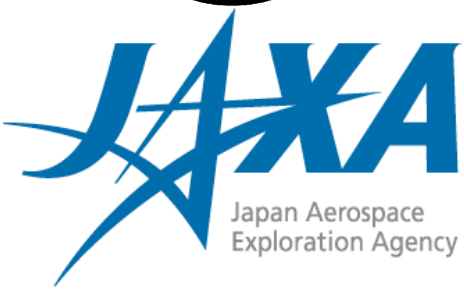
Increment Definition and Requirements Document for Increments 19 and 20

International Space Station Program

Baseline

July 2008



National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
Houston, Texas
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REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
-	Initial Release (Reference per SSCD XXXXXX, EFF. XX-XX-XX)	XX-XX-XX

PREFACE

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

This document is the Increment Definition and Requirements Document for Increments 19 and 20. 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).

SSP 54019_54020
Baseline

NASA/ROSCOSMOS

INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

JULY 2008

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

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INTERNATIONAL SPACE STATION PROGRAM

INCREMENT DEFINITION AND REQUIREMENTS DOCUMENT FOR INCREMENTS 19 AND 20

LIST OF CHANGES

JULY 2008

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

SSCB		Entry Date		Change		Paragraph(s)
		August 2008		Baseline		All

TABLE OF CONTENTS

PARAGRAPH PAGE

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APPENDIX

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TABLE

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FIGURE

SSP 54019_54020
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1.0 INTRODUCTION

1.0 1 PURPOSE

This document provides the assignment of flight dates, resources and accommodations, as well as defines the requirements for Increments 19 and 20. 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 Increments 19 and 20 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.

1.0 2 SCOPE

This document covers Increments 19 and 20, beginning at the undocking of Flight 17 Soyuz. Increment 19 will include the Expedition (E)19 Commander (CDR) and Flight Engineer (FE)-1 who arrive on ISS on Flight 18 Soyuz. The third crew member, FE-2, rotates on the Shuttle flights. At the start of Increment 19, the E18/19 FE-2 (15A) will have been on ISS since Flight 15A in Increment 18. The E19/20 FE-2 (2J/A) is launched on Flight 2J/A and replaces E18/19 FE-2 (15A). Increment 19 ends and Increment 20 begins with the docking of Flight 19 Soyuz which augments the ISS to 6 crew with the arrival of E20 FE-3, FE-4, and FE-5. E19 CDR and FE-1 will remain on ISS as the E20 CDR and FE-1. E20 FE-4 will return on Flight Utilization Logistics Flight (ULF)3 during Increment 21. The E20/21 FE-2 (17A) is launched on Flight 17A and replaces the previous E19/20 FE-2 (2J/A). E20/21 FE-2 (17A) returns on Flight 19 Soyuz during Increment 21. Increment 20 ends with the undocking of Flight 18 Soyuz. Note that the Flight 19 Soyuz and Flight ULF3 that returns the crew has requirements, including those for crew rotation specified in SSP 54021_54022 **<To Be Determined (TBD) 1-1>**, Increment Definition and Requirements Document (IDRD) for Increments 21 and 22.

Increment 19 (E19 Crew) begins with a crew complement of 2 United States On-orbit Segment (USOS) and 1 Russian Segment (RS) crew members. Increment 20 (E20 Crew) begins with a crew complement of 4 USOS and 2 RS crew members. During Increment 20, the FE-2 rotates on the Shuttle Flight 17A and the crew complement remains 4 USOS and 2 RS. With the arrival of Flight 20 Soyuz, the first Direct Crew Rotation will occur, the ISS crew will increase to 9 members, and there will be three Soyuz vehicles docked to the ISS for nine days. Flight 18 Soyuz returns the E20 CDR and FE-1. With the undocking of Flight 18 Soyuz, the Expedition Crew becomes the E21 Crew with a crew complement of 4 USOS and 2 RS. The details of E21 Crew and E22 Crew are specified in SSP 54021_54022 **<TBD 1-1>**.

This document is based on the ISS Flight Program definition, as specified in SSP 54100, Increment Definition and Requirements Document Flight Program **<TBD 12>**.

SSP 54019_54020
Baseline

This document defines the capabilities and objectives of Increments 19 and 20. This document also controls the following: resource and accommodation allocations between assembly, system, and utilization; requirements and priorities for ISS execution planning; ISS ascent and/or descent manifest [IDRD for Increment 18, Annex (ANX) 1: Station Manifest (SSP 54018-32P **<TBD 1-3>**; SSP 54018-18S **<TBD 1-4>**]; [IDRD for Increment 19, ANX 1: Station Manifest (SSP 54019-33P **<TBD 1-5>**; SSP 54019-2J/A **<TBD 1-6>**; [IDRD for Increment 20, ANX 1: Station Manifest (SSP 54020-19S **<TBD 1-7>**; SSP 54020-34P **<TBD 1-8>**; SSP 54020-17A **<TBD 1-9>**; SSP 54020-HTV1 **<TBD 1-10>**; SSP 54020-20S **<TBD 1-12>**;)]; On-Orbit Maintenance Plan (SSP 54019_54020-ANX 2 **<TBD 1-13>**, IDRD for Increments 19 and 20, Annex 2: On-Orbit Maintenance Plan); ISS imagery requirements (SSP 54019_54020-ANX 3 **<TBD 1-14>**, IDRD for Increments 19 and 20, Annex 3: Imagery Requirements); medical operations (SSP 54019_54020-ANX 4 **<TBD 1-15>**, IDRD for Increments 19 and 20, Annex 4: Medical Operations and Environmental Monitoring); and payloads (SSP 54019_54020-ANX 5 **<TBD 1-16>**, IDRD for Increments 19 and 20, Annex 5: Payload Tactical Plan). The above mentioned documents are published as separate documents.

1.0 3 PRECEDENCE

SSP 54019_54020 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 54319_54320, Post Increment Evaluation Report for Increments 19 and 20 **<TBD 1-17>**.

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 paragraph 3.4.

1.0 4 DELEGATION OF AUTHORITY

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

1.0 5 DEVIATION/WAIVER

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. National Aeronautics and Space Administration (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

2.0 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
JSC 26557	International Space Station On-Orbit Assembly, Modeling and Mass Properties Data Book	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
No Number	Consolidated Operations and Utilization Plan	Multilateral
NSTS 21434	International Space Station-2J/A Mission Integration Plan	NASA Internal
NSTS 21546	International Space Station-17A Mission Integration Plan	NASA Internal
SSP 41170	Configuration Management Requirements	NASA Internal
SSP 50110	Multi-Increment Manifest Document	Multilateral
SSP 50123	Configuration Management Handbook	Multilateral
SSP 50146	NASA/RSA Bilateral S&MA Process Requirements for International Space Station	Bilateral
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 50448	Station Development Test Objectives (SDTO) Catalog	Multilateral

SSP 54019_54020
Baseline

SSP 54018	Increment Definition and Requirements Document for Increment 18	Multilateral
SSP 54018-18S **<TBD 1-4>**	Increment Definition and Requirements Document for Increment 18, Annex 1: Station Manifest, Flight 18S	Multilateral
SSP 54018-32P **<TBD 1-3>**	Increment Definition and Requirements Document for Increment 18, Annex 1: Station Manifest, Flight 32P	Multilateral
SSP 54019-17A **<TBD 1-9>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 1: Station Manifest, Flight 17A	Multilateral
SSP 54020-19S **<TBD 1-7>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 1: Station Manifest, Flight 19S	Multilateral
SSP 54020-20S **<TBD 1-12>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 1: Station Manifest, Flight 20S	Multilateral
SSP 54019-2J/A **<TBD 1-6>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 1: Station Manifest, Flight 2J/A	Multilateral
SSP 54019-33P **<TBD 1-5>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 1: Station Manifest, Flight 33P	Multilateral
SSP 54020-34P **<TBD 1-8>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 1: Station Manifest, Flight 34P	Multilateral
SSP 54019_54020-ANX 2 **<TBD 1-13>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 2: On-Orbit Maintenance Plan	Multilateral
SSP 54019_54020-ANX 3 **<TBD 1-14>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 3: Imagery Requirements	Multilateral
SSP 54019_54020-ANX 4 **<TBD 1-15>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 4: Medical Operations and Environmental Monitoring	Multilateral
SSP 54019_54020-ANX 5 **<TBD 1-16>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 5: Payload Tactical Plan	Multilateral
SSP 54019_54020-HTV1 **<TBD 1-10>**	Increment Definition and Requirements Document for Increments 19 and 20, Annex 1: Station Manifest, Flight HTV1	Multilateral
SSP 54021_54022 **<TBD 1-1>**	Increment Definition and Requirements Document for Increments 21 and 22	Multilateral
SSP 54100 **<TBD 1-2>**	Increment Definition and Requirements Document Flight Program	Multilateral

SSP 54019_54020
Baseline

SSP 54319_54320 **<TBD 1-17>**	Post Increment Evaluation Report for Increments 19 and 20	Multilateral

2.0 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
NSTS 12820	Joint Shuttle/ISS Flight Rules Volume C Joint Operations	NASA Internal
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 50273	Segment Specification for the H-II Transfer Vehicle	Bilateral
SSP 50438	International Space Station to H-II Transfer Vehicle Interface Control Document, Part 1	Bilateral
SSP 50478	Payload Data Library Requirements Document	NASA Internal
SSP 50621	Generic On-Orbit Stowage Capabilities and Requirements: Pressurized Volume	Multilateral
SSP 50699-03	USOS Certification Baseline Volume III: Flight Attitudes	Multilateral
SSP 54318	Post Increment Evaluation Report for Increment 18	Multilateral
<TBD 2-1>		

3.0 INCREMENT OBJECTIVES

This section defines the Increments 19 and 20 objectives. The inclusion of objectives in this document provides ISS Program Office control of major events and emphasis during this time frame.

3.0 1 INCREMENT OVERVIEW

Figure 3.1-1, Increments 19 and 20 Overview, provides a high level graphical overview of the two increments. It contains the duration of each increment, 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 USOS and RS Extravehicular Activities (EVAs) are also shown in this figure. The two contingency EVAs specified in SSP 50261-01, paragraph 4.3.2.10, are not shown in this figure.

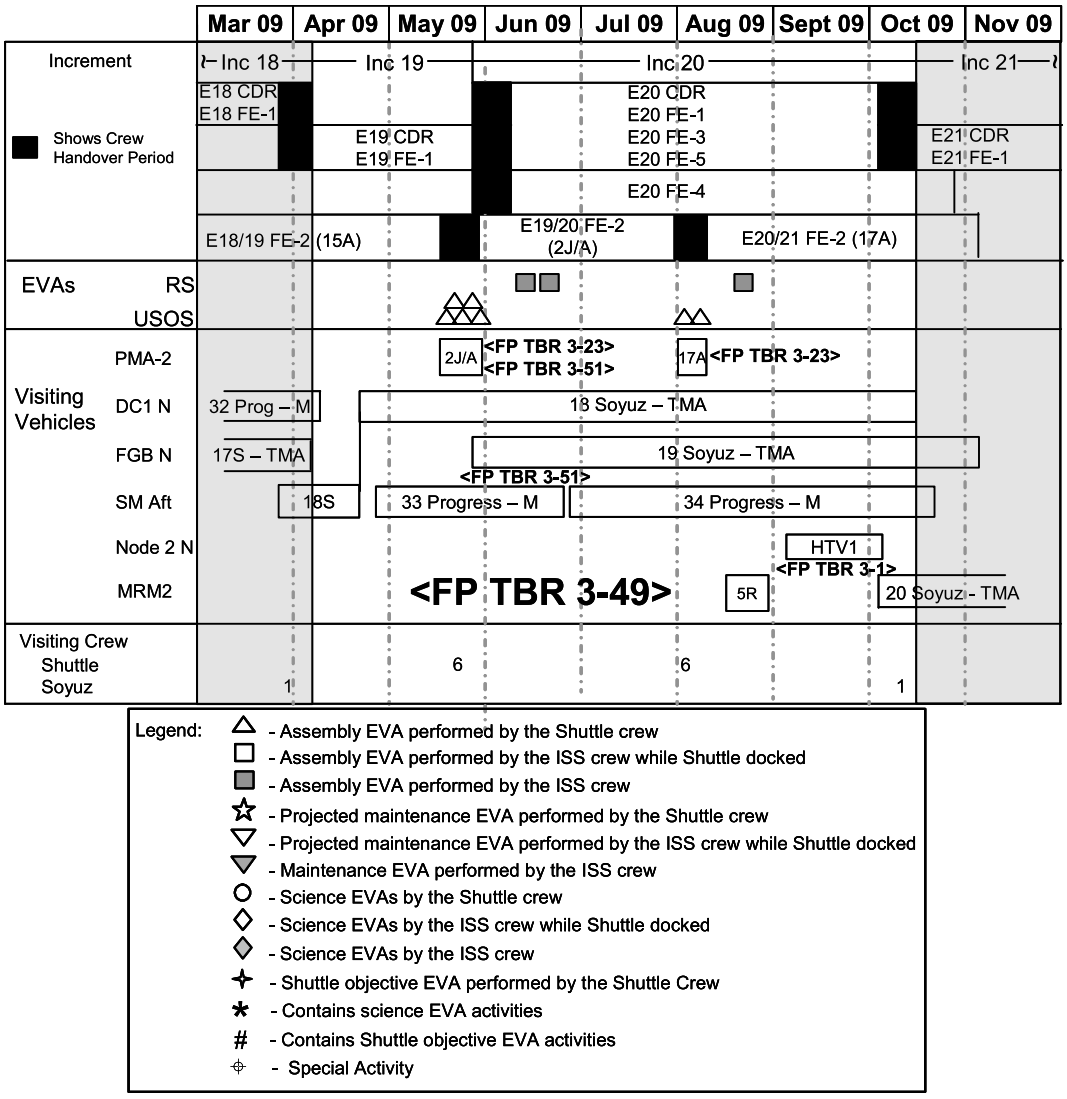

FIGURE 3.1-1 INCREMENTS 19 AND 20 OVERVIEW

3.0 2 INCREMENT FLIGHT SUMMARY

Table 3.2-1, Increments 19 and 20 Flight Summary, identifies planning data for all flights scheduled to visit the ISS or undock from the ISS during these increments.

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, Extravehicular Activity (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 dates contained in Table 3.2-1 are shown in Greenwich Mean Time (GMT).

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.

