



Soyuz-29, Expedition 30 Increment 30 Mission Operations Readiness Review (MORR)

November 02, 2011

BASELINE 11/16/11

Presented to:
NASA/Goddard Space Flight Center (GSFC)
Networks Integration Management Office (NIMO), Code 450.1



Agenda

1. Welcome and Introduction

- Review Board
- Review Schedule

J. Bangerter

2. Mission Overview

- Mission Profile
- ISS Supply Sequence

K. Riley

3. Integrated Network (IN) Overview

- International Space Station (ISS)/Soyuz IN Overview Chart
- Documentation
- Requirement Changes
- Operational/Network Changes
- Network Verification Test

K. Riley

5. IN Element Status

- GSFC Network Integration Center (NIC)
- Space Network (SN) White Sands Complex (WSC)
- Wallops Ground Station (WGS)
- Dryden Flight Research Center (DFRC)

K. Riley

E. Richards

M. Harris

J. Thomas

5. IN Element Status (cont'd)

- NASA/DoD C-bands Eastern Range (ER)
- Communications Service Office (CSO) Operations
- Flight Dynamics Facility (FDF)

M. Gawel

R. Honeycutt

P. Beckner

6. IN Summary

- Requirements/Test Matrix
- Risks

K. Riley

7. Action Item Summary

S. Testoff

8. Readiness Assessment

9. CoFR Signature Sheet

10. Abbreviations/Acronyms



Review Board

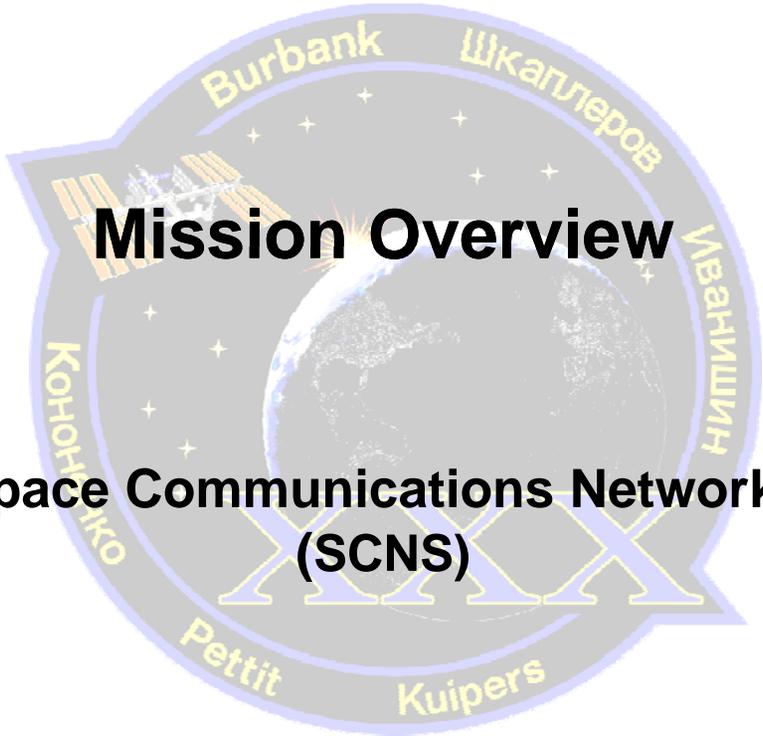
- **Robert L. Jones, Chairperson, GSFC, Code 599, 450 Senior Technical Authority**
 - **Scott A. Greatorex, GSFC, Code 450.1, Chief, Networks Integration Management Office**
 - **Susan L. Hoge, GSFC, Code 595, Navigation and Mission Design Branch**
 - **Bradford Butts, GSFC, Code 761, Systems Management Branch**
 - **Joseph M. Aquino, JSC-DD13, Manager, Space Communications Integration Office**
 - **Stephen F. Currier, GSFC, Code 453, Ground Network Project**
 - **Daniel J. Hein, GSFC, Code 452, Space Network Project**
 - **Michael E. Yettaw, 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)** **11/02/11**
- **Johnson Space Center (JSC) Mission Operations
Directorate (MOD) Flight Readiness Review (FRR)** **12/01/11**
- **NASA Stage Operations Readiness Review (SORR)** **TBD**



A circular graphic with a blue border containing the names of observatories: Burbank, Шкаплеров, Мваншшин, Kuipers, Pettit, and Кононко. In the center is a satellite and a globe. The text "Mission Overview" is overlaid in the center.

Mission Overview

**K. Riley/Space Communications Network Services
(SCNS)**



Mission Profile

- **Vehicle:** Russian Soyuz
- **Launch Date/Time:** December 21, 2011/1310 GMT
- **ISS Docking:** December 23, 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)	
10/30/11	45P Russian Progress	Logistics and Re-supply	
11/14/11	28S Russian Soyuz (Expedition 29)	Crew Transport, Logistics, and Re-supply	ISS Increment 29
11/22/11	27S Russian Soyuz (Undock)	Un-dock & Return To Earth	
12/21/11	29S Russian Soyuz (Expedition 30)	Crew Transport, Logistics, and Re-supply	ISS Increment 30
01/12/12	Falcon 9 Dragon Demo 2	Demonstrate rendezvous and berthing with the International Space Station	
01/26/12	46P Russian Progress	Logistics and Re-supply	
03/07/12	ATV 3	Logistics and Re-supply	
03/30/12	30S Russian Soyuz (Expedition 31)	Crew Transport, Logistics, and Re-supply	ISS Increment 31
04/25/12	47P Russian Progress	Logistics and Re-supply	
04/28/11	Taurus 2 Cygnus 1 Demo 1	Taurus 2 rocket will launch a simulated Cygnus spacecraft on a demonstration flight	
05/30/12	31S Russian Soyuz (Expedition 32)	Crew Transport, Logistics, and Re-supply	ISS Increment 32
06/26/12	HTV 3	Logistics and Re-supply	

