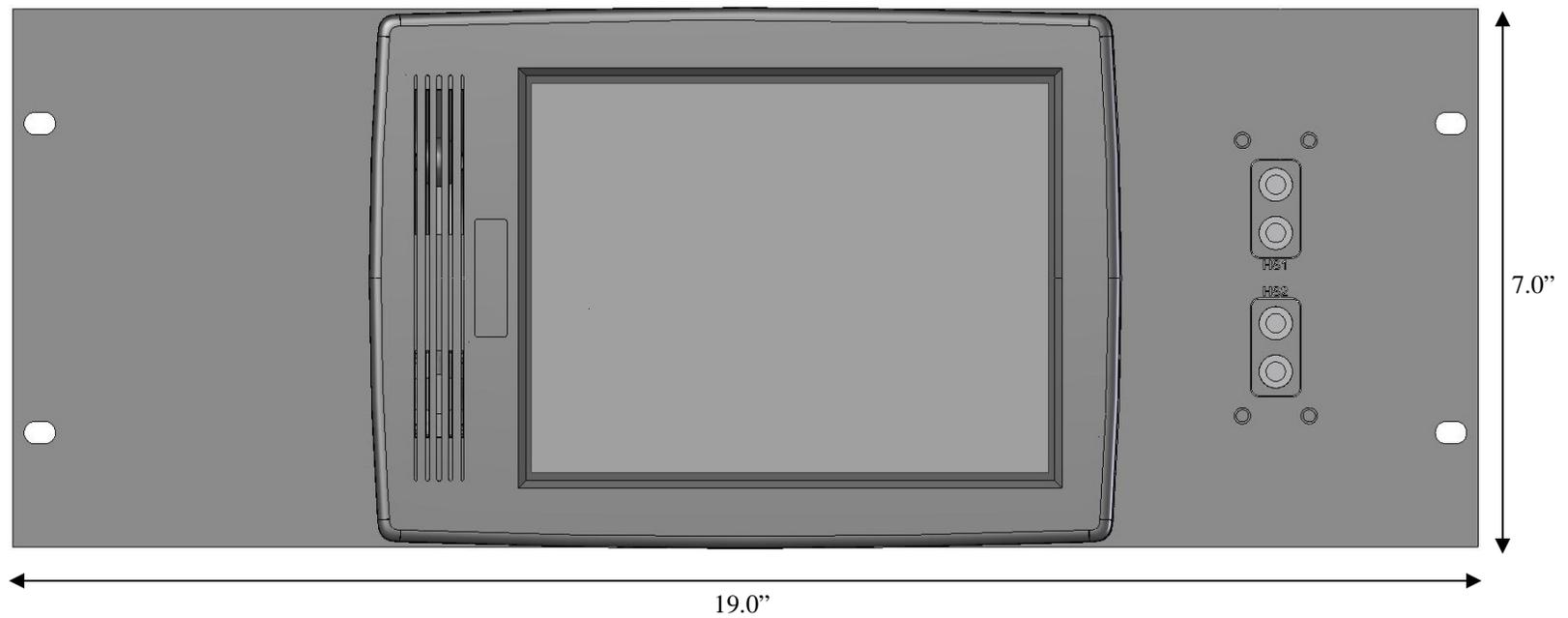
Type D Keyset GUI

The screenshot displays a grid of 24 conference call buttons, each with a speaker icon, a status bar (M or TL), and a label (Confre01-Confre24) with alphanumeric characters. A central control panel includes volume controls (- Vol +), a 'De1 Conf' button, a 'Pick Conf' button, and a 'Close' button. Below the grid, there is a status bar with 'User already logged on.', 'Keysetname/System Page 3', and 'Username(16Char) Pagename(16Char)'. At the bottom, there are navigation buttons: 'Switch Menu >>', 'Go to Page...', 'Dial', 'Hold', 'prev', 'next', 'Settings', 'MCS Ring', 'Pots', 'Release TLM', and 'MultiTL'.



Space Communications Customer Forum

Type D Rackmount Keyset





Space Communications Customer Forum

Type D Rackmount Main Screen

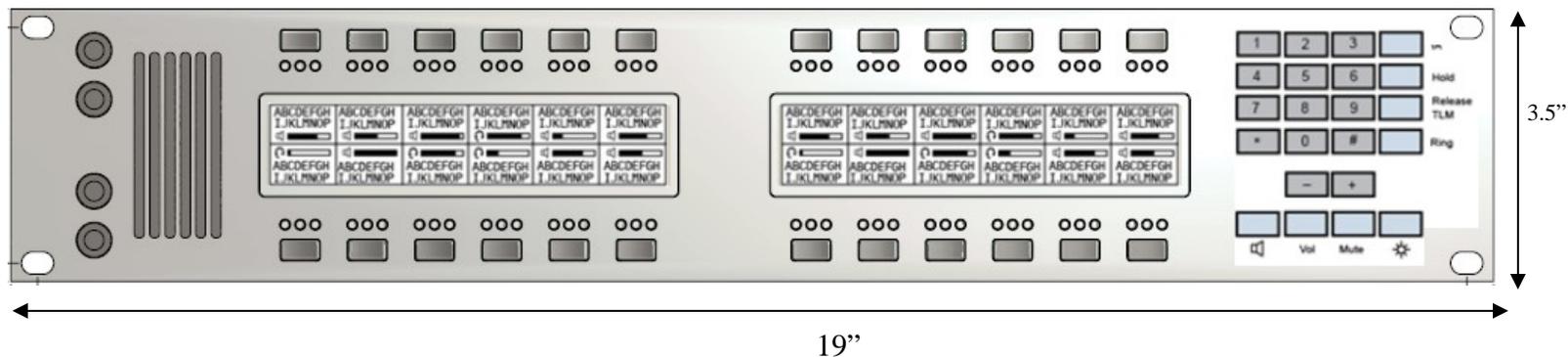
 M Confre01 Abcdefgh 12345678	 TL Confre02 Abcdefgh 12345678	 M TL Confre03 Abcdefgh 12345678	 M TL Confre04 Abcdefgh 12345678	 M Confre05 Abcdefgh 12345678	 M TL Confre06 Abcdefgh 12345678	User is already logged on.
 M TL Confre07 Abcdefgh 12345678	 TL Confre08 Abcdefgh 12345678	 M TL Confre09 Abcdefgh 12345678	 TL Confre10 Abcdefgh 12345678	 TL Confre11 Abcdefgh 12345678	 M TL Confre12 Abcdefgh 12345678	KS No. 1234 Username(16Char) Page 3/8 Pagename
 M Confre13 Abcdefgh 12345678	 TL Confre14 Abcdefgh 12345678	 M Confre15 Abcdefgh 12345678	 TL Confre16 Abcdefgh 12345678	 M TL Confre17 Abcdefgh 12345678	 M Confre18 Abcdefgh 12345678	Settings Logoff
 M Confre19 Abcdefgh 12345678	 TL Confre20 Abcdefgh 12345678	 M TL Confre21 Abcdefgh 12345678	 TL Confre22 Abcdefgh 12345678	 M TL Confre23 Abcdefgh 12345678	 M TL Confre24 Abcdefgh 12345678	Go to Page... Rename Page...
						prev next
						Monitor Mute Hold
						Dial MCS Ring
						Pots MultiTL (max. 8)



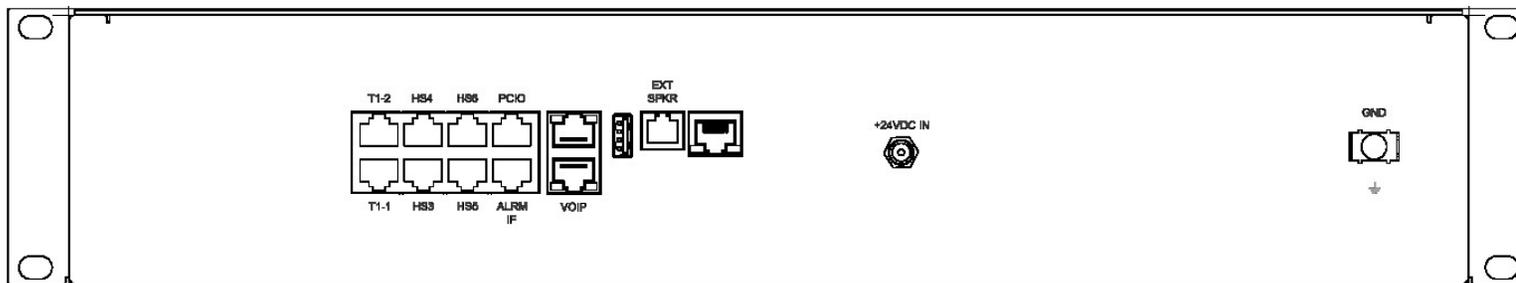
Space Communications Customer Forum

Type E Keyset

Front View



Back View





Space Communications Customer Forum

Space Network (SN) Project

Keiji K.Tasaki
Deputy Project Manager (Ground)
Space Network Project/Code 452
NASA/Goddard Space Flight Center

Jon Z. Walker
Deputy Project Manager (Space)
Space Network Project/Code 452
NASA/Goddard Space Flight Center