SSP 54019_54020
Baseline

TABLE 3.2-1 INCREMENTS 19 AND 20 FLIGHT SUMMARY

Increment (Duration) [2]	ISS Flight Name	Event [3]	Date (GMT)	Mission Duration (days) [1]	Docked Duration (days) [1]	Launch Vehicle Flight Name	Shuttle Docking Altitude (km/ nmi)	Launch Vehicle Crew Size
Inc 19 (52) **<FP TBR 3-49>**	32P	Undock	07 Apr 09	56 (Launch in Inc 18)	54 (Dock in Inc 18)	Progress-M	-	Unmanned
	18S	Relocation [4]	**<TBD 3-1>**	-	-	Soyuz-TMA	-	2+1
	33P	Launch	22 Apr 09	62 (Undock in Inc 20)	-	Progress-M	-	Unmanned
	33P	Dock	24 Apr 09	-	60 (Undock in Inc 20)	Progress-M	-	Unmanned
	2J/A	Launch	15 May 09 **<FP TBR 3-51>**	(15+1) (Undock in Inc 20)	-	STS-127 (OV-105)	-	6+1
	2J/A	Dock	17 May 09 **<FP TBR 3-51>**	-	(11+1) (Undock in Inc 20)	STS-127 (OV-105)	361/195	6+1
	19S	Launch	25 May 09 **<FP TBR 3-51>**	[5]	[5]	Soyuz-TMA	-	3+0
Inc 20 (137) **<FP TBR 3-49>**	19S	Dock	27 May 09 **<FP TBR 3-51>**	[5]	[5]	Soyuz-TMA	-	3+0
	2J/A	Undock	28 May 09 **<FP TBR 3-51>**	(15+1) (Launch in Inc 19)	(11+1) (Dock in Inc 19)	STS-127 (OV-105)	-	6+1
	33P	Undock	23 Jun 09	62 (Launch in Inc 19)	60 (Dock in Inc 19)	Progress-M	-	Unmanned
	34P	Launch	24 Jun 09	[5]	[5]	Progress-M	-	Unmanned
	34P	Dock	26 Jun 09	[5]	[5]	Progress-M	-	Unmanned
	17A	Launch	30 Jul 09	(11+1)	-	STS-128 (OV-104)	-	6+1
	17A	Dock	01 Aug 09	-	(7+1)	STS-128 (OV-104)	352/190	6+1
	17A	Undock	08 Aug 09	(11+1)	(7+1)	STS-128 (OV-104)	-	6+1
	5R	Launch	15 Aug 09	-	-	-	-	Unmanned
	5R	Dock	17 Aug 09	-	-	-	-	-
	HTV1	Launch	01 Sep 09 **<FP TBR 3-1>**	37	-	H-II B #1	-	Unmanned
	HTV1	Berthing	08 Sep 09 **<FP TBR 3-1>**	-	30	H-II B #1	-	Unmanned
	20S	Launch	01 Oct 09	[5]	[5]	Soyuz-TMA	-	2+1
	20S	Docking	03 Oct 09	[5]	[5]	Soyuz-TMA	-	2+1
	HTV1	Unberthing	08 Oct 09 **<FP TBR 3-1>**	37	30	H-II B #1	-	Unmanned
Inc 20 (137) **<FP TBR 3-49>** (cont.)	18S	Undock	11 Oct 09	200 (Launch in Inc 18)	198 (Dock in Inc 18)	Soyuz-TMA	-	2+1

SSP 54019_54020
Baseline

Increment (Duration) [2]	**ISS Flight Name**	**Event** [3]	**Date** (GMT)	**Mission Duration** (days) [1]	**Docked Duration** (days) [1]	**Launch Vehicle Flight Name**	**Shuttle Docking Altitude (km/ nmi)**	**Launch Vehicle Crew Size**

NOTES:

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

[2] Starting with Increment 21, the proposed 6-Crew Increment duration calculation will be the time period from the undocking of a Soyuz to the undocking of the next Soyuz **<FP TBR 3-49>**. Prior to Increment 19, Increment duration calculation is based on the time period between crew launch and undock. Increment 19 and 20 will have a “special one time only definition” due to the fact that these two Increments will be the transitional phase leading to the proposed 6-Crew Increment Definition beginning with Increment 21. Duration calculations are based on the calendar day difference between events.

[3] 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.

[4] Flight 18S relocates from the SM Aft port to the FGB Nadir port on **<TBD 3-1>**.

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

3.0 3 INCREMENT SUMMARY AND OBJECTIVES

The increment definitions and primary objectives for assembly, system, and utilization operations are provided in Table 3.3-1, Increments 19 and 20 Summary. The Multilateral Crew Operations Panel (MCOP) defines crew assignments and respective agencies.

TABLE 3.3-1 INCREMENTS 19 AND 20 SUMMARY

Increment 19 Start	Flight 17S Undock (05 Apr 09)	
Increment 19 End	Docking of Flight 19S (27 May 09)	
Increment Duration (days)	52	
Crew Plan	E19 CDR Gennady Padalka	18S (launch/return)
	E19 FE-1 Michael Barratt	18S (launch/return)
	E18/19 FE-2 (15A) Koichi Wakata	15A/2J/A (launch/return) [1]
	E19/20 FE-2 (2J/A) Timothy Kopra	2J/A/17A (launch/return)
Crew Days	In Space	On the ISS
	Increment 19/Total	Increment 19/Total
E19 CDR/FE-1	189/200	189/198
E18/19 FE-2 (15A)	55/107	53/103
E19/20 FE-2 (2J/A)	12/87	10/83
Stage 18S Assembly/System Objectives	• Undock 32 Progress-M from DC1 Aft port • Relocate 18 Soyuz from the SM Aft port to the DC-1 Nadir port • Dock 33 Progress-M to the SM Aft port • Perform checkout and preparation tasks for Flight 2J/A arrival • Perform checkout and preparation tasks for Flight 19 Soyuz arrival • E18/19 FE-2 (15A) preparation for return on 2J/A • Perform E19 crew SSC reloads • Continue 6-crew Regen ECLSS and Habitability Hardware checkout and operations	
Stage 18S Utilization Objectives	Reference SSP 54019_54020-ANX 5 **<TBD 1-16>**	
Flight 2J/A Assembly/System Objectives	• Rotate E18/19 FE-2 (15A) with E19/20 FE-2 (2 J/A) • Install, activate and checkout JEF • Install JLE to JEF • Remove and replace 6 P6 batteries • Transfer ISS critical spares Pump Module Assembly, SGANT and LDU from ICC-VLD to ESP3 • Install ICS-EF antenna and 2 JAXA payloads (MAXI and SEDA-AP) using JEMRMS • Install JEF video equipment • Return ICC-VLD required for future assembly sequence and Shuttle manifesting • Return JLE	
Flight 2J/A Utilization Objectives	Reference SSP 54019_54020-ANX 5 **<TBD 1-16>**	
Flight 19S Assembly/System Objectives	• Dock 19 Soyuz to the FGB Nadir port	
Increment 20 Start	Expedition Crew Augmentation (27 May 09)	
Increment 20 End	Undocking of Flight 18S (11 Oct 09)	
Increment Duration (days)	137	

SSP 54019_54020
Baseline

Crew Plan **<FP TBR 3-49>**	E20 CDR Gennady Padalka	18S (launch/return)
	E20 FE-1 Michael Barratt	18S (launch/return)
	E19/20 FE-2 (2J/A) Timothy Kopra	2J/A/17A (launch/return)
	E20/21 FE-2 (17A) Nicole Stott	17A/19S (launch/return) [3]
	E20 FE-3 Frank DeWinne	19S (launch/return) [3]
	E20 FE-4 Robert Thirsk	19S/ULF3 (launch/return) [2]
	E20 FE-5 Roman Romanenko	19S (launch/return) [3]
	E21 CDR **<TBD 3-2>**	20S (launch/return) [4]
	E21 FE-1 **<TBD 3-2>**	20S (launch/return) [4]

Crew Days **<FP TBR 3-49>**	In Space	On the ISS
	Increment 20/Total	Increment 20/Total
E20 CDR/FE-1	137/200	137/198
E19/20 FE-2 (2J/A)	75/87	73/83
E20/21 FE-2 (17A)	73/98	71/96
E20 FE-3/FE-5	139/164	137/162
E20 FE-4	139/158	137/154
E21 CDR/FE-1	10/[4]	8/[4]

Stage 19S Assembly/System Objectives	• Augment crew with FE-3, FE-4, FE-5 • Complete unfinished Flight 2J/A objectives • Undock Flight 2J/A • Undock 33 Progress-M from SM Aft port • Dock 34 Progress-M to the SM Aft port • Perform checkout and preparation tasks for Flight 17A • Perform E19/20 FE-2 (2J/A) preparation for return on 17A • Perform E20 crew SSC reloads • Perform software transition to SM 8.03 • Perform checkout and preparation for MRM2 arrival • Perform RS EVA #22 to install Kurs antenna mono-units and АФУ cables and disassemble and secure БТН-1М scientific hardware on SM in preparation for MRM2 arrival • Perform RS EVA #23 to relocate the -Y axis docking assembly conical cover to the +Y axis docking assembly and relocate the +Y axis docking assembly flat cover to the -Y axis docking assembly • Complete remaining JEF checkout activities (not completed during Flight 2J/A) • Invoke embedded patch PCS R11.MSS6 • Uplink and transition to MSS 6 software and checkout in support of HTV1 • Perform checkout and preparation for HTV1 arrival ○ Complete SSRMS FMS/FMA capability ○ Transition to and checkout of MSS 6 software ○ HTV1 PROX checkouts #3 ○ HTV1 Crew Monitoring checkout
Stage 19S Utilization Objectives	Reference SSP 54019_54020-ANX 5 **<TBD 1-16>**

SSP 54019_54020
Baseline

Flight 17A Assembly/System Objectives	• Rotate E19/20 FE-2 (2J/A) with E20/21 FE-2 (17A) • Transfer T2 rack to ISS • Transfer, remove, and replace ATA from LMC to P1 • Transfer and install remaining MPLM racks to ISS • Return empty P1 ATA to LMC • Transfer EuTEF/FSE IA from ISS Columbus EPF to LMC • Transfer MISSE 6a and 6b PECs from ISS Columbus EPF to Orbiter Cargo Bay • R&R S0 RGA • Remove and transfer MPLM BBAs and LHAs to ISS (install ISS BBAs and LHAs into MPLM)
Flight 17A Utilization Objectives	Reference SSP 54019_54020-ANX 5 **<TBD 1-16>**
Stage 17A Assembly/System Objectives	• Dock MRM2 to SM Zenith port • Perform checkout and preparation tasks for Flight 20 Soyuz • Perform checkout and preparation tasks for Flight ULF3 • Perform RS EVA #24 to install the Kurs АФУ 4АО-ВКА antenna and MRM2 docking target, connect MRM2 Kurs АФУ to SM Kurs АФУ signal switching unit (БКУ), and restore configuration of the SM БТН-1М scientific hardware • Perform checkout and preparation tasks for HTV1 launch • Perform HTV1 Demonstration Program (prior to berthing) • Perform preparation for HTV1 rendezvous operations and capture • Berth HTV1 to Node 2 Nadir port • HTV Attached Phase Operations • Unberth HTV1 from Node 2 Nadir port • Perform 6-crew Habitability Hardware activation and checkout • Install SpaceX CUCU and perform UHF checkout • E20 CDR/FE-1 preparations for return on Flight 18 Soyuz • E20 FE-4 preparations for return on Flight ULF3
Stage 17A Utilization Objectives	Reference SSP 54019_54020-ANX 5 **<TBD 1-16>**
Flight 20S Assembly/System Objectives	• Rotate E20 crew with E21 crew (CDR/FE-1) • Load and undock 18 Soyuz from the DC-1 Nadir port • Perform Visiting Crew operations
Flight 20S Utilization Objectives	Reference SSP 54019_54020-ANX 5 **<TBD 1-16>**

NOTE:

[1] Flight 15A occurs during Increment 18. Flight 15A will be documented in SSP 54018, which takes precedence over this document for E18/19 FE-2 (15A) on-orbit duration.

[2] Flight ULF3 occurs during Increment 21 and will be documented in SSP 54021_54022 **<TBD 1-1>**, which takes precedence over this document for E20 FE-4 on-orbit duration.

[3] Flight 19S return occurs during Increment 21 and will be documented in SSP 54021_54022 **<TBD 1-1>**, which takes precedence over this document for E20/21 FE-2 (17A), E20 FE-3, and E20 FE-5 on-orbit duration.

[4] The E21 CDR/FE-1 crew will return in the strategic timeframe.

3.0 4 DEVIATIONS TO THE GENERIC GROUNDRULES, REQUIREMENTS, AND CONSTRAINTS DOCUMENT

Deviations to SSP 50261-01 exist within the IDRD for Increments 19 and 20. 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 will be documented, as required in previous updates to this document.

Violations to SSP 50261-01 groundrules during Increments 19 and 20 if identified, are listed on the Increments 19 and 20 Management Team website which can be found at the following Uniform Resource Locator (URL): http://iss-www.jsc.nasa.gov/nwo/mio/riit/inc_19/web/

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 accommodation. Sub-allocations of utilization allocations are provided in the SSP 54019_54020-ANX 5 **<TBD 1-16>**. Any non-standard requirements of resources are also provided in paragraph 4.5. The allocation guidelines are baselined in the SSP 50261-01. All data contained in this section represent operational requirements.

4.0 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 (EPS) 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 three ISS 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 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 which satisfy the positive energy balance requirement and optimize power availability for Utilization. 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 EVAs, 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 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. Low Beta range is defined as $|\beta| < 37$. Mid Beta range is defined as $37 <= |\beta| <= 52$. High Beta range is defined as $|\beta| > 52$.

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 how much power needs to be transferred during different flights and stages. 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 converter increment value transferred at the output of the converters 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 RS 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 54019_54020-ANX 5 **<TBD 1-16>**.

SSP 54019_54020
Baseline

TABLE 4.1-1 POWER BALANCE AND ALLOCATIONS (PAGE 1 OF 2)

Flight/ Stage	Power Availability (kW) Total Capability [1] [16]			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 19 and 20 (rev2)															
USOS (NASA, JAXA, ESA, CSA)	**L [4]**	**M [4]**	**H [4]**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
S 18S [8]	66.8	74.2	58.8	27.2	27.2	27.2	XVV	XVV	XVV	8.4	8.4	10.2	25.0	30.9	17.1
S 18S [9]	66.8	74.2	58.8	27.2	27.2	27.2	XVV	XVV	XVV	6.6	8.4	8.4	26.4	30.9	18.6
F 2J/A [8] [13]	68.6	76.0	79.1 [15]	37.3	37.3	37.3 [15]	-XVV	-XVV	-XVV	8.4	8.4	10.2 [15]	18.3	24.3	25.3 [15]
S 2J/A [8]	66.8	74.2	58.8	27.8	27.8	27.8	XVV	XVV	XVV	8.4	8.4	10.2	24.5	30.4	16.7
S 19S [10]	66.8	74.2	58.8	27.8	27.8	27.8	XVV	XVV	XVV	8.4	8.4	10.2	24.5	30.4	16.7
F 17A [10]	68.6	76.0	79.1 [15]	31.6	31.6	31.6 [15]	-XVV	-XVV	-XVV	8.4	8.4	10.2 [15]	22.9	28.8	29.9 [15]
S 17A [10]	66.8	74.2	58.8	29.0	29.0	29.0	XVV	XVV	XVV	8.4	8.4	10.2	23.5	29.4	15.7
S 17A [10] [14]	66.8	74.2	58.8	29.0	29.0	29.0	XVV	XVV	XVV	8.4	8.4	10.2	23.5	29.4	15.7
S 17A [11] [14]	66.8	74.2	58.8	31.6	31.6	31.6	XVV	XVV	XVV	8.4	8.4	10.2	21.4	27.3	13.6
S 20S [12] [14]	66.8	74.2	58.8	29.6	29.6	29.6	XVV	XVV	XVV	8.4	8.4	10.2	23.0	29.0	15.2
FGB [6]	**L [4]**	**M [4]**	**H [4]**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
S 18S [8]	0.9	1.0	0.6	1.6	1.6	1.6	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.9	2.0	1.6
S 18S [9]	0.9	1.0	0.6	1.6	1.6	1.6	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.9	2.0	1.6
F 2J/A [8] [13]	0.9	1.0	0.6 [15]	1.6	1.6	1.6 [15]	-XVV	-XVV	-XVV	-3.0	-3.0	-3.0 [15]	1.9	2.0	1.6 [15]
S 2J/A [8]	0.9	1.0	0.6	1.6	1.6	1.6	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.9	2.0	1.6
S 19S [10]	0.9	1.0	0.6	1.8	1.8	1.8	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.6	1.7	1.3
F 17A [10]	0.9	1.0	0.6 [15]	1.8	1.8	1.8 [15]	-XVV	-XVV	-XVV	-3.0	-3.0	-3.0 [15]	1.6	1.7	1.3 [15]
S 17A [10]	0.9	1.0	0.6	1.8	1.8	1.8	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.6	1.7	1.3
S 17A [10] [14]	0.9	1.0	0.6	1.8	1.8	1.8	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.6	1.7	1.3
S 17A [11] [14]	0.9	1.0	0.6	1.8	1.8	1.8	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.6	1.7	1.3
S 20S [12] [14]	0.9	0.9	0.6	1.8	1.8	1.8	XVV	XVV	XVV	-3.0	-3.0	-3.0	1.6	1.6	1.3

SSP 54019_54020
Baseline

TABLE 4.1-1 POWER BALANCE AND ALLOCATIONS (PAGE 2 OF 2)

Flight/ Stage	Power Availability (kW) Total Capability [1] [16]			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 19 and 20 (rev2)															
RS [7]	L [4]	M [4]	H [4]	L	M	H	L	M	H	L	M	H	L	M	H
S 18S [8]	2.0	1.7	0.6	5.2	5.2	5.2	XVV	XVV	XVV	-5.4	-5.4	-7.2	1.4	1.0	1.5
S 18S [9]	2.0	1.70	0.60	4.9	4.9	4.9	XVV	XVV	XVV	-3.6	-5.4	-5.4	0.1	1.3	0.2
F 2J/A [8] [13]	2.0	1.60	0.6 [15]	5.2	5.2	5.2 [15]	-XVV	-XVV	-XVV	-5.4	-5.4	-7.2 [15]	1.4	1.0	1.5 [15]
S 2J/A [8]	2.0	1.60	0.60	5.2	5.2	5.2	XVV	XVV	XVV	-5.4	-5.4	-7.2	1.4	1.0	1.5
S 19S [10]	2.0	1.6	0.6	5.2	5.2	5.2	XVV	XVV	XVV	-5.4	-5.4	-7.2	1.4	1.0	1.5
F 17A [10]	2.0	1.6	0.6 [15]	5.2	5.2	5.2 [15]	-XVV	-XVV	-XVV	-5.4	-5.4	-7.2 [15]	1.4	1.0	1.5 [15]
S 17A [10]	2.0	1.6	0.6	5.2	5.2	5.2	XVV	XVV	XVV	-5.4	-5.4	-7.2	1.4	1.0	1.5
S 17A [10] [14]	2.0	1.6	0.6	5.5	5.5	5.5	XVV	XVV	XVV	-5.4	-5.4	-7.2	1.0	0.6	1.1
S 17A [11] [14]	2.0	1.6	0.6	5.5	5.5	5.5	XVV	XVV	XVV	-5.4	-5.4	-7.2	1.0	0.6	1.1
S 20S [12] [14]	2.0	1.6	0.6	5.7	5.7	5.7	XVV	XVV	XVV	-5.4	-5.4	-7.2	0.8	0.4	0.9

NOTES:

[1] Power Availability limited by; rules governing BCDU power output (limits each channel to 10.5 kW).