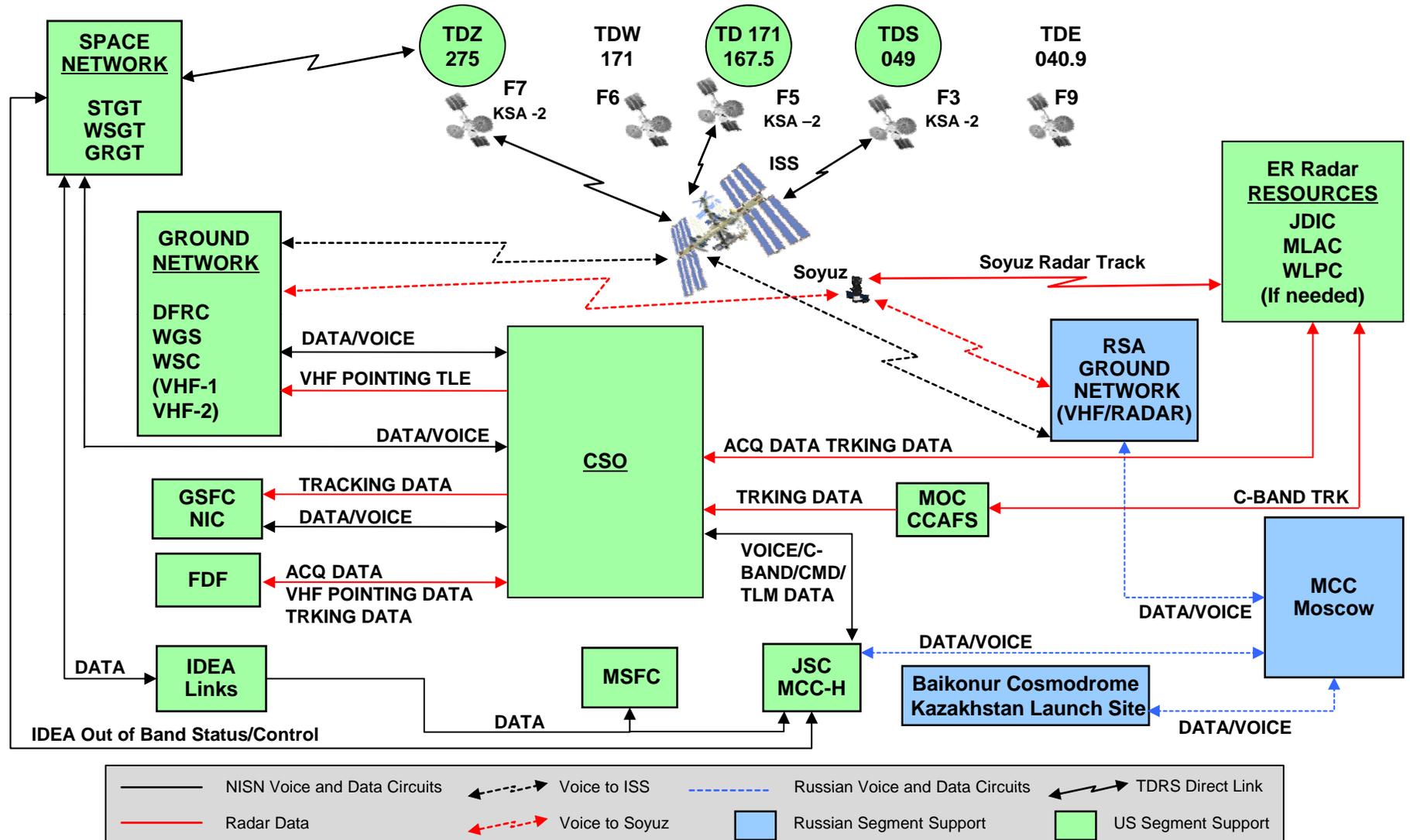
Red Date = Launch Planned

Gray Date = Completed Missions





ISS/Soyuz IN Overview Chart





Documentation

Document Title	Status	Published Date
<i>TDRSS Network Operations Support Plan for the International Space Station, 450-TNOSP-ISS</i>	Original	02/2010
<i>Very High Frequency Voice Communications Support Annex to the TDRSS Network Operations Support Plan for International Space Station,, 450-TNOSP-ISS VHF Annex</i>	Original DCN 001	09/2006 02/2009
Interim Support Instruction (ISI) – Change to the GSFC FDF Soyuz Satellite Identification (0516)	Complete	03/08/11
<i>Configuration Management Freeze Policy for Integrated Networks and Supporting Elements, 450-CMFP-HSF/ELV</i>	Original	06/2007
<i>NASA Integrated Services Network Standard Operating Procedures, NISN SOP-0002</i>	Revision C	11/2007
<i>Soyuz/Progress/ISS Joint Flight Rules, Vol D, NSTS-12820</i>	Final PCN-6	09/2006 05/2009
ISI – Pre-mission Status	In Process	Launch minus 30 (11/21/11)
ISI – C-Band Emergency Call-up Procedure	In Process	Launch minus 10 (12/11/11)
ISI – Mission Status	In Process	Launch minus 7 (12/14/11)
ISI – Mission Support	In Process	Launch minus 5 (12/16/11)
ISI – Mission Configuration Freeze for Soyuz 29 Docking	In Process	Docking minus 7 (12/16/11)
ISI – Mission Configuration Freeze for Soyuz 27 Undocking	In Process	Undocking minus 7 (11/15/11)
ISI – Mission Termination (Soyuz 27)	In Process	At conclusion of mission (11/22/11)



Requirement Changes

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



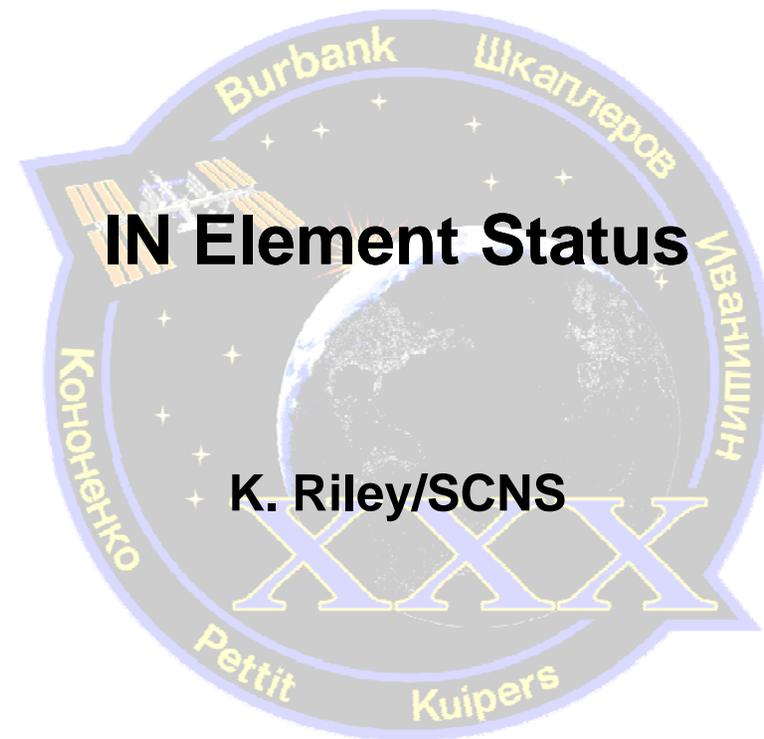
Operational/Network Changes

- **Very High Frequency (VHF) system upgrades at WSC**
 - **Equipment shelter re-cabled – 06/2011**
 - **VHF-1 Quad Yagi Antenna/Tower placed on order – 09/2011**
 - **VHF-2 will remain in place, VHF-1 will be on the new tower**
 - **Advance Tower Services Inc. has been selected to erect the VHF-1 antenna and tower on an existing pad at Extended TDRS Ground Terminal (ETGT) (scheduled for completion 12/31/11)**
 - **WSC VHF-1/2 transmit and receive record capabilities will be included in the antenna/tower upgrade Engineering Change (EC)**



