

# **Attachment J-02**

## **Data Requirement Deliverables (DRDs)**

## 1.0 DATA REQUIREMENTS LIST (DRL) DESCRIPTION

The DRL provides the Data Requirement Deliverable (DRD) number, title, data type, and submittal frequency for each data deliverable item.

## 2.0 ORGANIZATION OF DATA REQUIREMENTS LIST (DRL)

### 2.1 DRD Number

For the purpose of classification and control, the individual data deliverables in the DRL are grouped into the following categories:

- 0XX series DRDs applicable to all contract activities
- 1XX series DRDs applicable to Contract Line Item Number (CLIN) 001, applicable to CLIN 002 Post Certification Missions, Certification maintenance, and any re-Certification
- 2XX series DRDs applicable to CLIN 002, applicable to CLIN 001 for crewed flight tests

### 2.2 Data Types

The types of data and their contractually applicable requirements for approval and delivery after contract award are:

TYPE	DESCRIPTION
1	All submittals of and interim changes to Type 1 DRDs require written approval from NASA before formal release for use or implementation. Type 1 DRDs shall be delivered by the Contractor into a NASA location as specified by the Contracting Officer (CO).
2	For Type 2 DRDs, NASA reserves a time-limited right to provide written disapproval of any submittal of and interim changes to those submittals. Type 2 DRDs shall be delivered by the Contractor into a NASA location as specified by the Contracting Officer not less than 45 calendar days prior to its release for use or implementation. The Contractor shall clearly identify the target release date in the "submitted for review" transmittal. If the Contractor has not been notified of any disapproval prior to the target release date, the data shall be considered approved. To be an acceptable DRD submission, disapproved data shall be revised to remove causes for the disapproval and re-submitted for approval before its release.
3	Type 3 DRDs shall be delivered either electronically or in hardcopy by the Contractor into a NASA location as specified by the Contracting Officer. Type 3 DRDs do not require NASA approval; however, the DRD must satisfy all applicable contractual requirements.

TYPE	DESCRIPTION
4	Type 4 DRDs shall be delivered by the Contractor within the Contractor's electronic system where NASA has been granted read and downloadable access through contract completion. The Contractor's act of placing the data within their system wherein NASA is provided the ability to read and download the data shall constitute delivery for purposes of defining NASA's rights in data as set forth in FAR 52.227-14, <i>Rights in Data – General (Deviation)</i> , as modified in this contract. Type 4 DRDs do not require NASA approval; however, the DRD must satisfy all applicable contractual requirements. For Type 4 DRDs, the Contractor shall notify the Contracting Officer or designated representatives when the data has been delivered into the Contractor system.

In the cases where the DRL classifies a DRD with two data type requirements, (e.g., DRD 002 is a Type 2/4), the DRD will clearly identify the data type requirements as well as the delivery requirement associated with each type.

### 2.3 Delivery Fidelity

In addition to the required frequency for data deliverable submittals, the DRL also defines the level of readiness/fidelity, which applies to the submission of DRDs:

**Baseline (B)** - A preliminary version of a delivery for NASA review. Baseline submittals may contain some To be Determined (TBDs). Baseline version fidelity shall reflect the Contractor's internally approved baseline of the product and be adequate to permit NASA disposition in accordance with the DRD Type or Attachment J-03, Appendix A, *Milestone Acceptance Criteria and Payment Schedule*. Baseline versions may be submitted periodically leading to a Final version.

**Final (F)** – A Final version of a delivery shall reflect the Contractor's internally approved final version of the product and is ready for NASA disposition in accordance with the DRD Type or Attachment J-03, Appendix A, *Milestone Acceptance Criteria and Payment Schedule*. No TBDs may be included. Unless otherwise specified within the DRD, after final version DRD has been dispositioned by NASA, the contractor shall submit any changes or additions for NASA review and disposition in accordance with the DRD Type.

### 3.0 DATA REQUIREMENT DOCUMENT

This section provides a description of the fields of the Data Requirement Documents (DRDs).

- A. DRD No.:** Unique identifier for the DRD.
- B. DRD Title:** Unique name for the DRD.
- C. Date:** Date prepared.
- D. Purpose / Use:** The purpose of and NASA's intended use for the DRD.
- E. Remarks:** This field provides additional submittal information, if necessary.
- F. Data Requirements:** This field provides the detailed description of the required and/or expected content and scope of the deliverable(s).

### 4.0 DATA TRANSMITTAL AND FORMAT

This section provides additional detail regarding the transmittal and format of the DRDs.

#### 4.1 Data Transmittal

DRDs shall be transmitted to NASA via electronically, hardcopy, or by other mechanism agreed to by the Contracting Officer. The Contractor shall notify the Contracting Officer and the Contracting Officer Representative (COR) in writing of DRD delivery.

##### 4.1.1 Data Transmittal Package

For each DRD, the transmittal package shall include:

- (a) Contractor transmittal memorandum that provides the following information:
  - (1) Contract number.
  - (2) Contractor name.
  - (3) DRD number.
  - (4) DRD data type (specified in "Type" column of the DRL).
  - (5) Submission date or milestone being satisfied.
  - (6) Document number and revision.
  - (7) Document title.
  - (8) File names of all files being delivered; multiple files per document must be clearly related to the document.
  - (9) Distribution (Notification list as defined by the DRD distribution field and the Contracting Officer's letter).
  - (10) Targeted release date.
- (b) Electronic files submitted to the appropriate NASA or Contractor site.
- (c) Hardcopy as required. (See Section 4.2.2, *Hardcopy Format*)

#### 4.2 Data Format

Existing Contractor internal documents may be used to meet the data requirements of the DRD to the extent practicable. The DRD will call out any special format requirements, if they are required.

4.2.1 Electronic Format

The DRDs shall be provided in an electronic format that meets three basic requirements: “Readable”, “Printable”, and “Downloadable” (see Attachment J-05, *Glossary and Acronym List*) by NASA utilizing publicly available off-the-shelf software. If the electronic format is not supported by publicly available off-the-shelf software, the Contractor shall provide NASA with the necessary software and approach to support the three basic requirements.

4.2.2 Hardcopy Format

Hardcopy submission of DRDs is required by this contract for the Final version and subsequent updates to all Type 1 and Type 2 DRDs. One hardcopy of each DRD, shall be delivered to the Contracting Officer Representative at the following address:

NASA/Kennedy Space Center (KSC)  
Attn: CCtCap Contracting Officer Representative/FA  
Kennedy Space Center, FL 32899

**5.0 DRD MAINTENANCE PROCECURES**

Throughout the performance of the contract, the DRL provides a listing by data category of the DRDs.

