NASA/JAXA DTN DRTS TIM

NASA DTN Overview

MSFC Roles & Responsibilities for ISS DTN

MSFC Approach & Plans for DRTS Testing

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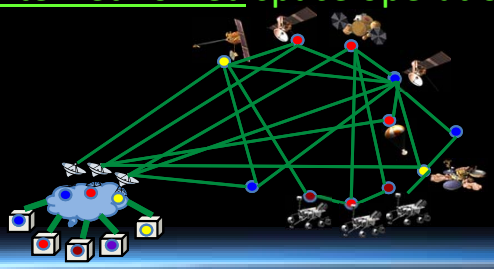
Objectives: NASA Space DTN Project

ISS International Lab

1. Mature DTN via ISS testing and use results to automate ISS Payload and Core operations **(AES)**
2. Continue Core Protocol development **(SCaN)**
3. Increase automation of current and upcoming point-to-point LEO and deep space mission operations
4. Lay DTN foundation for future internetworked space operations

Provide secure, accountable end-end data transfer with multiple Qualities of Service

Enable repurposing of spacecraft for future DTN relay support



SN

DSN

NEN

ISS Payload Users

Increase mission data return

Enhance international interoperability

MSFC

JSC

ESA

JAXA

JPL

APL

GSFC

Mission Support Networks

Facilitate networked sensor webs

DTN Core Team

Reduce Mission Operations costs

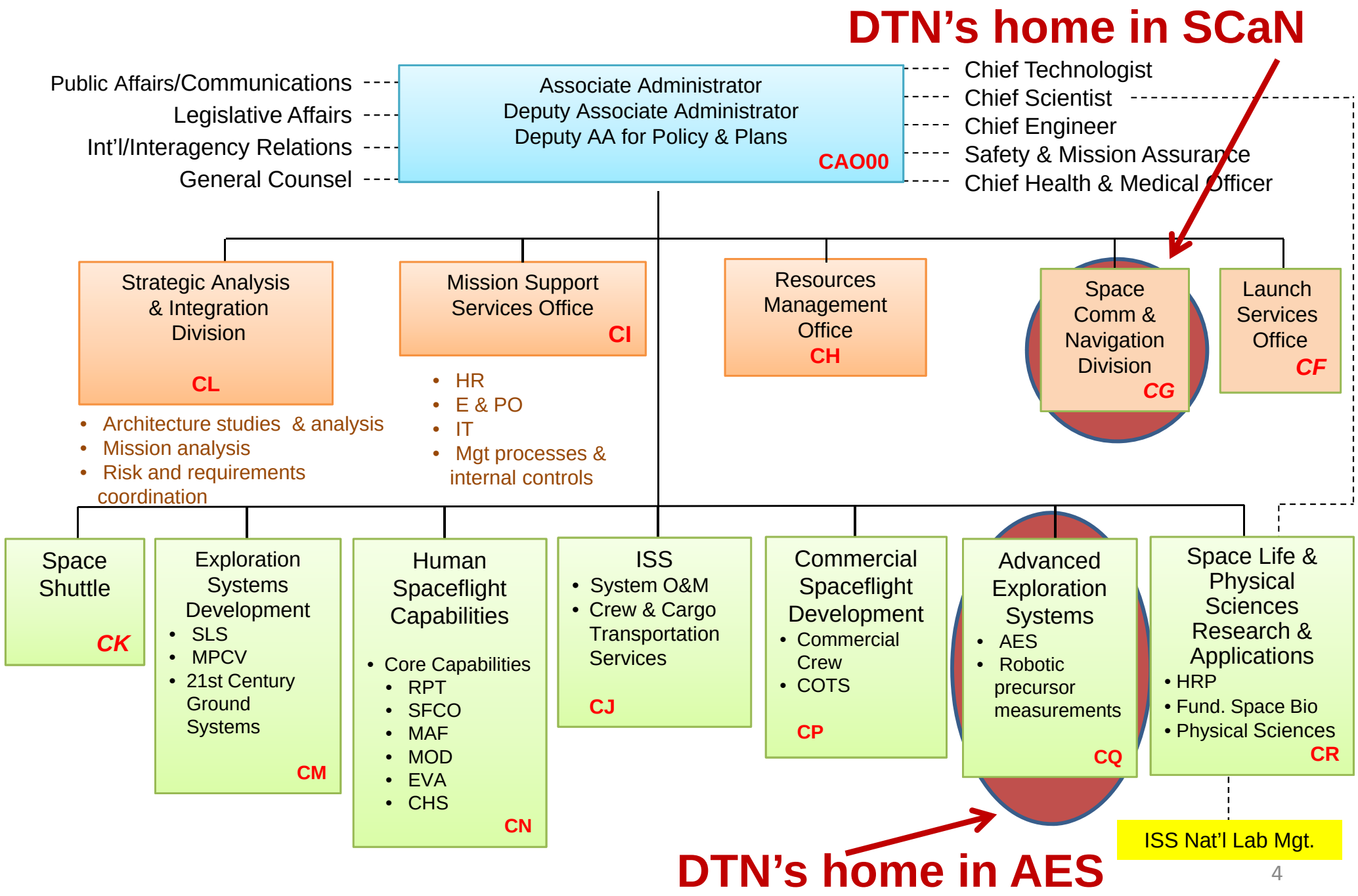
NASA DTN Project for FY13

- **The Project will be managed and executed jointly by the SCaN Technology Program and by the Advanced Exploration Systems office (AES) at NASA-HQ:**