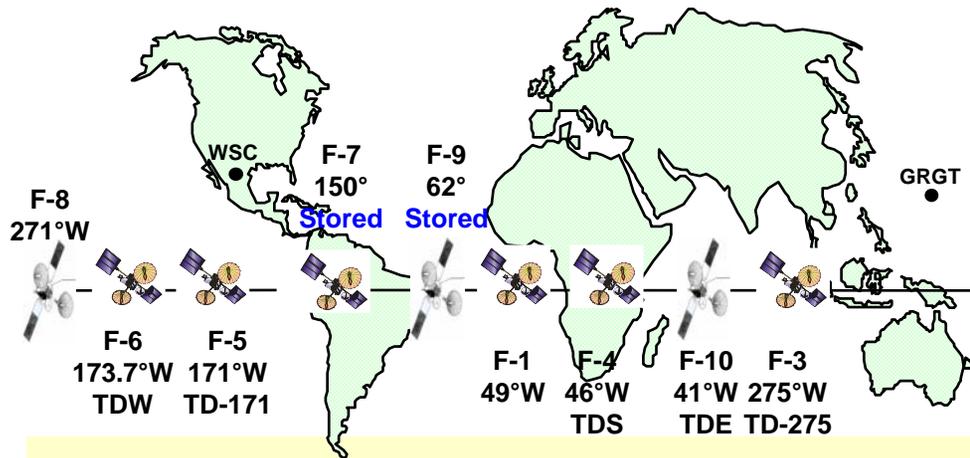
Space Communications Customer Forum #16

Space Network Code 452

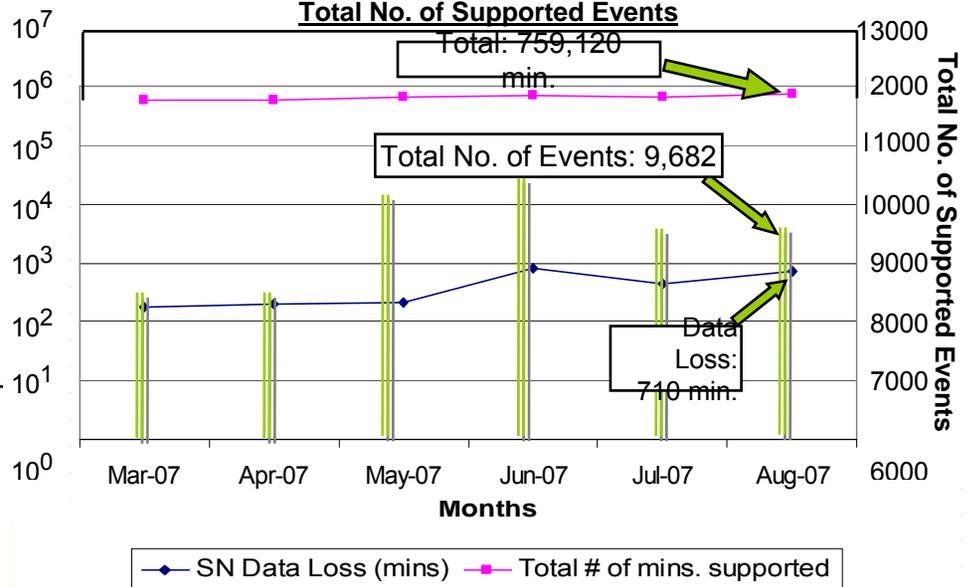
Project Manager:	Roger Flaherty
Deputy Project Manager (Ground):	Keiji Tasaki
Deputy Project Manager (Space):	Jon Walker
Systems Engineer:	Mike Rackley
Financial Manager:	Paula Tidwell
Prime Contractor:	Honeywell Technology Solutions, Inc. (HTSI)

September 20, 2007

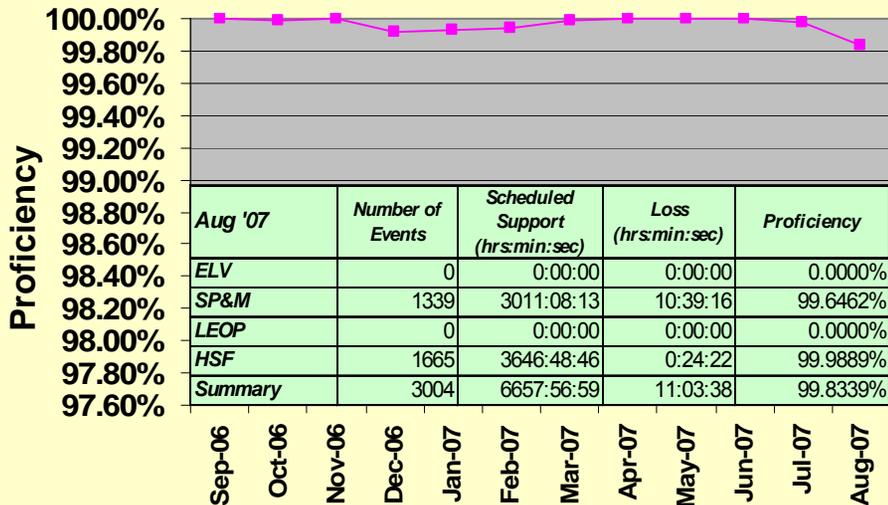
Space Network at a Glance



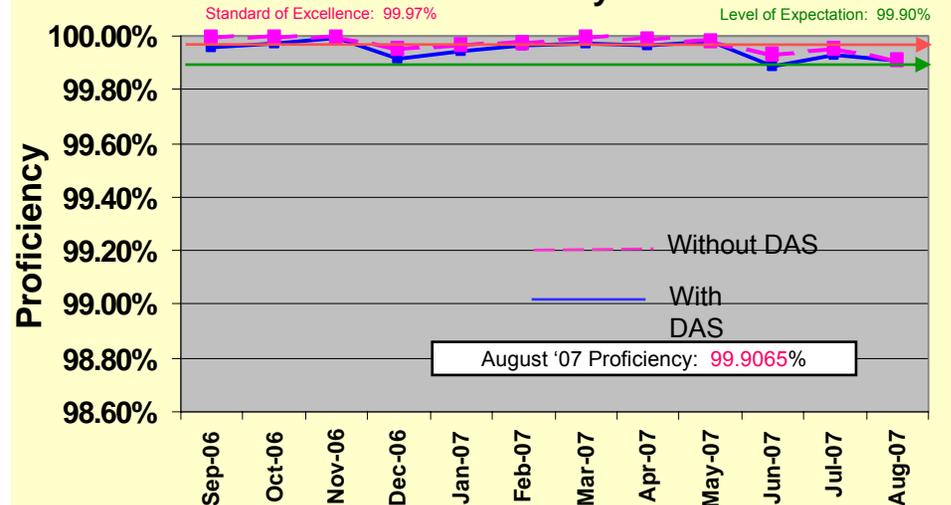
Minutes of Support and Minutes of Data Loss



SN Critical Support Proficiency Trend (with DAS)



SN Proficiency Trend

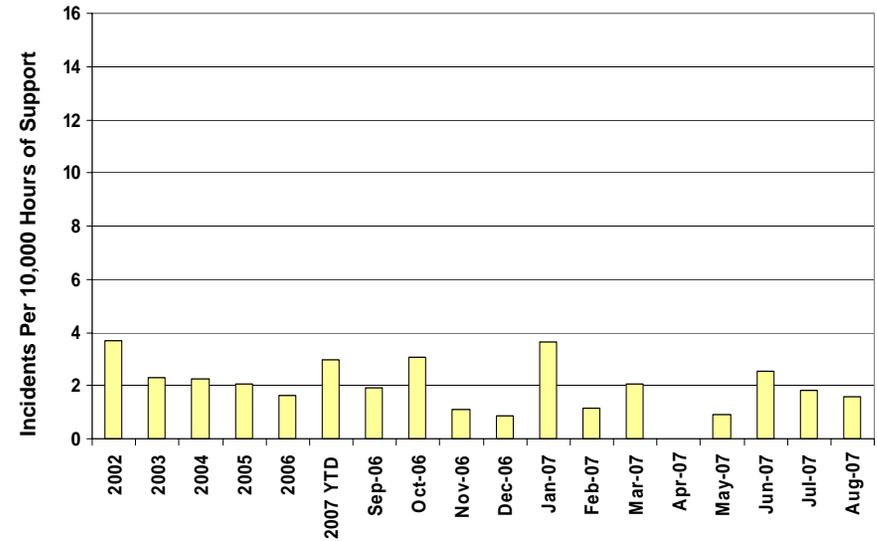


Missions	Total No. of Supported Events	Service Stat.	Proficiency (%)	Standard of Excellence (%)
Aqua, Aura, FUSE, GP-B, HST, ISS, L-5, L-7, SP&M, SPTR, Swift, TERRA, TRMM, ULDBP, XTE	9,682	12,652 hrs. sched 12,640 hrs. actual 11 hrs. 50 min. lost	99.91%	99.97%

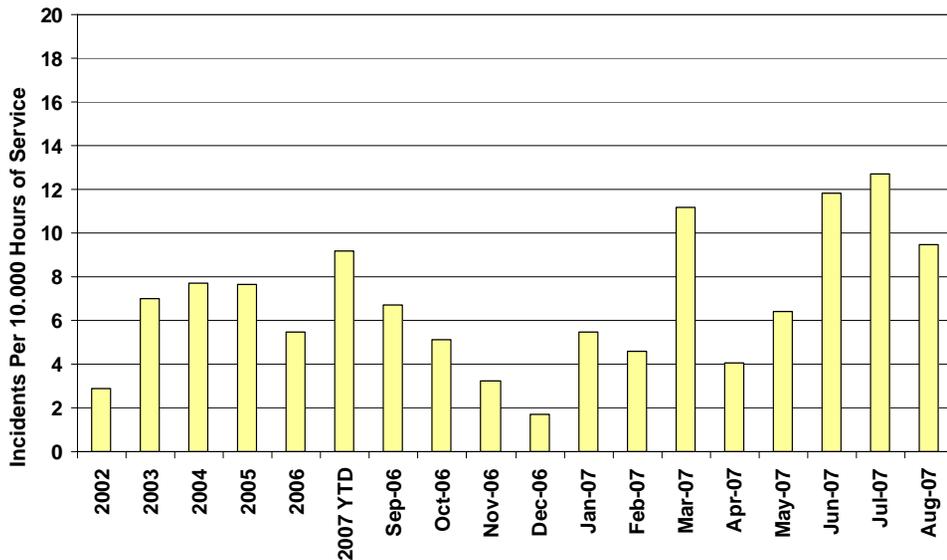
Space Network Error/Anomaly Trends

- Data loss errors only
- Only three error/anomaly types used
 - Operator error
 - Software anomaly
 - Hardware anomaly
- Normalized to 10,000 hours of support
- Metrics applicable to historical data
- The first five bars are for 2002 through 2006