[2] Includes power required for assembly and system tasks (including checkout of Regen ECLSS - stage ULF2 and subs)

[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 > 52 degrees

[5] USOS Power Consumption includes the following assumptions for ESA and JAXA system loads @ low ß:
ESA elements, 2729 watts; JAXA elements, R Sz 18S - 4296 watts, F 2J/A and subs - 4853 watts

[6] FGB Loads and Power Generation values provided by Khrunichev and includes the Soyuz transport vehicle docked to the FGB

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

[8] 1 Soyuz and 1 Progress attached to RS

[9] 1 Soyuz and 0 Progress attached to RS

[10] 1 Soyuz and 1 Progress attached to RS, 1 Soyuz attached to FGB

[11] 1 Soyuz and 1 Progress attached to RS, 1 Soyuz attached to FGB, 1 HTV (2600w load - per SSP 50273) attached to USOS

[12] 2 Soyuz and 1 Progress attached to RS, 1 Soyuz attached to FGB

[13] SSPTS load @ 7.2 kW

[14] MRM2 (330w) attaches to SM zenith (permanent configuration change)

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

[16] Power Availability **does** account for off-nominal effects of starboard SARJ anomaly (drag reduction not implemented)

Legend					
L	Low beta angle range	LTA	Launch To Activation	R Sz	Soyuz rotation
M	Mid beta angle range	F	Flight	XVV	Stage attitude
H	High beta angle range	S	Stage	-XVV	Shuttle mated attitude

4.0 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 54019_54020-ANX 5 **<TBD 1-16>**.

TABLE 4.2-1A INCREMENT 19 CREW TIME ALLOCATIONS

Increment 19 (ISS Crew of 3)	
Crew Time (hours)	**Total**
Total Capability [1] [6]	476
Systems Requirements [2]	507
Total Allocation to Utilization [3]	18.5
Utilization Requirements	[4]
Margin (+/-)	[5]

NOTES:

[1] Includes only ISS-19 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-19 crew member time allocated during Joint Soyuz and Shuttle missions. Refer to section 6 for average weekly crew time allocations.

[4] Utilization request is per SSP 54019_54020 ANX-5. **<TBD 1-16>**

[5] Any margin is made available to utilization.

[6] Total capability adjusted to account for only 1 shuttle flight in Increment 19.

TABLE 4.2-1B INCREMENT 20 CREW TIME ALLOCATIONS

Increment 20 (ISS Crew of 6)		
Crew Time (hours)	**Total**	
Total Capability [1]	3198	
Integrated Ops Requirements [2]	402	
	USOS	**RS**
Capability	1864	933
Segment Specific Systems Operations [3]	243	294
Segment Specific Traffic Operations [4]	449	165
EVAs		
3 RS EVAs		370
U.S. Crew time transfer for RS EVA [5]	185	
Total Allocation to Utilization [6] [7]	995	121

NOTES:

[1] Includes only ISS-20 crew duty time available during Independent Operations to perform assembly, system, and utilization activities. Includes one hour per crewmember per Saturday or Sunday.

[2] Integrated USOS and RS Operations Requirements include: integrated Medical operations, Emergency OBTs, Routine Operations (IMS updates, Audits, RS/US Miscellaneous Ops, crew tag ups, etc).

[3] Segment Specific Systems Operations include segmented: OBT, maintenance, assembly and PAO.

[4] Segmented Specific Traffic Operations include segmented: vehicle operations (Shuttle, Soyuz, Progress, HTV, Russian module), crew familiarization and departure preparation).

[5] Includes 185 hours of USOS support for Russian EVAs. Compensation is **<TBD 41>** required.

[6] Includes ISS-20 crew member time allocated during Joint Soyuz and Shuttle missions. Refer to section 6 for average weekly crew time allocations.

[7] Utilization request is per SSP 54019_54020-ANX 5 **<TBD 1-16>**.

4.0 3 ACCOMMODATIONS

Table 4.3-1, Increments 19 and 20 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 INCREMENTS 19 AND 20 ON-ORBIT RACK ACCOMMODATIONS (PRESSURIZED) (PAGE 1 OF 2)

Rack Volume Equivalents	ISS-19 and 20		
	18S-17A	17A-HTV1	HTV1-20S
Total Capability (RVE)	98.7	98.7	98.7
Node 1	4	4	4
Node 2	8	8	8
U.S. Lab	24	24	24
Airlock	4	4	4
Columbus	16	16	16
FGB [1]	13.2	13.2	13.2
JLP	8	8	8
JPM	23	23	23
NASA Allocation to System/Stowage			
Node 1	4	4	4
Node 2	8	8	8
U.S. Lab [2]	11	11	11
Airlock	4	4	4
Columbus	3	3	3
FGB	12.2	12.2	12.2
JLP	2.5	2.5	2.5
JPM	0	0	0
NASA Allocation to NASA Utilization			
Node 1	0	0	0
Node 2	0	0	0
U.S. Lab [2]	13	13	13
Airlock	0	0	0
Columbus	5	5	5
FGB	0	0	0
JLP	1.5	1.5	1.5
JPM	5.85	5.85	5.85
Total			
Amount subscribed [2]	20.35	22.35	23.35
Remaining available [2]	5	3	2

TABLE 4.3-1 INCREMENTS 19 AND 20 ON-ORBIT RACK ACCOMMODATIONS (PRESSURIZED) (PAGE 2 OF 2)

Rack Volume Equivalents	ISS-19 and 20		
	18S-17A	17A-HTV1	HTV1-20S
Roscosmos Allocation			
FGB System/Stowage	1.0	1.0	1.0
FGB Utilization	0	0	0
ESA Allocation			
Columbus System/Stowage	3	3	3
Columbus Utilization	5	5	5
JAXA Allocation			
JLP System/Stowage	2.5	2.5	2.5
JLP Utilization	1.5	1.5	1.5
JPM System/Stowage	11	11	11
JPM Utilization [3]	6.15	6.15	6.15

NOTES:

[1] The FGB has 13.2 m^3 of stowage volume, which is approximately equal to 13.2 RVEs. According to the July 1, 2006 Balance Agreement Addendum, the amount of Roscosmos stowage in the FGB from January 1 thru April 30, 2009 is 3.5 m^3. From May 1, 2009 thru 2011, Roscosmos stowage is 1.0 m^3.

[2] From ULF2 to 17A, the System allocation shown will be supplemented with six of the rack locations in the U.S. Lab allocated to Utilization for pre-positioning of Regen/ECLSS Racks, TeSS, CHeCS-1, and CHeCS-2. From 17A to 20S, the System allocation shown will be supplemented with five of the rack locations in the U.S. Lab allocated to Utilization for pre-positioning of Regen/ECLSS Racks, TeSS, and CHeCS-2.

[3] JAXA allocation of JPM Utilization includes 5 ISPR's, 1 stowage space, and 15% MELFI.

4.0 4 <RESERVED>

4.0 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 paragraphs 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 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 54019_54020-ANX 5 **<TBD 1-16>**.

TABLE 4.5-1 ADDITIONAL RESOURCE REQUIREMENT

USER [1]	Resource	Total Amount of Usage
Increments 19 and 20		
USOS Utilization: APEX/Cambium Payload (CSA/NASA)	Potable Water	0.2 Liter/week starting 2J/A stage

[1] User is defined as the IP needing the resource usage.

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 54019-XX or SSP 54020-XX. 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 MultiPurpose Logistics Module (MPLM) or HTV, Middeck Locker Equivalents (MLE)s for stowage on the middeck, and Cargo Transfer Bag Equivalents (CTBE)s for passive stowage in the MPLM and HTV, and RVEs for ATV. Progress and Soyuz data are described in terms of volume (in cubic meters (m^3)) and mass (in kilograms (kgs) and pounds (lbs)). The maintenance allocation includes prepositioned 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/return cargo.

SSP 54019_54020
Baseline

TABLE 5.0-1 ASCENT/DESCENT ALLOCATIONS AND MANIFEST SUMMARY (PAGE 1 OF 4)

Flight	Manifest Item Category	Mass (kg/lb)	Volume
32P	**DESCENT**		
	Nonrecoverable	---	---
33P	**ASCENT**		
	Progress-M1		
	Propellant	**<TBD 5-1>**	**<TBD 5-1>**
	Gas	**<TBD 5-1>**	**<TBD 5-1>**
	Water	**<TBD 5-1>**	**<TBD 5-1>**
	Dry Cargo	**<TBD 5-1>**	**<TBD 5-1>**
	Roscosmos	**<TBD 5-1>**	**<TBD 5-1>**
	Utilization	**<TBD 5-1>**	**<TBD 5-1>**
2J/A	**ASCENT**		
	Manifest Summary		
	JEF; 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)	39.0/85.98	4.88 MLE
	JAXA	0.52/1.15	0.02 MLE
	Maintenance	0.675/1.35	0.008 MLE
	Crew Provisions	15.87/35	1.325 MLE
	Utilization	130.7/288.09	5.94 MLE
	STS O_2 for EVA prebreathe	**<TBD 5-1>**	**<TBD 5-1>**
	O_2 transfer to ISS A/L HPGTs (as consumables permit)	0	
	N_2 transfer to ISS A/L HPGTs (as consumables permit)	13.61/30	
	Water transfer to ISS (8 CWCs, 6 ICWCs)	473/1043	473 liters
2J/A	**DESCENT**		
	Manifest Summary		
	JLE **<TBD 5-2>**; ICC-VLD (6 End of Life Batteries); Sidewall-1 (ANDE-2); Sidewall-2 (DragonSat)		
	Allocations		
	Russian (IELK)	30.5/67.24	3.89 MLE
	Maintenance	0.0/0.0	0.0 MLE
	Crew Provisions	19.95/44.0	1.84 MLE
	Utilization	88.9/196	3.925 MLE
19S	**ASCENT**		
	Manifest Summary		
	Soyuz-TMA		
	Allocations		
	Dry Cargo	**<TBD 5-1>**	**<TBD 5-1>**
	Roscosmos	**<TBD 5-1>**	**<TBD 5-1>** m^3

SSP 54019_54020
Baseline

TABLE 5.0-1 ASCENT/DESCENT ALLOCATIONS AND MANIFEST SUMMARY (PAGE 2 OF 4)

Flight	Manifest Item Category	Mass (kg/lb)	Volume
	Candidates	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Total	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Total with Candidates	**<TBD 5-1>**	**<TBD 5-1>** m^3
33P	**DESCENT**		
	Nonrecoverable	---	---
34P	**ASCENT**		
	Progress-M1		
	Propellant	**<TBD 5-1>**	**<TBD 5-1>**
	Gas	**<TBD 5-1>**	**<TBD 5-1>**
	Water	**<TBD 5-1>**	**<TBD 5-1>**
	Dry Cargo	**<TBD 5-1>**	**<TBD 5-1>**
	Roscosmos	**<TBD 5-1>**	**<TBD 5-1>**
	Utilization	**<TBD 5-1>**	**<TBD 5-1>**
17A	**ASCENT**		
	Manifest Summary		
	MPLM-1: 4 RSR-2s, 6 RSPs, 2 ZSRs, T-2, CQ-1, MELFI-2, FIR, MSRR, and N3 ARS racks		
	Sidewall Carrier mounted on an ICAPC		
	LMC: ATA and empty PFRAM		
	Middeck ISS content, Shuttle Integration H/W		
	Allocations		
	Russian	**<TBD 5-1>**	**<TBD 5-1>** CTBE
	ESA	**<TBD 5-1>**	**<TBD 5-1>** CTBE
	JAXA	**<TBD 5-1>**	**<TBD 5-1>** CTBE
	Maintenance		
	- Middeck	**<TBD 5-1>**	**<TBD 5-1>** MLE
	- MPLM	**<TBD 5-1>**	**<TBD 5-1>** Racks **<TBD 5-1>** CTBE
	Crew Provisions		
	- Middeck	**<TBD 5-1>**	**<TBD 5-1>** MLE
	- MPLM	**<TBD 5-1>**	**<TBD 5-1>** Racks **<TBD 5-1>** CTBE
	Utilization		
	- Middeck	**<TBD 5-1>**	**<TBD 5-1>** MLE

TABLE 5.0-1 ASCENT/DESCENT ALLOCATIONS AND MANIFEST SUMMARY (PAGE 3 OF 4)

Flight	Manifest Item Category	Mass (kg/lb)	Volume
	- MPLM	**<TBD 5-1>**	**<TBD 5-1>** Racks **<TBD 5-1>** CTBE
	STS O_2 for EVA prebreathe	**<TBD 5-1>**	**<TBD 5-1>**
	O_2 transfer to ISS A/L HPGTs (as consumables permit)	0	
	N_2 transfer to ISS A/L HPGTs (as consumables permit)	0	
	Water transfer to ISS (8 CWCs)	344/758	344 liters
17A	**DESCENT**		
	Manifest Summary MPLM-1: 4 RSRs, 6 RSP-1s MISSE PEC 6a and 6b on Sidewall Carriers mounted on an ICAPC LMC: Empty ATA, and EuTEF; and if required, a Return On Need (RON) ORU will return on PFRAM instead of EuTEF Middeck ISS content, Shuttle Integration H/W		
	Allocations		
	Russian	**<TBD 5-1>**	**<TBD 5-1>** CTBE
	ESA	**<TBD 5-1>**	**<TBD 5-1>** CTBE
	JAXA	**<TBD 5-1>**	**<TBD 5-1>** CTBE
	Maintenance		
	- Middeck	**<TBD 5-1>**	**<TBD 5-1>** MLE
	- MPLM	**<TBD 5-1>**	**<TBD 5-1>** Racks **<TBD 5-1>** CTBE
	Crew Provisions		
	- Middeck	**<TBD 5-1>**	**<TBD 5-1>** MLE
	- MPLM	**<TBD 5-1>**	**<TBD 5-1>** Racks **<TBD 5-1>** CTBE
	Utilization		
	- Middeck	**<TBD 5-1>**	**<TBD 5-1>** MLE
	- MPLM	**<TBD 5-1>**	**<TBD 5-1>** Rack **<TBD 5-1>** CTBE

TABLE 5.0-1 ASCENT/DESCENT ALLOCATIONS AND MANIFEST SUMMARY (PAGE 4 OF 4)

Flight	Manifest Item Category	Mass (kg/lb)	Volume
5R	**ASCENT**		
	Manifest Summary		
	MRM-2		
HTV1	**ASCENT**		
	Cargo		
	Pressurized: 7 HRR	**<TBD 5-1>**	**<TBD 5-1>**
	Unpressurized:	**0**	**0**
	Utilization		
	Pressurized: 1 ISPR	**<TBD 5-1>**	**<TBD 5-1>**
	Unpressurized:		
	JAXA: SMILES	**<TBD 5-1>**	**<TBD 5-1>**
	NASA: HREP	**<TBD 5-1>**	**<TBD 5-1>**
	DESCENT		
	Nonrecoverable	---	---
20S	**ASCENT**		
	Manifest Summary		
	Soyuz-TMA		
	Allocations		
	Dry Cargo		
	Roscosmos	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Candidates	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Total	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Total with Candidates	**<TBD 5-1>**	**<TBD 5-1>** m^3
18S	**DESCENT**		
	Manifest Summary		
	Soyuz-TMA		
	Allocations		
	Dry Cargo		
	Roscosmos	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Candidates	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Total	**<TBD 5-1>**	**<TBD 5-1>** m^3
	Total with Candidates	**<TBD 5-1>**	**<TBD 5-1>** m^3

NOTES:
[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] Required transfer quantities shall be consistent with the plan to have ISS A/L tanks full at Shuttle retirement.

