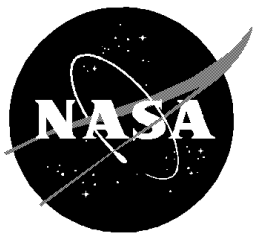
Shuttle/Launch Package Standard Integration Plan for International Space Station Missions

Space Shuttle Program Office

January 2001



National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas

DESCRIPTION OF CHANGES TO

SPACE STATION MISSION INTEGRATION PLAN

SPACE SHUTTLE PROGRAM

AND

INTERNATIONAL SPACE STATION PROGRAM

FOR THE

MISSION (__)

CHANGE NO.	DESCRIPTION/AUTHORITY	DATE	PAGES AFFECTED
--	Basic issue/B21000-SIP-MIP-001	10/28/94	All
1	Update section 13.0 and delete figure 13-1/B21000-SIP-MIP-002	07/11/95	53,54,58
2	Update figure 15-1/B21000-SIP-MIP-003	08/08/95	59
3	Update section 2.6/B21000-SIP-MIP-004	09/08/95	4,5
REV A	General revision/B21000-SIP-MIP-0005	11/15/96	All
1	Update sections 4.2.3.7, 8.1.3, and 14.0/B21000-SIP-MIP-0006A	03/25/97	13,37,51
REV B	General revision/B21000-SIP-MIP-0007;-0008;-0009A	09/16/97	All
1	Update table of contents, sections 4.2.3.3, 4.2.3.12, 4.2.7, 6.4, 7.0, 7.1, 8.2, 8.2.1, 8.2.2/ B21000-SIP-MIP-0012	03/10/98	vi,12,16,17, 17A,37,38, 41,43,44

DESCRIPTION OF CHANGES (Continued)

SPACE STATION MISSION INTEGRATION PLAN

SPACE SHUTTLE PROGRAM

AND

INTERNATIONAL SPACE STATION PROGRAM

FOR THE

MISSION (__)

CHANGE NO.	DESCRIPTION/AUTHORITY	DATE	PAGES AFFECTED
2	Update table of contents and sections 2.1.1, 2.1.2, 10.1, 10.2, 10.3, 10.4, and 16.0/B21000-SIP-MIP-0013A	04/28/98	v,2,3,3A,51, 52,53,58,59, 60,61
3	Update section 4.2.3.10/B21000-SIP-MIP-0015A	03/30/99	15,15A
REV C	General revision/B21000-SIP-MIP-0014A	05/10/00	All
	Errata to correct section 4.2.3.1 and renumber tables 4-4 to 4-3 and 4-5a and 4-5b to 4-4a and 4-4b	06/14/00	
REV D	General revision/B21000-SIP-MIP-0017	01/23/01	All
1	Update preface, table of contents, sections 1.0, 4.2.3.8, 4.2.9, 6.8, 7.1, 9.1, 9.3.2, 9.4.1, 9.5.1, 9.5.3, 13.0, 16.0, and appendix C/B21000-SIP-MIP-0018A	05/30/01	v,ix,1,8,9, 19,20,22,23, 24,25,26,27, 28,29,30, C-2,C-3

DESCRIPTION OF CHANGES (Continued)

SPACE STATION MISSION INTEGRATION PLAN

SPACE SHUTTLE PROGRAM

AND

INTERNATIONAL SPACE STATION PROGRAM

FOR THE

MISSION (__)

CHANGE NO.	DESCRIPTION/AUTHORITY	DATE	PAGES AFFECTED
2	Update table 4-1a/B21000-SIP-MIP-0019	07/17/01	3,3A
3	Update section 4.1.2 and table 4-1a/B21000-SIP-MIP-0021	10/05/01	2,3
4	Update table of contents, section 15.0 and add appendix E/B21000-SIP-MIP-0020A	11/16/01	9,29,E-1, E-2
5	Update section 4.2.3.7/B21000-SIP-MIP-023	04/02/02	7
6	Update preface, table of contents, section 15.0 and appendix E/B21000-SIP-MIP-0022	04/03/02	v,ix,29, 29A,E1,E-2
7	Update section 4.2.3 and table 4-2/B21000-SIP-MIP-0024A	04/25/02	5
8	Update preface, table of contents, section 15.0 and delete appendix E/B21000-0026	06/28/02	v,ix,29, E-1,E-2

DESCRIPTION OF CHANGES (Continued)

SPACE STATION MISSION INTEGRATION PLAN

SPACE SHUTTLE PROGRAM

AND

INTERNATIONAL SPACE STATION PROGRAM

FOR THE

MISSION (__)

CHANGE NO.	DESCRIPTION/AUTHORITY	DATE	PAGES AFFECTED
9	Update table of contents, sections 4.2.3.2, 6.8, 7.1, 7.2, appendix C and add new section 9.5.4/B21000-SIP-MIP-025C;-028;-030	09/04/02	viii,ix,6, 19,20,20A, 27,C-1,C-2
10	Update section 5.4/B21000-ISS-SIP-MIP-0029	09/17/02	14
11	Update table of contents, sections 3.1, 3.2, 4.1.2, 9.3.2, 9.4.1, 9.4.2, 9.5.1, 9.5.3, tables 4-1a, 4-1b, 5-1, and add appendix F/B21000-SIP-MIP-0027	09/27/02	ix,1-4,13, 13A,23,25, 26,27,F-1, F-2
12	Update table of contents and section 9.5.1/B21000-SIP-MIP-0031	10/02/02	ix,26,26A
13	Update table of contents, preface, sections 15.0, 16.0, appendix C and reletter appendix F to appendix E/B21000-SIP-MIP-0034	05/06/03	v,ix,29,30, C-2,E-1,E-2
14	Update section 6.8/B21000-SIP-MIP-0035B	06/09/03	19,19A

DESCRIPTION OF CHANGES (Concluded)

SPACE STATION MISSION INTEGRATION PLAN

SPACE SHUTTLE PROGRAM

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FOR THE

MISSION (__)

CHANGE NO.	DESCRIPTION/AUTHORITY	DATE	PAGES AFFECTED
15	Update section 5.7 and appendix E/B21000-SIP-MIP-0036B	10/17/03	16,E-1,E-2

Note: Dates reflect latest signature date of CR's received by PILS.

SPACE STATION MISSION INTEGRATION PLAN

SPACE SHUTTLE PROGRAM

AND

INTERNATIONAL SPACE STATION PROGRAM

FOR THE

MISSION (_____)

(DATE)

Prepared by

_____
Payload Integration Manager

APPROVED:

_____ Date	_____ Date
MANAGER, SPACE SHUTTLE PROGRAM	MANAGER, INTERNATIONAL SPACE STATION PROGRAM

FOREWORD

This Space Station standard Mission Integration Plan (MIP) is intended to be used for preparation of the primary agreement for the management and technical activities required for Launch Package (LP) and Return Complement (RC) integrated ground operation, Shuttle flight and integrated flight operations of the Phase II International Space Station Program (ISSP) with the Space Shuttle Program (SSP). Use of the standard format will provide a consistent definition of the required integration agreements.

PREFACE

[Any instructional information contained in this blank book MIP is enclosed in brackets []. All instructional information will be removed for the mission-unique MIP.]

The Standard Integration Agreement for All Space Shuttle Program and International Space Station Missions, NSTS 21458, and mission-unique MIP comprise the International Space Station Program (ISSP) and Space Shuttle Program (SSP) agreement on the responsibilities and tasks which directly relate to the integrated set of mission requirements for mission (no.). A Launch Package (LP) is the total complement of International Space Station (ISS) Cargo Elements (CEs) (cargo bay-mounted ISSP hardware), crew compartment items, and support equipment launched onboard the Orbiter on a single ISS/Orbiter flight. A Return Complement (RC) is the total complement of ISS CEs (including items removed from the ISS), crew compartment items, and support equipment returned from orbit aboard the Orbiter on a single ISS/Orbiter flight. The Standard Integration Agreement and the MIP encompass all requirements and constraints pertinent to the LP and/or RC on this flight.

The Standard Integration Agreement and the MIP also encompass all requirements, constraints, stage analyses, and postflight data requirements pertinent to LP and RC integration, deintegration, docking, berthing, assembly, and utilization portions of the integrated Orbiter and ISS ground and flight operations related to this mission. Included herein are the requirements and constraints associated with the operations and interfaces of the assigned ISSP LP and RC elements, as well as the joint SSP and ISSP activities onboard the orbiting ISS.

The detailed requirements and constraints for this mission, LP and RC are documented in the applicable annexes and data submittals described in section 14.0, and references are annotated throughout the Standard Integration Agreement and the MIP.