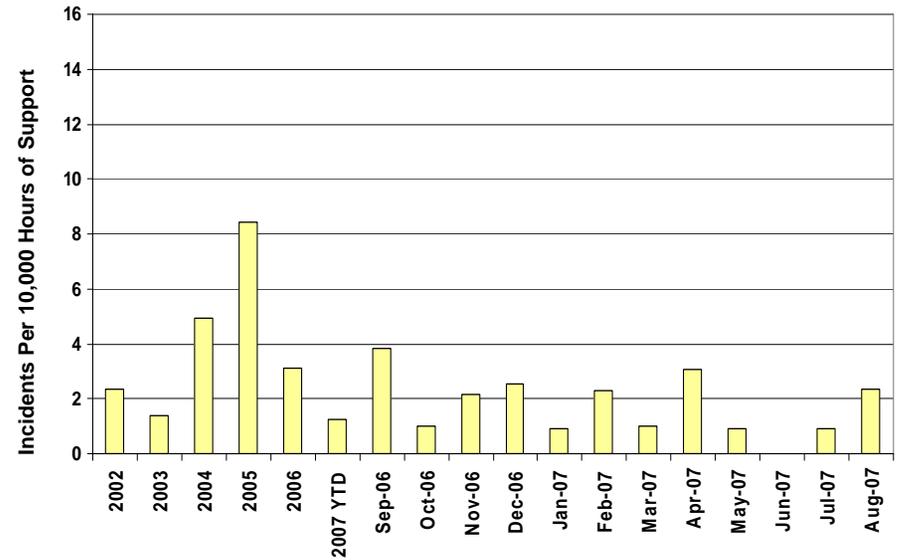
Space Network Ops Errors Versus Service Support
(Compared to Annual Averages for 2002 - 2006)



Space Network Hardware Anomalies Versus Service Support (Compared to Annual Averages for 2002 - 2006)



Space Network Software Anomalies Versus Service Support
(Compared to Annual Averages for 2002 - 2006)



Anomalies including DAS Only

TDRS Constellation Health (Status as of 8/31/2007)

F-1 Launch 04/83 49.0 °W 0 spare SGL TWT <i>Note 11</i>				
SA1	SA2			
S	S			
Ku	Ku	MA	BUS	TT&C

F-3 Launch 09/88 275.25°W 1 spare SGL TWT <i>Note 9</i>				
SA1	SA2			
S	S			
Ku	<i>Note 1</i> Ku	MA	BUS	<i>Note 16</i> TT&C

F-4 Launch 03/89 46°W 1 spare SGL TWT <i>Note 9</i>				
SA1	SA2			
S	S			
<i>Note 13</i> Ku	Ku	MA	BUS	<i>Note 7</i> TT&C

- Indicates fully operational
- Indicates backup unit(s) in use
- Indicates failed subsystem

General Notes:

- SGL TWTA Spares noted on chart.
- Ten-year design life for F-1 - F-7, 11 years for F-8 - F-10 and four years for on-orbit storage

Notes:

1. F-3 KSA2 polarization restricted to LCP, KSAR2 low performance; Redundant Ku-Band paramp selected to recover from switch anomaly
2. S-Band TWTA failed on F-3 (SSAF2), F-5 (SSAF1)
3. Both Ku-Band TWTA units on F-5 failed (KSAF1); Return available
4. F-8 MAR G/T shortfall
5. F-9 propulsion anomaly: failure of A-3 and W-2 thrusters
6. SSAR2 parametric amplifier failure on F-5
7. F-4 ESA and MFG LO failures
8. F-9 LO failure KSAR2
9. KSA Polarization services restricted on F-3 & F-4
10. F-3 Primary Coarse Sun Sensor Failure
11. F-1 SA2 SSAR & SSAF, KuSAR2 operational using WART
12. F-9 Primary Central Telemetry & Command Unit failure
13. F-4 KSA1F TWTA failure
14. F-8 payload deactivated 6/14/06, in support of SNE spiral 0 testing
15. F-6 SGL TWTA#4 failure, TWTA#3 activated
16. F-3 SGL TWTA#3 failure, TWTA#6 reactivated
17. F-5 SGL TWTA#6 failure, TWTA#1 activated

F-5 Launch 08/91 171.0°W 2 spare SGL TWT				
SA1	SA2			
<i>Note 2</i> S	<i>Note 6</i> S			
<i>Note 3</i> Ku	Ku	MA	BUS	<i>Note 17</i> TT&C

F-6 Launch 01/93 173.7°W 2 spare SGL TWT				
SA1	SA2			
S	S			
Ku	Ku	MA	BUS	<i>Note 15</i> TT&C

F-7 Launch 07/95 150.5°W Stored 4 spare SGL TWT				
SA1	SA2			
S	S			
Ku	Ku	MA	BUS	TT&C

F-8 Launch 06/00 271°W 2 spare SGL TWT <i>Note 14</i>				
SA1	SA2			
S	S			
Ku	Ku	MA	BUS	TT&C
Ka	Ka			

F-9 Launch 03/02 62.4 °W Stored 2 spare SGL TWT				
SA1	SA2			
S	S			
Ku	<i>Note 8</i> Ku	MA	BUS	TT&C
<i>Note 8</i> Ka	Ka			

F-10 Launch 12/02 40.9°W 2 spare SGL TWT				
SA1	SA2			
S	S			
Ku	Ku	MA	BUS	TT&C
Ka	Ka			

***Indicates Updates & Changes**

TDRS Constellation Bus Health (Status as of 8/31/2007)

F-1 Launch 04/83 49.0 °W				
<u>Note 1</u> TT&C	<u>Note 8</u> Power	<u>Note 2</u> Propulsion	Thermal	<u>Note 3</u> ACS

F-3 Launch 09/88 275.25°W				
TT&C	Power	Propulsion	Thermal	<u>Note 4</u> ACS

F-4 Launch 03/89 46°W				
<u>Note 5</u> TT&C	Power	Propulsion	Thermal	<u>Note 6</u> ACS

- Indicates fully operational
- Indicates backup unit(s) in use
- Indicates failed subsystem

General Notes:

- Ten-year design life for F-1 - F-7, 11 years for F-8 - F-10 and four years for on-orbit storage

F-5 Launch 08/91 171.0°W				
TT&C	Power	Propulsion	Thermal	ACS

F-6 Launch 01/93 173.7°W				
<u>Note 12</u> TT&C	Power	Propulsion	Thermal	ACS

F-7 Launch 07/95 150.5°W Stored				
TT&C	Power	Propulsion	Thermal	ACS

Notes:

1. F-1: Transponder A unusable; no spare TWTA
2. F-1: A-side thruster manifold and -Roll thruster failed
3. F-1: CPE-A failed; Gyro 1/2 failed
4. F-3: Coarse Sun Sensor - A failed
5. F-4: MFG-A Tlm LO failed
6. F-4: ESA-A failed
7. F-9: Thrusters A3 & W2 failed
8. F-1 High Rate Charge capability from Battery 1 failed
9. F-9 Primary Central Telemetry & Command Unit failure
10. F-1 Telemetry Processor C/RCTU B failure
11. F-8 payload deactivated 6/14/06, in support of SNE spiral 0 testing
12. F-6 Telemetry processor A failed

F-8 Launch 06/00 271°W <u>Note 11</u>				
TT&C	Power	Propulsion	Thermal	ACS

F-9 Launch 03/02 62.4 °W Stored				
<u>Note 9</u> TT&C	Power	<u>Note 7</u> Propulsion	Thermal	ACS

F-10 Launch 12/02 40.9°W				
TT&C	Power	Propulsion	Thermal	ACS



Space Communications Customer Forum #16

TDRS Constellation Status

- **Transition of a 2nd generation TDRS to SN Expansion**
 - TDRS-8 on station at 271°W and supporting the first customer
 - Additional customers to be added in the fall, when SNE Spiral 2 ORR is completed

- **TDRS-K, -L**
 - TDRS Project funded in FY07 for the start of procurement activities
 - RFP released at the end of March 2007 and proposals are being evaluated



Space Communications Customer Forum #16

Space-to-Ground Link Terminal-7 (SGLT-7) at Guam Remote Ground Terminal (GRGT)

- SGLT-7 / TDRS-8 combination will not be available for general use
- SNE Spiral 0 $\xrightarrow[\text{Transition}]{\text{M\&O}}$ SGLT-7 occurred on 2/9/07 after a successful ORR
- Contract modification to include M&O into NENS core is being negotiated
- The Spiral 1 system is installed and supporting the first customer
- Schedule
 - Spiral 1 ORR Successfully completed
 - Spiral 2 ORR Fall 2007



Space Communications Customer Forum #16

Second Guam Antenna System (SGAS)

Status

- SGAS reflector was assembled and installed on pedestal
- SGAS radome assembled, but high winds delayed the radome lift
- Tropical storm passed by Guam, but outer band winds exceeded the uninstalled radome spec (~65 mph), destroying radome
- Manufacturer was insured and is fabricating a new radome, to be installed this spring
- SGAS antenna to be disassembled until new radome ready

Schedule

- | | |
|----------------------------------|-------------|
| – Installation and test of 16.5M | Completed |
| – Installation of new Radome | Spring 2008 |
| – Testing of 16.5M and 5M | Spring 2008 |
| – ORR | TBD |