Network Verification Test

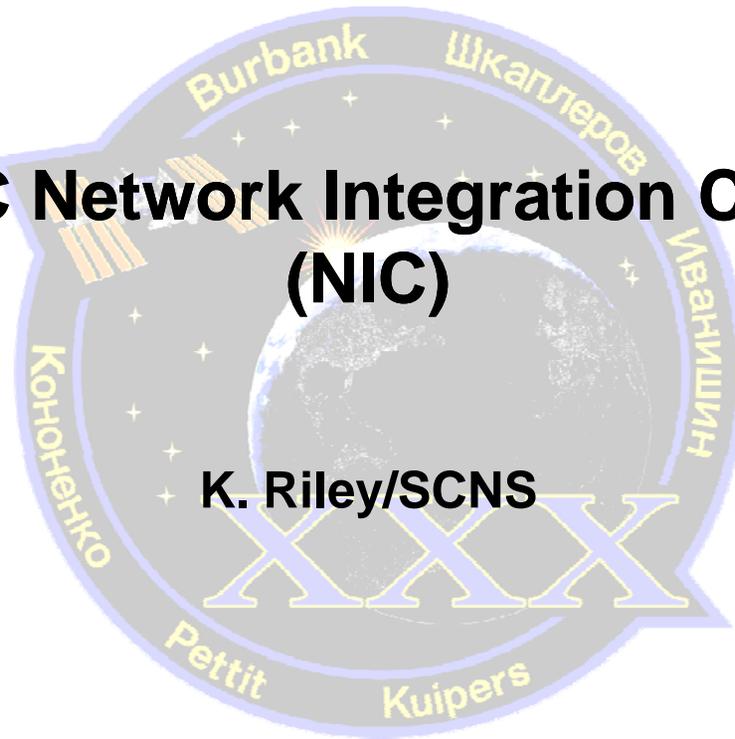
- **VHF Emergency Communication Verification Passes**
 - **VHF-1 good two-way voice checks performed with ISS and WGS on 08/29/11 and 09/20/11, DFRC on 08/31/11 and 09/30/11, and WSC on 08/31/11 and 09/30/11**





GSFC Network Integration Center (NIC)

K. Riley/SCNS





IN Element Status – NIC

- **Operational Changes since the Soyuz 28 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	Mission Operations Voice Enhancement (MOVE) Keysets	Power down when not in use

- **Open Discrepancy Reports (DR): None**
- **Freeze Exemption Requests (FER):**

Item	Status	Comments
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	MOVE Keysets	Retrofit

- **Projected Changes:**

- Plans to reconfigure the NIC consoles/workstations over the next few months

- **NIC Facility Status**

Item	Status	Comments
Commercial Power	G	PM's completed 10/2011
Uninterruptible Power Supply (UPS)	G	UPS PM's completed 06/2011; Battery PM's completed 08/2011
Heating, Ventilating and Air Conditioning (HVAC)	G	No issues to report



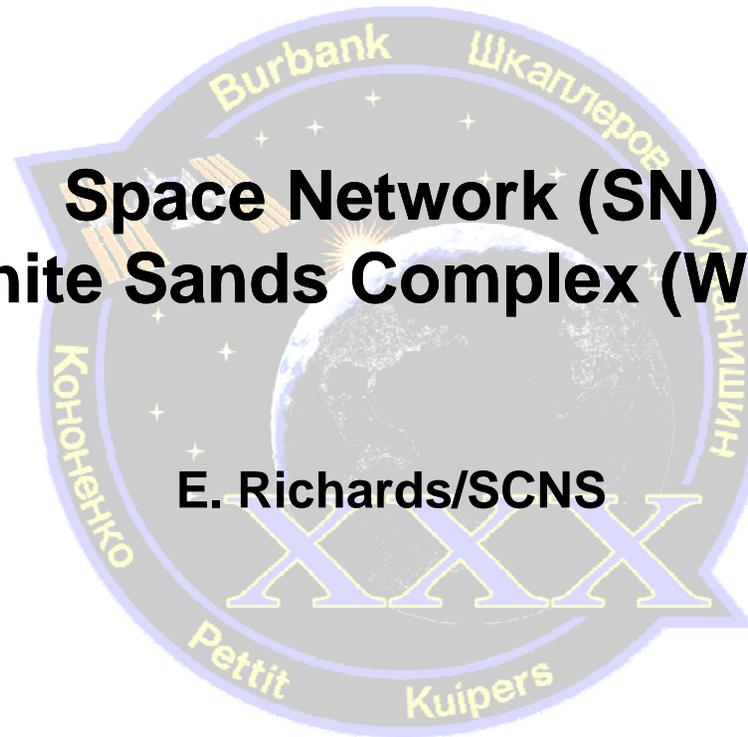
IN Element Status – NIC (cont'd)

- **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 29/Expedition 30 and ISS Increment 30



Space Network (SN) White Sands Complex (WSC)

E. Richards/SCNS





IN Element Status – SN

- **SN Operational Changes since the Soyuz 28 MORR**

Type	System	Significant Changes
Software	WSGT/STGT/GRGT: SGLT-1/SGLT-2/SGLT-3/SGLT-4/SGLT-5/SGLT-6/DIS ADPE, MMIs/STTCs and Workstations	09/28/11 – STGT SIMOSKIF Delivery (TDRS-6/TDRS-5) 10/11/11 – WSGT/GRGT SIMOSKIF Delivery (TDRS-3/TDRS-7/TDRS-9)
Hardware	None	None

- **Open DRs: None**
- **Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	None	None



IN Element Status – SN (cont'd)

- **Projected Changes: None**
- **Tracking and Data Relay Satellite (TDRS) Fleet Configuration through 12/2011**

