Soyuz-28, Expedition 29
Increment 29
Mission Operations Readiness Review (MORR)

August 09, 2011

BASELINE 08/15/11

Presented to:

NASA/Goddard Space Flight Center
Networks Integration Management Office, Code 450.1

Agenda

1. **Welcome and Introduction** — **J. Bangerter**
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   - Review Schedule
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   - ISS Supply Sequence
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   - Space Network (SN) White Sands Complex (WSC) — **D. Glasscock**
   - Wallops Ground Station (WGS) — **M. Harris**
   - Dryden Flight Research Center (DFRC) — **J. Thomas**
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7. **Action Item Summary** — **S. Testoff**
8. **Readiness Assessment**
9. **CoFR Signature Sheet**
10. **Abbreviations/Acronyms**

Review Board

- Carolyn P. Dent, Chairperson, GSFC, Code 301, Systems Review Office
- Robert L. Jones, GSFC, Code 599, 450 Senior Technical Authority
- Scott A. Greatorex, GSFC, Code 450.1, Chief, Networks Integration Management Office
- Susan L. Hoge, GSFC, Code 595, Navigation and Mission Design Branch
- Bradford Butts, GSFC, Code 761, Systems Management Branch
- Joseph M. Aquino, JSC-DD13, Manager, Space Communications Integration Office
- Marco M. Midon, GSFC, Code 453, Ground Network Project
- Donald W. Shinners, GSFC, Code 452, Space Network Project
- Thomas L. Barlow, DFRC Range Technical Monitor, Western Aeronautical Test Range
- James A. Bangerter, GSFC, Code 450.1, Human Spaceflight Network Director

Review Schedule

- **Goddard Space Flight Center (GSFC) Mission Operations Readiness Review (MORR)** — **08/09/11**
- **Johnson Space Center (JSC) Mission Operations Directorate (MOD) Flight Readiness Review (FRR)** — **08/17/11**
- **NASA Stage Operations Readiness Review (SORR)** — **08/25/11**

Mission Overview

K. Riley/SCNS

Mission Profile

- **Vehicle:** Russian Soyuz
- **Launch Date/Time:** September 22, 2011/0134 GMT
- **International Space Station (ISS) Docking:** September 24, 2011
- **Length of Time Docked:** 6 months (becomes the Russian Crew Return Vehicle)
- **Station Element:** Soyuz
- **Orbit:** 146 nautical miles
- **Inclination:** 51.6 degrees
- **Payload:** Crew, Logistics, and Supplies

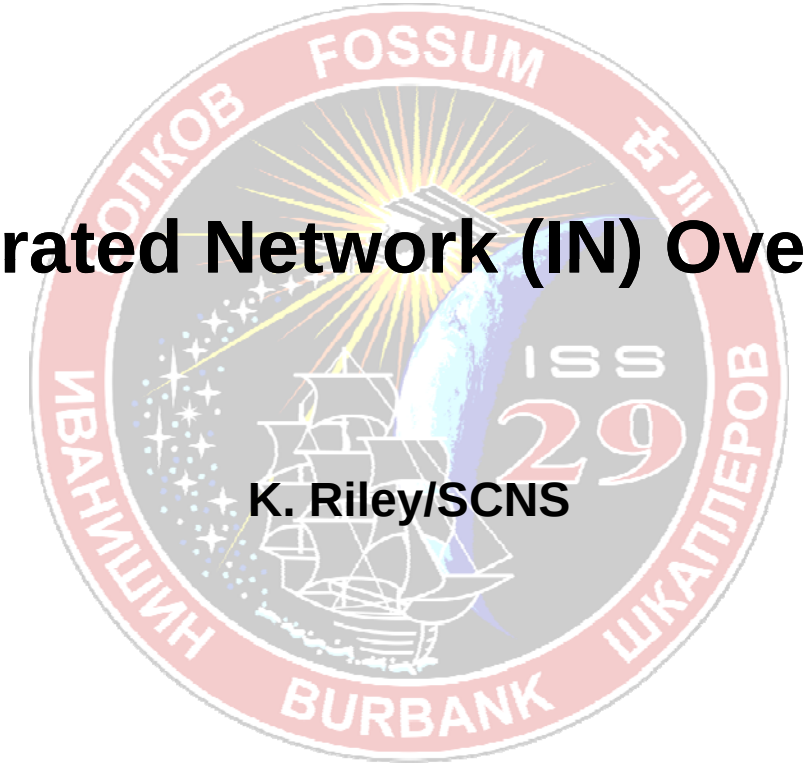
ISS Supply Sequence

Date	Flight	Launch Vehicle/Elements	
05/30/11	27S Russian Soyuz (Expedition 28)	Crew Transport, Logistics, and Re-supply	ISS Increment 28
06/21/11	43P Russian Progress	Logistics and Re-supply	
07/08/11	ULF7 Space Shuttle (STS-135)	Multi-Purpose Logistics Module (MPLM) Raffaello and a Lightweight Multi-Purpose Carrier (LMC)	
09/22/11	28S Russian Soyuz (Expedition 29)	Crew Transport, Logistics, and Re-supply	ISS Increment 29
09/24/11	44P Russian Progress	Logistics and Re-supply	
10/26/11	45P Russian Progress	Logistics and Re-supply	
11/30/11	29S Russian Soyuz (Expedition 30)	Crew Transport, Logistics, and Re-supply	ISS Increment 30
11/30/11	Falcon 9 Dragon Demo 2	Demonstrate rendezvous and berthing with the International Space Station	
02/20/12	HTV 3	Logistics and Re-supply	
02/23/12	Taurus 2 Cygnus 1 Demo 1	Taurus 2 rocket will launch a simulated Cygnus spacecraft on a demonstration flight	
03/10/12	ATV 3	Logistics and Re-supply	
03/30/12	30S Russian Soyuz (Expedition 31)	Crew Transport, Logistics, and Re-supply	ISS Increment 31
05/11/12	Taurus 2 Cygnus 1	Launch the first Cygnus cargo freighter on a test flight to the International Space Station	