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)

Flight	Ascent	On-Orbit	Descent
2J/A [1]	500 W	500 W	500 W
17A	500 W	500 W	500 W

Notes:
[1] Can be adjusted on a mission by mission basis depending on Cryo availability.

6.0 REQUIREMENTS

This section defines all of the unique programmatic requirements for Increment 19 and Increment 20 flight and stage intervals necessary to ensure successful completion of planned assembly, maintenance, operations, and utilization of the International Space Station (ISS) during each increment. Generic requirements and constraints are documented in SSP 50261-01.

The section 6 flight and stage paragraphs also include generic groupings of tasks in paragraphs 6.x.2. These generic groupings of tasks include the integrated Roscosmos, National Aeronautics and Space Administration (NASA), Canadian Space Agency (CSA), European Space Agency (ESA), and Japan Aerospace Exploration Agency (JAXA) requirements that are to be performed within the assigned allocation of crew time (in terms of average weekly crew hours). The groups include maintenance, medical, payload (utilization), Onboard 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.

6.0 1 <RESERVED>

6.0 2 INCREMENT 19 SPECIFIC REQUIREMENTS

This paragraph identifies requirements applicable during Increment 19. Detailed multilateral requirements and agreements for Payloads/Utilization are specified in SSP 54019_54020-ANX 5 **<TBD 1-16>**.

6.0 2 1 RUSSIAN UTILIZATION EXPERIMENTS

Russian science experiments to be conducted during Increment 19 shall consist of the following:

<TBD 6-1>

6.0 3 FLIGHT 17 SOYUZ UNDOCK TO FLIGHT 2J/A DOCK REQUIREMENTS (STAGE 18S)

This paragraph identifies requirements applicable from Flight 17 Soyuz undock to Flight 2J/A dock including requirements associated with 32 Progress-M undocking, 18 Soyuz-TMA relocation, and 33 Progress-M docking.

6.0 3 1 <RESERVED>

6.0 3 2 STAGE 18S 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 high priority ISS medical operations (average of 10 crew hours per week for crew of 3). **[IVA]**
3. Complete 32 Progress-M loading of trash and undock from Docking Compartment (DC)1 Nadir port. **[IVA] [Imagery]**
4. Relocate 18 Soyuz from Service Module (SM) Aft port to DC1 Nadir port. **[IVA] [Imagery]**
5. Dock 33 Progress-M to SM Aft port and perform cargo/propellant transfer. **[IVA] [Imagery]**
6. Perform high-priority OBT (average of 4.0 crew hours per week) substituting planned Space Station Remote Manipulator System (SSRMS) tasks as OBT when appropriate. **[IVA] [Robotics]**
7. Perform checkout and preparation tasks for Flight 2J/A. **[IVA]**
   A. Perform imagery of Orbiter Thermal Protection System (TPS) during rendezvous R-bar Pitchover Maneuver (RPM) and downlink the data. **[Imagery]**
      - Perform proficiency training for imagery of Orbiter during RPM.
   B. Position Mobile Transporter (MT)/SSRMS at Work Site (WS) # **<TBD 6-2>** for Flight 2J/A joint operations. **[Robotics] [Ground]**
   C. Perform SSRMS pre-launch checkout at Mobile Servicing System (MSS) WS # **<TBD 6-2>**. **[Robotics] [Ground]**
   D. Perform Japanese Experiment Module Remote Manipulator System (JEMRMS) pre-launch checkout [include Backup Drive System (BDS)].
   E. Unstow and configure Joint Airlock.
   F. Complete Flight 2J/A pre-pack.

G. Configure and checkout EVA equipment.

H. Perform training and preparation for joint operations.

I. Complete Flight Plan and EVA timeline reviews.

J. Perform tool preparation.

K. Perform transfer tag-up.

8. Perform checkout and preparation tasks for Flight 19 Soyuz arrival. **[IVA]**

   A. Perform training and preparation for joint operations.

   B. Perform tool preparation.

   C. Perform transfer tagup.

9. Continue 6-crew Regen Environmental Control and Life Support System (ECLSS) and Habitability Hardware activation and checkout (if not completed in Increment 18). **[IVA] [Imagery]**

   A. Continue to run Waste and Hygiene Compartment (WHC), Water Recovery System (WRS) and Galley for a total of 90 days or greater continuous operations.

      1) Perform micro sampling and in-flight analysis from Potable Water Dispenser (PWD) and Total Organic Carbon Analyzer (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 and micro archive).

   B. Run WHC, WRS, Galley and OGS integrated for a total of 90 days or greater continuous operations

      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).

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

   D. Continue activation and check out of ARED.

10. Perform Expedition (E)19 crew Station Support Computer (SSC) software reloads. **[IVA]**

11. Perform high priority ISS payload operations (average of **<TBD 6-3>** crew hours, total combined for all International Partners (IP)s, per week). **[IVA]**

12. Perform high priority PAO events (average of 2.0 crew hours per week). **[IVA] [Imagery]**
13. Perform medium priority ISS maintenance. **[IVA] [Imagery]**
14. Perform medium priority ISS payload operations (combined crew time total for all IPs). **[IVA]**
15. Perform remaining ISS PAO activities. **[IVA] [Imagery]**
16. Perform remaining maintenance. **[IVA]**
17. Perform remaining ISS payload operations. **[IVA]**
18. Perform SSRMS/Mobile Remote Servicer (MRS) Base System (MBS) and Special Purpose Dexterous Manipulator (SPDM) On-orbit Checkout Requirements (OCRs) per the priorities in Appendix H **<TBD H-1>**. **[IVA] [Robotics] [Imagery] [Ground]**
19. Reboost ISS with SM Aft thrusters as required. **[Ground]**
20. Perform Station Development Test Objective (SDTO) 13005-U, ISS Structural Life Validation and Extension, for ISS alone reboost [ISS Wireless Instrumentation System (IWIS) required]. **[IVA] [Imagery] [Ground]**
21. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 32 Progress-M undocking from the DC1 Nadir port (IWIS required). **[IVA] [Ground]**
22. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 18S relocation from the SM Aft port to the DC-1 Nadir port. **[IVA] [Ground]**
23. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 33 Progress-M docking to the SM Aft port (IWIS required). **[IVA] [Ground]**
24. Perform SDTO 17011-U/R, Validation of On-Orbit Methodology for the Assessment of Cardiac Function and Changes in the Circulating Volume Using Ultrasound and "Braslet-M" Occlusion Cuffs (if sufficient subject data not collected during Increment 18). **[IVA]**
25. Perform SDTO 25007-U, Spatial Differences in CO2 Concentrations on ISS (Part 2). **[IVA]**

6.0 3 3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.0 3 3 1 THE 32 PROGRESS-M SHALL UNDOCK FROM THE DC1 NADIR PORT.

6.0 3 3 2 THE 18 SOYUZ-TMA SHALL RELOCATE FROM THE SM AFT PORT TO THE DC1 NADIR PORT.

6.0 3 3 3 THE 33 PROGRESS-M SHALL DOCK TO THE SM AFT PORT.

6.0 3 3 4 THE ISS SHALL BE IN CONTROL MOMENT GYROSCOPE (CMG) CONTROL WITHOUT ISS THRUSTERS FIRING FOR THE FOLLOWING ACTIVITIES:

None identified.

6.0 3 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.

6.0 3 4 CONTINGENCY REQUIREMENTS

6.0 3 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 assembly tasks as follows:

   None identified.

C. Remove/replace critical spares as follows:

   - JEMRMS Joint Electronics Unit (JEU)

6.0 3 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 SSP 50261-01, paragraph 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) Multiplexer/Demultiplexer (MDM) Remove and Replace (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 Direct Current-to-Direct Current Converter Units (DDCU)s 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 (RPCM)s 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 **<To Be Resolved (TBR) 6-1>**
3. Perform Solar Array Rotary Joint (SARJ) recovery activities.
    a. Cleaning and lubrication activities
    b. R&R Trundle Bearing Assemblies (TBA)s
    c. Remove SARJ Launch Restraints (SLR)s
    d. R&R Rotary Joint Motor Controllers (RJMC)s
    e. R&R Drive Lock Assemblies (DLA)s
4. Transition the SARJ hardware for outboard operations.

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

None identified.

C. Remove/replace critical spares as follows:

None identified.

D. Contingency MT safing requirement:

- Contingency EVA power cable routing for stranded MT. (For Increment 19, this requirement will be met with already accomplished skills based training and additional OBT if the contingency is invoked.)

6.0 3 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 reentry, 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, NASA/RSA Bilateral S&MA Process Requirements for International Space Station.

6.0 3 5 1 PLANNED JETTISON

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

A. United States (U.S.): None identified.

B. Russian: None identified.

6.0 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. U.S.: None identified.

B. Russian: None identified.

6.0 3 6 GROUND SYSTEMS REQUIREMENTS

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

B. Ground support is highly desired to operate Space Acceleration Measurement System (SAMS)-II, Microgravity Acceleration Measurement System (MAMS) and Russian Optical Linear Accelerometer (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.

6.0 4 FLIGHT 2J/A REQUIREMENTS

This paragraph identifies 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 2J/A Mission Integration Plan.

6.0 4 1 <RESERVED>

6.0 4 2 FLIGHT 2J/A 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 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 five 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 Pressurized Mating Adapter (PMA)-2 port and perform mandatory crew safety briefing for all crew members. **[IVA] [Imagery]**
2. Rotate E18/19 FE-2 (15A) crew member with E19/20 FE-2 (2J/A) crew member, transfer mandatory crew rotation cargo per Flight 2 J/A Transfer Priority List (TPL) in Appendix I and perform mandatory tasks consisting of Individual Equipment Liner Kit (IELK) install and Sokol suit checkout. **[IVA] [Imagery]**
3. Transfer mandatory quantities of water from Orbiter to ISS per Flight 2 J/A TPL in Appendix I. **[IVA]**
4. Transfer and stow critical items per Flight 2 J/A TPL in Appendix I. **[IVA]**
5. Install Japanese Experiment Module (JEM) Exposed Facility (JEF) to JEM Pressurized Module (JPM) using SSRMS. **[EVA] [Robotics] [Imagery] [Ground] [IVA]**
   A. Disconnect JEF Launch to Activation (LTA) cable and install protective cap.
   B. Remove 4 JPM active Exposed Facility Berthing Mechanism (EFBM) thermal covers and 1 contamination cover, and 1 JEF passive EFBM thermal cover.
   C. Provide EVA Guidance Control Assistant (GCA) as required.
   D. Remove LTA Box (LTAB) thermal cover, remove LTA mode plug and replace with ISS2 mode plug, re-install LTAB thermal cover.
   E. Activate and perform partial checkout of JEF to allow installation of JEM Experiment Logistics Module - Exposed Section (JLE), Inter-Orbit Communication System (ICS), MAXI, and Space Environment Data Acquisition-Attached Payload (SEDA-AP).

6. Install Integrated Cargo Carrier-Vertical Light Deployable (ICC-VLD) on the Payload ORU Accommodation (POA) using Shuttle Remote Manipulator System (SRMS) and SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**
   - Disconnect ICC-VLD LTA cable
7. Install JLE to JEF utilizing SRMS handoff to SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**
   A. Install, activate, and checkout JEF forward camera (1) remove camera thermal covers (2) and mate connector (needed for JLE install and HTV operations).
   B. Activate and checkout JLE
8. R&R P6 batteries (6) using SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**
9. Install ICS on JEF.
   A. Remove 4 thermal covers: ICS antenna [Payload Interface Unit (PIU)], sensor (forward), and Nadir skirt (2). **[EVA] [Imagery]**
   B. Release ICS antenna hold mechanisms (2). **[EVA]**
   C. Perform JEMRMS calibration (to support JLE payload transfers). **[Robotics] [Imagery] [IVA] [Ground]**
   D. Install ICS on JEF Exposed Facility Unit (EFU) #7 using JEMRMS. **[Robotics] [Imagery] [IVA]**
   E. Activate ICS and deploy ICS-Exposed Facility (EF) antenna. **[Ground]**
10. Install ISS critical spare, Space to Ground Antenna (SGANT) on External Stowage Platform (ESP)3 Site #5 using SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**
11. Install ISS critical spare, Pump Module (PM) on ESP3 Site #3 using SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**
12. Install ISS critical spare, Linear Drive Unit (LDU) on ESP3 Site #4 using SSRMS. **[EVA] [Robotics] [Imagery] [IVA]**
13. Return ICC-VLD, required for future assembly sequence and Shuttle manifesting, to payload bay using SSRMS. **[EVA] [Robotics] [Imagery]**
    - Connect ICC-VLD LTA cable
14. Remove Monitor of All-Sky X-ray Image (MAXI) thermal (PIU), and contamination covers and install MAXI on EF (EFU#1) using JEMRMS, and activate MAXI. **[EVA] [Robotics] [Imagery] [IVA] [Ground]**
15. Release SEDA-AP back up launch lock mechanism, and install SEDA-AP on EF (EFU#9) using JEMRMS, and activate SEDA-AP. **[EVA] [Robotics] [Imagery] [IVA] [Ground]**
16. Return JLE to Orbiter payload bay utilizing SSRMS handoff to SRMS. **[Robotics] [Imagery] [IVA]**

17. Perform minimum crew handover of 12 hours per rotating crew member which includes crew safety handover. **[IVA]**
18. Transfer remaining cargo items per Flight 2 J/A TPL in Appendix I. **[IVA]**
    - Perform Radiation Areas Monitors (RAMs) Installation/Return, qty. 24. **[IVA] [Imagery]**
19. Perform daily ISS payload status checks as required. **[IVA]**
20. Install and activate JEF aft camera [needed for HTV1]. **[EVA] [Imagery]**
    A. Remove camera thermal covers (2) and mate connector.
    B. Remove LTAB thermal cover, remove ISS2 mode plug and replace with ISS mode plug, re-install LTAB thermal cover.
21. 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]**
    - Remove remaining EF thermal covers. **[EVA] [Imagery]**
        1) Robotics-compatible (R)-ORU Multi-Layer Insulation (MLI) (5) for Fluid Pump Package (FPP) -a, -b, EF System Controller (ESC) -a, -b, and Video Switcher (VSW).
        2) EVA-compatible (E)-ORU MLI (4) for Heater Control Equipment (HCE) -a, -b, Thermal Interface Unit (TIU), and EFU Driver Unit (EDU).
        3) Small fine arm Storage Equipment (SSE) MLI (2) for Structure Latch Mechanism (SLM) and Tool Fixture (TF) -2.
        4) EFU #2, 4, 8, and 12 MLI.
22. Deploy Atmospheric Neutral Density Experiment (ANDE)2 payloads. **[IVA] [Imagery]**
23. Deploy DragonSat payloads. **[IVA] [Imagery]**
24. Perform daily middeck activities to support payloads (includes cases where Shuttle crew also performs payloads on the ISS). **[IVA]**
25. Perform ISS payload research operations tasks. **[IVA]**
26. Transfer N2 from the Orbiter to the ISS Airlock HPGTs. Required transfer quantities shall be consistent with the plan to have A/L tanks full at Shuttle retirement. **[IVA]**
27. Transfer O2 from the Orbiter to the ISS Airlock High Pressure Gas Tank (HPGT)s. Required transfer quantities shall be consistent with the plan to have ISS Airlock (A/L) tanks full at Shuttle retirement. **[IVA]**
28. Perform Program-approved IVA get-ahead tasks. The following IVA get-ahead tasks do not fit in the existing IVA timelines; however, the IVA team will be trained and ready to perform should the opportunity arise. **[IVA] [Imagery]**

    None identified.