<u>SGLT</u>	<u>TDRS</u>	<u>NAME</u>	<u>LONGITUDE</u>
SGLT-1	TDRS-6	WEST	171
SGLT-2	TDRS-K TEST	N/A	N/A
SGLT-3	TDRS-5	171	167.5
SGLT-4	TDRS-9	EAST	40.9
SGLT-5	TDRS-3	SPARE	49
SGLT-6	TDRS-7	275	275



IN Element Status – SN (cont'd)

- TDRSS Fleet Configuration through January through March 2012
- Changes after 12/31/11 are indicated in red

<u>SGLT</u>	<u>TDRS</u>	<u>NAME</u>	<u>LONGITUDE</u>
SGLT-1	TDRS-K TEST	N/A	N/A
SGLT-2	TDRS-10	WEST	174*
SGLT-3	TDRS-9**	EAST	40.9
SGLT-4	TDRS-5	171	167.5
SGLT-5	TDRS-3	SPARE	49
SGLT-6	TDRS-7	275	275

TDRS-10 Relocation Stop maneuvers: 11/7 through 11/11. Drift to 174 degrees W, on location 12/02/11.
*TDRS-6 replaced by TDRS-10 as TDRS-WEST (Mid January 2012). TDRS-6 Drift start (TBD) to location (TBD).
TDRS-9 operational as TDE on 09/20/11



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 29/Expedition 30 and ISS Increment 30



IN Element Status – WSC VHF

- **WSC VHF Operational Changes since the Soyuz 28 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	None	None

- **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	Closed 10/17/11



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

- **EC TO011-01 and -02 have been created for the WSC work**
 - **VHF-1 system move to ETGT set to begin 11/2011 with completion 12/31/11**
 - **Audio recording via MOVE system will be done in parallel with the VHF-1 system move**

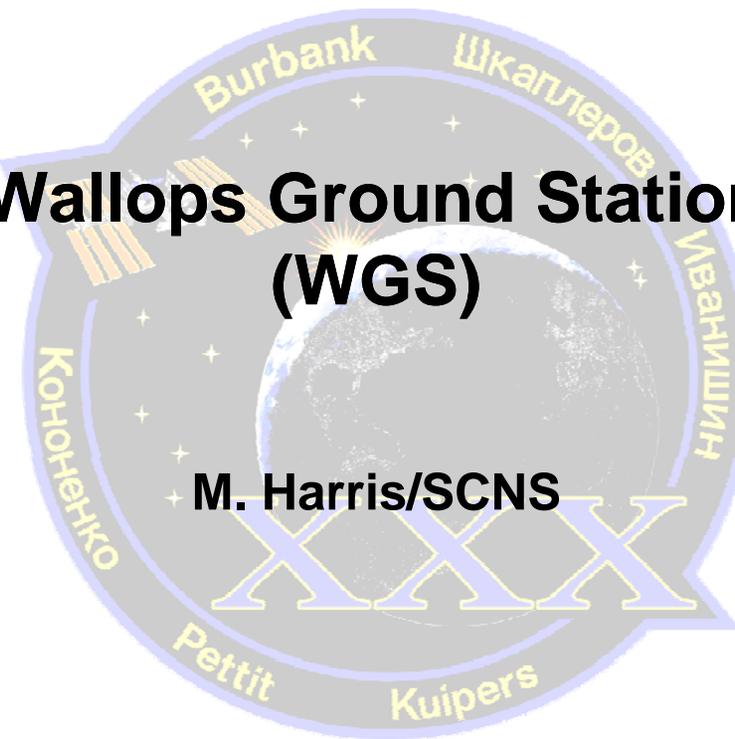


IN Element Status – WSC VHF (cont'd)

- **Staffing, Training and Certification**
 - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
 - **Documentation is up to date**
- **Summary and Readiness Assessment**
 - **WSC is ready to support the Soyuz 29/Expedition 30 and ISS Increment 30**



Wallops Ground Station (WGS)





IN Element Status – WGS

- **Operational Changes since the Soyuz 28 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**



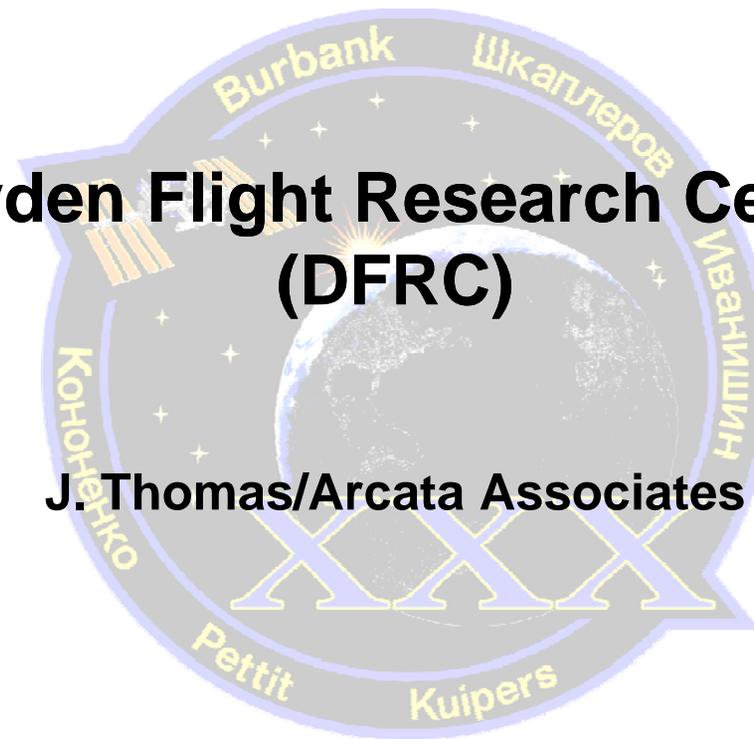
IN Element Status – WGS (cont'd)

- **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 29/Expedition 30 and ISS Increment 30**



Dryden Flight Research Center (DFRC)

J. Thomas/Arcata Associates





IN Element Status – DFRC

- Operational Changes since the Soyuz 28 MORR**

Type	System	Significant Changes
Software	None	None
Hardware	V2 System	Installed new spare V2 computer. This computer will be updated real-time and monitor Soyuz Mission. In the event of a prime or back computer failing DFRC Technicians will switch tracking capabilities to the spare computer

- Open DRs: None**
- Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	V2 System	Installed new spare V2 computer. This computer will be updated real-time and monitor Soyuz Mission. In the event of a prime or back computer failing DFRC Technicians will switch tracking capabilities to the spare computer