Red Date = Launch Planned

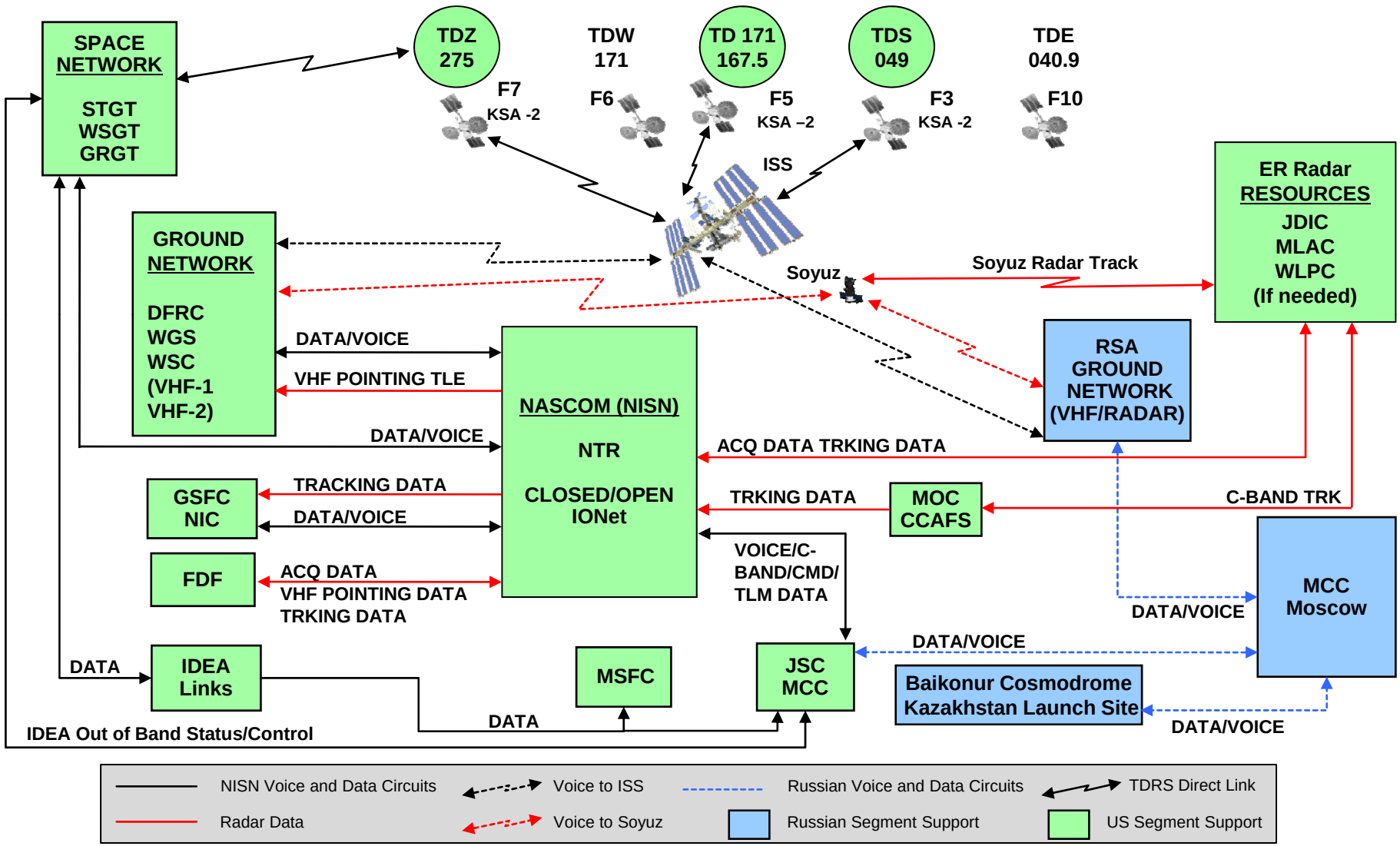
Gray Date = Completed Missions

Integrated Network (IN) Overview



K. Riley/SCNS

ISS/Soyuz IN Overview Chart



Documentation

Document Title	Status	Published Date
***TDRSS Network Operations Support Plan for the International Space Station*, 450-TNOSP-ISS**	**Original**	**02/2010**
***TDRSS Network Operations Support Plan for International Space Station*, *Very High Frequency Annex*, 450-TNOSP-ISS VHF Annex**	**Original DCN 001**	**09/2006 02/2009**
Interim Support Instruction (ISI) – Change to the GSFC FDF Soyuz Satellite Identification (0516)	**Complete**	**03/08/11**
ISI – Pre-mission Status	**In Process**	**Launch minus 30 (08/24/11)**
ISI – Mission Status	**In Process**	**Launch minus 7 (09/15/11)**
ISI – Mission Support	**In Process**	**Launch minus 5 (09/17/11)**
ISI – Mission Configuration Freeze for Soyuz 28 Docking	**In Process**	**Docking minus 7 (09/17/11)**
ISI – Mission Configuration Freeze for Soyuz 26 Undocking	**In Process**	**Undocking minus 7 (09/2011)**
ISI – Mission Termination (Soyuz 26)	**In Process**	**At conclusion of mission (09/08/11)**
***Configuration Management Freeze Policy for Integrated Networks and Supporting Elements*, 450-CMFP-HSF/ELV**	**Original**	**06/2007**
***NASA Integrated Services Network Standard Operating Procedures*, NISN SOP-0002**	**Revision C**	**11/2007**
Soyuz/Progress/ISS Joint Flight Rules, Vol D, NSTS-12820	**Final PCN-6**	**09/2006 05/2009**
C-Band Emergency Call-up Procedure	**In Process**	**Launch minus 10 (09/12/11)**

Requirement Changes

- **Program Requirements Document (PRD) changes**
  - **None**

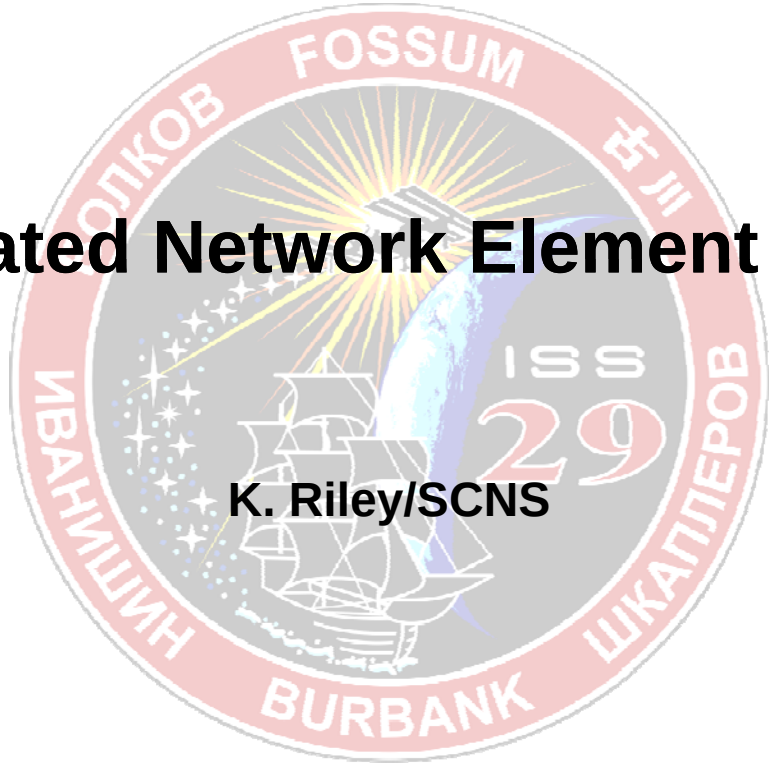
Operational/Network Changes

- **Very High Frequency (VHF) Recording (WSC)**
  - **WSC VHF-1/2 transmit and receive record capabilities**
    - **Under review**

