Increment Definition and Requirements Document for Increment 18

International Space Station Program

Baseline (Draft - December 2007)

January 2008

National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
Houston, Texas
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PREFACE

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENT 18

This document is the Increment Definition and Requirements Document for Increment 18. Official delivery of this document is under control of the Space Station Control Board (SSCB). Any changes or revisions will be jointly agreed to and signed by the National Aeronautics and Space Administration (NASA) and the affected International Partners (IPs).

NASA/ROSCOSMOS

INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENT 18

JANUARY 2008

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INTERNATIONAL SPACE STATION PROGRAM

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INTERNATIONAL SPACE STATION PROGRAM

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INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENT 18

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INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENT 18

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENT 18

LIST OF CHANGES

JANUARY 2008

All changes to paragraphs, tables, and figures in this document are shown below:

SSCB	Entry Date	Change	Paragraph(s)
	December 2007	Baseline	All

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FIGURE

1.0 INTRODUCTION

1.1 PURPOSE

This document provides the assignment of flight dates, resources and accommodations, as well as defines the requirements for Increment 18 in Planning Period 8. Requirements are provided for both joint International Space Station (ISS)/mated vehicle operations and ISS-only continuous operations stages of the increment.

The schedule for products (i.e., documentation, reviews, etc.) that must be developed to support Increment 18 is found in the Common Schedule Database (CSD). The requirements contained herein shall be used in the execution of the flight and stage Certification of Flight Readiness (CoFR) processes carried out by each ISS supporting organization.

1.2 SCOPE

This document covers Increment 18, beginning with the launch of the Expedition (E)18 Commander (CDR) and Flight Engineer-1 (FE-1) on Flight 17 Soyuz and ends with their departure on Flight 17 Soyuz.

The E18 FE-2 (~~15A~~ULF2) is launched on Flight ~~15A~~ ULF2 and replaces the previous E17/18 FE-2 (~~ULF2~~1J). ~~E16~~ E18 FE-2 (~~15A~~ULF2) returns on Flight ~~2J/A~~15A during Increment 18. E18 FE-2 (15A) launches on 15A and replaces E18 FE-2 (ULF2). E18/19 FE-2 (2J/A) launches on Flight 2J/A, replaces the ~~E16~~ E18 FE-2 (15A) and returns in the strategic timeframe. Note that the Flight that returns the crew has requirements, including those for crew rotation specified in SSP 54018.

This document is based on the ISS Flight Program Definition, as specified in SSP 54100, IDRD Flight Program.

This document defines the capabilities and objectives of Increment 18. This document also controls the following: resource and accommodation allocations between assembly, system, and utilization; requirements and priorities for ISS execution planning; ISS manifest (Increment Definition and Requirements Document for Increment (IDRD) for Increment 18, Annex 1: Station Manifest (SSP 54018-17S **<TBD 1-1>**, SSP 54018-15A **<TBD 1-2>**, SSP 54018-32P **<TBD 1-3>**, SSP 54018-33P **<TBD 1-4>,** SSP 54018-2J/A **<TBD 1-5>**); On-Orbit Maintenance Plan (SSP 54018-ANX 2 **<TBD 1-6>**, Increment Definition and Requirements Document for Increment 18, Annex 2: On-Orbit Maintenance Plan); ISS imagery requirements (SSP 54018-ANX 3 **<TBD 1-7>**, Increment Definition and Requirements Document for Increment 18, Annex 3: Imagery Requirements); medical operations (SSP 54018-ANX 4 **<TBD 1-8>**, Increment Definition and Requirements Document for Increment 18, Annex 4: Medical Operations and Environmental Monitoring); and payloads (SSP 54018-ANX 5 **<TBD 1-9>**, Increment Definition and Requirements Document for Increment 18, Annex 5: Payload Tactical Plan). The above mentioned documents are published as separate documents.

1.3 PRECEDENCE

SSP 54018 will be developed in compliance with the specification documents. Deviations from the specifications are possible only as a result of specific scenarios analysis. If there are any discrepancies between this document and SSP 54100, SSP 54100 takes precedence. If there are any discrepancies between this document, SSP 50110, Multi-Increment Manifest Document, and the Consolidated Operations and Utilization Plan, this document shall take precedence.

The real-time time frame for a flight and its associated stage begins after the applicable Stage Operations Readiness Review (SORR) in accordance with the process in SSP 50200-02, Station Program Implementation Plan Volume 2: Program Planning and Manifesting. The differences between the “as planned” requirements in the IDRD and the “real-time” requirements will be documented in SSP 54318, Post Increment Evaluation Report for Increment 18 **<TBD 1-10>**.

This document should be used in conjunction with SSP 50261-01, Generic Groundrules, Requirements, and Constraints Part 1: Strategic and Tactical Planning. Deviations to SSP 50261-01 for this increment are documented in Section 3.4.

1.4 DELEGATION OF AUTHORITY

The Space Station Control Board (SSCB) has formal control and approval of this document. All changes to this document shall be processed in accordance with the procedures as specified in SSP 50123, Configuration Management Handbook.

1.5 DEVIATION

Any request for deviation from this document shall be made to the Space Station Program Control Board (SSPCB) in accordance with the procedures as specified in SSP 41170, Configuration Management Requirements NASA will maintain this document and process changes per these requirements. IPs should provide any recommended changes to the NASA Mission Integration and Operations Office for processing..

2.0 DOCUMENTS

2.1 APPLICABLE DOCUMENTS

The following documents include specifications, models, standards, guidelines, handbooks, and other special publications. The documents listed in this paragraph are applicable to the extent specified herein. Inclusion of applicable documents herein does not in any way supersede the order of precedence identified in Paragraph 1.3 of this document.

DOCUMENT	TITLE	TYPE
SSP 41170	Configuration Management Requirements	NASA Internal
SSP 50110	Multi-Increment Manifest Document	Multilateral
SSP 50123	Configuration Management Handbook	Multilateral
SSP 50200-02	Station Program Implementation Plan, Volume 2: Program Planning and Manifesting	Multilateral
SSP 50255	Flight Mechanics - Trajectory	Bilateral
SSP 50260	International Space Station Medical Operations Requirements Document (ISS MORD)	Multilateral
SSP 50261-01	Generic Groundrules, Requirements, and Constraints Part 1: Strategic and Tactical Planning	Multilateral
~~SSP 50562~~	~~ISS Program Off-Nominal Situation Plan~~	~~Multilateral~~
SSP 50585	Facility and Communication Requirements for MCC-H/SSIPC Intercenter Operations (FRIO)	Multilateral
SSP 50699-03	ISS Certification Baseline Volume 3	Multilateral
SSP 54017	Increment Definition and Requirements Document for Increment 17	Multilateral
SSP 54018-17S **<TBD 1-1>**	Increment Definition and Requirements Document for Increment 18, Annex 1: Station Manifest, Flight 17S (Soyuz)	Multilateral
SSP 54018-15A **<TBD 1-2>**	Increment Definition and Requirements Document for Increment 18, Annex 1: Station Manifest, Flight 15A, STS-119	Multilateral

SSP 54016-2J/A **<TBD 1-5>**	Increment Definition and Requirements Document for Increment 18, Annex 1: Station Manifest, Flight 2J/A, STS- 127	Multilateral
SSP 54018-32P **<TBD 1-3>**	Increment Definition and Requirements Document for Increment 18, Annex 1: Station Manifest, Flight 32P (Progress)	Multilateral
SSP 54018-33P **<TBD 1-4>**	Increment Definition and Requirements Document for Increment 18, Annex 1: Station Manifest, Flight 33P (Progress)	Multilateral
SSP 54018-ANX 2 **<TBD 1-6>**	Increment Definition and Requirements Document for Increment 18, Annex 2: On-Orbit Maintenance Plan	Multilateral
SSP 54018-ANX 3 **<TBD 1-7>**	Increment Definition and Requirements Document for Increment 18, Annex 3: Imagery Requirements	Multilateral
SSP 54018-ANX 4 **<TBD 1-8>**	Increment Definition and Requirements Document for Increment 18, Annex 4: Medical Operations and Environmental Monitoring	Multilateral
SSP 54018-ANX 5 **<TBD 1-9>**	Increment Definition and Requirements Document for Increment 18, Annex 5: Payload Tactical Plan	Multilateral
SSP 54019 **<TBD 1-11>**	Increment Definition and Requirements Document for Increment 19	Multilateral
SSP 54100	Increment Definition and Requirements Document Flight Program	Multilateral
NSTS 21510	International Space Station-15A Mission Integration Plan	NASA Internal
NSTS 21434	International Space Station-2J/A Mission Integration Plan	NASA Internal
NAS15-10110	Contract NAS15-10110 between the National Aeronautics and Space Administration of the United States of America and the Russian Space Agency of the Russian Federation for Supplies and Services Relating to MIR-1 and the International Space Station: Phase One and Selected Phase Two Activities	Bilateral

JSC 26557	On-orbit Assembly, Modeling and Mass properties Data Book	NASA Internal
No Number	Consolidated Operations and Utilization Plan	Multilateral

2.2 REFERENCE DOCUMENTS

The following documents contain supplemental information to guide the user in the application of this document. These reference documents may or may not be specifically cited within the text of this document.

DOCUMENT	TITLE	TYPE
SSP 41000	System Specification for the International Space Station	NASA Internal
SSP 41160	European Space Agency Segment Specification for Columbus	Bilateral
SSP 41162	Segment Specification for the United States On-Orbit	NASA Internal
SSP 41163	Russian Segment Specification	Bilateral
SSP 41165	Segment Specification for the Japanese Experiment Module	Bilateral
SSP 50094	NASA/RSA Joint Specifications Standards Document for the ISS Russian Segment	Bilateral
SSP 50448	Station Development Test Objectives (SDTO) Catalog	Multilateral
SSP 50478	Payload Data Library Requirements Document	NASA Internal
SSP 50621	Generic On-Orbit Stowage Capabilities and Requirements	Multilateral
SSP 50699-03	USOS Certification Baseline Volume III: Flight Attitudes	Multilateral
SSP 543XX	Post Increment Evaluation Report (PIER)	Multilateral
NSTS 12820	Joint Shuttle/ISS Flight Rules Volume C Joint Operations	NASA Internal

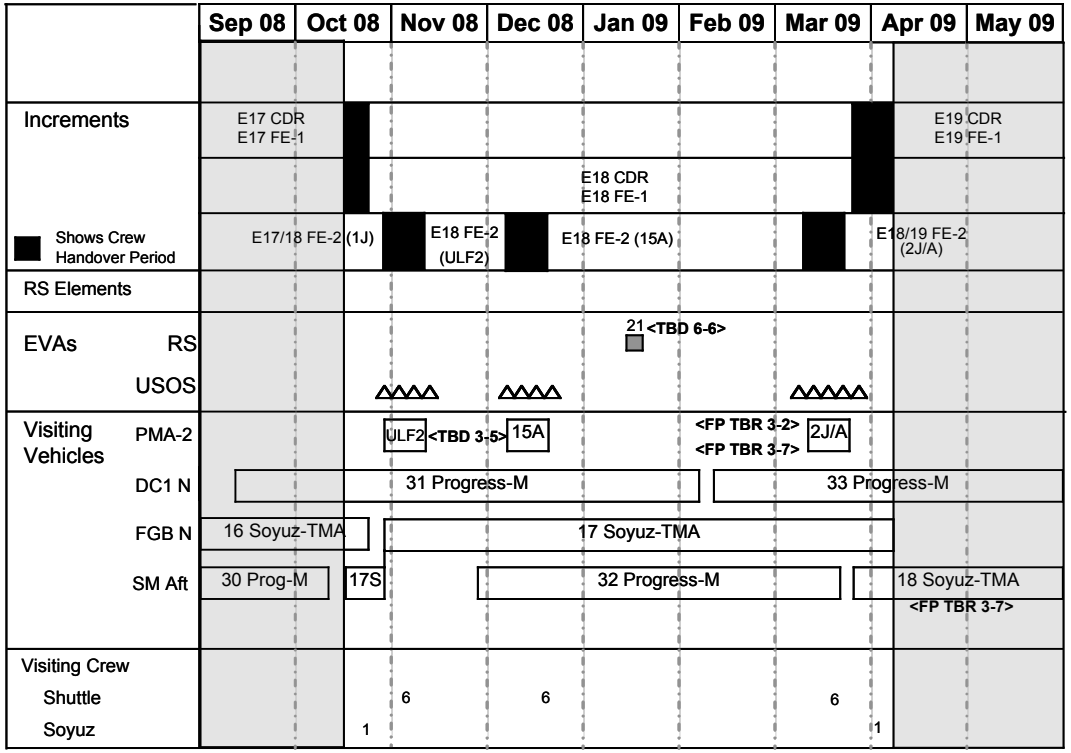
3.0 INCREMENT ~~DEFINITION~~OBJECTIVES

This section defines the Increment 18 objectives. The inclusion of objectives in this document provides the ISS Program Office control of major events and emphasis during this time frame.

3.1 INCREMENT OVERVIEW

Figure 3.1-1, Increment 18 Overview, provides a high level graphical overview of the increment. It contains the increment's duration, when and where vehicles are docked to the ISS, planned crew rotations, the number of ISS crew on ISS, and the number of Shuttle and Soyuz (Sz) visiting crews.

The number of planned United States On-orbit Segment (USOS) Joint Airlock and Russian Segment (RS) Docking Compartment Extravehicular Activities (EVAs) are also shown in this figure. The two contingency EVAs specified in SSP 50261-01, Section 4.3.2.10, are not shown in this figure.



Legend:
- △ - **Assembly EVA performed by the Shuttle crew**
- □ - Assembly EVA performed by the ISS crew while Shuttle docked
- ■ - Assembly EVA performed by the ISS crew after Shuttle undock
- ☆ - Projected maintenance EVA performed by the Shuttle crew
- ▽ - Projected maintenance EVA performed by the ISS crew while Shuttle docked
- ▼ - Maintenance EVA performed by the ISS crew after Shuttle undock
- ○ - Science EVAs by the Shuttle Crew
- ◇ - Science EVAs by the ISS crew while Shuttle docked
- ✦ - Science EVAs by the ISS crew after Shuttle undock
- ◆ - Shuttle objective EVA performed by the Shuttle Crew
- * - Contains science EVA activities
- # - Contains Shuttle objective EVA activities

FIGURE 3.1-1 INCREMENT 18 OVERVIEW

3.2 INCREMENT FLIGHT SUMMARY

Table 3.2-1, Increment Flight Summary, identifies planning data for all flights scheduled to visit the ISS or undock from the ISS during this increment.

The mission duration column lists the planned mission duration of each flight. For Shuttle flights in this column, two numbers are listed:

1. The nominal mission duration.

2. Additional contingency days available to accomplish ISS mission objectives (to cover docking problems, mated operations delays, EVA, etc.).

The docked duration column lists the planned docked duration for each flight. Duration calculations are based on the calendar day difference between events.

All planning docking altitudes presented in this document represent average altitudes unless stated otherwise. Altitudes are defined in accordance with SSP 50255, Flight Mechanics - Trajectory.

For those Shuttle missions identified to be performance critical, the docking altitudes are to be maximum apogee altitude limits. ISS Flight Mechanics will coordinate with Shuttle Flight Design at the start of each increment design cycle to identify performance-critical missions. Modifications to the altitude strategy will be made in the final increment product cycle.

All launch dates in Table 3.2-1 are shown in the time standard selected by the launch vehicle organization. Space Shuttle Program dates correspond to the Kennedy Space Center (KSC) time zone. Russian dates correspond to the Decreed Moscow Time (DMT) zone. Automated Transfer Vehicle (ATV) dates correspond to the Kourou time zone.

Soyuz ascent crew size is denoted in the “Launch Vehicle Crew Size” column in Table 3.2-1, using the following convention: x+y, where x=number of Expedition crew members and y=number of Soyuz crew members. Soyuz descent crew size will be identified with a table note when it differs from ascent crew size.

Shuttle ascent crew size is denoted in the “Launch Vehicle Crew Size” column in Table 3.2-1, using the following convention: w+z, where w=number of Shuttle Transportation System (STS) crew members and z=number of Expedition crew members. Shuttle descent crew size will be identified with a table note when it differs from ascent crew size.

TABLE 3.2-1 INCREMENT 18 FLIGHT SUMMARY <TBD 3-5>

ISS Flight Name	Launch Vehicle Flight Name	Launch Vehicle Crew Size	Launch Date [5]	Mission Duration (days) [1]	Shuttle Docking Altitude (km/nmi)	Docking Date	Docked Duration (days) [1]	Undock Date
16S	Soyuz-TMA	2+1	[2]	198	-	[2]	196	23 Oct 08
31P	Progress-M	Unmanned	[2]	152	-	[2]	150	09 Feb 09
17S	Soyuz-TMA	2+1	12 Oct 08	175	-	14 Oct 08 [4]	173	05 Apr 09
ULF2	STS-126 (OV-105)	6+1	Last week of October 2008 **<TBD 3-5>**	15+1	352/190	Last week of October 2008 **<TBD 3-5>**	11+1	**<TBD 3-5>**
15A	STS-119 (OV-103)	6+1	First week of Dec. 2008 ~~06 Nov 08~~ **<TBD 3-5>**	13+1	361/195	First week of Dec. 2008 ~~08 Nov 08~~ **<TBD 3-5>**	9+1	~~17 Nov 08~~ **<TBD 3-5>**
32P	Progress-M	Unmanned	26 Nov 08	118	-	28 Nov 08	116	24 Mar 09
33P	Progress-M	Unmanned	10 Feb 09	[3]	-	12 Feb 09	[3]	[3]
2J/A	STS-127 (OV-105)	6+1	12 Mar 09 **<FP TBR 3-2>** **<FP TBR 3-7>**	15+1	370/200	14 Mar 09 **<FP TBR 3-2>** **<FP TBR 3-7>**	11+1	25 Mar 09 **<FP TBR 3-2>** **<FP TBR 3-7>**
18S	Soyuz-TMA	2+1	25 Mar 09 **<FP TBR 3-7>**	[3]	-	27 Mar 09 **<FP TBR 3-7>**	[3]	[3]

NOTES:

[1] Duration calculations are based on the calendar day difference between events.

[2] The planned launch and docking dates of this flight are specified in SSP 54017.

[3] This data is outside the Increment Definition and Requirements Document Flight Program time frame.

[4] Flight 17S relocates from SM Aft port to the FGB Nadir port on **<TBD 3-1>**.

[5] Space Shuttle launch dates are expressed as target dates until the mission-specific Space Shuttle Program Flight Readiness Review, which occurs at Launch minus 2 weeks.

<FP TBR 3-2> Launch date is under review with the Shuttle Program.

<FP TBR 3-7> Dates are under review to resolve GGR&C conflicts.

3.3 INCREMENT SUMMARY AND OBJECTIVES

The increment definitions and primary objectives for assembly, system, and utilization operations are provided in Table 3.3-1, Increment 18 Summary. The Multilateral Crew Operations Panel (MCOP) defines crew assignments and respective agencies.

TABLE 3.3-1 INCREMENT 18 SUMMARY (PAGE 1 OF 4)

Increment Start	Flight 17S Launch (12 Oct 08)	
Increment End	Undocking of Flight 17S (05 Apr 09)	
Increment Duration (days)	173	
Crew Plan	E18 CDR Mike Fincke E18 FE-1 Salizhan Sharipov E17/18 FE-2 (1J) Greg Chamitoff E~~17/~~18 FE-2 (ULF2) **~~<TBD 3-2>~~** Sandy Magnus E18 FE-2 (15A) **~~<TBD 3-2>~~** Koichi Wakata E18/19 FE-2 (2J/A) **<TBD 3-2>**	16S (launch/return) 16S (launch/return) 1J/ULF2 (launch/return) ULF2/15A (launch/ return) 15A/2J/A(launch/ return) 2J/A/ **<TBD 3-3>** (launch return)
Crew Days E18 CDR/FE-1 E17/18 FE-2 (1J) E~~17/~~18 FE-2 (ULF2) E18 FE-2 (15A) E18/19 FE-2 (2J/A)	In Space: 175 Increment 18/Total **<TBD 3-5>** ~~36/60~~**<TBD 3-5>** ~~139/139~~ **<TBD 3-5>** ~~24/<TBD 3-3>~~**<TBD 3-5>**	On the ISS: 173 Increment 18/Total **<TBD 3-5>** ~~34/56~~**<TBD 3-5>** ~~137/137~~**<TBD 3-5>** ~~22/<TBD 3-3>~~**<TBD 3-5>**
Flight 17S Assembly/System Objectives	• Dock 17 Soyuz to the SM Aft port • Rotate E18 crew with E17 crew (CDR/FE-1) • ~~Perform high priority 6-crew ECLSS and Habitability Hardware activation and checkout~~ • Perform Visiting Crew Operations • Load and undock 16 Soyuz from the FGB Nadir port	
Flight 17S Utilization Objectives	**NASA:** **Russian:** SSP 54018-ANX 5 **<TBD 1-9>** **CSA:** **ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** **JAXA:** Reference SSP 54018-ANX 5 **<TBD 1-9>**	
Stage 17S Assembly/System Objectives	• Perform checkout and preparation tasks for Flight ~~15A~~ULF2 • Perform high priority 6-crew Regen ECLSS and Habitability Hardware activation and checkout to allow for sample return on 15A • Perform E18 SSC Reload	
Stage 17S Utilization Objectives	**NASA:** Conduct On-orbit research program to support: • CEO • EarthKAM • Enose • In-SPACE-2 • Integrated Immune • MISSE 6A/6B • Nutrition, Respository	

	• Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1**[1]** **Russian:** Reference SSP 54018-ANX 5 **<TBD 1-9>** **CSA:** None

TABLE 3.3-1 INCREMENT 18 SUMMARY (PAGE 2 OF 4)

Stage 17S Utilization Objectives (cont.)	**ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** ~~• Dosis/Dobies~~ ~~• EuTEF~~ ~~• Neurospat~~ • ~~Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1~~**~~[1]~~** **JAXA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** ~~• DomeGene~~ ~~• ICE Crystal~~ ~~• RadGene/LOH~~ ~~• Area Padles~~ • ~~Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1~~**~~[1]~~**
Flight ULF2 Assembly/System Objectives	• Rotate E17 FE-2 (1J) with E17/18 FE-2 (ULF2) • Transfer 6-Crew racks and hardware • Transfer FHRC from LMC to ESP3 (move and temporarily stow NTA) • Return NTA from ESP3 to LMC • Relocate P6 PDGF from P6 to FGB • Relocate 2 CETA carts • Install JAXA Proximity GPS antenna on JLP • Install ETVCG on CP7
Flight ULF2 Utilization Objectives	**NASA:** Conduct On-orbit research program to support: • PSSC [DoD payload] • Journals, Integrated Immune, Midodrine • MISSE 6 • Perform operations to support the following SDBIs and Sorties: • Integrated Immune • Sleep Short • MAUI • SEITE **Russian:** Reference IDRD Paragraph 6.2.1 and SSP 54017-ANX 5 **<TBD 1-9>** **CSA:** None ~~•~~ **ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** **JAXA:** None
Stage ULF2 Assembly/System Objectives	• Perform checkout and preparation tasks for Flight 15A • Perform high priority 6-crew Regen ECLSS and Habitability Hardware activation and checkout to allow for sample return on 15A • Perform NASA software transition PVCA to R3
Stage ULF2 Utilization Objectives	**NASA:** Conduct On-orbit research program to support: • Journals, Nutrition • Repository, Integrated Immune, Sleep Long • Midodrine Long, MISSE 6 • HRF Facility ops • LOCAD-PTS, SPHERES • ELITE-S2 **Russian:** Reference IDRD Paragraph 6.2.1 and SSP 54017-ANX 5 **<TBD 1-9>** **CSA:** None **ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** ~~•~~ **JAXA:** Reference SSP 54018-ANX 5 **<TBD 1-9>**
Flight 15A Assembly/System Objectives	• Rotate E17/18 FE-2 (ULF2) with E18 FE-2 (15A) • Complete Prep for S6 Installation