- Projected Changes: None**

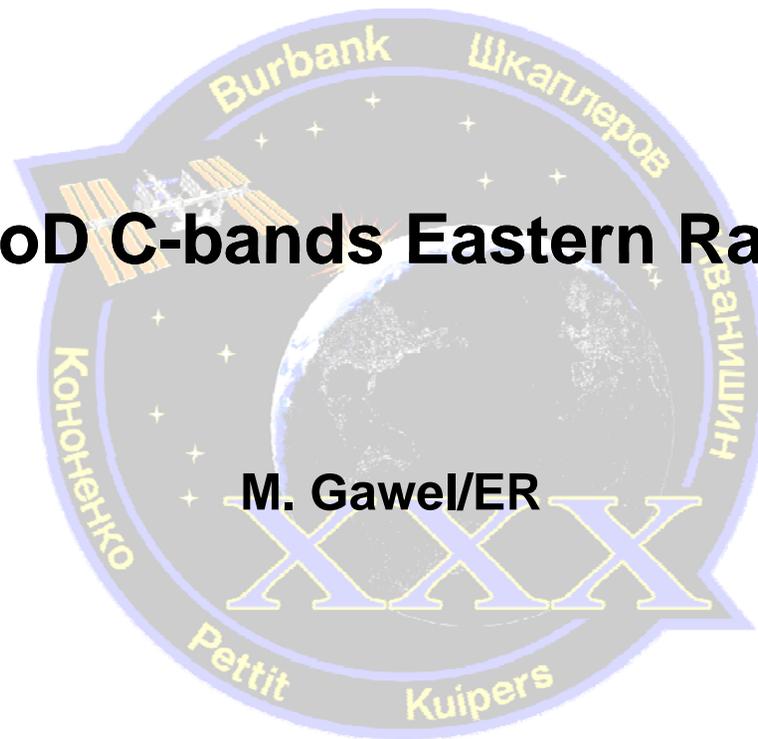


IN Element Status – DFRC (cont'd)

- **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 29/Expedition 30 and ISS Increment 30



NASA/DoD C-bands Eastern Range (ER)



M. Gawe/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**



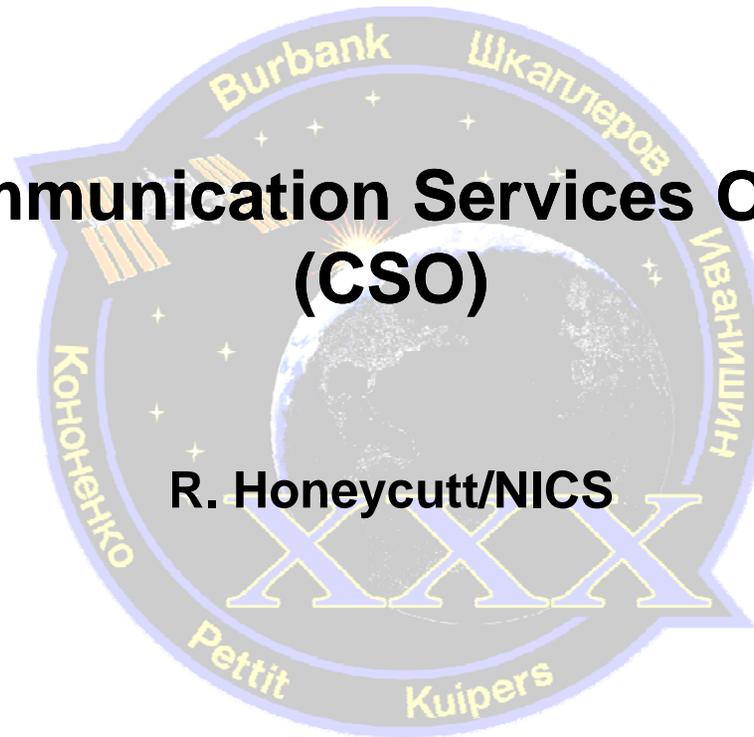
C-band Radar Contingency (cont'd)

- **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**
-



Communication Services Office (CSO)

R. Honeycutt/NICS





IN Element Status – CSO

- **Operational Changes since Soyuz 28 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**



IN Element Status – CSO

- **Open Work**

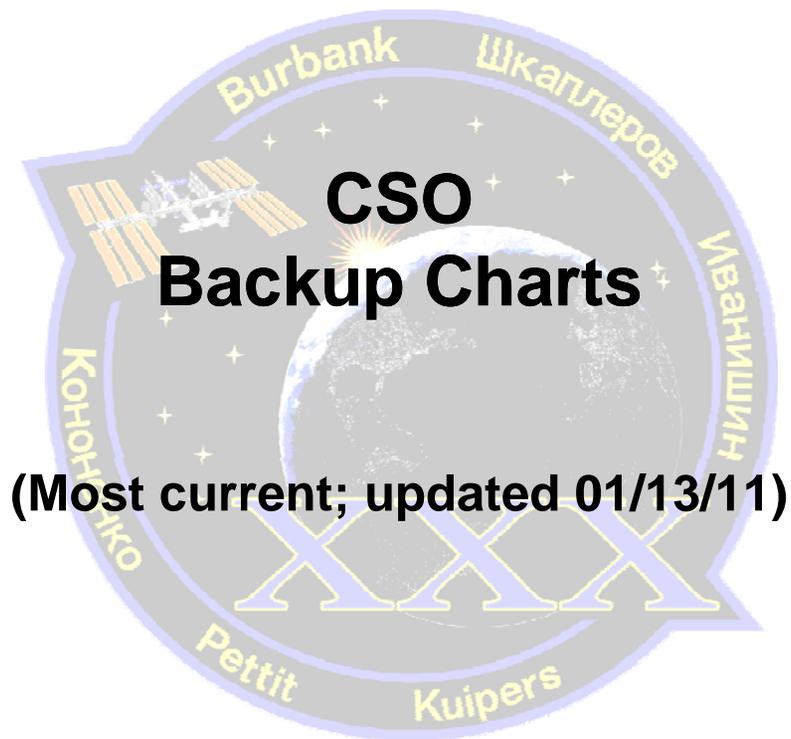
Type	System	Significant Changes
Software	None	None
Hardware	MOVE Type D Keysets	<ul style="list-style-type: none">• Type D keysets have the potential to electrically arc causing a burning odor and melting within the housing of the keyset• The best way to retrofit all customer keysets is still being considered by the vendor, but will probably be accomplished at their facility in Columbia, Md.• CSO will implement a plan and scheduled on the best way to ship keysets from customer site to vendors facility which will be the least impacting• Dates , times, and schedules to be distributed to all customers upon receipt from vendor

- **Projected Changes: None**



IN Element Status – CSO (cont'd)