The SSP documents NSTS 21000-IDD-ISS, Shuttle Orbiter/ International Space Station Interface Definition Document (IDD); NSTS 21000-IDD-SML, Shuttle/Payload Interface Definition Document for Small Payload Accommodations; and NSTS-21000-IDD-MDK, Shuttle/Payload Interface Definition Document for Middeck Accommodations, define the environments and interface services that are available to the ISSP for the LP and RC.

Issues, which are yet To Be Resolved are, designated "TBR" in this MIP and additional details are documented in Appendix A. Information not at issue but which is yet To Be Determined is designated "TBD" and is documented in Appendix B. Acronyms and abbreviations are listed in Appendix C, and definitions are located in Appendix D. The ISS middeck Utilization payload requirements are located in Appendix E. The generic MIP Product Launch Minus Schedule is located in NSTS 21458 Appendix C. The flight-specific MIP Product Schedule (MPS) is located on the Integrated Product Team (IPT) web site.

CONTENTS

1.0 INTRODUCTION

This Mission Integration Plan (MIP) when combined with the Standard Integration Agreement for Space Shuttle Program and International Space Station Program Missions, NSTS 21458, will address the requirements for this specific mission and the capabilities of the Space Shuttle. Included are ISSP-funded services that will be paid for by the ISSP.

The Space Shuttle Program (SSP) and the International Space Station Program (ISSP) plan to launch and [choose the appropriate words: deploy, assemble, retrieve, service, exchange] the Cargo Elements (CEs) and crew compartment items to the on-orbit stage on mission (no.), using the Space Shuttle Orbiter. ISS middeck sortie payload requirements will be identified in the payload-specific integration plan.

2.0 MANAGEMENT RESPONSIBILITIES

(Reference NSTS 21458)

3.0 LAUNCH PACKAGE/RETURN COMPLEMENT DESCRIPTION AND FLIGHT AND GROUND OPERATIONS OVERVIEW

This section contains configuration descriptions for the LP/RC plus a general overview of the major flight and ground objectives. Requirements and constraints shall not be documented within this section.

3.1 Launch Package Description

[Describe in this paragraph the LP configuration, including crew compartment items. Include sketches of the CE configurations and support equipment (TBD) and crew compartment items.]

[Two Assembly Power Converter Units (APCUs) will be utilized on this flight. (Add this sentence if APCU power is required.)]

ISS Utilization middeck payload requirements are provided in Appendix F.

3.2 Return Complement Description

{Describe in this paragraph the RC configuration. Include sketches of the RC configurations.}

ISS Utilization middeck payload requirements are provided in Appendix F.

3.3 Prelaunch Ground Operations Overview

[Describe any unique prelaunch ground operations processing to be performed by John F. Kennedy Space Center (KSC) for the LP.]

3.4 Flight Operations Overview

[Describe any unique mission operations to be performed by the Orbiter or ISS flightcrew for this mission.]

3.5 Postlanding Ground Operations Overview

[Describe any unique postlanding ground operations processing to be performed by KSC for this LP.]

4.0 MISSION OPERATIONS

4.1 Orbital Requirements and Control Parameters

4.1.1 Orbital Requirements.- The Orbiter will be inserted into a rendezvous phasing orbit based on the altitude of the ISS stage at launch and the planned rendezvous day. The planned rendezvous altitude for this mission is (no.) n. mi. ((no.) km.). [If required, add launch window constraints:]

The ISS stage orbital inclination shall be 51.6°.

4.1.2 Control Parameters.- Control parameters for the LP and RC are defined in tables 4-1a and 4-1b. The control weight defines the maximum weight for cargo bay, crew compartment, and external airlock items. The control length defines the maximum length for cargo bay items and includes Airborne Support Equipment (ASE) and dynamic clearances. The control volume for Orbiter stowage defines the maximum Middeck Locker Equivalents (MLEs) and weight for Orbiter middeck stowage items. Control weights for the ISS Utilization middeck payloads are provided in Appendix F. Control parameters are used for SSP mission planning purposes and may not be exceeded without SSP approval.

The ISS/SSP reserves five middeck lockers for use by the ISS/SSP Flight IPT. The assignment of three lockers will be determined by the Flight IPT at the Flight Planning and Stowage Review (FPSR) with the remaining two lockers assigned by the Crew Compartment Configuration Review (CCCR).

Table 4-1a.- LP CONTROL PARAMETERS

	Weight (lb)	Length (in.)
Payload Bay		
CE	X	Y
CE	X	
Element	X	
Carrier	X	
CE	X	
ISS Logistics	X	
EVA Hardware:		
Mission-specific Tools	X	N/A
Tool Logistics	X	N/A
Payload Bay Total:	Y	
Crew Compartment:		(MLE)
ISS Equipment	X	
ISS Utilization middeck payloads – Total Weight**	X	
Item deleted		
EVA Tools		
Item deleted		
ISS Mission Specific	X	
ISS Logistics	X	
EMU:		
ISS Standard	X	
ISS Mission Specific	X	
ISS Logistics	X	
Crew Rotation		
Crew Compartment Total*:	Z	
LP Total:	Y+Z	N/A

*A 5-MLE bag + 1 locker will be held as ISSP reserve via flight IPT management for nonpowered stowage until L-25 days.
**See Appendix F for ISS Utilization middeck payloads control weights.

Table 4-1b.- NOMINAL RC CONTROL PARAMETERS

	Weight (lb)	Length (in.)
Payload Bay		
CE	X	Y
Element	X	
Carrier	X	
CE	X	
EVA Hardware:		
Mission-specific Tools	X	N/A
Tool Logistics	X	N/A

Table 4-1b.- NOMINAL RC CONTROL PARAMETERS (Concluded)

Payload Bay Total:	Y	
Crew Compartment:		Volume (MLE)
ISS Mission Support	X	
ISS Logistics	X	
EVA Tools:		
ISS Utilization middeck payloads – Total Weight**	X	

**See Appendix F for ISS Utilization middeck payloads control weights.

4.2 Operational Requirements and Constraints

The following sections will define the mission activities and requirements including operations, maintenance, and logistics to be accomplished by flight crewmembers or ground facility personnel.

4.2.1 Launch Readiness.-

4.2.1.1 Launch Commit Criteria: [For LPs that have no Launch Commit Criteria (LCC), state so and delete the remaining paragraphs.] LP Launch Commit Criteria (LCC) will be developed in accordance with NSTS 07700, Volume XIV, Appendix 5, System Description and Design Data-Ground Operations, requirements and constraints. All LCCs must be monitored via ground systems and must not rely on flightcrew monitoring. Any function whose failure results in a call for a hold must be designed with fault tolerance and must be monitored such that no single telemetry failure will result in a loss of visibility into the status of that function. (Exceptions to this requirement must be negotiated and identified in this section.) LP safety and mission-success LCC will be submitted to the Payload Integration Manager (PIM) by L-7 months in accordance with the format and guidelines specified in NSTS 16007, Shuttle Launch Commit Criteria and Background, Appendix C, identifying the parameters, limits, and rationale used as a basis for a launch hold. Review and approval of LCC must be accomplished by L-5 months, at which time the LP safety and mission success LCC will be documented by the SSP. All safety LCC will be documented in NSTS 16007. Mission success LCC may be documented in NSTS 16007 or the Flight Rules, depending upon the organization making the call. Mission success LCC for holds to be called by the Mission Control Center-

Houston (MCC-H) or International Partner Control Center (e.g., requirements that support on-orbit operations facilities or communication networks) will be documented by the SSP in the Flight Rules. Mission success LCC for which KSC is responsible will be documented in NSTS 16007.

a. Safety LCC - [For LPs that have no safety LCC, state so and delete item a.]

   LP safety holds may be called until L-31 seconds.

   LP safety holds will be called by (specify the responsible organization and location, such as console or Ground Launch Sequencer (GLS)). [For an LP with multiple flights, safety LCC to be called after L-5 minutes must be in the GLS.]

b. Mission success LCC - [For LPs that have no mission success LCC, state so and delete remaining text of item b.]

   LP mission success holds may be called until T-9 minutes for a confirmed loss of redundancy of a flight function that would affect a primary mission objective.

   LP mission success holds may be called until T-5 minutes for a confirmed loss of a total function that would cause the loss of primary mission objectives or for specific redundant system failures that would jeopardize a majority of the primary mission objectives.

4.2.2 Ascent.- [Any LP-unique constraints during ascent should be specified.]

4.2.3 On-orbit.- Table 4-2 defines the [mission designation] SSP and ISSP integrated mission on-orbit tasks and their relative mission priorities. All SSP and ISSP major tasks are included.

Table 4-2.- JOINT MISSION ON-ORBIT TASK PRIORITY OVERVIEW

Mission Priority	Task	Method
[Fill in]	[Fill in]	[Fill in; i.e., Remote Manipulator System (RMS), EVA, etc.]