	• Install S6 • Configure ISS, S3/S4 & deploy S6 SAWs
Flight 15A Utilization Objectives	**NASA:** Conduct On-orbit research program to support: • MISSE 6A/6B Perform Operations to support the following SDBIs and Sorties: • Integrated Immune • Sleep Short • MAUI • SEITE **Russian:** Reference SSP 54018-ANX 5 **<TBD 1-9>** **CSA:** None **ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>**~~MOP & Muscle~~ **JAXA:** Reference SSP 54018-ANX 5 **<TBD 1-9>**~~DomeGene~~
Stage 15A Assembly/System Objectives	• Dock 32 Progress-M to SM Aft **<TBD 6-2>** port • Undock 31 Progress-M from DC1 **<TBD 6-2>** port • Dock 33 Progress-M to DC1 **<TBD 6-2>** port • Perform 6-crew Regen ECLSS and Habitability Hardware activation and checkout • Perform HTV prep tasks • Perform checkout and preparation tasks for Flight 2J/A
Stage 15A Utilization Objectives	**NASA:** Conduct On-orbit research program to support: • CEO • EarthKAM • Enose • In-SPACE-2 • MISSE 6A/6B • Bisphosphonates, Integrated Immune, Miodrine Long, Nutrition, Respository • Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1**[1]** **Russian:** Reference SSP 54018-ANX 5 **<TBD 1-9>** **CSA:** None **ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** ~~• 3D Space~~ ~~• Dosis/Dobies~~ ~~• Energy~~ • ~~EuTEF~~

TABLE 3.3-1 INCREMENT 18 SUMMARY (PAGE 3 OF 4)

Stage 15A Utilization Objectives (cont.)	~~• Genara~~ ~~• Immuno~~ ~~• Neurospat~~ ~~• Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1~~**~~[1]~~** **JAXA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** ~~• DomeGene~~ ~~• ICE Crystal~~ ~~• RadGene/LOH~~ ~~• Rad Silk~~ ~~• Area Padles~~ • ~~Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1~~**~~[1]~~**
Flight 2J/A Assembly/System Objectives	• Rotate E18 FE-2 (15A) with E18 FE-2 (2 J/A) • Install ~~JEM EF~~JEF to ~~JEM PM~~JPM • Activate and checkout ~~JEM EF~~JEF • Install ~~ELM-ES~~JLE to ~~JEM EF~~JEF • Remove and replace 6 P6 batteries • Transfer Pump Module Assembly, SGANT and LDU from ICC-VLD to ESP3 • Install ICS-EF antenna and 2 JAXA payloads (MAXI and SEDA-AP) to the ~~JEM-EF~~JEF • Return ICC-VLD • Return JLE
Flight 2J/A Utilization Objectives	**NASA:** Conduct On-orbit research program to support: • MISSE 6A/6B Perform Operations to support the following SDBIs and Sorties: • Integrated Immune • Sleep Short • MAUI • SEITE • ANDE-2 • DragonSat **Russian:** Reference SSP 54018-ANX 5 **<TBD 1-9>** **CSA:** None **ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>**~~MOP & Muscle~~ **JAXA:** Reference SSP 54018-ANX 5 **<TBD 1-9>**
Stage 2J/A Assembly/System Objectives	• Undock 32 Progress-M from SM Aft **<TBD 6-2>** port • Perform 6-crew Regen ECLSS and Habitability Hardware checkout and operations. • Perform checkout and preparation tasks for 18S arrival and 17S return.
Stage 2J/A Utilization Objectives	**NASA:** Conduct On-orbit research program to support: • CEO • EarthKAM • Enose • In-SPACE-2 • MISSE 6A/6B • Bisphosphonates, Integrated Immune, Nutrition, Respository • Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1**[1]** **Russian:** Reference SSP 54018-ANX 5 **<TBD 1-9>** **CSA:** APEX Cambium **ESA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** ~~• Dosis/Dobies~~

	~~• Energy~~ ~~• EuTEF~~ ~~• Immuno~~ • ~~Reserve payloads identified in SSP 54018-ANX5, Table 6.1-1~~**~~[1]~~**

TABLE 3.3-1 INCREMENT 18 SUMMARY (PAGE 4 OF 4)

Stage 2J/A Utilization Objectives (cont.)	**JAXA:** Reference SSP 54018-ANX 5 **<TBD 1-9>** ~~• JAXA EPO~~ ~~• FACET~~ ~~• Holter ECL~~ ~~• MAXI 1~~ ~~• MEIS 2~~ ~~• Rad Silk~~ ~~• Area Padles~~ ~~• SEDA API~~ • ~~Reserve payloads identified in SSP 54018 ANX5, Table 6.1 1~~**~~[1]~~**

Notes:

[1] Reserve Payloads will be performed as priorities & resources allow.

3.4 DEVIATIONS TO THE GENERIC GROUNDRULES, REQUIREMENTS, AND CONSTRAINTS DOCUMENT

The following deviations to SSP 50261-01 have been identified for Increment 18:

<TBD 3-4>

Additional deviations to SSP 50261-01 exist within the IDRD Flight Program for Increment 18. The identified deviations are to the Flight Program Plans in Figure 3.1-1 and Table 3.2-1. The resolution of the deviations will continue to be worked through the Flight Program and IDRD for Increment 18 processes.

Violations to SSP 50261-01 groundrules during Increment 18 if identified, are listed on the Increment 18 Management Team website which can be found at the following Uniform Resource Locator (URL): http://iss-www.jsc.nasa.gov/ss/issapt/mio/Inc_18.htm.

4.0 ON-ORBIT RESOURCE ASSUMPTIONS AND ALLOCATIONS

This section defines the allocation of the on-orbit ISS capabilities between systems and utilization across the increment. Allocations are limited to power, crew time, and on-orbit accommodations. Sub-allocations of utilization allocations are provided in SSP 54018-ANX 5, Increment Definition and Requirements Document for Increment 18, Annex 5: Payload Tactical Plan. Any non-standard requirements of resources are also provided in Section 4.5. The allocation guidelines are baselined in the SSP 50261-01. All data contained in this section represent operational requirements.

4.1 POWER BALANCE AND ALLOCATIONS

Table 4.1-1, Power Balance and Allocations, summarizes ISS power capability for each flight/stage in the increment as power is generated by the Electrical Power Systems of the USOS, Functional Cargo Block (FGB), and RS for the Flight Attitude Plan specified. The table also shows the integrated systems demands and allocations for the 3 ISS Electrical Power System (EPS) groups. The USOS power consumption includes the United States elements, the European Columbus elements, the Japanese Experiment Module (JEM) elements, and the Canadian robotics elements. The Russian Segment (RS) supply and distribution group includes the Russian elements of the ISS. The FGB includes only the FGB and, for analysis purposes, is considered to be separate from the RS.

Power consumptions are representative, and are based on assumed operational modes and the Flight Attitude Plan included in this table. The Flight Attitude Plan represents the attitudes for flights and stages approved by the ~~program~~ Program which satisfy the positive energy balance requirement and optimize power availability for Utilization. Post 12A.1 Flight, it includes only X-Axis into the Velocity Vector (XVV) Local Vertical Local Horizontal (LVLH) attitude. This plan does not contain attitudes used for waste-water dumps, proximity operations, stage Extravehicular Activity (EVA)s, etc. Deviations from planned attitudes and power transfers will be reviewed by the ISS Program, the Operations community, and all affected parties, and will be documented in their respective increment Flight Rules. All calculations in this table represent power availability while the station is in eclipse.

The XVV symbol in Flight Attitude Plan section of the table refers to ~~the XVV~~ an attitude defined as +X axis toward the Velocity Vector with the +Z axis Nadir and –XVV symbol refers to an attitude defined as +X axis away from the Velocity Vector with the +Z axis Nadir (used when Shuttle is mated to ISS).

The solar beta angle rates are divided into three categories: low, mid and high. Mid Beta range is defined as 37<=|_|<=52. High Beta range is defined as |_|>52.

Table 4.1-1 also shows power transfer, in kilowatts (kW), between the power supply and distribution systems of the USOS, FGB, and RS for the Flight Attitude Plan specified. A primary purpose of this table is to identify power generation versus systems demand by the USOS, FGB, and RS and to identify the on-orbit time periods when and how much

power needs to be transferred. The power transfer allocation values are based on RS and FGB core system power deficits. All values are from the output of the ISS USOS EPS. However, due to inability to limit power transfer via converters to the Russian segment and FGB, numbers are shown in converter incremental values that reflect the maximum transfer capacity at the converter saturation point.

The RS power margins (allocations to utilization) are a result of USOS power transfers and are calculated as the difference in the total increment value transferred at the output of the ARCUs (American-to-Russian-Converter Unit) and the core systems deficit for the identified time period. During real time operations the Mission Control Center-Houston (MCC-H) may consider cycling the converters to recover power transfer above allocation if needed, and the Mission Control Center-Moscow (MCC-M) will be notified in advance when cycling will be executed. During the pre-mission planning process and real time operations, power transfers will be updated to meet minimum system power requirements as needed. A negative transfer power number represents a transfer in the opposite direction.

The USOS power margin (allocation to utilization) will be managed for allocation to the United States, European, Japanese, and Canadian utilization programs through the Multilateral Payload Control Board (MPCB) and the allocations will be documented in SSP 54018, IDRD for Increment 18 Annex 5.

TABLE 4.1-1 POWER BALANCE AND ALLOCATIONS

Flight/ Stage	Power Availability (kW) Total Capability [1][12]			Power Consumption (kW) Allocation to Systems [2] [5]			Flight Attitude Plan			Power Transfer (kW) Allocation to Systems [2]			Power Margin (kW) Allocation to Utilization [3]		
Increment 18															
USOS (NASA, JAXA, ESA, CSA)	**L [4]**	**M [4]**	**H [4]**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
R Sz 17S [8]	56.9	60.5	59.3	26.4	26.4	26.4	XVV	XVV	XVV	8.4	8.4	10.2	15.5	18.0	15.9
S 17S [8]	56.9	60.5	59.3	26.4	26.4	26.4	XVV	XVV	XVV	6.6	8.4	8.4	16.7	18.0	17.2
F ULF2 [8], [10]	60.7	61.5	61.5 [11]	34.1	34.1	34.1 [11]	-XVV	-XVV	-XVV	6.6	8.4	8.4 [11]	14.0	13.3	13.3 [11]
S ULF2 [8]	56.5	60.2	59.1	26.4	26.4	26.4	XVV	XVV	XVV	6.6	8.4	8.4	16.4	17.8	17.0
F 15A [9], [10]	79.5	81.8	81.8 [11]	33.6	33.6	33.6 [11]	-XVV	-XVV	-XVV	8.4	8.4	8.4 [11]	30.0	31.8	31.8 [11]
S 15A [9]	73.6	78.7	76.3	26.4	26.4	26.4	XVV	XVV	XVV	8.4	8.4	8.4	31.1	35.1	33.2
F 2J/A [9], [10]	79.1	81.6	81.6 [11]	34.2	34.2	34.2 [11]	-XVV	-XVV	-XVV	8.4	8.4	8.4 [11]	29.2	31.2	31.2 [11]
S 2J/A [8]	73.1	78.3	76.1	27.0	27.0	27.0	XVV	XVV	XVV	6.6	8.4	8.4	31.6	34.4	32.6
R Sz 18S [8]	73.1	78.3	76.1	27.0	27.0	27.0	XVV	XVV	XVV	8.4	8.4	10.2	30.2	34.4	31.2
FGB [6]	**L [4]**	**M [4]**	**H [4]**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
R Sz 17S [8]	0.0	0.0	0.0	1.7	1.7	1.7	XVV	XVV	XVV	-3.0	-3.0	-3.0	0.9	0.9	0.9
S 17S [8]	0.0	0.0	0.0	1.7	1.7	1.7	XVV	XVV	XVV	-3.0	-3.0	-3.0	0.9	0.9	0.9
F ULF2 [8], [10]	0.0	0.0	0.0 [11]	1.7	1.7	1.7 [11]	-XVV	-XVV	-XVV	-3.0	-3.0	-3.0 [11]	0.9	0.9	0.9 [11]
S ULF2 [8]	0.0	0.0	0.0	1.7	1.7	1.7	XVV	XVV	XVV	-3.0	-3.0	-3.0	0.9	0.9	0.9
F 15A [9], [10]	0.0	0.0	0.0 [11]	1.7	1.7	1.7 [11]	-XVV	-XVV	-XVV	-3.0	-3.0	-3.0 [11]	0.9	0.9	0.9 [11]
S 15A [9]	0.0	0.0	0.0	1.7	1.7	1.7	XVV	XVV	XVV	-3.0	-3.0	-3.0	0.9	0.9	0.9
F 2J/A [9], [10]	0.0	0.0	0.0 [11]	1.7	1.7	1.7 [11]	-XVV	-XVV	-XVV	-3.0	-3.0	-3.0 [11]	0.9	0.9	0.9 [11]
S 2J/A [8]	0.0	0.0	0.0	1.7	1.7	1.7	XVV	XVV	XVV	-3.0	-3.0	-3.0	0.9	0.9	0.9
R Sz 18S [8]	0.0	0.0	0.0	1.7	1.7	1.7	XVV	XVV	XVV	-3.0	-3.0	-3.0	0.9	0.9	0.9
RS [7]	**L [4]**	**M [4]**	**H [4]**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
R Sz 17S [8]	2.1	1.7	0.7	6.1	6.1	6.1	XVV	XVV	XVV	-5.4	-5.4	-7.2	0.5	0.1	0.6
S 17S [8]	2.1	1.7	0.7	4.8	4.8	4.8	XVV	XVV	XVV	-3.6	-5.4	-5.4	0.3	1.4	0.4
F ULF2 [8], [10]	2.1	1.7	0.7 [11]	4.8	4.8	4.8 [11]	-XVV	-XVV	-XVV	-3.6	-5.4	-5.4 [11]	0.3	1.4	0.4 [11]
S ULF2 [8]	2.1	1.7	0.7	4.8	4.8	4.8	XVV	XVV	XVV	-3.6	-5.4	-5.4	0.3	1.4	0.4
F 15A [9], [10]	2.0	1.7	0.6 [11]	5.1	5.1	5.1 [11]	-XVV	-XVV	-XVV	-5.4	-5.4	-5.4 [11]	1.4	1.1	0.0 [11]
S 15A [9]	2.0	1.7	0.6	5.1	5.1	5.1	XVV	XVV	XVV	-5.4	-5.4	-5.4	1.4	1.1	0.0
F 2J/A [9], [10]	2.0	1.6	0.6 [11]	5.1	5.1	5.1 [11]	-XVV	-XVV	-XVV	-5.4	-5.4	-5.4 [11]	1.4	1.1	0.0 [11]
S 2J/A [8]	2.0	1.6	0.6	4.8	4.8	4.8	XVV	XVV	XVV	-3.6	-5.4	-5.4	0.2	1.3	0.3
R Sz 18S [8]	2.0	1.6	0.6	6.1	6.1	6.1	XVV	XVV	XVV	-5.4	-5.4	-7.2	0.4	0.0	0.5

NOTES:

Generic

[1] Power Availability limited by; rules governing BCDU power output (limits each channel to 10.5 kW), and the drag reduction plan (bias up to 44deg).

[2] Includes power required for assembly and system tasks

[3] Utilization Allocations to each IP based on USOS: 100 percent of USOS power, Roscosmos:100 percent of RS power

[4] Low Beta is defined as ≤ 37 degrees, Mid Beta is defined between 37 and 52 degrees, High Beta is defined as >52degrees

[5] USOS Power Consumption includes the following assumptions for ESA and JAXA system loads @ low ß :

ESA elements, 2729 watts; JAXA elements, R Sz 17S through S 15A - 3871 watts, F 2J/A and subs - 4505 watts

[6] FGB Loads and Power Generation values provided by Khrunichev.

[7] RS Loads and Power Generation values provided by Energia (SM arrays in sun tracking mode)

Flight/Stage Specific

[8] 1 Progress attached to RS

[9] 2 Progress attached to RS

[10] SSPTS load @ 7.2kW

[11] Shuttle mated flight ops are constrained to solar beta angles of less than 60 degrees

[12] Power Availability does not account for off-nominal effects of SARJ or BGA anomalies/constraints

4.2 CREW TIME

Table 4.2-1, Crew Time Allocations, shows the integrated ISS crew time availability, systems demand, and utilization allocation. The ISS utilization allocation will be managed for allocation to the United States, Russian, European, Japanese, and Canadian utilization programs through the MPCB. The International Partner utilization crew time allocations will be documented in SSP 54018, IDRD for Increment 18, Annex 5.

TABLE 4.2-1 CREW TIME ALLOCATIONS <TBR 4-1>

~~Crew Time (hours)~~	
~~Total Capability~~	
~~Systems Requirements~~	
~~Utilization Requirements~~	
~~Total Requirements~~	
~~Margin (+/-)~~	

NOTES:

Crew Time (hours)	Total
Total Capability [1]	
Systems Requirements [2]	
Total Allocation to Utilization [3]	
Utilization Requirements	
Margin (+/-)	

NOTES:

[1] Includes only ISS-18 crew duty time available during Independent Operations to perform assembly, system, and utilization activities. Includes one hour per crewmember per Saturday or Sunday.

[2] In addition to the crew time allocations for stage operations (assembly and systems tasks including Vehicle Traffic, Assembly/Outfitting, Maintenance, EVA, Routine Operations, Medical, OBT and PAO), additional NASA and Roscosmos systems activities are scheduled during Soyuz and Shuttle docked timeframes per the GGR&C.

[3] Includes ISS-18 crewmember time allocated during Joint Soyuz and Shuttle missions. Refer to section 6 for average weekly crew time allocations.

4.3 ACCOMMODATIONS

Table 4.3-1, On-Orbit Rack Accommodations (Pressurized), displays the pressurized on-orbit rack accommodation for the increment and when the positions change. The accommodations are specified in Rack Volume Equivalents (RVEs), which can be equated to rack locations in Nodes 1 and 2, US Lab, Airlock, Columbus, JPM, and JLP. Appendix D contains detailed on-orbit descriptions, flight/stage rack moves, and flight/stage topology information. Russian rack accommodations are not shown since they are not allocated to the other International Partners. SSP 50564, ISS Internal Volume Configuration (IVC) Document, shows detailed flight/stage topologies for all flights as well as the USOS Rack Position Allocations chart.

TABLE 4.3-1 INCREMENT 18 ON-ORBIT RACK ACCOMMODATIONS (PRESSURIZED) (PAGE 1 OF 2) <TBD 4-2>

Rack Volume Equivalents	ISS-18	
	17S-~~15A~~ULF2	ULF2-15A, 15A-2J/A, 2J/A-18S
Total Capability (RVE)	98.7	98.7
Node 1	4	4
Node 2	8	8
U.S. Lab	24	24
Airlock	4	4
Columbus	16	16
FGB [1]	11.7	11.7
~~ELM-PS~~JLP	8	8
~~JEM~~JPM	23	23
NASA Allocation to System/Stowage		
Node 1	4	4
Node 2	8	8
U.S. Lab [2]	~~17~~11	~~17~~11
Airlock	4	4
Columbus	3	3
FGB	10.9	10.9
~~ELM-PS~~JLP	2.5	2.5
~~JEM~~ JPM ~~[6]~~	~~10~~	~~10~~ [4]
NASA Allocation to NASA Utilization		
Node 1	0	0
Node 2	0	0
U.S. Lab [2]~~[3]~~	~~7~~13	~~7~~13
Airlock	0	0
Columbus	5	5
FGB	0	0
~~ELM-PS~~JLP	1.5	1.5
~~JEM~~ JPM ~~[6]~~	~~4.85~~5.85	~~4.85~~5.85
Total		

Amount subscribed ~~[3]~~[2]	~~9+3~~11.85	~~9+3~~17.85
Remaining available~~[5]~~[2]	~~11.85~~13.5	~~11.85~~7.5

TABLE 4.3-1 ON-ORBIT RACK ACCOMMODATIONS (PRESSURIZED) (PAGE 2 OF 2)

Rack Volume Equivalents [1]	ISS-18	
	17S – 15A	ULF2-15A, 15A-2J/A, 2J/A-18S
Roscosmos Allocation		
FGB System/Stowage[4][3]	.8	.8
FGB Utilization	0	0
ESA Allocation		
Columbus System/Stowage	3	3
Columbus Utilization	5	5
JAXA Allocation		
JLP System/Stowage	2.5	2.5
JLP Utilization	1.5	1.5
JPM System/Stowage	12	12
JPM Utilization	5.15	5.15 [4]

NOTES:

[1] The FGB has 11.7 m^3 of stowage volume before installation of new stowage enclosures, which is approximately equal to 11.7 RVEs. After installation of new enclosures is complete, the FGB will have 13.2 m3 of stowage volume, which is approximately 12.3 RVEs.

[2] ~~During Increment 18, System will use~~ During 17S Stage, the System allocation shown will be supplemented with two of the rack locations in the U.S. Lab allocated to Utilization for pre-positioning Regen/ECLSS Racks and TeSS. During the ULF-2, 15A, and 2J/A Stages, the System allocation shown will be supplemented with six of the rack locations in the U.S. Lab allocated to Utilization for pre-positioning Regen/ECLSS Racks, ~~and~~ TeSS, and CHeCS 2.

~~[3] Utilization items belonging to the utilization passive stowage RVE allocation might not be physically stowed in the U.S. Lab.~~

[4][3] Includes 0.8 m^3 for stowage provided by FGB enclosures per January 2003 protocol (Ref. OC-03-003).

~~[5] One unsubscribed RVE is positioned in front of LAB window.~~

[6][4] ~~Three US ISPR's plus one MELFI and one ZSR for utilization stowage.~~ One JAXA utilization allocated location is used by Crew Quarters (system rack).

4.4 <RESERVED>

4.5 ADDITIONAL RESOURCE REQUIREMENT

Table 4.5-1, Additional Resource Requirement, provides the tactical agreements on using non-standard requirements of on-orbit resources (i.e. consumables: water, Oxygen [(O_2)], Nitrogen [(N_2)], propellant, etc.) that is not specified in Sections 4.1 - 4.4 but whose consumption can result in errors of important on board consumables management if not tracked and recorded.

Table 4.5-1 provides the total amount of a resource needed for a specific increment or stage. When the resource is used on-orbit, the resource may be recovered back into the resource or emitted in the ISS environment. If the requirement has a closed-loop system, then, the percentage recovered and emitted is not applicable. The utilization allocations will be documented in SSP 54018, IDRD for Increment 18, Annex 5.

TABLE 4.5-1 ADDITIONAL RESOURCE REQUIREMENT <TBD 4-1>

User	Resource	Total Amount of Usage
INCREMENT 18		

5.0 ASCENT/DESCENT CARGO ALLOCATIONS AND MANIFEST SUMMARY

Table 5.0-1, Ascent/Descent Allocations and Manifest Summary, contains the cargo delivery and return allocations, and the manifest summary for each flight in the increment. The table includes major cargo to the rack or Orbital Replacement Unit (ORU) level. This table controls program-level allocations. Detailed ISS manifest items are documented in the appropriate SSP 54018-Annex 1. The cargo allocations are for the Partner that provides the transportation vehicle unless stated otherwise.

The allocations are based on the Consolidated Operations and Utilization Plan, and then refined based on current capability and ISS requirements. Volume data shown is for pressurized stowage areas only and is listed as rack equivalents for full racks in the Multi-Purpose Logistics Module (MPLM), Middeck Locker Equivalents (MLEs) for stowage on the middeck, and Cargo Transfer Bag Equivalents (CTBEs) for passive stowage in the MPLM ~~and SpaceHab~~, and RVEs for ATV. Progress and Soyuz data are described in terms of volume (in m^3) and mass (in kgs and lbs). The maintenance allocation includes pre-positioned spares and planned maintenance equipment. It does not include items that are considered urgent need spares. Water transfer listed under allocations represents the transfer target for Shuttle water generated on-orbit that is transferred to the ISS. Water transfer listed under International Partner vehicles is water transported up in the International Partner vehicle.

All allocations need to include packing factor and trash. Each owner is responsible for including packing factor and trash.

Soyuz Transportation Modified Anthropometric (TMA) vehicles provide transportation for the Soyuz crew, Expedition crew rotation and will provide the capability for ISS crew rescue return (up to three). The Soyuz TMA has minimal capability to deliver cargo.