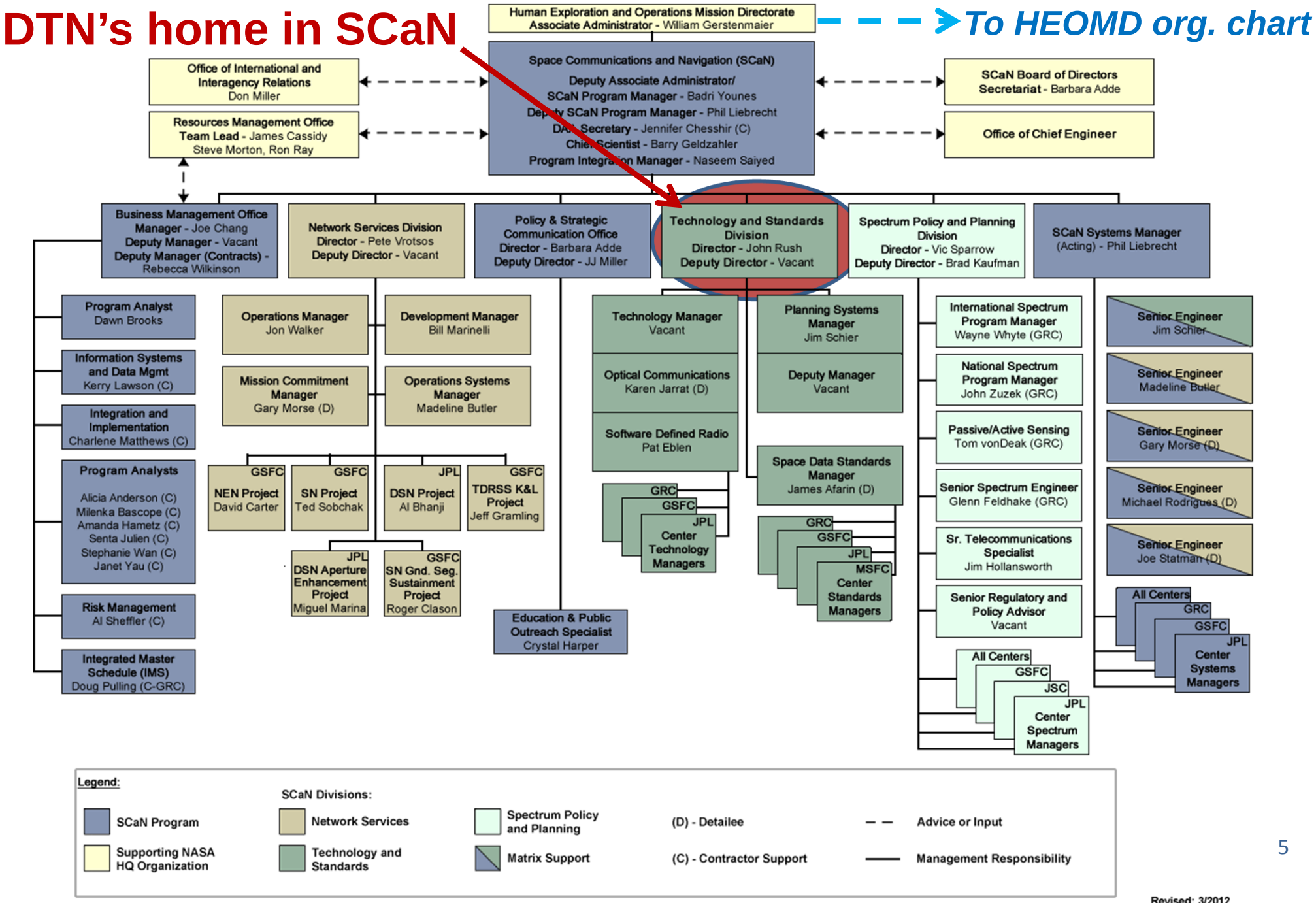
- **SCaN's role in FY13 will be to continue to support the protocol development and international standardization aspects of the DTN suite for NASA:**
  - **SCaN will fund the DTN Core Team activities**
  - **CCSDS Blue Books: 'LTP for CCSDS'; 'BP for CCSDS' – *the core DTN protocols* - are nearly complete**
  - **Solar System Internetworking Architecture document is complete**
  - **Key elements of the *full* DTN suite (routing, network management, security, key management, etc.) required to operate a space network are in early stages of development and their development will be funded by SCaN**
  - **DTN Project Focus in FY13 is Network Management and Security**
  - **Draft CCSDS Green Book on 'Network Management Concept of Operations' in work**

- **AES will take over the ISS test, demonstration and infusion activities for Human Space Flight:**
  - **All DTN flight test and demonstrations using the ISS or Human Space Flight Systems**
  - **MSFC will gradually assume responsibility for interfacing with payload customers and conducting flight development and demonstration activities**
    - **The University of Colorado will be retained in a consulting role during and after this transition.**