5.1 DRD Submittals

5.1.1 Configuration Management of DRD

The Contractor shall employ a system for organizing, identifying, and tracking all submittals of DRDs, to include any changes or revisions. At a minimum, this system shall include the mapping of Contractor documents and files submitted in response to each DRD, and shall include identification of the DRD Type per the DRL.

5.1.2 Reference to Other Documents and DRDs in Data Submittals

The Contractor’s submittal of a DRD may make reference to other documents and/or other DRDs. At the time of submission of the DRD, any referenced document within the DRD shall be made available to NASA. The Contractor shall provide NASA with access to any referenced document and the location of that data within the referenced document. Any reference made to data associated with another DRD that is required separately by the contract shall include the DRL number of and location of the data within the referenced DRD.

5.1.3 Additional Information Regarding Type 1 and Type 2 DRD Submittals

All Type 1 and Type 2 submittals shall be marked as “Pending NASA Approval”, and once approved shall be delivered and marked as “Approved by NASA”. Type 1 and Type 2 DRDs shall be updated and delivered when, in the opinion of the Contractor and/or NASA, the document has been revised to the extent that it is unusable in its present state, or when directed by the Contracting Officer.

**6.0 DATA REQUIREMENTS LIST (DRL)**

<b>DRD #</b>	<b>DRD Title</b>	<b>Type</b>	<b>Delivery</b>	<b>Update / Frequency</b>
001	Insight Implementation Plan	2	With Proposal	F 45 days prior to Certification Baseline Review (CBR)
002	Integrated Master Plan (IMP) and Integrated Master Schedule (IMS)	2/4	See DRD	See DRD
003	IT Security Management Plan (ITSMP)	3	30 days after Contract Start	As Required
004	IT Security Plan (ITSP)	3	If required by the Government, based on ITSMP	As Required
005	Quarterly Program Review (QPR) Data Package	3	90 days after Contract Start	Quarterly
006	Export Control Plan	3	30 days after Contract Start	As Required

DRD #	DRD Title	Type	Delivery Dates & Frequency Requirements											
			CBR	DCR	FTRR	ORR	CR	ATP	VBR	MIR	MCR	SORR/FRR	PFR	Update / Frequency
101	Milestone Review Plan	2												See DRD
102	Certification Baseline Review (CBR) Data Package	3/2	See DRD											See DRD
103	Design Certification Review (DCR) Data Package	3		F 45 Days prior to DCR										
104	Flight Test Readiness Review (FTRR) Data Package	3			F 45 Days prior to FTRR									
105	Operations Readiness Review (ORR) Data Package	3				F 45 Days prior to ORR								
106	Certification Review (CR) Milestone Data Package	3					F 45 Days prior to CR							

DRD #	DRD Title	Type	Delivery Dates & Frequency Requirements											Update / Frequency	
			CBR	DCR	FTRR	ORR	CR	ATP	VBR	MIR	MCR	SORR/FRR	PFR		
107	Certification Plan	1	B 45 Days prior to CBR												F 30 Days prior to dCDR
108	Verification and Validation (V&V) Plan	1	B 45 Days prior to CBR												F 30 Days prior to dCDR
109	Flight Test Plan	2	B 45 Days prior to CBR	F 45 Days prior to DCR											See DRD
110	Hazard Reports	2													See DRD
111	Verification Closure Notice (VCN)	1		F 45 Days prior to DCR							F 45 Days prior to MCR				Incremental delivery in support of the process leading up to DCR and MCR is required by DRD
112	Certification Data Package	1		F 45 Days prior to DCR							F 45 Days prior to MCR				



DRD #	DRD Title	Type	Delivery Dates & Frequency Requirements												
			CBR	DCR	FTRR	ORR	CR	ATP	VBR	MIR	MCR	SORR/FRR	PFR	Update / Frequency	
113	Range Safety Data Documentation	4		F 45 Days prior to DCR								F 45 Days prior to MCR			
114	CTS Data Input for NASA Integration and Independent Verification and Validation (IV&V)	3													See DRD
201	Mission Integration and Operations Management Plan (MIOMP)	2						F with task order proposal							See DRD For DDTE, DRD baseline is delivered at L-12 months in support of the flight tests to ISS.
202	Post Certification Mission (PCM) Work Plan	2						F with task order proposal							See DRD
203	Vehicle Interface Definition Document (IDD)	3		B					F 45 Days prior to VBR						Also delivered at L-12 months in support of the flight tests to the ISS.

DRD #	DRD Title	Type	Delivery Dates & Frequency Requirements											Update / Frequency	
			CBR	DCR	FTRR	ORR	CR	ATP	VBR	MIR	MCR	SORR/FRR	PFR		
204	Mission Resource Allocation Document (MRAD)	3									See DRD	See DRD	See DRD		For DDTE, DRD is delivered at L-10 months, L-3 months, and L-1 month in support of the flight tests to ISS. Same as PCM timeline.
205	Spacecraft Computer Aided Design (CAD) Models	3								B	F				For DDTE, DRD baseline is delivered at L-12 months, and final at L-9 months in support of the flight tests to ISS.
206	Internal Cargo Interface Control Agreement (ICA)	2								B	F at L-8m				For DDTE, DRD baseline is delivered at L-12 months, and final at L-8 months in support of the flight tests to ISS.
207	Integrated Cargo Phase III Hazard Report	2										F NLT 45 Days prior to MCR			
208	Flight Readiness Review Data Package	3											F NLT 45 Days prior to SORR/FRR		

DRD #	DRD Title	Type	Delivery Dates & Frequency Requirements											Update / Frequency	
			CBR	DCR	FTRR	ORR	CR	ATP	VBR	MIR	MCR	SORR/FRR	PFR		
209	Post Flight Assessment Report	2												See DRD	For DDTE, DRD is delivered 14 days after landing then F at 30 days after landing in support of the flight tests.
210	Imagery Plan and Associated Cataloging	3/2										See DRD	See DRD		For DDTE, DRD B is delivered at L-6 months and F at L-2 months in support of the flight tests to ISS. Same as PCM timeline.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 001

**B. DRD Title:** Insight Implementation Plan

**C. Date:** 12/20/13

**D. Purpose / Use:**

NASA will utilize the Contractor's Insight Implementation Plan to ensure NASA personnel and its support services contractors can perform their insight as defined in clause H.15, *Government Insight*, and consistent with the model in CCT-PLN-1100, *Crew Transportation Plan*, Section entitled *CCP Insight/Oversight* and Appendix entitled *Insight Areas*. In addition, NASA will utilize the Contractor's Insight Implementation Plan to ensure NASA personnel can perform Joint Test Team (JTT) participation role as defined in clause H.15, *Government Insight*, and consistent with CCT-PLN-1120, *Crew Transportation Technical Management Processes*.