Space Communications Customer Forum #16

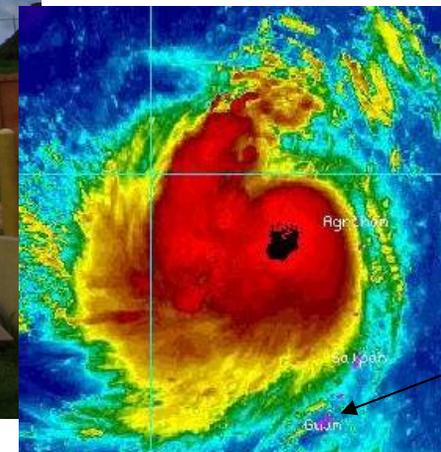
GRGT SGAS Radome Ready for Assembly



Assembled upper radome



*Lower radome panels
installed on ringwall*



Tropical Storm passes north of Guam on 7/30



Space Communications Customer Forum #16

GRGT Radome Destruction



Result of winds exceeding uninstalled radome specs



Space Communications Customer Forum #16

TDRSS K-band Upgrade Project (TKUP)

- **Replace and enhance the TDRSS Ku-Band return data services, and optionally increase the Ka-Band return data services to 1.5 Gbps via the 650MHz channel.**
 - Request For Information (RFI) – Jan. 2006
 - Demonstration Requirements Review – Aug. 2006
 - Demonstration RFP – Oct. 2006
 - Demonstration contract award – May 2007
 - Tech. Interchange meetings and prelim. Demos – through Nov. 2007
 - Final Demonstration and report – Jan. 2008 and Feb. 2008
- **Cx participation via the JPL Ka-Band Rate 1/2 LDPC CODEC.**
- **Provided the GSFC Rate 1/2 LDPC CODEC core to both contractors.**
- **Plan activities beyond the demonstration phase, recognizing that there are several major parallel Ground Segment efforts taking place.**
- **Obtain funding to carry out the next steps.**



Space Communications Customer Forum #16

BRTS Replacement

- **Status**

- NENS awarded contract to General Dynamics for 9 units
- 8 of 9 units have been delivered, have been tested, and are ready for deployment.
- The last unit, the spare, will be delivered shortly.

- **Schedule**

- System Requirements Review 3/3/2004
- NENS Task Start 4/2005
- Preliminary Design Review 3/22/2006
- Critical Design Review 10/26/2006
- Ascension Installation Late October 2007
- Alice Springs Installation Mid November 2007
- WSC Installation Late November 2007
- American Samoa Mid December 2007



Space Communications Customer Forum #16

Demand Access System (DAS)

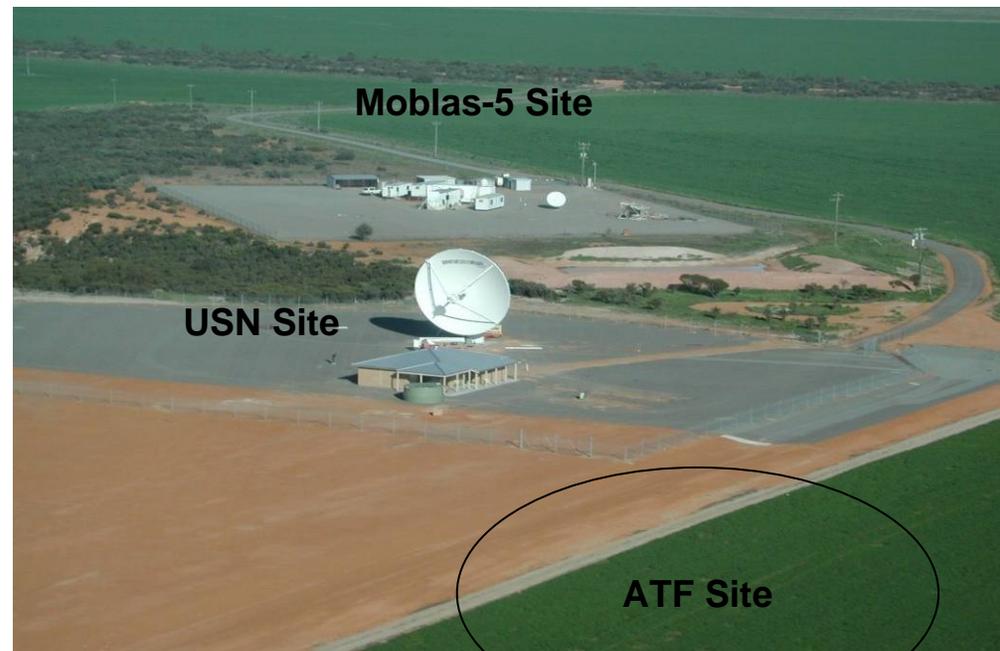
- **DAS proficiency in support of Swift for August was 99.88%, largest outage due to GDIS outage.**
- **Support of multiple/simultaneous missions will be a challenge, i.e., Swift and C/NOFS, plus balloons, though it has been demonstrated.**
- **Funding for the procurement of expansion units is in the FY08 budget.**
- **SN looking at various capacity expansion options to meet DAS demand.**



Space Communications Customer Forum #16

Australian TDRS Facility

- Limited motion TT&C facility to track drifting/stored TDRS
- Also provide contingency TT&C support (no user service) for Indian Ocean Region TDRS
- Located in western Australia; co-located with Moblas-5 and USN sites
- Site facilities preparations underway
- 11m antenna ready for shipment this week
- Planned to be operational in Spring 2008





Space Communications Customer Forum #16

Education & Public Outreach

Space Operations Learning Center



Space Operations Learning Center (SOLC) is a great place for students to learn about space! Through informative videos and challenging interactive simulations. Choose from a variety of Flight Training Modules to learn, and explore the many interesting and exciting facts about space.



The Space Operations Learning Center is a joint effort between two organizations at NASA Goddard Space Flight Center:

- The **Space Network Project (Code 452)** provided most of the funding and resources for the SOLC development. The **Real-time Software Engineering Branch (Code 584)** provided the management oversight of the overall design and development.

- The **Goddard Education Office (Code 130)** provided tremendous technical and consultation support to this development effort.

Special thanks to **Analytical Graphics, Inc. (AGI)** for their generous support. AGI provided the 3-D animations, software tools (AGI Viewer, STK), and technical support.

<http://solc.gsfc.nasa.gov>



Space Communications Customer Forum

Deep Space Network (DSN) 26M STATUS

Gene Burke
DSN TMS Manager
JPL Office 911
NASA/Jet Propulsion Laboratory



Space Communications Customer Forum

DSN 26M DECOMMISSIONING

- **Decommissioning schedule:**
 - **Goldstone DSS-16 completed January 31, 2006**
 - **Madrid DSS-66 September 30, 2008 ***
 - **Canberra DSS-46 December 30, 2008 ***
- * May occur earlier in case of catastrophic failure**



Space Communications Customer Forum

DSN 26M SUPPORT REQUIREMENTS

- **LEO & GEO Missions:**
 - Transition to GN to be completed by **September 30, 2007**
- **HEO/L1/L2/Lunar Missions:**
 - Transfer to DSN 34M subnet
 - . **26M now being used to offload from 34M**



Ground Network Accomplishments & Plans

John T. Jackson

Ground Network Orbital Services Manager

September 20, 2007



Current Network

Ground Network



Partner Station:
NOAA Satellite Facility
Gilmore Creek, Alaska



Alaska Ground Station
Poker Flat, Alaska



USN Alaska Station
North Pole, Alaska



Kongsberg Satellite Services
Svalbard, Norway



Wallops Ground Station
Wallops, VA



Satellite Applications Center
Hartebeesthoek, Africa



USN Australia Station
Dongara, Australia



McMurdo Ground Station
McMurdo Base, Antarctica



University of Chile
Santiago, Chile



Merritt Island Launch
Annex
Merritt Island, Florida



Alaska Satellite Facility
Fairbanks, Alaska



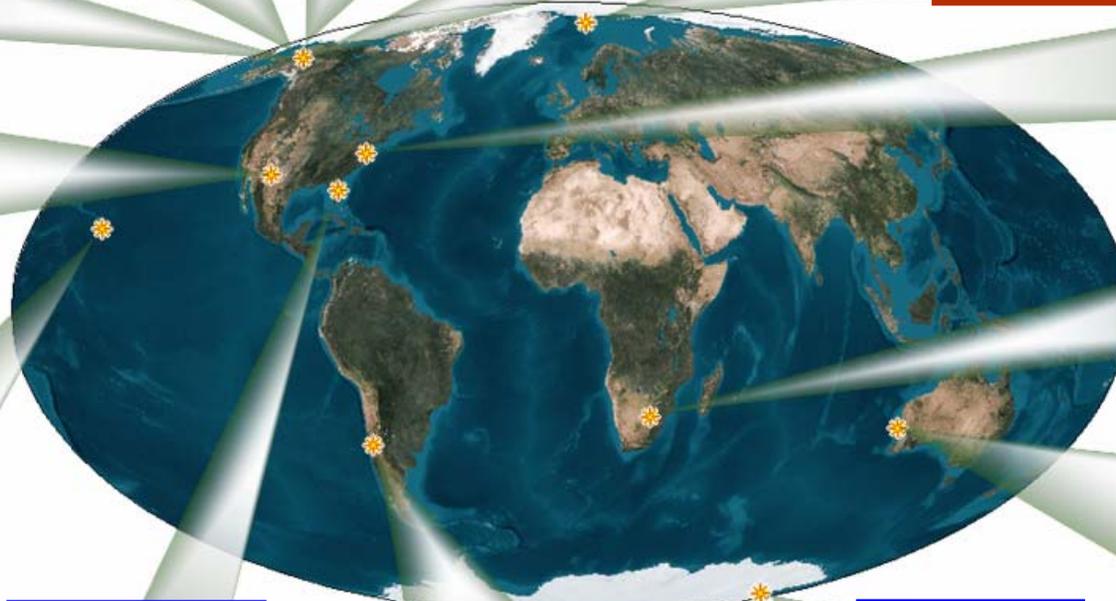
White Sands Complex
White Sands, New Mexico



USN Hawaii Station
South Point, Hawaii



- NASA
- Commercial
- Other Gov't Agency





Station Status

Ground
Network

Santiago, Chile (AGO)



Station Mission set includes: GOES, RHESSI, HST, IMP-8, LANDSAT-5, RADARSAT, SHUTTLE, SOLAR-B, SORCE, TDRS and THEMIS 1-5

