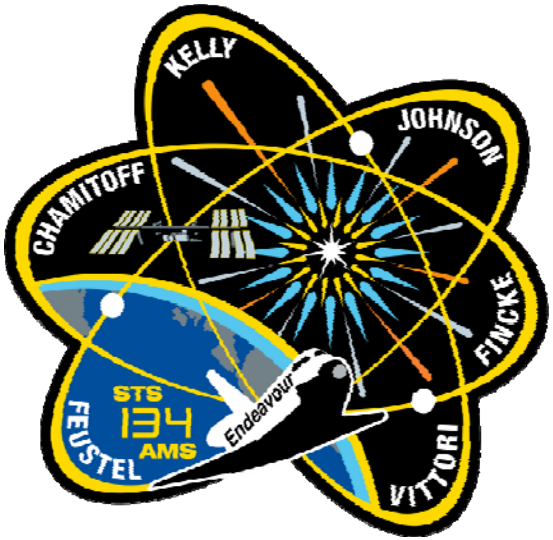
STS-134/135 Mission Planning Splinter Meeting Integrated Networks Status



03/29/11

Erik Richards /NENS/HSF

Near Earth Networks Services

Agenda

- Significant Changes Since STS-133
- Integrated In-Flight Anomalies (IFA) from STS-133
- STS-134/STS-135 Overview
- STS-134/STS-135 Mission Readiness Schedule (MRS)
- STS-134 Mission
- STS-135 Mission
- Documentation
- Issues and Concerns
- Backup Slides

Significant Changes Since STS-133

- **Space Communications Network Services (SCNS) Contract Change**
  - **The transition from the Near Earth Networks Services (NENS) contract to the SCNS contract will occur on 04/09/11. Entities affected by this transition include:**
    - **GSFC Mission Integration and Operations (MI&O)**
      - **Human Space Flight (HSF) Team (Ground Network Operation Manager's (GNOM), Spaceflight Mission Manager's (SMM), Advanced Mission Planning/ HSF Doc's) / GSFC NIC**
      - **Electronic Systems Test Laboratory (ESTL)**
    - **GSFC Test and Integration**
    - **GSFC Sustaining Engineering**
    - **Merritt Island Launch Annex (MILA) and Ponce de Leon (PDL)**
    - **Wallops Ground Site (WGS)**
    - **White Sands Complex (WSC)**

IFA's from STS-133

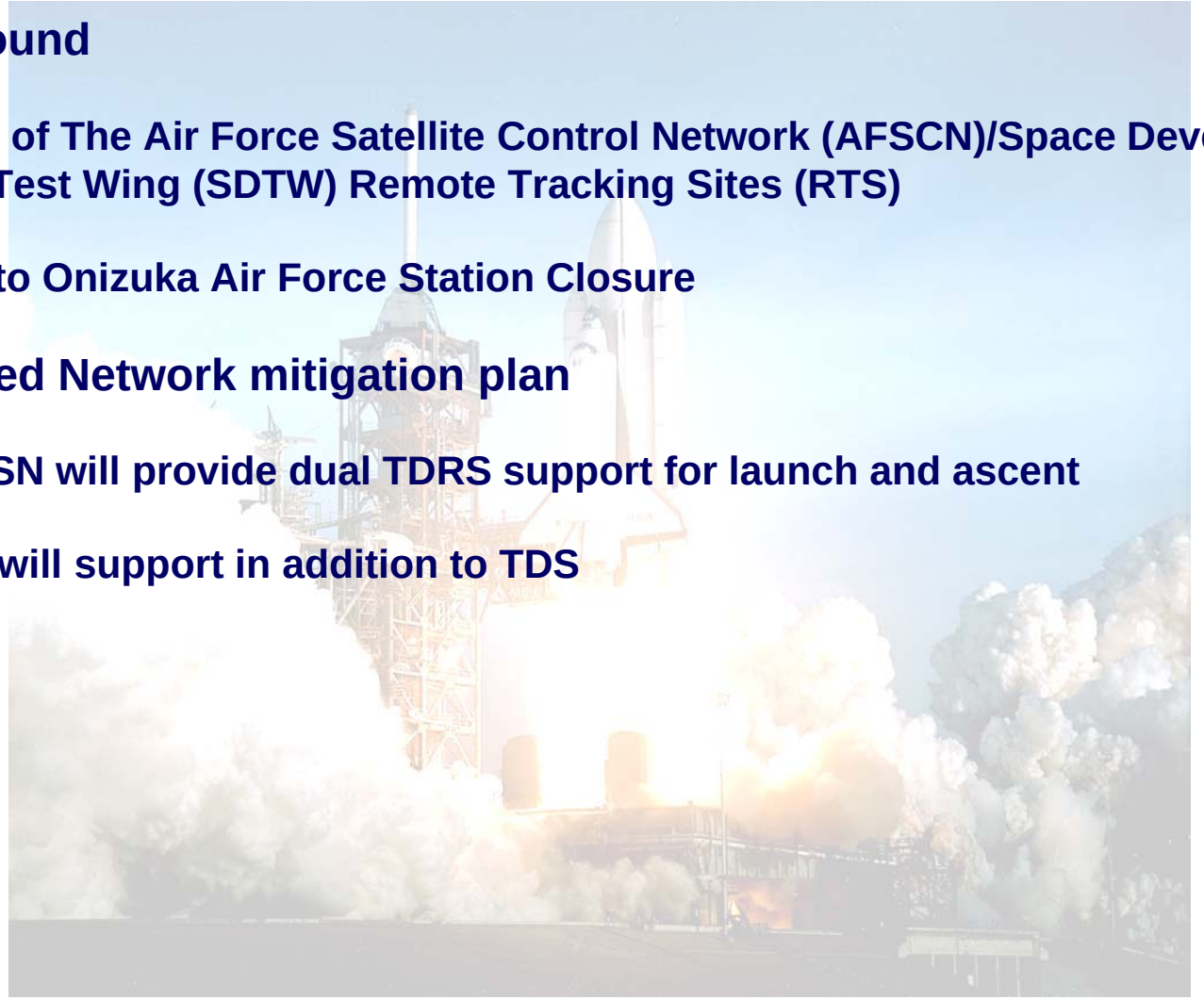
- **IFA STS-133-G-001**
  - **WGS - Anomaly in the Monitoring & Control software when changing from low (default) to high frequency**
    - **Closed to software anomaly**
- **IFA STS-133-G-002**
  - **STGT Common Time Frequency Standard-A (CTFS-A) failed**
    - **Closed to hardware failure**
- **IFA STS-133-G-003**
  - **Guam Data Interface System Replacement (GDIS-R) Return Service Anomaly**
    - **Under investigation**
    - **Workaround in place for STS-134 if cause cannot be identified and fixed**

STS-134 and STS-135 TDRS-275

- JSC events will be scheduled on the SA2 antenna only
  - No routine user access is available on SA1
- Full utilization on the Eastern and Western TDRS satellites
  - To minimize time to be scheduled on TDRS-275
- The SA1 antenna can only be scheduled if:
  - Times are designated as Super Critical in the Critical Period Restriction ISI
  - Pre-approved by the NASA Network Director
- Super Critical: Supports on TDRS-275 that require both SA1 and SA2 in order to support ISS and a visiting vehicle during docking and undocking

Dual TDRSS

- **Background**
  - **Loss of The Air Force Satellite Control Network (AFSCN)/Space Development and Test Wing (SDTW) Remote Tracking Sites (RTS)**
  - **Due to Onizuka Air Force Station Closure**
- **Integrated Network mitigation plan**
  - **The SN will provide dual TDRS support for launch and ascent**
  - **TDE will support in addition to TDS**