TABLE 5.0-1 ASCENT/DESCENT ALLOCATIONS AND MANIFEST SUMMARY (PAGE 1 OF 3)

Flight	Manifest Item Category	Mass (kg/lb)	Volume
17S	**ASCENT**		
	Manifest Summary: ***Soyuz TMA-13***		
	Allocations		
	Dry Cargo	**<TBD 5-2>**	**<TBD 5-2>**
	Roscosmos	**<TBD 5-2>**	**<TBD 5-2>**
	NASA	**<TBD 5-2>**	**<TBD 5-2>**
	Candidates	**<TBD 5-2>**	**<TBD 5-2>**
	Total	**<TBD 5-2>**	**<TBD 5-2>**
	Total with Candidates	**<TBD 5-2>**	**<TBD 5-2>**
16S	**DESCENT**		
	Manifest Summary: ***Soyuz TMA-12***		
	Allocations		
	Dry Cargo	**<TBD 5-2>**	**<TBD 5-2>**
	Roscosmos	**<TBD 5-2>**	**<TBD 5-2>**
	NASA	**<TBD 5-2>**	**<TBD 5-2>**
	Candidates	**<TBD 5-2>**	**<TBD 5-2>**
	Total	**<TBD 5-2>**	**<TBD 5-2>**
	Total with Candidates	**<TBD 5-2>**	**<TBD 5-2>**
ULF2	**ASCENT**		
	Manifest Summary LMC: FHRC MPLM: 16 Racks: 6 Crew Hardware, CIR, Express Rack 6 Middeck ISS content, Shuttle Integration H/W		
	Allocations		
	- Middeck		
	CHeCS	25.38/55.96	2.488 MLE
	Maintenance	20.70/45.64	.8885 MLE
	ISS EMU	86.18/200	
	ISS EVA Tools	45.36/100	
	Joint IPT Reserve	113.40/250	
	- MPLM		
	CHeCs	10.02/22.08	.7623 CTBE
	Maintenance	274.36/604.86	11.90 CTBE
	- LMC		
	FHRC	206.702/455.70	

TABLE 5.0-1 ASCENT/DESCENT ALLOCATIONS AND MANIFEST SUMMARY (PAGE 2 OF 3)

ULF2 (continued)	Utilization		
	- Middeck	91.14/200.93	3.381 MLE
	- MPLM	1642.88/3621.93	83.2408 CTBE
	- Cargo Bay	57.1481/125.99	**<TBD 5-1>**
	STS O_2 for EVA prebreathe	**<TBD 5-1>**	**<TBD 5-1>**
	O_2 transfer to ISS A/L HPGTs	22.67/50	
	N_2 transfer to ISS A/L HPGTs	0	
	(Water transfer to ISS)	473/1043	473 liters
	DESCENT		
	Manifest Summary		
	LMC: NTA		
	MPLM:		
	Middeck ISS content, Shuttle Integration H/W		
	Allocations		
	- Middeck		
	CHeCs	27.25/60.07	2.1845 MLE
	Maintenance	9.62/21.20	.311 MLE
	ISS EMU	90.71/200	
	ISS EVA Tools	45.36/100	
	Joint IPT Reserve	113.40/250	
	-MPLM		
	CHeCs	25.98/57.28	.709
	Maintenance	139.19/304.66	17.239
	Utilization		
	- Middeck	119.3	4.4 MLE
	- MPLM	169.7	6.4 CTBE
	- Cargo Bay	49.9	**<TBD 5-1>**
15A	**ASCENT**		
	Manifest Summary:		
	Allocations		
	Russian (IELK)	**<TBD 5-2>**	**<TBD 5-2>**
	Maintenance	**<TBD 5-2>**	**<TBD 5-2>**
	Crew Provisions	**<TBD 5-2>**	**<TBD 5-2>**
	Utilization	**<TBD 5-2>**	**<TBD 5-2>**
	STS O_2 for EVA prebreathe	**<TBD 5-2>**	**<TBD 5-2>**
	O_2 transfer to ISS A/L HPGTs	~~25~~ 22.68/50~~lbm~~	---
	N_2 transfer to ISS A/L HPGTs	**<TBD 5-2>**	**<TBD 5-2>**
	(Water transfer to ISS)	11 CWCs	---

TABLE 5.0-1 ASCENT/DESCENT ALLOCATIONS AND MANIFEST SUMMARY (PAGE 3 OF 3)

15A	**DESCENT**		
	Manifest Summary:		
	Allocations		
	Russian (IELK)	**<TBD 5-2>**	**<TBD 5-2>**
	Maintenance	**<TBD 5-2>**	**<TBD 5-2>**
	Crew Provisions	**<TBD 5-2>**	**<TBD 5-2>**
	Utilization	**<TBD 5-2>**	**<TBD 5-2>**
32P	**ASCENT**		
	Propellant	**<TBD 5-2>**	**<TBD 5-2>**
	Gas	**<TBD 5-2>**	**<TBD 5-2>**
	Water	**<TBD 5-2>**	**<TBD 5-2>**
	Dry Cargo	**<TBD 5-2>**	**<TBD 5-2>**
	Roscosmos	**<TBD 5-2>**	**<TBD 5-2>**
	NASA	**<TBD 5-2>**	**<TBD 5-2>**
	Utilization	**<TBD 5-2>**	**<TBD 5-2>**
	(Water transfer to ISS)	**<TBD 5-2>**	**<TBD 5-2>**
31P	**DESCENT**		
	Nonrecoverable	---	---
33P	**ASCENT**		
	Propellant	**<TBD 5-2>**	**<TBD 5-2>**
	Gas	**<TBD 5-2>**	**<TBD 5-2>**
	Water	**<TBD 5-2>**	**<TBD 5-2>**
	Dry Cargo	**<TBD 5-2>**	**<TBD 5-2>**
	Roscosmos	**<TBD 5-2>**	**<TBD 5-2>**
	NASA	**<TBD 5-2>**	**<TBD 5-2>**
	Utilization	**<TBD 5-2>**	**<TBD 5-2>**
	(Water transfer to ISS)	**<TBD 5-2>**	**<TBD 5-2>**
2J/A	**ASCENT**		
	Manifest Summary: ~~JEM EF~~JEF; ~~ELM ES~~JLE (2 JAXA EF Payloads (SEDA AP, MAXI), ICS); ICC-VLD (6 Batteries, Pump Module, LDU, SGANT); Sidewall-1 (ANDE-2); Sidewall-2 (DragonSat)		
	Allocations		
	Russian (IELK)	**<TBD 5-2>**	**<TBD 5-2>**
	JAXA	**<TBD 5-2>**	4 MLE
	Maintenance	**<TBD 5-2>**	**<TBD 5-2>**
	Crew Provisions	**<TBD 5-2>**	**<TBD 5-2>**
	Utilization	**<TBD 5-2>**	**<TBD 5-2>**
	STS O2 for EVA prebreathe	**<TBD 5-2>**	**<TBD 5-2>**
	O2 transfer to ISS A/L HPGTs	**<TBD 5-2>**	**<TBD 5-2>**
	N2 transfer to ISS A/L HPGTs	**<TBD 5-2>**	**<TBD 5-2>**
	(Water transfer to ISS)	11 CWCs	**---**
2J/A	**DESCENT**		

	Manifest Summary: ~~ELM-ESJLE~~**<TBD 5-4>**; ICC-VLD (6 End of Life Batteries); Sidewall-1 (ANDE-2); Sidewall-2 (DragonSat)		
	Allocations		
	Russian (IELK)	**<TBD 5-2>**	**<TBD 5-2>**
	Maintenance	**<TBD 5-2>**	**<TBD 5-2>**
	Crew Provisions	**<TBD 5-2>**	**<TBD 5-2>**
	Utilization	**<TBD 5-2>**	**<TBD 5-2>**
32P	**DESCENT**		
	Nonrecoverable	---	---

[1] 1 RVE - 19 CTBE.

[2] 3 gas tanks can accommodate two different types of gas (O_2, N_2, or air).

[3] 8 Racks can accommodate up to 1800 kg/3968 lb of dry cargo.

[4] Control propellant for ATV includes reboosts and attitude control for reboosts, attitude maneuvers associated with reboosts, vehicle dockings and undockings, and other operations.

[5] ATV can either accommodate U.S. or Russian grade water.

Table 5.0-1A, Ascent/On-Orbit/Descent Power Allocation for Utilization (Watts), contains power availability for each flight in the increment.

TABLE 5.0-1A ASCENT/ON-ORBIT/DESCENT POWER ALLOCATION FOR UTILIZATION (WATTS) <TBD 5-3>

Flight	Ascent	On-Orbit	Descent
17S			
ULF2			
15A			
2J/A			

6.0 REQUIREMENTS

This section defines all of the unique programmatic requirements for the increment's flight and stage intervals necessary to ensure successful completion of planned assembly, maintenance, operations, and utilization of the ISS during the increment. Generic requirements and constraints are documented in SSP 50261-01.

The section 6.0 stages and flights section also include generic groupings of tasks in section 6.x.2 and contingency tasks in sections 6.x.4. These generic groupings of tasks include the integrated Roscosmos, NASA, CSA, ESA, and JAXA requirements that are to be performed within the assigned allocation of crew time (in terms of average weekly crew hours). Crew times are not usually assigned to contingency tasks. The groups include maintenance, medical, payload (utilization), On-Board Training (OBT), and Public Affairs Office (PAO) task requirements. The integrated Roscosmos, NASA, CSA, ESA, and JAXA requirements are managed within the identified ISS Program documentation. Each group may also be distributed into high, medium, and low (or remaining) priorities.

6.1 <RESERVED>

6.2 INCREMENT 18 SPECIFIC REQUIREMENTS

This section identifies requirements applicable during Increment 18. Detailed multilateral requirements and agreements for Payloads/Utilization will be specified in SSP 54018- ANX5.

In addition, this section defines ISS requirements for Flight 17S, Stage 17S, Flight 15A, Stage 15A, Flight 2J/A and Stage 2J/A. Detailed requirements and agreements between ISS Program and the Space Shuttle (SSP) for Flight 15A are specified in NSTS 21510, International Space Station (ISS) 15A Mission Integration Plan (MIP), and in NSTS 21434 for ISS 2J/A MIP.

6.2.1 RUSSIAN UTILIZATION EXPERIMENTS

Russian science experiments to be conducted during Increment 18 shall consist of the following:

<TBD 6-1>

6.2.2 VISITING CREW UTILIZATION EXPERIMENTS

Visiting crew utilization experiments to be performed for Increment 18 shall consist of the following:

<TBD 6-1>

6.3 FLIGHT 17S REQUIREMENTS

This section identifies ISS requirements during Flight 17 Soyuz Transportation Modified Anthropometric (TMA).

6.3.1 <RESERVED>

6.3.2 FLIGHT 17S TASKS (IN DESCENDING PRIORITIZED ORDER)

These tasks, listed in order of ISS Program priority, are to be executed during this flight. The order of execution for these tasks in the nominal plan may vary, depending on timeline efficiencies. The Flight 17S Task Priorities have been prepared so that, in the event of a shortened mission, task execution order can be modified such that all mandatory tasks will be completed. The following numbered tasks shall be accomplished for successful completion of this flight.

1. Dock Flight 17 Soyuz TMA to Service Module (SM) Aft**<TBD 6-2>** port and perform mandatory crew safety briefing for all crew members. **[Intravehicular Activity (IVA)] [Imagery]**
2. Rotate Expedition 17 CDR and FE-1 crewmembers with Expedition 18 Commander and FE-1 crewmembers, transfer mandatory crew rotation cargo, perform mandatory tasks including Sokol suit checkout. Transfer and install or swap the Visiting Crew's (VC) and FE-2's seat liner in the appropriate Soyuz. **[IVA]**
3. Perform minimum crew handover of 12 hours per rotating crewmember, which includes crew safety handover. **[IVA] [Robotics]**
4. Transfer and stow all delivered and returning cargo to and from Soyuz. **[IVA]**
5. Undock 16 Soyuz-TMA from FGB Nadir**<TBD 6-2>** port. **[IVA] [Imagery]**
6. Perform ISS high priority maintenance activities. **[IVA]**
7. Perform high priority medical operations (average of 10 crew hours per week). **[IVA] [Imagery]**
8. Perform high priority Onboard Training (OBT) substituting planned SSRMS tasks as OBT when appropriate. **[IVA] [Robotics]**

   A. Perform Soyuz descent training.

9. Conduct visiting crew operations. **[IVA] [Imagery]**

   The following activities are 17 Soyuz visiting crew activities (not listed in priority order). All operations are to be conducted using only RS resources unless specified otherwise in Appendix K. **<TBD 6-3> <TBD K-1>**

   A. Conduct photo/video imagery.

   B. Conduct utilization activities specific to Visiting Crew.

C. Conduct RS public affairs activities and commemorative activities.

D. Conduct transfer activities.

1) Soyuz unloading.

2) Equipment return.

E. Conduct Communications.

1) Russian Mission Control Center (Soyuz and ISS).

2) Sessions using the Sputnik-Service Module (SM) ham radio.

F. Conduct Soyuz systems maintenance.

G. Conduct Soyuz handover.

H. Conduct crew life support activities onboard the ISS.

~~10. Perform high priority 6-crew Regen Environmental Control and Life Support Systems (ECLSS) and Habitability Hardware activation and checkout. **[IVA] [Imagery]**~~

~~A. Install WRS 1 in LAB1D4.~~

~~B. Install WRS 2 in LAB1P4.~~

~~C. Install mod kit #3 to connect WRS 1 & 2.~~

~~D. Install WHC in LAB1P2.~~

11. Perform ISS daily ISS payload status checks as required. **[IVA]**

12. Perform ISS payload research operations tasks. **[IVA]**

13. Perform high priority Public Affairs Office (PAO) events. **[IVA] [Imagery]**

14. Perform medium priority ISS maintenance. **[IVA]**

15. Perform additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crewmember total). **[IVA]**

16. Transfer remaining cargo items. **[IVA]**

17. Perform Station Development Test Objective (SDTO) 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 16S undocking from FGB Nadir **<TBD 6-2>** port [ISS Wireless Instrumentation System (IWIS) required]. **[IVA] [Ground]**

18. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 17S docking to SM Aft **<TBD 6-2>** port (IWIS required). **[IVA] [GROUND]**

6.3.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.3.3.1 Flight 17 Soyuz TMA shall dock to the SM Aft **<TBD 6-2>** port.

6.3.3.2 Flight 16 Soyuz TMA shall undock from FGB **<TBD 6-2>** port.

6.3.3.3 The ISS shall be in Control Moment Gyroscope (CMG) control with all thrusters inhibited for the following activities:

None Identified.

6.3.3.4 The ISS shall be in a free drift configuration with the CMGs not controlling and with all thrusters inhibited for the following activities:

None Identified.

6.3.4 CONTINGENCY REQUIREMENTS

6.3.4.1 MCC-H and MCC-M shall build procedures, contingency timelines, and conduct training for the following non-EVA tasks (The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked.):

A. ISS critical maintenance tasks as follows:

   None Identified.

B. Complete critical unfinished ULF2 assembly tasks as follows:

   None Identified.

6.3.4.2 MCC-H and MCC-M shall build procedures, contingency timelines, and provide pre-flight training for the EVA tasks to sufficient maturity to provide for the EVA response times designated.

A. Class 1: All procedures, timelines and training are developed and certified to support an EVA response within 24 hours.

   None Identified.

B. Class 2: For contingencies occurring during the docked timeframe an EVA response is available on a subsequent EVA based on re-prioritization of the mission tasks. Published procedures and timelines are developed, but may require real time updates to match the flight specific failure.

   None identified.

C. Class 3: For contingencies related to first flights hardware that are not time critical, skeleton EVA procedures will be developed preflight to support a Class 3 EVA. The EVA response time can be greater than two weeks and can be deferred to the

stage or next available mission. The ISS Program has determined that additional resources will not be applied to further refine the training and integrated planning until the failure occurs. Subsequent flight listings for these hardware items will be contained in the Generic Groundrules, Requirements, and Constraints (GGR&C).

None Identified.

6.3.5 JETTISON REQUIREMENTS

Planning and product development, including safety and data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite identification and desired jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.3.5.1 Planned Jettison

The following items are planned for jettison during EVA in this flight:

A. USOS:

None identified.

B. RS DC EVAs

None identified.

6.3.5.2 Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. USOS JAL EVAs:

None identified.

B. RS DC EVAs:

None identified.

6.3.6 GROUND SYSTEMS REQUIREMENTS

A. Ground support is required to operate Space Acceleration Measurement System (SAMS)-II, SDMS, and Microgravity Acceleration Measurement System (MAMS) sensors for SDTO 13004-U. (SAMS and MAMS availability will be assessed real time.)

B. Ground support is desired to operate Russian Optical Linear Accelerometers [ALO] for SDTO 13004-U during the 16S undock.

6.4 FLIGHT 16S UNDOCK TO FLIGHT 15A REQUIREMENTS (STAGE 17S)

This section identifies ISS requirements applicable from Flight 16 Soyuz undock to Flight 15A dock.

6.4.1 <RESERVED>

6.4.2 STAGE 17S TASKS (IN DESCENDING PRIORITIZED ORDER)

These tasks, listed in order of ISS Program priority, are to be executed during this stage. The order of execution for these tasks in the nominal plan may vary depending on timeline efficiencies. The following numbered tasks, which include no Station-based Extravehicular Activities (EVAs), shall be accomplished for successful completion of this interval.

1. Perform high priority ISS maintenance and Shuttle Launch Commit Criteria for the next Shuttle Flight. **[IVA] [Imagery]**
2. Perform ISS medical operations (average of 10 crew hours per week for crew of 3). **[IVA]**
3. Perform checkout and preparation tasks for Flight ULF2. **[IVA]**
   - A. Perform imagery of Orbiter Thermal Protection System (TPS) during rendezvous R-bar Pitchover Maneuver (RPM) and downlink the data. **[Imagery]**
   - B. Perform proficiency training for imagery of Orbiter during RPM. **[Imagery]**
   - C. Position Mobile Transporter (MT) at WS #6 **<TBD 6-7>** for Flight ULF2 joint operations (if not completed in Increment 17). **[Robotics] [Ground]**
   - D. Perform Space Station Remote Manipulator System (SSRMS) pre-launch checkout at Node 2 Power Data Grapple Fixture (PDGF) (if not completed in Increment 17). **[Robotics] [Ground]**
   - E. Complete Flight ULF2 pre-pack (if not completed in Increment 17).
   - F. Perform training and preparation for joint operations.
   - G. Complete Flight plan and EVA timeline reviews.
   - H. Perform transfer tag-up.

~~3. Perform checkout and preparation tasks for Flight 15A. [IVA]~~

~~A. Position MT/SSRMS at Work Site (WS) #**<TBD 6-10>** for Flight 15A joint operations. **[Robotics] [Ground]**~~

~~B. Perform SSRMS pre-launch checkout at Mobile Servicing System (MSS) WS # **<TBD 6-10>**. [Robotics] [Ground]~~

~~C. Unstow and configure Joint Airlock.~~

~~D. Perform Flight 15A pre-pack.~~

~~E. Configure and checkout EVA equipment.~~

~~F. Perform training and preparation for joint operations.~~

~~G. Complete Flight Plan and EVA timeline reviews.~~

~~H. Perform tool preparation.~~

~~I. Perform transfer tag-up.~~

5. Relocate 17 Soyuz from SM Aft **<TBD 6-2>** to FGB Nadir **<TBD 6-2>** docking port. **<TBD 3-1> [IVA] [Imagery]**

6. Perform high-priority OBT (average of **<TBD 6-4>** crew hours per week) substituting planned SSRMS tasks as OBT when appropriate. [IVA] [Robotics]

~~5. Perform high priority 6-crew Regen ECLSS and Habitability Hardware activation and checkout to allow for sample return on 15A. [IVA] [Imagery]~~

~~A. Activate WPA to allow fill of WPA waste water tank and install condensate tank check valve in LAB1D5.~~

~~B. Perform WPA catalytic reactor startup filtration.~~

~~C. Prepare (prep) UPA for activation including priming RFTA and DA with urine from EDV.~~

~~D. Activate WPA.~~

~~E. Activate UPA and run distillate through WPA for one batch process.~~

~~G. Activate Total Organic Carbon Analyzer (TOCA) while WRS processing is ongoing.~~

~~H. Offload 20 pounds of water to Portable Water Reservoir (PWR) or CWC.~~

~~I. Sample first batch of potable water and perform TOCA and micro in-flight analysis.~~

~~J. Take potable sample of first batch using REFH to return for ground analysis (chemical and micro archival).~~

~~K. Activate WHC.~~

~~L. Integrate potable/waste water lines with WRS.~~

~~M. Run WHC and WRS integrated until WPA processes one batch of waste water and fills up EDV flush tank 1 time (~3 days) while offloading potable water as required.~~

~~N. Sample potable water and perform TOCA and micro in-flight analysis.~~

~~O. Take potable sample using REFH to return for ground analysis (once per week) (chemical and micro archival).~~

8. Perform Expedition 18 crew Station Support Computer (SSC) software reloads. **[IVA]**
9. Perform high priority ISS payload operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**
10. Perform high priority PAO events (average of **<TBD 6-4>** crew hours per week). **[IVA] [Imagery]**
11. Perform medium priority ISS maintenance. **[IVA] [Imagery]**
12. Perform medium priority ISS payload operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**
13. Perform low priority OBT substituting planned SSRMS tasks as OBT when appropriate**. [IVA] [Robotics]**
14. Perform remaining ISS PAO activities. **[IVA] [Imagery]**
15. Perform remaining maintenance. **[IVA]**
16. Perform remaining ISS payload operations. **[IVA]**
17. Perform SSRMS/Mobile Remote Servicer (MRS) Base System (MBS) On-orbit Checkout Requirements (OCRs) per the priorities in Appendix H **<TBD H-1>**. **[IVA] [Robotics] [Imagery] [Ground]**
18. Reboost ISS with SM Aft thrusters as required. **[Ground]**
19. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, for ISS alone reboost (IWIS required). **[IVA] [Imagery] [Ground]**
20. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 17S relocation. **[IVA] [Ground]**

6.4.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.4.3.1 The ISS shall be in CMG control without ISS thrusters firing for the following activities:

None Identified

6.4.3.2 The ISS shall be in free drift configuration with the CMGs not controlling and without ISS thrusters firing for the following activities:

None Identified.

6.4.4 CONTINGENCY REQUIREMENTS

6.4.4.1 MCC-H and MCC-M shall build procedures, contingency timelines, and conduct training to allow the crew to perform the following non-EVA tasks (The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked.):

A. ISS critical maintenance tasks as follows:

None identified.

B. Complete critical unfinished 17 Soyuz assembly tasks as follows:

None Identified.

C. Remove/replace critical spares as follows:

None identified.

6.4.4.2 MCC-H and MCC-M shall build task specific procedures, contingency timelines, and conduct training to a high level sufficient to meet the following objectives:

The readiness of these tasks will be based upon the generic development of the task procedures and timelines to a level that can be validated against a set of criteria defined in GGR&C 3.9.1. For contingency tasks not listed below, the ISS program has determined that until the contingency is invoked, resources will not be applied to develop products or plans and the feasibility to perform those tasks on this flight/increment will be undetermined.

None Identified

6.4.5 JETTISON REQUIREMENTS

Planning and product development, including safety and data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite identification and desired jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.4.5.1 Planned Jettison

The following items are planned for jettison during EVA in this flight/stage:

A. U.S.:

None identified.

B. Russian:

None identified.

6.4.5.2 Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. U.S.:

None identified.

B. Russian:

None identified.

6.4.6 GROUND SYSTEMS REQUIREMENT

6.5 FLIGHT ULF2 REQUIREMENTS

This paragraph identifies ISS requirements during Flight ULF2. Detailed requirements and agreements between the ISS Program and the Space Shuttle Program are specified in NSTS 21514, International Space Station Mission Utilization Logistics Flight 2 (ULF2) Integration Plan.