Recent Achievements:

- Certified for Shuttle:
 - Provided 21 STS-117 on-orbit supports
 - Provided 23 STS-118 on-orbit supports
- Certified for Landsat-5 04/18/07.
- Certified the XP Programmable Telemetry Processor (PTP) for S-band mission set: HESSI, LANDSAT-5, THEMIS 1-5,
- Certified RADARSAT-1, which completed DSN 26m offload at AGO

FY08 Plans:

- Potential missions for certification in '08 include GRACE 1 and GRACE 2



Station Status

Hartebeesthoek, Africa (HBK)



Station Mission set includes THEMIS 1-5

Recent Achievements:

Provided THEMIS 1-5 TT&C support:

- Launch & Early Orbit Phase (L + 30),
- Ops Check-out and Verification Phase (through L + 60),
- On-Orbit Phase (through L+ 90)
- Supported 270 passes since launch 02/17/07

FY08/09 Plans:

Mission Orbit Placement	Sep 07 - Dec 07
Normal Science Operations	Jan 08 - Mar 09
Special Operations Support	Sep 07 - Mar 09
Contingency Support	Sep 07 - Mar 09



Station Status

Ground
Network

Alaska Satellite Facility



Station mission set includes: AIM,
ERS2, FAST, QUIKSCAT,
RADARSAT-1, SCISAT

Recent Achievements:

- Completed ASF Station SAFS Installation
- Identified source of AIM Radio Frequency Interference (RFI). Working resolution.

FY08 Plans:

- Certify Tracking Data at FDF
- Provide solution for Doppler Jitter in Tracking Data Formatter (TDF) in ASF 11-meter system
- Certify SAMPEX & TRACE
- Resolve AIM RFI issue.



Station Status

Ground
Network

Poker Flat Ground Station



Station mission set includes: AIM, ACRIMSAT, AQUA, AURA, CALIPSO, CHAMP, ELV, EO-1, FAST, GP-B, GRACE-1&2, ICESAT, JASON-1, LANDSAT-5, LANDSAT-7, QUIKSCAT, SAC-C, SAMPEX, SWAS, TERRA, TRACE, WIRE

Recent Achievements:

- Certified PF2 11-meter for GRACE-1, GRACE-2, ICESat, Landsat-5, Landsat-7 Quikscat, and TRACE. Aqua and Aura are awaiting official notification.
- Provided AIM launch and on-orbit support
- Completed Integration of two EOS Ground Station Interface Processors (GSIP's) into PF2-11.
- Certified AGS-11m for Radarsat for DSN 26m offload 09/13/07

FY08 Plans:

- Complete certification of PF2-11m for ACRIMSAT, CHAMP, GP-B, SAC-C and Terra.



Station Status

Universal Space Network



Recent Achievements:

- Completed certifications for HST at:
South Point, Hawaii 08/06/07
Dongara, Australia 07/25/07
- Completed certifications for TDRS
8,9,10 on 03/26/07
- Completed certifications for TDRS 1-7
at Australia and Hawaii on 06/28/07

FY08 Plans:

- Certify TDRS-7 at North Pole, Alaska
- Certify THEMIS on USN sites
- Support GOES-O Launch 3/15/08
and LEOP

USN mission set includes: FAST,
FUSE, GALEX, GOES-10,11,12,13,
HST, SWAS, SWIFT, TDRS 1-10,
TIMED, TRACE, WIRE,



Station Status

Ground
Network

Svalbard Ground Station



Station mission set includes:
ACRIMSAT, AIM, AQUA, AURA,
CHAMP, EO-1, FAST, GP-B,
GRACE-1&2, ICESAT, LANDSAT-7,
QUIKSCAT, SAC-C and TERRA

Recent Achievements:

- Provided AIM launch and on-orbit support
- In process of certifying NOAA 14, 15, 16 and 17 on SG1 for DSN-26m offload support. NOAA has repaired NISN interface board (SIMPAC) and is making software modifications required for data ingest from SG1.

FY08 Plans

- Complete SG1-11m NOAA certification
- Certify SG2 11-meter for AIM



Station Status

Ground
Network

McMurdo Ground Station (MGS)



Recent Achievements:

- Preparing for COSMIC supports.

FY08 Plans:

- Install Enertec system providing upgraded capabilities including QPSK
- Install new Antenna Control Unit (ACU)
- Install new Station Standard Autonomous File Server (SAFS)
- Install new Programmable Telemetry Processor (PTP)
- Complete QuikSCAT certification
- Support Landsat-7 Maneuver October 2, 2007

Station mission set includes: COSMIC, EO-1, ERS-2, ELV, FAST, GOME, GP-B, GRACE-1&2, ICESAT, Landsat-7, QUIKSCAT, RADARSAT-1, SAC-C, SAMPEX, SWAS, TRACE, WIRE



Station Status

Ground
Network

White Sands Complex-1 (WS1)



Recent Achievements:

- Completed Assembly and Preliminary Integration
- Supported LRO MOR

FY08 Plans:

- Complete Acceptance Testing
- Transition WS1 Into operations
- Certify/Support THEMIS
- Test with POLAR
- Certify/Support other near earth S-Band missions

Station mission set includes:

LRO, THEMIS, TBD Near Earth S-Band Missions



Station Status

Ground
Network

Wallops Ground Station



Station mission set includes: ACRIMSAT, AIM, AQUA, AURA, CALIPSO, CHAMP, CHIPSAT, ELV, EO-1, FAST, FUSE, ELV, GOES, GP-B, GRACE 1&2, HESSI, HST, ICESAT, ISS, JASON-1, QUIKSCAT, STS, SAC-C, SAMPEX, SEAWIFS, SOLAR-B, SORCE, SOYUZ, SWAS, THEMIS, TRACE, & WIRE

Recent Achievements

- Completed re-certification of the 11-meter mission set with the exception of ICESAT, Landsat-5 and QUIKSCAT. Quikscat is certified for normal operations TR codes
- Successfully supported the STS-117 launch 06/09/07, and provided 22 on-orbit supports
- Successfully supported the STS-118 launch 08/08/07, and provided 63 on-orbit supports.
- Completed WGS Station Standard Autonomous File Server (SAFS) installation and transition to ops 05/14/07
- Supported AIM, (2)ATLAS-V, (2) SOYUZ, TACSAT and NFIRE launches
- Complete equipment relocation from 11-meter pedestal to shelter.
- Complete Enertec Installation in WGS-11m system
- Complete VHF computer replacements
- Certified WGS-11m for RADARSAT in support of DSN 26m offload

FY08 Plans:

- Recertify the 11-meter for ICESat, Lansat-5 and the remaining QUIKSCAT contingency support configurations
- Certify the 11-meter for TDRS
- Complete VHF1 equipment relocations
- Complete transition to Enertec on WGS-11m

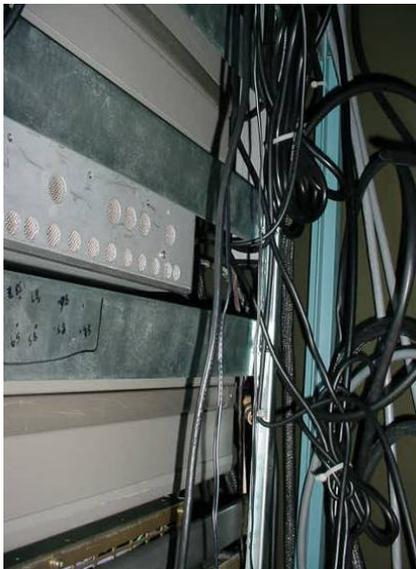


Wallops Antenna Pedestal Racks Relocation

Ground Network



Front View



Rear View

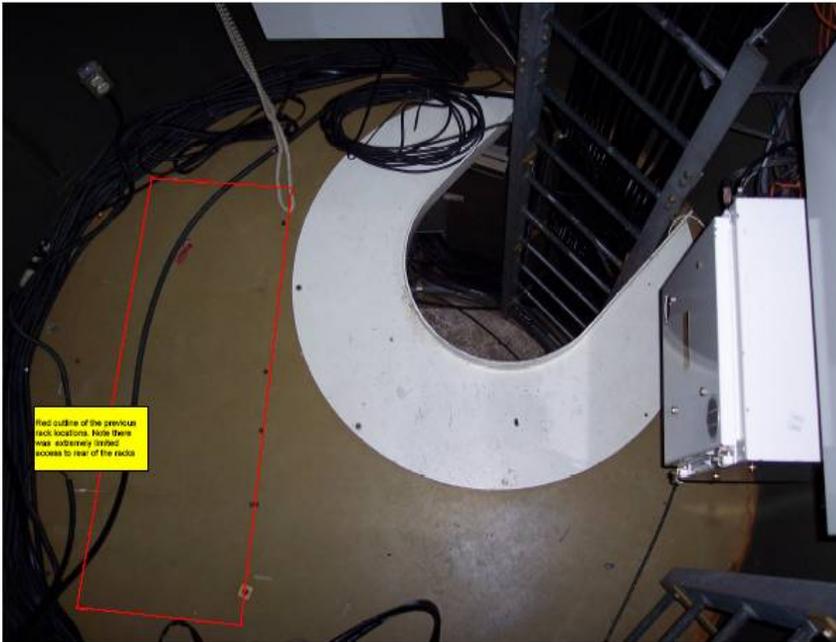


**Rear Access
(6-inches)**



Wallops Antenna Pedestal Racks Relocation

Ground Network



Previous Rack Location



Relocated Equipment Racks



Wallops Antenna Pedestal Racks Relocation

Ground Network





Summary

The Ground Network continues to streamline operations through:

- **The reduction of government-owned antenna systems and assets**
- **Increased usage of commercial service providers**
- **The redistribution of missions' support by certification of missions on remaining assets**