Dual TDRSS (cont'd)

- **Launch configuration**
  - **TDS:**
    - **30 minutes prior to preferred launch time**
    - **Low Frequency, Spreading On, East Codes**
  - **TDE:**
    - **15 minutes prior to preferred launch time**
    - **High Frequency, Spreading On, West Codes**
  - **TDZ:**
    - **Predicted AOS (19 minutes MET) to TDZ LOS**
    - **Low Frequency, Spreading On, West Codes**
  - **T171:**
    - **Predicted AOS (50 minutes MET)**
    - **Low Frequency, Spreading On, East Codes, K-Band only as placeholder**

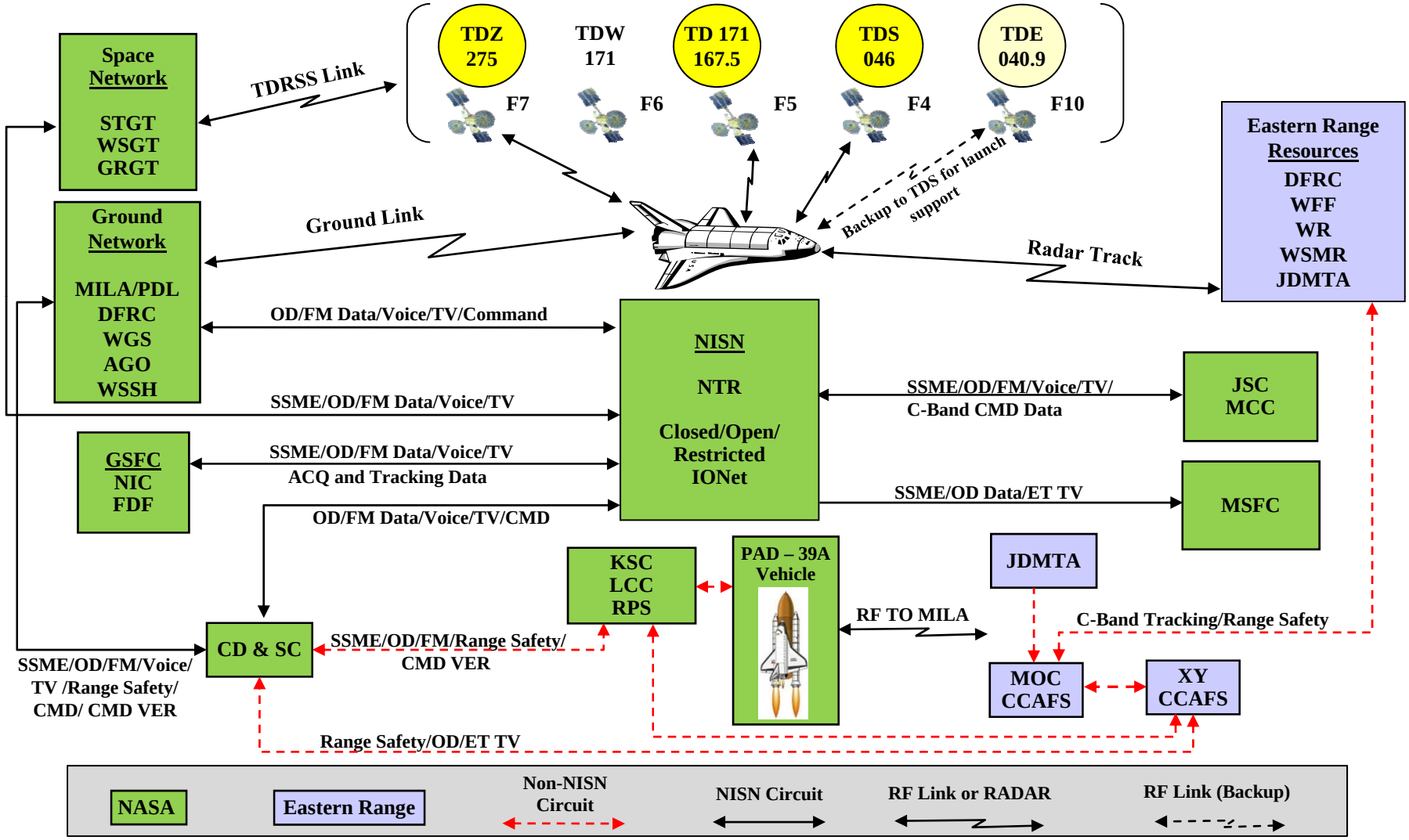
STS-134 and STS-135 Integrated Ground Network

- Integrated Network ground support
  - Launch support: MILA, PDL and WGS
    - UHF, ET TV, and S-band
  - On orbit support: MILA, WGS, DFRC and AGO**
    - Available for all view periods above 7 degrees
    - Backup to TDRSS (except AGO), FM dumps and commanding as required
  - L-1 day checks and landing: MILA, DFRC and WSSH (as required)
    - UHF and S-band

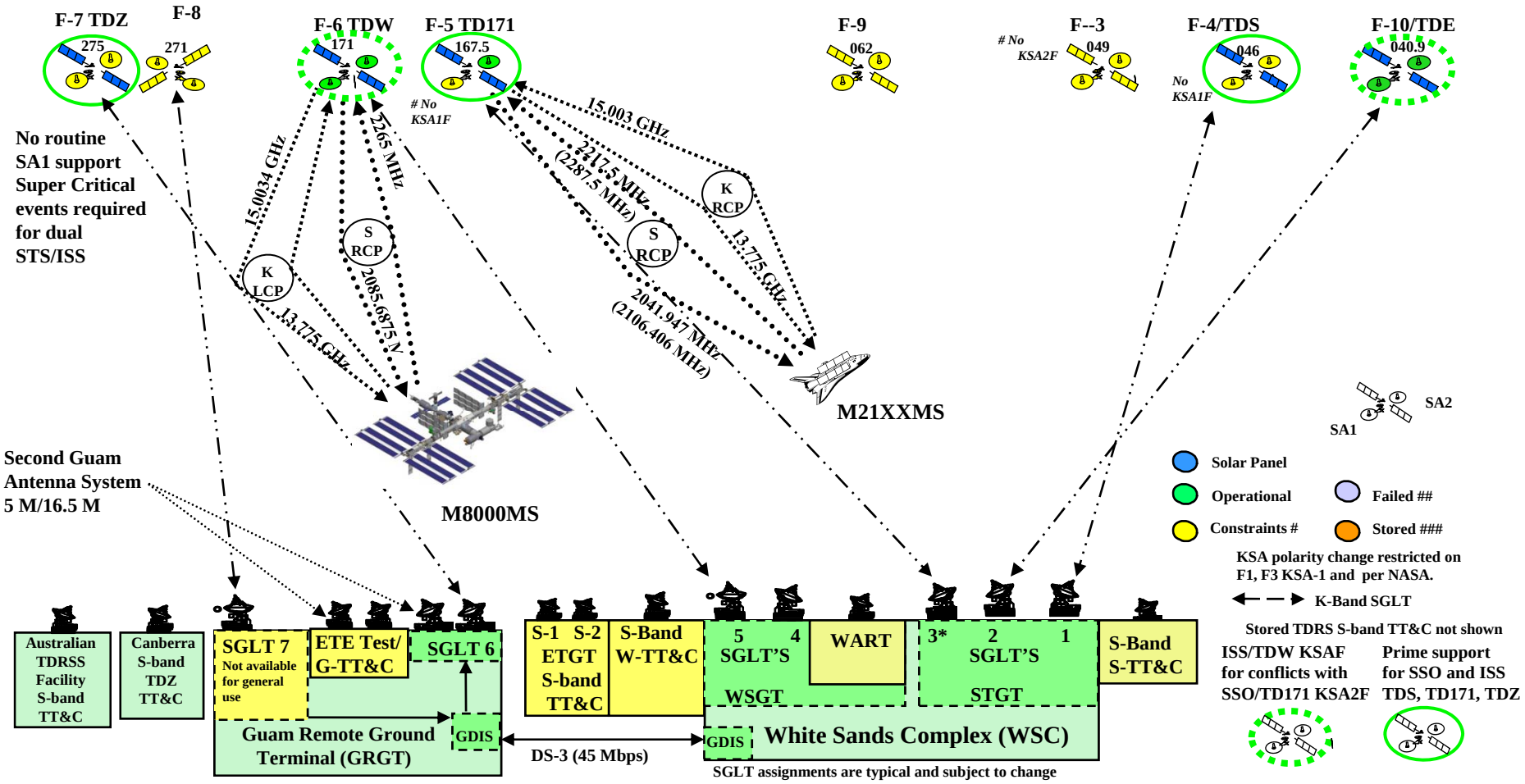
**AGO support:

- Committed support hours: 1230 GMT (AOS) to 2330 GMT (LOS) Monday thru Friday
- Available outside of committed hours with prior approval

STS-134 and STS-135 Integrated Network



Generic STS/ISS TDRSS Support



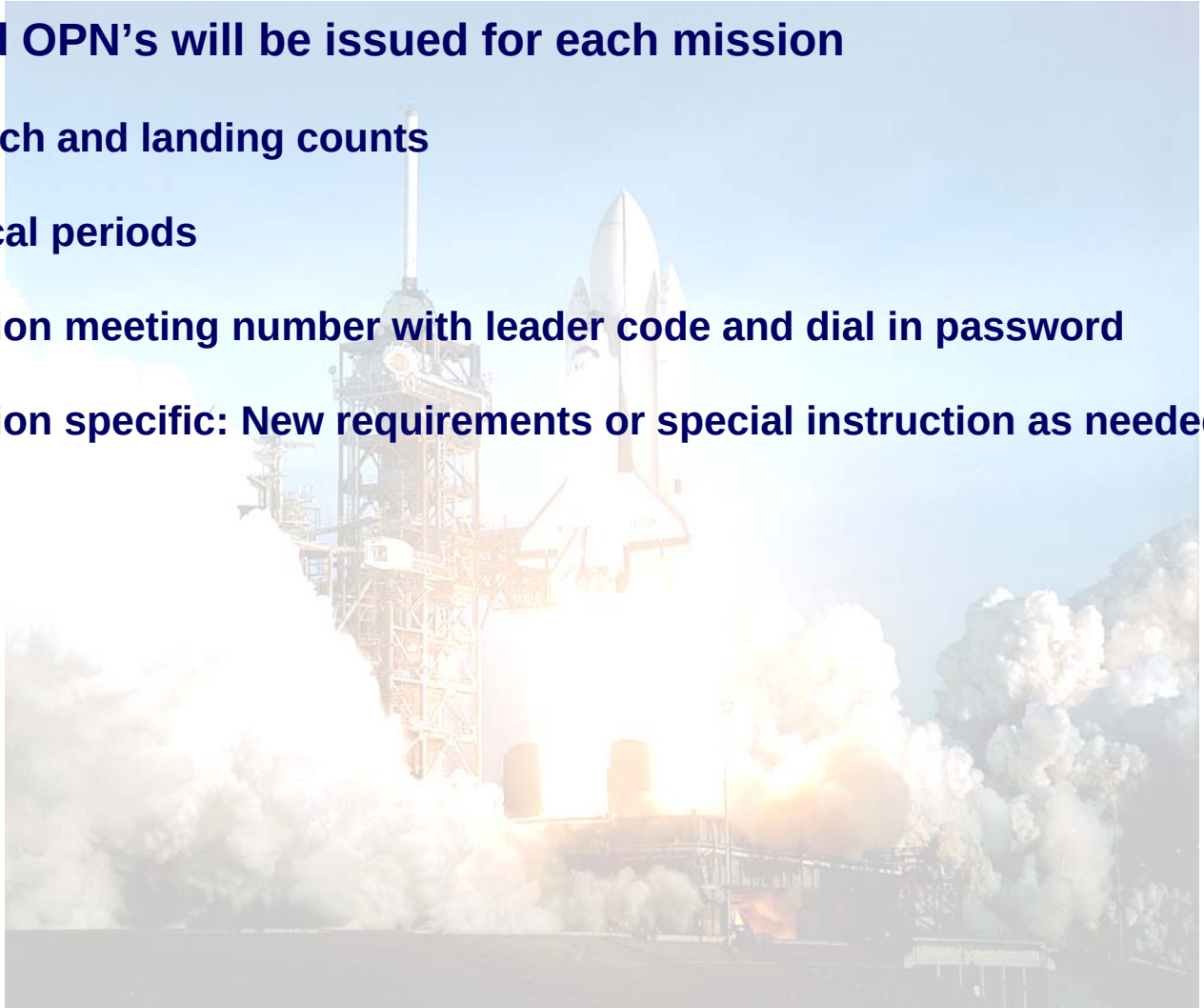
Mission Readiness Schedule

EVENT	STS-134	STS-135
ORR Inputs Call	01/07/11	03/31/11
ORR Inputs Due	01/18/11	04/14/11
ORR Dry Run	01/25/11	04/28/11
ORR/MORR	02/17/11	05/17/11
JSC DD FRR	03/03/11	05/19/11
JSC MOD FRR	03/10/11	05/26/11
SSP FRR	03/31/11	06/14/11
Agency	04/08/11	06/21/11
PMT	04/12/11	06/22/11
LAUNCH	04/19/11	06/28/11
LANDING	05/03/11	TBD

Completed Events

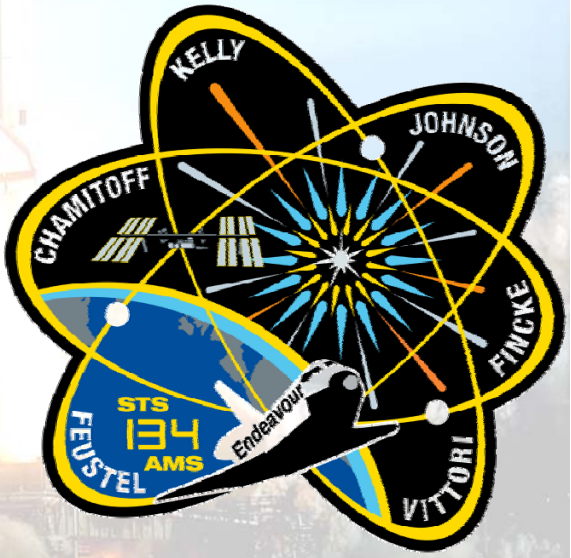
Documentation

- ISI's and OPN's will be issued for each mission
  - Launch and landing counts
  - Critical periods
  - Mission meeting number with leader code and dial in password
  - Mission specific: New requirements or special instruction as needed