Network Verification Test

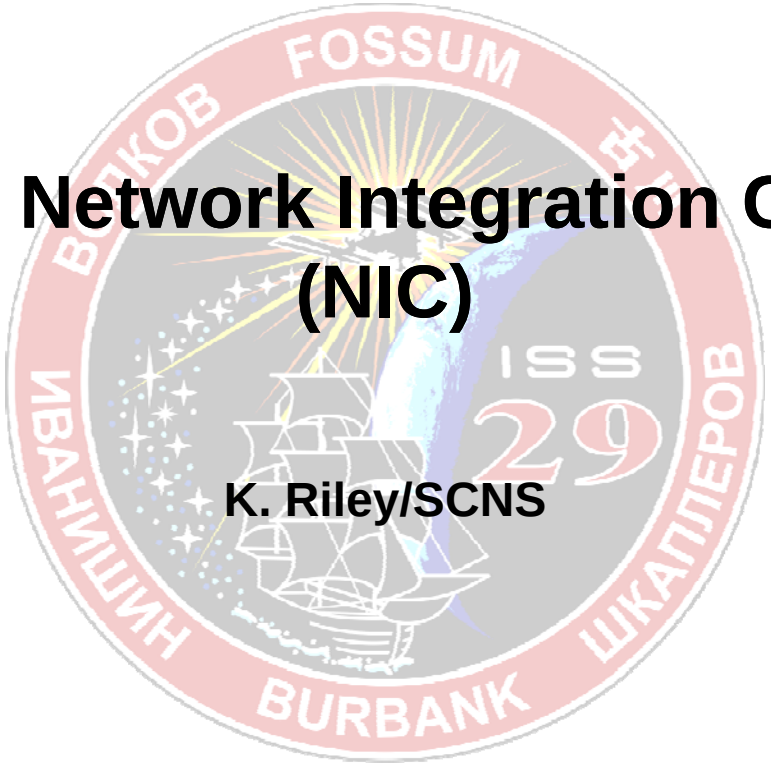
- **VHF Emergency Communication Verification Passes**
  - **VHF-1 good two-way voice checks performed with ISS and WGS on 07/01/11, DFRC on 07/06/11, and WSC on 07/06/11**

Integrated Network Element Status



K. Riley/SCNS

GSFC Network Integration Center (NIC)



K. Riley/SCNS

IN Element Status – NIC

- **Operational Changes since the Soyuz 27 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Open Discrepancy Reports (DR): None**

- **Freeze Exemption Requests (FER):**

Item	Status	Comments
GSFC Building 13 Fire Alarm Upgrade	Approved through 09/18/11	Fire Alarm System upgrade
GSFC Bldg 32 Environmental Sensor Installation	Approved through 09/30/11	Install Environmental Sensors in various locations within B32
GSFC Building 35 Construction	Approved through 02/29/12	Construction of new Logistics Facility. Separate FER's will be submitted when efforts involve critical zones 1, 2, and/or 3

IN Element Status – NIC (cont'd)

- **Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

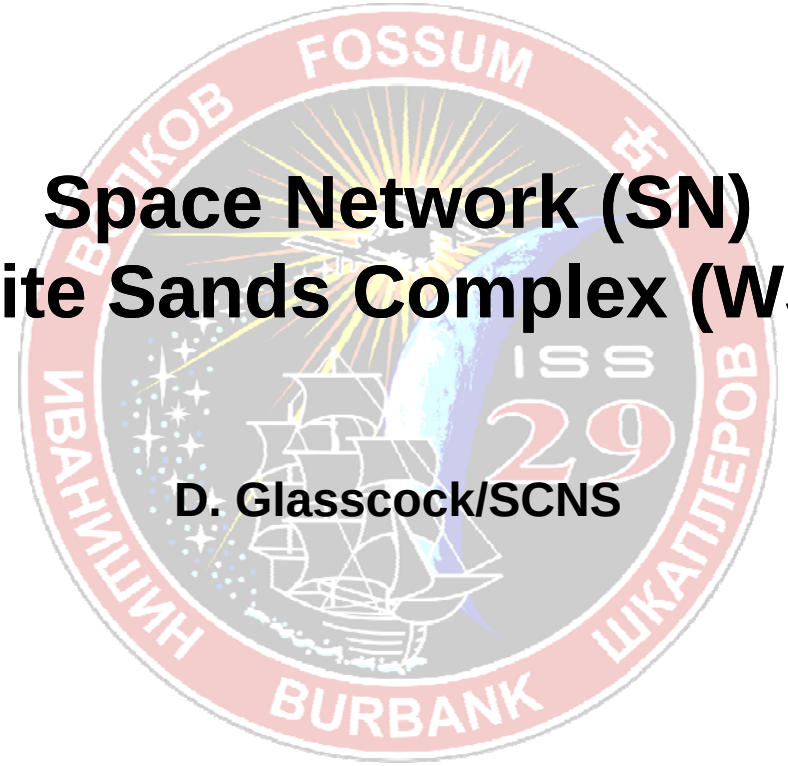
- **Projected Changes: None**

- **NIC Facility Status**

Item	Status	Comments
Commercial Power	G	Load Center LC 4-13-7/10-13-8 replacement is in progress as of 07/11/11. Task will be complete, tested, and operational by 08/31/11
Uninterruptible Power Supply (UPS)	G	PM's completed on 06/15/11
Heating, Ventilating and Air Conditioning (HVAC)	G	No issues to report

IN Element Status – NIC (cont'd)

- **Staffing, Training, and Certification**
  - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
  - **Documentation is up to date**
- **Summary and Readiness Assessment**
  - **NIC is ready to support the Soyuz 28/Expedition 29 and ISS Increment 29**



Space Network (SN)
White Sands Complex (WSC)