29. Reboost the ISS with the Orbiter if mission resources allow and are consistent with ISS trajectory analysis and planning. **[IVA]**
30. Perform imagery survey of the ISS exterior during Orbiter fly around after undock. **[IVA] [Imagery]**
31. Perform an additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crew member total). **[IVA]**
32. Perform Maui Analysis of Upper Atmospheric Injections (MAUI) and Shuttle Exhaust Ion Turbulence Experiments (SEITE) (payloads of opportunity - not required during docked ops). **[IVA]**
33. 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.
    B. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during 2J/A Orbiter docking (IWIS highly desired, but not required).
    C. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, Dedicated Thruster Firing, as consumables allow (IWIS required).
    D. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during 2J/A Orbiter undocking (IWIS highly desired, but not required).

6.0 4 3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.0 4 3 1 THE MAXIMUM RENDEZVOUS ALTITUDE FOR FLIGHT 2J/A SHALL BE 195 NAUTICAL MILES (NMI).

6.0 4 3 2 THE ORBITER SHALL DOCK AT PMA-2.

6.0 4 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.

6.0 4 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.

6.0 4 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 Mission Operations Directorate (MOD) for incorporation into planned timelines via a the CHIT system at approximately L-2 weeks for specific vehicle launch.

6.0 4 4 CONTINGENCY REQUIREMENTS

6.0 4 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. 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 [Orbiter Boom Sensor System (OBSS) handoff] and downlink data.

6.0 4 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) #1 of JEF
5. End Effector release from FRGF#2 of JEF
6. End Effector release from FRGF#1 of JLE
7. End Effector release from FRGF#2 of 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. Deployment Mechanism (DM) deployment of ICS-EF

3. Deployment Latch Mechanism (DLM) latch of ICS-EF
4. End Effector release from FRGF of ICS-EF, SEDA-AP, or MAXI FRGF
5. EF Payload Release from Payload Attach Mechanism (PAM)
6. Extravehicular Excursion Unit (EEU) Manual Release
7. JLE PIU Manual Release
8. Primary Locking Mechanism (PLM) release or Extendable 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 SSP 50261-01.

None identified.

6.0 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.

6.0 4 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.

6.0 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.

6.0 4 6 GROUND SYSTEMS REQUIREMENTS

None Identified.

6.0 4 7 ISS REQUIREMENTS ON SHUTTLE DURING NON-DOCKED TIME FRAME

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

6.0 5 FLIGHT 19 SOYUZ REQUIREMENTS

This paragraph identifies requirements during Flight 19 Soyuz-TMA.

6.0 5 1 <RESERVED>

6.0 5 2 FLIGHT 19S 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 19S 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 the successful completion of this flight.

1. Dock Flight 19 Soyuz-TMA to FGB Nadir port. **[IVA] [Imagery]**

6.0 5 3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.0 5 3 1 FLIGHT 19S SHALL DOCK AT THE FGB NADIR PORT

6.0 5 3 2 THE ISS SHALL BE IN CMG CONTROL WITH ALL THRUSTERS INHIBITED FOR THE FOLLOWING ACTIVITIES:

None identified.

6.0 5 3 3 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.

6.0 5 4 CONTINGENCY REQUIREMENTS

6.0 5 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.):

- ISS critical maintenance tasks as follows:

  None identified.

6.0 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 reentry, 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.

6.0 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.

6.0 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.

6.0 5 6 GROUND SYSTEMS REQUIREMENTS

None Identified.

6.0 6 INCREMENT 20 SPECIFIC REQUIREMENTS

This paragraph identifies requirements applicable during Increment 20. Detailed multilateral requirements and agreements for Payloads/Utilization will be specified in SSP 54019_54020-ANX 5 **<TBD 1-16>**.

6.0 6 1 RUSSIAN UTILIZATION EXPERIMENTS

Russian science experiments to be conducted during Increment 20 shall consist of the following:

<TBD 6-1>

6.0 6 2 VISITING CREW UTILIZATION EXPERIMENTS

Visiting crew utilization experiments to be performed during Increment 20, Flight 20 Soyuz shall consist of the following:

<TBD 6-1>

6.0 7 EXPEDITION CREW AUGMENTATION TO FLIGHT 17A DOCK REQUIREMENTS (STAGE 19S)

This paragraph identifies requirements applicable from Expedition Crew augmentation to Flight 17A dock, including requirements associated with 33 Progress undocking and 34 Progress docking.

6.0 7 1 <RESERVED>

6.0 7 2 STAGE 19S 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 two Station-based Orlan EVAs, shall be accomplished for successful completion of this interval.

1. Perform mandatory 19 Soyuz crew safety briefing and augment Expedition crew with E20 FE-3, FE-4, and FE-5, transfer mandatory crew rotation cargo and perform mandatory tasks including Sokol suit checkout. (E19 CDR and FE-1 remain on ISS as the E20 CDR and FE-1.) **[IVA]**
2. Complete unfinished Flight 2J/A objectives as documented in Section 6.4.2.
3. Undock Flight 2J/A from PMA-2 port. **[IVA] [Imagery]**
4. Perform 12 hours crew handover per arriving 19S crew member. **[IVA]**
5. Perform high priority ISS maintenance and Shuttle Launch Commit Criteria for the next Shuttle Flight (if not completed in Increment 19). **[IVA] [Imagery]**
6. Complete 33 Progress-M loading of trash and undock from the SM Aft port. **[IVA] [Imagery]**
7. Dock 34 Progress-M to SM Aft port and perform cargo/propellant transfer. **[IVA] [Imagery]**
8. Transfer and stow critical items. **[IVA]**
9. Perform ISS medical operations (average of 18 crew hours per week for crew of 6). **[IVA]**
10. Perform high-priority OBT (average of 4.0 crew hours per week) substituting planned SSRMS tasks as OBT when appropriate. **[IVA] [Robotics]**
11. Perform checkout and preparation tasks for Flight 17A. **[IVA]**
    A. Perform imagery of Orbiter TPS during rendezvous RPM and downlink the data. **[Imagery]**
       - Perform proficiency training for imagery of Orbiter during RPM.
    B. Position MT/SSRMS at WS # **<TBD 6-2>** for Flight 17A joint operations. **[Robotics] [Ground]**
    C. Perform SSRMS pre-launch checkout at MSS WS # **<TBD 6-2>**. **[Robotics] [Ground]**

D. Unstow and configure Joint Airlock.

E. Perform Flight 17A pre-pack.

F. Configure and checkout EVA equipment.

G. Perform training and preparation for joint operations.

H. Complete Flight Plan and EVA timeline reviews.

I. Perform tool preparation.

J. Perform transfer tag-up.

K. Perform Node 2 Nadir Active Common Berthing Mechanism (ACBM) sealing surface inspection using SSRMS. **[IVA] [Robotics] [Imagery]**

12. Perform E20 crew SSC software reloads. **[IVA]**
13. Perform checkout and preparation tasks for Mini-Research Module (MRM)2 arrival. **[IVA]**
14. Transition of Service Module (SM) 7.05 to SM 8.03. **[IVA] [Ground]**
15. Perform Orlan-based EVA #22. **[EVA] [Imagery]**
    A. Install Kurs antenna mono-units on SM zenith port.
    B. Connect Kurs' antenna feeder unit (АФУ) cables.
    C. Disassemble and temporarily secure the БТН-1М scientific hardware on SM to exclude an impact with MRM2 in case of oscillation during MRM2 docking to SM.
16. Perform Orlan-based EVA #23. **[EVA] [Imagery]**
    A. Relocate the conical cover from the -Y axis docking assembly [СтА] to +Y axis docking assembly of the SM transfer compartment.
    B. Relocate the flat cover from the +Y axis docking assembly to -Y axis docking assembly.
17. Perform Columbus Software Cycle 12 transition. **[IVA] [Ground]**
18. Complete remaining JEF checkout activities not completed during Flight 2J/A. **[Ground]**
    A. Complete JEF checkout per Appendix H **<TBD H-1>**.
    B. Complete ICS checkout/Commissioning Activities per Appendix H **<TBD H-1>**.
    C. Complete MAXI Checkout/Commissioning Activities per Appendix H **<TBD H1>**.
    D. Complete SEDA-AP Checkout/Commissioning Activities per Appendix H **<TBD H-1>**.
19. Perform high priority ISS payload operations (average of **<TBD 6-3>** crew hours, total combined for all IPs per week). **[IVA]**

20. Perform high priority PAO events (average of 9.0 crew hours per week). **[IVA] [Imagery]**
21. Complete commissioning of SSRMS Force Moment Sensor (FMS)/Force/Moment Accommodation (FMA) capability in support of HTV1. **[IVA] [Robotics]**
22. Invoke embedded patch – Portable Computer System (PCS) R11 to PCS R11.MSS6. **[IVA]**
23. Uplink and transition to MSS 6 software and complete checkout in support of HTV1. **[IVA]**
24. Perform HTV1 PROX checkout #3. **[IVA] [Ground]**
25. Perform HTV1 Crew Monitoring checkout. **[IVA] [Ground]**
26. Perform medium priority ISS maintenance. **[IVA] [Imagery]**
27. Perform medium priority ISS payload operations (average of **<TBD 6-3>** crew hours per week). **[IVA]**
28. Transfer remaining items from 19S TMA to ISS. **[IVA]**
29. Perform remaining ISS PAO activities. **[IVA] [Imagery]**
30. Perform remaining maintenance. **[IVA]**
31. Perform remaining ISS payload operations. **[IVA]**
32. Reboost ISS with Progress as required. **[Ground]**
33. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, for ISS alone reboost (IWIS required). **[IVA] [Imagery] [Ground]**
34. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 19S docking to the FGB Nadir port (IWIS required). **[IVA] [Ground]**
35. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 33P undocking from SM Aft port (IWIS required). **[IVA] [Ground]**
36. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 34P docking to SM Aft port (IWIS required). **[IVA] [Ground]**
37. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, Dedicated Thruster Firing, as consumables allow (IWIS required). **[IVA] [Ground]**
38. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during JEF berthing (IWIS required). **[IVA] [Imagery] [Ground]**
39. Perform SDTO 15008-U, Solid State Lighting Module (SSLM). **[IVA]**
40. Perform autonomous activity SDTO 15010-E, On-orbit demonstration of a Novel LEON-2 based Computer System. **[IVA]**
41. Perform SDTO 17003-U, Soldering in Reduced Gravity Environment with US Soldering Kit **<TBR 6-3>. [IVA] [Imagery]**
42. Perform SDTO 17009-U, Space Video Gateway. **[IVA] [Imagery]**

43. Perform SDTO 17010-J/U, Multi-Protocol Converter for HDTV. **[IVA] [Imagery]**
44. Perform SDTO 17012-U, Joint ISSP-CxP Component Repair Experiment 1 (CRE). **[IVA] [Imagery]**
45. Perform ARISS contact for E20 FE-3. **[IVA]**

6.0 7 3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.0 7 3 1 THE ORBITER SHALL UNDOCK FROM PMA-2.

6.0 7 3 2 THE 33 PROGRESS-M SHALL UNDOCK FROM THE SM AFT PORT.

6.0 7 3 3 THE 34 PROGRESS-M SHALL DOCK TO THE SM AFT PORT.

6.0 7 3 4 THE ISS SHALL BE IN CMG CONTROL WITHOUT ISS THRUSTERS FIRING FOR THE FOLLOWING ACTIVITIES:

None identified.

6.0 7 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.

6.0 7 4 CONTINGENCY REQUIREMENTS

6.0 7 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 assembly tasks as follows:

   None identified.

C. Remove/replace critical spares as follows:

   None identified.

D. Complete critical unfinished assembly tasks as follows:

- If JLE is present on JEF, then, move JLE to JLP before HTV arrival to accommodate a Payload External Pallet on the JEF.

6.0 7 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 SSP 50261-01, paragraph 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.

   The tasks listed in Paragraph 6.3.4.2 are still applicable.

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

   None identified.

C. Remove/replace critical spares as follows:

   None identified.

D. Contingency MT safing requirement:

   - Contingency EVA power cable routing for stranded MT. (For Increment 20, this requirement will be met with already accomplished skills based training and additional OBT if the contingency is invoked.)

6.0 7 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 reentry, 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.

6.0 7 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.

6.0 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.

6.0 7 6 GROUND SYSTEMS REQUIREMENTS

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

B. Ground support is highly desired to operate Space Acceleration Measurement System (SAMS)-II, Microgravity Acceleration Measurement System (MAMS) and Russian Optical Linear Accelerometer (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.

6.0 8 FLIGHT 17A REQUIREMENTS

This paragraph identifies requirements during Flight 17A. Detailed requirements and agreements between the ISS Program and the SSP are specified in NSTS 21546, International Space Station-17A Mission Integration Plan.

6.0 8 1 <RESERVED>

6.0 8 2 FLIGHT 17A 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 17A 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 two Station-based EVAs to be performed by the Orbiter crew, shall be accomplished for the successful completion of this flight.

1. Dock Shuttle Flight 17A to PMA-2 port and perform mandatory crew safety briefing for all crew members. **[IVA] [Imagery]**
2. Berth Multi-Purpose Logistics Module (MPLM) to ISS Node 2 nadir port using SSRMS, activate and checkout MPLM. **[IVA] [Robotics]**
3. Rotate E19/20 FE-2 (2J/A) crew member with E20/21 FE-2 (17A) crew member, transfer mandatory crew rotation equipment per Flight 17A TPL in Appendix I and perform mandatory tasks consisting of IELK install and Sokol suit checkout. **[IVA] [Imagery]**
4. Transfer mandatory quantities of water from Orbiter to ISS per Flight 17A TPL in Appendix I. **[IVA]**
5. Transfer Treadmill-2 (T-2) Rack and associated system components to ISS and install in interim rack location. **[IVA]**
6. Transfer and stow critical items per Flight 17A TPL in Appendix I including Task Priorities 1-3. **[IVA]**
7. Perform minimum crew handover of 12 hours per rotating crewmember which includes crew safety handover. **[IVA]**
8. Transfer, remove, and replace Ammonia Tank Assembly (ATA) from the Lightweight Multi-Purpose Experiment Support Structure (MPESS) Carrier (LMC) to the P1 site using SSRMS. Temp stow of ATA required **<TBD 6-8>**. **[EVA] [Robotics]**
9. Return empty P1 ATA to the LMC using SSRMS. Temp stow of P1 ATA required **<TBD 6-8>**. **[EVA] [Robotics]**
10. Return MPLM to Orbiter Payload Bay (PLB) using SSRMS. **[IVA] [Robotics]**
11. Transfer and install remaining ISS MPLM racks to the ISS. **[IVA]**
    A. Deck Crew Quarters.
    B. Node 3 Air Revitalization System rack (N3 ARS).