STS-134 Mission

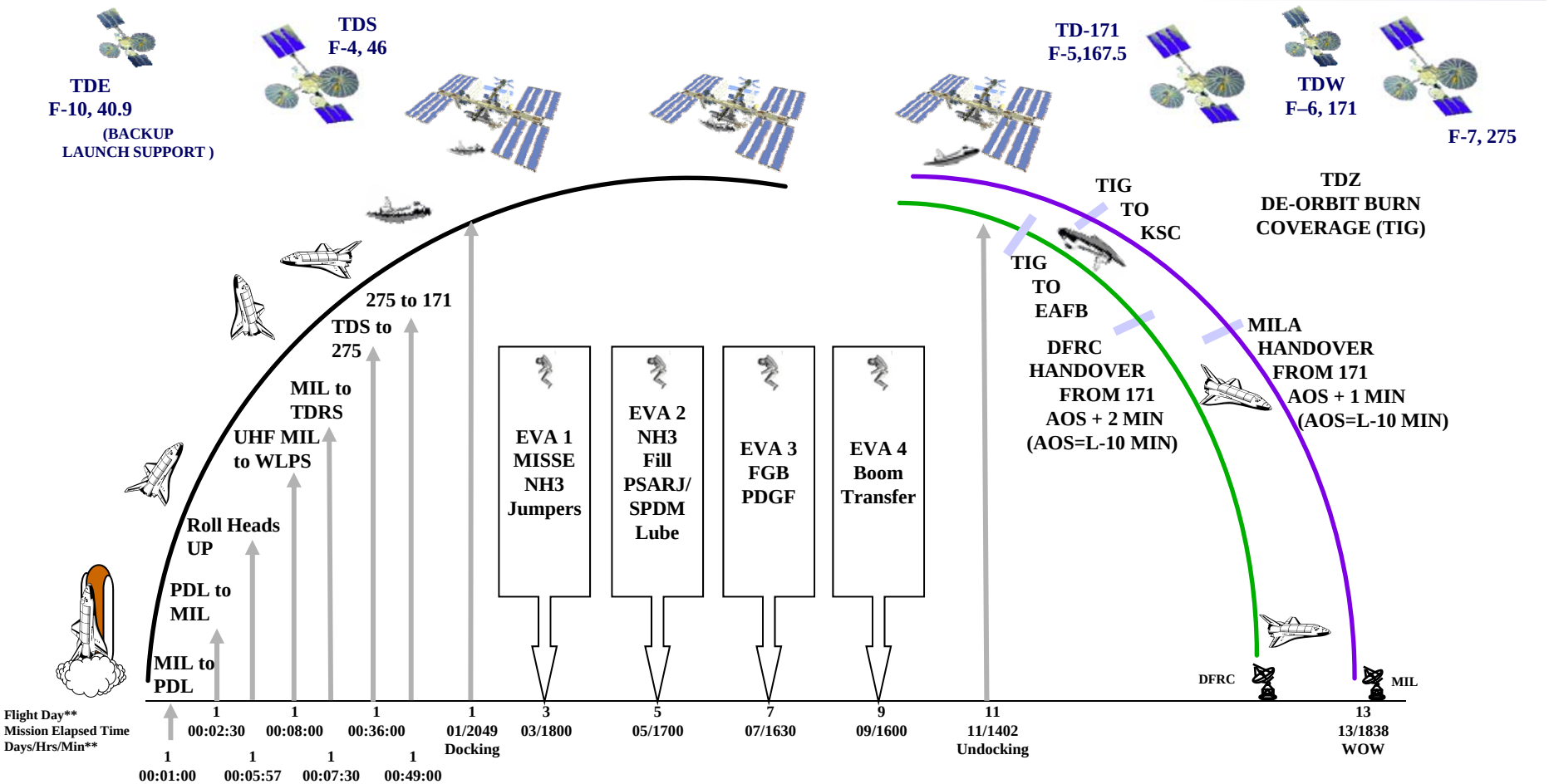
- Space Shuttle: Endeavour
- Launch pad: 39A
- Primary Payload: Alpha Magnetic Spectrometer (AMS)
- Launch date: 04/19/11
- Landing: 05/03/11
- Mission duration: 14
- SMM: Fred Pifer/Kevin Riley
- Goddard Ops: Melvin Calhoun

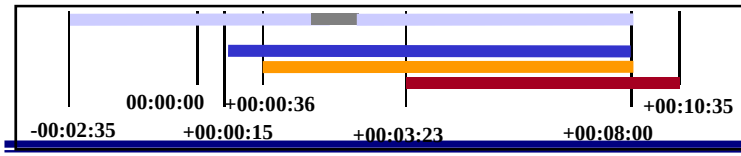


STS-134 Mission (cont'd)

- **The mission marks:**
  - **165th NASA manned space flight**
  - **134th shuttle mission since STS-1**
  - **25th flight of Endeavour**
  - **36th shuttle mission to the ISS**
  - **109th post-Challenger mission**
  - **21st post-Columbia mission**
- **Spacewalks**
  - **Four spacewalks (EVAs) are scheduled during the flight. These EVAs are currently scheduled to be the final EVAs conducted by a shuttle crew**

STS-134 Integrated Network Coverage Chart





MILA
PDL
JDMTA
WPS

Notes:
1. PDL, JDMTA and WPS acquire sequentially at 00:00:15, 00:00:36 and 00:03:23
2. WPS tracks Orbiter; not ET link as tank drops away