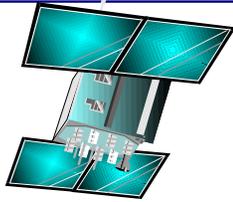


Flight Dynamics Facility

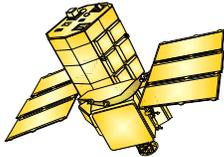
S. Hoge



FDF Support Services



Mission Design



- LEO, HEO, geosynchronous, lunar, deep space
- Launch windows
- Propulsion analysis
- Mission trade studies

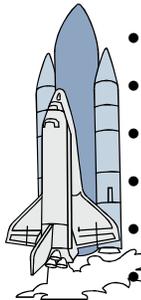


Launch Support for ELVs

- Orbital insertion vectors from tracking or telemetry
- Tracker acquisition data

Support for STS and

ISS



- Launch/landing
- Orbit determination
- Critical period support
- Acquisition data
- Planning aids
- SN Vector

Management

Orbit Determination and Control

- OD state vectors
- Ephemerides
- Orbit error analysis
- Metric tracking data analysis

FDF is an established operational facility providing multi-mission support

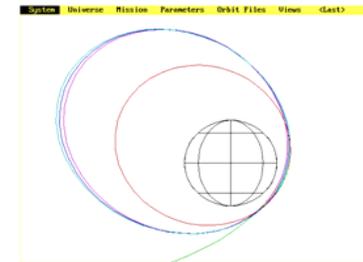
Spacecraft Operations

Support

- Launch/Early orbit support
- Operational support of all phases
- End-of-life disposal, controlled reentry

Trajectory Design, Orbit Analysis, Delta-V Maneuver Planning, and Calibration

- Trajectory/Delta-V targeting
- Trajectory Options
- Orbit Maintenance
- Burn Planning / burn commands
- Propulsion evaluation



Spacecraft Acquisition Data

- Ground Network
- Space Network
- Deep Space Network
- Non-NASA sites



Flight Dynamics Facility



- **FDF continues to support**
 - STS/ISS
 - 15-20 Robotic missions
 - TDRS
 - ELVs
- **Certification and Accreditation Audit in May**
 - Given Authorization to Process in August



FDF System Changes



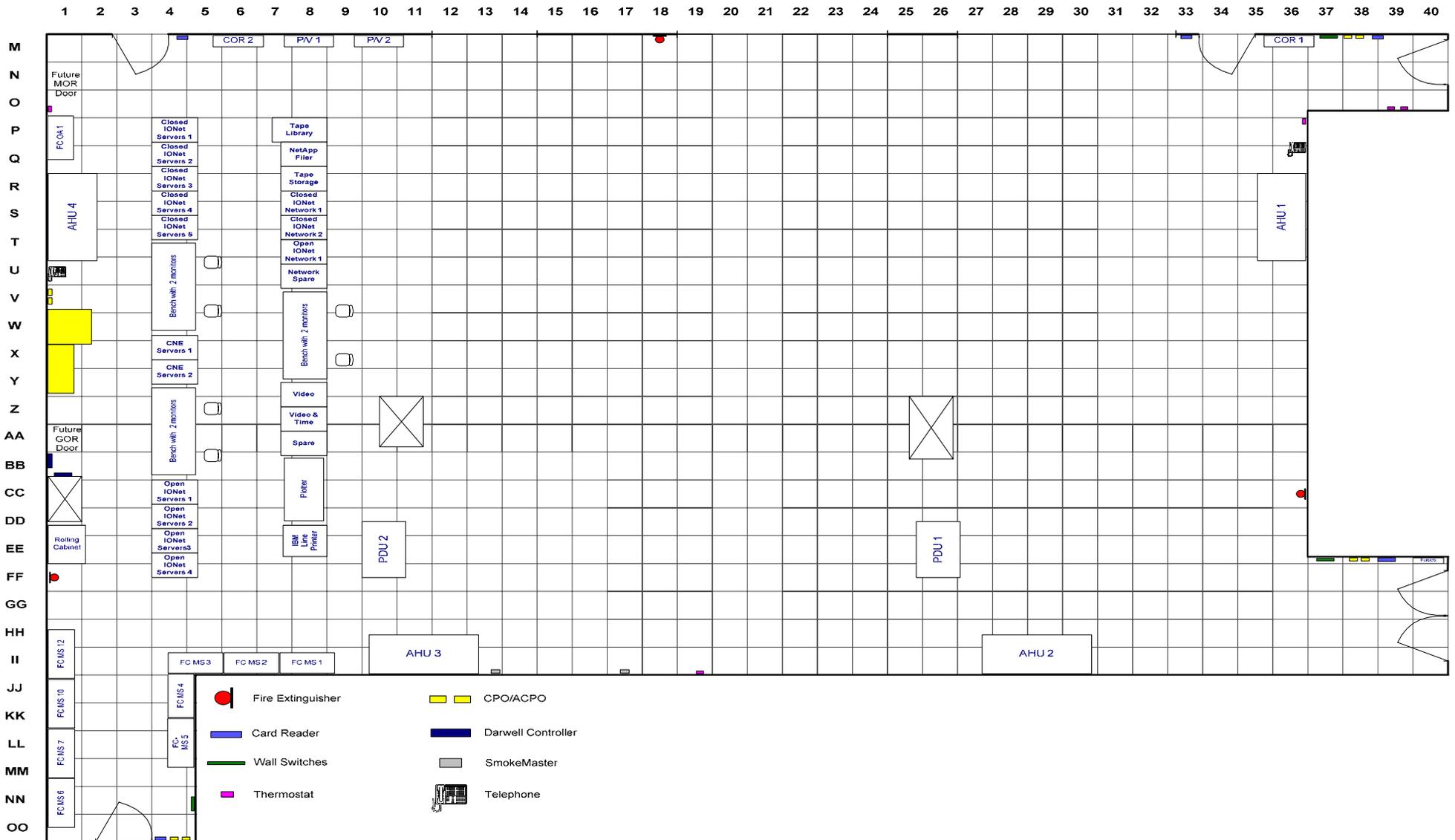
- Database upgrade from ORACLE 7.3.2 to ORACLE 9i
- Installed new database machines
- Upgrade UNIX operating system from HP-UX 10.2 to HP-UX 11
- Installed 4 new HP general purpose machines
- Replaced IONET switches
- Moved some/removed many/consolidated a few systems within COR



FDF Computer Room - Now



Computer Operations Room – Final View





FDF Architecture Study



- **Began architecture study in March 2007**
- **Multi-disciplined team from both Flight Dynamics Analysis Branch and the Information Systems Division**
- **Group look at present FDF**
 - Future mission set
 - Current problems/issues
- **White paper will be published September 2007**
 - Recommend GMSEC based architecture
 - High level implementation plan



FDF New Addition



- **Computer Aided Visualization Environment (CAVE) being installed in FDF COR**
- **Allows for 3-D visualization**
 - Used for trajectory design
 - Ops visualization
- **Calibration complete by mid-October**
- **Demonstrations tentatively beginning in November**



SCIP Overview and Status to the NIMO Customer Forum

9/20/2007

Ron Miller / John Hudiburg





Since We Last Talked...

SCIP

- **New SCaN AAA - Badri Younes**
 - He has hit the ground running
 - Is placing renewed emphasis on SCaN Program definition
- **The SCaN Program has been tweaking its structure and Roles and Responsibilities**
 - Not ready for Prime Time yet.
 - Role of SCIP has been expanded (next page)
- **Cx Program is involved in some major trades that effect Comm. and Nav**





Current Role of SCIP

SCIP

- **SCIP continues in its existing role as the main interface of the SCaN program for Cx.**
 - Working Systems Engineering and Requirements with Cx
 - Defining requirements for modifications to SCaN assets
 - Pre-Formulation of identified upgrades.

- **SCIP is also becoming the *Program Systems Engineering* entity for SCaN**
 - NOT SE for networks (DSN, SN, NEN responsible for internal SE)
 - Establishing Programmatic documentation
 - Developing “as is” Architecture
 - Assisting HQ in the development of program processes





Process Development

SCIP

- **SCIP** was required to develop many processes as a “project” - some of these are the basis for the SCan Program Process development
- The following chart is an example of the SE process **SCIP** implemented for Cx upgrades, which we will also implement at Program level.