6.5.1 <RESERVED>

6.5.2 FLIGHT ULF2 TASKS (IN DESCENDING PRIORITIZED ORDER)

These tasks, listed in order of ISS Program priority, are to be executed during this flight. The order of execution for these tasks in the nominal plan may vary, depending on timeline efficiencies. The Flight ULF2 Task Priorities have been prepared so that, in the event of a shortened mission, task execution order can be modified such that all mandatory tasks will be completed. The following numbered tasks, which include four Station-based EVAs to be performed by the Orbiter crew, shall be accomplished for successful completion of this flight:

1. Dock Flight ULF2 to Pressurized Mating Adapter (PMA)-2 port and perform mandatory safety briefing for all crew members. **[IVA] [Imagery]**
2. Rotate E17 FE-2 (1J) crew member with E17/18 FE-2 (ULF2) crew member, transfer mandatory crew rotation equipment per ULF2 TPL in Appendix I and perform mandatory tasks consisting of IELK install and Sokol suit checkout. **[IVA] [Imagery]**
3. Berth Multi-Purpose Logistics Module (MPLM) to ISS Node 2 using SSRMS; activate and checkout MPLM. **[IVA] [Robotics]**
4. Transfer mandatory quantities of water from Orbiter to ISS per Flight ULF2 TPL in Appendix I. **[IVA]**
5. Transfer critical items per Flight ULF2 TPL in Appendix I. **[IVA]**
6. Perform minimum crew handover of 12 hours per rotating crew member which includes crew safety handover. **[IVA]**
7. Return MPLM to the cargo bay using SSRMS. **[IVA] [Robotics]**
8. Transfer Flex Hose Rotary Coupler (FHRC) from the Lightweight Multi-Purpose Experiment Support Structure (MPESS) Carrier (LMC) to the ESP3, Site #2 using SSRMS. [requires NTA move to a temporary location.**[EVA] [Robotics]**
9. Transfer and install ISS MPLM items/racks to the ISS. **[IVA]**
   A. WRS1 to LAB1D4~~CHeCS 2 (ZSR) to LAB1O5.~~
   B. WRS2 to LAB1P4.~~EXPR #6 (includes Galley) to LAB1O4.~~
   C. WHC to LAB1P2.~~WRS2 to LAB1P4.~~

D. EXPR #6 (includes Galley) to LAB1O4.~~WHC to LAB1P2.~~

E. Crew Quarters to NOD2P5.~~WRS1 to LAB1D4~~.

F. Crew Quarters to NOD2S5.~~Combustion Integration Rack (CIR) (PaRIS) to LAB1S3.~~

G. Crew Quarters to JPM F3.~~TRDML 2 to NOD2D5.~~

H. TRDML 2 to NOD2D5.~~Crew Quarters to NOD2P5.~~

I. CHeCS 2 (ZSR) to LAB1O5.~~Crew Quarters to NOD2S5.~~

J. Combustion Integration Rack (CIR) (PaRIS) to LAB1S3.~~Crew Quarters to NOD2O5.~~

K. ZSR to JLP1F2.

10. Return NTA from the ESP3 (temporary location) to the LMC using SSRMS. **[EVA] [Robotics]**

11. Transfer remaining cargo items per Flight ULF2 TPL in Appendix I. **[IVA]**

~~12. Relocate P6 PDGF from P6 to FGB using SSRMS. **[EVA] [Robotics]**~~

13. Relocate 2 Crew and Equipment Translation Aid (CETA) carts from starboard-starboard to port-port using SSRMS. **[EVA] [Robotics]**

14. Perform Solar Alpha Rotary Joint (SARJ) outboard operations R & R activities. **<TBD 6-14> [EVA] [Robotics]**

A. Cleaning and Remove and Replace (R&R) TBAs

B. SLRs

C. Rotary Joint Motor Controller (RJMC)

D. Drive Lock Assembly (DLA)

~~14. Perform Development Test Objective (DTO) 848 Tile Repair Ablator Dispenser (TRAD). **<TBD 3-5> [EVA]**~~

16. Perform daily middeck activities to support payloads (includes cases where shuttle crew also performs payloads on the ISS): (HRP/Integrated Immune, HRP/Sleep Short, Midodrine, Glacier, MOP, and MUS). **[IVA]**

17. Deploy PSSC.

18. Perform USOS/ISS daily payload status checks as required. **[IVA]**

19. Transfer required N_2 from the Orbiter to the ISS A/L HPGTs. **[IVA]**

20. Transfer required O_2 from the Orbiter to the ISS A/L HPGTs. **[IVA]**

21. Perform additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crew member total). **[IVA]**

22. Reconfigure Portable Fire Extinguisher (PFE)/Portable Breathing Apparatus (PBA) in JPM.

23. Reboost ISS with the Orbiter if mission resources allow and are consistent with ISS trajectory analysis and planning. **[IVA]**

24. Perform payloads of opportunity: MAUI and SEITE.

25. Perform imagery survey of the ISS exterior during Orbiter fly around after undock. **[IVA] [Imagery]**

26. The following tasks are deemed to fit within the existing EVA timelines; however, may be deferred if the EVA is behind schedule. The EVA will not be extended to complete these tasks. **[EVA]**

A. ~~19.~~ Perform Exposed Facility Berthing Mechanism checkout. **[EVA] [IVA] [Ground]** (for 2J/A)

B. Install External Television Camera Group (ETVCG) at Camera Port (CP)9 using SSRMS. **[IVA] [EVA] [Robotics]** (for 2J/A)

C. ~~20.~~ Install two (2) JAXA Proximity Global Positioning System (GPS) antennas on JLP using SSRMS. **[EVA] [Robotics]** (for HTV)

~~21. Install External Television Camera Group (ETVCG) at Camera Port (CP)7 using SSRMS. **[IVA] [EVA] [Robotics]**~~

~~22. Perform additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crew member total). **[IVA]**~~

~~23. Reconfigure Portable Fire Extinguisher (PFE)/Portable Breathing Apparatus (PBA) in JPM.~~

~~24. Reboost ISS with the Orbiter if mission resources allow and are consistent with ISS trajectory analysis and planning. **[IVA]**~~

~~25. Perform imagery survey of the ISS exterior during Orbiter fly around after undock. **[IVA] [Imagery]**~~

~~26. The following tasks are deemed to fit within the existing EVA timelines; however, may be deferred if the EVA is behind schedule. The EVA will not be extended to complete these tasks. **[EVA]**~~

~~None identified.~~

~~27. Perform ISS payload research operations tasks. **[IVA]**~~

~~A. NASA: **<TBD 3-8>**~~

~~B. ESA: **<TBD 3-8>**~~

36~~28~~. Perform Program-approved EVA get-ahead tasks. The following EVA get ahead tasks do not fit in the existing EVA timelines; however, the EVA team will be trained and ready to perform should the opportunity arise. EVA MOD has the flexibility to

select the tasks to be completed based on efficiencies gained in performing the already scheduled required tasks. **[EVA] [Imagery]**

A. Deploy S3 upper outboard PAS. **[Imagery] [IVA] [EVA] [Robotics]** (for ULF-3)~~None identified.~~

37. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during Shuttle mated ISS reboost (IWIS required) (only if crew time available). **[IVA] [Imagery] [Ground]**

38. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during ULF2 Orbiter undocking (IWIS highly desired, but not required) (only if crew time available). **[IVA] [Ground]**

6.5.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.5.3.1 The maximum rendezvous, altitude for Flight ULF2 shall be 352 km (190 nmi).

6.5.3.2 The Orbiter shall dock at Pressurized Mating Adapter (PMA)-2.

6.5.3.3 The ISS with Shuttle docked shall be in Control Moment Gyroscope (CMG) control without ISS thrusters firing as well as the Shuttle Reaction Control System (RCS) inhibited for the following activities:

A. Unberth of MPLM from Orbiter Payload Bay (PLB).

B. Mating of MPLM to Node 2.

C. Demate of MPLM from Node 2.

D. Berthing of MPLM in Orbiter PLB.

6.5.3.4 The ISS with Shuttle docked shall be in a free drift configuration with the CMGs not controlling, Shuttle RCS inhibited and without ISS thrusters firing for the following activities:

None identified.

6.5.3.5 The Space Station Remote Manipulator System (SSRMS) shall be located on the Node 2 at the beginning of Flight ULF2.

6.5.4 CONTINGENCY REQUIREMENTS

6.5.4.1 Mission Control Center - Houston (MCC-H) and Mission Control Center - Moscow (MCC-M) shall build procedures, contingency timelines, and conduct training for the following non-EVA tasks. (The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked.):

A. ISS critical maintenance tasks as follows:

None identified.

B. Orbiter TPS inspection.

6.5.4.2 MCC-H and MCC-M shall build procedures, contingency timelines, and provide pre-flight training for the EVA tasks to sufficient maturity to provide for the EVA response times designated.

A. Class 1: All procedures, timelines and training are developed and certified to support an EVA response within 24 hours.

1. Clear/restrain CBM Capture Latch
2. Manually open/close CBM Petal
3. Remove/replace Center Disk Cover
4. Remove/replace CBM Capture Latch
5. Remove/replace CBM Controller Panel Assembly (CPA)
6. Remove/replace CBM Petal
7. Manual release of SSRMS from MPLM Flight Releasable Grapple Fixture (FRGF).

B. Class 2: For contingencies occurring during the docked time frame an EVA response is available on a subsequent EVA based on re-prioritization of the mission tasks. Published procedures and timelines are developed, but may require real time updates to match the flight specific failure.

None identified.

C. Class 3: For contingencies related to first flights hardware that are not time critical, skeleton EVA procedures will be developed preflight to support a Class 3 EVA. The EVA response time can be greater than two weeks and can be deferred to the stage or next available mission. The ISS Program has determined that additional resources will not be applied to further refine the training and integrated planning until the failure occurs. Subsequent flight listings for these hardware items will be contained in the Generic Groundrules, Requirements, and Constraints (GGR&C).

None identified.

6.5.5 JETTISON REQUIREMENTS

Planning and product development, including safety data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite identification and desired

jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.5.5.1 Planned Jettison

The following items are planned for jettison during EVA in this flight:

A. U.S.: None identified.

B. Russian: None identified.

6.5.5.2 Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. U.S.: None identified.

B. Russian: None identified.

6.5.6 GROUND SYSTEMS REQUIREMENTS

A. Ground Support is required to operate Structural Dynamic Measurement System (SDMS), IWIS and External Wireless Instrumentation System (EWIS) for SDTO: 13005-U.

B. Ground support is highly desired to operate Station Acceleration Measurement System - II (SAMS-II), MAMS and Russian ALO (Optical Linear Accelerometers) sensors for SDTO: 13005-U. SAMS and MAMS availability will be assessed real time.

6.5.7 ISS REQUIREMENTS ON SHUTTLE DURING NONDOCKED TIME FRAME

A. NASA: ~~<TBD 3-8>~~

B. ESA: ~~<TBD 3-8>~~

6.6 FLIGHT ULF2 UNDOCK TO FLIGHT ~~17S~~ 15A DOCK REQUIREMENTS (STAGE ULF2)

This paragraph identifies requirements applicable from Flight ULF2 undock to Flight ~~17 Soyuz TMA~~15A dock~~., including requirements associated with 30 Progress-M undocking **<FP TBR 3-8>**~~.

6.6.1 <RESERVED>

6.6.2 STAGE ULF2 TASKS

These tasks, listed in order of ISS Program priority, are to be executed during this stage. The order of execution for these tasks in the nominal plan may vary depending on timeline efficiencies. The following numbered tasks, which include no Station-based EVAs, shall be accomplished for successful completion of this interval.

1. Perform high priority ISS maintenance and Shuttle Launch Commit Criteria for the next flight. **[IVA] [Imagery]**

~~2. Complete 30P loading of trash and undock from the SM Aft port. **<FP TBR 3-8> [IVA] [Imagery]**~~

3. Perform ISS medical operations (average of 10 crew hours per week crew of 3). **[IVA]**

4. Perform checkout and preparation tasks for Flight 15A. **[IVA]**

   A. Position MT/SSRMS at Work Site (WS) #**<TBD 6-10>** for Flight 15A joint operations. **[Robotics] [Ground]**

   B. Perform SSRMS pre-launch checkout at Mobile Servicing System (MSS) WS # **<TBD 6-10>**. **[Robotics] [Ground]**

   C. Unstow and configure Joint Airlock.

   D. Perform Flight 15A pre-pack.

   E. Configure and checkout EVA equipment.

   F. Perform training and preparation for joint operations.

   G. Complete Flight Plan and EVA timeline reviews.

   H. Perform tool preparation.

   I. Perform transfer tag-up.

~~Perform checkout and preparation tasks for Flight 17 Soyuz arrival and Flight 16 Soyuz crew return. **[IVA]**~~

~~A. Complete pre-pack.~~

~~B. Perform training and preparation for joint operations.~~

~~C. Perform Soyuz on-orbit vehicle training/familiarization training for Soyuz 16 return.~~

~~D. Complete Flight Plan reviews.~~

~~E. Perform tool preparation.~~

~~F. Perform transfer tag-up.~~

5. Perform high priority OBT (average of 4 **<TBD 6-4>** crew hours per week) substituting planned SSRMS/SPDM tasks as OBT when appropriate. **[IVA] [Robotics]**

6. Unpack and stow hardware delivered on Flight ULF2. **[IVA]**

7. Perform high priority 6-crew Regen ECLSS and Habitability Hardware activation and checkout to allow for sample return on 15A. **[IVA] [Imagery]**

A. Assemble WRS1 offloaded ORUs into rack.

B. Assemble WRS2 offloaded ORUs into rack and reconfigure FCPA and PCPA acoustic isolators from launch configuration.

C. Vacuum backfill fuel cell bus in US Lab only.

D. Install mod kit #3 to connect WRS 1 & 2.

E. Assemble WHC offloaded ORUs into rack and deply Kabin.

F. Activate WPA to allow fill of WPA waste water tank and install condensate tank check valve in LAB1D5.

G. Perform WPA catalytic reactor startup filtration.

H. Prepare (prep) UPA for activation including priming RFTA and DA with urine from EDV.

I. Activate WPA.

J. Activate UPA and run distillate through WPA for one batch process.

K. Install Total Organic Carbon Analyzer (TOCA) on front of WRS 2.

L. Activate TOCA while WRS processing is ongoing.

M. Offload 20 pounds of water to Payload Water Reservoir (PWR) or CWC.

N. Sample first batch of potable water and perform TOCA and micro in-flight analysis.

O. Take potable sample using REFH to return for ground analysis.

P. Activate WHC.

Q. Integrate potable/waste water lines with WRS.

R. Run WHC and WRS integrated until WPA processes one batch of waste water and fills up EDV flush tank 1 time (~3 days) while offloading potable water as required.

S. Sample potable water and perform TOCA and micro in-flight analysis.

T. Take potable sample using REFH to return for ground analysis (once per week) (chemical and micro archival).

U. Perform functional test of ER6.

V. Perform functional test of PWD, food warmer and MERLIN

W. Offload iodinated water that launched in PWD to fill with processed water.

X. Start using PWD to mimic crew usage and put additional potable water demand on system.

Y. Run WHC, WRS and Galley for 90 days.

1) Perform micro sampling and in-flight analysis from PWD and TOCA analyses from WRS every 4 days.

2) Perform TOCA analyses from PWD once per month

3) Take potable sample at PWD to return for ground analysis every 8 days (for chemical & micro archive).

8. Perform high priority ISS payload operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**

   A. NASA: Journals, Nutrition, Repository, Sleep Long, Integrated Immune, Bisphosphonates, Midodrine Long.

   B. ESA: IMMUNO, SAMPLE, ETD, ALTCRISS, Colored Fungi in Space (CFS-A), EXPOSE-R, EuTEF, Solar variability and irradiance monitor (SOLAR).

   C. JAXA: Rad Gene & LOH, Ice Crystal.

9. Perform high priority ISS PAO events (average of **<TBD 6-4>** crew hours per week). **[IVA]**

10. Perform medium priority ISS maintenance. **[IVA]**

11. Perform medium-priority ISS payloads operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**

12. Transition Photovoltaic Control Application (PVCA) Computer Software Configuration Item (CSCI) from R2 to R3. **<TBR 6-2> [IVA] [Ground]**

13. Perform low-priority OBT substituting planned SSRMS/SPDM tasks as OBT when appropriate. **[IVA] [Robotics]**
14. Perform remaining ISS PAO events. **[IVA] [Imagery]**
15. Perform remaining ISS maintenance. **[IVA]**
16. Perform remaining ISS payload operations. **[IVA]**
17. Perform SPDM On-orbit Checkout Requirements (OCRs) per the priorities in Appendix H **<TBD H-1>**. **[IVA] [Robotics] [Imagery] [Ground]**

~~17. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 30P undocking from the SM Aft port (IWIS required). **<FP TBR 3-8>** **[IVA] [Ground]**~~

6.6.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

~~6.6.3.1 The 30 Progress-M shall undock from the SM Aft port. **<FP TBR 3-8>**~~

~~6.6.3.2~~ 6.6.3.1 The ISS shall be in CMG control without ISS thrusters firing for the following activities:

None identified.

~~6.6.3.3~~ 6.6.3.2 The ISS shall be in free drift configuration with the CMGs not controlling and without ISS thrusters firing for the following activities:

None identified.

6.6.4 CONTINGENCY REQUIREMENTS

6.6.4.1 MCC-H and MCC-M shall build procedures, contingency timelines, and conduct training to allow the crew to perform the following non-EVA tasks. The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked:

A. ISS critical maintenance tasks as follows:

   None identified.

B. Complete critical unfinished Flight ULF2 assembly tasks as follows:

   None identified.

C. Remove/replace critical spares as follows:

   None identified.

6.6.4.2 MCC-H and MCC-M shall build task specific procedures, contingency timelines, and conduct training to a high level sufficient to meet the following objectives:

- Identify task specific technical and safety issues.
- Identify on-board equipment required to perform the task.
- Determine the scope of effort required to prepare for the specific configurations, locations, and environmental conditions for the EVA.
- Provide the crew with the proper skill set required to perform the tasks given the on-board proficiency training assets available.

The readiness of these tasks will be based upon the generic development of the task procedures and timelines to a level that can be validated against a set of criteria defined in the “Process for EVA Readiness” in the GGR&C. For contingency tasks, products/planning are already in place from previous flights/stages, and the ISS Program has determined that resources will not be applied to develop products/planning and the feasibility to perform those tasks on this flight/increment will be undetermined until the contingency is invoked.

A. ISS critical maintenance tasks as follows. This list is not in order of priority. The criteria for tasks being added to this list are that the failure of the function provided by the ORU causes a situation placing the ISS in a configuration that is zero tolerant, or effectively zero fault tolerant, to survival.

1. Maintain ISS Primary EPS Survivability

a. External (EXT) Multiplexer/Demultiplexer (MDM) R&R

b. Battery Charge/Discharge Unit (BCDU) Backout

c. Main Bus Switching Unit (MBSU) R&R

d. Sequential Shunt Unit (SSU) R&R

e. Direct Current Switching Unit (DCSU) R&R

f. R&R of DC to DC Converter Units (DDCUs) 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, S01A, S02B

g. Solar Array Wing (SAW) Manual Positioning

h. Pump Flow Control Subassembly (PFCS) R&R

i. Photovoltaic Controller Unit (PVCU) MDM R&R

j. R&R of External Remote Power Control Modules (RPCMs) S01A_C, S02B_C, S01A_A, S11A_D, S02B_A, and P12B_D

2. Maintain ISS Thermal Control System (TCS) Survivability

a. Interface Heat Exchanger (IFHX) R&R

b. External Thermal Control System (ETCS) Pump Module (PM) R&R

c. Flex Hose Rotary Coupler (FHRC) R&R

d. Ammonia (NH_3) Leak Isolation and Recovery

3. Perform SARJ outboard operations R & R activities. **<TBD 6-14> [EVA] [Robotics]**

~~ISS critical maintenance tasks as follows:~~

~~The tasks listed in Paragraph 6.4.4.2 are still applicable.~~

B. Complete critical unfinished Flight ULF2 assembly tasks as follows:

None identified.

C. Remove/replace critical spares as follows:

None identified.

6.6.5 JETTISON REQUIREMENTS

Planning and product development, including safety data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite identification and desired jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.6.5.1 Planned Jettison

The following items are planned for jettison during EVA in this stage:

A. U.S.: None identified.

B. Russian: None identified.

6.6.5.2 Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. U.S.: None identified.

B. Russian: None identified.

6.6.6 GROUND SYSTEMS REQUIREMENTS

A. Ground Support is required to operate Structural Dynamic Measurement System (SDMS), IWIS and External Wireless Instrumentation System (EWIS) for SDTO: 13004-U.

B. Ground support is highly desired to operate Station Acceleration Measurement System - II (SAMS-II), MAMS and Russian ALO (Optical Linear Accelerometers) sensors for SDTO: 13004-U. SAMS and MAMS availability will be assessed real time.

~~6.5~~ 6.7 FLIGHT 15A REQUIREMENTS

This section identifies ISS requirements during Flight 15A. Detailed requirements and agreements between the ISS Program and the SSP are specified in NSTS 21510, International Space Station 15A Mission Integration Plan.