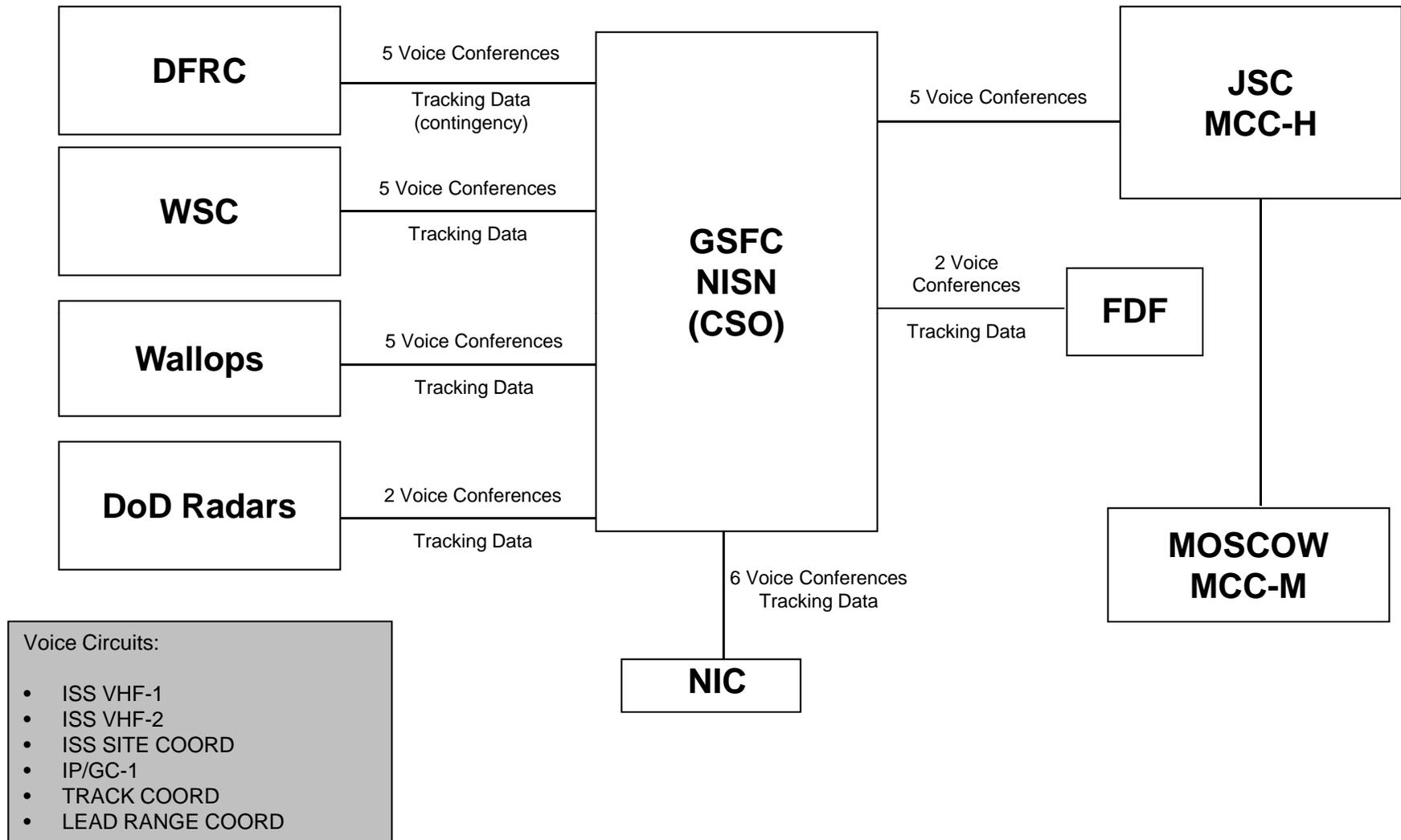
- **Staffing, Training and Certification**
 - **Staffing is sufficient to meet all requirements**
- **Documentation Status**
 - **Documentation is up to date**
- **Summary and Readiness Assessment**
 - **CSO will process all Freeze Exemption Requests (FER) during mission in accordance with NISN SOP-002, published 10/2009**
 - **CSO is ready to support the Soyuz 29/Expedition 30 and ISS Increment 30**



(Most current; updated 01/13/11)