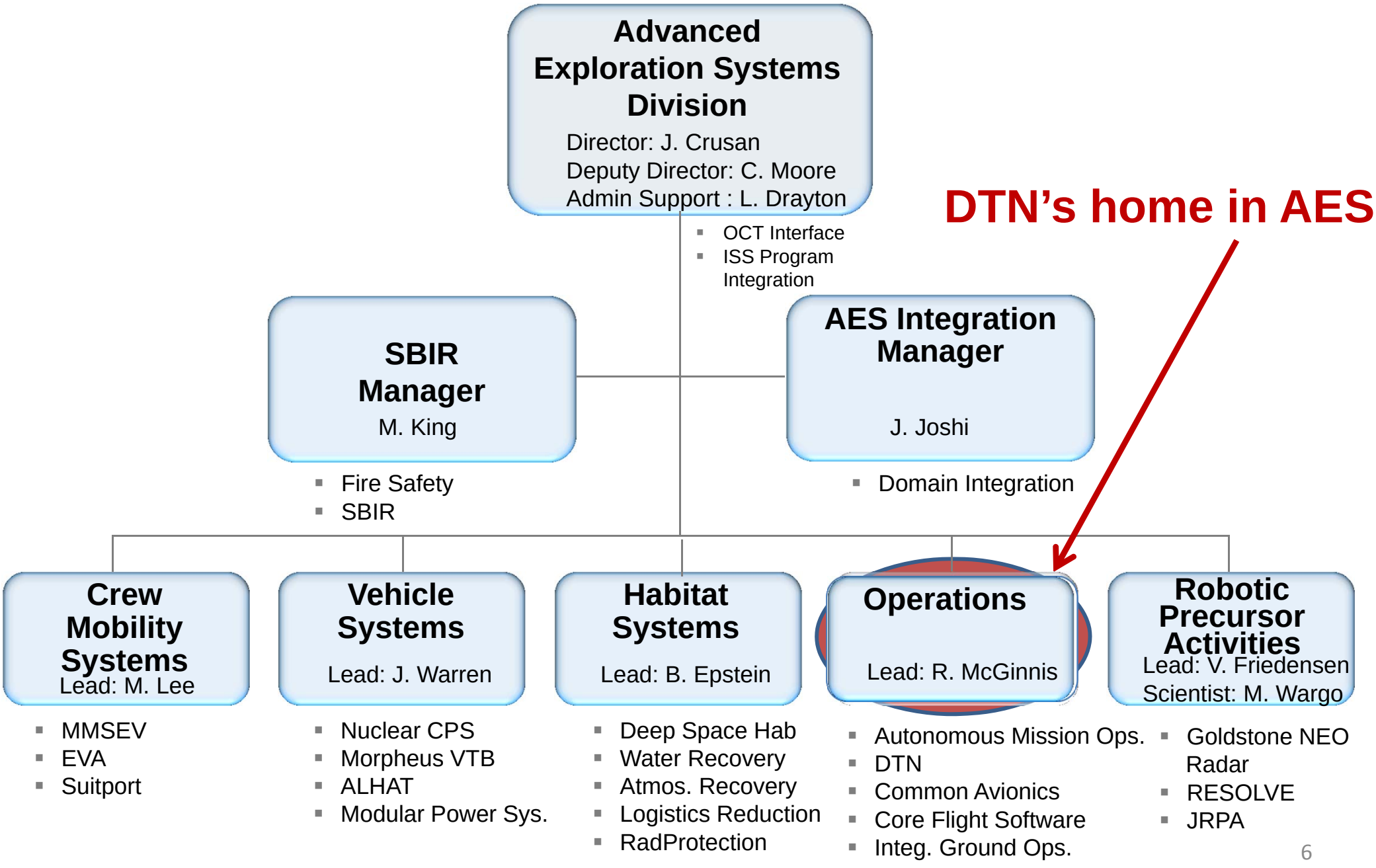
Human Exploration and Operations Mission Directorate Organization