~~6.5.1~~ 6.7.1 <RESERVED>

~~6.5.2~~ 6.7.2 FLIGHT 15A TASKS (IN DESCENDING PRIORITIZED ORDER)

These tasks, listed in order of ISS Program priority, are to be executed during this flight. The order of execution for these tasks in the nominal plan may vary, depending on timeline efficiencies. The Flight 15A Task Priorities have been prepared so that, in the event of a shortened mission, task execution order can be modified such that all mandatory tasks will be completed. The following numbered tasks, which include three Station-based EVAs to be performed by the Orbiter crew, shall be accomplished for successful completion of this flight:

1. Dock Flight 15A to Pressurized Mating Adapter (PMA)-2 port and perform mandatory safety briefing for all crew members. **[IVA] [Imagery]**
2. Rotate Expedition 18/19 FE-2 (ULF2) with Expedition 18 FE-2 (15A), transfer mandatory crew rotation cargo per Flight 15A Transfer Priority List (TPL) in Appendix I **<TBD I-1>** and perform mandatory tasks consisting of Individual Equipment Liner Kit (IELK) install and Sokol suit check. **[IVA]**
3. Configure ISS for Starboard (S)6 Installation. **[IVA]**
   A. Configure ISS power distribution and loads to support operations with no tracking of port or starboard Solar Alpha Rotary Joint (SARJ).
   B. Position and lock S3/SARJ at required S6 installation orientations.
   C. Position for optimize power generation and command S4-1A/3A Beta Gimbals to position hold.
   D. Position both Port (P)3/SARJ and P4-2A/4A Beta Gimbals to optimize power generation and command to position hold until minimum S6 structural attachment complete.
4. Unberth S6 from the Shuttle Payload Bay using SRMS and hand off to SSRMS. **[Robotics][Imagery]**
5. S6 install and deploy tasks.
   A. Install S6 to S5 with Rocketdyne Truss Attachment System (RTAS) 4 of 4 bolts or corresponding contingency bolts to the minimum configuration to support subsequent visiting vehicle docking and undocking loads. **[IVA] [EVA] [Robotics][Imagery]**

B. Connect S5/S6 lower (nadir) and upper (Zenith) utility tray power umbilicals. **[EVA] [Imagery]**

C. Remove SSU and Electronics/environmental Control Unit (ECU) blankets. **[EVA]**

D. Prep S6 Solar Array Wings. **[EVA]**

E. S6 PVR uncinch and unwinch **[EVA]**

F. Activate S6 to minimal survival configuration. **[Ground]**

6. Transfer mandatory quantities of water from the Orbiter to the ISS per Flight 15A TPL in Appendix I. **<TBD I-1> [IVA]**

7. Transfer and stow critical cargo items to ISS per Flight 15A TPL in Appendix I. **<TBD I-1> [IVA]**

8. Deploy S6 Photovoltaic Radiator (PVR). **[IVA]**

A. Configure ISS power distribution and loads to support locked S3/SARJ operations.

B. Position and lock S3/SARJ at the PVR deployment position. **[Ground]**

C. Position S4 Beta Gimbals for optimal S6/PVR viewing and command to position hold. **[Ground]**

D. Configure and deploy S6 PVR. **[EVA]**

E. Resume starboard SARJ and Beta Gimbal Assembly (BGA) operations.

F. Activate S6 thermal control system.

9. Configure ISS, S3/S4 & deploy S6 (Channel 1B & 3B) Solar Array Wings (SAW)s. **[IVA] [EVA] [Imagery]**

A. Configure ISS power distribution and loads to support locked S3/SARJ operations.

B. Position & lock S3/SARJ, & S6 Beta Gimbals **<TBR 6-1>** for S6 SAW deployment.

C. Position S4 Beta Gimbals for optimal S6/SAW viewing and command to position hold.

D. Maneuver to required attitude and perform thermal conditioning of S6 SAWs.

E. Deploy S6 1B & 3B SAWs.

10. Configure ISS for post S6 installation. **[IVA] [Imagery]**

A. Resume S4 Beta Gimbal Tracking.

B. Begin S6 Beta Gimbal Tracking.

C. Resume Starboard SARJ tracking.

D. Resume nominal power distribution and loads & configure to accept S6 power.

11. Verify S6 1B & 3B SAW positioning capability to support docking and undocking operations for visiting vehicles. **[IVA]**

12. Perform minimum crew handover of 12 hours per rotating crewmember which includes crew safety handover. **[IVA]**

13. Completion of 1J EVA Tasks in preparation for the JEM Exposed Facility (~~JEM EF~~JEF) using SSRMS. **[EVA] [Robotics]**

    A. Deploy CBM MMOD Shields (2). **[EVA] [Imagery]**

    B. EFBM Thermal Cover release. **[EVA] [Imagery]**

14. CETA Cart Relocation. **[EVA]**

    A. Relocate 1 CETA Cart to Starboard for Stbd-MT-Port Configuration

    B. Relocate 1 CETA Cart to Starboard for P6 Battery R&R (Stbd-Stbd-MT) ~~Release S6 Integrated Equipment Assembly (IEA) Micrometeoroid Orbital Debris (MMOD) Cover using SSRMS. **[EVA] [Robotics]**~~

15. Install ETVCG at CP7. **[EVA]** ~~Use SSRMS to checkout the functionality of the PDGF on FGB. **[IVA] [Robotics] [Imagery]**~~

16. JAXA Prox GPS Antenna Installations (2) **[EVA]** ~~Install WETA #3 at CP1 (S3 location)~~

17. Release S6 Integrated Equipment Assembly (IEA) Micrometeoroid Orbital Debris (MMOD) Cover using SSRMS. **[EVA] [Robotics]** ~~Install ETVCG at CP9. **[EVA]**~~

18. PDGF Relocation to FGB Tasks. **[EVA] [Robotics]**

    A. Relocate P6 PDGF from P6 to FGB using SSRMS.

    B. Install VSC Video Fiber Cable – Route to FGB.

    C. Install PDFG Harness Cable. ~~Deploy S3 Upper Outboard PAS. [EVA]~~

19. Use SSRMS to checkout the functionality of the PDGF on FGB. **[IVA] [Robotics] [Imagery]** ~~Deploy P3 Nadir Unpressurized Cargo Carrier Attachment System (UCCAS) site. **[EVA]**~~

20. Deploy (other 3) - S3/Payload Attachment System (PAS) sites **[EVA]**

    A. Deploy S3 Lower Outboard PAS

    B. Deploy S3 Upper Outboard PAS. **[EVA]**

    C. Deploy S3Lower Inboard PAS

    ~~C~~D. Deploy S3Upper Inboard PAS (Proposed AMS Location)

21. Transfer required N2 from the Orbiter to the ISS A/L High Pressure Gas Tank (HPGT). **[IVA]**

22. Transfer required O_2 from the Orbiter to the ISS A/L HPGT if Orbiter margins permit. **[IVA]**

23. Transfer remaining cargo items per Flight 15A TPL in Appendix I. **<TBD I-1> [IVA]**

24. Perform ISS daily ISS payload status checks as required. **[IVA]**

25. Perform additional crew handover of 4 hours for rotating crewmember. **[IVA] [Robotics] [Imagery]**

26. Perform ISS Sortie and Short Duration Bioastronautics Investigations (SDBI) payloads. **<TBD 6-8> [IVA]**

27. The following tasks are deemed to fit within the existing EVA timelines; however, may be deferred if the EVA is behind schedule. The EVA will not be extended to complete these tasks.

28. Perform program approved EVA get-ahead tasks. The following EVA get ahead tasks do not fit in the existing EVA timelines; however, the EVA team will be trained and ready to perform should the opportunity arise. EVA/Mission Operations Directorate (MOD) has the flexibility to select the tasks to be completed based on efficiencies gained in performing the already scheduled required tasks.

    A. **<TBD 6-9>**, including 1J Stage ~~JEM PM~~JPM get aheads (if required).

29. Reboost ISS with the Orbiter if mission resources allow and are consistent with ISS trajectory analysis and planning. **[IVA] [Imagery]**

30. Perform imagery survey of the ISS exterior during Orbiter flyaround after undock. **[IVA] [Imagery]**

31. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during S6 installation. **[Ground] [Imagery]**

32. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during Shuttle mated Reboost. (IWIS only if crew time available). **[IVA] [Ground] [Imagery]**

33. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during 15A Orbiter Undocking (IWIS highly desired, but not required) (only if crew time available). **[Ground] [IVA] [Imagery]**

~~6.5.3~~ 6.7.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.7.3.1 ~~6.5.3.1~~ The maximum rendezvous altitude for Flight 15A shall be 352 km (190 nmi).

6.7.3.2 ~~6.5.3.2~~ The Orbiter shall dock at PMA-2.

6.7.3.3 ~~6.5.3.3~~ The S6 install operations will require two EVAs for completion.

6.7.3.4 ~~6.5.3.4~~ During S6 installation S4 solar arrays shall be fixed at a SARJ angle of 230 degrees and BGA angles for channels 1A and 3A are not constrained to a specific position but should not be tracking.

6.7.3.5 ~~6.5.3.5~~ The mated vehicles shall meet the following constraints to mated vehicle attitude control **<TBD 6-11>**:

A. The ISS with Shuttle docked shall be in a free drift configuration with the Control Moment Gyroscope (CMGs) not controlling, Shuttle Reaction Control System/Subsystem (RCS) inhibited and without ISS thrusters firing for the following activities:

   None identified.

B. The ISS with Shuttle docked shall be in CMG control without ISS thrusters firing as well as the Shuttle Reaction Control System (RCS) inhibited for the following activities

   1. SRMS unberthing of ITS S6, handoff to SSRMS, and SSRMS berthing of S6 to ITS S5 until RTAS capture and secure with at least **<TBD 6-11>** of four bolts.
   2. During S6 SAW deploy or retract.
   3. During S6 Photovoltaic (PV) Radiator deploy or retract.
   4. During MT/Load Transfer Unit (LTU) latch transition open or closed.
   5. During Umbilical Mating Assembly (UMA) translation.

C. The mated stack will be limited to CMG only control with desat enabled using only ISS propulsive sources under the following conditions. The ISS propulsive sources that may be used are also constrained. The allowable propulsive control sources will be defined with flight specific analysis and documented in the appropriate mission or vehicle specific flight rules.

   1. Any motion or planned positions of the SRMS or SSRMS with the S6 grappled and while clear of structure.
   2. Until all RTAS operations are nominally completed or until a minimum **<TBD 6-11>** bolts are fully engaged.
   3. During MT operations until latched at a worksite in the minimum required configuration.
   4. When the S6 SAW is not fully retracted or fully deployed and tensioned.
   5. If the S6 PVR is not fully retracted or deployed.

D. The mated stack may perform attitude control using Shuttle Vernier Reaction Control System (VRCS) for the following conditions/activities:

1. After RTAS mating operations for S6 is completed with any combination of **<TBD 6-11>** bolts at full torque or the associated contingency bolts at those locations.
2. MT is unlatched with MT Brake engaged, SSRMS loaded or unloaded.
3. If the S6 SAW is either ready to deploy or re-latch or not fully deployed and tensioned.
4. If the S6 PVR is partially deployed which is defined as a radiator uncinched and unwinched and not fully deployed.

E. The mated stack may perform attitude control using Shuttle Primary Reaction Control System (PRCS) for the following conditions/activities:

1. Any planned SRMS position with the S6 element grappled when clear of structure.
2. Any planned positions of the SSRMS with the S6 element grappled when clear of structure.
3. After RTAS bolt operations for S6 is complete with any combination of **<TBD 6-11>** bolts at full torque or the associated contingency bolts at those locations.
4. MT fully latched.

F. ISS reboost (SM, Progress, or Soyuz thrusters) or Shuttle reboost (VRCS thrusters) is allowed during the following conditions/activities:

1. After RTAS bolt operations for S6 is complete with any combination of **<TBD 6-11**> bolts at full torque or the contingency bolts at those locations.
2. MT fully latched with MT Brake engaged, SSRMS loaded or unloaded.
3. MT unlatched, brakes on, SSRMS unloaded.
4. If S6 SAW is either ready to deploy or re-latch or partially deployed and the solar array blankets are not tensioned.
5. If the S6 PVR is partially deployed which is defined as a radiator uncinched and unwinched and not fully deployed.

6.7.3.6 ~~6.5.3.6~~ Shuttle and ISS crew exercise is not permitted during the following activities **<TBD 6-11>**:

A. Either isolated or non-isolated exercise:

1. During any motion of the S6 SAW or PVR.
2. Until after RTAS capture and bolting operations are complete.
3. During MT translations.

B. Non-isolated exercise:

1. During RTAS capture latch and bolt operations until at least any combination of **<TBD 6-11>** RTAS bolts are fully tight or the associated contingency bolts at those locations.
2. MT is unlatched.
3. If S6 SAW is either ready to deploy or re-latch.

6.7.3.7 ~~6.5.3.7~~ Solar Array Position for Critical Operations

- For all planned, critical operations (ops) (including Orbiter Prox Ops, Obiter Mated Mission activities, RS Prox Ops, etc.) VIPER produces a nominal array plan with, in some cases, multiple array positioning/management options for each event. This array plan, referred to as the "Solar Array Constraints Matrix" is produced prior to each shuttle mission and extends through the subsequent Stage. This Matrix is delivered to MOD for incorporation into planned timelines via a the CHIT system at approximately L-2 weeks for specific vehicle launch.

6.7.3.8 ~~6.5.3.8~~ Shuttle undocking should not be performed unless in response to a vehicle or crew emergency under the following conditions due to potential damage of the cargo elements or the ISS vehicle **<TBD 6-12>**.

A. During any motion of the S6 SAW.

B. During any motion of the S6 PVR.

C. If the S5/S6 attachment is less than 3 of 4 RTAS bolts or the associated contingency bolts at those locations.

D. If the MT is not fully latched with a minimum of 3 of 4 LTUs.

6.7.3.9 ~~6.5.3.9~~ Subsequent visiting vehicle dockings can not be supported under the following conditions **<TBD 6-12>**:

A. If the S6 cargo element have been secured to the S5 interface with less than 3 of 4 RTAS Bolts fully tight or the associated contingency bolts installed at those locations.

B. If the MT is not latched with a minimum of 3 of 4 LTUs fully engaged.

C. If the S6 SAW is partially deployed which is defined as a SAW mast that is 5 percent – 100 percent deployed and the solar array blanket is not in tension.

D. If the S6 PVR is partially deployed which is defined as a radiator that is uncinched and unwinched and not fully deployed.

6.7.3.10 ~~6.5.3.10~~ EVA operations on and to the S6 cargo element will have the following limitations for the specified vehicle configurations **<TBD 6-12>**:

A. No EVA operations are allowed until completion of the RTAS mating operations with a minimum of 3 of 4 RTAS Bolts fully tight or the associated contingency bolts at those locations.

B. No EVA operations are allowed outboard of the SARJ until at least 1 Drive Lock Assembly (DLA) is placed in the “Locked” position.

C. No maximum EVA loads are allowed while on the S6 element or in conditions which induce loads into the S6 element for the following conditions:

1. Once the S6 SAW is unlatched and until the arrays are fully deployed with the solar array blankets fully tensioned.

2. Once the S6 PVR has been uncinched and unwinched until the radiators are fully deployed.

6.7.3.11 ~~6.5.3.11~~ Shuttle undocking is allowable with the S6 on the SSRMS only if the SSRMS is stationary and in an acceptable pre-analyzed position. Shuttle, Progress or Soyuz dockings are not allowed with the S6 cargo element is attached only to the SSRMS **<TBD 6-12>**.

6.7.3.12 ~~6.5.3.12~~ The ISS will maneuver to and maintain a specified attitude to provide thermal conditioning of the S6 SAW Blankets to support S6 SAW deployment.

6.7.3.13 ~~6.5.3.13~~ The ISS and Shuttle will be configured to receive, process and record/downlink wireless EVA video in support of assembly operations and photo documentation.

6.7.4 ~~6.5.4~~ CONTINGENCY REQUIREMENTS

6.7.4.1 ~~6.5.4.1~~ MCC-H and MCC-M shall build procedures, contingency timelines, and conduct training for any of the following non-EVA tasks (The items listed below are for unique tasks or /first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked).

None identified.

6.7.4.2 ~~6.5.4.2~~ MCC-H and MCC-M shall build procedures, contingency timelines, and provide pre-flight training for the EVA tasks to sufficient maturity to provide for the EVA response times designated. Examples below are not in prioritized order, but are to show what type of activities could be included.

A. Class 1: All procedures, timelines and training are developed and certified to support an EVA response within 24 hours. When listing Class 1 items, a parenthetical should be added to denote the location of the Orbital Replacement Unit (ORU) spare, or if prepositioning is required.

1. Manually override the Blanket Box Motor Drive Assembly (MDA) to support SAW Blanket Tensioning.
2. Manually override the Mast MDA. Deploy or retract the SAW on S6.
3. Using the Payload Retention Device (PRD)s to bring the truss segments together in the event of gapping due to RTAS Capture Latch failure.
4. Complete RTAS mating using EVA contingency bolts.
5. Manual assist of S6 4-Bar linkage deployment.
6. Manual release of the Solar Array Blanket Box (SABB) Restraint Pins.
7. Install SABB Locking Strut Aids on S6.
8. Remove and replace ~~Sequential Shunt Unit (~~SSU~~)~~ on any PV Module.
9. Remove and replace Direct Current Switching Unit (DCSU)on any PV Module.
10. Remove and replace MBSU on S0.
11. Remove and replace Photovoltaic Controller Unit (PVCU) on any PV Module.
12. EVA release of Payload Retention Latch Assembly (PRLA)s for S6 unberth.
13. EVA release of S6 Grapple Fixture for failed SRMS End Effector.
14. EVA release of SSRMS Latching End Effector (LEE) from S6 Grapple Fixture.
15. Remove and replace SSRMS Arm Computer Unit (ACU).
16. Installation of spare Fluid Quick Disconnect Coupling (FQDC) detent button.
17. Manually deploy or retract the S6 PVR.
18. Re-winch and re-cinch S6 PVR.
19. ~~Install VSC Video Fiber Optic Cable, route on FGB/PMA1/Node1/S0 and mate S0 and VSC connectors~~
20. ~~Install PDGF Cable harness on FGB and mate to PDGF, VSC and FGB cables~~
21. ~~Install VSC on FGB and reinstall VSC Thermal Cover~~
22. ~~Deploy 1J CBM MMOD Shields (2).~~

B. Class 2: For contingencies occurring during the docked time frame an EVA response is available on a subsequent EVA based on re-prioritization of the mission tasks. Published procedures and timelines are developed, but may require real-time updates to match the flight specific failure.

1. Manually override the Blanket Box MDA to support SAW deployment /stowage.
2. Manually override the Beta Gimbal Anti-rotation Latch.
3. Manually release and jettison a SAW. **<TBR 6-3>**

4. Perform DLA Back-off.
5. Manually release & jettison PV Radiator.
6. Remove and temporarily stow the Battery Charge/Discharge Unit (BCDU) on to an adjacent battery ORU for any PV Module.
7. Remove and replace PVR Pump/Flow Control Subsystem (PFCS) on any PV Module.
8. Remove and replace S0, S1, P1 or any PV Module's Direct Current-to-Direct Current Converter Unit External (DDCU-E).
9. Remove and replace RPCM.
10. Remove and replace Node1 ~~Multiplexer/Demultiplexer (~~MDM~~)~~.
11. Remove and replace S0 External MDM.
12. Remove and replace S0 MDM.
13. Remove and replace P3 or S3 MDM.
14. Position any PV Module's BGA to orient the SAW to support docking/undocking loads if SAWs already deployed.
15. Fill any PV Module's Photovoltaic Thermal Control System (PVTCS) with ammonia from ammonia servicer.
16. Remove and replace SARJ Rotary Joint Motor Controllers (RJMC) on P3 or S3.
17. Remove and replace ~~Electronics/environmental Control Unit (~~ECU~~)~~ on any PV Module.
18. Re-spool Solar Array Tension/Guide Wires.

C. Class 3: For contingencies related to first flights hardware that are not time critical, skeleton EVA procedures will be developed preflight to support a Class 3 EVA. The EVA response time can be greater than two weeks and can be deferred to the stage or next available mission. The ISS Program has determined that additional resources will not be applied to further refine the training and integrated planning until the failure occurs. Subsequent flight listings for these hardware items will be contained in the GGR&C.

1. Remove and replace SARJ Trundle Bearing on P3 or S3.

6.7.4.3 ~~6.5.4.3~~ The S6 cargo element will be returned for the following conditions:

S6 cannot structurally support docking/undocking loads of visiting vehicles and the required structural integrity cannot be reasonably achieved through stage EVAs. Consideration will be made in real-time to return the S6 cargo element if the element cannot be activated or safed to the minimal thermal survival configuration.

6.7.4.4 ~~6.5.4.4~~ In the event of an ISS CMG failure while the S6 element is attached to the SRMS/SSRMS, Shuttle attitude control using VRCS may be used with the S6 on the SRMS/SSRMS in the following pre-analyzed, static configurations **<TBD 6-12>**.

A. Either Low or High Payload Bay (PLB) Hover.

B. At Handoff position.

C. SRMS ungrapple/SSRMS grapple.

D. S6 pre-install position.

6.7.5 ~~6.5.5~~ JETTISON REQUIREMENTS

Planning and product development will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite identification and desired jettison direction and velocity, and related hazard assessments.

6.7.5.1 ~~6.5.5.1~~ Planned Jettison

The following items are planned for jettison during EVA in this flight/stage:

A. U.S.:

- S6 SSU thermal cover (quantity 2) **<TBR 6-3>**
- S6 ECU thermal cover (quantity 2) **<TBR 6-3>**
- S6 MDM thermal cover (quantity 1) **<TBR 6-3>**

~~None Identified.~~

B. Russian:

None Identified.

6.7.5.2 ~~6.5.5.2~~ Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. U.S.:

- SAW **<TBR 6-3>**
- PV Radiator **<TBR 6-3>**

B. Russian:

None Identified.

6.7.6 ~~6.5.6~~ GROUND SYSTEMS REQUIREMENTS

A. Ground Support is required to operate Space Acceleration Measurement System - II (SAMS-II), SDMS and Microgravity Acceleration Measurement System (MAMS) sensors for SDTOs: 13005-U.

B. Ground support is desired to operate Russian Airlock Outfitting (ALO) for SDTOs: 13005-U.

6.7.7 ~~6.5.7~~ ISS REQUIREMENTS ON SHUTTLE DURING NONDOCKED TIME FRAME

After docking but before the start of undocking and after final separation is completed, the Shuttle will provide the necessary support for downlink of the experiment data through the Shuttle communications system for ground evaluation.

A. The Shuttle will execute specified propulsive burns in support of the Maui Analysis of Upper-Atmospheric Injections payload.

B. Designated Shuttle crewmembers will perform the required support tasks for the Midodrine Experiment between the completion of the Shuttle de-orbit burn and landing.

~~6.6~~ 6.8 FLIGHT 15A UNDOCK TO FLIGHT 2J/A DOCK REQUIREMENTS (STAGE 15A)

This section identifies requirements applicable from Flight 15A undock to Flight 2J/A dock, including requirements associated with 32 Progress and 33 Progress.

~~6.6.1~~ 6.8.1 <RESERVED>

~~6.6.2~~ 6.8.2 STAGE 15A TASKS

These tasks, listed in order of Program priority, are to be executed during this stage. The order of execution for these tasks in the nominal plan may vary depending on timeline efficiencies. The following numbered tasks, which will include one station based Orlan EVA, shall be accomplished for successful completion of this interval.

1. Perform high priority ISS maintenance and Shuttle Launch Commit Criteria for the next Shuttle flight. **[IVA] [Imagery]**
2. Dock 32 Progress-M to SM Aft **<TBD 6-2>** port and perform cargo/propellant transfer. **[IVA] [Imagery]**
3. Complete 31 Progress-M loading of trash and undock from the DC1 **<TBD 6-2>** port. **[IVA] [Imagery]**
4. Dock 33 Progress-M to DC1 **<TBD 6-2>** port and perform cargo/propellant transfer. **[IVA] [Imagery]**
5. Perform ISS medical operations (average of 10 crew hours per week crew of 3). **[IVA]**
6. Perform 6-crew Regen ECLSS and Habitability Hardware activation and checkout. **[IVA] [Imagery]**

   ~~A. Install Galley (ER6) in LAB1O4.~~

   B. Perform functional test of ER6.

   C. Perform functional test of PWD, food warmer and MERLIN

   D. Offload iodinated water that launched in PWD to fill with processed water.

   E. Start using PWD to mimic crew usage and put additional potable water demand on system.

   F. Run WHC, WRS and Galley for 90 days.

      1) Perform micro sampling and in-flight analysis from PWD and TOCA analyses from WRS every 4 days.

      2) Perform TOCA analyses from PWD once per month

      3) Take potable sample at PWD to return for ground analysis every 8 days (for chemical & micro archive).

~~G. Off load water from PWD needle to CWC~~

H. ~~Install~~ Assemble Crew Quarters (CQ). Remove, reverse and reinstall the "bumpout" and "popup". Perform utility hook ups. ~~in NOD2P5, JPM1A5, and NOD2S5~~

I. ~~Install~~ Assemble T2 system components to rack. Remove PaRIS llaunch restraints. ~~in NOD2D5~~

~~J. Install TOCA on from of WRS 2~~

K. Remove Oxygen Generating System (OGS) feed water system and connect OGS to potable bus and waste water bus.

L. Reactivate OGS and operate for 1-2 crew (requires Elektron to be turned down).

M. Run WHC, WRS, Galley and OGS integrated for 90 days

1) Offload/supplement potable water as required.

2) After 90 days, perform sampling and TOCA and micro in-flight analysis from PWD once per month.

3) After 90 days, perform TOCA analyses from WRS once per week.

4) After 90 days, take potable samples at PWD to return for ground analysis (once per month ~~(~~for chemical archives and once per Shuttle return for micro archives).

N. Perform functional test of CQs

1) Perform software transition for the following CSCIs (software readiness February 2009):

(a) Internal Systems (INTSYS) from Revision 3 to Revision 4

(b) Node 2 Systems 1 from Revision 1 to Revision 2

(c) Node 2 Systems 2 from Revision 1 to Revision 2

2) Set Node 2 temperatures for CQ thermal operation scenario to force condensate collection.