C. Fluids Integration Rack (FIR).

D. Materials Science Research Rack (MSRR).

E. Minus Eighty Laboratory Freezer-2 (MELFI-2).

12. Transfer European Technology Exposure Facility (EuTEF)/Flight Support Equipment (FSE) Integrated Assembly (IA) from ISS Columbus Exposed Payload Facility (EPF) to the LMC using SSRMS. **[EVA] [Robotics]**
13. Transfer Materials International Space Station Experiment (MISSE) 6a and 6b Passive Experiment Container (PEC)s from ISS Columbus EPF to the Orbiter Cargo Bay using SSRMS. **[EVA] [Robotics]**
14. Perform ISS daily ISS payload status checks as required. **[IVA]**
15. Perform daily middeck activities to support payloads (includes cases where Shuttle crew also performs payloads on the ISS). **[IVA]**
16. Perform ISS Sortie and Short Duration Bioastronautics Investigations (SDBI) payloads. **[IVA]**
17. Perform ISS payload research operations tasks. **[IVA]**
18. Transfer remaining cargo items per Flight 17A TPL in Appendix I. **[IVA]**
19. R&R the S0 Rate Gyro Assembly (RGA). **[EVA]**
20. Remove MPLM Baseplate Ballast Assemblies (BBA)s and Lamp Housing Assemblies (LHA)s and transfer to ISS. If required, install the failed ISS- BBAs/ LHAs back into MPLM. **[IVA]**
21. Transfer N_2 from the Orbiter to the ISS Airlock HPGTs. Required transfer quantities shall be consistent with the plan to have ISS A/L tanks full at Shuttle retirement. **[IVA]**
22. Transfer O_2 from the Orbiter to the ISS Airlock HPGTs. Required transfer quantities shall be consistent with the plan to have ISS A/L tanks full at Shuttle retirement. **[IVA]**
23. Perform an additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crew member total). **[IVA]**
24. The following EVA 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.

25. 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]**

    None identified.

26. Reboost the ISS with the Orbiter if mission resources allow and are consistent with ISS trajectory analysis and planning. **[IVA]**
27. Perform imagery survey of the ISS exterior during Orbiter fly around after undock. **[IVA] [Imagery]**
28. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during Shuttle mated Reboost (IWIS required). **[IVA] [Ground] [Imagery]**
29. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during 17A Orbiter docking (IWIS required). **[IVA] [Ground] [Imagery]**
30. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during 17A Orbiter undocking (IWIS required). **[IVA] [Ground] [Imagery]**

6.0 8 3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.0 8 3 1 THE MAXIMUM RENDEZVOUS, ALTITUDE FOR FLIGHT 17A SHALL BE 352 KILOMETERS (KM)/(190 NMI).

6.0 8 3 2 THE ORBITER SHALL DOCK AT PMA-2.

6.0 8 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.

6.0 8 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.

6.0 8 3 5 THE SSRMS SHALL BE LOCATED ON THE NODE 2 AT THE BEGINNING OF FLIGHT 17A

6.0 8 4 CONTINGENCY REQUIREMENTS

6.0 8 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 Flight 17A assembly tasks as follows:

6.0 8 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.

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.

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 SSP 50261-01.

6.0 8 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 reentry, 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.

6.0 8 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.

6.0 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.

6.0 8 6 GROUND SYSTEMS REQUIREMENTS

None Identified.

6.0 8 7 ISS REQUIREMENTS ON SHUTTLE DURING NON-DOCKED TIME FRAME

None Identified.

6.0 9 FLIGHT 17A UNDOCK TO FLIGHT 20 SOYUZ-TMA DOCK REQUIREMENTS (STAGE 17A)

This paragraph identifies requirements applicable from Flight 17A undock to Flight 20 Soyuz-TMA dock, including requirements associated with docking of MRM2 and berthing and unberthing of HTV1.

6.0 9 1 <RESERVED>

6.0 9 2 STAGE 17A 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 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. Perform transition of Portable Computer System (PCS) R11.MSS6 to PCS R12 and Command and Control System (CCS) to R8 and complete checkout in support of MRM2, HTV1 and COTS. **[IVA] [Ground]**
3. Dock MRM2 to SM Zenith port. **[IVA] [Imagery]**
4. Perform ISS medical operations (average of 18 crew hours per week for crew of 6). **[IVA]**
5. Perform high-priority OBT (average of 4.0 crew hours per week) substituting planned SSRMS tasks as OBT when appropriate. **[IVA] [Robotics]**
6. Perform Orlan-based EVA #24. **[EVA] [Imagery]**
   A. Install the Kurs АФУ 4АО-ВКА antenna and MRM2 docking target into operational position.
   B. Connect MRM2 Kurs АФУ to SM Kurs АФУ signal switching unit (БКУ) in place of the SM zenith docking assembly Kurs АФУ.
   C. Restore configuration of the SM БТН-1М scientific hardware.
7. Perform checkout and preparation tasks for Flight 20 Soyuz arrival and Flight 18 Soyuz 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 18 crew return.
   C. Complete flight plan review.
   D. Perform tool preparation.
   E. Perform transfer tag-up.
8. Perform 6-crew Habitability Hardware activation and checkout. **[IVA] [Imagery]**

A. Assemble CQ. Remove, reverse and reinstall the “bumpout” and “popup”. Perform utility hook ups.

B. Assemble T2 Vibration Isolation and Stabilization (VIS) components.

C. Assemble T2 system components to rack.

D. Activate and checkout T2.

9. Perform checkout and preparation tasks for HTV1 launch. **<TBR 6-2>**

A. Perform MSS checkout, including Node 2 Power Data Grapple Fixture (PDGF) connectivity checkout with SSRMS on Node 2 PDGF. **[IVA] [Robotics]**

B. Position MT at correct work station. **[Robotics] [Ground]**

C. Perform PROX and HTV1 Hardware Command Panel (HCP) checkout (PROX checkout #4). **[IVA] [Ground]**

D. Checkout two primary and two backup cameras for monitoring of the HTV1 and calibrate the cameras if necessary. **[IVA]**

E. Load any new configuration files for the Remote Workstation (RWS) overlay software. **[IVA]**

F. Perform HTV Crew Monitoring (HCM) functional checkout. **[IVA] [Imagery] [Robotics] [Ground]**

G. Perform JEMRMS and EFU Checkout. **[IVA] [Imagery] [Robotics]**

H. Complete HTV1 pre-pack for disposal as trash. **[IVA]**

I. Perform Node 2 Nadir Active Common Berthing Mechanism (ACBM) sealing surface inspection using SSRMS. **[IVA] [Imagery] [Robotics]**

10. Prior to HTV1 berthing, perform HTV1 Demonstration Program as follows (major ISS Program objective): **<TBR 6-2>**

A. Configure ISS Guidance, Navigation and Control (GNC), solar arrays and radiators for proper proximity communication with HTV1. **[IVA] [Ground]**

B. Prepare two cameras (USOS and possibly MBS) to visually monitor the approach of the HTV1 from a distance of 1 kilometer (km) until arrival at the capture box. This video will be downlinked to the ground in realtime. **[IVA] [Imagery]**

C. Configure SSRMS for hot backup capability. **[IVA] [Robotics]**

D. Demonstration mission Proximity Rendezvous Day 1. **[IVA] [Ground]**

- Verify the HOLD/RETREAT/ABORT(PA) functions from HCP by Crew. This activity requires visual crew monitoring and crew commanding of the HTV1 using HCP.

11. Perform capture of HTV1. **<TBR 6-2>**

A. Perform capture operations using SSRMS. **[IVA] [Robotics] [Imagery]**

B. Maneuver HTV1, using SSRMS, to overnight park position in configuration to maintain thermal and solar power requirements. **[IVA] [Robotics] [Imagery]**

C. Configure ISS GNC, solar arrays and radiators for operational use. **[IVA] [Ground]**

D. Install and configure Centerline Berthing Camera System (CBCS) at Node 2 Nadir Common Berthing Mechanism (CBM). **[IVA][Ground] [Imagery]**

12. Perform HTV1 Berthed Operations. **<TBR 6-2>**

A. Perform HTV1 Passive Common Berthing Mechanism (PCBM) sealing surface inspection (on best effort without violating HTV thermal and solar power constraints). **[IVA] [Robotics] [Imagery]**

B. Berth HTV1 to Node 2 Nadir using SSRMS. **[IVA] [Robotics] [Imagery]**

C. Install the 2 power and 2 data cables, IMV supply duct and ARS jumper line to the Node2-HTV1 vestibule. **[IVA]**

D. Change the HTV1 power source from the HTV1 battery to the ISS and the communication line from the PROX link to the ISS 1553B. **[Ground]**

E. Activate lights and cabin fan required for crew presence: **[IVA] [Ground]**

F. Transfer from ISS and install in HTV1: PBA, PFE, dummy panel, and handrails. **[IVA]**

13. Transfer HTV1 priority cargo. **<TBR 6-2> [IVA]**

A. Perform critical Pressurized Cargo Transfer (if any) operations.

B. Transfer International Standard Payload Rack (ISPR)s.

C. Transfer Pressurized Cargo for high priority ISS payload operations.

14. Remove Exposed Pallet (EP) from HTV1 Unpressurized Logistics Carrier (ULC) and hand off to JEMRMS. Return EP to HTV1 ULC after the payloads installation. **<TBR 6-2> [IVA] [Robotics]**

A. Configure MT and SSRMS for EP operations.

B. Remove EP from HTV1, using SSRMS, and handoff to JEMRMS. During removal of EP, perform HTV Berthing Camera System (HBCS) Checkout. The video during HBCS checkout will be downlinked to the ground realtime. **[Imagery] [Ground]**

C. Use JEMRMS to install EP onto JEF/EFU #10. **[Imagery]**

D. Use JEMRMS to transfer payloads from EP onto JEF. **[Imagery]**

E. Use JEMRMS to remove EP from JEF and handoff to SSRMS.

F. Use SSRMS and HTV Berthing Camera System (HBCS) to install EP into HTV1 Unpressurized Logistics Carrier (ULC). The video during HBCS operations will be downlinked to the ground realtime. **[Imagery] [Ground]**

15. Transfer remaining HTV1 pressurized cargo. **<TBR 6-2> [IVA]**

16. Complete HTV1 loading of trash. **<TBR 6-2> [IVA] [Imagery]**
17. Unberth HTV1 from Node 2 nadir port. **<TBR 6-2>**
    A. Position SSRMS at Node 2 PDGF. **[IVA] [Robotics]**
    B. Remove PFE, PBA, handrails, and dummy panels and stow in ISS. **[IVA]**
    C. Remove Smoke Detector (SD) and General Luminaire Assemblies (GLA)s and stow in ISS. **[IVA]**
    D. Test HCP prior to undock. **[IVA] [Ground]**
    E. Configure ISS GNC, solar arrays and radiators for HTV1 departure operations. **[Ground]**
    F. Prepare two USOS cameras to visually monitor the departure of the HTV1 until it reaches a distance of 200m from ISS. **[IVA] [Imagery]**
    G. Configure SSRMS for hot backup capability. **[IVA] [Robotics]**
    H. Grapple HTV1 FRGF with SSRMS. **[IVA] [Robotics] [Imagery]**
    I. Configure HTV1 systems in preparation for HTV1 departure. **[IVA] [Ground]**
    J. Disconnect utilities between ISS and HTV1. **[IVA]**
    K. Perform CBM operations to release the HTV1. **[IVA]**
    L. Move HTV1 to the release point using SSRMS. **[IVA] [Robotics] [Imagery]**
    M. Release HTV1 from SSRMS. **[IVA] [Robotics] [Imagery]**
    N. Remove and stow HCP and power off the PROX communication rack after Integrated Operations has been completed. **[IVA]**
18. Perform checkout and preparation tasks for Flight ULF3. **[IVA]**
    A. Position MT/SSRMS at WS # **<TBD 6-2>** for Flight ULF3 joint operations. **[Robotics] [Ground]**
    B. Perform SSRMS pre-launch checkout at MSS WS # **<TBD 6-2>**. **[Robotics] [Ground]**
    C. Unstow and configure Joint Airlock.
    D. Perform Flight ULF3 pre-pack.
    E. Configure and checkout EVA equipment.
    F. Perform tool preparation.
    G. Perform checkout of P3 Nadir Unpressurized Cargo Carrier Attach System (UCCAS) and S3 Upper Outboard Payload Attachment System (PAS) sites. **<TBD 6-7> [Ground]**
19. Perform high priority ISS payload operations (average of **<TBD 6-3>** crew hours, total combined for all IPs, per week). **[IVA]**

20. Install Space Exploration Technologies Corporation (SpaceX) Commercial off the Shelf (COTS) Ultra High Frequency (UHF) Communication Unit (CUCU) in Expedite the Processing of Experiments to the Space Station (EXPRESS) Rack (ER)6 and perform UHF checkout. **[IVA] [Ground]**
21. Perform high priority ISS PAO events (average of 9.0 crew hours per week). **[IVA]**
22. Perform medium priority ISS maintenance. **[IVA] [Imagery]**
23. Perform medium priority ISS payload operations (combined crew time total for all IPs). **[IVA]**
24. Reboost ISS with Progress as required. **[Ground]**
25. Perform remaining ISS PAO events. **[IVA] [Imagery]**
26. Perform remaining ISS maintenance. **[IVA] [Imagery]**
27. Perform remaining ISS payload operations (combined crew time total for all IPs). **[IVA]**
28. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, for ISS alone reboost (IWIS required). **[IVA] [Imagery] [Ground]**
29. Perform IWIS SDTOs. **[IVA] [Ground] [Imagery]**
    A. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during JEF berthing (IWIS required). **[IVA] [Imagery] [Ground]**
    B. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during HTV1 berthing (IWIS required). **[IVA] [Imagery] [Ground]**
    C. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during T2 Treadmill Exercise, if being conducted (IWIS required). **[IVA] [Imagery] [Ground]**
    D. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during FWED Exercise, if being conducted (IWIS required). **[IVA] [Imagery] [Ground]**
    E. Perform SDTO 13005-U, ISS Structural Life Validation and Extension, during ARED Exercise, if being conducted (IWIS required). **[IVA] [Imagery] [Ground]**
30. Perform SDTO 15008-U, Solid State Lighting Module (SSLM). **[IVA]**
31. Perform autonomous activity SDTO 15010-E, On-orbit demonstration of a Novel LEON-2 based Computer System. **[IVA]**
32. Perform SDTO 17003-U, Soldering in Reduced Gravity Environment with US Soldering Kit. **<TBR 6-3> [IVA] [Imagery]**
33. Perform SDTO 17009-U, Space Video Gateway. **[IVA] [Imagery]**
34. Perform SDTO 17010-J/U, Multi-Protocol Converter for HDTV. **[IVA] [Imagery]**
35. Perform SDTO 17012-U, Joint ISSP-CxP Component Repair Experiment 1 (CRE). **[IVA] [Imagery]**

36. Perform ARISS contact for E20 FE-3. **[IVA]**

6.0 9 3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.0 9 3 1 THE MRM2 SHALL DOCK TO THE SM ZENITH PORT.

6.0 9 3 2 THE ISS ATTITUDE SHALL BE **<TBD 6-12>** TO SUPPORT HTV1 DEMONSTRATION PROGRAM.

6.0 9 3 3 THE HTV1 SHALL BERTH TO THE NODE 2 NADIR PORT.

6.0 9 3 4 THE ISS RENDEZVOUS ALTITUDE FOR HTV SHALL BE BETWEEN 350 AND 460 KM.

6.0 9 3 5 THE ISS ATTITUDE SHALL BE DTEA TO SUPPORT HTV JOINT OPERATIONS DURING APPROACH, CAPTURE, AND RELEASE.

6.0 9 3 6 THE USOS SOLAR ARRAYS SHALL HAVE THE SARJ LOCKED AND ARRAYS POSITIONED TO AVOID NAVIGATION AND COMMUNICATION INTERFERENCE DURING HTV RENDEZVOUS AND UNTIL CAPTURE.

6.0 9 3 7 THE SM ARRAY SHALL BE POSITIONED **<TBD 6-10>** DURING HTV RENDEZVOUS.

6.0 9 3 8 SSRMS SHALL BE LOCATED AT NODE 2 PDGF IN PREPARATION FOR HTV1 ARRIVAL.

6.0 9 3 9 MT SHALL BE POSITIONED AT WS #5 IN PREPARATION FOR HTV1 ARRIVAL TO ALLOW BACKUP CAMERA FOR MONITORING DURING APPROACH AND CAPTURE.

6.0 9 3 10 THE HTV SHALL BE PLACED IN AN OVERNIGHT PARKED POSITION ON THE SSRMS AFTER CAPTURE AND POSITIONED TO MAINTAIN THE PASSIVE THERMAL AND POWER REQUIREMENTS.

6.0 9 3 11 USOS SOLAR ARRAYS SHALL BE FEATHERED FOR **<TBD 6-10>** MINUTES PRIOR TO UNBERTHING OF THE HTV1.