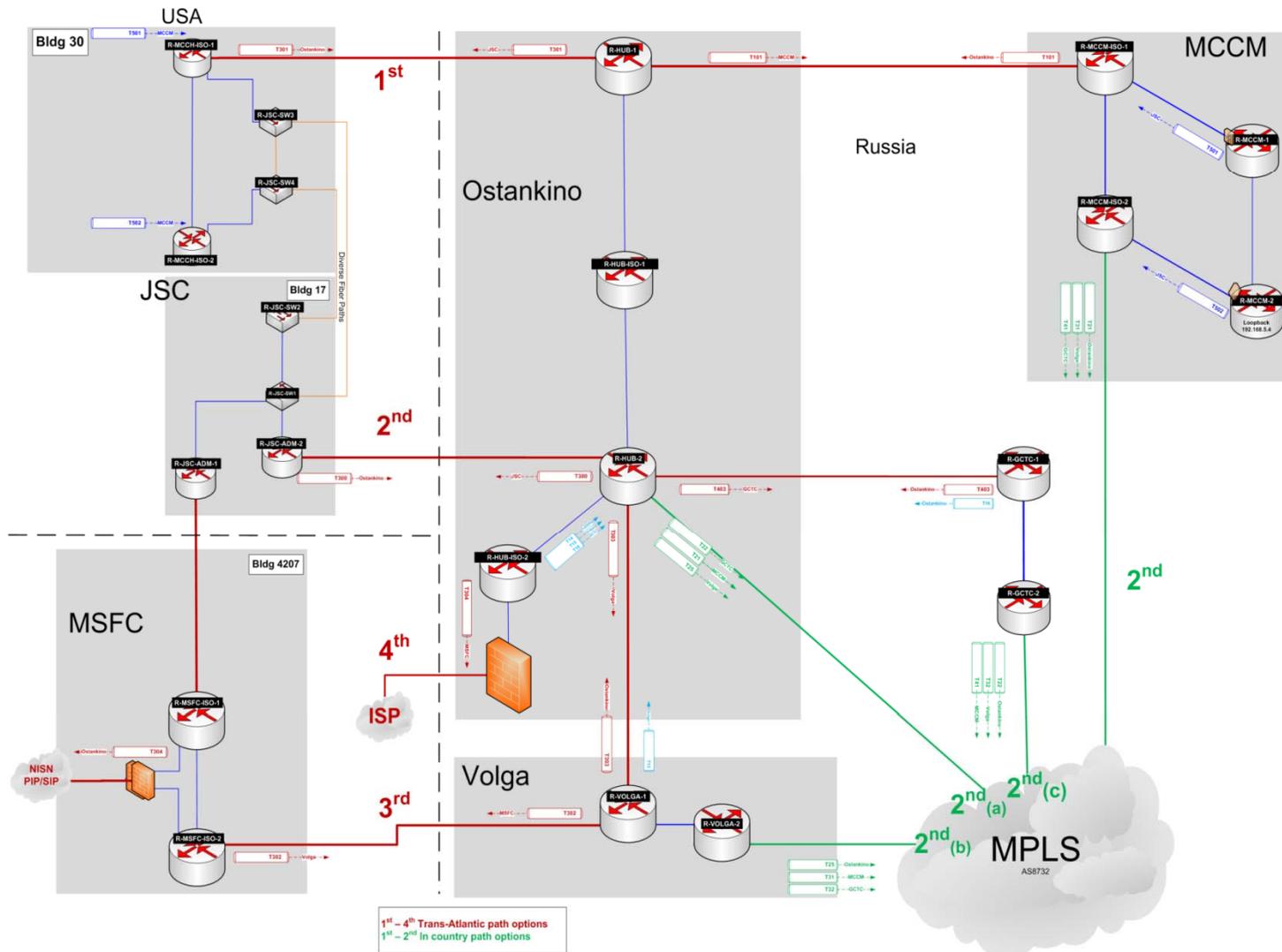


Soyuz Integrated Network Voice and Data Circuits





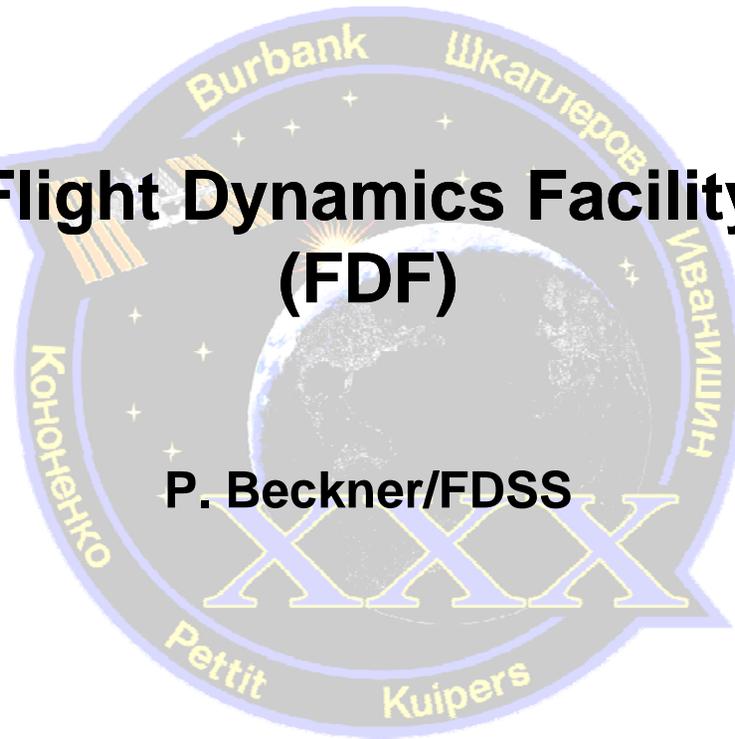
Russian Mission Network Backbone





Flight Dynamics Facility (FDF)

P. Beckner/FDSS





IN Element Status – FDF

- **Operational Changes since Soyuz 28 MORR**

Type	System	Significant Changes
Software	New modernized FDF Software system	• New communication front end with new external interfaces
Hardware	New modernized FDF Hardware system	• New communication front end with new external interfaces

- **Transition to operations: 11/09/11**
- **Transition completion: 12/19/11**
- **Dismantling of FDF legacy system: 01/01/12**

- **Open DRs: None**



IN Element Status – FDF (cont'd)

- **Open Work**

Type	System	Significant Changes
Software	None	None
Hardware	Two-Line Elements (TLE)	Verify receipt/processing of Soyuz 29 TLE by VHF sites

- **Projected Changes: None**

- **Staffing, Training and Certification**

- Staffing is sufficient to meet all requirements

- **Documentation Status**

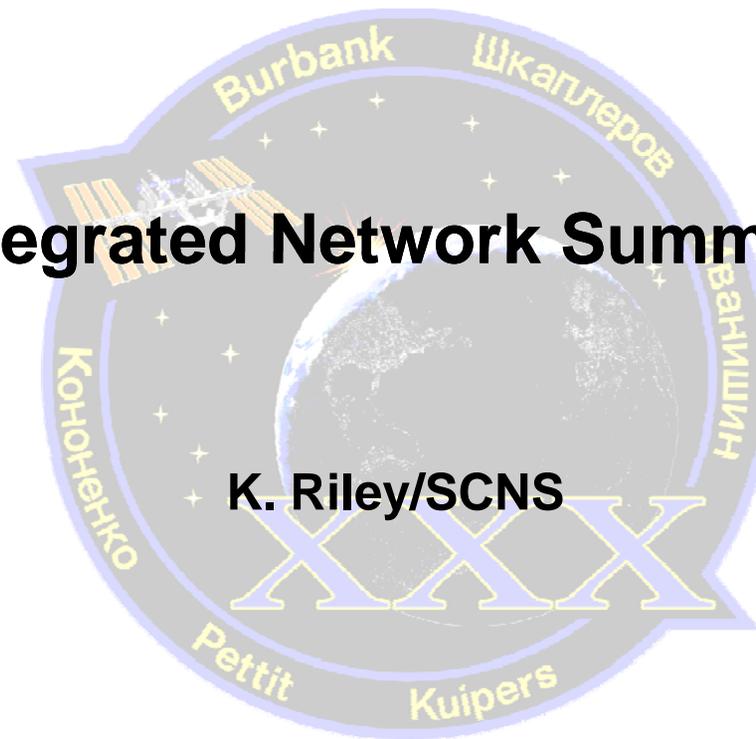
- Soyuz 29 Mission Support Plan (MSP) will be delivered by 12/07/11

- **Summary and Readiness Assessment**

- FDF is ready to support the Soyuz 29/Expedition 30 and ISS Increment 30
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Integrated Network Summary