O. Run WHC, WRS, Galley, OGS and CQ integrated.

P. Activate T2.

7. Perform checkout and preparation tasks for Flight 2J/A.

A. Position MT/SSRMS at WS **#<TBD 6-7>** for Flight 2J/A joint operations. **[Robotics] [Ground]**

B. Perform SSRMS pre-launch checkout at MSS WS # **<TBD 6-7>**. **[Robotics] [Ground]**

C. Perform JEMRMS pre-launch checkout (include BDS).

D. Unstow and configure Joint Airlock. **[IVA]**

E. Perform Flight 2J/A pre-pack. **[IVA]**

F. Configure and checkout EVA equipment. **[IVA]**

G. Perform training and preparation for joint operations. **[IVA]**

H. Complete Flight Plan and EVA timeline reviews. **[IVA]**

I. Perform tool preparation. **[IVA]**

J. Perform transfer tag-up. **[IVA]**

8. Perform imagery of Orbiter Thermal Protection System (TPS) during rendezvous R-bar Pitchover Maneuver (RPM) and downlink the data. **[IVA] [Imagery]**

9. Perform high priority OBT (average of **<TBD 6-4>** crew hours per week) substituting planned SSRMS tasks as OBT when appropriate. **[IVA] [Robotics]**

10. Unpack and stow hardware delivered on Flight 15A. **[IVA]**

11. Connect Hardware Command Panel (HCP) cables and perform PROX functional checkout #2 per Appendix H. **<TBD H-1> [IVA] [Ground]**

12. Perform high priority ISS payload operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**

13. Perform high priority ISS PAO events (average of **<TBD 6-4>** crew hours per week). **[IVA]**

14. Perform Russian EVA #21. **[EVA] <TBD 6-6>**.

A. Inspection of installation locations for the Kurs target and antennas to support MRM2 docking to the SM zenith port.

B. Deactivate and remove **<TBD 6-6>** Rokwiss equipment; install and activate Expose-R equipment.

C. Removal of Biorisk-MSN container #2.

D. Install Impuls experiment equipment. **<TBD 6-6>**

E. Conduct the RadioSkaf2 experiment. **<TBD 6-6>**

15. Perform software transition for the following CSCIs (software readiness December 2008):

A. Payload Executive Processor (PEP) Revision 6 to Revision 7

B. Lab Systems 1(LSYS 1) from Revision 3 to Revision 4

C. Lab Systems 2 (LSYS 2) from Revision 2 to Revision 3

D. Starboard/Port Thermal Radiator (SPTR) Revision 1 to Revision 2

16. Perform medium priority ISS maintenance. **[IVA]**

    A. Monitor, inspect and photograph condition of ISS RS window glass. **[Imagery]**

17. Perform medium-priority ISS payloads operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**

18. Perform low-priority OBT substituting planned SSRMS tasks as OBT when appropriate. **[IVA] [Robotics]**

19. Perform remaining ISS PAO events. **[IVA] [Imagery]**

20. Perform remaining ISS maintenance. **[IVA]**

21. Perform remaining ISS payload operations. **[IVA]**

22. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 31 Progress (P) undocking from SM Aft **<TBD 6-2>** port (IWIS required). **[IVA] [Ground]**

23. Perform SDTO 13005-U ISS Structural Life Validation and Extension for 15A Orbiter docking (IWIS required). **[IVA] [Ground] [Imagery]**

24. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, for ISS alone reboost (IWIS required). **[IVA] [Imagery] [Ground]**

~~6.6.3~~ 6.8.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.8.3.1 ~~6.3.3.1~~ 32 Progress-M shall dock to the SM Aft **<TBD 6-2>** port.

6.8.3.2 ~~6.3.3.2~~ 31 Progress-M shall undock from DC1 **<TBD 6-2>** port.

6.8.3.3 ~~6.3.3.3~~ 33 Progress-M shall dock to the DC1 **<TBD 6-2>** port.

6.8.3.4 ~~6.6.3.4~~ The ISS shall be in CMG control without ISS thrusters firing for the following activities:

None identified

6.8.3.5 ~~6.6.3.5~~ The ISS shall be in free drift configuration with the CMGs not controlling and without ISS thrusters firing for the following activities:

None identified

~~6.6.4~~ 6.8.4 CONTINGENCY REQUIREMENTS

6.8.4.1 ~~6.6.4.1~~ MCC-H and MCC-M shall build procedures, contingency timelines, and conduct training to allow the crew to perform the following non-EVA tasks (The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous

flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked.):

A. ISS critical maintenance tasks as follows:

None identified.

B. Complete critical unfinished Flight 15A or 17 Soyuz assembly tasks as follows:

None identified.

C. Remove/replace critical spares as follows:

None identified.

6.8.4.2 ~~6.6.4.2~~ MCC-H and MCC-M shall build task specific procedures, contingency timelines, and conduct training to a high level sufficient to meet the following objectives:

The readiness of these tasks will be based upon the generic development of the task procedures and timelines to a level that can be validated against a set of criteria defined in GGR&C 3.9.1, “Process for EVA Readiness”. For contingency tasks not listed below, the ISS Program has determined that until the contingency is invoked, resources will not be applied to develop products or plans and the feasibility to perform those tasks on this flight/increment will be undetermined.

A. ISS critical maintenance tasks as follows. This list is not in order of priority. The criteria for tasks being added to this list are that the failure of the function provided by the ORU causes a situation placing the ISS in a configuration that is zero tolerant, or effectively zero fault tolerant, to survival.

1. Maintain ISS Primary EPS Survivability

a. External (EXT) MDM R&R

b. Battery Charge/Discharge Unit (BCDU) Backout

c. Main Bus Switching Unit (MBSU) R&R

d. SSU R&R

e. Direct Current Switching Unit (DCSU) R&R

f. R&R of DC to DC Converter Units (DDCUs) 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, S01A, S02B

g. Solar Array Wing (SAW) Manual Positioning

h. Pump Flow Control Subassembly (PFCS) R&R

i. Photovoltaic Controller Unit (PVCU) MDM R&R

j. R&R of External Remote Power Control Modules (RPCMs) S01A_C, S02B_C, S01A_A, S11A_D, S02B_A, and P12B_D

2. Maintain ISS Thermal Control System (TCS) Survivability

a. Interface Heat Exchanger (IFHX) R&R

b. External Thermal Control System (ETCS) Pump Module (PM) R&R

c. Flex Hose Rotary Coupler (FHRC) R&R

d. Ammonia (NH_3) Leak Isolation and Recovery

3. Perform SARJ outboard operations R & R activities. **<TBD 6-14> [EVA] [Robotics]**

~~1. Sequential Shunting Unit (SSU) R&R.~~

~~2. Direct Current Switch Unit (DCSU) R&R.~~

~~3. Direct Current-to-Direct Current Converter Unit - External (DDCU-E) (all S0, P1, S1, and Integrated Equipment Assembly (IEA)) R&R.~~

~~4. SAW manual positioning.~~

~~5. Pump Flow Control Subassembly (PFCS) R&R.~~

~~6. NH_3 Leak Repair (Fluid Line Anchor Patch (FLAP) and launch-on-need of, and Fluid Leak Detector). **<TBR 6-2>**~~

~~7. Photovoltaic Control Unit (PVCU) Multiplexer-Demultiplexer (MDM) R&R.~~

~~8. External thermal Control System (ETCS) Pump Module Assembly R&R.~~

~~9. Main Bus Switching Unit (MBSU) R&R.~~

~~10. Interface Heat Exchanger (IFHX) R&R.~~

~~11. Battery Charge/Discharge Unit (BCDU) Remove and Tie-down.~~

~~12. External (EXT) MDM R&R.~~

~~13. Flex Hose Rotary Coupler (FHRC) R&R.~~

B. Complete critical unfinished Flight 15A assembly tasks as follows:

C. Complete critical unfinished Stage 15A assembly tasks as follows:

D. Remove/replace critical spares as follows:

None Identified.

~~6.6.5~~ 6.8.5 JETTISON REQUIREMENTS

Planning and product development, including safety and data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite

identification and desired jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.8.5.1 ~~6.6.5.1~~ Planned Jettison

The following items are planned for jettison during EVA in this flight/stage:

A. U.S.:

None identified.

B. Russian:

None identified.

6.8.5.2 ~~6.6.5.2~~ Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. U.S.:

None identified.

B. Russian:

None identified.

~~6.6.6~~ 6.8.6 GROUND SYSTEMS REQUIREMENTS

A. Ground Support is required to operate SDMS, IWIS and External Wireless Instrumentation System (EWIS) for SDTOs 13004-U and 13005-U.

B. Ground support is highly desired to operate SAMS-II, MAMS and Russian ALO sensors for SDTOs 13004-U and 13005-U. (SAMS and MAMS availability will be assessed real time.)

C. Ground support is required to perform SSRMS/MBS prelaunch checkout.

~~6.7~~ 6.9 FLIGHT 2J/A REQUIREMENTS

This section identifies ISS Program requirements during Flight 2J/A. Detailed requirements and agreements between the ISS Program and the Space Shuttle Program (SSP) are specified in NSTS 21510, International Space Station 15A Mission Integration Plan.

~~6.7.1~~ 6.9.1 <RESERVED>

~~6.7.2~~ 6.9.2 FLIGHT 2J/A TASKS (IN DESCENDING PRIORITIZED ORDER)

These tasks, listed in order of program priority, are to be executed during this flight. The order of execution for these tasks in the nominal plan may vary, depending on timeline efficiencies. The Flight 2J/A Task Priorities have been prepared so that, in the event of a shortened mission, task execution order can be modified such that all mandatory tasks will be completed. The following numbered tasks, which include four Station-based EVAs to be performed by the Orbiter crew, shall be accomplished for the successful completion of this flight.

1. Dock Shuttle Flight 2 J/A to PMA-2 port and perform mandatory crew safety briefing for all crew members. **[IVA] [Imagery]**
2. Rotate E18 FE-2 (15A) crew member with E18 FE-2 (2J/A) crew member, transfer mandatory crew rotation equipment per 2 J/A TPL in Appendix I and perform mandatory tasks consisting of IELK install and Sokol suit checkout. **<TBD I-1> [IVA] [Imagery]**
3. Transfer mandatory quantities of water from Orbiter to ISS per Flight 2 J/A TPL ~~**<TBD I-1>**~~ in Appendix I. **<TBD I-1> [IVA]**
4. Transfer and stow critical items per Flight 2 J/A TPL in Appendix I. **<TBD I-1> [IVA]**
5. Install JEM Exposed Facility (EF) to JEM Pressurized Module (PM) using SSRMS. **[EVA] [Robotics] [Imagery][Ground] [IVA]**

   A. Disconnect ~~JEM EF~~JEF LTA cable

   B. Remove ~~JEM PM~~JPM active Exposed Facility Berthing Mechanism (EFBM) and ~~JEM EF~~JEF passive EFBM thermal covers

   C. Provide EVA GCA as required

   D. Activate and checkout ~~JEM EF~~JEF ~~survival power~~
6. Install Integrated Cargo Carrier-Vertical Light Deployable (ICC-VLD) on the POA using SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**

   A. Disconnect ICC-VLD LTA cable

~~7. Activate and checkout EF **[IVA]**~~

~~8~~7. Install Experiment Logistics Module-Exposed Section (~~ELM-ES~~JLE) to ~~JEM EF~~JEF utilizing SRMS handoff to SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**

~~A. Remove JEM EF active Exposed Facility Unit (EFU) thermal cover~~

~~B. Provide EVA GCA as required~~

A. Install, activate, and checkout ~~JEM EF~~JEF forward camera (needed for ES install)

B. Activate and checkout ~~ELM-ES~~JLE

~~9~~8. R&R P6 batteries (6) using SSRMS **[EVA] [Robotics] [Imagery] [IVA]**

9. Remove Inter-Orbit Communication System (ICS) antenna thermal (Payload Interface Unit (PIU)) cover, release ICS antenna hold mechanism, and install ICS on EF (EFU#7) using JEM RMS **[EVA] [Robotics] [Imagery] [IVA]**

10. Install Space to Ground Antenna (SGANT) on ESP3 using SSRMS **[EVA] [Robotics] [Imagery] [IVA]**

11. Install Pump Module (PM) on ESP3 using SSRMS **[EVA] [Robotics] [Imagery] [IVA]**

12. Install Linear Drive Unit (LDU) on ESP3 using SSRMS **[EVA] [Robotics] [Imagery] [IVA]**

13. Return Integrated Cargo Carrier (ICC)-VLD to payload bay using SSRMS **[EVA] [Robotics] [Imagery]**

A. Connect ICC-VLD LTA cable

~~14. Remove Inter-Orbit Communication System (ICS) antenna thermal cover, release ICS antenna hold mechanism, and install ICS on EF (EFU#7) using JEM RMS **[EVA] [Robotics] [Imagery] [IVA]**~~

~~15~~14. Remove Monitor of All-Sky X-ray Image (MAXI) thermal (PIU), and contamination covers and install MAXI on EF (EFU#1) using JEM RMS **[EVA] [Robotics] [Imagery] [IVA]**

~~16~~15. Remove Space Environment Data Acquisition-Attached Payload (SEDA-AP) thermal (PIU) cover, release back up launch lock mechanism, and install SEDA-AP on EF (EFU#9) using JEM RMS **[EVA] [Robotics] [Imagery] [IVA]**

~~17~~16. Return ~~ELM-ES~~JLE to Orbiter payload bay utilizing SSRMS handoff to SRMS **[Robotics] [Imagery] [IVA]**

~~18~~17. ~~Install and activate JEM EF Vision Equipment. **[EVA] [Imagery]**~~

~~19~~18. ~~Remove remaining EF thermal covers **[EVA] [Imagery]**~~

~~20~~19. Perform minimum crew handover of 12 hours per rotating crewmember which includes crew safety handover. **[IVA]**

~~21~~20. Transfer remaining cargo items per Flight 2 J/A TPL in Appendix I. **<TBD I-1> [IVA]**

~~22~~21. Transfer O_2 from the Orbiter to the ISS Airlock HPGTs if consumables permit**.** **[IVA]**

~~23~~22. Transfer N_2 from the Orbiter to the ISS Airlock HPGTs if consumables permit**.** **[IVA]**

23. Install and activate ~~JEM EF~~JEF aft camera (needed for HTV-1). **[EVA] [Imagery]**

24. Perform USOS/RS daily ISS payload status checks as required. **[IVA]**

25. The following tasks are deemed to fit within the existing EVA timelines; however, may be deferred if the EVA is behind schedule. The EVA will not be extended to complete these tasks. **[EVA]**

    None Identified **<TBD>**

26. Perform daily middeck activities to support payloads (includes cases where Shuttle crew also performs payloads on the ISS). **[IVA]**

27. Perform USOS/Russian ISS payload research operations tasks. **[IVA]**

28. Reboost the ISS with the Orbiter if mission resources allow and are consistent with ISS trajectory analysis and planning. **[IVA]**

29. Perform imagery survey of the ISS exterior during Orbiter fly around after undock. **[IVA] [Imagery]**

30. Perform an additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crew member total). **[IVA]**

31. Deploy ANDE2 payloads **[IVA] [Imagery]**

32. Deploy DragonSat payloads **[IVA] [Imagery]**

33. Perform ~~RAM Burn Observations (RAMBO) and~~ MAUI (payload of opportunity – not required during docked ops)

34. Perform IWIS SDTOs if crew time available **[IVA] [Ground] [Imagery]**

    A. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during Shuttle mated Reboost. ~~(IWIS only if crew time available)~~. ~~**[IVA] [Ground] [Imagery]**~~

~~34.~~ B. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during 2J/A Orbiter Undocking (IWIS highly desired, but not required) ~~(only if crew time available).~~ ~~**[Ground] [IVA] [Imagery]**~~

~~6.7.3~~ 6.9.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.9.3.1 ~~6.7.3.1~~ The maximum rendezvous altitude for Flight 2J/A shall be 200 nmi~~<TBD 6-13>~~.

6.9.3.2 ~~6.7.3.2~~ The Orbiter shall dock at Pressurized Mating Adapter (PMA)-2.

6.9.3.3 ~~6.7.3.3~~ The ISS with Shuttle docked shall be in CMG control without ISS thrusters firing as well as the Shuttle Reaction Control System (RCS) inhibited for the following activities:

None identified.

6.9.3.4 ~~6.7.3.4~~ The ISS with Shuttle docked shall be in a free drift configuration with the CMGs not controlling, Shuttle RCS inhibited and without ISS thrusters firing for the following activities:

None identified.

6.9.3.5 ~~6.7.3.5~~ Solar Array Position for Critical Operations

- For all planned, critical operations (including Orbiter Prox Ops, Obiter Mated Mission activities, RS Prox Ops, etc.) VIPER produces a nominal array plan with, in some cases, multiple array positioning/management options for each event. This array plan, referred to as the "Solar Array Constraints Matrix" is produced prior to each shuttle mission and extends through the subsequent Stage. This Matrix is delivered to MOD for incorporation into planned timelines via a the CHIT system at approximately L-2 weeks for specific vehicle launch.

~~6.7.4~~ 6.9.4 CONTINGENCY REQUIREMENTS

6.9.4.1 ~~6.7.4.1~~ Mission Control Center - Houston (MCC-H) and Mission Control Center - Moscow (MCC-M) shall build procedures, contingency timelines, and conduct training for the following non-EVA tasks (The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked.):

A. USOS and/or RS critical maintenance tasks as follows:

None identified.

B. Contingency Orbiter separation from the ISS and re-rendezvous.

C. Perform focused Orbiter TPS inspection using SRMS (and SSRMS as required for OBSS handoff) and downlink data.

6.9.4.2 ~~6.7.4.2~~ MCC-H and MCC-M shall build procedures, contingency timelines, and provide pre-flight training for the EVA tasks to sufficient maturity to provide for the EVA response times designated. Examples below are not in prioritized order, but are to show what type of activities could be included.

A. Class 1: All procedures, timelines and training are developed and certified to support an EVA response within 24 hours.

1. Orbiter TPS inspection/repair
2. EFBM (Active half) manual operation
3. EFBM (Passive half) manual release
4. End Effector release from Flight Releasable Grapple Fixture (FRGF) of ~~JEM-EF~~JEF
5. End Effector release from FRGF#1 of ~~ELM-ES~~JLE
6. End Effector release from FRGF#2 of ~~ELM-ES~~JLE

B. Class 2: For contingencies occurring during the docked time frame an EVA response is available on a subsequent EVA based on re-prioritization of the mission tasks. Published procedures and timelines are developed, but may require real time updates to match the flight specific failure.

1. LM (Launch Mechanism) release of ICS-EF
2. DM (Deployment Mechanism) deployment of ICS-EF
3. DLM (Deployment Latch Mechanism) latch of ICS-EF
4. End Effector release from FRGF of ICS-EF, SEDA-AP, or MAXI FRGF
5. EF Payload Release from PAM
6. EEU Manual Release
7. ~~ELM-ES~~JLE Payload Interface Unit (PIU) Manual Release
8. Primary Locking Mechanism (PLM) release or Mast (MST) extension of SEDA-AP

C. Class 3: For contingencies related to first flights hardware that are not time critical, skeleton EVA procedures will be developed preflight to support a Class 3 EVA. The EVA response time can be greater than two weeks and can be deferred to the stage or next available mission. The ISS Program has determined that additional resources will not be applied to further refine the training and integrated planning until the failure occurs. Subsequent flight listings for these hardware items will be contained in the GGR&C.

None identified.

~~6.7.5~~ 6.9.5 JETTISON REQUIREMENTS

Planning and product development, including safety and data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite

identification and desired jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.9.5.1 ~~6.7.5.1~~ Planned Jettison

The following items are planned for jettison during EVA in this flight:

A. U.S.:

None identified

B. Russian:

None identified.

6.9.5.2 ~~6.7.5.2~~ Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. U.S.:

None identified

B. Russian:

None identified.

~~6.7.6~~ 6.9.6 GROUND SYSTEMS REQUIREMENTS

None Identified

~~6.7.7~~ 6.9.7 ISS REQUIREMENTS ON SHUTTLE DURING NON-DOCKED TIME FRAME

None Identified.

~~6.8~~ 6.10 FLIGHT 2J/A UNDOCK TO FLIGHT ~~17S~~ 18S DOCK REQUIREMENTS (STAGE 2J/A)

This section identifies requirements applicable from Flight 2J/A undock to Flight ~~17~~ 18 Soyuz dock, including requirements associated with 32 Progress.

~~6.8.1~~ 6.10.1 <RESERVED>

~~6.8.2~~ 6.10.2 STAGE 2J/A TASKS (IN DESCENDING PRIORITIZED ORDER)

These tasks, listed in order of program priority, are to be executed during this stage. The order of execution for these tasks in the nominal plan may vary depending on timeline efficiencies. The following numbered tasks, which include no Station-based EVAs, shall be accomplished for successful completion of this interval.

1. Perform high priority ISS maintenance and Shuttle Launch Commit Criteria for the next Shuttle Flight. **[IVA] [Imagery]**
2. Complete 32 Progress-M loading of trash and undock from the SM Aft **<TBD 6-2>** port. **[IVA] [Imagery]**
3. Perform ISS medical operations (average of 10 crew hours per week for crew of 3). **[IVA]**
4. Perform checkout and preparation tasks for Flight 18 Soyuz arrival and Flight 17 Soyuz crew return. **[IVA]**
   A. Complete pre-pack.
   B. Perform training and preparation for joint operations, which includes performing Soyuz on-orbit vehicle training/familiarization training for Soyuz 17 crew return.
   C. Perform Soyuz on-orbit vehicle training/familiarization training for Soyuz 17 crew return.
   D. Complete flight plan reviews.
   E. Perform tool preparation.
   F. Perform transfer tag-up.
5. Perform high-priority OBT (average of **<TBD 6-4>** crew hours per week) substituting planned SSRMS tasks as OBT when appropriate. **[IVA] [Robotics]**
6. Perform 6-crew Regen ECLSS and Habitability Hardware checkout and operations. Continue to run WRS, WHC and Galley (PWD) for 90 days. Pull archival samples every 8 days. **[IVA]**
7. Perform high priority ISS payload operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**

8. Perform high priority ISS PAO events (average of **<TBD 6-4>** crew hours per week). **[IVA]**
9. Perform medium priority ISS maintenance. **[IVA] [Imagery]**
10. Perform medium priority ISS payload operations (average of **<TBD 6-4>** crew hours per week). **[IVA]**
11. Reboost ISS with SM Thrusters or Progress as required. **[Ground]**
12. Perform low priority OBT substituting planned SSRMS tasks as OBT when appropriate. **[IVA]**
13. Perform remaining ISS PAO events. **[IVA] [Imagery]**
14. Perform remaining ISS maintenance. **[IVA] [Imagery]**
15. Perform remaining ISS payload operations. **[IVA]**
16. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, for ISS alone reboost (IWIS required). **[IVA] [Imagery] [Ground]**
17. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 30 Progress (P) undocking from DC-1 **<TBD 6-2>** port (IWIS required). **[IVA] [Ground]**

~~6.8.3~~ 6.10.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.10.3.1 ~~6.8.3.1~~ 32 Progress-M shall undock from the SM Aft **<TBD 6-2>** port.

6.10.3.2 ~~6.8.3.2~~ The ISS shall be in CMG control without ISS thrusters firing for the following activities:

None identified

6.10.3.3 ~~6.8.3.3~~ The ISS shall be in free drift configuration with the CMGs not controlling and without ISS thrusters firing for the following activities:

None identified

~~6.8.4~~ 6.10.4 CONTINGENCY REQUIREMENTS

6.10.4.1 ~~6.8.4.1~~ MCC-H and MCC-M shall build procedures, contingency timelines, and conduct training to allow the crew to perform the following non-EVA tasks (The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked.):

A. ISS critical maintenance tasks as follows:

None identified.

B. Complete critical unfinished Flight 2J/A or 15A assembly tasks as follows:

None identified.

C. Remove/replace critical spares as follows:

None identified.

6.10.4.2 ~~6.8.4.2~~ MCC-H and MCC-M shall build task specific procedures, contingency timelines, and conduct training to a high level sufficient to meet the following objectives:

The readiness of these tasks will be based upon the generic development of the task procedures and timelines to a level that can be validated against a set of criteria defined in GGR&C 3.9.1, “Process for EVA Readiness”. For contingency tasks not listed below, the ISS Program has determined that until the contingency is invoked, resources will not be applied to develop products or plans and the feasibility to perform those tasks on this flight/increment will be undetermined.

A. ISS critical maintenance tasks as follows. This list is not in order of priority. The criteria for tasks being added to this list are that the failure of the function provided by the ORU causes a situation placing the ISS in a configuration that is zero tolerant, or effectively zero fault tolerant, to survival.