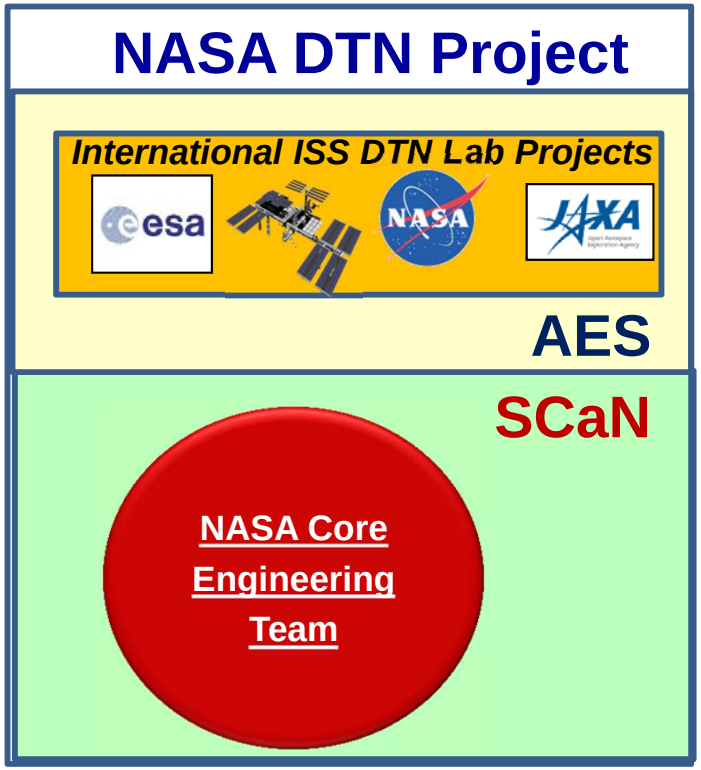
SCaN Organization Chart



Advanced Exploration Systems Organization Chart



New NASA DTN Project Management Structure:
Jointly Managed by SCaN and AES



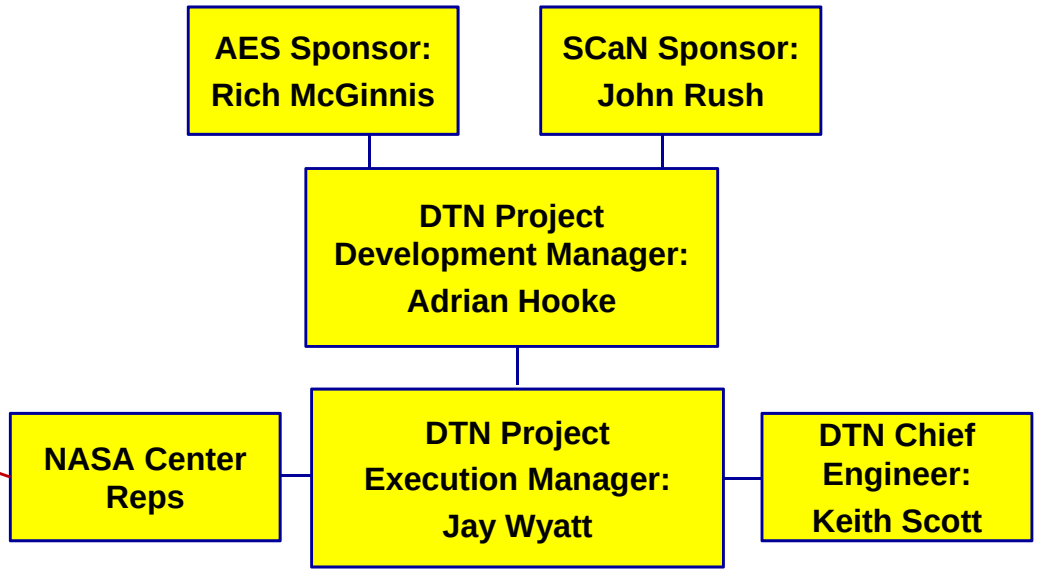
AES: **oversees all NASA DTN flight test and demonstration activities conducted on the ISS:**

- ***NASA formal Point of Contact:***
  Richard McGinnis, NASA-HQ

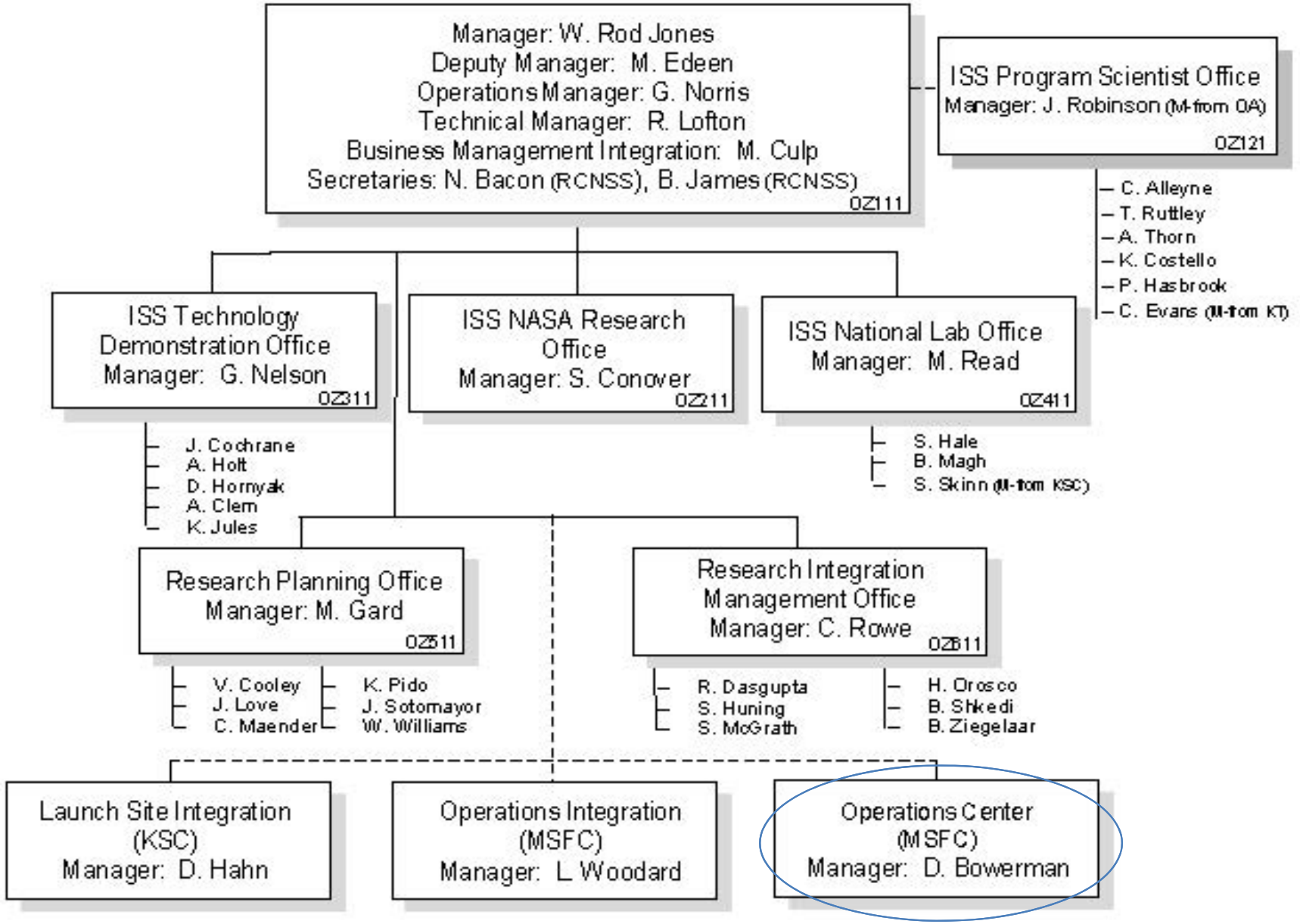
SCaN: **oversees all NASA DTN protocol engineering, development and validation activities, including international standardization:**