4.2.3.1 SSP-imposed Thermal Environment – Unmated: The LP/RC design and operation shall be analyzed and/or assessed for compatibility with the attitudes and durations specified in table 4-1 of NSTS 21458.

[For +Rbar approach, insert the following: For a +Rbar approach prior to the ISS docking, the Transition Initiation (TI) maneuver will be followed by an additional 4 hours of bottom-Earth (-ZLV). Any deviation from the attitudes in table 4-3 prior to docking to ISS shall be negotiated through the Thermal Control Joint Technical Working Group (JTWG), Joint Operations Panel (JOP), and the Vehicle Integrated Performance and Resource (VIPeR) Team.]

[For +Vbar approach, insert the following: For a +Vbar approach prior to the ISS docking, the TI maneuver will be followed by an additional 4 hours of tail-down (+XLV). Any deviation from the attitudes in table 4-3 prior to docking to ISS shall be negotiated through the JTWG, JOP, and the VIPeR Team.]

4.2.3.2 ISSP Launch to Activation (LTA) Thermal Requirements and Constraints: [Any flight-specific CE LTA thermal requirements and/or constraints should be specified in this paragraph.]

4.2.3.3 Floodlight Operations: [If ISSP has any floodlight constraints, state so here.]

4.2.3.4 Proximity Operations: [Describe proximity operations requirements appropriate to the specific mission in addition to the general requirements defined in NSTS 21458.]

[If additional proximity operations capability is desired following a contingency Orbiter backout, include the following words:

Sufficient additional propellant shall be included for proximity operations following a contingency Orbiter backout. For the backout case, the Orbiter will back away from the Stage to a safe distance. Following a period of stationkeeping, either a second approach and docking will be attempted or the Orbiter will break out to a safe separation trajectory.]

[If there are requirements for stationkeeping or flyaround other than for planned berthing/docking operations, so state in this section. If flyaround required, it must be >400 feet.]

[If separation and reattachment of the Orbiter to another location on the ISS are required, so state in this section.]

4.2.3.5 Mated Attitude Control: [Use this paragraph to state the ISSP vehicle integrated performance and resources specifications in terms of which vehicle nominally provides attitude control, the primary attitude orientation definition for power generation, propellant usage, etc.] Attitude control requirements during combined ISS/Orbiter configurations are as specified in table 4-3.

Table 4-3.- ATTITUDE REQUIREMENTS
(Orbiter Structural Coordinate System)

Mission phase/configuration	Controlling vehicle	Attitude requirements or constraints	Rate requirements or constraints
TBD	TBD	TBD	TBD

Detailed attitude, attitude maneuver, and flight control configuration requirements for this mission are specified in an ISSP-provided data submittal.

4.2.3.6 Primary Reaction Control System Compatibility: During Stage and CE reconfiguration phases or operation of deploy system mechanisms, limited periods of Orbiter attitude free drift can be provided to meet ISSP requirements. ISSP free drift requirements are as follows: [List free drift activities and durations; if none, so state.]

4.2.3.7 Extravehicular Activity Requirements:

a. Scheduled Extravehicular Activities (EVAs) - Table 4-4a contains a listing of all scheduled EVA tasks for this mission. (No.) scheduled EVAs are required. [If no scheduled EVA requirements exist, so state.]

b. Unscheduled and Contingency EVAs - Table 4-4b contains a listing of unscheduled EVA tasks required for mission success and contingency EVAs required for safety (No.) unscheduled EVAs are required and (No.) contingency EVAs are required. [If no unscheduled or contingency EVA requirements exist, so state.]

c. Stage EVAs – [Number of stage EVAs] increment joint airlock EVA[s] (no Shuttle present) after the undocking of the previous Shuttle mission [is or are] planned.

[Any exceptions to the 10.2 psia requirement should be documented here.]

Table 4-4a.– SCHEDULED EVA TASKS

Task	Description

Table 4-4b.- UNSCHEDULED AND CONTINGENCY EVA TASKS

Task	Description

4.2.3.8 Orbiter Manipulator and Payload Handling Mechanism Requirements and Constraints: [Identify the Orbiter Payload Deployment and Retrieval System (PDRS) functions requiring analyses, unique technique development, or special assessments.]

4.2.3.9 Integrated Photo/Television and Visual Cues Requirements: [Define any real-time or postflight unique photographic documentation (still photos and/or video) requirements.]

Real-time visual cue requirements include the following:

a. Payload bay camera views (including Shuttle Remote Manipulator System (SRMS) camera) to the Orbiter Space Vision System (OSVS) with OSVS targets

b. Keel cameras

c. Orbiter Docking System (ODS) centerline camera

[Use one or all applicable above phrases as required.]

4.2.3.10 Contamination Constraints: [If the ISS has any constraints on the Orbiter for contamination avoidance; state so here.]

4.2.3.11 Consumables Requirements: [This paragraph is reserved for additional consumables requirements by the ISSP to protect for contingency operations; i.e., Orbiter-provided mated attitude control or maneuvering, module pressurization using Orbiter consumables, and etc.] Consumables will be budgeted for a contingency additional docked EVA day (charged to ISSP) to protect for completion of assembly operations. The Orbiter will

also provide the capability to pressurize the Pressurized Mating Adapter (PMA) volume to allow PMA ingress.

4.2.3.12 Other Crew Activities: [This paragraph is reserved for any additional on-orbit crew activities that are required on this flight. Details of the activities will be documented by the ISSP in a data submittal. These activities may include items such as maintenance and logistics. Detailed stowage requirements in the Orbiter crew cabin are to be detailed in the Interface Control Annex (ICA).]

4.2.4 Orbiter and ISS Intentional Radio Frequency Radiation Constraints.- (Reference NSTS 21458)

4.2.4.1 Orbiter-imposed Intentional RF Radiation Constraints:

4.2.4.2 ISS-imposed Intentional RF Radiation Constraints:

4.2.5 Rendezvous/Navigation.- (Reference NSTS 21458)

4.2.6 Other Constraints.- [In addition to the constraints listed in NSTS 21458, include other required ISS LP/RC or stage operational constraints. If none, state “Not applicable.”]

4.2.7 Associated Non-Space Shuttle Program Launch Vehicles.- (Reference NSTS 21458)

4.2.8 Operational Safety Constraints.- (Reference NSTS 21458)

4.2.8.1 Safe Without Services: (Reference NSTS 21458)

4.2.8.2 Floodlights: (Reference NSTS 21458)

4.2.8.3 Abort Descent and Landing: (Reference NSTS 21458)

4.2.8.4 Vent Doors: (Reference NSTS 21458)

{Add if required:
4.2.9 Lasers Pointed to Space.- All payloads that shine lasers into Space shall, as part of the integration process, obtain approval for operation from the SSP. The ISSP will provide the laser’s physical properties for assessment.}

5.0 ISS CARGO ELEMENT, CREW COMPARTMENT AND STAGE-TO-ORBITER INTERFACES

The Orbiter-to-CE interfaces are specified in unique SSP/(CE) Interface Control Document (ICD)-A-(nos.), which include all agreed-to unique interface applications. All interfaces between the Orbiter and the ISS stage for this mission are specified in [state appropriate on-orbit ICD].

The following sections define the requirements that the LP, RC, and the ISS stage require for Orbiter interfaces and services. These interfaces and services apply for all phases of this mission from prelaunch through postlanding for each CE.

5.1 Structural/Mechanical Interfaces

[Describe the structural/mechanical interfaces for each CE and the Stage using text similar to that provided below.]

[For each across-the-cargo bay CE, use the following:

The structural/mechanical interface between the (name) CE and the Orbiter consists of (no.) longeron trunnions and (no.) keel trunnions that will attach to the SSP-provided longeron and keel attach fittings. All structural/mechanical interfaces between the Orbiter and the CE will be specified in Space Shuttle/(CE) ICD (provide number).]

[For each sidewall-mounted CE, use the following:

The (name) CE will be mounted to the sidewall of the cargo bay via the SSP-provided [name type of beam such as Get-Away Special (GAS), Adaptive Payload Carrier (APC), Increased Capability Adaptive Payload Carrier (ICAPC), etc.] sidewall carrier which is installed on the [state whether port or starboard] side of Bay No. [provide number]. All structural/mechanical interfaces between the Orbiter and the CE will be specified in Space Shuttle/(CE) ICD [provide number].]

[For the Stage, use the following:

The structural/mechanical interface between the Orbiter and the ISS Stage for this mission is [describe which PMA and which Node is the primary berthing port and secondary port if one is known] and is specified in [state appropriate ICD].]

5.2 Cable Interfaces

The standard Aft Flight Deck (AFD) and cargo bay harnesses are provided for the ISS in accordance with NSTS 21000-IDD-ISS. The specific AFD and cargo bay configuration is:

a. Cable configuration as defined in the APCU ICD-A-21321 shall be provided. [If APCU is used, specify this sentence with appropriate APCU cable configuration]

b. [List other unique cable requirements.]