**E. Remarks:** None

**F. Data Requirements:**

At a minimum, the Contractor's Insight Implementation Plan shall establish a cooperative environment that ensures an effective working relationship between NASA and the Contractor dedicated to successful CTS Certification and Post Certification Missions. The Contractor's Insight Implementation Plan shall describe the accommodations for providing Government personnel and its support services contractor(s) timely and open access necessary to obtain a working-level understanding into all Contractor's Certification and Post Certification Mission activities. These accommodations include facility access, data, and any other information including technical and management processes required to meet contract requirements, milestone acceptance criteria, and to support approval of Type 1 and 2 data deliverables. The Contractor's Insight Implementation Plan shall identify instructions or training required to allow for meaningful NASA insight and participation (e.g., facility and safety familiarization).

In addition, the Insight Plan shall address:

(a) Accommodating clause H.15, *Government Insight* and the following items:

- (1) The transparency by which the Contractor will provide the Government on-going access into activities and data used for mutually achieving successful milestone acceptance, approval of Type 1 and 2 data deliverables and making progress toward NASA Certification and Post Certification Missions.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 001**B. DRD Title:** Insight Implementation Plan**F. Data Requirements (continued):**

(a) continued:

(2) The transparency by which the Contractor will provide the Government on-going access to data, both remotely and on-site, in a useable and readable format; and provide the Government the ability to locate and review all data used in performance of this contract and any other information related to the Crew Transportation System (CTS), to include technical data, supporting data/information, and administrative and management information with the exception of financial information. Whether the data accessed includes the ability of the Government to download or copy data; the Contractor's proposed data restriction legends on accessed data; and mechanisms to ensure that access data is not confused with data delivered under the contract.

(3) The timeframe the Contractor shall notify the Commercial Crew Program designee of technical meetings, control boards, reviews, demonstrations and tests to permit meaningful Government participation through the entire event.

(4) The timeliness and ease by which the Contractor will provide access and make data available to mutually address risks associated with completing acceptance milestone review criteria, approving Type 1 and 2 data deliverables and making progress toward NASA Certification and Post Certification Missions. This includes the technical plans required in CCT-REQ-1130, *ISS Crew Transportation and Services Requirements Document*, and SSP 50808, *ISS to Commercial Orbital Transportation Services (COTS) Interface Requirements Document (IRD)*.

(b) Accommodating NASA's participation in the Joint Test Team in accordance with clause H.15, *Government Insight*. This shall include:

(1) The timeliness and ease by which the Contractor will accommodate NASA's participation in the JTT activities and make data available to mutually address risks associated with achieving successful demonstrations, tests, completing acceptance milestone review criteria and making progress toward NASA Certification and Post Certification Missions.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 001

**B. DRD Title:** Insight Implementation Plan

**F. Data Requirements (continued):**

(b) continued:

(2) The timeliness and ease by which the Contractor will accommodate NASA's participation during the planning and build up phase of ground testing (e.g., simulator training and evaluations, mockup demonstrations, etc.), during test flights, and during the post-test flight evaluation process.

(3) The approach to implement a Joint Test Team (JTT) for the planning and execution of flight test activities, including how they are incorporating Government flight and ground personnel in qualitative assessments of crew operational interfaces with the vehicle and human-in-the-loop assessments of operational suitability; development of operations products; development of flight test objectives and plans; post-flight evaluation; and any other activities.

(c) Accommodating Government Quality Assurance (GQA) functions in accordance with clause H.15, *Government Insight*. This shall include:

(1) The timeliness and ease by which the Contractor will accommodate NASA and make data available for the Government to perform a successful risk based analysis that will facilitate the identification of high risk areas.

(2) The timeliness and ease by which the Contractor will accommodate NASA performing the GQA activities identified by the risk based analysis and make data available to achieve successful GQA activities.

(d) Establishing a cooperative environment between NASA and the contractor dedicated to successful Certification and Post Certification Missions. This shall include:

(1) Establishing excellent working relationships at every level of both organizations that enable both parties to solve problems as a team.

(2) Ensuring a level of candor that permits the parties to mutually avoid risk and enables a continuous dialogue.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 001

**B. DRD Title:** Insight Implementation Plan

**F. Data Requirements (continued):**

(e) Resolving concerns and issues identified by NASA and its support services contractor's insight effort as well as from NASA's participation in the JTT activities. This shall include:

- (1) The process to permit timely elevation of issues to NASA.
- (2) The process of highlighting critical activities of interest (such as changes, decisions, key testing events, critical meetings) to NASA.

(f) Accommodating NASA's insight in the Contractor's development and successful fulfillment of operational requirements. This shall include:

- (1) The timeliness and ease by which the Contractor will accommodate NASA's insight in the operational activities and make data available to mutually address risks associated with achieving successful demonstrations, tests, completing acceptance milestone review criteria and making progress toward NASA Certification and Post Certification Missions.
- (2) The process of highlighting critical activities of interest (such as changes, decisions, key events, critical meetings) to NASA.
- (3) The process to permit timely elevation of issues to NASA.

(g) In addition to access to Contractor facilities for insight, the Contractor shall describe the NASA provisions for office space co-located on-site, badging, furniture, telephones, and use of easily accessible fax, data lines, and copy machines, for full-time and temporary Government insight and support services contractor personnel in performance of this contract, including training. This shall include:

- (1) Co-located on site accommodations clearly identified.
- (2) Innovative use of technology that enables effective participation for completing milestone reviews acceptance criteria and making progress toward NASA Certification and Post Certification Missions.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 001

**B. DRD Title:** Insight Implementation Plan

**F. Data Requirements (continued):**

(h) The process of providing the Government insight into all subcontractors and suppliers performing or supporting any critical work associated with this contract.



**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 002**

**B. DRD Title:** Integrated Master Plan (IMP) & Integrated Master Schedule (IMS)

**C. Date:** 11/19/13

**D. Purpose / Use:**

To provide NASA the Contractor's integrated program schedules using established standard processes, data structures and reporting conventions to plan, manage, and report the work required in the performance of this contract.