- ***NAS formal Point of Contact:***
  John Rush, NASA-HQ

Ed Birrane/APL
Kevin Gifford/CU
Phil Paulsen/GRC
Dave Leucht/GSFC
Jay Wyatt/JPL
Adam Schlesinger/JSC
Mike Kearney/MSFC



Research Integration Office



Approved on 6/28/12

W. Rod Jones
Manager

8 Date

(OZ-n)Research Integration Office

M - Matrix

MISSION OPERATIONS LABORATORY

Office of the Manager – EO01 (6)
Jay F. Onken, Director
Lewis Wooten, Deputy Director
Lybrease F. Woodard, Associate Manager
Michael W. Kearney III, Lead Technology. Manager
Raymond W. Shaughnessy, Technical Assistant
Norma W. Coleman, MSA

Resource Management Office - EO02 (6) [WYE 2]
Debrah B. Underwood, Chief
Robyn A. Brick (AO)
Georgia A. James
Phyllis M. Ragland
James K. Rice
Serena C. Sage
Vacant

Integration & Advanced Planning Office – EO04 (6) [WYE 2]
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Victoria L. Stewart, MSA
Deborah S. Bowerman
Christopher J. Bramon
Steven P. Durham
Carmen S. Price (assume role upon completion of SEB)
Michael D. Watson

Operations Directors Office – EO03 (31) [WYE 18]
Sam V. Digesu, Chief
Vacant, Deputy Chief
Dawn B. Walton, MSA

Mission Execution Team
Vacant, TL
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Craig A. Cruzen
Stephanie R. Dudley
Steven V. Dyer
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Carol D. Jacobs
Clifton A. Jones
Geoffrey D. Lochmaier
Jody (Joby) L. Minor
A. Jay Nichols
Jason E. Norwood
Katherine J. Presson
Michael T. Shell
Jeffrey A. Stephenson
Stephen A. Wise
*TJ Creamer (JSC MOU)

Mission Development Team
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Cynthia S. Grant
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Timothy J. Horvath
Bobby T. Money
Denise P. Morris
Patricia M. Patterson
Ricardo Rodriguez
Donna S. Simpson
Kenneth L. Stacy
James P. Whitaker

TOTAL CS: 151
7/16/12
UNOFFICIAL ORG CHART

Planning, Operations & Analysis Branch
EO10 (16) [WYE 47]
Raymond T. Echols, Chief
Lori D. Manis, Assistant
Carol Bruno, MSA (DC)

Mission Planning Team
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Martha B. Cash
Dexter J. Edmond
Callie D. Gerhardt
Edward E. Litkenhous
Christopher J. Traylor
Vacant – critical hire
Vacant – critical hire

Operations Control Team
Vacant, TL
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Tresa K. Mitchell
Beau C. Simpson
Paul F. Tatum

Erek J. Allen (Co-Op)
Leslie D. Smith (Co-Op)
Vacant (co-op)

Training & Crew Operations Branch
EO20 (20) [WYE 61]
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Jenna E. Ruddock
Dorinna D. Thom
Mardi M. Wilkerson

Payload Training Team
Vacant, TL
Crescentia M. Canerday
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Francee P. Logston
Reagan N. Malone
Sheila W. McDonald
Melinda H. Naderi
Penny J. Pettigrew
Shannon L. Rutherford
Carole Y. Wagner

Keon Hawthorne (Co-Op)
Vacant (Co-Op)

Space Systems Operations Branch
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P. Kevin Barnes
Edward A. Bermea
John C. Calvert
Jessica A. Caudle
Judith A. Gregory
Kevin D. Hix
Javiheir Q. Hogan (Jarvis)
George W. Olden
Edwin B. Smith

DC = Deltha Critique

Operations Engineering Branch
EO40 (29) [WYE 26]
R. Mark McElyea, Chief
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Pamela M. Stone, MSA

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Karla T. Kochevar
J. Greg Parrish
Courtney K. Ryals

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John Gulick
W. Russell Lane

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Daniel L. Gunter
Angela T. Haddock
Gary E. Knickerbocker
J. Todd Thompson
Van A. Woodruff

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Suman Chakrabarti
S. Kaye Inman
Kay S Martin
David A. Smith
Samantha Shine (Co-Op)
Vacant (Co-Op)

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Joseph L. Pirani, Deputy
Angela F. Trimew, MSA

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Susan B. Best, TL
Patrick E. Meyer
Kerri A. Minton
Kimberly G. Muery
Leatha M. Richardson

Systems Software Development Team
Michelle P. Schneider, TL
Stephen A. Chubb
E. Jeff Lippincott
Christopher L. Sims

Systems Engineering & Architecture Team
Amy S. Epps, TL
Andrew J. Cecil
Rodney P. Grubbs
Gayleen C. Ijames
Kelvin F. Nichols
David W. Scott
Bryan K. Walls