Nominal ET TV Coverage

NENS
Near Earth Networks Services

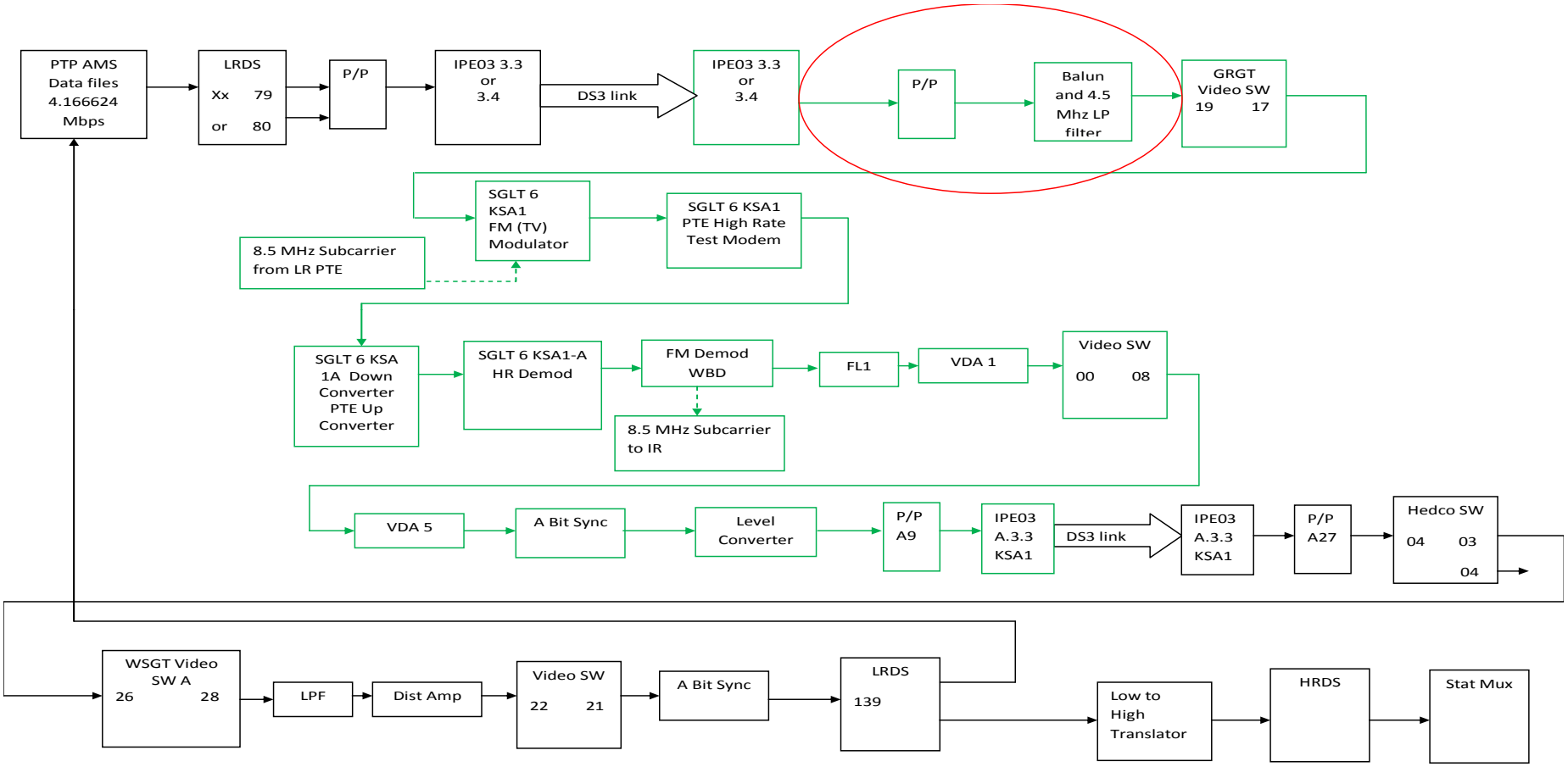
STS-134 Network Testing Chart

Test Name	Date
MILA/PDL Prelaunch Checkout	3/28/2011
DFRC L-1/Landing Simulation	3/28/2011
Range Safety Training Test	3/29/2011
MILA L-1/Landing Simulation	3/30/2011
AGO/JSC On-orbit Simulation	3/31/2011
TCDT	3/31/2011
TCDT	4/1/2011
MILA/WPS Checkout	4/4/2011
PSS/TDRS Calibration	4/4/2011
Launch Simulation w/ JSC	4/4/2011
1108 Range Safety Test	4/5/2011
MILA/JSC AMS End-to-End Test	4/6/2011
SN VEC/VER	4/13/2011
GWM VER/VAL	4/13/2011
SN VER/VAL	4/14/2011
Abbreviated 1108 Rng Safety	4/18/2011

AMS-02 Payload

- Alpha Magnetic Spectrometer 2 (AMS-02)
  - Designed to search for antimatter and the origin and structure of dark matter
  - AMS Testing for 4.166 Mbps
    - Several AMS data flows have been performed with ESTL and have been successful
  - Unable to successfully flow AMS data out of Guam
    - Suspected over modulation due to GRGT test equipment configuration
    - 50 Ohm to 75 Ohm impedance mismatch is the suspected root cause of testing trouble
    - The connectors is on order, delivery date unknown
  - Test configuration
    - No PTP at GRGT
    - Medium loop back via GDIS-R

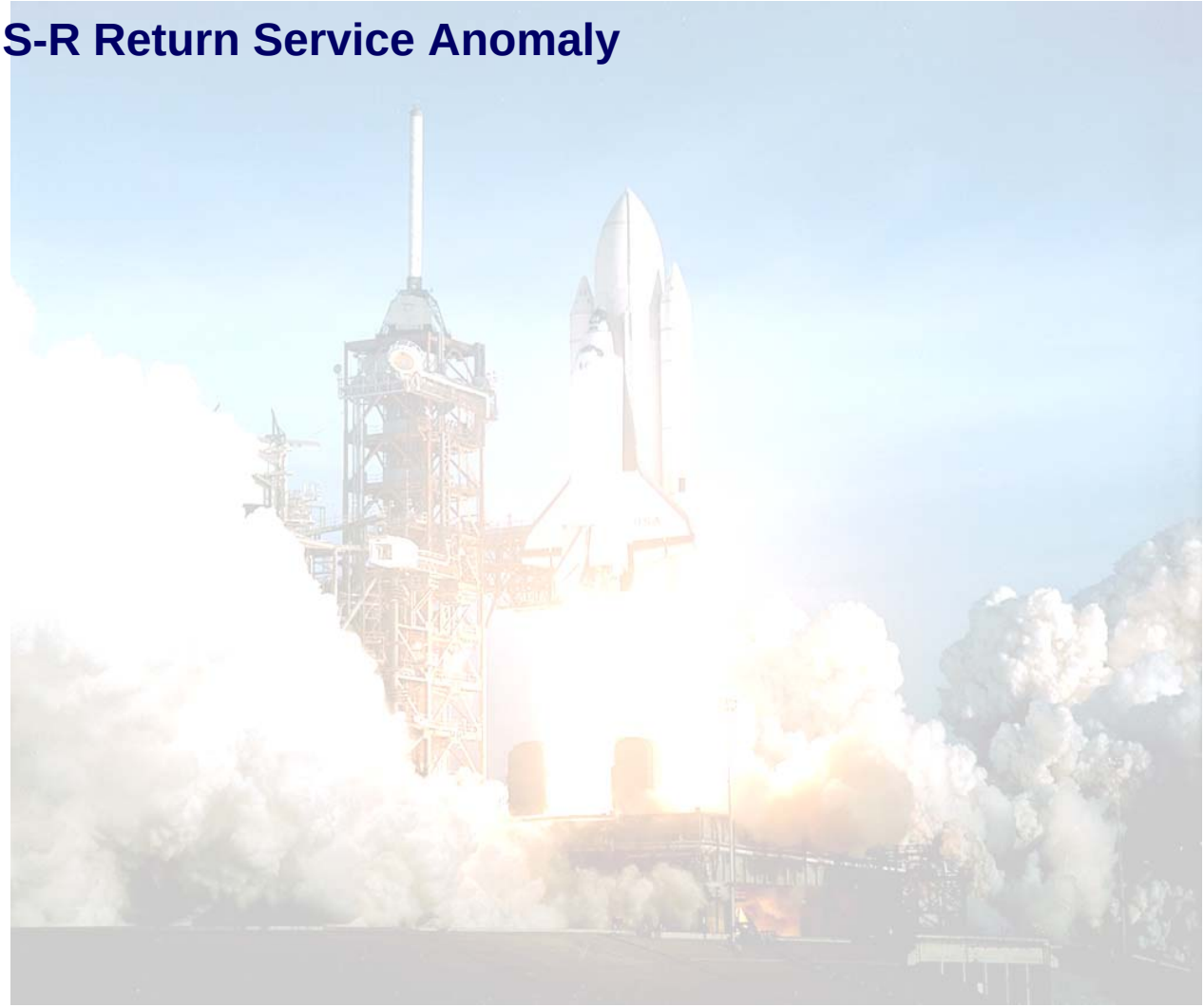
AMS Guam Test Configuration



STS-134 AMS Chann
TV Digital GRGT
Medium Loop Test

STS-134 Issues and Concerns

- **The GDIS-R Return Service Anomaly**



STS-135 Mission

- Space Shuttle: Atlantis
- Launch pad: 39A
- Launch date: 06/28/11
- Landing: 07/10/11
- Mission duration: 12
- SMM: Fred Pifer/Erik Richards
- Goddard Ops: Melvin Calhoun