D. Glasscock/SCNS

IN Element Status – SN

- **SN Operational Changes since the Soyuz 27 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Open DRs: None**

- **Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Projected Changes: None**

IN Element Status – SN (cont'd)

- **Tracking and Data Relay Satellite (TDRS) Fleet Management Status**
  - **TDRS-3 (TDS) KSA-1R Intermittent 1-second dropouts**
    - **The KSA-1 Return has been demonstrating intermittent 1-second dropouts at a frequency of about one every other day**
    - **These dropouts are not limited to one user, one time of day, or even every service for one user**
    - **The PDAs have already been adjusted to a minimum setting allowing little or no room for further adjustment**
  - **TDRS-3 (TDS) Polarization Limits**
    - **TDRS-3 KSA-2 is locked in Left Circular Polarization (LCP) due to a switch failure**
    - **Due to the limited number of LCP users, TDRS-3 KSA-1 is restricted to RCP only**

IN Element Status – SN (cont'd)

- **TDRS Fleet Management Status (cont'd)**
  - **TDRS-9 Drift to 40.9 deg West**
    - **Drift from 62°W in progress; arrival @ 40.9°W expected on 09/04/11**
    - **TDRS-9 will transition to TDE on 09/12/11**
    - **TDRS-10 will be moved west, probably to TDW location (no schedule currently available)**

IN Element Status – SN (cont'd)

- **Staffing, Training and Certification**
  - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
  - **Documentation is up to date**
- **Summary and Readiness Assessment**
  - **SN is ready to support the Soyuz 28/Expedition 29 and ISS Increment 29**

IN Element Status – WSC VHF

- **WSC VHF Operational Changes since the Soyuz 27 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	VHF	The VHF-1 and VHF-2 cable replacement project, which replaced and redressed all the cabling within the VHF shelter was completed on 06/20/11
	VHF	The directional couplers were replaced on 06/21/11

- **Open DRs**

Mission Impact (Y/N)	DR#	System/ Subsystem	Problem Description	Operational Workaround	Current Status	Projected Closure Date
Y	258962	VHF-1	Noisy downlink	Operate on System 2	Green	TBD

IN Element Status – WSC VHF (cont'd)

- **Open Work**

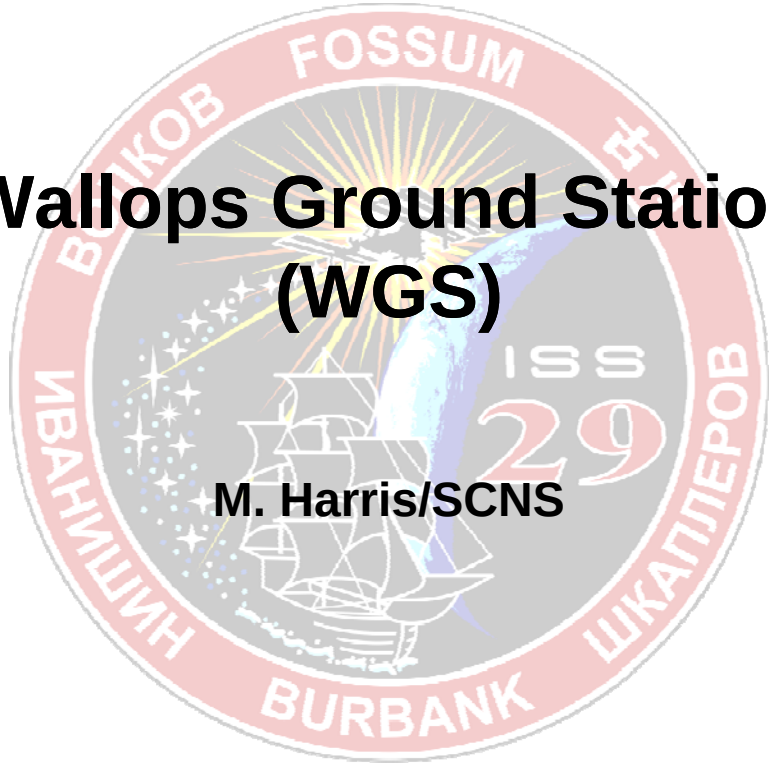
Type	System	Significant Changes
Software	VHF	Audio record capabilities
Hardware	VHF	Audio record capabilities
	VHF	VHF-1 and VHF-2 system separation

- **Projected Changes**
  - **Addition of the transmit and receive audio record capabilities (EC TO015-4)**

IN Element Status – WSC VHF (cont'd)

- **Staffing, Training and Certification**
  - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
  - **Documentation is up to date**
- **Summary and Readiness Assessment**
  - **WSC VHF-1 and VHF-2 systems are ready to support the Soyuz 28/Expedition 29 and ISS Increment 29**

Wallops Ground Station (WGS)



M. Harris/SCNS

IN Element Status – WGS

- **Operational Changes since the Soyuz 27 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Open DRs: None**

- **Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Projected Changes: None**

IN Element Status – WGS (cont'd)

- **Staffing, Training and Certification**
  - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
  - **Documentation is up to date**
- **Summary and Readiness Assessment**
  - **WGS is ready to support the Soyuz 28/Expedition 29 and ISS Increment 29**

Dryden Flight Research Center (DFRC)

J. Thomas/Arcata Associates

IN Element Status – DFRC

- **Operational Changes since the Soyuz 27 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Open DRs: None**

- **Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Projected Changes: None**

IN Element Status – DFRC (cont'd)

- **Staffing, Training and Certification**
  - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
  - **Documentation is up to date**
- **Summary and Readiness Assessment**
  - **DFRC is ready to support the Soyuz 28/Expedition 29 and ISS Increment 29**

NASA/DoD C-bands Eastern Range (ER)

M. Gawel/ER

C-band Radar Contingency

- **ISS Visiting Vehicles (VV) are not routinely supported by the Eastern Range (ER) and Western Range (WR). If a contingency is declared by the ISS Ground Controller (GC) during a VV mission, the ranges have agreed the ER and WR C-band radars will provide VV contingency support within agreed upon call-up times for Nominal and Off-duty hours**

- **ISI for C-band Radar Contingency Call-up Procedures will be published prior to mission**

C-band Radar Contingency (cont'd)

- **Procedure**
  - **ISS GC will declare a VV contingency**
  - **ISS GC will announce whether ER/WR C-band radar support is needed**
  - **All declared VV contingencies will be confirmed via E-mail, facsimile or memorandum from ISS GC to DoD Track**
  - **DoD Track will schedule C-band radar support**
    - **DoD Track has normal and off operating hours and points of contact for supporting radar sites identified in ISI**
  - **Following termination of contingency conditions, the ISS GC will verbally notify Spaceflight Mission Manager (SMM) and/or DoD Track to release C-band radar sites from support**
  - **ISS GC will also release confirmation message as soon as possible**