Systems Integration, Operations And Maintenance Team
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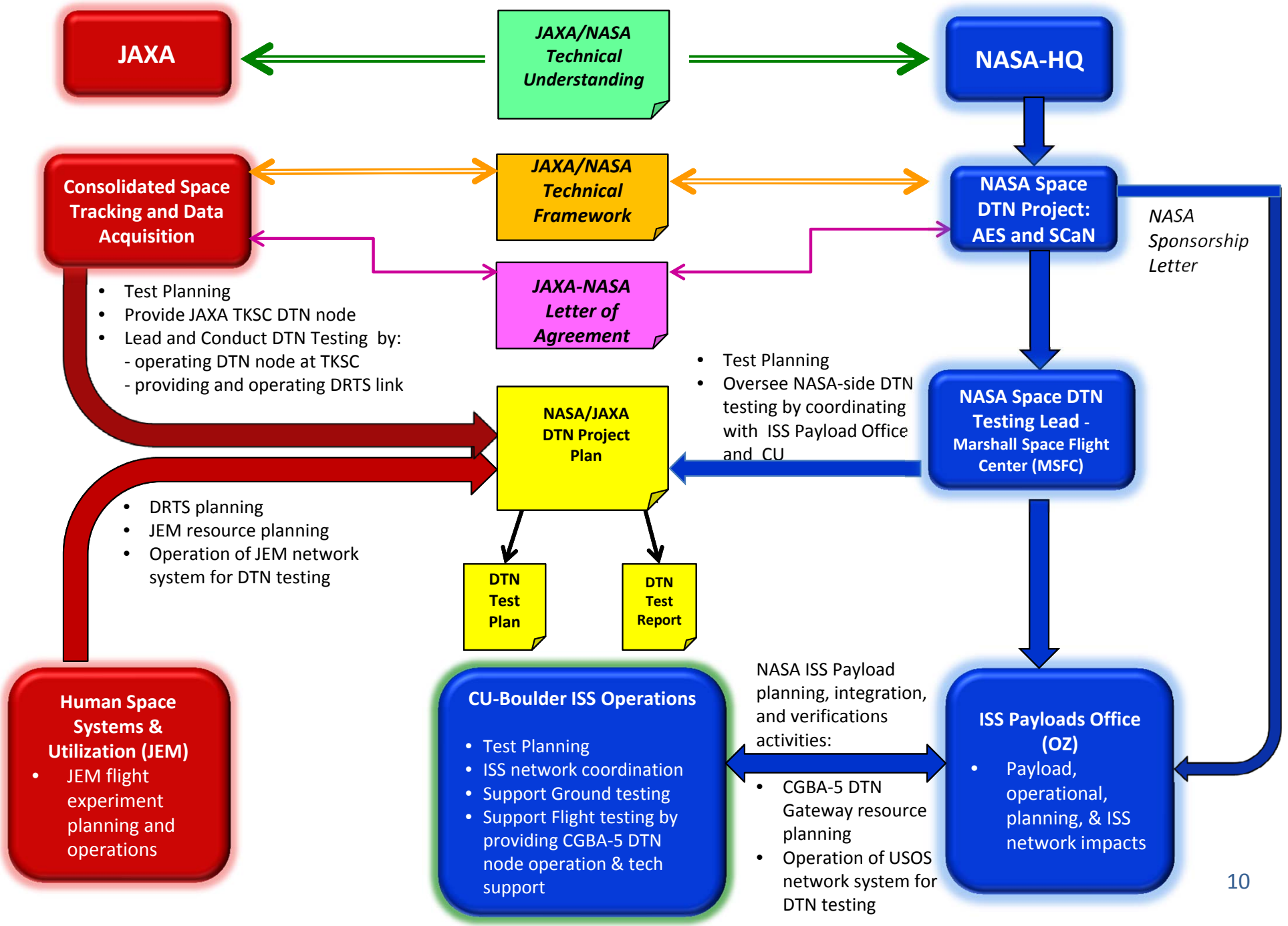
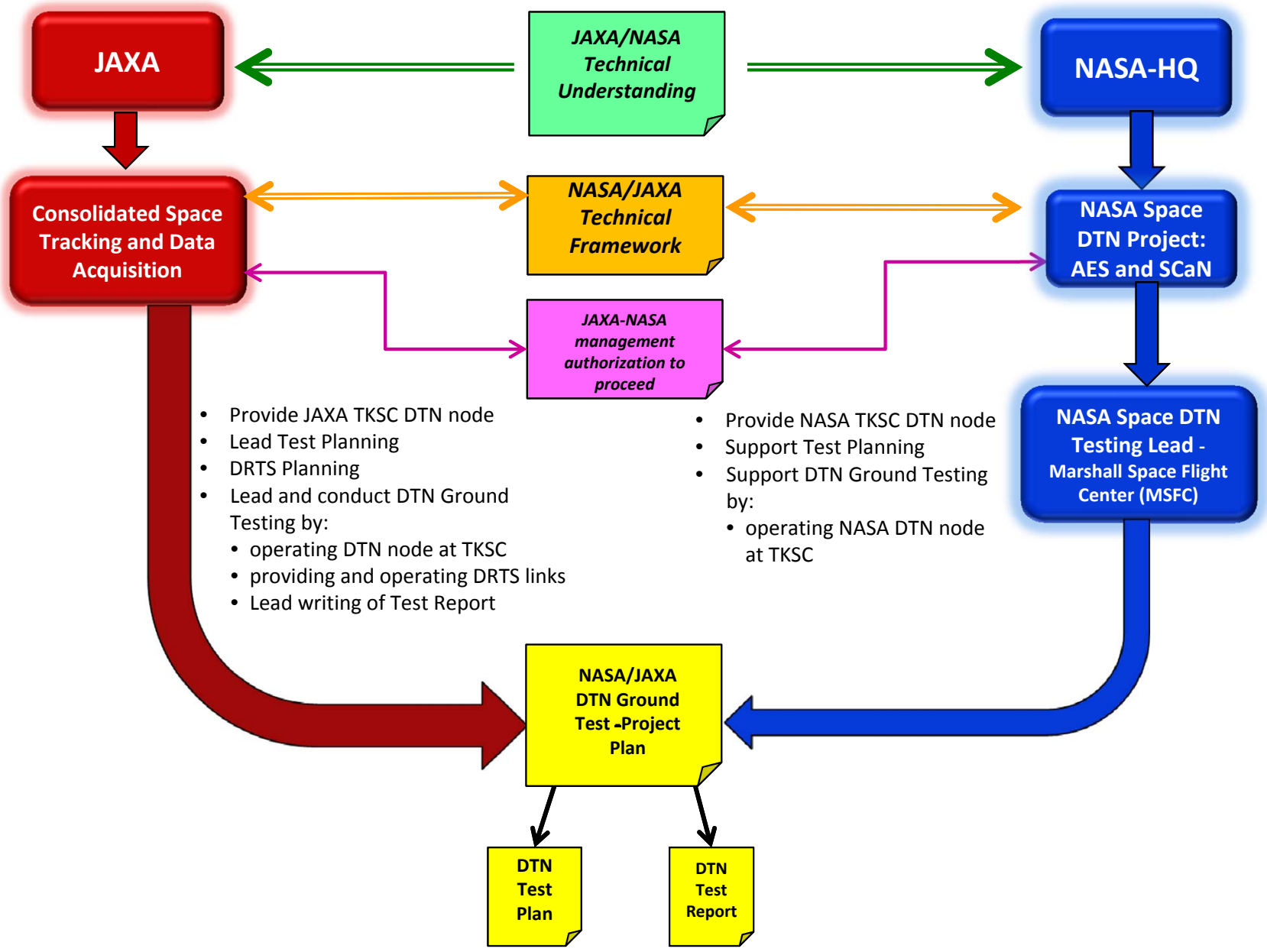
Phillip A. Cauthen
Debra P. Graham
George M. LaCoe
Patty J. Montgomery
Brenda B. Wade