6.0 9 3 12 THE ISS SHALL BE IN CMG CONTROL WITHOUT ISS THRUSTERS FIRING FOR THE FOLLOWING ACTIVITIES:

- HTV1 capture and release.

6.0 9 3 13 THE ISS SHALL BE IN FREE DRIFT CONFIGURATION WITH THE CMGS NOT CONTROLLING AND WITHOUT ISS THRUSTERS FIRING FOR THE FOLLOWING ACTIVITIES:

None identified.

6.0 9 4 CONTINGENCY REQUIREMENTS

6.0 9 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 17A assembly tasks as follows:

   None identified.

C. Remove/replace critical spares as follows:

   None identified.

D. Complete critical unfinished assembly tasks as follows:

   - If JLE is present on JEF, then, move JLE to JLP before HTV arrival to accommodate a Payload External Pallet on the JEF.

E. Complete critical unfinished or contingency HTV tasks as follows:

   1. SSRMS Snare reseating.
   2. Calculation of HTV1 cargo mass and center of gravity in the event of a contingency requiring the rapid closure of the HTV1 hatch and subsequent departure of the HTV1 from the ISS.
   3. Continue the HTV mission and capture without the HTV Crew Monitoring RWS overlay.

6.0 9 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 SSP 50261-01, paragraph 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.

The tasks listed in Paragraph 6.3.4.2 are still applicable.

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

None identified.

C. Remove/replace critical spares as follows:

None identified.

D. Contingency MT safing requirement:

- Contingency EVA power cable routing for stranded MT. (For Increment 20, this requirement will be met with already accomplished skills based training and additional OBT if the contingency is invoked.)

E. Complete critical unfinished HTV tasks as follows:

1. Restrain HTV EP in ULC with Payload Retention Device (PRD)
2. Payload tie-down to HTV EP (via adjustable tether or wire-tie)
3. Manual HTV Cargo Attach Mechanism (HCAM) release (HCAMs hold payload on EP)
4. HTV Manual Tie-Down Separation mechanism (TSM) release (releases EP from ULC via flexible shaft)
5. HTV Manual Harness Separation Mechanism (HSM) release (HSM releases electrical connection between EP and ULC)
6. Grapple fixture release (FRGF, PVGF, PDGF) from EP/HTV/SSRMS Base
7. Manual release of PIU on EP (PIU interfaces with EFU and holds HTV EP onto EF)
8. HTV Connector Separation Mechanism (HCSM) manual release (demates electrical connection between EP and payload)
9. EFU manual drive to release the EP or to attach a payload to the EF
10. JEMRMS Joint Electronic Unit (JEU) R&R
11. SSRMS EVA manual joint drive
12. Remove/Replace Node 2 Nadir CBM center disk cover
13. Remove/Replace Node 2 Nadir CBM Controller Panel Assembly (CPA)
14. Clear/restrain Node 2 Nadir CBM capture latch
15. Remove/Replace Node 2 Nadir CBM capture latch
16. Remove Node 2 Nadir CBM Ready-To-Latch (RTL)
17. Remove/Replace Node 2 Nadir CBM Petal

6.0 9 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 reentry, 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.

6.0 9 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.

6.0 9 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.

6.0 9 6 GROUND SYSTEMS REQUIREMENTS

None identified.

6.0 10 FLIGHT 20 SOYUZ REQUIREMENTS

This paragraph identifies requirements during Flight 20 Soyuz-TMA.

6.0 10 1 <RESERVED>

6.0 10 2 FLIGHT 20S 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 20S 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 the successful completion of this flight.

1. Dock Flight 20 Soyuz-TMA to MRM2 and perform mandatory crew safety briefing for all crew members. **[IVA] [Imagery]**
2. Rotate E20 CDR and FE-1 crewmembers with E21 CDR 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 the FE-2's seat liner in the appropriate Soyuz. **[IVA]**
3. Complete 18 Soyuz loading and undock from DC1 Nadir port. **[IVA] [Imagery]**
4. Perform minimum crew handover of 12 hours per rotating crewmember, which includes crew safety handover. **[IVA] [Robotics]**
5. Transfer and stow critical items. **[IVA]**
6. Perform ISS high priority maintenance activities. **[IVA]**
7. Perform high priority medical operations (average of 18 crew hours per week for crew of 6). **[IVA] [Imagery]**
8. Conduct visiting crew operations. **[IVA] [Imagery]**

   The following activities are 20 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 K-1>**.

   A. Conduct photo/video imagery.

   B. Conduct VC Utilization activities.

   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-SM ham radio.

F. Conduct Soyuz systems maintenance.

G. Conduct Soyuz handover.

H. Conduct RS crew life support activities onboard the ISS.

9. Perform ISS payload research operations tasks (combined crew time total for all IPs). **[IVA]**
10. Perform daily ISS payload status checks as required (combined crew time total for all IPs). **[IVA]**
11. Perform additional 4 hours per rotating crewmember of ISS crew handover (16 hours per crewmember total). **[IVA]**
12. Transfer remaining items from 20S TMA to ISS. **[IVA]**
13. Perform SDTO 13004-U, Russian Vehicle Docking/Undocking Loads on ISS, for 18S undocking from DC1 Nadir port (IWIS required). **[IVA] [Ground]**

6.0 10 3 ISS/VEHICLE ORBITAL AND CONFIGURATION REQUIREMENTS

6.0 10 3 1 FLIGHT 20 SOYUZ-TMA SHALL DOCK AT THE MRM2 PORT.

6.0 10 3 2 FLIGHT 18 SOYUZ-TMA SHALL UNDOCK FROM THE DC-1 NADIR PORT.

6.0 10 3 3 THE ISS SHALL BE IN CMG CONTROL WITH ALL THRUSTERS INHIBITED FOR THE FOLLOWING ACTIVITIES:

None identified.

6.0 10 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.

6.0 10 4 CONTINGENCY REQUIREMENTS

6.0 10 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.):

- ISS critical maintenance tasks as follows:

  None identified.

6.0 10 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

reentry, 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.

6.0 10 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.

6.0 10 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.

6.0 10 6 GROUND SYSTEMS REQUIREMENTS

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

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

APPENDIX A - ACRONYMS AND ABBREVIATIONS

A/L	Airlock
ACBM	Active Common Berthing Mechanism
ALO	Optical Linear Accelerometer
AMS	Alpha Magnetic Spectrometer
ANDE	Atmospheric Neutral Density Experiment
ANX	Annex
ARED	Advanced Resistive Exercise Device
ARIS	Active Rack Isolation System
ARISS	Amateur Radio on International Space Station
ARS	Air Revitalization System
ATA	Ammonia Tank Assembly
ATV	Automated Transfer Vehicle
BBA	Baseplate Ballast Assembly
BCDU	Battery Charge/Discharge Unit
BDS	Backup Drive System
C&C	Command and Control
CBCS	Centerline Berthing Camera System
CBM	Common Berthing Mechanism
CCS	Command and Control System
CDR	Commander
CHeCS	Crew Health Care System
CIR	Combustion Integration Rack
CMG	Control Moment Gyroscope
CO2	Carbon Dioxide
CoFR	Certification of Flight Readiness
COTS	Commercial off the Shelf
CP	Camera Port
CPA	Control Panel Assembly
CQ	Crew Quarters
CRE	Component Repair Experiment
Cryo	Cryogenic
CSA	Canadian Space Agency
CSD	Common Schedule Database
CTBE	Cargo Transfer Bag Equivalent

CUCU	COTS UHF Communication Unit
CWC	Contingency Water Container
DC	Docking Compartment
DCSU	Direct Current Switching Unit
DDCU	Direct Current-to-Direct Current Converter Unit
DLA	Drive Lock Assembly
DLM	Deployment Latch Mechanism
DM	Deployment Mechanism
DTEA	Docking Torque Equilibrium Attitude
E	Expedition
ECLSS	Environmental Control and Life Support System
EDMS	Electronic Document Management System
EDR	European Drawer Rack
EEU	Extravehicular Excursion Unit
EF	Exposed Facility
EFBM	Exposed Facility Berthing Mechanism
EFU	Exposed Facility Unit
ELC	ExPRESS Logistics Carrier
EMU	Extravehicular Mobility Unit
EP	Exposed Pallet
EPF	Exposed Payload Facility
EPM	European Physiology Module
EPS	Electrical Power Supply
ER	EXPRESS Rack
ESA	European Space Agency
ESC	EF System Controller
ESP	External Stowage Platform
ETC	European Transportation Carrier
ETCS	External Thermal Control System
ETVCG	External Television Camera Group
EuTEF	European Technology Exposure Facility
EVA	Extravehicular Activity
EWIS	External Wireless Instrumentation System
EXPR	ExPRESS Rack
ExPRESS	Expedite the Processing of Experiments to the Space Station

EXT	External
FE	Flight Engineer
FEL	First Element Launch
FGB	Functional Cargo Block
FHRC	Flex Hose Rotary Coupler
FIR	Fluids Integration Rack
FMA	Force/Moment Accommodation
FMS	Force Moment Sensor
FP	Flight Program
FPMU	Floating Potential Measurement Unit
FPP	Floating Potential Probe
FRGF	Flight Releasable Grapple Fixture
FSE	Flight Support Equipment
FSL	Fluid Science Laboratory
GCA	Guidance Control Assistant
GGR&C	Generic Groundrules, Requirements, and Constraints
GLA	General Luminaire Assembly
GMT	Greenwich Mean Time
GNC	Guidance, Navigation and Control
GPS	Global Positioning System
H/W	Hardware
HBCS	HTV Berthing Camera System
HCAM	HTV Cargo Attach Mechanism
HCE	Heater Control Equipment
HCM	HTV Crew Monitoring
HCP	Hardware Command Panel
HCSM	HTV Cargo Attachment Mechanisms
HDTV	High Definition Television
HPGT	High Pressure Gas Tank
HREP	HICO & RAIDS Experiment Payload
HRF	Human Research Facility
HRR	HTV Resupply Racks
hrs	hours
HSM	Harness Separation Mechanism
HTV	H-II Transfer Vehicle

IA	Integrated Assembly
ICAPC	Increased Capacity Adaptive Payload Carrier
ICC	Integrated Cargo Carrier
ICS	Inter-Orbit Communication System
ICWC	Iodine Contingency Water Container
IDRD	Increment Definition and Requirements Document
IELK	Individual Equipment Liner Kit
IFHX	Interface Heat Exchanger
IMS	Inventory Management System
IMV	Intra-module Ventilation
in	Inch
Inc	Increment
IP	International Partner
ISPR	International Standard Payload Rack
ISS	International Space Station
ISS MORD	International Space Station Medical Operations Requirements Documents
ISSP-CxP	International Space Station Program - Constellation Program
IVA	Intravehicular Activity
IVC	Interior Volume Configuration
IWIS	ISS Wireless Instrumentation System
JAXA	Japan Aerospace Exploration Agency
JEF	JEM Exposed Facility
JEM	Japanese Experiment Module
JEMRMS	Japanese Experiment Module Remote Manipulator System
JEU	Joint Electronics Unit
JLE	JEM Experiment Logistics Module - Exposed Section
JLP	JEM Experiment Logistics Module - Pressurized Section
JPM	JEM Pressurized Module
JRSR	JEM Re-Supply Stowage Rack
JSC	Johnson Space Center
kg	Kilogram
km	Kilometer
KW	kilowatt
LDU	Linear Drive Unit
LHA	Lamp Housing Assembly

LMC	Lightweight MPESS Carrier
LTA	Launch to Activation
LTAB	Launch to Activation Box
LVLH	Local Vertical Local Horizontal
M	Modified
m^3	Cubic Meter
MAMS	Microgravity Acceleration Measurement System
MAUI	Maui Analysis of Upper Atmospheric Injections
MBS	MRS Base System
MBSU	Main Bus Switching Unit
MCC-H	Mission Control Center - Houston
MCC-M	Mission Control Center - Moscow
MCOP	Multilateral Crew Operations Panel
MDM	Multiplexer/Demultiplexer
MELFI	Minus Eighty-Degree Laboratory Freezer for ISS
MISSE	Materials International Space Station Experiment
MLE	Middeck Locker Equivalent
MLI	Multi-Layer Insulation
MOD	Mission Operations Directorate
MPCB	Multilateral Payloads Control Board
MPESS	Multi-Purpose Experiment Support Structure
MPLM	Multi-Purpose Logistics Module
MRM	Mini-Research Module
MRS	Mobile Remote Servicer
MSG	Microgravity Science Glovebox
MSRR	Materials Science Research Rack
MSS	Mobile Servicing System
MST	Mast
MT	Mobile Transporter
N_2	Nitrogen
NASA	National Aeronautics and Space Administration
NH_3	Ammonia
nmi	Nautical Mile
O_2	Oxygen
OBSS	Orbiter Boom Sensor System

OBT	Onboard Training
OCA	Orbiter Communication Adapter
OCR	On-orbit Checkout Requirement
OGS	Oxygen Generating System
Ops	Operations
ORG	Organization
ORU	Orbital Replacement Unit
OV	Orbiter Vehicle
PAM	Payload Attach Mechanism
PAO	Public Affairs Office
PAS	Payload Attachment System
PBA	Portable Breathing Apparatus
PCBM	Passive Common Berthing Mechanism
PCS	Portable Computer System
PDGF	Power Data Grapple Fixture
PEC	Passive Experiment Container
PFCS	Pump Flow Control Subassembly
PFE	Portable Fire Extinguisher
PFRAM	Passive Flight Releaseable Attachment Mechanism
PIU	Payload Interface Unit
PLB	Payload Bay
PM	Pump Module
PMA	Pressurized Mating Adapter
POA	Payload ORU Accommodation
PRD	Payload Retention Device
PROX	Proximity
PVCU	Photovoltaic Controller Unit
PVGF	Power Video Grapple Fixture
PWD	Potable Water Dispenser
R&R	Remove and Replace
rack loc	rack location
RAM	Radiation Area Monitor
RCS	Reaction Control System
Ref	Reference
RGA	Rate Gyro Assembly

RJMC	Rotary Joint Motor Controller
RMS	Remote Manipulator System
ROBoT	Robotic On-board Trainer
RPCM	Remote Power Control Module
RPM	R-bar Pitchover Maneuver
RPWG	Research Planning Working Group
RS	Russian Segment
RSA	Russian Space Agency
RSC-E	Rocket Space Corporation - Energia
RSP	Resupply Stowage Platform
RSR	Resupply Stowage Rack
RTL	Ready To Launch
RVE	Rack Volume Equivalent
RWS	Remote Workstation
S&M	Structure and Mechanism
S&MA	Safety and Mission Assurance
SAMS	Space Acceleration Measurement System
SARJ	Solar Array Rotary Joint
SAW	Solar Array Wing
SDBI	Short Duration Bioastronautics Investigations
SDMS	Structural Dynamic Measurement System
SDTO	Station Development Test Objective
SE	Subelement
SEDA-AP	Space Environment Data Acquisition-Attached Payload
SEITE	Shuttle Exhaust Ion Turbulence Experiment
SGANT	Space to Ground Antenna
SLM	Structure Latch Mechanism
SLR	SARJ Launch Restraint
SM	Service Module
SMILES	Superconducting Sub millimeter-wave Limb-Emission Sounder
SORR	Stage Operations Readiness Review
SpaceX	Space Exploration Technologies Corporation
SPDM	Special Purpose Dexterous Manipulator
SRMS	Shuttle Remote Manipulator System
SSC	Station Support Computer

SSCB	Space Station Control Board
SSCD	Space Station Change Directive
SSE	Small fine arm Storage Equipment
SSLM	Solid State Lighting Module
SSPCB	Space Station Program Control Board
SSPTS	Station/Shuttle Power Transfer System
SSRMS	Space Station Remote Manipulator System
SSU	Sequential Shunt Unit
TBA	Trundle Bearing Assembly
TBD	To Be Determined
TBR	To Be Resolved
TCS	Thermal Control System
TeSS	Temporary Sleep Station
TF	Tool Fixture
TMA	Transportation Modified Anthropometric
TOCA	Total Organic Carbon Analyzer
TPL	Transfer Priority List
TPS	Thermal Protection System
TRDML	Treadmill
TSM	Tie-Down Separation Mechanism
U	Ultrasound
U/R	US/Russian
UCCAS	Unpressurized Cargo Carrier Attach System
UHF	Ultra High Frequency
ULC	Unpressurized Logistics Carrier
ULF	Utilization Logistics Flight
URL	Uniform Resource Locator
U.S.	United States
USOS	United States On-orbit Segment
VC	Visiting Crew
VIS	Vibration Isolation and Stabilization
VLD	Vertical Light Deployable
VSW	Video Switcher
WETA	Wireless Video System External Transceiver Assembly
WHC	Waste and Hygiene Compartment

WRS	Water Recovery System
WS	Work Site
XVV	X-Axis into the Velocity Vector
ZSR	Zero-gravity Stowage Rack

APPENDIX B - GLOSSARY OF 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

The KU frequency band is 12-18 Gigahertz (GHz) and the frequencies used by the ISS KU-Band subsystem use 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 HII 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) crew member(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 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], [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 A/L, 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 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*XX*>**).