NASA Integrated Services Network (NISN)

R. Honeycutt/NICS

IN Element Status – NISN

- **Operational Changes since Soyuz 27 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

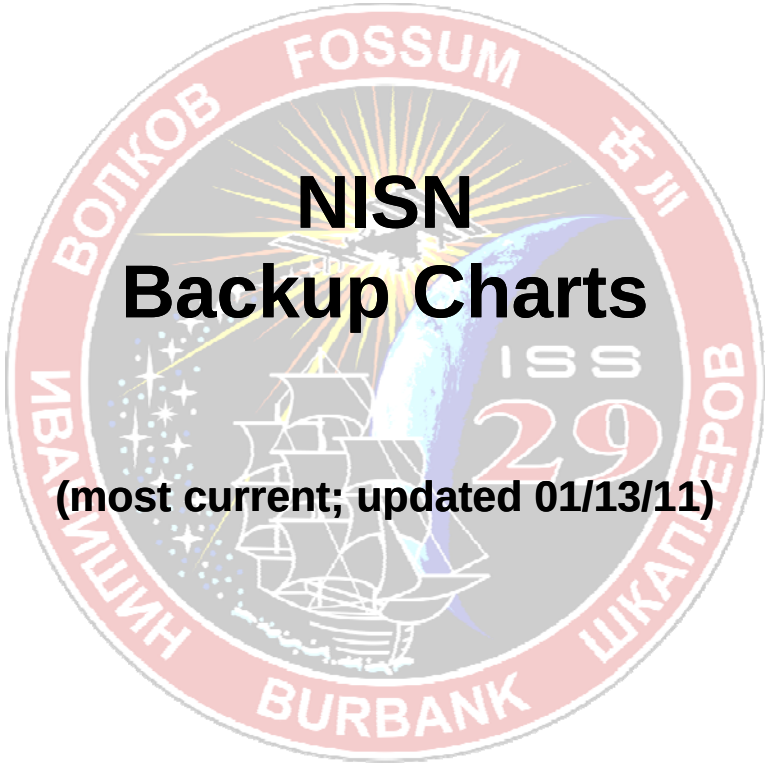
- **Marshall Space Flight Center (MSFC) Russian Services: No changes**
- **Open Problem Management Dispatch System (PMDS) Tickets: None**
- **Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Projected Changes: None**

IN Element Status – NISN (cont'd)

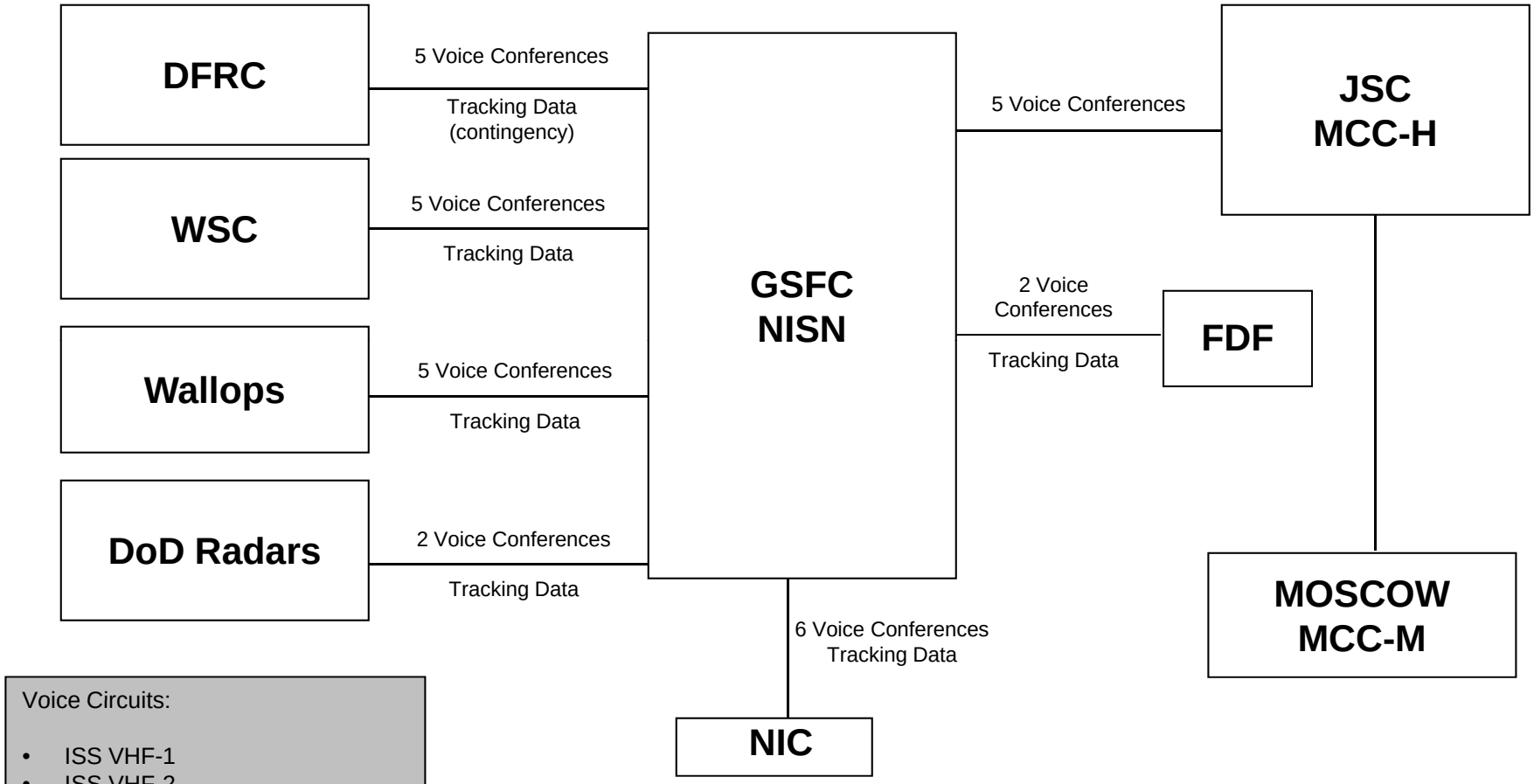
- **Staffing, Training and Certification**
  - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
  - **Documentation is up to date**
- **Summary and Readiness Assessment**
  - **NISN will process all Freeze Exemption Requests (FER) during mission in accordance with NISN SOP-002, published 10/2009**
  - **NISN is ready to support the Soyuz 28/Expedition 29 and ISS Increment 29**