K. Riley/SCNS

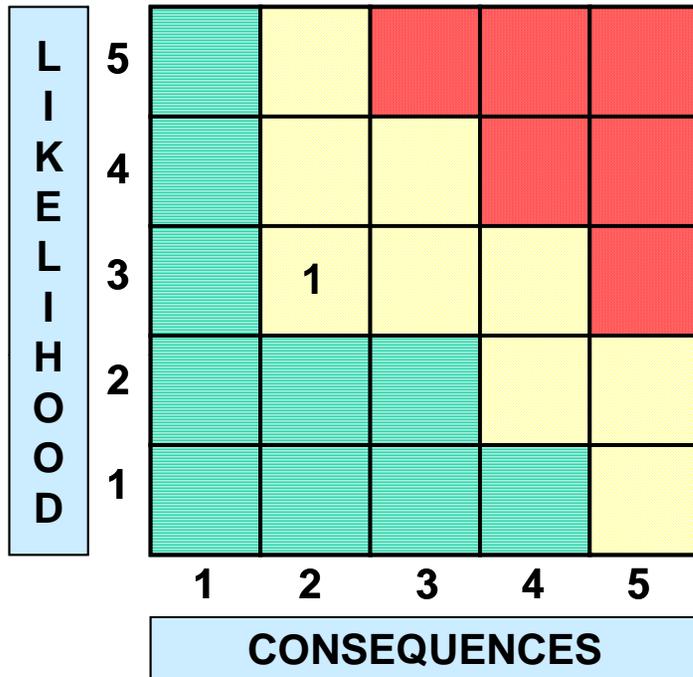


Requirements/Test Matrix

Network Resource	Requirement	Verification Method	Verification Complete
Space Network	<ul style="list-style-type: none"> ISS S-band Forward/Return ISS K-band Forward/Return 	Operational	Operational
White Sands VHF-1 VHF-2	<ul style="list-style-type: none"> 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)	08/31/11 & 09/30/11
Wallops VHF-1 VHF-2	<ul style="list-style-type: none"> 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)	08/29/11 & 09/20/11
Dryden VHF-1 VHF-2	<ul style="list-style-type: none"> 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)	08/31/11 & 09/30/11
Eastern Range	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Voice/Data Communications 	Operational	Operational
Flight Dynamics Facility	<ul style="list-style-type: none"> 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
<p>1</p> 	<p>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</p>	<p>Mitigate</p> <ul style="list-style-type: none"> 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 	<p>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</p> <p>Systems readiness tests are conducted monthly to verify the system, minus the RF transmission, which is restricted</p> <p>VHF-2 would be used in contingency situations on Soyuz; should the Astronauts have to evacuate the ISS to the Soyuz capsule</p> <p>Note: The FAA has refused to allow the use of the restricted frequency for periodic VHF-2 system validation</p> <p>The last VHF-2 ETE Comm check was performed in September 2004</p>

Risk Criticality



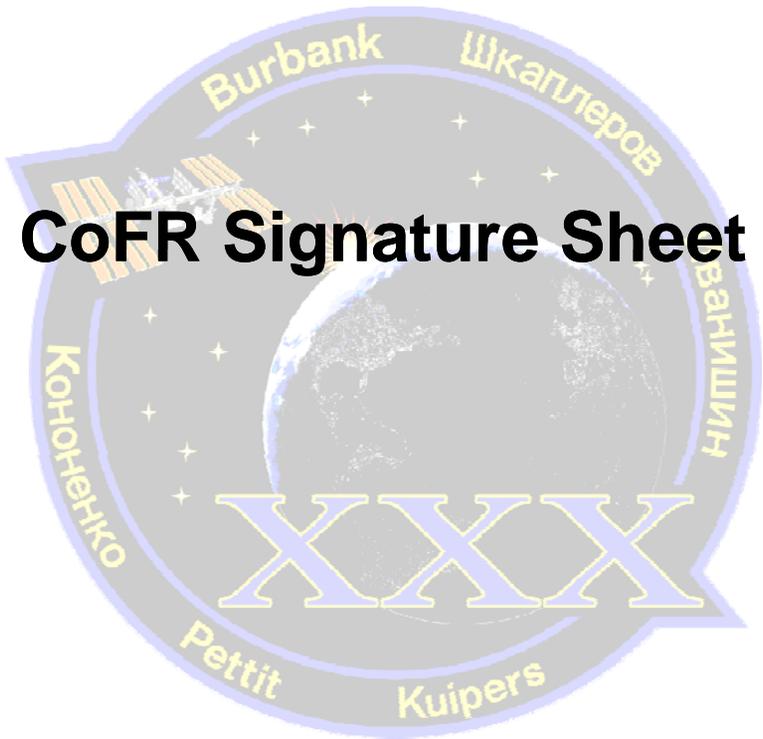


Action Item Summary





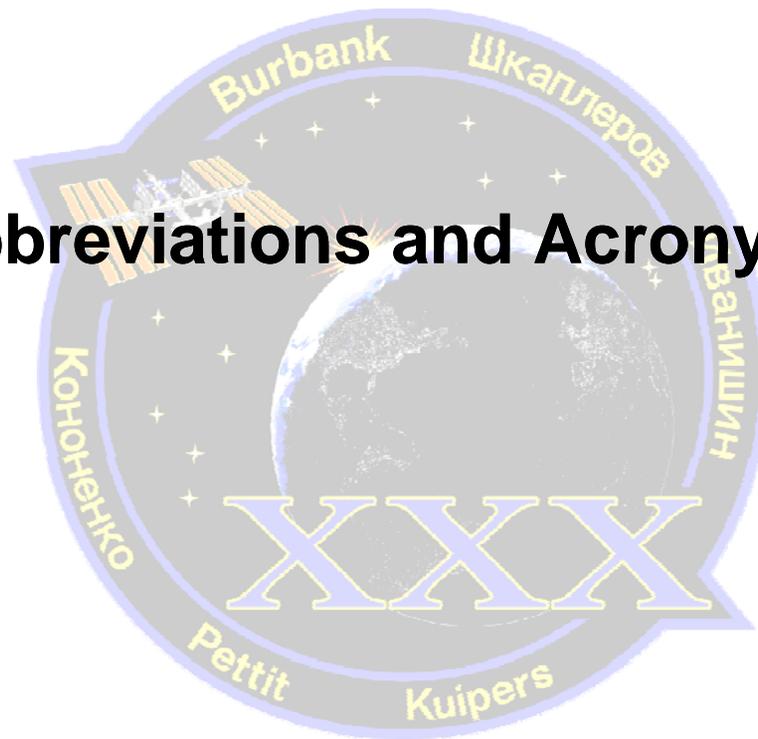
Readiness Assessment



CoFR Signature Sheet



Abbreviations and Acronyms





Abbreviations and Acronyms

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