Specific wiring pin function assignments will be defined in the [state appropriate ICD(s)].

5.3 Display and Control Interfaces

Display and Control (D&C) functions which are required for this flight, are accomplished using the crew-controlled equipment identified below:

[Example

a. Standard switch panel

b. Portable Computer Station (PCS)(two)

c. Payload Data Interface Panel (PDIP)

d. Computer Interface Panel (CIP)]

[Use this sentence if standard switch panel is used.] Assignment of functions and nomenclature for the standard switch panel are to be defined in the ICA.

5.4 Electrical Power Interfaces

[If no electrical power interfaces are required, so state and delete the following.]

Before installation in the Orbiter, power will be supplied to the CE using ISSP-provided or SSP-provided Ground Support Equipment (GSE), as negotiated in Annex 8. [Insert this statement if required: After installation in the Orbiter, Orbiter bus power will be supplied by the SSP, except during planned outages (e.g., ordinance activities); T-0 umbilical power will be supplied by CE

Electrical Ground Support Equipment (EGSE). When supplying T-0 umbilical power, CE EGSE shall meet the Electromagnetic Compatibility (EMC) requirements specified in NSTS 21000-IDD-ISS.]

The CE shall provide means for its power activation/deactivation via crew control, in addition to any other power control capabilities.

Electrical power interfaces and maximum continuous/peak power requirements are as follows in table 5-1.

Table 5-1.- ELECTRICAL POWER

[Note: If multiple CEs and/or the ISS are powered by the Orbiter, include each CE and the ISS as separate line items in this table.]

	Prelaunch		Ascent	Docked			Descent	Post-flight*
	PLBD closure			Pre	During	Post		
Power Source	Pre**	Post						
a. Orbiter bus to APCU No. 1***	N/R	N/A	N/A	(cont)W (peak)W	(cont)W (peak)W	(cont)W (peak)W	N/A	N/A
b. Orbiter bus to APCU No. 2***	N/R	N/A	N/A	(cont)W (peak)W	(cont)W (peak)W	(cont)W (peak)W	N/A	N/A
c. APCU No. 1 to CE/ISS	N/A	N/A	N/A	(cont)W (peak)W	(cont)W (peak)W	(cont)W (peak)W	N/A	N/A
d. Orbiter bus to PLB CE	(cont)W (peak)W	N/A	N/A	(cont)W (peak)W	(cont)W (peak)W	(cont)W (peak)W	N/A	N/A
e. Hardwire through T-0 umbil-ical****	(cont)W (peak)W	(cont)W (peak)W	N/A	N/A	N/A	N/A	N/A	(cont)W (peak)W

f. Orbiter/ ISS Utilization middeck payload total power* *Individual ISS Utilization payload power is specified in Appendix F	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W
g. Cabin PL bus	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W
h. Orbiter AUX dc power bus	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W	cont W (peak)W
i. Payload and General Support Computer (PGSC)	N/A	N/A	N/A	(cont)W (peak)W	(cont)W (peak)W	(cont)W (peak)W	N/A	N/A
j. Safing *****	N/A	N/A	N/A	(cont)W (peak)W	(cont)W (peak)W	(cont)W (peak)W	N/A	N/A

(Value inserted where interface is required; N/A inserted where interface is not available; and N/R inserted where interface is not required; peak power values are identified by parenthesis.)

*Service available until Orbiter power down.

**An entry not required under Pre-PLBD closure for Interface Verification Test (IVT) or end-to-end test.

***Whenever the cargo bay primary payload bus is powered, the APCUs draw 32 W each or 64 W total with the converters turned off. If the APCU converters are turned on, the APCUs will draw 100 W each or 200 W total with no load.

****From 30 minutes before launch until launch, the amount of current being transferred through T-0 umbilical shall be limited to 500 milliamps/circuit (wire pair).

*****Fill in if necessary. Safing power is that power required by a CE/RC to reconfigure from a nonsafe mode to a safe mode before permanent termination of power. Time limits shall be specified.

The specific flight power profile will be defined by the ISSP in Annex 2, Part I.

For loss of Orbiter-supplied power to the CE during ascent, power reconfiguration will be attempted when the Orbiter has achieved a safe orbit. [Use only if ascent power is supplied.]

Loss of Orbiter-supplied on-orbit power to the CE shall, as a minimum, require manual reconfiguration of Orbiter power to restore power to the CE/RC. This power will nominally be restored within 15 minutes of CE/RC power loss detection.

The nominal total energy shall not exceed TBD Kilowatt Hour (kWh)/day (worst case TBD kWh/day). This number includes all power consumption from the payload primary power bus, the AFD power busses, and the middeck power busses. Survival power for two contingency weather wave-off days shall not exceed TBD kWh.

5.5 Command Interfaces

Command Interfaces are identified in table 5-2.

Table 5-2.- COMMAND INTERFACES

[Note: If multiple CEs and/or the ISS is commanded by/through the Orbiter, include each CE and the ISS as separate line items in this table.]

Command I/F route	Prelaunch		Ascent	Docked			Descent	Post-flight*
	PLBD Closure Pre**	PLBD Closure Post		Pre	During	Post		
a. Hardwire through T-0 umbilical			N/A	N/A	N/A	N/A	N/A	
b. Hardwire from standard switch panel to APCUs			N/A				N/A	N/R
c. Payload Signal Processor (PSP) via Orbiter Interface Unit (OIU) to CE	N/A	N/A	N/A				N/A	N/A
d. PSP via OIU to ISS 1553 (Stage)	N/A	N/A	N/A	N/A		N/A	N/A	N/A

e. PSP via OIU to Space-to-Space Orbiter Radio (SSOR) (Stage)	N/A	N/A	N/A			N/A	N/A
f. Portable Computer System (PCS)-to-ISS 1553 (Stage)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(X inserted where interface is required; N/A inserted where interface is not available; and N/R inserted where interface is not required.)

*Service available until Orbiter power down.
**No entry required for IVT or end-to-end test.

5.6 Telemetry Interfaces

Telemetry and data interfaces are as follows in table 5-3.

Table 5-3.- TELEMETRY INTERFACES

[Note: If multiple CEs and/or the ISS transmit to/through the Orbiter, include each CE and the ISS as separate line items in this table.]

Data source	Prelaunch		Ascent	Docked		Descent	Post-flight *
	PLBD Pre**	Closure Post	Pre	During	Post		
a. Hardwire through T-0 umbilical			N/A	N/A	N/A	N/A	N/A	
b. Discretes/ analogs to Orbiter PF-1 & PF-2 Multi-plexer/ Demulti-plexer (MDM) from APCUs		N/A	N/A			N/A	N/A

c. Hardwire to standard switch panel from APCUs			N/A			N/A	N/A
d. Payload Data Interleaver (PDI) via/ OIU (CE) [list data rates]			N/A			N/A	N/A
e. PDI via OIU from ISS 1553 (Stage)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
f. PCS via 1553 (Stage)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
g. PDI via OIU from SSOR	N/A	N/A	N/A	N/A		N/A	N/A

(X inserted where interface is required; N/A inserted where interface is not available; and N/R inserted where interface is not required.)

*Service available until Orbiter powerdown.
**No entry required for IVT or end-to-end test.

The phased sequence of operational usage of the data systems will be specified in a data submittal.

All data streams (and where applicable, individual parameters) processed by the Orbiter will be described in Annex 4.

5.7 Actively Cooled Interfaces

[Specify any special (spigot, vent, in-bay active cooling, AFD equipment cooling, etc.) interface requirements (including ground requirements).] [Show Remotely Operated Fluid Umbilical (ROFU) and APCU-I actively cooled interfaces, when required.] Specific middeck cooling requirements are listed in Appendix E. [Specify the actual rear-cooled payload air flow rates, both continuous and peak for the last column in Appendix E.]

5.8 Orbiter General Purpose Computer Software Services

The General Purpose Computer (GPC) software support for commands from the ground to the CE and/or Stage and data from the CE and/or Stage to the ground will be provided for the applicable interfaces defined in tables 5-2 and 5-3.

Standard commands for the applicable interfaces defined in table 5-2 will be prestored in the GPC on-orbit software.

Data parameters for applicable interfaces defined in table 5-3 will be acquired by the GPC on-orbit software and processed (standard processing) for crew display.

[Specify any CE GPC software services.]

Standard command/data processing services are defined in NSTS 21000-IDD-ISS and NSTS 19943, Command Requirements and Guidelines for NSTS Customers. Detailed ISSP requirements will be specified in Annex 4.