**E. Remarks:**

Schedule consistency as used in this DRD is defined as the degree to which the Contractor utilized standardized scheduling approaches between similar activities and flows. Scheduling accuracy as used in this DRD is defined as the accurate representation of work content and tasks duration (predicted vs. actuals). Schedule stability as used in this DRD refers to the degree to which daily schedule changes are minimized and limited to unforeseen hardware or software problems or NASA-directed changes.

The Contractor is encouraged to utilize modern manufacturing resource planning, industrial engineering techniques, and other approaches to ensure schedule stability, accuracy, reliability, predictability, and achievability. The Contractor may satisfy the requirements of the DRD by combining the requirements of the IMP and the IMS in a single format.

**F. Data Requirements:**

The IMP shall describe the significant activities, with the associated success criteria, as derived from the Contract Performance Work Statement (Attachment J-03, *Contract PWS*), DRDs, and other contract requirements.

The IMS is an integrated logically linked schedule and shall capture the activities described in the IMP and the lower level work necessary to support each of the IMP activities. The IMS will be used to verify attainability of contract objectives and requirements, and to evaluate progress.

The IMS shall include all contract milestones, activities, and tasks leading to the proposed date for CTS Certification and for work described in task orders, including those for Post Certification Missions (PCMs) and Special Studies. The IMS shall show percentage completion of all Design, Development, Testing and Evaluation (DDTE) and PCM milestones. The IMS Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 002

**B. DRD Title:** Integrated Master Plan (IMP) & Integrated Master Schedule (IMS)

**F. Data Requirements (continued):**

shall provide the ability to fully identify, analyze, mitigate and control scheduling risks and impacts; accurately identify and analyze critical path activities; and allow its users to easily measure the progress towards achieving the IMP. At a minimum, the IMS shall identify tasks at the Subsystem level (whereas the Crew Transportation System (CTS) is a “System” and the spacecraft and launch vehicles are “Elements”, the Subsystem level is a level lower than the Element) for major activities or products associated with DDTE and PCM(s). Additionally, at a minimum, the IMS shall be formatted with the largest increment of time being measured in units of months.

The IMS should identify priorities of tasks, order and sequence of tasks, primary and secondary critical path, schedule margin, and dependencies and relationships among tasks. The IMS should clearly identify tasks or activities which have a dependency on a NASA delivery or approval (for example, delivery of an NASA Docking System (NDS) unit), and should distinguish tasks or activities which are conducted jointly with NASA (for example, an integrated test with the ISS Program).

For both Type 2 and Type 4 deliveries of the IMP/IMS, the Contractor shall provide the DRDs in an electronic format.

The IMP/IMS shall be delivered for NASA approval on the following schedule (reference Type 2 DRD definition):

- (a) For the Certification Baseline Review (CBR), the Contractor shall deliver to NASA a final IMP/IMS, for approval, 45 days prior to the CBR. See Attachment J-03.
- (b) For a Design Certification Review (DCR), the Contractor shall deliver to NASA an updated IMP/IMS, for approval, 45 days prior to a DCR. Reference DRD 103, DCR Data Package and Attachment J-03.
- (c) For the Post Certification Missions (PCMs), the Contractor shall deliver to NASA an updated IMP/IMS, for approval, with the PCM Work Plan, DRD 202.

The IMS shall be maintained and delivered to NASA on a monthly basis (reference Type 4 DRD definition).

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 003**

**B. DRD Title:** IT Security Management Plan (ITSMP)

**C. Date:** 11/19/13

**D. Purpose / Use:**

To provide Government insight into the Contractor's methodology for managing all aspects of information security and to ensure critical components are addressed.

**E. Remarks:**

The ITSMP will be in compliance with NFS 1852.204-76, *Security Requirements for Unclassified Information Technology Resources (Jan 2011)*. The Government, after review of the ITSMP, will notify the Contractor of the need for an IT Security Plan (ITSP) and the associated due date.

**F. Data Requirements:**

The Contractor shall describe the processes and procedures that will be followed to ensure appropriate security of information technology (IT) resources that are developed, processed, or used under this contract.

Unlike the IT security plan, which addresses the IT system and the security control implementations, the ITSMP addresses how the Contractor will manage personnel and processes associated with IT security on the contract.

The ITSMP shall include, at a minimum, the following:

(a) Contractor's information security Points of Contact (POC(s)) including roles and responsibilities.

(b) A description of policies, processes, and/or procedures for:

- (1) Meeting all applicable security assessment & authorization requirements, including but not limited to development and maintenance of IT Security Plans (ITSPs), including external IT systems; implementation and validation of security controls, security assessment, authorization, and continuous monitoring in accordance to NASA directives and guidance.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 003

**B. DRD Title:** IT Security Management Plan (ITSMP)

**F. Data Requirements (continued):**

(b) continued:

(2) Addressing all applicable information security requirements, including vulnerability scanning and mitigation, maintaining secure operating system configuration, patch/configuration management, contingency planning, and protection of sensitive data in transit and at rest.

(3) Information security, privacy, incident management and responses, including coordination with NASA Security Operations Center (SOC), Center Chief Information Security Officer (CISO), and Center Privacy Manager as required.

(4) Ensure the Contractor employees meet information security requirements, such as information security awareness, rules of behavior, and elevated privilege training as required. Users are knowledgeable of NASA information security policies and procedures when handling NASA data.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 004**

**B. DRD Title:** IT Security Plan (ITSP)

**C. Date:** 11/19/13

**D. Purpose / Use:**

To provide Government insight into the Contractor's methodology for managing all aspects of information security and to ensure critical components are addressed.

**E. Remarks:**

The **DRD 003 ITSMP** is required within thirty (30) days of contract start. The Government, after review of the ITSMP, will notify the Contractor of the need for an IT Security Plan (ITSP) and the associated due date. The ITSP will be in compliance with NFS 1852.204-76, *Security Requirements For Unclassified Information Technology Resources (Jan 2011)*.

**F. Data Requirements:**

The Contractor shall develop, implement and maintain an ITSP for all systems provided or operated in performance of this contract as required in clause I.12, NFS 1852.204-76, *Security Requirements for Unclassified Information Technology Resources*.

The ITSP provides an overview of the security requirements of the system and describes the implementation details of the management, operational, and technical security controls in place or planned, and responsibilities and expected behavior of all individuals who access the system.

The ITSP, at a minimum, shall include the following:

- (a) Security categorization of the Information System
- (b) A description of the detailed implementation of the following classes of control:
  - (1) Operational Controls - The security controls (i.e., safeguards or countermeasures) for an information system that are primarily implemented and executed by people (as opposed to systems).