1. Maintain ISS Primary EPS Survivability
   a. EXT MDM R&R
   b. BCDU Backout
   c. MBSU R&R
   d. SSU R&R
   e. DCSU R&R
   f. R&R of DDCUs 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, S01A, S02B
   g. SAW Manual Positioning
   h. PFCS R&R
   i. PVCU MDM R&R
   j. R&R of External RPCMs S01A_C, S02B_C, S01A_A, S11A_D, S02B_A, and P12B_D
2. Maintain ISS TCS Survivability
   a. IFHX R&R
   b. ETCS PM R&R
   c. FHRC R&R
   d. NH_3 Leak Isolation and Recovery

3. Perform SARJ outboard operations R & R activities. **<TBD 6-14> [EVA] [Robotics]**

~~1. SSU R&R~~

~~2. DCSU R&R~~

~~3. DDCU-E (all S0, P1, S1, and IEA) R&R~~

~~4. SAW manual positioning~~

~~5. PFCS R&R~~

~~6. NH_3 Leak Repair FLAP and launch-on-need of, and Fluid Leak Detector) **<TBR 6-2>**~~

~~7. PVCU MDM R&R~~

~~8. ETCS Pump Module Assembly R&R~~

~~9. MBSU R&R~~

~~10. IFHX R&R~~

~~11. BCDU Remove and Tie-down~~

~~12. EXT MDM R&R~~

~~13. FHRC R&R~~

B. Complete critical unfinished Flight ~~15A~~ 2J/A assembly tasks as follows:

C. Complete critical unfinished Stage ~~15A~~ 2J/A assembly tasks as follows:

D. Remove/replace critical spares as follows:

None Identified.

~~6.8.5~~ 6.10.5 JETTISON REQUIREMENTS

Planning and product development, including safety and data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite identification and desired jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.10.5.1 ~~6.8.5.1~~ Planned Jettison

The following items are planned for jettison during EVA in this flight/stage:

A. U.S.:

None identified.

B. Russian:

None identified.

6.10.5.2 ~~6.8.5.2~~ Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. U.S.:

None identified.

B. Russian:

None identified.

~~6.8.6~~ 6.10.6 GROUND SYSTEMS REQUIREMENTS

A. Ground Support is required to operate SDMS, IWIS and EWIS for SDTOs 13004-U and 13005-U.

B. Ground support is highly desired to operate SAMS-II, MAMS and Russian ALO sensors for SDTOs 13004-U and 13005-U. (SAMS and MAMS availability will be assessed real time.)

C. Ground support is required to perform SSRMS/MBS prelaunch checkout

6.11 FLIGHT 18S REQUIREMENTS

This section identifies ISS requirements during Flight 18 Soyuz Transportation Modified Anthropometric (TMA).

6.11.1 <RESERVED>

6.11.2 FLIGHT 18S TASK REQUIREMENTS (IN DESCENDING PRIORITY ORDER)

These tasks, listed in order of ISS Program priority, are to be executed during this flight. The order of execution for these tasks in the nominal plan may vary, depending on timeline efficiencies. The Flight 18S Task Priorities have been prepared so that, in the event of a shortened mission, task execution order can be modified such that all mandatory tasks will be completed. The following numbered tasks shall be accomplished for successful completion of this flight.

1. Dock Flight 18 Soyuz TMA to Service Module SM Aft **<TBD 6-2>** port and perform mandatory crew safety briefing for all crew members. **[Intravehicular Activity (IVA)] [Imagery]**
2. Rotate Expedition 18 CDR and FE-1 crewmembers with Expedition 19 Commander and FE-1 crewmembers, transfer mandatory crew rotation cargo, perform mandatory tasks including Sokol suit checkout. Transfer and install or swap the Visiting Crew's (VC) and FE-2's seat liner in the appropriate Soyuz. **[IVA]**
3. Perform minimum crew handover of 12 hours per rotating crewmember, which includes crew safety handover. **[IVA] [Robotics]**
4. Transfer and stow all delivered and returning cargo to and from Soyuz. **[IVA]**
5. Undock 17 Soyuz-TMA from FGB Nadir **<TBD 6-2>** port. **[IVA] [Imagery]**
6. Perform ISS high priority maintenance activities. **[IVA]**
7. Perform high priority medical operations (average of 10 crew hours per week). **[IVA] [Imagery]**
8. Perform high priority Onboard Training (OBT) substituting planned SSRMS tasks as OBT when appropriate. **[IVA] [Robotics]**

   A. Perform Soyuz descent training.

9. Conduct visiting crew operations. **[IVA] [Imagery]**

   The following activities are 17 Soyuz visiting crew activities (not listed in priority order). All operations are to be conducted using only RS resources unless specified otherwise in Appendix K. **<TBD 6-3> <TBD K-1>**

   A. Conduct photo/video imagery.

   B. Conduct utilization activities specific to Visiting Crew.

C. Conduct RS public affairs activities and commemorative activities.

D. Conduct transfer activities.

1) Soyuz unloading.

2) Equipment return.

E. Conduct Communications.

1) Russian Mission Control Center (Soyuz and ISS).

2) Sessions using the Sputnik-Service Module (SM) ham radio.

F. Conduct Soyuz systems maintenance.

G. Conduct Soyuz handover.

H. Conduct crew life support activities onboard the ISS.

10. Perform ISS daily ISS payload status checks as required. **[IVA]**

11. Perform ISS payload research operations tasks. **[IVA]**

12. Perform high priority Public Affairs Office (PAO) events. **[IVA] [Imagery]**

13. Perform medium priority ISS maintenance. **[IVA]**

14. Perform additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crewmember total). **[IVA]**

15. Transfer remaining cargo items. **[IVA]**

16. Perform Station Development Test Objective (SDTO) 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 17S undocking from SM Aft **<TBD 6-2>** port [ISS Wireless Instrumentation System (IWIS) required]. **[IVA] [Ground]**

17. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 18S docking to FGB Nadir **<TBD 6-2>** port (IWIS required). **[IVA] [GROUND]**

6.11.3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.11.3.1 Flight 18 Soyuz TMA shall dock to the SM Aft **<TBD 6-2>** port.

6.11.3.2 Flight 17 Soyuz TMA shall undock from FGB Nadir **<TBD 6-2>** port.

6.11.3.3 The ISS shall be in Control Moment Gyroscope (CMG) control with all thrusters inhibited for the following activities:

None Identified.

6.11.3.4 The ISS shall be in a free drift configuration with the CMGs not controlling and with all thrusters inhibited for the following activities:

None Identified.

6.11.4 CONTINGENCY REQUIREMENTS

6.11.4.1 MCC-H and MCC-M shall build procedures, contingency timelines, and conduct training for the following non-EVA tasks (The items listed below are for unique tasks or first implementation of new tasks. For contingency tasks not listed below, products/planning are already in place from previous flights/stages, or the ISS Program has determined that resources will not be applied to develop products/planning until the contingency is invoked.):

A. ISS critical maintenance tasks as follows:

None Identified.

B. Complete critical unfinished 2J/A assembly tasks as follows:

None Identified.

6.11.4.2 MCC-H and MCC-M shall build procedures, contingency timelines, and provide pre-flight training for the EVA tasks to sufficient maturity to provide for the EVA response times designated.

A. Class 1: All procedures, timelines and training are developed and certified to support an EVA response within 24 hours.

None Identified.

B. Class 2: For contingencies occurring during the docked timeframe an EVA response is available on a subsequent EVA based on re-prioritization of the mission tasks. Published procedures and timelines are developed, but may require real time updates to match the flight specific failure.

None identified.

C. Class 3: For contingencies related to first flights hardware that are not time critical, skeleton EVA procedures will be developed preflight to support a Class 3 EVA. The EVA response time can be greater than two weeks and can be deferred to the stage or next available mission. The ISS Program has determined that additional resources will not be applied to further refine the training and integrated planning until the failure occurs. Subsequent flight listings for these hardware items will be contained in the Generic Groundrules, Requirements, and Constraints (GGR&C).

None Identified.

6.11.5 JETTISON REQUIREMENTS

Planning and product development, including safety and data packages, will be performed to support jettison of the following items during EVA. This will include trajectory analysis to ensure acceptable low risk of recontact with ISS and of damage or injury following re-entry, procedures and training for the crew including worksite

identification and desired jettison direction and velocity, and related hazard assessments, including joint safety review in accordance with SSP 50146.

6.11.5.1 Planned Jettison

The following items are planned for jettison during EVA in this flight:

A. USOS:

None identified.

B. RS DC EVAs

None identified.

6.11.5.2 Contingency Jettison

The following items may require jettison if they cannot be configured safely to allow vehicle dockings or maneuvers or if their continued operation poses a hazard to the EVA crew.

A. USOS JAL EVAs:

None identified.

B. RS DC EVAs:

None identified.

6.11.6 GROUND SYSTEMS REQUIREMENTS

A. Ground support is required to operate Space Acceleration Measurement System (SAMS)-II, SDMS, and Microgravity Acceleration Measurement System (MAMS) sensors for SDTO 13004-U. (SAMS and MAMS availability will be assessed real time.)

B. Ground support is desired to operate Russian Optical Linear Accelerometers [ALO] for SDTO 13004-U during the 17S undock.

APPENDIX A - ACRONYMS AND ABBREVIATIONS

A/L	Airlock
ACU	Arm Computer Unit
ALO	Airlock Outfitting
ANDE	Atmospheric Neutral Density Experiment
ANX	Annex
ARCU	American-to-Russian Converter Unit
ATV	Automated Transfer Vehicle
BCDU	Battery Charge/Discharge Unit
BGA	Beta Gimbal Assembly
CBM	Common Berthing Mechanism
CDR	Commander
CEO	Crew Earth Observations
CMG	Control Moment Gyroscope
CoFR	Certification of Flight Readiness
CQ	Crew Quarters
CR	Change Request
CSA	Canadian Space Agency
CSD	Common Schedule Database
CTBE	Cargo Transfer Bag Equivalent
CWC	Contingency Water Container
DC	Docking Compartment
DCSU	Direct Current Switching Unit
DDCU	Direct Current-to-Direct Current Converter Unit
DDCU-E	Direct Current-to-Direct Current Converter Unit - External
DLA	Drive Lock Assembly
DMT	Decreed Moscow Time
DQA	Document Quality Assurance
EarthKAM	Earth Knowledge Acquired by Middle School
ECLSS	Environmental Control and Life Support System
ECU	Electronics/environmental Control Unit
EDMS	Electronic Document Management System
EDV	Russian Water Container
EF	Exposed Facility
EFBM	Exposed Facility Berthing Mechanism
EFU	Exposed Facility Unit
~~ELM-ES~~	~~Experiment Logistics Module - Exposed Section~~
~~ELM-PS~~	~~Experiment Logistics Module - Pressurized Section~~
EMU	Extravehicular Mobility Unit
EPO	Education Payload Operations
EPS	Electrical Power System

ESA	European Space Agency
ETCS	External Thermal Control System
ETVCG	External Television Camera Group
EuTEF	European Technology Exposure Facility
EVA	Extravehicular Activity
EWIS	External Wireless Instrumentation System
EXPRESS	EXpedite the PRocessing of Experiments to the Space Station
EXT	External
F	Flight
FE	Flight Engineer
FEL	First Element Launch
FGB	Functional Cargo Block
FHRC	Flex Hose Rotary Coupler
FLAP	Fluid Line Anchor Patch
FP	Flight Program
FQDC	Fluid Quick Disconnect Couplings
FRGF	Flight Releasable Grapple Fixture
G	Gravity
GGR&C	Generic Groundrules, Requirements, and Constraints
H/W	Hardware
H2	Hydrogen
HPGT	High Pressure Gas Tank
I-	Increment minus
ICC	Integrated Cargo Carrier
ICE	ISS Characterization Experiment
IDRD	Increment Definition and Requirements Document
IEA	Integrated Equipment Assembly
IELK	Individual Equipment Liner Kit
IFHX	Interface Heat Exchanger
Inc	Increment
IP	International Partner
ISPR	International Standard Payload Rack
ISS	International Space Station
ISS MORD	International Space Station Medical Operations Requirements Documents
ITS	Integrated Truss Segment
IVA	Intravehicular Activity
IVC	Interior Volume Configuration
IWIS	ISS Wireless Instrumentation System
JAL	Joint Airlock (see AL)
JAXA	Japan Aerospace Exploration Agency
JEM	Japanese Experiment Module

~~JEM EF~~JEF	Japanese Experiment Module-Exposed Facility
JLE	Japanese Experiment Logistics Module - Exposed Section
JLP	Japanese Experiment Logistics Module - Pressurized Section
JSC	Johnson Space Center
kg	kilogram
KSC	Kennedy Space Center
kW	kilowatt
L	Launch
L-	Launch minus
Lab	Laboratory
lb	pound
lbm	Pounds Mass
LEE	Latching End Effector
LTA	Launch to Activation
LTU	Load Transfer Unit
LVLH	Local Vertical Local Horizontal
M	Medium Beta Angle
m3	cubic meter
MAMS	Microgravity Acceleration Measurement System
MAUI	Maui Analysis of Upper Atmospheric Injections
MBS	MRS Base System
MBSU	Main Bus Switching Unit
MCC	Mission Control Center
MCC-H	Mission Control Center - Houston
MCC-M	Mission Control Center - Moscow
MCOP	Multilateral Crew Operations Panel
MDA	Motor Drive Assembly
MDM	Multiplexer/Demultiplexer
MEIS	Chaos, Turbulence and its Transition Process in Marangoni convection
MELFI	Minus Eighty-Degree Laboratory Freezer for ISS
MIC	Mission Integration Contract
MIP	Mission Integration Plan
MISSE	Materials International Space Station Experiment
MLE	Middeck Locker Equivalent
MMOD	Micrometeoroid Orbital Debris
MOD	Mission Operations Directorate
MOP	Motion Perception
MPCB	Multilateral Payloads Control Board
MPLM	Multi-Purpose Logistics Module
MRS	Mobile Remote Servicer
MSS	Mobile Servicing System
MT	Mobile Transporter
N	Nadir

N2	Nitrogen
NASA	National Aeronautics and Space Administration
NH3	Ammonia
nmi	nautical mile
NSTS	National Space Transportation System
O	Overhead
O2	Oxygen
OBSS	Orbiter Boom Sensor System
OBT	Onboard Training
OCA	Orbiter Communication Adapter
OCR	On-orbit Checkout Requirement
OGS	Oxygen Generating System
ONS	Off-Nominal Situation
Ops	Operations
ORG	Organization
ORU	Orbital Replacement Unit
OV	Orbiter Vehicle
P	Port
P	Progress
PAM	Payload Attach Mechanism
PAO	Public Affairs Office
PAS	Payload Attachment System
PDGF	Power Data Grapple Fixture
PFCS	Pump Flow Control Subassembly
PIER	Post Increment Evaluation Report
PLB	Payload Bay
PM	Pressurized Module
PMA	Pressurized Mating Adapter
POA	Payload ORU Accommodation
PRCS	Primary Reaction Control System
PRD	Payload Retention Device
Prep	Prepare
PRLA	Payload Retention Latch Assembly
PV	Photovoltaic
PVCU	Photovoltaic Controller Unit
PVR	Photovoltaic Radiator
PVTCS	Photovoltaic Thermal Control System
PWR	Portable Water Reservoir
R	Russian
R&R	Remove and Replace
RCS	Reaction Control System
Ref.	Reference
RJMC	Rotary Joint Motor Controller
RMS	Remote Manipulator System

RPCM	Remote Power Control Mechanism
RPM	R-bar Pitchover Maneuver
RS	Russian Segment
RSA	Russian Space Agency
RSC-E	Rocket Space Corporation - Energia
RTAS	Rocketdyne Truss Attachment System
RVE	Rack Volume Equivalent
S	Soyuz
S	Starboard
SABB	Solar Array Blanket Box
SAMS	Space Acceleration Measurement System
SAMS-II	Space Acceleration Measurement System - II
SARJ	Solar Alpha Rotary Joint
SAW	Solar Array Wing
SDBI	Short Duration Bioastronautics Investigation
SDMS	Structural Dynamic Measurement System
SDTO	Station Development Test Objective
SE	Subelement
SEITE	Shuttle Exhaust Ion Turbulence Experiment
SM	Service Module
SORR	Stage Operations Readiness Review
SRMS	Shuttle Remote Manipulator System
SSC	Station Support Computer
SSCB	Space Station Control Board
SSCD	Space Station Change Directive
SSIPC	Space Station Integration and Promotion Center
SSP	Space Station Program
SSPCB	Space Station Program Control Board
SSRMS	Space Station Remote Manipulator System
SSU	Sequential Shunt Unit
STS	Space Transportation System
Sz	Soyuz
TBD	To Be Determined
TBR	To Be Resolved
TCM	Technical Coordination Meeting
TCS	Thermal Control System
TeSS	Temporary Sleep Station
TMA	Transportation Modified Anthropometric
TO	Target Object
TOCA	Total Organic Carbon Analyzer
TPL	Transfer Priority List
TPS	Thermal Protection System
U	Ultrasound
U.S.	United States

U.S. Lab	United States Laboratory
UCCAS	Unpressurized Cargo Carrier Attachment System
UMA	Umbilical Mating Assembly
URL	Uniform Resource Locator
USOS	United States On-orbit Segment
V	Velocity Vector
V	Volts
VC	Visiting Crew
VRCS	Vector/Vernier Reaction Control System
VSC	Video Signal Converter
WETA	Wireless Video System External Transceiver Assembly
WS	Work Site
WS	Workstation
X	X-axis
XVV	X-Axis into the Velocity Vector
ZSR	Zero-gravity Stowage Rack

APPENDIX B - GLOSSARY AND TERMS

ACCOMMODATIONS

Launch vehicles or ISS physical locations where utilization or system items are stowed or installed. The following specific types of accommodations are recognized (the unit of measure of the accommodation is shown in parentheses):

A. Rack locations (number)

B. MLEs

C. CTBEs

D. Pressurized volume (RVE)

E. Unpressurized volume (cubic feet)

F. Truss attach points (number)

G. Experiment Module Exposed Facility attach points (number)

H. Experiment Logistics Module Exposed Section attach points (number)

ALLOCATION

The portioning of resources and accommodations to the ISS users. Total ISS resources and accommodations are allocated between system and utilization. Utilization resources and accommodations are allocated between IPs.

ASSEMBLY PHASE

Refers to the time period starting with First Element Launch (FEL) and ending with the landing of the last flight in the assembly sequence.

CARGO CARRIER

Element of a transportation vehicle that provides capability to carry cargo.

CHECKOUT

To ensure that the rack performs its intended functions with respect to data, power, Thermal Control System (TCS), etc.

CONSOLIDATED OPERATIONS AND UTILIZATION PLAN

The strategic document that defines the system and utilization activities planned for the ISS. On a planning period basis, it establishes the amount of resources and accommodations allocated to and subscribed by system and each International Partner for utilization, and reflects the planned amounts of supporting services from other Programs that are available and subscribed. The Consolidated Operations and Utilization Plan also provides specific direction and guidance to tactical planning regarding Consolidated Operations and Utilization Plan implementation.

CONTINGENCY EXTRAVEHICULAR ACTIVITY

An unplanned EVA required to support the safe return of the vehicle and crew and/or restore critical systems/functions.

CREW DAYS IN SPACE

The time period from launch of a crew rotation vehicle to landing of the vehicle which returns that crew.

CREW DAYS ON THE ISS

The time period from docking of a crew rotation vehicle to undock of the vehicle which returns that crew.

EXECUTION PLANNING

The planning that occurs 18 months before the start of an increment through real-time operations.

FLIGHT

For Shuttle flights, the term “Flight” refers to the sequence of events that takes place between the lift-off and landing of the Shuttle. For permanent Russian Elements flights, the term refers to the sequence of events that takes place between the lift-off of the element through completion of docking to the ISS. For replaceable IP Element flights, the term refers to the sequence of events that take place between lift-off and entry/landing of the element.

HARD COMMIT

Amount of resources allocated to utilization based on specified ISS Program system capabilities.

INCREMENT

(Also known as Expedition.) A specific time period which combines different operations such as assembly, scientific research, testing, logistics, maintenance, and other ISS system and utilization operations. The initial unmanned timeframe and subsequently, the timeframe of each crew expedition. During the assembly phase, an increment is defined as a period supporting crew rotation. The duration of an increment is the time period from the launch of a designated Expedition crew to the undocking of the return vehicle for that Expedition crew.

INSTALL

Complete the structural attachment and, if applicable, connect utilities.

INTEGRATED TRUSS SEGMENT

An un-pressurized structural element of the ISS that includes ground-installed electrical, thermal, communications, command, and data components. Examples are Zenith (Z)1 and Starboard (S)0.

INTERNATIONAL PARTNER

Denotes the international space agencies that are jointly involved in the development of the ISS. These agencies include the Canadian Space Agency (CSA), European Space Agency (ESA), NASA, Japan Aerospace Exploration Agency (JAXA), and Federal Space Agency (Roscosmos).

JETTISON

The intentional manual release of an object during an EVA such that the object safely separates from ISS and eventually re-enters through earth's atmosphere. Jettisons may be planned, to achieve waste disposal or scientific objectives, or in response to a contingency, such as inability to install or safely stow or return an item.

KU-BAND

12.0 to 18.0 Gigahertz, frequencies used by the ISS Ku-band subsystem are an uplink frequency of 13.775 GHz and a downlink frequency of 15.0034 GHz.

LAUNCH VEHICLE

A booster vehicle that delivers the transportation vehicle from the launch pad to an insertion orbit in low earth orbit (Proton, Soyuz, Ariane 5, or H2 for example).

NONRECOVERABLE CARGO

Cargo that is designated as cargo that will either be destroyed upon reentry or when it is returned to Earth (e.g., Shuttle/ISS trash).

OBJECTIVES

High-level goals that do not specify any particular activity. For an IDRD, each increment will have objectives. During assembly, the main system objectives are building, activating, and supporting the ISS. Examples of utilization objectives during assembly are installing and activating research facility racks, and performing research operations.

PLANNING PERIOD

Approximately one calendar year of ISS activity. A planning period is comprised of one or more increments.

RACK VOLUME EQUIVALENT

A unit of volume that equals 36.0 cubic feet or 1.0193 cubic meters.

RECOVERABLE CARGO

Cargo that is removed from the ISS and returned to Earth to be refurbished for future use, samples for evaluation, or items to be examined as part of sustaining engineering.

RESOURCES

Identifies a particular subset of ISS on-orbit capabilities used in support of system and utilization operations. It includes the following:

A. Average power kW

B. Crew time (hours)

C. Communications

D. On-orbit accommodations (pressurized and unpressurized)

E. Transportation Mass

F. Transportation Volume

S-BAND

1550 to 5200 Megahertz

SCHEDULED EXTRAVEHICULAR ACTIVITY

An EVA planned prior to the start of an increment or flight/stage with nominal crew training and included in the nominal mission timeline.

SHORT DURATION BIOASTRONAUTICS INVESTIGATION

A medical research payload that will be flown and returned in a pressurized volume on the same Shuttle flight, involves a Shuttle (non-ISS) crewmember(s) as the test subject, and does not require any ISS resources (e.g., ISS crew time, ISS power, ISS communications) to accomplish the research objective. Responsibility for manifesting and prioritizing Short Duration Bioastronautics Investigations (SDBIs) with respect to the other ISS payloads resides with the ISS Payloads Office. However, responsibility for planning SDBI activities and resources during the mission, as well as Certification of Flight Readiness (CoFR) for the SDBIs, resides with the Space Shuttle Program and will be accomplished in accordance with Space Shuttle Program processes and procedures.

SOFT COMMIT

Amount of resources estimated to be available to utilization based on either estimated capabilities above specified conditions/assumptions, a reduction of system reserves, or both.

STAGE

Period of on-orbit configuration of the ISS after each flight which adds capability to the ISS. This can also refer to a designated period between launch vehicles defined by the ISS Program for requirement documentation and planning purposes.

SYSTEMS

A group of H/W that collectively supports or provides capabilities to the orbiting ISS. In general, anything other than utilization. Specifically included in this set are assembly, logistics/maintenance environmental support, power, etc.

TASK TYPE DESIGNATOR

Identifies categories for mission task requirements and include: [Extravehicular Activity (EVA)], [Intravehicular Activity (IVA)], [Robotics], [Robotic On-board Trainer (ROBoT)], [Utilization], [Ground], [Jettison] and [Imagery].

TRANSFER

To remove H/W and/or provisions from one vehicle or module and place onto another vehicle or module.

TRANSFER VEHICLE

A transportation vehicle that provides capability to move mass and volume from the insertion orbit to ISS and from ISS to reentry.

TRANSPORTATION VEHICLE

A vehicle that docks to the ISS to deliver provisions, cargo and/or crew for ISS operations.

UNSCHEDULED EXTRAVEHICULAR ACTIVITY

An EVA resulting from unforeseen developments during a mission and not included in the nominally scheduled mission activities, but which may be required to achieve ISS Program mission success.