5.9 Audio and Video Interfaces

{If required, define unique audio and video interfaces in table 5-4:

Table 5-4.- UNIQUE AUDIO AND VIDEO INTERFACES

Service	Predocked	Docked	Undocked}

6.0 ENVIRONMENTAL ANALYSES AND INTERFACES

(Reference NSTS 21458)

6.1 Structural Loads and Deflections

(Reference NSTS 21458)

[The following two paragraphs and the Mission Landing Cases table will be modified by the Structures community on a mission-specific basis. The table is an example from a recent MIP and will be modified to show all possible landing cases for a particular mission with no initial consideration of number of failures, etc. leading to those cases.]

For Mission (specify mission number), several possible contingency landing configurations have been identified. The SSP/ISSP Joint Structures Team (JST) will monitor the EVA activities, assembly sequence scenario, and contingency plans to identify all reasonable contingency-landing scenarios that might occur. The additional contingency landing analysis (or assessments) can be performed by the ISSP prior to the Pre-verification Loads Review (PVLR) or will be performed by the SSP as part of the Verification Loads Analysis (VLA). The final selection of contingency landing cases for the VLA will be consistent with the baselined flight plan and flight rules that exists at the time of the PVLR. The contingency landing loads will be assessed by the ISSP to determine the structural compatibility of each CE for each contingency case. The ISSP will be responsible for providing the extra models required for this effort including the appropriate grid points for clearance monitoring studies.

The following table identifies the possible landing configurations that may be analyzed or assessed for this mission. If additional payloads are manifested on this mission, additional contingency landing cases will most likely result.

Mission (Specify number: e.g., UF-1) Landing Cases

Case	Comment	Description
1	Normal landing	All CEs in their planned return configuration
2	Abort landing	All CEs in their launch configuration
3	Contingency n	N = identify possible contingency landing cases
4	Contingency n+1	Identify second contingency landing case
5	Contingency n+2	Identify third contingency landing case

6.1.1 Launch and Landing Structural Analysis.- (Reference NSTS 21458)

6.1.2 On-orbit Loads Analyses.- (Reference NSTS 21458)

6.2 Thermal Analytical Integration

(Reference NSTS 21458)

6.2.1 Thermal Integration for Undocked and Docked Mission Phases.- (Reference NSTS 21458)

6.2.2 Thermal Integration Planning and Verification.- (Reference NSTS 21458)

6.3 Electromagnetic Interference/Compatibility Assessment

(Reference NSTS 21458)

6.4 Contamination Control

(Reference NSTS 21458)

6.5 Shock, Vibration, and Acoustic Environments

(Reference NSTS 21458)

6.6 Ground Environmental Requirements

(Reference NSTS 21458)

6.7 Manipulator and Payload Handling Mechanisms Analyses

(Reference NSTS 21458)

The report of the OSVS estimated target locations shall be provided by the ISSP 18 months prior to launch. The report of the actual target locations shall be provided by the ISSP 12 months prior to launch.

6.8 Environmental Control Life Support Systems Environment and Interfaces

(Reference NSTS 21458)

During the docked phase, the ISS shall be primary for CO_2 control for both the Orbiter and ISS by operating the Carbon Dioxide Removal Assembly (CDRA) and Vozdukh. In exchange, the SSP will offload Lithium Hydroxide (LiOH) canisters from the Orbiter to make additional stowage available to the ISS.

The SSP will offload LiOH from the Shuttle based on the following:

a. CDRA will operate in [dual or single] bed mode for [quantity] days while the Shuttle is docked. [Dual or single] bed will provide [seven or four] Shuttle crewmembers worth of CO_2 removal during docked operations.

b. Vozdukh will operate during docked operations and will provide three ISS crewmembers worth of CO_2 removal.

c. The amount of LiOH manifested for Shuttle use plus the amount of usable LiOH in the ISS on-orbit stockpile inventory will be equal to or greater than the amount of LiOH necessary to support the Shuttle nominal mission duration requirements including additional days as specified in the Flight Definition Requirements Document (FDRD) plus 3 extension days (End of Mission (EOM)+3) in the event CDRA is unavailable.

d. The amount of LiOH manifested for Shuttle use will be no less than 31 cans. [The absolute minimum amount of LiOH that may be manifested for Shuttle use will be enough to support Shuttle requirements for 7 undocked days.]

Any use of the ISS Lithium Hydroxide (LiOH) stockpile by the SSP during a given flight shall require the SSP to transfer LiOH canisters to the International Space Station (ISS) to replenish the on-board stockpile on subsequent flights. (Table 7-1 defines the amount).

The SSP shall replace unused LiOH canisters in the ISS stockpile with fresh cans to maintain the stockpile within LiOH shelf life limitations until the next subsequent Shuttle mission. (Table 7-1 defines the amount).

The ISS shall provide U.S. LiOH canisters, from the ISS on-orbit inventory, for use by the SSP if the ISS cannot meet the carbon dioxide levels documented in the NSTS-21000-IDD-ISS for both the Orbiter and ISS. In such a case the ISS will provide an amount of U.S. LiOH sufficient to give the SSP End of Mission (EOM) +3 capability. (Table 7-2 defines the amount).

7.0 HARDWARE

This section specifies the unique hardware required for this LP and Stage and the party responsible for supplying the hardware.

7.1 Space Shuttle Program-provided Hardware

The following unique hardware will be provided by the SSP. [List any unique items required, including IVT equipment hardware, and identify the items' use. If the hardware item is a ISSP-funded service, so state.] [Examples are listed below:

a. Remotely Operated Electrical Umbilical (ROEU) (TBD flight, TBD simulator for CITE, TBD Cargo Integration Test Equipment (CITE))

b. Remotely Operated Fluid Umbilical (ROFU) (TBD flight, TBD simulator for CITE)

c. Trajectory Control Sensor (TCS) retroreflectors (state no. required)

d. Special cables (state no. required) (TBD flight, TBD for CITE)

e. APCU integration hardware

f. Lithium Hydroxide Canisters:

   -[Quantity] canisters of LiOH for ISS on-orbit stockpile replenishment

   -[Quantity] canisters to be rotated with canisters from the ISS stockpile due to shelf life limitations

7.2 ISSP-provided Hardware

The following mission-unique hardware will be provided by the ISSP:

[List any mission-unique hardware items required, including Cargo Integration Test Equipment (CITE) hardware, and identify the item's use. Examples listed below:

a. PCS and flight-specific hardware (2 flight, TBD spare, TBD CITE)

b. Drag-thru cables]

c. A maximum of [Quantity] U.S. LiOH cans from the ISS on-orbit inventory if the ISS cannot meet the CO_2 removal requirements of NSTS-21000-IDD-ISS.

   [A minimum of [Quantity] U.S. LiOH cans from the ISS on-orbit inventory will nominally be provided.]

8.0 FLIGHT OPERATIONS

This section defines the flight design, flight activity planning, flightcrew and flight controller training, and flight operations support activities required for Orbiter/ISS integration.

8.1 Flight Activity Planning and Flight Operations Integration

The ISSP will provide flight activity planning requirements as part of a data submittal.

8.1.1 Flight Plan.- The SSP will be responsible for all crew activity planning and will develop an integrated Space Shuttle Flight Plan to support the flight. The plan will be developed using ISSP-supplied crew activity requirements as specified in table 8-1.

8.1.2 Data Submittal Requirements for Flight Operations Integration.- The ISSP is responsible for development and verification of the data submittals as specified in table 8-1. At the Flight Operations Review (FOR), it will be verified that all necessary data is implemented into the flight documentation. Details on these data submittals are available in the Payload Operations Workbook, JSC-27508.

Table 8-1.- DATA SUBMITTAL REQUIREMENTS

Operational data requirements	ISSP submittal	Submittal deadline
Flight Rules	OP-01: Assembly and Operations Support Plan (SSP 50075-TBD). VE-32: Vehicle Engineering Data	L-24 months and every 6 months following until L-6 months
Nominal, Backup, and Contingency Procedures	OP-01: Assembly Operations Support Plan (SSP 50075-TBD). VE-32: Vehicle Engineering Data	L-24 months and every 6 months following until L-6 months
Malfunction Procedures	OP-01: Assembly and Operations Support Plan (SSP 50075-TBD). VE-32: Vehicle Engineering data	L-24 months and every 6 months following until L-6 months
In-flight Maintenance (IFM) Procedures	OP-01: Assembly and Operations Support Plan (SSP 50075-TBD). VE-32: Vehicle Engineering Data	L-24 months and every 6 months following until L-6 months
Unique ISSP Data Collection Requirements	OP-01: Assembly and Operations Support Plan (SSP 50075-TBD). VE-32: Vehicle Engineering Data	L-24 months and every 6 months following until L-6 months
Operational Sequence Diagrams and Functional Task List		L-36 months

8.2 Training

(Reference NSTS 21458)

8.2.1 CE-specific Part-task Training and ISS Element Standalone Training.- (Reference NSTS 21458)

8.2.2 Shuttle Mission Simulator Requirements.- (Reference NSTS 21458)

8.2.3 ISS Training Facilities.- (Reference NSTS 21458)

8.2.4 Integrated Simulations.- (Reference NSTS 21458)

8.3 Ground Operations Communications Requirements

(Reference NSTS 21458)

9.0 LAUNCH AND LANDING (L&L) SITE OVERVIEW

(Reference NSTS 21458)

9.1 Launch Package Preintegration

Upon arrival at the launch site, most CE items are delivered to the Space Station Processing Facility (SSPF). When a unique Payload Processing Facility (PPF) is required, this preassigned facility and support will be identified in Annex 8.