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 004

**B. DRD Title:** IT Security Plan

**F. Data Requirements (continued):**

(b) Continued:

(2) Management Controls - Actions taken to manage the development, maintenance, and use of the system, including system-specific policies, procedures and rules of behavior, individual roles and responsibilities, individual accountability, and personnel security decisions.

(3) Technical Controls - Security controls (i.e., safeguards or countermeasures) for an information system that are primarily implemented and executed by the information system through mechanisms contained in the hardware, software, or firmware components of the system. The controls can provide automated protection for unauthorized access or misuse, facilitate detection of security violations, and support security requirements for applications and data.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 005**

**B. DRD Title:** Quarterly Program Review (QPR) Briefing Package

**C. Date:** 11/19/13

**D. Purpose / Use:**

QPRs provide an opportunity for discussions and technical interchange between NASA and the Contractor regarding progress of CCtCap objectives and scope. As a basis for the discussions and technical interchange, the QPR Briefing Package shall detail the Contractor's technical progress, risk assessment, schedule status, and cost assessment, and plans forward. Progress shall be estimated and reported in a quantifiable performance method. NASA will provide feedback, may assign actions and request action responses to be completed by jointly agreed upon dates.

**E. Remarks:**

The QPRs should occur, on average, every three (3) months. For the cases where a QPR coincides with a required milestone (Certification Baseline Review (CBR), Design Certification Review(s) (DCR), Operations Readiness Review (ORR), Flight Test Readiness Review(s) (FTRR), Certification Review (CR), Vehicle Baseline Review (VBR), Mission Integration Review (MIR), Mission Certification Review (MCR), Flight Readiness Review (FRR) or Post Flight Review (PFR)), the QPR may be combined with the required milestone.

**F. Data Requirements:**

The Quarterly Program Review (QPR) Briefing Package shall include the following items:

- (a) A summary highlighting accomplishments.
- (b) Identification of new challenges and opportunities and a status of those discussed or identified in the previous QPR.
- (c) Status of the interim and completion milestones, with an emphasis on milestones occurring in the next six (6) months.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

i. **DRD No.:** 005

**B. DRD Title:** Quarterly Program Review (QPR) Briefing Package

**F. Data Requirements (continued):**

(d) The status, closure plan and schedule to demonstrate compliance to the contract requirements. This shall include:

- (1) A status of the CTS design requirements, verifications activities, and Verification Closure Notice (VCN) closures.
- (2) A summary of any tasks required to be repeated in the event of changes to the CTS Certification baseline.
- (3) Master Equipment List (MEL) showing the categorized list of equipment related to the Crew Transportation System (CTS). The equipment items shall be identified at the Subsystem level (whereas the CTS is a “System” and the spacecraft and launch vehicles are “Elements”, the Subsystem level is a level lower than the Element), organized by the Element level, and include the following for each item, as applicable:
  - (i) Quantity
  - (ii) Mass, contingency mass, and expected mass changes
  - (iii) Power
  - (iv) Center of Gravity (cg)

(e) Status of the Integrated Master Schedule (IMS) (ref. **DRD 002 IMP & IMS**) progress to date and schedule reserves. Identification of interdependencies among tasks associated with all CLINs, and associated risks, impacts and mitigation plans.

(f) A risk management status that includes a description of the top programmatic risks with a discussion of potential impacts to the CTS safety, technical, cost and schedule performance, and the associated mitigation strategies.

Continued on next page...



**Data Requirement Document** (Continuation Sheet)

(a) **DRD No.:** 005

**B. DRD Title:** Quarterly Program Review (QPR) Briefing Package

**F. Data Requirements (continued):**

(g) A cost assessment that provides updates to the expected costs through Certification and the associated costs for Post Certification Missions. The cost assessment shall:

- (1) Clearly identify and forecast potential cost growth from the contract value, highlighting any changes since the previous QPR or milestone.
- (2) Detail the contractor's risk mitigation strategies associated with potential cost growth, including planned methods of resolving potential cash flow needs and potential impacts to PCMs.
- (3) Provide an integrated assessment of the cost growth and its impact(s) to the most current IMS.
- (4) Provide details of progress of corporate commitments.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 006

**B. DRD Title:** Export Control Plan

**C. Date:** 11/19/13

**D. Purpose / Use:** The plan shall describe all export control activities related to the performance of contract requirements.

**E. Remarks:** None

**F. Data Requirements:**

The Contractor shall prepare and submit an Export Control Plan (ECP), describing the Contractor's planned approach for accomplishing contract functions while adhering to export laws, regulations and directives.

The final export control plan shall be submitted within thirty (30) days after contract start. The plan shall be reviewed at least annually thereafter and updated as required.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 101**

**B. DRD Title:** Milestone Review Plan

**C. Date:** 11/19/13

**D. Purpose / Use:**

To establish an agreement between NASA and the Contractor on planning, preparing for, and conducting milestone reviews.

**E. Remarks:** None

**F. Data Requirements:**

The Contractor shall deliver a Milestone Review Plan for the reviews identified in the contract requirements, the Attachment J-03, Appendix A, *Milestone Acceptance Criteria and Payment Schedule*, including contractor defined interim milestones, and Attachment J-03, *Contract PWS*. Milestone reviews shall meet the requirements noted in CCT- PLN-1120, *Crew Transportation Technical Management Processes Document*, Attachment J-03 Appendix A, and Section F, *Data Requirements*, of **DRDs 102, 103, 104, 105 and 106**. For each milestone, including interim milestones, the milestone review plan shall describe: the review process (including any specific tools and tool training required to conduct the review), schedule, location, deliverables, delivery method, delivery dates, means and timing by which data will be made available to NASA, document review dates, presentation meetings, Technical Interchange Meetings (TIMs), pre-boards, boards, and other logistics related information.

The milestone review plan shall describe the approach for review input including comments and when the comments are due, disposition process, actions, action recording and tracking, configuration management and minutes. The plan shall ensure the Government has adequate time and access to data to perform meaningful technical reviews of the deliverables. The milestone review plan shall identify data/documentation subject to Review Item Dispositions (RIDs). The plan may be segregated into volumes for individual reviews or split up accordingly to optimize incremental updates. Upon NASA approval/concurrence of each iteration of the **DRD 101 Milestone Review Plan**, it will supersede the CCT-PLN-1120 data requirements for that specific review.

Continued on next page...