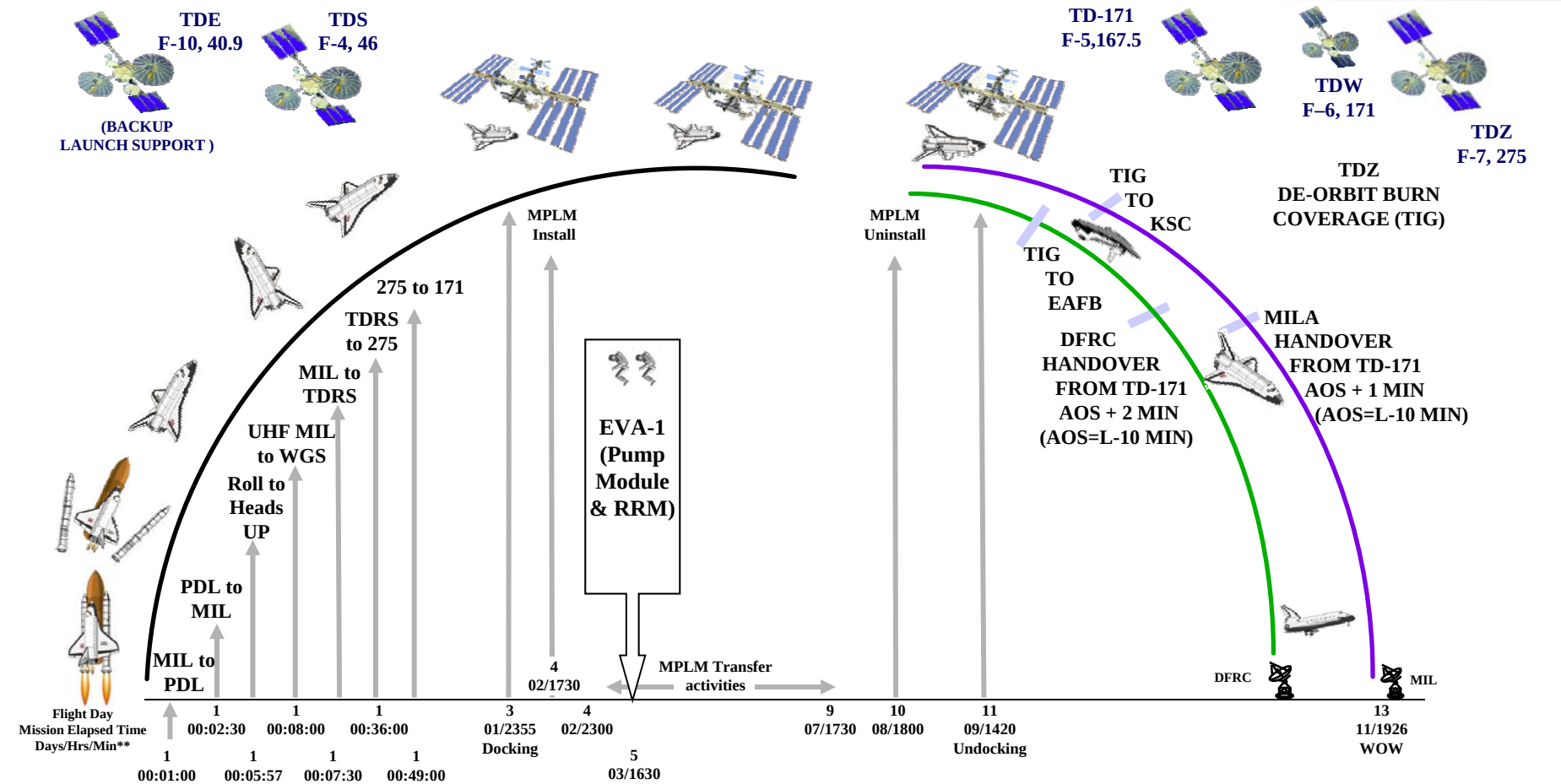
STS-135 Mission (cont'd)

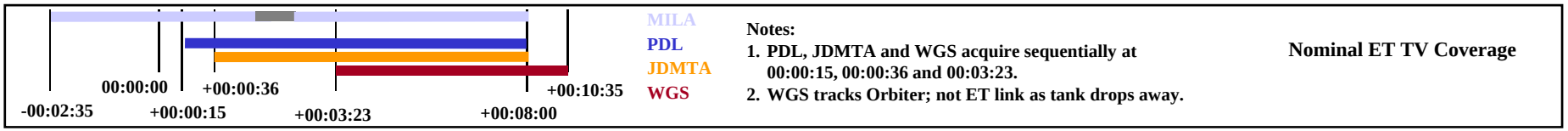
- **The mission marks:**
  - **166th (and currently the final planned) NASA manned space flight**
  - **135th shuttle mission since STS-1**
  - **33rd flight of Atlantis**
  - **37th shuttle mission to the ISS**
  - **110th post-Challenger mission**
  - **22nd post-Columbia mission**
- **Mission timeline**
  - **Atlantis will rendezvous with the ISS on Flight Day 4 as opposed to the typical Flight Day 3 because the small crew will create more demand on each individual crew-member that cannot be met with existing timelines**

Robotic Refueling Mission (RRM)

- **Satellite servicing demonstration project at GSFC**
  - **Voice and data requirements are currently being worked**

STS-135 Integrated Network Coverage Chart





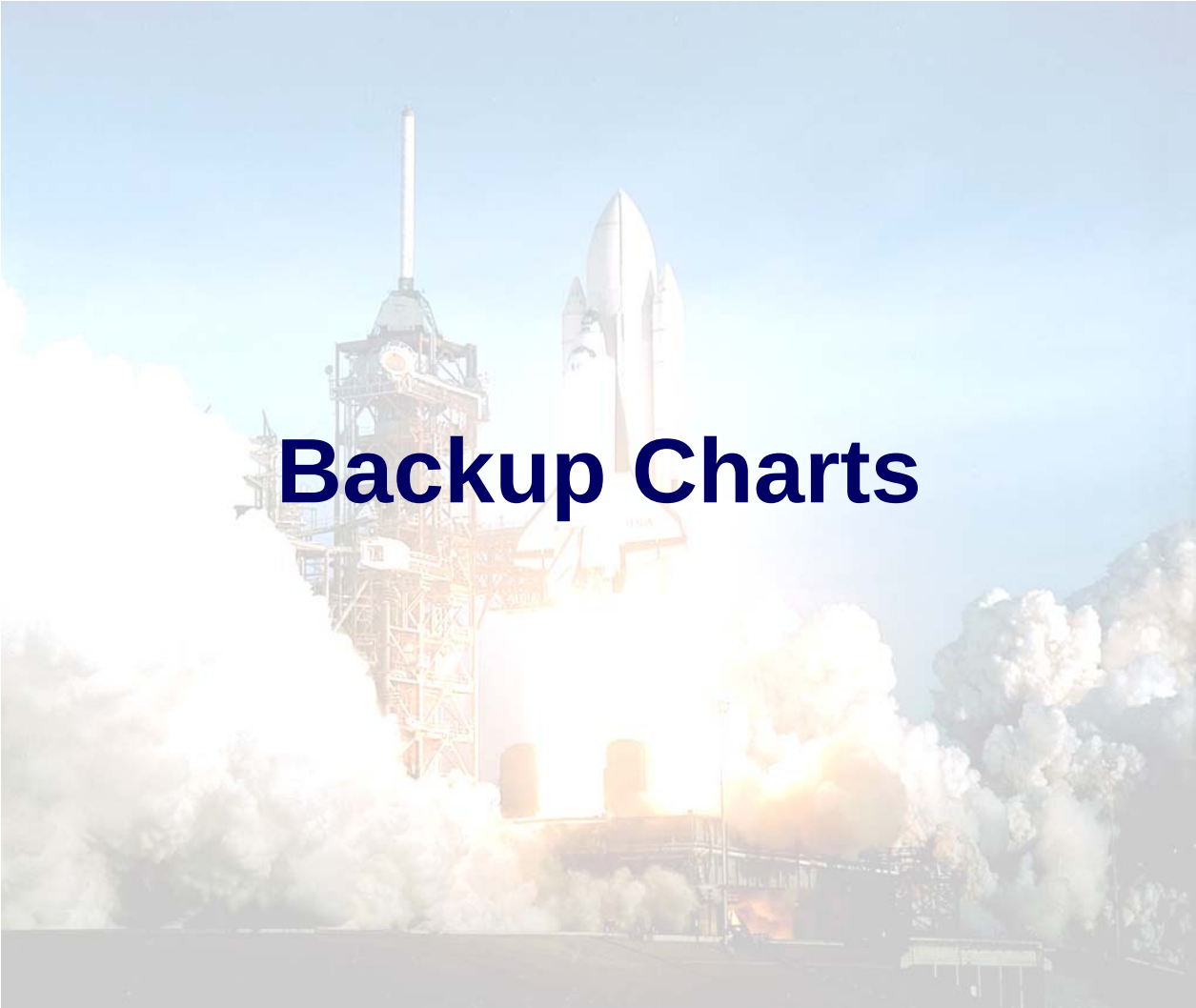
Notes:
1. PDL, JDMTA and WGS acquire sequentially at 00:00:15, 00:00:36 and 00:03:23.
2. WGS tracks Orbiter; not ET link as tank drops away.