[If a prepacked middeck locker payload, use the following paragraph: The payload will be received at KSC as a JSC prepacked middeck locker. Installation and removal from the Orbiter are the only L&L requirements.]

[For middeck payloads, if the ISSP requires real-time Customer Ancillary Service (CAS) data, use the following:

The ISSP requires real-time transmission of CAS data to the assigned Payload Processing Facility (PPF) starting at payload installation into the Orbiter and continuing throughout the mission until the payload is removed from the Orbiter at the landing site. The transmission of CAS data to Hangar L will be considered on a flight-by-flight basis and will be provided depending upon availability of data lines within KSC.]

[List any SSP-managed support required or note that none is required.]

9.2 Launch Package Integration

(Reference NSTS 21458)

[List any SSP-managed support required or note that none is required.]

9.2.1 Orbiter-to-Cargo Element Interface Verification.- [Indicate if high-fidelity Orbiter-to-CE interface verification will be conducted.]

9.2.2 Crew Equipment Interface Test.- (Reference NSTS 21458)

9.3 Orbiter Integration

(Reference NSTS 21458)

9.3.1 OPF Activities.- [Indicate any exceptions to nominal up-mission processing in the OPF.]

9.3.2 Pad Activities.- With the Payload Ground Handling Mechanism (PGHM) in the rollback position, the CE may be available for activities before Orbiter arrival at the pad. Agreed-upon services to be performed at the pad for this CE are as follows: [Describe unique CE activities in the Payload Changeout Room (PCR).]

[If KSC middeck processing is required, use the following: Middeck payloads will be installed and any interface verification tests, closeout procedures, and payload-unique tests will be accomplished by the SSP and documented in the OMRSD and/or mission-unique Time-Critical Ground Handling Requirements Table (TGHR) table.] ISS Utilization middeck payload processing requirements at the Pad are provided in Appendix F.

9.4 Late Launch Package Operations

(Reference NSTS 21458)

The LP in the payload bay will be in final lift-off configuration at PLBD closure for flight. [Exceptions to this must be negotiated with the SSP and documented in this section of the MIP.]

9.4.1 After Normal Payload Bay Door Closure.- Access after L-19 days may be scheduled. [List any SSP-managed and payload bay support required.]

[Add for Multi-Purpose Logistics Module (MPLM) missions: This would normally be between L-7 days and L-88 hours for access to the internal MPLM. MPLM late access requirements will be documented in the Operations and Maintenance Requirements and Specifications Document (OMRSD).]

[Add for ISS middeck payloads: Agreed-upon services to be performed at the pad for this payload are as follows: [List as required.]

[For ISS middeck payloads that require late installation/servicing within L-3 days but prior to L-24 hours (category 1 - installation is within normal launch countdown activities), add the following:

The ISS middeck payload(s) requires late installation in the Orbiter within L-3 days (or TBD hours). The payload will be turned over from the ISSP to KSC to allow installation in accordance with launch countdown and crew compartment stowage activities.]

[For ISS middeck payloads that require late installation/servicing within L-24 hours (category 2 - installation is accomplished during flightcrew equipment late stowage), add the following:

The ISS middeck payload(s) requires late installation in the Orbiter within L-24 hours. Appropriate justification has been provided by the ISSP to the SSP for installation within L-24 hours. The payload will be turned over from the ISSP to KSC to allow installation in accordance with a mission-unique late stowage schedule.]

[For ISS middeck payloads that require late installation/servicing at a specific time within L-24 hours but prior to the start of the ascent switch list activities (category 3 - installation is within L-24 but prior to L-18.5 hours), add the following:

The ISS middeck payload(s) requires late installation in the Orbiter within L-(TBD) hours but prior to the start of ascent switch list activities. Appropriate justification has been provided by the ISSP to the SSP for installation at the specified time. The payload will be turned over from the ISSP to KSC in accordance with a mission-unique late stowage schedule.]

[For ISS middeck payloads that require late installation/servicing during times in conflict with nominally scheduled switch list activities (category 4 - installation is within L-18.5 hours but prior to L-15.5 hours, add the following:

The ISS middeck payload(s) requires late installation in the Orbiter within L-(TBD) hours and this conflicts with nominally scheduled ascent switch list activities. Appropriate justification has been provided by the ISSP to the SSP for installation at the specified time. This installation time must have additional approval and be integrated with other payloads by the KSC Launch Countdown Working Group.]

ISS middeck payload installations must be completed by L-15.5 hours. Late installation (within L-24 hours) requirements for payloads with interface verification testing may affect manifesting. Late installation requirements will require coordination with the Launch Team/Launch Director during the launch countdown planning process. Installation conflicts will be resolved using the Flight Requirements Document (FRD) payload priority list which may result in adjustments to installation times. Details for late installation requirements will be documented in the mission-unique TGHR table. ISSP turnover times are typically 1.5 to 2 hours, but no more than 4 hours, prior to installation to accommodate KSC preparation and transportation to the launch pad.

Fit checks will be required for all first-time manifested middeck payloads that are replacements for middeck lockers. The need for subsequent fit checks with different serial numbers, Orbiters, or locations will be determined by the SSP, KSC and payload representatives. Fit check requirements will be documented in the Operations and Maintenance Requirements and Specifications Document (OMRSD).]

[For a prepacked middeck locker payload, use the following:

ISS Utilization middeck payload processing requirements after normal payload bay door closure are provided in Appendix F and documented in the OMRSD and/or mission-unique TGHR table.

The middeck locker containing the stowed payload will be installed by the SSP in the Orbiter middeck during normal stowage operations at the launch pad.]

9.4.2 After Launch Delays/Scrub-Turnaround.- [For payloads that require refurbishment in the event of a launch delay, use the following paragraph:

For payloads that require refurbishment, details are documented in the mission-unique TGHR table (middeck payloads) or the OMRSD (payload bay payloads). ISS Utilization middeck payload launch

delay/scrub turnaround requirements are provided in Appendix F with details in the mission-unique TGHR table.

9.5 Postlanding

(Reference NSTS 21458)

[For a prepacked ISS middeck locker payload, use only the following paragraph:

The ISS middeck payload will be removed from the Orbiter during normal destow operations and returned to JSC for return to the ISSP.]

9.5.1 Landing Processing.- [For nominal turnover of ISS payload stowed in the crew compartment, (by Orbiter Return/Wheels Stop (R)+4 days) add the following:

The payload will be returned to the customer at the landing site within 4 days of landing during nominal destow operations at KSC or Dryden Flight Research Center (DFRC). Payloads not turned over at the landing site will be turned over to the ISS payload representative at Lyndon B. Johnson Space Center (JSC) within 12 days or will be shipped directly to the payload representative at his facility.]

[If early postflight removal of crew compartment stowed ISS payload is required, use the following: If a flight ends at either KSC or DFRC, and the payload customer requires early turnover of the payload to prevent loss of science or engineering data, turnover can be accommodated by R+6 hours. The payload will be removed from the Orbiter crew compartment prior to Orbiter tow. If the payload customer requires early turnover of payload due to time-critical schedule constraints (for example: crew debrief, failure analysis, turnaround for future mission support), turnover can be accommodated by R+25 hours. ISS middeck payload early turnover requirements are listed in Appendix F.

Details for early return of payload to the customer are negotiated and documented in the mission-unique TGHR table or Landing Site Disposition Report (LSDR).

Removal of payload is a top priority after completion of Orbiter safing and crew egress activities.

Early payload turnover requirements will be integrated with other manifested payloads and negotiated on a mission-specific basis. For missions with large quantities of crew compartment hardware requiring early turnover, the early turnover times may extend past R+6 hours.]

[If early postflight removal of MPLM hardware is required, use the following: If a flight ends at either KSC or DFRC, items containing time-critical data in the MPLM must be offloaded as soon as access can be established.]

Agreed-upon services to be performed postlanding for this RC are: [List any middeck turnover requirements or MPLM early destow requirements. List as KSC and/or other site requirements.]

9.5.2 Postmission Payload Removal.- (Reference NSTS 21458)

9.5.3 Early End of Mission Support.- An Early End of Mission (EEOM) occurs if a flight lands at KSC or EAFB before the planned EOM.