TReK Team

JAXA/NASA Project Relationships:
Ground and Flight Testing



JAXA/NASA Project Relationships



MSFC DRTS Testing Approach

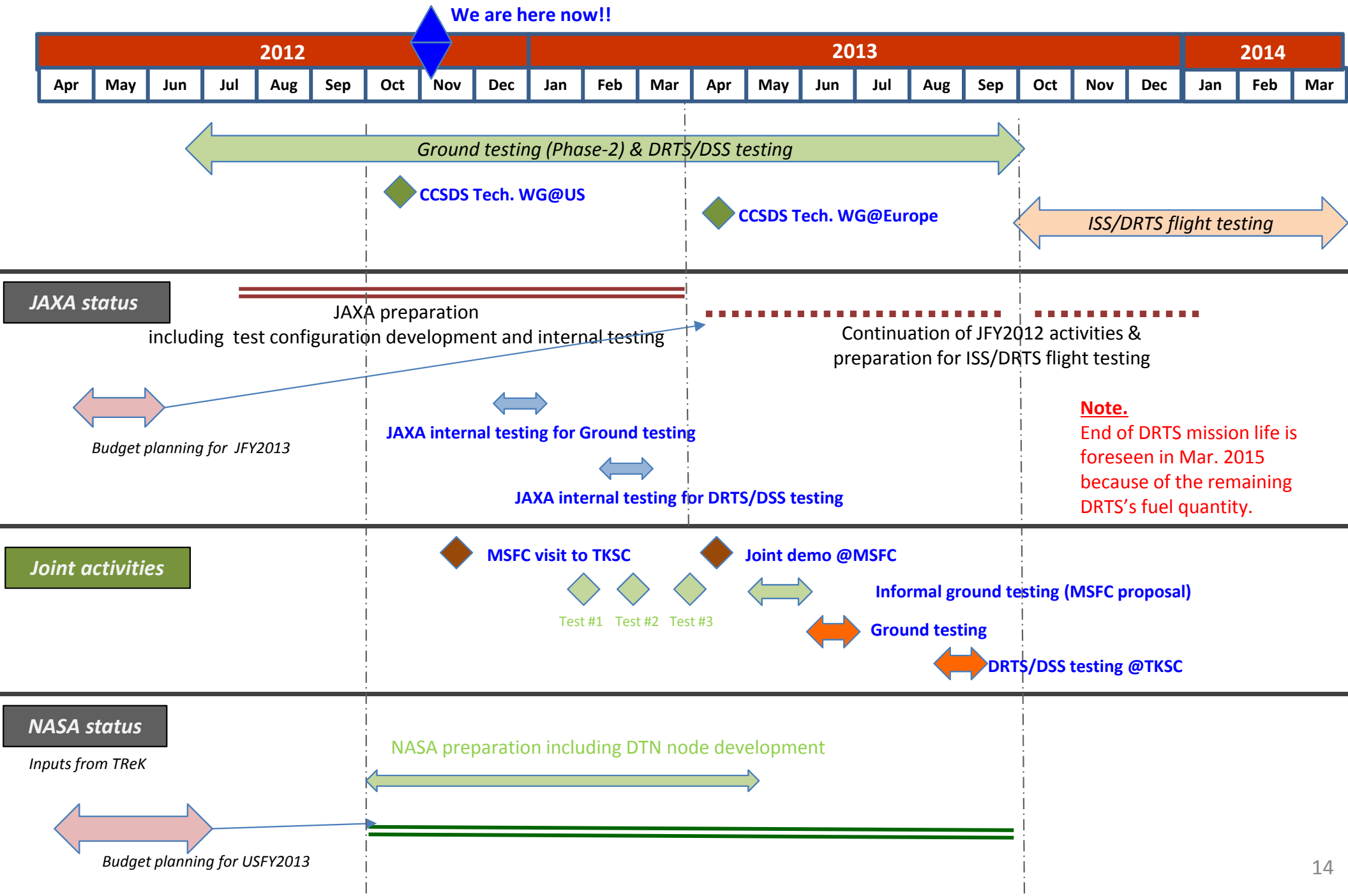
Jeff Lippincott
MSFC Mission Operations Lab