Nominal ET TV Coverage

Near Earth Networks Services

STS-135 Issues and Concerns

- **None**



Backup Charts

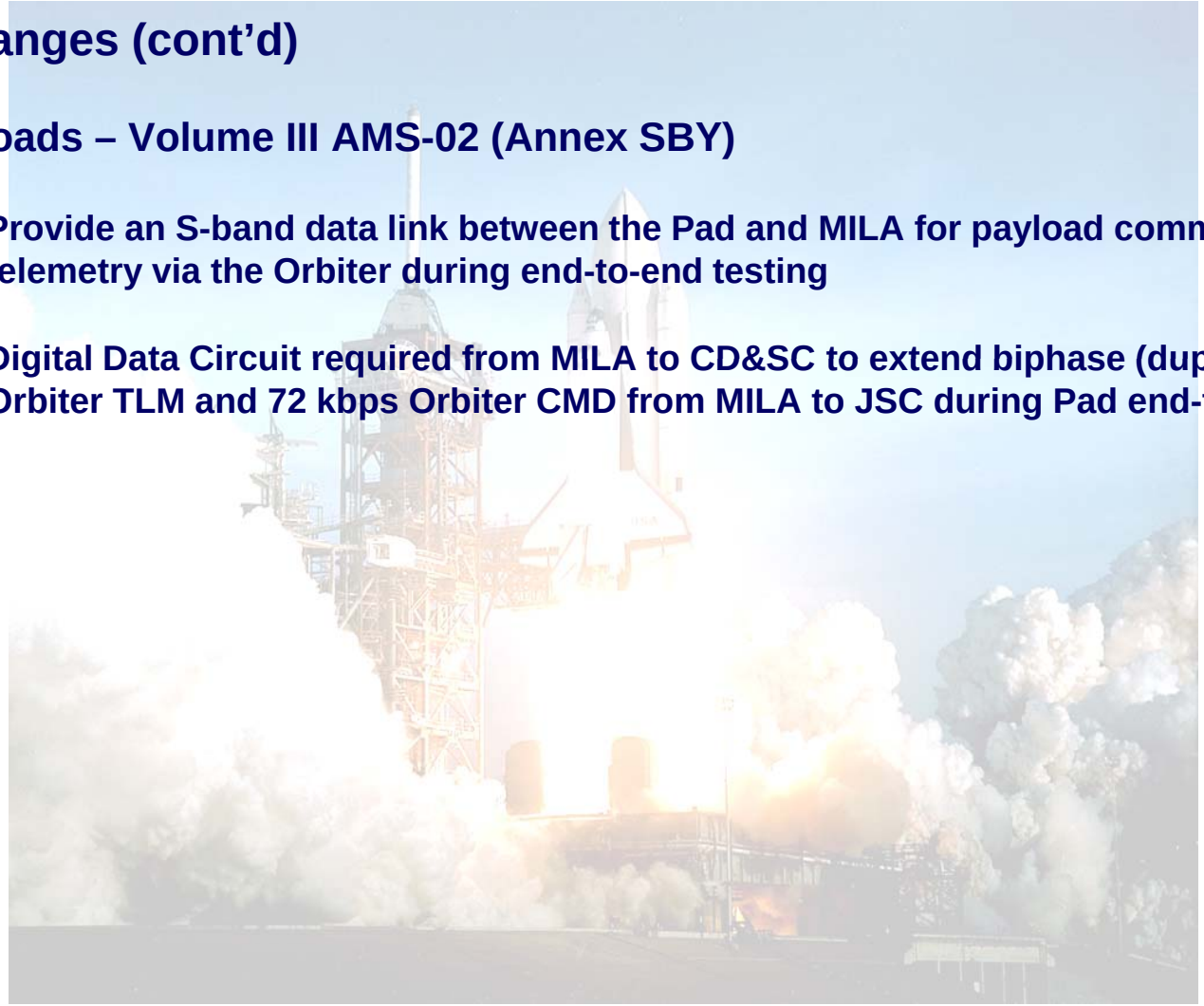
Requirement Changes

- **Program Requirements Document (PRD) changes**
  - **Payloads – Volume III AMS-02 (Annex SBY)**
    - **Added OIS channels to the descriptions listed:**
      - **JSC to GSFC via NISN**
        - » **Circuit Description: PTC/AFT 1** — **OIS 134**
        - » **Circuit Description: PAYLOAD-2/AFT-5** — **OIS 174**
        - » **Circuit Description: INTEGRATED TEST/AFT-2** — **OIS 144**
        - » **Circuit Description: Flight Director*** — **OIS 6001**
        - » **Circuit Description: A/G-1*** — **OIS 212**
      - **GSFC to KSC via NISN**
        - » **Circuit Description: PTC/AFT 1** — **OIS 134**
        - » **Circuit Description: PAYLOAD-2/AFT-5** — **OIS 174**
        - » **Circuit Description: INTEGRATED TEST/AFT-2** — **OIS 144**
        - » **Circuit Description: A/G-1** — **OIS 212**

*** Not required for end-to-end tests**

Requirement Changes (cont'd)

- **PRD changes (cont'd)**
  - **Payloads – Volume III AMS-02 (Annex SBY)**
    - **Provide an S-band data link between the Pad and MILA for payload command and telemetry via the Orbiter during end-to-end testing**
    - **Digital Data Circuit required from MILA to CD&SC to extend biphase (duplex) 128 kbps Orbiter TLM and 72 kbps Orbiter CMD from MILA to JSC during Pad end-to-end test**



Requirement Changes (cont'd)

- **PRD changes (cont'd)**
  - **Payloads – Volume II Launch and Landing (Annex LLP)**
    - **Deleted references to PAD-B for RF Data links to MILA**
    - **Deleted requirement for X-band RF Data Links from KSC to MILA**
    - **Deleted Hangar AE requirement for CAS data**
    - **Removed reference to the O&C for Wideband Analog Data Circuit between KSC CD&SC and JSC**
    - **Added O&C room number and circuit ID's for 128 kb TLM and 72 kb CMD to/from MILA**

STS-134 Test Matrix

STS-134
Networks Service
Requirements
Test Matrix

Green - Successfully Completed
Yellow - Partially Successful
Red - Failed
Black - Not Applicable
White - To Be Tested