[For middeck and/or MPLM, select the appropriate paragraph:]

a. The middeck and/or MPLM payload does not require EEOM support.

b. [If additional ISSP funding has been provided to support early destowage at the Dryden Flight Research Facility (DFRF), use the following sentence:] Because valuable data is obtained early in the mission, the payload requires EEOM support (ISSP-funded service) at KSC and DFRC beginning at

L+TBD hours to remove time-critical hardware from the [select: middeck and/or the MPLM]. Details for EEOM support will be documented in the mission-unique TGHR table (middeck payloads) or OMRSD (MPLM payloads).

ISS Utilization middeck payload EEOM requirements are provided in Appendix F.

9.5.4 Ferry Flight Operations.- The payload will be compatible with ferry flight operations. [Reference NSTS-21000-IDD-ISS for payload bay ferry flight environments.]

[Identify any unique purge requirements before, during stopovers, and after ferry flight if required.]

9.6 Contingency Shuttle Rollback

(Reference NSTS 21458)

10.0 SAFETY

(Reference NSTS 21458)

10.1 General

10.2 ISSP Experiments in the Orbiter Crew Compartment

(Reference NSTS 21458)

11.0 INTERFACE VERIFICATION AND TESTING

(Reference NSTS 21458)

[Indicate if CITE is required for cargo element testing.]

12.0 POSTFLIGHT DATA REQUIREMENTS

13.0 ISSP-FUNDED SERVICES SUMMARY

This section of the MIP identifies and sets forth all integration hardware, interface verification, and flight operations services to be performed by the SSP for the ISSP, which are currently identified as ISSP-funded services. These ISSP-funded services are budgeted as agreed upon by the ISSP. All other services are provided for the mission as standard services. A summary of ISSP-funded services identified herein are listed as follows:

14.0 ANNEXES AND DATA SUBMITTALS

As identified in sections of NSTS 21458 and other sections of this MIP, the information required to develop the following annexes and data submittals is to be provided by the ISSP (unless specifically defined as a joint ISSP/SSP or SSP only responsibility) in a format negotiated by the ISSP and SSP. [Include those annexes and data submittals defined in the body of the NSTS 21458 and the MIP.]

Annex 1 - Payload Data Package

Annex 2 - Part I: Flight Planning (Consumables)

Annex 4 - Command and Data

ICA - Interface Control Annex

Annex 8 - Launch Site Support Plan

OMRSD - Launch Package Verification Requirement

Data submittals in lieu of Annexes are as specified herein.

15.0 MISSION INTEGRATION PLAN PRODUCT SCHEDULE

The generic MIP Product Launch Minus (L-) schedule template in NSTS 21458, Appendix C defines the generic L- delivery due dates agreed to between the SSP and the ISSP. That template is used as a guideline for the development of the flight-specific MPS.

NSTS 37375, MIP Product Schedules documents the MPS process. The MPS is negotiated with the ISSP through the flight IPT and approved using the process described in NSTS 37375. The lead Payload Integration Manager (PIM) uses the MPS to report and track the flight-specific scheduled due dates of the required SSP and ISSP flight products. The approved MPS is posted to the flight IPT web site at http://sspweb.jsc.nasa.gov/ipt/.

16.0 APPLICABLE DOCUMENTS

The following documents are applicable to the extent stated herein. Any future changes or revisions to the current issue that may conflict with ISSP requirements can be negotiated with the SSP.

a. NSTS 07700, Volume XIV, Space Shuttle System Payload Accommodations, Revision K, including Appendices 1-10, but excluding ICD 2-19001*

b. NSTS-21000-IDD-ISS, Shuttle Orbiter/International Space Station Interface Definition Document*

c. NSTS 19943, Command Requirements and Guidelines for NSTS Customers*

d. NSTS 16007, Shuttle Launch Commit Criteria and Background*

e. NSTS 21000-IDD-MDK, Shuttle/Payload Interface Definition Document for Middeck Payloads*

f. NSTS 21458, Standard Integration Agreement for All Space Shuttle Program and International Space Station Program Missions*

g. OP-01, Customer Expectation Agreements and the Prime/Product Group Worksite Analysis*

h. JSC 27508, Payload Operations Workbook, current issue*

i. NSTS ICD-A-21321, Shuttle/Orbiter/APCU Cargo Element Interfaces*

j. NSTS 21000-IDD-SML, Shuttle/Payload Interface Definition Document for Small Payload Accommodations, current issue*

k. NSTS 37375, Mission Integration Plan Product Schedule*

*Current issue includes all future changes and revisions.

APPENDIX A

TO-BE-RESOLVED ISSUES

APPENDIX B

TO-BE-DETERMINED ITEMS

APPENDIX C

ACRONYMS AND ABBREVIATIONS

ACCN	Audio Central Control System
AFD	Aft Flight Deck
APC	Adaptive Payload Carrier
APCU	Assembly Power Converter Unit
ASE	Airborne Support Equipment
CAS	Customer Ancillary Service
CCTV	Closed Circuit Television
CDRA	Carbon Dioxide Removal Assembly
CE	Cargo Element
CIP	Computer Interface Panel
CITE	Cargo Integration Test Equipment
CO_2	Carbon Dioxide
D&C	Display and Control
EAFB	Edwards Air Force Base
EEOM	Early End of Mission
EGSE	Electrical Ground Support Equipment
EMC	Electromagnetic Compatibility
EMU	Extravehicular Mobility Unit
EOM	End of Mission
EVA	Extravehicular Activity
FOR	Flight Operations Review
FPS	Flight Production Schedule
FRD	Flight Requirements Document
GAS	Get-Away Special
GLS	Ground Launch Sequencer
GPC	General Purpose Computer
GSE	Ground Support Equipment
Hz	Hertz (cycles per second)
I/F	Interface
ICA	Interface Control Annex
ICAPC	Increased Capability Adaptive Payload Carrier
ICD	Interface Control Document
IDD	Interface Definition Document
IFM	In-flight Maintenance
ISS	International Space Station
ISSP	International Space Station Program
IVT	Interface Verification Test

JOP	Joint Operations Panel
JSC	Lyndon B. Johnson Space Center
JST	Joint Structures Team
JTWG	Joint Technical Working Group
KSC	John F. Kennedy Space Center
kWh	kilowatt hour
L-	Launch minus
L&L	Launch and Landing
LCC	Launch Commit Criteria or Launch Control Center
LiOH	Lithium Hydroxide
LP	Launch Package
LTA	Launch to Activation
MCC	Mission Control Center
MDK	Middeck
MDM	Multiplexer/Demultiplexer
MIP	Mission Integration Plan
MLE	Middeck Locker Equivalent
MPLM	Mini-pressurized Logistics Module
MPS	MIP Product Schedule
N/A	Not applicable
ODS	Orbiter Docking System
OIU	Orbiter Interface Unit
OMRSD	Operations and Maintenance Requirements and Specifications Document
OPF	Orbiter Processing Facility
OSVS	Orbiter Space Vision System
PCR	Payload Changeout Room
PCS	Portable Computer System (ISS)
PDI	Payload Data Interleaver
PDIP	Payload Data Interface Panel
PDRS	Payload Deployment and Retrieval System
PGHM	Payload Ground Handling Mechanism
PGSC	Payload and General Support Computer
PIM	Payload Integration Manager
PLB	Payload Bay
PLBD	Payload Bay Door
PMA	Pressurized Mating Adapter
PPF	Payload Processing Facility
psia	pounds per square inch absolute
PSP	Payload Signal Processor
PVLR	Pre-Verification Loads Review

RC	Return Complement
RF	Radio Frequency
RMS	Remote Manipulator System
ROEU	Remotely Operated Electrical Umbilical
ROFU	Remotely Operated Fluid Umbilical
SRMS	Shuttle Remote Manipulator System
SSOR	Space-to-Space Orbiter Radio
SSP	Space Shuttle Program/Space Station Program (only in reference to ISSP documentation)
SSPF	Space Station Processing Facility
TBD	To Be Determined
TBR	To Be Resolved
TBS	To Be Supplied
TCS	Trajectory Control Sensor
TI	Transition Initiation
VADAR	Verification Analysis Data Acceptability Review
VAR	Verification Acceptance Review
VIPeR	Vehicle Integrated Performance and Resource Team
VHF	Very High Frequency
VLA	Verification Loads Analysis
VSU	Video Switching Unit
W	watts

APPENDIX D

DEFINITIONS

Ascent - The period of time from Solid Rocket Booster (SRB) ignition through the establishment of a stable orbit (typically post-Orbital Maneuvering System (OMS) second burn).

Assembly - The period of time from the start of the activity or assembly sequence until the completion of the Cargo Element (CE) assembly operations; i.e., docked operations.