TABLE C-1 TO BE DETERMINED ITEMS

TBD	Section	Description	Status
1-1	1.2, 2.1, Table 3.31	SSP 54021_54022 has not been published.	Open
1-2	1.2, 2.1	SSP 54100 updates to support this document are in work.	Open
1-3	1.2, 2.1	SSP 54018_32P has not been published.	Open
1-4	1.2, 2.1	SSP 54018_18S has not been published.	Open
1-5	1.2, 2.1	SSP 54019-33P has not been published.	Open
1-6	1.2, 2.1	SSP 54019-2J/A has not been published.	Open
1-7	1.2, 2.1	SSP 54020-19S has not been published.	Open
1-8	1.2, 2.1	SSP 54020-34P has not been published.	Open
1-9	1.2, 2.1	SSP 54020-17A has not been published.	Open
1-10	1.2, 2.1	SSP 54020-HTV1 has not been published.	Open
1-11	1.2, 2.1	SSP 54020-ULF3 has not been published.	Closed
1-12	1.2, 2.1	SSP 54020-20S has not been published.	Open
1-13	1.2, 2.1	SSP 54019_54020 ANX 2 has not been published.	Open
1-14	1.2, 2.1	SSP 54019_54020 ANX 3 has not been published.	Open
1-15	1.2, 2.1	SSP 54019_54020 ANX 4 has not been published.	Open
1-16	1.2, 2.1, Table 3.31, 4.0, 4.1, 4.2, Table 4.2-1B, 4.5, 6.2, 6.6	SSP 54019_54020 ANX 5 has not been published.	Open
1-17	1.3, 2.1	SSP 54319_54320 has not been published.	Open
2-1	2.2	SSP 54318 has not been published.	Open
3-1	Table 3.21	Date of the 18S relocation from the SM Aft port to the FGB Nadir port is to be determined.	Open
3-2	Table 3.31	Crew assignment is to be determined.	Open
4-1	Table 4.2-1B	ISS External Integration Office (OX) will negotiate crew time compensation.	Open
5-1	Table 5.0-1	Mass and Volume to be provided at a later date.	Open
5-2	Table 5.0-1	Further assessments of the return of the JEM JLE are required.	Open

TBD	Section	Description	Status
5-3	Table 5.0-1	Pending Flight 17A manifest development.	Closed
6-1	6.2.1, 6.6.1, 6.6.2	List of Russian and Visiting Crew Member Experiments will be provided at a later date.	Open
6-2	6.3.2, 6.7.2, 6.9.2	Work Site number for positioning of MT/SSRMS not yet defined.	Open
6-3	6.3.2, 6.7.2, 6.9.2	Crew Time Allocations are not yet defined.	Open
6-4	6.10.2	Node 3 Preparatory tasks under review.	Closed
6-5	6.10.2	Pending Crew Review and Approval.	Closed
6-6	6.10.2	Structural SDTO plan to be verified.	Closed
6-7	6.9.2	UCCAS and PAS Site Checkout tasks not yet defined.	Open
6-8	6.8.2	Temporary stowage location is to be determined.	Open
6-9	6.10.2	SARJ tasks are to be defined.	Closed
6-10	6.9.3.7, 6.9.3.11	HTV 1 berthing and unberthing ISS/Vehicle Orbital Configuration Requirements are still in work.	Open
6-11	6.8.3.1	Maximum rendezvous altitude is under discussion.	Closed
6-12	6.9.3.2	The attitude required to support HTV1 Demonstration Operations is to be determined.	Open
H-1	6.3.2, 6.7.2	Appendix H) will be provided at a later date.	Open
K-1	6.10.2, Appendix K	Appendix K data to be provided at a later date.	Open

Table C-2 lists the specific 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-*XX*>**).

TABLE C-2 TO BE RESOLVED ISSUES

TBR	Section	Description	Status
FP 3-1	Figure 3.1-1, Table 3.2-1	Dates are under review.	Open
FP 3-2	Table 3.3-1	Launch date is under review with the Shuttle Program.	Closed
FP 3-7	Figure 3.1-1, Table 3.2-1, Table 3.3-1	Dates are under review to resolve GGR&C conflicts.	Closed
FP 3-23	Figure 3.1-1, Table 3.2-1, 6.8.3.1	Shuttle docking altitude is under review.	Closed

SSP 54019_54020
Baseline

TBR	Section	Description	Status
FP 3-49	Figure 3.1-1, Table 3.2-1, Table 3.3-1	Forward work acknowledged for preparing 6-Crew Increment Definition and Expedition Crew Numbering Plans for this preparation have not been approved yet by the MCOP and SSCB. It is proposed that 6-Crew Increments will be ~2/4 month increment duration based on Soyuz undocking. For each increment change the Expedition Crew number will change and the two will stay in synch.	Open
FP 3-51	Figure 3.1-1, Table 3.2-1	Open work to conduct analysis to determine if 19S docking can occur during the 2J/A mission (simultaneous operations).	Open
6-1	6.3.4.2	Task is not currently certified due to hardware unavailability and immature repair methodology.	Open
6-2	6.9.2	Resolution of potential conflict between HTV1 berthed operations and Flight 20S is in work.	Open
6-3	6.7.2, 6.9.2	Pending update of training and crew procedures by SDTO investigators.	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 A/L, Columbus, JLP and JEM Pressurized Module (JPM). Figures are included for each planned change of rack locations.

D.2 ON-ORBIT RACK DESCRIPTIONS

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

TABLE D.2-1 ON-ORBIT RACK DESCRIPTIONS

Rack SE Number	Rack Description
2	TCS
3	TCS
4	Avionics #1
5	Avionics #2
6	Avionics #3
7	DDCU#1
8	ARS
9	DDCU#2
11	MSS/AV
12	MSS/AV
13	HRF-1
14	ER1
15	ER2
16	ER3
17	ER4
18	MSG
21	CIR
22	MSRR-1
23	ER5
25	MELFI-1
27	TeSS
28	CHeCS-1
31	ZSR
32	ER8
34	MELFI-2
45	TRDML-2
60	Crew Qrts
62	Crew Qrts
63	Crew Qrts
110	ZSR
111	ZSR
112	ZSR
113	ZSR
116	ZSR

SSP 54019_54020
Baseline

Rack SE Number	Rack Description
117	ZSR
118	ZSR
120	ZSR
121	ZSR
122	ZSR
123	ZSR
126	ZSR
155	CHeCS (RSR)
191	Stowage
192	Stowage
193	CA Equip
194	Avionics
301	DDCU JEM-1
302	DDCU JEM-2
303	DDCU ESA-1
304	DDCU ESA-2
313	OGS
314	ARS
315	WRS-1
316	WRS-2
317	WHC
318	Galley (ER6)
351	DMS-1
352	DMS-2
353	JRSR-1
355	RMS
356	ECLSS/TCS-1
357	ECLSS/TCS-2
358	EPS-1
359	EPS-2
360	ICS/PROX
362	W/S
364	RYUTAI
365	SAIBO
370	FIR
381	RSR
400	System
400	System
400	System
411	EDR
412	FSL
413	EPM
414	Bio Lab
415	ETC
417	HRF-2

D.3 FLIGHT AND STAGE RACK MOVES

Table D.3-1, Flight and Stage Rack Moves, summarizes the rack traffic during the increment's flights and stages. Note that for prioritization order, refer to Section 6.0 for corresponding rack move tasks.

TABLE D.3-1 FLIGHT AND STAGE RACK MOVES

Flight and Stage Topology File	Racks Up		Rack Moves			Racks Down	
	Name	Location	Name	Location 1	Location 2	Name	Location
Stage 18S	N/A	N/A	None			N/A	N/A
Flight 2J/A	None		None			None	
Stage 2J/A	N/A		None			N/A	N/A
Flight 17A	MSRR-1 (ARIS) FIR (ARIS) MELFI-2 TRDML-2 ZSR ZSR ARS Crew Qtrs	LAB1O3 LAB1S4 LAB1S2 NOD2D5 JLP1A2 JLP1A1 JPM1O2 JPM1F3	None			CHeCS-1	LAB1S4
Stage 17A	N/A		None			N/A	
Flight HTV1	EXPR-8	JPM1A5	None			None	
Flight 20S	N/A		None			N/A	

D.4 FLIGHT/STAGE 18S TOPOLOGY

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

FIGURE D.4-1 FLIGHT/STAGE 18S TOPOLOGY

D.5 FLIGHT/STAGE 2J/A TOPOLOGY

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

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

D.6 FLIGHT/STAGE 17A TOPOLOGY

Figure D.6-1, Flight/Stage 17A Topology, shows a high level overview of the Flight/Stage on-orbit topology. Refer to Table D.2-1 for a definition of the rack SE numbers.

FIGURE D.6-1 FLIGHT/STAGE 17A TOPOLOGY

D.7 FLIGHT/STAGE HTV1 TOPOLOGY

Figure D.7-1, Flight/Stage HTV1 Topology, shows a high level overview of the Flight/ Stage on-orbit topology. Refer to Table D.2-1 for a definition of the rack SE numbers.

FIGURE D.7-1 FLIGHT/STAGE HTV1 TOPOLOGY

APPENDIX E - INCREMENT CONFIGURATIONS

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

SSP 54019_54020
Baseline

APPENDIX F - INCREMENTS 19 AND 20 CAMERA PORT PLAN

	ISS Camera Ports													
	CP1	CP2	CP3	CP4	CP5	CP6	CP7	CP8	CP9	CP10	CP11	CP12	CP13	CP14
Flight	S3*	S1 Outboard Upper* (4) (5) (6)	S1 Outboard Lower* (5) (7)	S1 Inboard Upper (2)	S1 Inboard Lower* (3)	P1 Inboard Upper (2)	P1 Inboard Lower* (7)	P1 Outboard Upper*	P1 Outboard Lower* (7)	P3*	Node 2*	Node 1* (1)	Lab*	Node 3
2J/A	WETA	FPMU	ETVCG				ETVCG	WETA	ETVCG			WETA	ETVCG	
17A	WETA	FPMU	ETVCG				ETVCG	WETA	ETVCG			WETA	ETVCG	
HTV1	WETA	FPMU	ETVCG				ETVCG	WETA	ETVCG			WETA	ETVCG	
5R	WETA	FPMU	ETVCG				ETVCG	WETA	ETVCG			WETA	ETVCG	

Notes:
* - Wireless video transceivers can be used on these ports.
(1) The use of the Node 1 (CP12) camera port may cause clearance issues if the 5th joint airlock tank is installed.
(2) The use of the S1 Inboard Upper (CP4) and P1 Inboard Upper (CP6) camera ports should be minimized due to potential camera damage from S-Band antenna radiation.
(3) The S1 Inboard Lower (CP5) camera port is unavailable when ESP-2 is attached to the Airlock forward trunnion due to physical clearances.
(4) S1 Outboard Upper (CP2) camera port is unavailable when AMS is attached to S3 Upper Inboard PAS due to magnetic field interference issues with ETVCG and WETA.
(5) ELC cargo layout should be optimized to maximize clearance between the camera, including sweep envelope, and the ELC cargo.
(6) FPMU interferes with payload envelope of ELC installed at S3 Upper Inboard PAS site. ELC at S3 Upper Inboard installation planned for ULF5.
(7) HTV camera requirement for proximity and capture operations: Primary pair - CP3 & CP7; Back-up pair - CP3 & MBS camera at WS5; Back-up pair - CP9 & MBS camera at WS5.

Legend:	CP is not on-orbit	CP is not available for use	CP is available and not being utilized	CP is occupied

APPENDIX G - <RESERVED>

APPENDIX H - ON-ORBIT CHECKOUT REQUIREMENTS

OCRs included in this table are defined as activities performed as the vehicle is assembled, activated, operated or maintained to confirm the operational health and readiness of safety and mission critical functions and assure readiness to continue assembly and operations. OCRs are also performed periodically to assess the continued health of limited life items and items which are not normally monitored, or when specific events or conditions occur such as the installation and activation of replacement components or subassemblies.

OCR groundrules are as follows:

- Should not require temporary configurations resulting in a reduction of available critical function redundancy, fault tolerance or failure protection capability.
- Should not disable fault detection, isolation and automated function recovery capabilities.

Should not require intrusion or invasion into configured systems beyond capabilities designed into the system that allow for on-orbit maintenance.

Appendix H contains a listing of those 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 SSRMS OCRs from the previous increment not completed and carried forward. 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 IDRDs for subsequent increments. Changes to requirements during real time operations should be addressed to the ISS Management Center.

TABLE H-1 HTV1 ON-ORBIT CHECKOUT REQUIREMENTS

Task Number	Checkout Task	Description	Type of OCR Required			Priority and Required Operations-Phase (Joint Operations/Stage Operations, Options)			Comments	
			One-Time Activation	Periodic	Conditional	Desirable	Highly Desirable	Mandatory	Special MCC/ISS/ Shuttle Resources	
	HCM on-orbit Checkout	HTV Crew Monitoring functionality will be tested to insure cameras, overlays and MSS software are operating nominally prior to use at HTV approach and capture.	x				H-1	During Stage 2J/A	ISS crew will use RWS and SSRMS	

	PROX onorbit Checkout	Functionality of the communication between PROX (in JEM) via ISS to JAXA control center and GPS data processing will be tested prior to HTV.	x					During Stage 2J/A	Coordination with JAXA ground station (C&C MDM, SBand).	
	Final PROX onorbit Checkout	Functionality of the communication between PROX (in JEM) via ISS to JAXA control center, GPS data processing and HCP commanding will be tested prior to HTV.	x					During Stage 17A, prior to HTV flight	ISS crew will connect and send commands via HCP; coordination with JAXA ground station (C&C MDM, SBand).	

APPENDIX I - SHUTTLE FLIGHT TRANSFER PRIORITY LISTS

Flight 2J/A Transfer Priority List

Flight 2J/A TPL will be provided after the L-6 month Manifest baseline. Users may contact the respective Launch Package Team for the preliminary version of the TPL.

Flight 17A Transfer Priority List

Flight 17A TPL will be provided after the L-6 month Manifest baseline. Users may contact the respective Launch Package Team for the preliminary version of the TPL.

Flight HTV1 Transfer Priority List

Flight HTV1 TPL will be provided after the L-6 month Manifest baseline. Users may contact the respective Launch Package Team for the preliminary version of the TPL.

APPENDIX J - <RESERVED>

APPENDIX K - USOS RESOURCES TO BE PROVIDED FOR FLIGHT <XXS> VISITING CREW MEMBER <TBD K-1>

Table K-1, USOS Resources to be Provided for 20 Soyuz Visiting Crew member, is limited to the below-listed and agreed-to resources that NASA will provide to the 20 Soyuz crew member during this mission on 20 Soyuz. The listing of utilization to be performed during the 20 Soyuz mission will be provided via Rocket Space Corporation - Energia (RSC-E) and is listed in the main document under paragraph 6.2, Increment 20 Specific Requirements. NASA agrees to provide the following resources and will be compensated by *X*.

TABLE K-1 USOS RESOURCES TO BE PROVIDED FOR 20 SOYUZ VISITING CREW MEMBER <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 (including USOS food)	
Exercise Equipment	
Video Down	
Up/Downlink Data (includes OCA)	
Ground Support	
Preflight Crew Training for Prime and Backup *X* Crew members	