NISN
Backup Charts

(most current; updated 01/13/11)

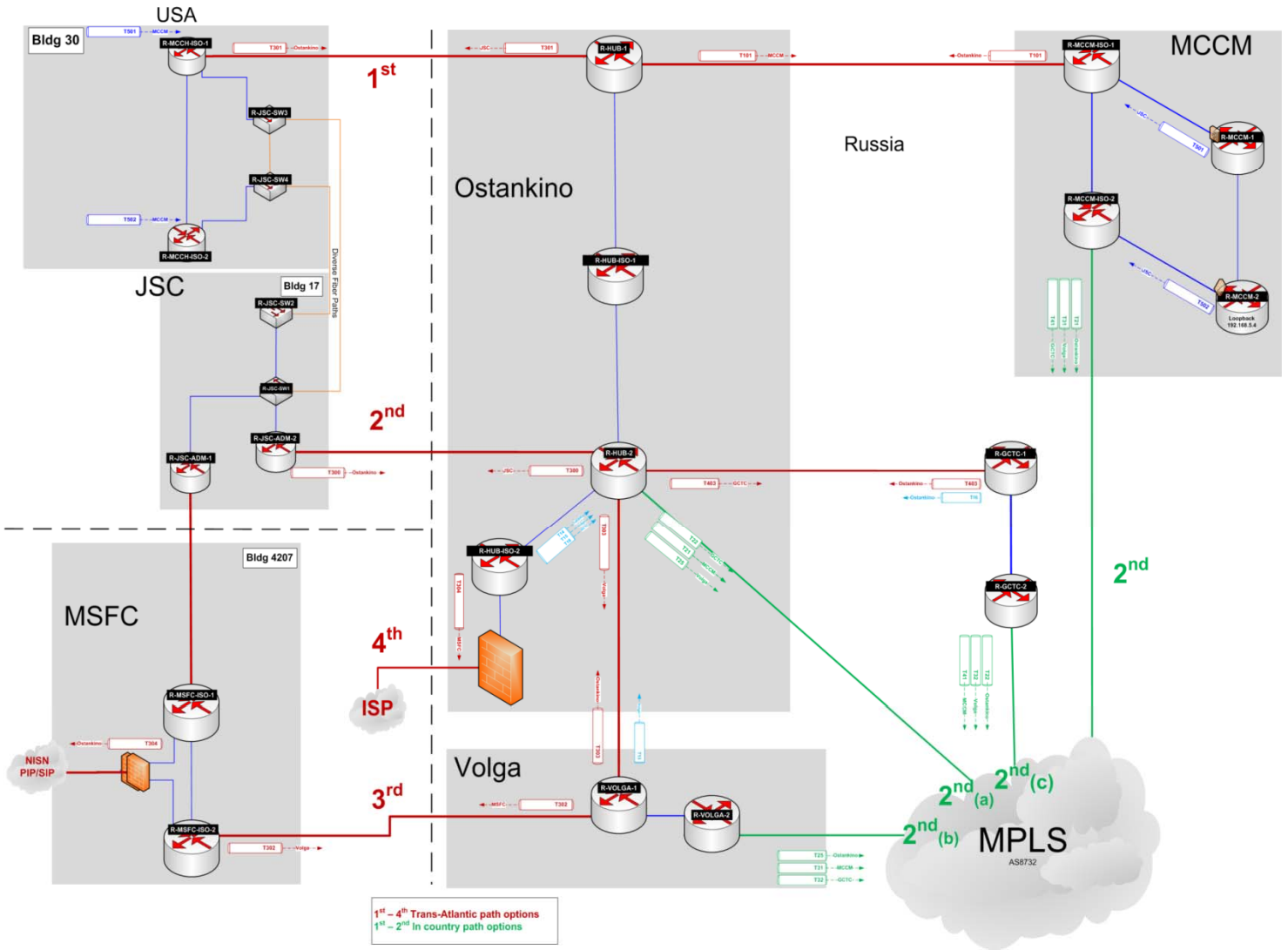
Soyuz Integrated Network Voice and Data Circuits



Voice Circuits:

- ISS VHF-1
- ISS VHF-2
- ISS SITE COORD
- IP/GC-1
- TRACK COORD
- LEAD RANGE COORD

Russian Mission Network Backbone



Flight Dynamics Facility (FDF)

P. Beckner/FDSS

IN Element Status – FDF

- **Operational Changes since Soyuz 27 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **Open DRs: None**

- **Open Work**

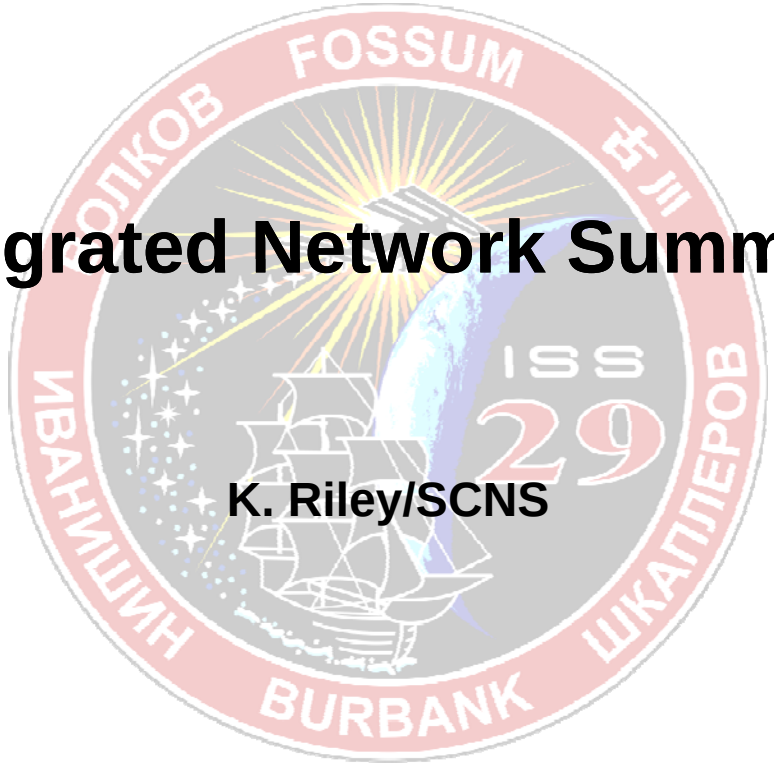
Type	System	Significant Changes
Software	None	None
Hardware	Two-Line Elements (TLE)	Verify receipt/processing of Soyuz 28 TLE by VHF sites – Elements have been sent and verified by stations
	Operational (General)	Transition will start in October 2011 and last 4-6 weeks