Assembly operations - On any flight, the process of building, connecting together, transporting, or attaching items to the International Space Station (ISS) through the completion of assembled components checkout.

CE - The minimum complement of specific structure, instruments, space equipment, and support hardware integrated into the Orbiter payload bay as a single unit.

Contingency Extravehicular Activity (EVA) - EVA required to effect the safe return of the Orbiter and crew.

Control Length - The maximum cargo element length including dynamic clearances and access clearance (if required).

Control Weight - This weight is defined as the weight for all ISSP-provided hardware (i.e., payload bay hardware and crew compartment stowed hardware). SSP-provided equipment installed on the ISS is also included (i.e., grapple fixtures, payload disconnect assemblies, reflectors, etc.).

Descent - The period of time from start of preparation for entry through wheel stop.

EVA - The time from crew egress of the airlock to crew reentry of the airlock.

Flight - That portion of a mission encompassing the period from SRB ignition (T-0) to landing (wheels stop).

Flight activities - Those crew tasks and ground support operations defined as necessary to accomplish mission objectives.

Flight Data File (FDF) - The onboard complement of timelines, procedures, reference material, and test data available to the crew for flight execution.

Flight design - The trajectory, consumables, attitude and pointing, and navigation analysis necessary to support the planning of a flight.

Intravehicular Activity (IVA) - Crew shirtsleeve operations in a pressurized environment.

ISS - The on-orbit assembled structure, composed of both pressurized and unpressurized CEs provided by the United States (U.S.) and a group of international partners.

Launch Package (LP) - The total complement of ISSP flight hardware, crew compartment items and support equipment launched onboard the Orbiter on a single ISS/Space Shuttle Flight. The LP applies both for assembly and cargo service flights. Crew compartment items are those Station-allocated middeck, airlock or Aft Flight Deck (AFD) items including crew provisions (clothing, food, personal items) payloads, spares, and ORUs.

Local Vertical/Local Horizontal (LVLH) - A rotating, orthogonal coordinate frame centered at the spacecraft center of gravity (c.g.) with axes aligned with the spacecraft radius and angular momentum vectors.

Orbiter Support Equipment (OSE) - The items that remain onboard with the Orbiter after the CE is deployed or will support retrieval of an Orbiter CE.

Postassembly - The period of time from the completion of the CE assembly operations (undocking) to start of preparation for entry.

Postflight - The period of time from wheel stop to the removal of a return complement.

Post-Payload Bay Door (PLBD) closure - Period of time from PLBD closure for flight to SRB ignition. (Ascent software configuration loading at T-20.)

Postretrieval - The period of time from the completion of postberthing reconfiguration until redeployment or through landing.

Preassembly - The period of time from just after the establishment of a stable orbit until the start of the CE deployment or assembly operations (i.e., docking).

Pre-PLBD closure - Period of time from CE insertion into the Orbiter bay to PLBD closure for flight.

Preretrieval - The period of time from just after the establishment of a stable orbit until the start of the final Line of Sight (LOS) approach.

Program - A plan of operations to be performed from start of preparation for assembly until completion of postassembly activity.

Return Complement (RC) - The total complement of ISS CEs, (including items removed from the ISS) crew compartment items and support equipment returned from orbit aboard the Orbiter on a single ISS/Space Shuttle Flight. The RC applies both for assembly and cargo service flights. Crew compartment items are those Station-allocated middeck of AFD lockers including crew provisions (clothing, food, personal items) payloads, spares, ORUs, and items returned from the ISS.

Separation - The execution of a translation maneuver or a sequence of translation maneuvers resulting in an opening rate between the Orbiter and the ISS.

Scheduled EVA - EVA planned prior to launch and included in the nominal mission timeline.

Unscheduled EVA - EVA not included in the nominal scheduled mission activities, but which may be required to achieve ISSP operations success.

APPENDIX E

UPDATE FOR REAR-COOLED MIDDECK PAYLOADS

PAYLOAD NAME	Control Weight lb S(Single) or D(Double) Middeck Locker	Elect Power Ascent Cont (peak)	Elect Power On-Orbit Cont (peak)	Elect Power Entry Cont (peak)	Turnover to KSC Time*	Scrub Turn-Around Time**	Post-Landing Turnover to Customer Time***	EEOM Reqs Yes or No	Other Constraints	Rear-Cooled Air Flow Rate Cont (peak)
MIP Reference Section No.	Sec 4.1.2, Table 4-1a & 4-1b	Sec 5.4 & Table 5-1	Sec 5.4 & Table 5-1	Sec 5.4 & Table 5-1	Sec 9.4.1	Sec 9.4.2	Sec 9.5.1	Sec 9.5.3		Sec 5.7
MIDDECK PAYLOADS UP (UNPOWERED)										
Payload #1 Name	lb	N/A	N/A	N/A	L-XX hours	Turnover + XX hours	N/A	N/A	[N/A or Note X]	N/A
Payload #2 Name	lb	N/A	N/A	N/A	L-XX hours	Turnover + XX hours	N/A	N/A	[N/A or Note X]	N/A
Payload #3 Name	lb	N/A	N/A	N/A	L-XX hours	Turnover + XX hours	N/A	N/A	[N/A or Note X]	N/A
MIDDECK PAYLOADS UP (POWERED)										
Payload #1 Name	lb S or D	W (W peak)	W (W peak)	N/A	L-XX hours	Turnover + XX hours	N/A	N/A	[N/A or Note X]	CFM (CFM peak)
Payload #2 Name	lb S or D	W (W peak)	W (W peak)	N/A	L-XX hours	Turnover + XX hours	N/A	N/A	[N/A or Note X]	CFM (CFM peak)
Payload #3 Name	lb S or D	W (W peak)	W (W peak)	N/A	L-XX hours	Turnover + XX hours	N/A	N/A	[N/A or Note X]	CFM (CFM peak)

PAYLOAD NAME	Control Weight lb S(Single) or D(Double) Middeck Locker	Elect Power Ascent Cont (peak)	Elect Power On-Orbit Cont (peak)	Elect Power Entry Cont (peak)	Turnover to KSC Time*	Scrub Turn-Around Time**	Post-Landing Turnover to Customer Time***	EEOM Reqs Yes or No	Other Constraints	Rear-Cooled Air Flow Rate Cont (peak)
MIDDECK PAYLOADS DOWN (UNPOWERED)										Sec 5.7
Payload #1 Name	lb	N/A	N/A	N/A	N/A	N/A	R+ XX hours	Yes or No	[N/A or Note X]	N/A
Payload #2 Name	lb	N/A	N/A	N/A	N/A	N/A	R+ XX hours	Yes or No	[N/A or Note X]	N/A
Payload #3 Name	lb	N/A	N/A	N/A	N/A	N/A	R+ XX hours	Yes or No	[N/A or Note X]	N/A
MIDDECK PAYLOADS DOWN (POWERED)										
Payload #1 Name	lb S or D	N/A	W (W peak)	W (W peak)	N/A	N/A	R+ XX hours	Yes or No	[N/A or Note X]	CFM (CFM peak)
Payload #2 Name	lb S or D	N/A	W (W peak)	W (W peak)	N/A	N/A	R+ XX hours	Yes or No	[N/A or Note X]	CFM (CFM peak)
Payload #3 Name	lb S or D	N/A	W (W peak)	W (W peak)	N/A	N/A	R+ XX hours	Yes or No	[N/A or Note X]	CFM (CFM peak)

Assumption: Payloads Up are transferred to ISS and Payloads Down are transferred from ISS to Shuttle and back to Earth.

[List appropriate numbered Other Constraints and the source of documentation.

Notes:

1. This payload has ground power interrupt constraints; details will be documented in the mission-unique Time-critical Ground Handling Requirements (TGHR) table.
2. This payload has ground orientation constraints; details will be documented in the mission-unique TGHR table.
3. This payload has unique ground handling constraints; details will be documented in the mission-unique TGHR table.]

Details for Integration/Stowage will be specified in the Interface Control Annex (ICA). Back-up units will also be specified in the ICA. Details for Turnaround/Scrub Turnaround will be specified in the TGHR table. For non-Utilization hardware scrub turnaround requirements, refer to section 9.4.

*Turnover to KSC Time: Prelaunch time that the custodial responsibility of the payload hardware, and Integration Data Package (IDP) as required, is formally reassigned from the customer to John F. Kennedy Space Center (KSC), prior to payload transport to the Pad for installation into the Orbiter.

**Scrub Turnaround Time: The time from turnover to KSC until the payload science expires, at which time the payload is no longer viable for a successful mission. If the launch is delayed beyond the payload expiration time and if prelaunch timeline allows, the payload can be removed for refurbishment or replacement.

***Postlanding Turnover to Customer Time: Postlanding time that the custodial responsibility of the payload hardware, and IDP as required, is formally reassigned from KSC to the customer.