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 101

**B. DRD Title:** Milestone Review Plan

**F. Data Requirements (continued):**

The plan is due with proposal. The proposal submittal shall provide the detailed plan for Certification Baseline Review (CBR), estimated dates for remaining milestones, and the allocated time for NASA review and approval of milestone data. The proposal submittal shall describe when the plan will be updated to address the detailed content for future milestones. The final plan shall be submitted forty-five (45) days prior to CBR, for approval at CBR. The Contractor shall update the plan in accordance with the schedule identified in the CBR version to address the detailed content prior to the upcoming milestones.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 102**

**B. DRD Title:** Certification Baseline Review (CBR) Data Package

**C. Date:** 11/19/13

**D. Purpose / Use:** Identify the data required to baseline the Contractor's current state of design and development for the integrated CTS associated with the requirements defined in CCT-REQ-1130, *ISS Crew Transportation and Services Requirements Document*, SSP 50808, *ISS to Commercial Orbital Transportation Services (COTS) Interface Requirements Document*, and CCT-PLN-1120, *Crew Transportation Technical Management Processes*, and to define management plans and products.

**E. Remarks:** None

**F. Data Requirements:**

Unless otherwise specified in this DRD, the data delivered under this DRD is Type 3.

The Contractor shall deliver to NASA the CBR Data Package No Later Than (NLT) forty-five (45) days prior to the CBR milestone. The CBR Data Package shall contain:

(a) A Requirements Baseline that contains, at a minimum:

- (1) Documentation of requirements, including allocation to the Elements and Subsystems of the CTS traceable to CCT-REQ-1130 and SSP 50808. Identification of approved variances and alternate standards in the Contractor's CTS requirements baseline.
- (2) Joint ISS integration products (Interface Control Documents (ICDs), Joint Integrated Verification Test Plan (JiVTP), Bilateral Data Exchange Agreement List and Schedule (BDEALS), Bilateral Hardware Software Exchange Agreement List and Schedule (BSHEALS)) identified in SSP 50964, *Visiting Vehicle ISS Integration Plan*.
- (3) Concept of operations.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 102**B. DRD Title:** Certification Baseline Review (CBR) Data Package**F. Data Requirements (continued):**

(b) A Design baseline that contains, at a minimum:

- (1) Definition of proposed design baseline, including design analyses, drawings, models, software artifacts, system and cargo interface definition, and other artifacts to be proposed. Physical location and access details of design baseline artifacts to allow interrogation of design baseline through insight activities.
- (2) Status of system safety process and analyses including a Human Error Analysis, integrated Probabilistic Safety Analysis, hazard identification, control and verification, fault tolerance assessment, top safety risks, and the crew survival strategy with capabilities required to support the strategy.
- (3) Evidence of expected integrated vehicle performance margin and design margin as defined in CCT-PLN-1120.
- (4) Crew training template to accommodate crew to ISS. Contractor and NASA will develop crew training templates for crewed test flight to ISS and for Post Certification Mission flights to ensure crew can perform required functions at ISS.
- (5) Human Systems Integration Data Products as identified in CCT-PLN-1120.

(c) Final management plans and products

- (1) The management and technical plans in CCT-PLN-1120, that support the design, development, test, evaluation, and Certification of the CTS, including:
  - (i) Program Management Plan [Data Type 2]
  - (ii) Configuration Management Plan [Data Type 2]
  - (iii) Risk Management Plan [Data Type 2]
  - (iv) Safety and Reliability Plan [Data Type 2]
  - (v) Requirements Management Plan [Data Type 2]

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 102

**B. DRD Title:** Certification Baseline Review (CBR) Data Package

**F. Data Requirements (continued):**

(c) (1) Final Management plans and products (continued)

(i) Quality Management Plan [Data Type 2]

(ii) Human System Integration Strategy [Data Type 2] including the Human Systems Integration Data Products

(iii) Software Safety Plan

(iv) Radioactive Materials Usage Report

(v) Software Development Plan

(vi) Margin Management Plan

(2) Status and definition of Production and Operations Plans and Products as described in CCT-PLN-1120.

(d) Documentation demonstrating the top programmatic risks have been identified and assessed to include plans, processes, and appropriate resources necessary to effectively manage the risks.

(e) All Review Item Dispositions (RIDs), To be Determined (TBD) and To be Resolved (TBR) items clearly identified with acceptable plans and schedules for their disposition.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 103**

**B. DRD Title:** Design Certification Review (DCR) Data Package

**C. Date:** 12/20/13

**D. Purpose / Use:**

The DCR Data Package establishes the data required for a Design Certification Review of the integrated CTS and planned operations. DCR acceptance criteria in Attachment J-03, Appendix A, *Milestone Acceptance Criteria and Payment Schedule*, must be met prior to any crewed orbital test flights.

**E. Remarks:** None

**F. Data Requirements:**

The DCR Data Package shall address the following:

- (a) DCR Presentation Package including summary of the Certification Data Package, integrated vehicle performance, margin and constraints, variances, and identification of open items with the plan for completion.
- (b) Incremental tests required or conducted due to design or requirements changes made since test initiation, and resolution of issues have been identified and submitted.
- (c) Evidence that configurations used for certification have been reconciled with the design configuration.
- (d) All Review Item Dispositions (RIDs) and actions from design reviews, verification reviews and Certification Baseline Review (CBR) including status of To be Determined (TBD) and To be Resolved (TBR) items clearly identified with plans for disposition.
- (e) Provide an assessment of the top cost schedule, and technical Programmatic risks to Crew Transportation System (CTS) Certification, an assessment of risks to contract performance, and management of residual risk acceptance.

Continued on next page...



**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 103

**B. DRD Title:** Design Certification Review (DCR) Data Package

**F. Data Requirements (continued):**

(f) Facilities and processes to develop and execute operational plans, products, training and in-flight/post-flight anomaly resolution including joint processes for ISS integration that meets the operational requirements in CCT-PLN-1120, *Crew Transportation Technical Management Processes*, and SSP 50808, *ISS to Commercial Orbital Transportation (COTS) Interface Requirements Document (IRD)*. Operational controls, limitations and constraints of integrated vehicle have been incorporated.

(g) Operational products, personnel and crew are ready or are scheduled for completion prior to need date (to support crewed test flight).

(h) Status, constraints and interdependencies with crewed flight tests and Post Certification Missions.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 104**

**B. DRD Title:** Flight Test Readiness Review (FTRR) Data Package

**C. Date:** 12/20/13

**D. Purpose / Use:**

The FTRR Data Package establishes the data required to evaluate readiness and provide approval to conduct a crewed orbital flight test within the risk baseline accepted at a Design Certification Review (DCR).