- **Projected Changes: None**

IN Element Status – FDF (cont'd)

- **Staffing, Training and Certification**
  - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
  - **Soyuz 28 Mission Support Plan (MSP) will be delivered by 09/15/11**
- **Summary and Readiness Assessment**
  - **FDF is ready to support the Soyuz 28/Expedition 29 and ISS Increment 29**

Integrated Network Summary

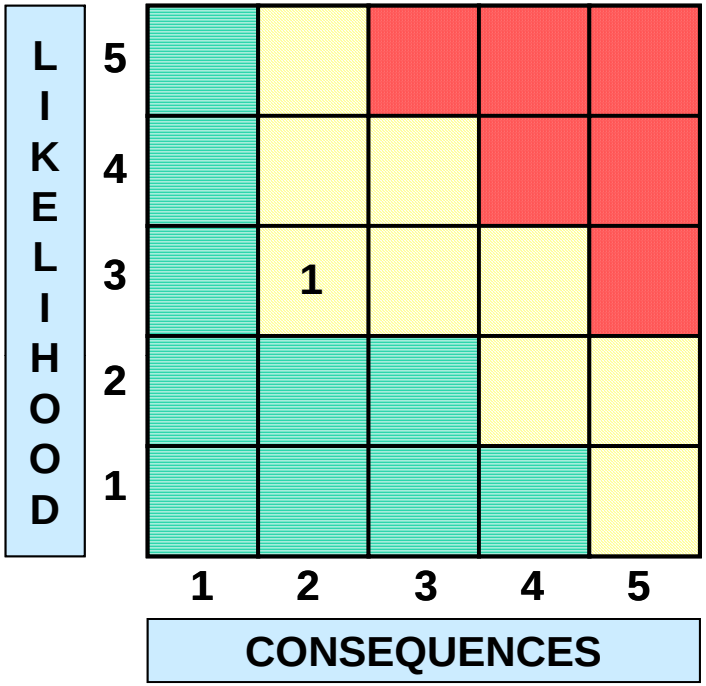


K. Riley/SCNS

Requirements/Test Matrix

Network Resource	Requirement	Verification Method	Verification Complete
Space Network	• ISS S-band Forward/Return • ISS K-band Forward/Return	Operational	Operational
White Sands VHF-1 VHF-2	• Contingency communications support to ISS • Soyuz contingency communications support during selected view periods from early orbit through ISS docking	Emergency Comm Verification Passes (VHF-1)	07/06/11
Wallops VHF-1 VHF-2	• Contingency communications support to ISS • Soyuz contingency communications support during selected view periods from early orbit through ISS docking	Emergency Comm Verification Passes (VHF-1)	07/01/11
Dryden VHF-1 VHF-2	• Contingency communications support to ISS • Soyuz contingency communications support during selected view periods from early orbit through ISS docking	Emergency Comm Verification Passes (VHF-1)	07/06/11
Eastern Range	• C-band metric data support, tracking of Soyuz for VHF-2, and C-band slaving at DFRC for emergency support only	Operational	Operational
NASA Integrated Services Network	• Voice/Data Communications	Operational	Operational
Flight Dynamics Facility	• Provide Tracking and Data Relay Satellite System (TDRSS) vectors for ISS support • Perform ISS orbit determination for acquisition data and planning products • Provide TLEs for VHF tracking	Operational Operational Simulated Orbital Support	Operational Operational

Risks



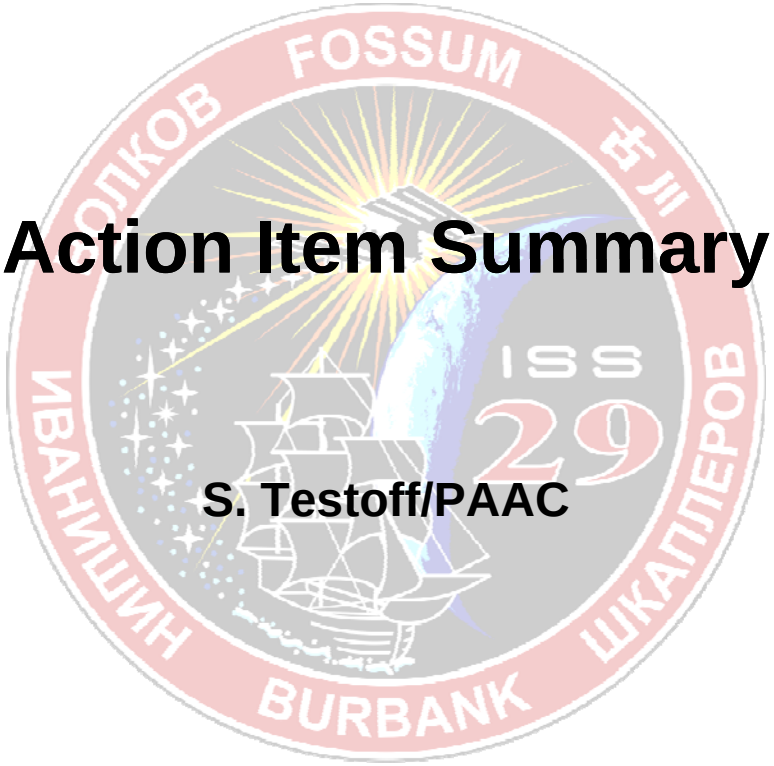
LxC Trend	Rank	Approach	Risk Title
➡	1	M	VHF-2

Criticality	L x C Trend	Approach
High	⬇ Decreasing (Improving)	M – Mitigate
Med	⬆ Increasing (Worsening)	W – Watch
Low	➡ Unchanged	A – Accept
	* New since last mission	R – Research

VHF-2 Risk

Rank	Risk Statement	Approach & Plan	Comments
1 M	If the VHF-2 system is not periodically End-to-End (ETE) tested including Radio Frequency (RF) transmission, then the system's readiness to support cannot be validated	Mitigate • U.S. Airways is reviewing the request for testing and an approval letter was sent from the airline • Test plan has been completed. Plans are to establish quarterly ETE test • Testing of the VHF-2 emergency voice interfaces via DFRC/WSC/WGS has been placed on hold. The use of the U.S. restricted frequencies is being revisited by JSC Spectrum Management	VHF-2 Systems at DFRC, WSC, and WGS are utilized to support emergency voice communications with Soyuz capsules. CONUS use of the VHF-2 frequency is restricted by FCC, as it is allocated commercially Systems readiness tests are conducted monthly to verify the system, minus the RF transmission, which is restricted VHF-2 would be used in contingency situations on Soyuz; should the Astronauts have to evacuate the ISS to the Soyuz capsule Note: The FAA has refused to allow the use of the restricted frequency for periodic VHF-2 system validation The last VHF-2 ETE Comm check was performed in September 2004