	AGO/JSC Sim (03/31/11)	MILA/PDL PSS Test (03/30/11)	TCDT / KSC S0017 (04/01/11)	KSC S0044 (03/04/11)	KSC S0009 (w/ETTV) (PADVAL) (03/31/11)	Range Safety - 1108 (04/05/11)	Abbrev. Range Safety - 1108 (04/18/11)	MILA Landing-1 Day/Landing Sim (04/06/11)	DRFC Landing-1 Day/Landing Sim (03/29/11)	Launch Sim (04/04/11)	Vector Proficiency Sim (TBD)	SN 1201 (Ver/Val) WSC (04/12/11)	SN 1201 (Ver/Val) Guam (04/11/11)	FDF 3201 (Vector Ver) (04/11/11)	SN 5202- WSC (04/13/11)	SN 5202- Guam (04/14/11)	MILA/PDL 5202 (L-7 days)	DFRC 5202 (L-7 days)	WSSH UHF Checks (w/PSS) (TBD)	**Current Status**
GSFC Network Integration Center (NIC) Requirements																				
GN Verification																				
SN Verification																				
NASA Integrated Services Network (NISN) Requirements																				
Closed IONet																				
Tracking Data System																				
Flight Dynamics Facility (FDF) Requirements																				
Generate/Distribute GN Acquisition Data																				
IIRV																				
IRV																				
INP																				
Generate/Distribute SN Acquisition Data																				
Generate/Distribute TDRS Vectors																				
Evaluate Tracking Data																				
LS UDTF																				
HS UDTF																				
TDM																				
MDDF																				

Near Earth Networks Services

Service Requirements/Test Matrix

STS-134
Networks Service Requirements
Test Matrix

Green - Successfully Completed
Yellow - Partially Successful
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Black - Not Applicable
White - To Be Tested

	AGO/JSC Sim (03/31/11)	MILA/PDL PSS Test (03/30/11)	TCDT / KSC S0017 (04/01/11)	KSC S0044 (03/04/11)	KSC S0009 (w/ETTV) (PADVAL) (03/31/11)	Range Safety - 1108 (04/05/11)	Abbrev. Range Safety - 1108 (04/18/11)	MILA Landing-1 Day/Landing Sim (04/06/11)	DRFC Landing-1 Day/Landing Sim (03/29/11)	Launch Sim (04/04/11)	Vector Proficiency Sim (TBD)	SN 1201 (Ver/Val) WSC (04/12/11)	SN 1201 (Ver/Val) Guam (04/11/11)	FDF 3201 (Vector Ver) (04/11/11)	SN 5202- WSC (04/13/11)	SN 5202- Guam (04/14/11)	MILA/PDL 5202 (L-7 days)	DFRC 5202 (L-7 days)	WSSH UHF Checks (w/PSS) (TBD)	**Current Status**
White Sands Space Harbor (WSSH) Requirements																				
Acquisition Data Processing																				
LTAS																				
INP																				
IIRV																				
UHF A-G Communications																				
Eastern Range (ER) Requirements																				
Range Safety																				
C-band Radar Tracking																				
LTAS Data Generation/Distribution																				
Space Network (SN) Requirements																				
Telemetry																				
Command																				
Tracking (TDM)																				
Vector Processing (Nominal and Contingency)																				
Video																				

Near Earth Networks Services

Service Requirements/Test Matrix (cont'd)

STS-134
Networks Service Requirements
Test Matrix

Green - Successfully Completed
Yellow - Partially Successful
Red - Failed
Black - Not Applicable
White - To Be Tested

	AGO/JSC Sim (03/31/11)	MILA/PDL PSS Test (03/30/11)	TCDT / KSC S0017 (04/01/11)	KSC S0044 (03/04/11)	KSC S0009 (w/ETTV) (PADVAL) (03/31/11)	Range Safety - 1108 (04/05/11)	Abbrev. Range Safety - 1108 (04/18/11)	MILA Landing-1 Day/Landing Sim (04/06/11)	DRFC Landing-1 Day/Landing Sim (03/29/11)	Launch Sim (04/04/11)	Vector Proficiency Sim (TBD)	SN 1201 (Ver/Val) WSC (04/12/11)	SN 1201 (Ver/Val) Guam (04/11/11)	FDF 3201 (Vector Ver) (04/11/11)	SN 5202- WSC (04/13/11)	SN 5202- Guam (04/14/11)	MILA/PDL 5202 (L-7 days)	DFRC 5202 (L-7 days)	WSSH UHF Checks (w/PSS) (TBD)	**Current Status**
Santiago (AGO) Requirements																				
FM Telemetry																				
OD Telemetry																				
Command																				
Acquisition Data Processing (IIRV)																				
DFRC Requirements																				
FM Telemetry																				
OD Telemetry																				
Command																				
UHF A-G Communications																				
Tracking																				
SSM Creation/Distribution																				
Acquisition Data Processing																				
ATF1																				
ATF2																				
ATF3																				
Video																				

Service Requirements/Test Matrix (cont'd)

STS-134
Networks Service Requirements
Test Matrix

Green - Successfully Completed
Yellow - Partially Successful
Red - Failed
Black - Not Applicable
White - To Be Tested

	AGO/JSC Sim (03/31/11)	MILA/PDL PSS Test (03/30/11)	TCDT / KSC S0017 (04/01/11)	KSC S0044 (03/04/11)	KSC S0009 (w/ETTV) (PADVAL) (03/31/11)	Range Safety - 1108 (04/05/11)	Abbrev. Range Safety - 1108 (04/18/11)	MILA Landing-1 Day/Landing Sim (04/06/11)	DRFC Landing-1 Day/Landing Sim (03/29/11)	Launch Sim (04/04/11)	Vector Proficiency Sim (TBD)	SN 1201 (Ver/Val) WSC (04/12/11)	SN 1201 (Ver/Val) Guam (04/11/11)	FDF 3201 (Vector Ver) (04/11/11)	SN 5202- WSC (04/13/11)	SN 5202- Guam (04/14/11)	MILA/PDL 5202 (L-7 days)	DFRC 5202 (L-7 days)	WSSH UHF Checks (w/PSS) (TBD)	**Current Status**
MILA/PDL Requirements																				
FM Telemetry																				
OD Telemetry																				
Command																				
UHF A-G Communications																				
Tracking																				
Range Safety																				
SSM Creation/Distribution																				
Acquisition Data Processing																				
9M1																				
9M2																				
Best Source Select																				
KSC RPS																				
Video																				

Service Requirements/Test Matrix (cont'd)

STS-134
Networks Service Requirements
Test Matrix

Green - Successfully Completed
Yellow - Partially Successful
Red - Failed
Black - Not Applicable
White - To Be Tested

	AGO/JSC Sim (03/31/11)	MILA/PDL PSS Test (03/30/11)	TCDT / KSC S0017 (04/01/11)	KSC S0044 (03/04/11)	KSC S0009 (w/ETTV) (PADVAL) (03/31/11)	Range Safety - 1108 (04/05/11)	Abbrev. Range Safety - 1108 (04/18/11)	MILA Landing-1 Day/Landing Sim (04/06/11)	DRFC Landing-1 Day/Landing Sim (03/29/11)	Launch Sim (04/04/11)	Vector Proficiency Sim (TBD)	SN 1201 (Ver/Val) WSC (04/12/11)	SN 1201 (Ver/Val) Guam (04/11/11)	FDF 3201 (Vector Ver) (04/11/11)	SN 5202- WSC (04/13/11)	SN 5202- Guam (04/14/11)	MILA/PDL 5202 (L-7 days)	DFRC 5202 (L-7 days)	WSSH UHF Checks (w/PSS) (TBD)	**Current Status**
Wallops Ground Station (WGS) Requirements																				
FM Telemetry																				
OD Telemetry																				
Command																				
UHF A-G Communications																				
Range Safety																				
Acquisition Data Processing																				
11M																				
7.3M																				