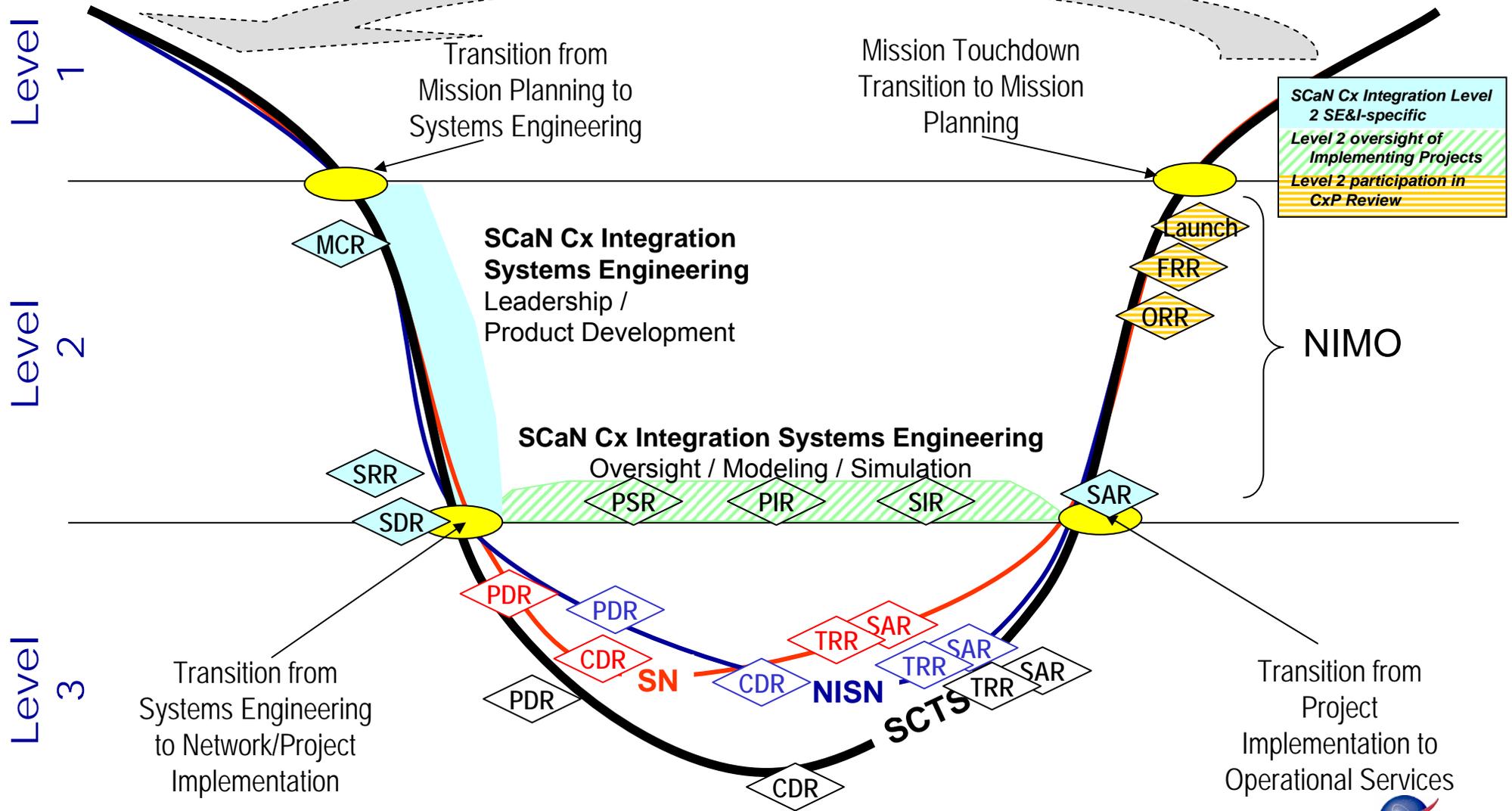




Office of Primary Responsibility Transition Process

SCIP

Lessons Learned Feed Into Future Mission / Network Asset Upgrade Planning





Status of Cx Interface

SCIP

- **Bob Menrad earlier gave Cx Status**
- **Cx Support Architecture change since last SCCF - No NASA Launch Head at KSC**
 - Expect to use ER Assets for Launch TLM and track
 - Expect to use SN for Orion CMD, and all TLM after exiting Launch vicinity.
 - Expect to use Navy MUOS system for UHF diverse comm..
- **Ongoing “reduced reliance on ground stations” study to conclude this CY**





Cx Interface (Cont)

SCIP

- **Orion is in the midst of a major “mass scrub”**
 - Many assumptions and implementations are in trade space
 - There are no scared cows in Comm. and Nav.
 - We expect some results announced in next few weeks.
 - Orion just completed their System Design Review

- **Ares has just started their SDR cycle**
 - Data rates off the vehicle have been in a lot of flux
 - Will likely result in some additional Comm. capability from Eastern Range over current TEL4/JDMTA.
 - Initiation of 2nd TDRS link (in addition to Orion) still in trade space.



Current SCaN Cx Upgrades in Study

SCIP

- **Compatibility Test Sets**

- Modular test racks to emulate SCaN elements for Compatibility Tests
- Include SN S and Ka band
- Upgradeable for GN and DSN in future.

- **SN Upgrades**

- IP Interface (SNIS) is under study.
- Analyzing other LDPC modulation formats for inclusion

- **NISN**

- Analysis underway to determine if upgrades are required to accommodate Cx C3I spec.



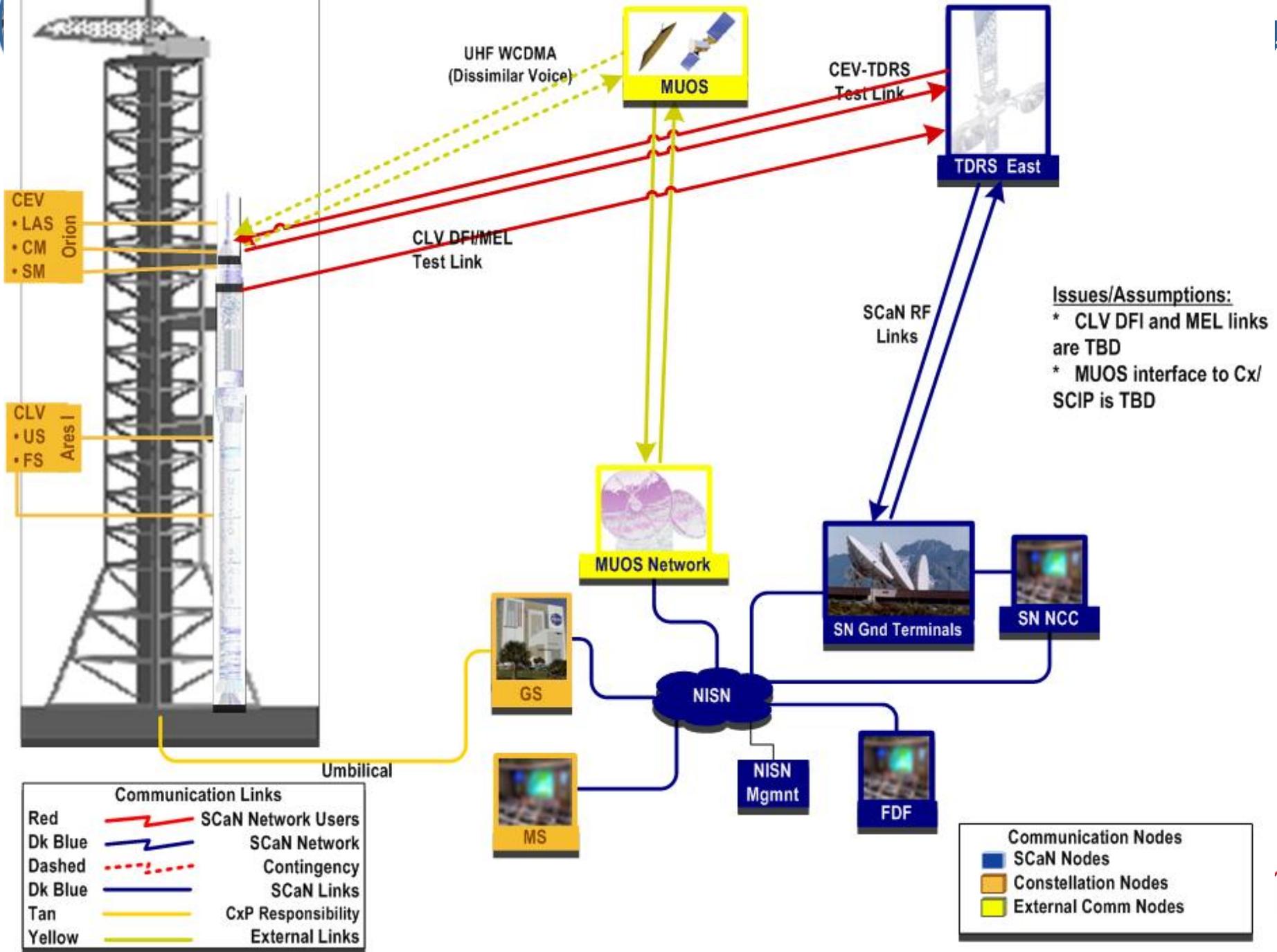


Interface Progress

SCIP

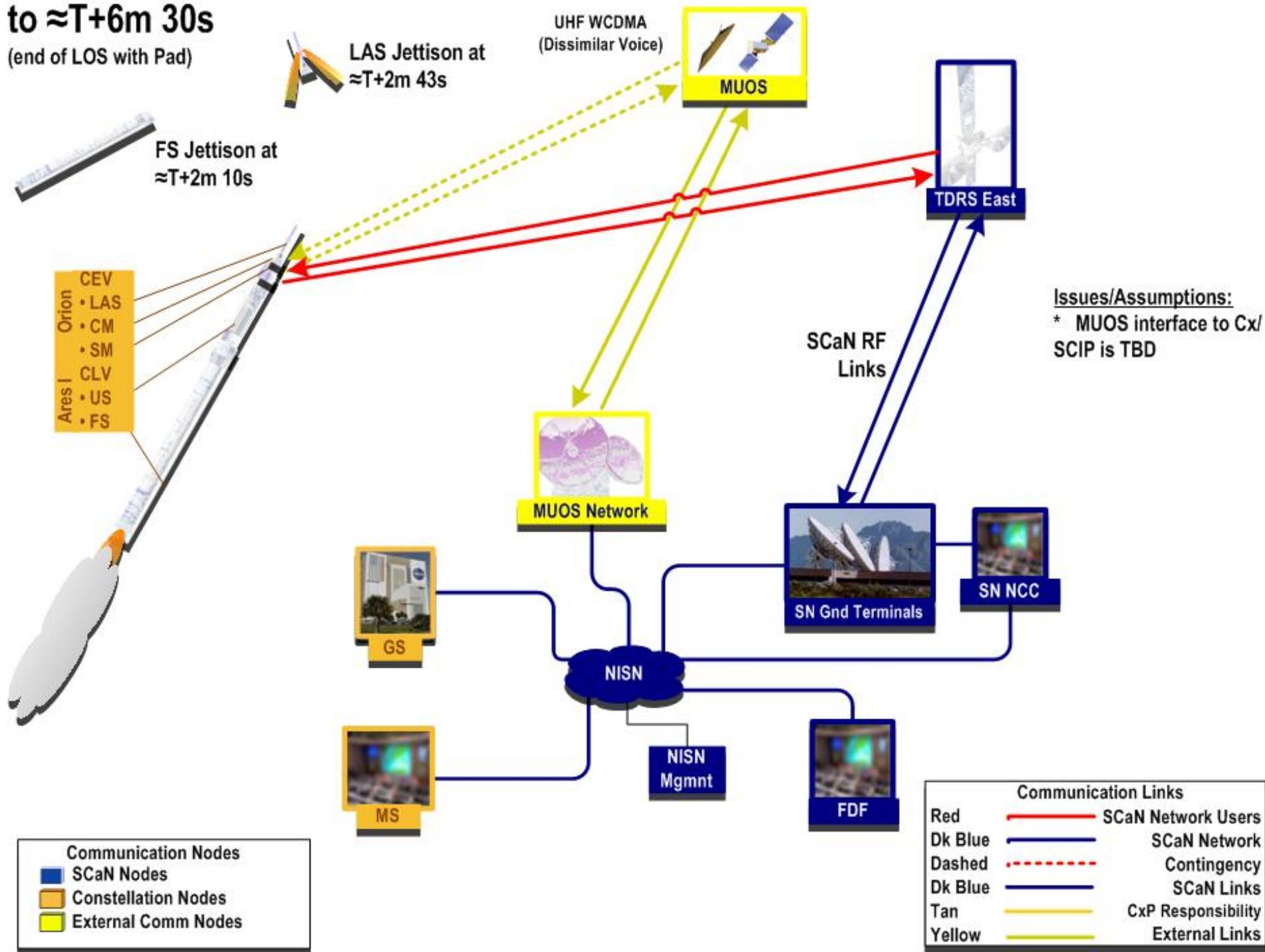
- **Have assisted Cx in the development of Architecture and Concept of Operations**
- **Working on cross-Program requirements closure**
- **Initial data flows are being developed in a “standard” and coordinated format between SCan and Cx**
 - Draft versions follow.