Risk Criticality	H	M	L

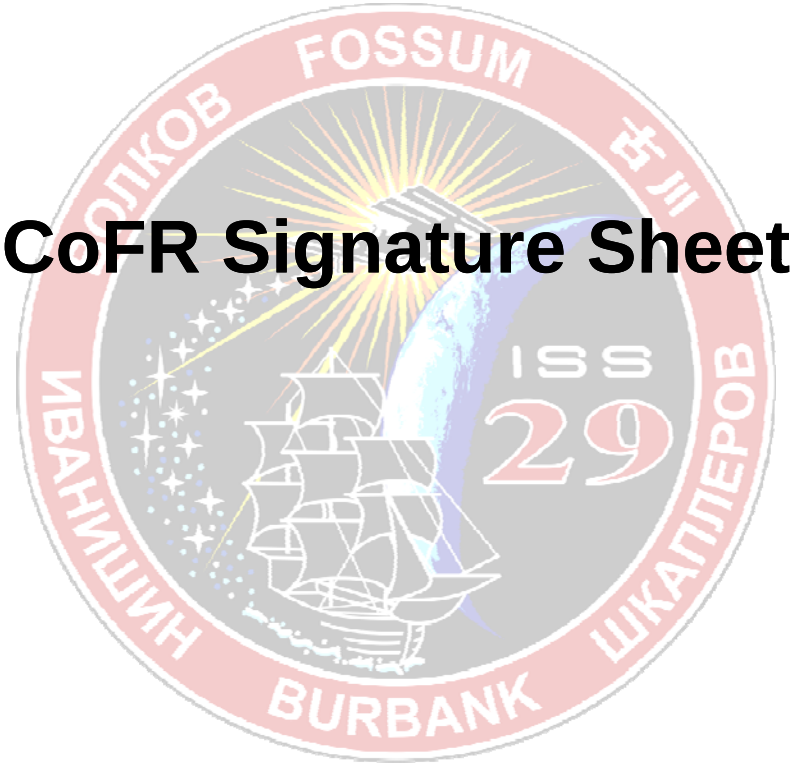


Action Item Summary

S. Testoff/PAAC

Readiness Assessment

CoFR Signature Sheet



Exploration and Space Communications Projects Division

Certificate of Flight Projects Directorate Networks Readiness

This is to certify that with successful completion of flight readiness preparations and closure of associated action items, all integrated network elements are ready to support the Soyuz-28, Expedition 29 mission

8/9/2011
Carolyn P. Dent, Chairperson, Code 301, GSFC, Systems Review Office — **Date**

8/9/2011
Susan L. Hoge, Code 595, GSFC, Navigation and Mission Design Branch — **Date**

Robert L. Jones, Code 599, GSFC, 450 Senior Technical Authority — **Date**

8/15/2011
Bradford Butts, Code 761, GSFC, Systems Management Branch — **Date**

8/09/2011
Scott A. Greatorex, Code 450.1, GSFC, Chief, Networks Integration Management Office — **Date**

8/9/2011
for **Joseph M. Aquino, JSC, Code DD13, Manager, Space Communications Integration Office** — **Date**

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Marco M. Midon, Code 453 — Date
GSFC, Ground Network Project

Thomas L. Barlow — 8/9/2011 — Date
Range Technical Monitor, Western Aeronautical Test Range (WATR)

Donald W. Shinners, Code 452 — 8/9/2011 — Date
GSFC, Space Network Project

James A. Bangerter, Code 450.1 — 8/9/11 — Date
GSFC, Human Spaceflight Network Director

Abbreviations and Acronyms

Abbreviations and Acronyms

CoFR	Certificate of Flight Readiness
CCB	Configuration Control Board
CPU	Central Processor Unit
DoD	Department of Defense
DCN	Document Control Number
DFRC	Dryden Flight Research Center
DR	Discrepancy Report
ER	Eastern Range
ETE	End-to-End
FDF	Flight Dynamics Facility
FER	Freeze Exemption Requests
FRR	Flight Readiness Review
GC	Ground Controller
GMT	Greenwich Mean Time
GN	Ground Network
GNOM	Ground Network Operation Manager
GRGT	Guam Remote Ground Terminal
GSFC	Goddard Space Flight Center
H/W	Hardware
HSF	Human Space Flight
HVAC	Heating, Ventilating and Air Conditioning
IN	Integrated Network
I/O	Input/Output
ISI	Interim Support Instruction
ISS	International Space Station
JDIC	Jonathan Dickinson 28.14
JSC	Johnson Space Center
KSA	Ku-band Single Access
KSC	Kennedy Space Center
LOP	Local Operating Procedures
LSR	Low Sample Rate
MCC	Mission Control Center
MLAC	Merritt Island 19.17
MMA	Mission Management Area
MOC	Morrell Operations Center (formerly ROCC)
MOD	Mission Operations Directorate
MORR	Mission Operations Readiness Review
MOVE	Mission Operations Voice Enhancement
MSFC	Marshall Space Flight Center
MSP	Mission Support Plan
NASA	National Aeronautics and Space Administration
NASCOM	NASA Communications
NENS	Near Earth Networks Services
NIC	Network Integration Center
NISN	NASA Integrated Services Network
NSR	NISN Support Request
PMDS	Problem Management Dispatch System
PRD	Program Requirements Document
RF	Radio Frequency
SCNS	Space Communications Network Services
SGLT	Space-to-Ground Link Terminal
SMM	Spaceflight Mission Manager
SN	Space Network
SNAS	Space Network Access System
SORR	Stage Operations Readiness Review
STGT	Second TDRSS Ground Terminal
STS	Space Transportation System
S/W	Software
TBD	To Be Determined
TCDT	Terminal Countdown Demonstration Test
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TLE	Two-Line Elements
TOCC	TDRSS Operations Control Center
TRK	Tracking
TT&C	Tracking, Telemetry, and Command
UPS	Uninterruptible Power Supply
VHF	Very High Frequency
VV	Visiting Vehicle
WLPC	Wallops Island Radar 5
WGS	Wallops Ground Station
WR	Western Range
WSC	White Sands Complex
WSGT	White Sands Ground Terminal