**E. Remarks:** None

**F. Data Requirements:**

The Contractor shall deliver to NASA the following data:

- (a) Flight Test Readiness Review Data Package in accordance with CCT-PLN-1120, *Crew Transportation Technical Management Processes*, Appendix F, *CTS FTRR/FRR Milestone Data*, clearly identifying any Crew Transportation System (CTS) changes from DCR.
- (b) All changes, modifications and anomalies since DCR have been resolved.
- (c) Status of all Review Item Dispositions (RIDs), actions, and open work from Interim Milestone Reviews, DCR, and Stage Operational Readiness Review (SORR).
- (d) Documentation that Mission support team is defined, has been trained, and is in place.
- (e) Evidence that all operational supporting and enabling capabilities necessary for nominal and contingency operations have been tested and delivered/installed at the site(s).
- (f) Plans, procedures, and training for nominal and contingency operations for the CTS have been completed.
- (g) Evidence that systems, hardware, software, personnel, and procedures are in place.
- (h) Status of system safety process and analyses including a Human Error Analysis, integrated Probabilistic Safety Analysis, hazard identification, control and verification, fault tolerance assessment, top safety risks, and the crew survival strategy with capabilities required to support the strategy.

Continued on next page...

**Data Requirement Document**(Continuation Sheet)

**A. DRD No.:** 104

**B. DRD Title:** Flight Test Readiness Review (FTRR) Data Package

**F. Data Requirements (continued):**

- (i) Documentation showing all acceptance, checkout and integration testing has been completed.
- (j) Plan and schedule of preplanned forward work.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 105**

**B. DRD Title:** Operations Readiness Review (ORR) Data Package

**C. Date:** 11/19/13

**D. Purpose / Use:**

The ORR Data Package establishes the data required to evaluate that the actual Crew Transportation System (CTS) system characteristics and the procedures used in operations reflect the deployed state of the CTS. The ORR Data Package also establishes the data required to demonstrate that all program and support (flight and ground) hardware, software, personnel, and procedures to ensure flight and associated ground systems are in compliance with program requirements and constraints.

**E. Remarks:** None

**F. Data Requirements:**

The Operations Readiness Review Data Package shall address the following:

- (a) ORR Presentation Package, including summary of ORR Data Package and constraints
- (b) Closure of any remaining open requirements (**DRD 111 Verification Closure Notice**).
- (c) Evidence that all validation testing has been completed (or planned for completion prior to Certification Review (CR)).
- (d) Evidence that anomalies have been resolved and the results incorporated.
- (e) Evidence that all operational supporting and enabling capabilities (e.g., facilities, equipment, documents, updated databases) necessary for nominal and contingency operations have been tested and delivered/installed at the site(s) necessary to support recurring operations.
- (f) Evidence that plans, processes, procedures, personnel and training for nominal and contingency operations for the CTS have been completed to support recurring operations.
- (g) Evidence that systems, hardware, and software, are in place to support recurring operations.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 105

**B. DRD Title:** Operations Readiness Review (ORR) Data Package

**F. Data Requirements (continued):**

(h) Documentation demonstrating the top programmatic risks have been identified and assessed to include plans, processes, and appropriate resources necessary to effectively manage the risks.

(i) Status of system safety process and analyses including a Human Error Analysis, integrated Probabilistic Safety Analysis, hazard identification, control and verification, fault tolerance assessment, top safety risks, and the crew survival strategy with capabilities required to support the strategy.

(j) Documentation substantiating all Review Item Dispositions (RIDs) and actions from design reviews, verification reviews, Design Certification Review(s) (DCR(s)), and Flight Test Readiness Review(s) (FTRR(s)) are closed.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 106

**B. DRD Title:** Certification Review (CR) Milestone Data Package

**C. Date:** 11/19/13

**D. Purpose / Use:**

The Certification Review Milestone Data Package establishes the data required for the review and approval of Certification by NASA of the CTS and planned implementation of ISS servicing missions at the Certification Review Milestone.

**E. Remarks:** None

**F. Data Requirements:**

The Certification Review Milestone Data Package shall address the following:

- (a) Certification Review Milestone Presentation, including: integrated vehicle performance, margin and constraints, variances, a summary of Certification Data Package (**DRD 112 Certification Data Package**), and identification of open items with the plan for completion.
- (b) Technical management processes have effectively controlled the design, been implemented for manufacturing and operations, and accepted by NASA.
- (c) Any incremental tests conducted due to design or requirement changes made since ISS Design Certification Review (DCR) and resolution of issues have been identified and submitted.
- (d) All actions from ISS DCR, Flight Test Readiness Review (FTRR) and Operations Readiness Review (ORR) are closed and have been submitted. Any updates required to plans and processes have been implemented and released.
- (e) Provide an assessment of the top cost, schedule, and technical Programmatic risks; an assessment of risks to contract performance; and management of residual risk acceptance.
- (f) Operational products and documentation are available and ready or are scheduled for completion prior to need date. Operational limits and constraints have been incorporated into the operational documentation. Operational roles, responsibilities, and procedures have been incorporated for crew, mission team and mission management into the operational products.

Continued on the next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 106

**B. DRD Title:** Certification Review Milestone Data Package

**F. Data Requirements (continued):**

(g) Production plans and processes are in place, including verification plans and procedures.

(h) Facilities and processes to develop and execute operational plans, products, training and in-flight/post-flight anomaly resolution including joint processes for ISS integration that meets the operational requirements in CCT-PLN-1120, *Crew Transportation Technical Management Processes*, and SSP 50808, *ISS to Commercial Orbital Transportation Services (COTS) Interface Requirements Document (IRD)*. Operational controls, limitations and constraints of integrated vehicle have been incorporated.

(i) Operational personnel and crew are ready or are scheduled for completion prior to need date (to support crewed flight).

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 107

**B. DRD Title:** Certification Plan

**C. Date:** 11/19/13

**D. Purpose / Use:**

The Certification Plan will be used to approve the Contractor's approach for Certification of the Crew Transportation System (CTS).

**E. Remarks:**

The Certification Plan and any deliverables associated with its implementation may be submitted incrementally until the final version delivery date.

**F. Data Requirements:**

If the Contractor had a Certification Products Contract (CPC) during Phase 1 of this procurement, the CPC products that were delivered to and dispositioned by NASA as part of final delivery are approved for initial use during performance of CCtCap. Subsequent approvals of this DRD supersede the CPC approved version.