General Approach & Plans

- Work Prior to NASA/JAXA Meeting in November 2012
  - Installed IOS 3.0.2.
    - Worked through Tutorials.
    - Modifying tutorial and example configuration files to implement single and multi-node configurations for learning purposes.
    - Working with DTN Apps: bping, bpcp, bpchat, cfdptest, and bss.
  - Reviewed Previous Test Plan provided by JAXA.

- Work After NASA/JAXA Meeting in November 2012
  - Assist JAXA with test plan development by participating in the iterative update/review process.
  - Perform any tasks necessary to procure and configure the computers to host NASA DTN Nodes.
  - Develop the NASA DTN nodes at NASA/MSFC facility and conduct both NASA-internal testing in a lab environment and external (NASA<->JAXA) ground testing.
    - NASA would like to invite JAXA to participate in the informal external ground tests identified. (Details on following page).
  - Configure the NASA DTN nodes at NASA/MSFC in preparation for tests in partnership with JAXA at MSFC in April 2013.
  - Configure the NASA DTN nodes at NASA/MSFC for Ground Testing and conduct tests in partnership with JAXA over the Internet.
  - Bring NASA DTN nodes to Tsukuba for conducting the DRTS space-link testing of DTN data protocols in partnership with JAXA, work with JAXA to install and configure the NASA DTN nodes at JAXA for Ground Testing over DRTS with DSS, conduct tests in partnership with JAXA , and bring the NASA DTN Nodes back to NASA after the test.
  - Evaluate the DTN testing result in partnership with JAXA.

JAXA-NASA DRTS Test Schedule

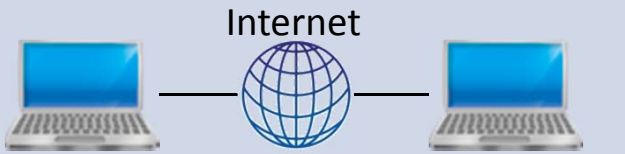


NASA Proposed Informal Internet Ground Test Concept - Summary

	Informal Ground Test #1	Informal Ground Test #2	Informal Ground Test #3
Test Purpose	Connectivity Test (Ping) Initial Configuration Test	Streaming Configuration Test	CGR Configuration Test
Proposed Date	Plan: January 16, 2013 Test: January 30, 2013	Plan: February 13, 2013 Test: February 27, 2013	Plan: March 13, 2013 Test: March 27, 2013
DTN node	NASA: one ground node JAXA: one ground node	NASA: one ground node JAXA: one ground node	NASA: multiple ground nodes JAXA: multiple ground nodes
Protocols	CFDP/BP/LTP	BP/LTP	CFDP/BP/LTP
DTN Routing	None	None	CGR
DTN App.	bping, bpchat cfdptest, bpcp	bssrecv, bssStreamingApp	bping, bpcp,bpchat, cfdptest, bssrecv, bssStreamingApp

- NASA plans to perform the informal ground tests identified above prior to the joint Demo scheduled in Spring 2013.
- All of the tests are planned to be disruption free.
- The purpose of the tests is to incrementally build confidence in test configurations and DTN Node functionality.
- NASA will develop and provide a Test Configuration prior to each test.
- NASA would like to invite JAXA to participate in these tests. Participation would help to reduce risk for future test activities.
- All Tests would be conducted during the following time on the dates identified: JAXA 8:00 a.m.– 10:00 a.m./NASA 6:00 p.m.– 8:00 p.m.
- In the Proposed Date row, the “Plan” is the date the test configuration would be available, and the “Test” is the date the test would be conducted.

Test Concept

	Test Items			Test configuration
	Large file transfer	BSS	CGR	
Joint demo	Conducted with CU-Boulder . Apr. & Aug. 2011	**Spring 2013@MSFC** To confirm connection and basic DTN functions before commencing formal testing.		
Ground testing	Phase-1 Completed with CU-Boulder. Dec.-Jan. 2012	**Phase-2, June 2013** To confirm DTN functions simulating S/C operation scenarios		
DRTS/DSS testing	**August 2013@ TKSC** To confirm DTN functions under real DRTS space-link environment and DRTS operation scenarios			
ISS/DRTS flight testing	**After JEM/ICS recovery** To confirm DTN functions connecting NASA DTN node onboard ISS with JAXA node@TKSC through DRTS space- link.