Pre-Launch

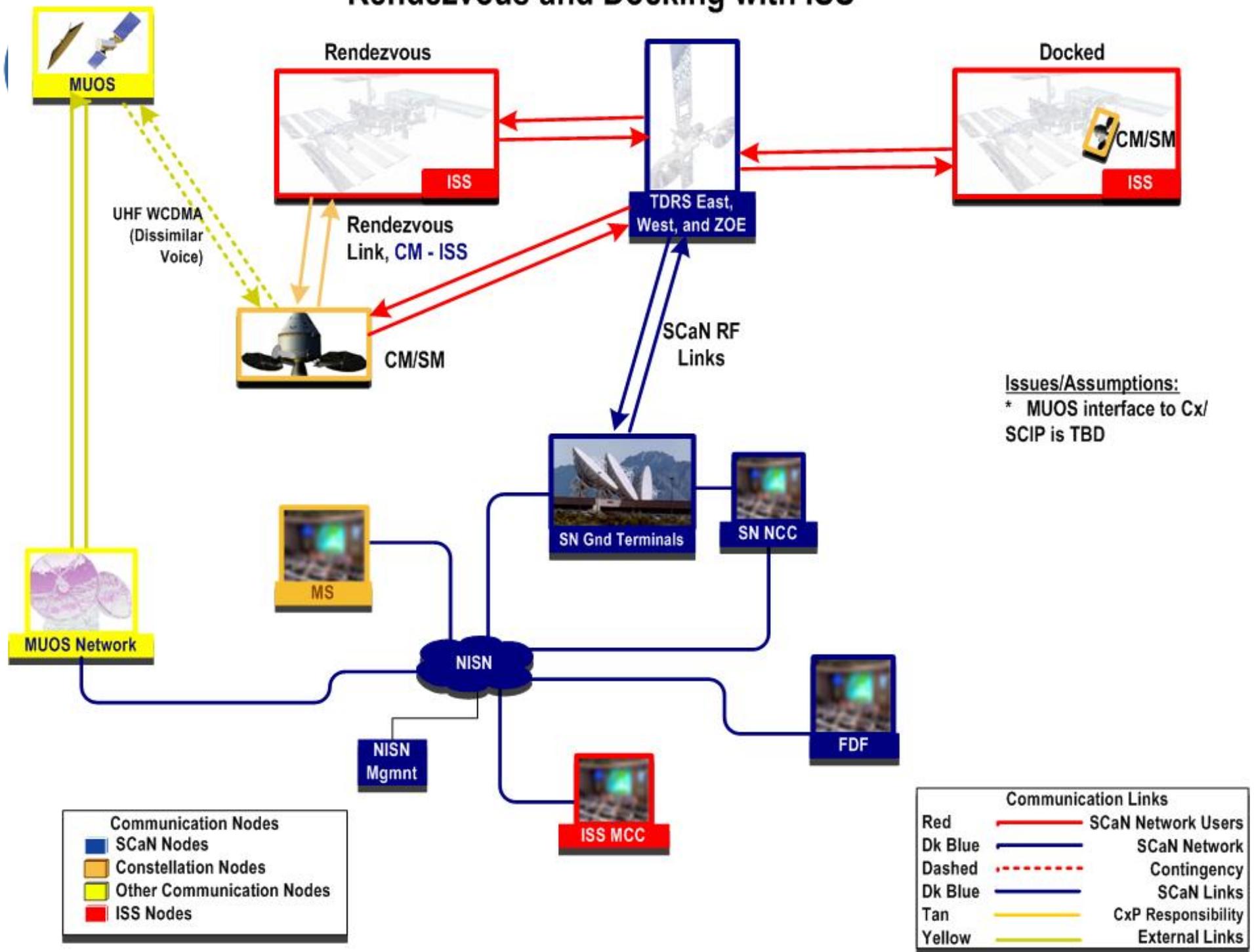


Launch from T0 to $\approx T+6m\ 30s$

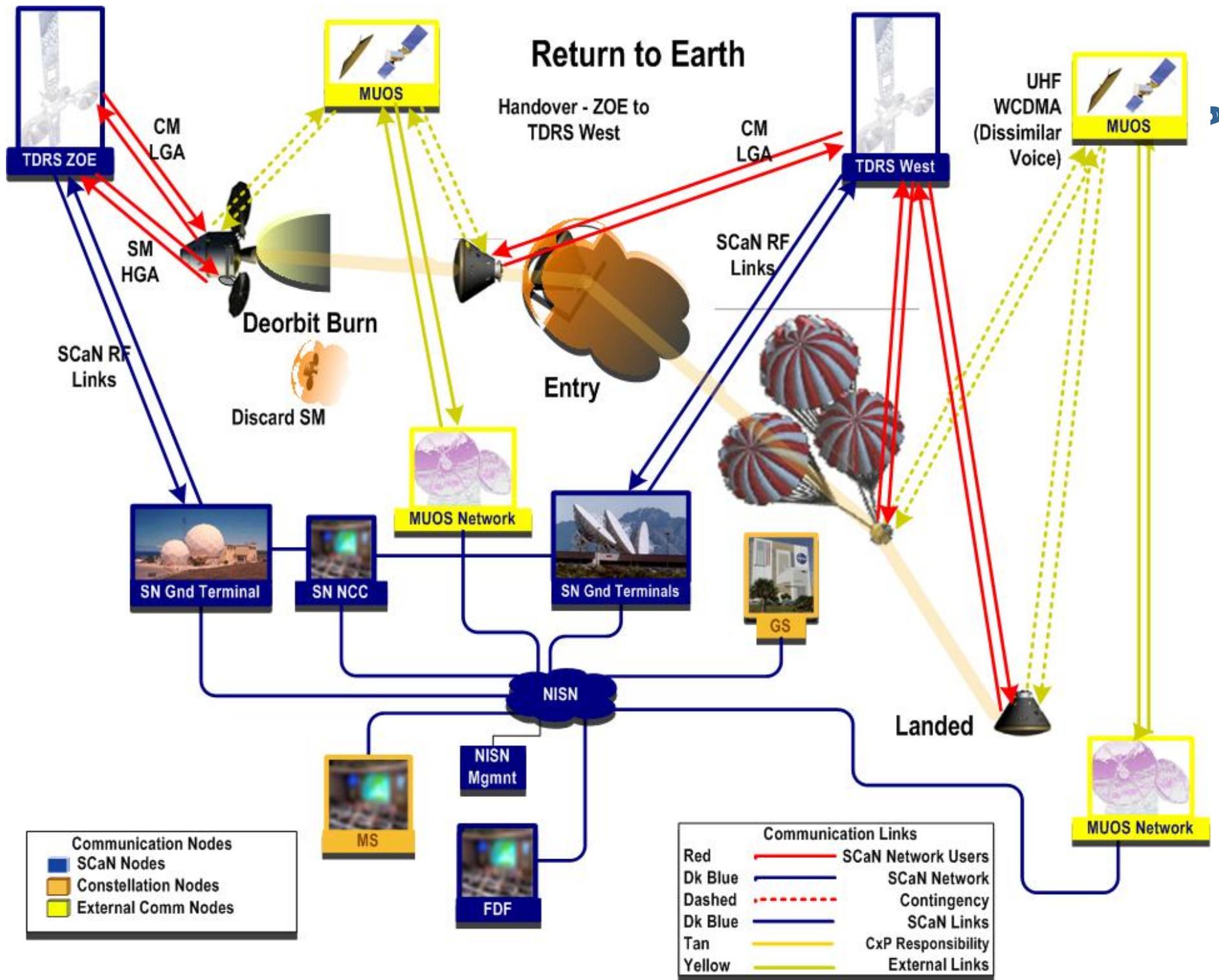
(end of LOS with Pad)



Rendezvous and Docking with ISS



Return to Earth





Summary

SCIP

- **Cx ISS phase Comm and Nav requirements appear to be converging - which is nice**
- **The SCaN Program is also converging - which is even nicer!**
- **By next SCCF, most of the uncertainty “should” be behind us..**





Space Communications Customer Forum

Open Floor

Allen J. Levine
Service Planning Manager
NIMO/Code 450.1
NASA/Goddard Space Flight Center



Space Communications Customer Forum

Closing Remarks

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