USOS (UNITED STATES ON-ORBIT SEGMENT)

Term that generically describes ISS hardware and software systems manufactured and installed on-orbit by NASA. Within this document, examples of USOS include the truss solar arrays for the generation of power and the Joint Airlock, EMU suit, tools and associated hardware for NASA based EVAs.

UTILIZATION

The set of requirements associated with research experiment integration and operation.

VALIDATION

The process of formally approving the developed process, services, or products at the conclusion of operational test and evaluation. This approval indicates developed processes, services, or products satisfy their intended operational mission.

VERIFICATION

The activities which assure that each level of requirements (including test requirements) or specifications correctly echoes the intentions of the immediately superior level of requirements.

APPENDIX C - OPEN WORK

Table C-1 lists the specific To Be Determined (TBD) items in the document that are not yet known. The TBD is inserted as a placeholder wherever the required data is needed and is formatted in bold type within brackets. The TBD item is numbered based on the section where the first occurrence of the item is located as the first digit and a consecutive number as the second digit (i.e., **<TBD 4-1>** is the first undetermined item assigned in Section 4 of the document). As each TBD is solved, the updated text is inserted in each place that the TBD appears in the document and the item is marked "Closed" in the status column. As new TBD items are assigned, they will be added to this list in accordance with the above described numbering scheme. Original TBDs will not be renumbered and the same TBD number cannot be used more than once. NOTE: TBDs incorporated into this document via the IDRD Flight Program will be preceded by "FP" (i.e. **<FP TBD 3-15A>**).

TABLE C-1 TO BE DETERMINED ITEMS

TBD	Section	Description	Status
1-1	1.2, 2.1	SSP 54018-17S has not been published.	Open
1-2	1.2, 2.1	SSP 54018-15A has not been published.	Open
1-3	1.2, 2.1	SSP 54018-32P has not been published.	Open
1-4	1.2, 2.1	SSP 54018-33P has not been published.	Open
1-5	1.2, 2.1	SSP 54018-2J/A has not been published.	Open
1-6	1.2, 2.1	SSP 54018-ANX2 has not been published.	Open
1-7	1.2, 2.1	SSP 54018-ANX3 has not been published.	Open
1-8	1.2, 2.1	SSP 54018-ANX4 has not been published.	Open
1-9	1.2, 2.1, Table 3.3-1	SSP 54018-ANX5 has not been published.	Open
1-10	1.3	SSP 543XX, Post Increment Evaluation Report for Increment 18, has not been published.	Open
1-11	2.1	Increment Definition and Requirements Document for Increment 19 has not been developed	Open
3-1	Table 3.2-1, 6.4.2	Date for 17S relocation has not been determined.	Open
3-2	Table 3.3-1	Crewmember has not been determined	Open
3-3	Table 3.3-1	Crew return is outside of current planning timeframe	Open
3-4	3.4	Deviations will be defined in the next IDRD CR	Open
3-5	3.1-1, 3.2-1	These dates are for planning purposes only. Actual dates will be updated with the release of the Flight Program IDRD CR.	Open
4-1	Table 4.5-1	Data for this table will be provided at a later date.	Open
4-2	Table 4.3-1	Updates to this table to reflect addition of ULF2 and current stowage capabilities are in work. This will be updated through the TCM.	Open
5-2	5.0, Table 5.0-1	Mass and Volume to be provided at a later date.	Open
5-3	Table 5.0-1a	Data for this table will be provided at a later date	Open
5-4	Table 5.0-1	Further assessments of the return of the JEM JLE are required.	Open
6-1	6.2.1, 6.2.2	List of Russian and Visiting Crew Member Experiments will be provided at a later date.	Open
6-2	Table 3.3-1,	Port Utilization is still in work.	Open

TBD	Section	Description	Status
	6.3.2, 6.3.3, 6.4.2, 6.6.2, 6.6.3, 6.8.2, 6.8.3		
6-3	6.3.2	Pending official receipt of Visiting Crew operations tasks.	Open
6-4	6.4.2, 6.6.2, 6.8.2	Crew Time Allocations are not yet defined.	Open
6-6	6.6.2	Russian EVA tasks are still under review.	Open
6-7	6.6.2	Work Site number for positioning of MT/SSRMS not yet defined.	Open
6-8	6.5.2	List of Sortie and SDBI payloads to be determine.	Open
6-9	6.5.2	List of get-ahead tasks are in work.	Open
6-10	6.4.2,	Work Site to be determined	Open
6-11	6.5.3	Number of RTA bolts per task to be determined at a later date	Open
6-12	6.5.3	This data is still under review	Open
6-13	6.7.3	Maximum rendezvous angle for Flight 2J/A has yet to be determined	Open
6-14	6.5.2	SARJ contingency tasks are listed as a placeholder for training plans. Activity details are in work to be defined.	Open
D-1	Appendix D	This Table to be completed through TCM process.	Open
H-1	6.4.2, Appendix H	Appendix H is not included in this release of the IDRD.	Open
I-1	6.5.2, 6.7.2, Appendix I	Appendix I is not included in this release of the IDRD.	Open
J-1	Appendix J	Appendix J is not included in this release of the IDRD	Open
K-1	6.3.2, Appendix K	Appendix K is not included in this release of the IDRD.	Open

Table C-2 lists the specific To Be Resolved (TBR) issues in the document that are not yet known. The TBR is inserted as a placeholder wherever the required data is needed and is formatted in bold type within brackets. The TBR issue is numbered based on the section where the first occurrence of the issue is located as the first digit and a consecutive number as the second digit (i.e., **<TBR 4-1>** is the first unresolved issue assigned in Section 4 of the document). As each TBR is resolved, the updated text is inserted in each place that the TBR appears in the document and the issue is marked "Closed" in the status column. As new TBR issues are assigned, they will be added to this list in accordance with the above described numbering scheme. Original TBRs will not be renumbered and the same TBR number cannot be used more than once. NOTE: TBRs incorporated into this document via the IDRD Flight Program will be preceded by "FP" (i.e. **<FP TBR 3-15A>**).

TABLE C-2 TO BE RESOLVED ISSUES

TBR	Section	Description	Status
FP 3-2	Table 3.2-1	Launch date is under review with the Shuttle Program	Open
FP 3-7	Table 3.2-1	Dates are under review to resolve GGR&C conflicts	Open
4-1	Table 4.2-1	Crew Time to be worked in as TCM inputs.	Open
6-1	6.5.2	Loads analysis is being reviewed to determine if Beta Gimbal locking is required for this operation.	Open

TBR	Section	Description	Status
6-2	6.6.4, 6.8.4	Tasks are not currently certified due to hardware unavailability and immature repair methodology.	Open
6-3	6.5.4, 5.5.5	Pending analysis and approval by Program that these items can be safely jettisoned.	Open

APPENDIX D - TOPOLOGIES

D.1 GENERAL

This appendix provides an overview of the internal on-orbit topologies for Node 1, Node 2, the U.S. Lab, the Joint Airlock, Columbus, the JLP and the JPM. Figures are included for each planned change of rack locations. Subrack topologies are included for the EXpedite the PRocessing of Experiments to the Space Station (EXPRESS) Racks located in the U.S. Lab. **<TBD D-1>**

D.2 ON-ORBIT RACK DESCRIPTIONS

Table D.2-1, On-Orbit Rack Descriptions, shows the description of the rack represented by each rack subelement number in the topologies contained in this appendix.

TABLE D.2-1 ON-ORBIT RACK DESCRIPTIONS <TBD D-1>

Rack SE Number	Rack Description

D.3 FLIGHT AND STAGE RACK MOVES

This table summarizes the rack traffic during the Increment's flights and stages. Note that for prioritization order please refer to Section 6.0 for corresponding rack move tasks.

TABLE D.3-1 FLIGHT AND STAGE RACK MOVES ~~<TBD D-1>~~

Flight and Stage Topology File	Racks Ups		Rack Moves			Racks Down	
	Name	Location	Name	Location 1	Location 2	Name	Location
Stage 17S	N/A	N/A	NONE			N/A	N/A
Flight ULF2	CHeCS 2 (ZSR) EXPR #6 (includes Galley) WRS2 WHC WRS1 CIR (PaRIS) TRDML 2 Crew Qtrs Crew Qtrs ZSR Crew Qtrs	LAB1O5 LAB1O4 LAB1P4 LAB1P2 LAB1D4 LAB1S3 NOD2D5 NOD2P5 NOD2S5 JLP1P2 JPM1A5				RSR RSR	NOD2P5 NOD2S5
Stage ULF2	N/A	N/A	NONE			N/A	N/A
Flight 15A	N/A	N/A	NONE			N/A	N/A
Stage 15A	N/A	N/A	NONE			N/A	N/A
Flight 2J/A	N/A	N/A	NONE			N/A	N/A
Stage 2 J/A	N/A	N/A	NONE			N/A	N/A
Flight 18S	N/A	N/A	NONE			N/A	N/A

D.4 FLIGHT/STAGE ULF2 TOPOLOGY

Figure D.4-1, Flight/Stage ULF2 Topology, shows a high level overview of the ULF2 on-orbit topology. Refer to Table D.2-1 for a definition of the rack SE numbers.

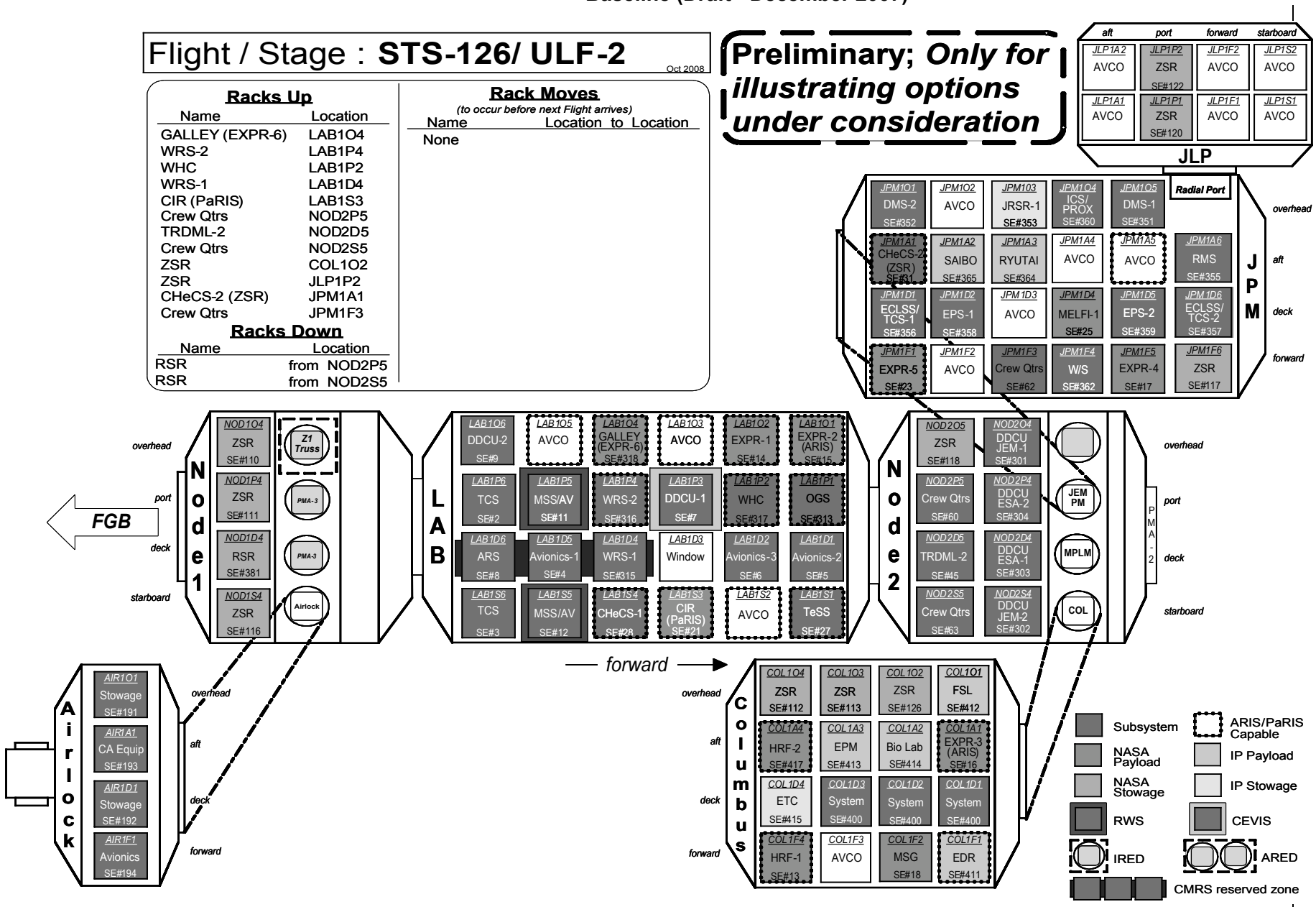


FIGURE D.4-1 FLIGHT/STAGE ULF2 TOPOLOGY

D.54 FLIGHT/STAGE 15A TOPOLOGY

Figure D.4-1, Increment 18 Flight/Stage 15A Topology, shows a high level overview of the on-orbit topology at the beginning of the increment. Refer to Table D.2-1 for a definition of the rack SE numbers.

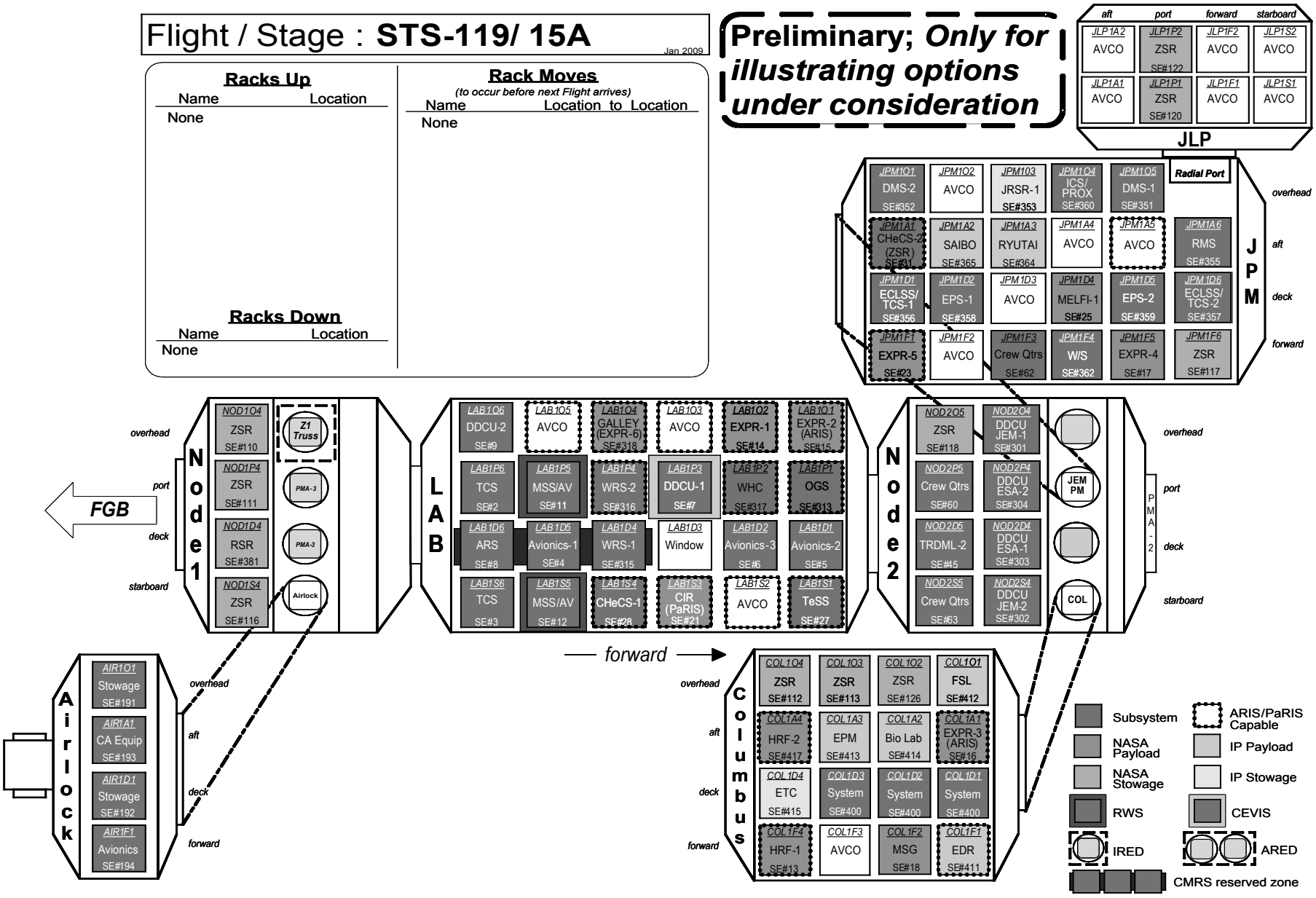


FIGURE D.4-1 FLIGHT/STAGE 15A TOPOLOGY

D.6~~5~~ FLIGHT/STAGE 2J/A TOPOLOGY

Figure D.5-1, Increment 18 Flight/Stage 2J/A Topology, shows a high level overview of the on-orbit topology at the end of Flight 1E. Refer to Table D.3-1 for rack moves. Refer to Table D.2-1 for a definition of the rack SE numbers.

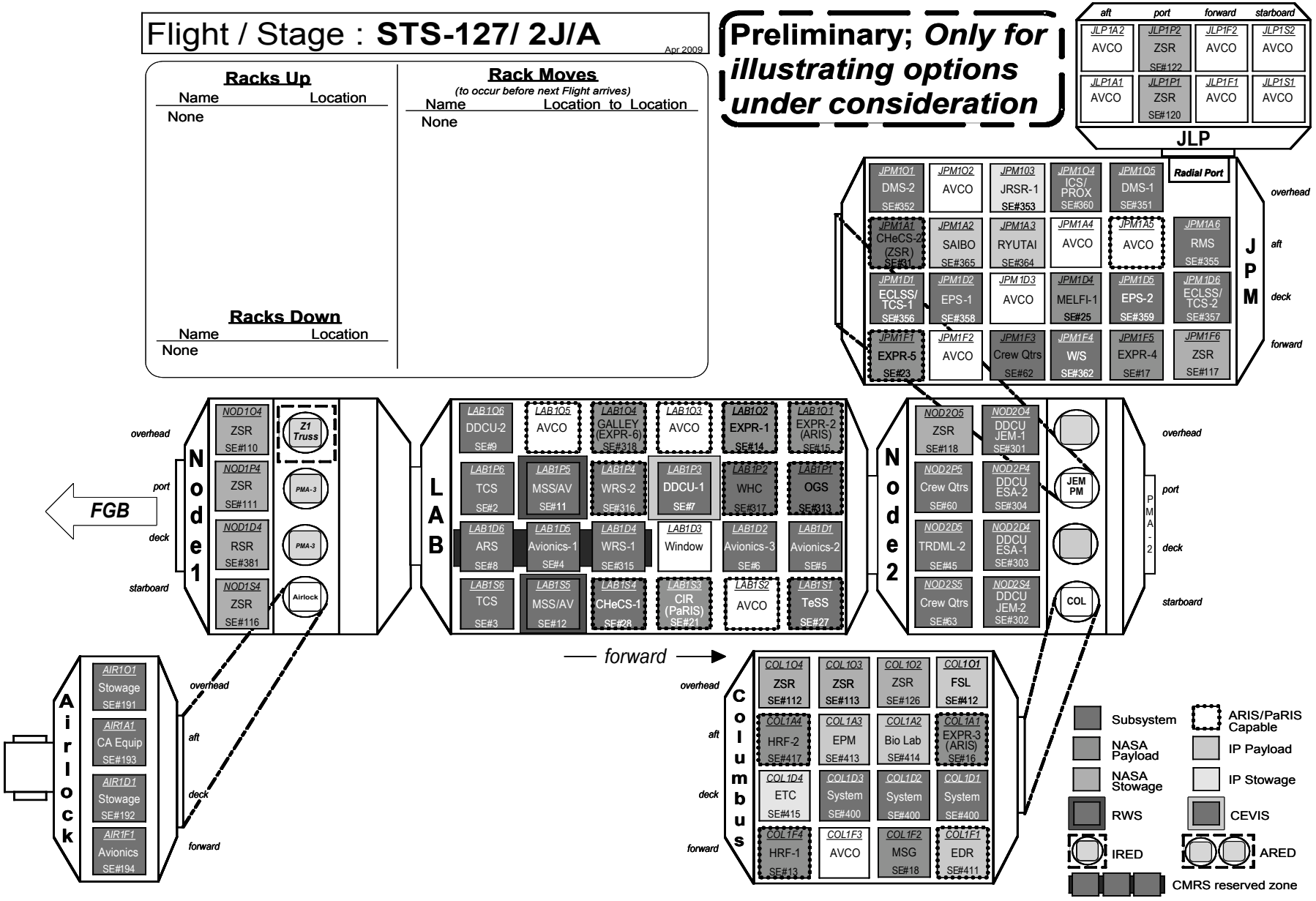


FIGURE D.5-1 INCREMENT 18 FLIGHT/STAGE 2J/A TOPOLOGY

APPENDIX E - INCREMENT CONFIGURATIONS

The configuration plans for flight and stage are in JSC 26557, On-orbit Assembly, Modeling, and Mass Properties Data Book, also known as Blue Book, accessible through Electronic Document Management System (EDMS).

APPENDIX F - <DELETED>

APPENDIX G - <DELETED>

APPENDIX H - ON-ORBIT CHECKOUT REQUIREMENTS <TBD H-1>

Appendix H contains a listing of those Mobile Servicing System (MSS) On-orbit Checkouts (OCRs) that can be completed during this increment. All tables have been scrubbed to eliminate completed OCRs or OCRs that cannot be accomplished within this increment. Table H-1 Part 1 of this plan contains Space Station Remote Manipulator System (SSRMS) OCRs from the previous increment not completed and carried forward. Table H-2 contains Mobile Remote Servicer Base System (MBS) OCRs. With the exception of Periodic and Conditional OCRs, the tasks in this matrix, as well as those planned in other increments, must be completed for Canadian Space Agency (CSA) to consider the SSRMS and MBS fully commissioned. Periodic/Data Trending checkout tasks are described where 'start of life' baseline data sets are required in this increment. Periodic checkouts will be further addressed in the Increment Definition and Requirements Documents (IDRDs) for subsequent increments. Changes to requirements should be addressed to CSA via the Manager, Mission Operations. Changes to requirements during real time operations should be addressed to the International Space Station (ISS) Management Center.

APPENDIX I - SHUTTLE FLIGHT TRANSFER PRIORITY LISTS <TBD I-1>

APPENDIX J - OFF-NOMINAL SITUATIONS <TBD J-1>

TABLE J-1 FLIGHT *XX* OFF-NOMINAL SITUATIONS MATRIX <TBD J-1>

ONS Number	Task	Cause	Consequences	Response/Task
XX-1				
XX-2				
XX-3				
XX-4				
XX-5				
XX-6				
XX-7				
XX-8				
XX-9				
XX-10				

APPENDIX K <TBD K-1> - <RESERVED>

Table K-1, USOS Resources to be Provided for 17S taxi Crewmember, is limited to the below-listed and agreed-to resources that NASA will provide to the 17S taxi crewmember during this mission on 17 Soyuz. The listing of utilization to be performed during the 17 Soyuz mission will be provided via Rocket Space Corporation - Energia (RSC-E) and is listed in the main document under Section 6.2, Increment 18 Specific Requirements. NASA agrees to provide the following resources and will be compensated by 17S taxi Crewmember.

TABLE K-1 USOS RESOURCES TO BE PROVIDED FOR 17S TAXI CREWMEMBER <TBD K-1>

Resource	Agreements
E-mail	
IP Phone	
Timeline	
Procedures	
Lab Facilities	
Ham * Not solely a USOS resource - International Hardware	
Imagery	
PAO	
Medical	
Crew Provisions:	
Exercise Equipment	
Video Down	
Up/Downlink Data (includes OCA)	
Ground Support	
Preflight Crew Training for Prime and Backup *X* Crewmembers	