The Contractor shall deliver a Certification Plan that meets the requirements of CCT-PLN-1120, *Crew Transportation Technical Management Processes*, including Appendix C, *CTS Certification Plan*. The Contractor shall clearly define the order of execution, with a schedule and critical path clearly outlined.

The Contractor shall propose a final submittal, consistent with the Contractor system development, production, and Certification lifecycle.



**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 108**

**B. DRD Title:** Verification and Validation (V&V) Plan

**C. Date:** 11/19/13

**D. Purpose / Use:**

The Verification and Validation Plan will be used to approve the Contractor's detailed plans for completing Crew Transportation System (CTS) verification and validation tasks.

**E. Remarks:**

The Verification and Validation Plan and any deliverables associated with its implementation may be submitted incrementally until the final version delivery date

**F. Data Requirements:**

If the Contractor had a Certification Products Contract (CPC) during Phase 1 of this procurement, the CPC products that were delivered to and dispositioned by NASA as part of final delivery are approved for initial use and implementation during performance of CCtCap. Subsequent approvals of this DRD supersede the CPC approved version.

The Contractor shall deliver a Verification and Validation Plan that meets the requirements of CCT-PLN-1120, *Crew Transportation Technical Management Processes*, including Appendix D, *CTS Verification and Validation Plan*. The V&V Plan shall include at a minimum the Contractor's approach for verifying compliance with the requirements, including detailed verification methods and objectives and definition of necessary compliance data required for the Verification Closure Notice (VCN). Where CCT-REQ-1130, *ISS Crew Transportation and Services Requirements Document*, requirement calls out a specific verification plan as part of the requirement (e.g., Structural Verification Plan), the V&V Plan approval is contingent upon approval of that specific plan.

The V&V Plan shall also address the data and products for verification and validation of: manufacturing operations, hardware and software qualification, acceptance test programs, and environmental testing. It shall also address the data and products for the verification and validation of the models or simulations used to make critical decisions that may impact human safety and mission success.

The Contractor shall propose a final submittal, consistent with the Contractor system development, production, and Certification lifecycle.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 109

**B. DRD Title:** Flight Test Plan

**C. Date:** 12/20/13

**D. Purpose / Use:**

The purpose is to baseline the plan for conducting the flight test program as part of Crew Transportation System (CTS) Certification. The Flight Test Plan will be used to approve the Contractor's flight test objectives and plan for accomplishing the flight.

**E. Remarks:** None

**F. Data Requirements:**

The Contractor shall deliver to NASA a flight test plan that meets the requirements of CCT-PLN-1120, *Crew Transportation Technical Management Processes*, the Attachment J-03, *Contract Performance Work Statement*, and this DRD.

The format for delivery may be a single plan that addresses the entire flight test program and each flight test, or separate plans for each flight test. The format and organization of the plan should accommodate NASA incremental approvals as described below.

The Data Requirements List (DRL) defines delivery of a Baseline version at Certification Baseline Review (CBR) and Final version to be proposed, but no later than the first Design Certification Review (DCR).

**Baseline:** The Baseline version delivered for CBR shall include information to evaluate the entire flight test program and the scope and objectives for each flight test, and information necessary for NASA participation and joint activities.

**Final:** The Contractor shall propose when the final version shall be delivered based on their development plan, milestones and the following constraints:

(a) *Crewed Flight Tests* - Final approval no later than (NLT) the DCR associated with that Flight Test.

(b) *Uncrewed Flight Tests* - Occurring prior to the first DCR, final approval of the plan content related to that flight test is prior to the applicable proposed interim milestones (e.g. Test Readiness Reviews (TRRs)) for that test. For uncrewed flight tests occurring after the first DCR, final approval NLT the first DCR.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 109**B. DRD Title:** Flight Test Plan**F. Data Requirements (continued):**

Flight tests include flight test events performed to demonstrate design performance, validate models or used as substantiation data for verification or validation of a requirement. The following are examples of flight tests, although not an exhaustive list:

- Pad Abort Test
- Ascent Abort Test
- Stage Separation Flight Tests
- Atmospheric Drop Tests
- Powered Flight Tests
- Suborbital Flight Tests
- Orbital Flight Tests

The flight test plan shall include the following information:

<b>CBR</b>	<b>DCR(s) – Update to CBR information including additional information provided below</b>
<ul style="list-style-type: none"> <li>• Test Team Organization</li> <li>• Ground Team definition</li> <li>• Test Organizational Interfaces (such as range, ISSP, communications and tracking)</li> <li>• Review and Approval Authority</li> <li>• Linkages to Risk Management Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Test Team Roles and responsibilities</li> <li>• Test Organizational Interface agreements</li> <li>• Review and Approval Authority</li> </ul>
<ul style="list-style-type: none"> <li>• Test Configuration</li> <li>• Test Objectives</li> <li>• Success Criteria</li> <li>• Linkage to V&amp;V Plan</li> <li>• Identified test attributes to be used for validation, verification, or demonstration of design requirements, system performance, mission suitability, or accuracy of analytical models beyond that described in the Verification and Validation Plan</li> <li>• Post Certification Mission (PCM) DRDs applicable to the crewed flight test(s)</li> </ul>	<ul style="list-style-type: none"> <li>• Test Configuration</li> <li>• Test Objectives</li> <li>• Success Criteria</li> <li>• Linkage to Verification &amp; Validation (V&amp;V) Plan</li> <li>• Identified test attributes to be used for validation, verification, or demonstration of design requirements, system performance, mission suitability, or accuracy of analytical models beyond that described in the Verification and Validation Plan</li> <li>• Development Flight Instrumentation list</li> <li>• Data collection and reconstruction</li> </ul>
<ul style="list-style-type: none"> <li>• Integrated schedule</li> <li>• Test Duration</li> </ul>	<ul style="list-style-type: none"> <li>• Schedule Updates</li> <li>• Test Duration</li> </ul>

Continued on next page...

**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 109**B. DRD Title:** Flight Test Plan**F. Data Requirements (continued):**

The flight test plan shall include the following information (continued):

<b>CBR</b>	<b>DCR(s) – Update to CBR information including additional information provided below</b>
<ul style="list-style-type: none"> <li>• Test Locations</li> </ul>	<ul style="list-style-type: none"> <li>• Test Locations</li> <li>• Mission design</li> </ul>
<ul style="list-style-type: none"> <li>• Test Logistics organization</li> <li>• Procedure development Process</li> <li>• Progress and Approval Milestone</li> <li>• Flight Test requirements definition</li> <li>• Instrumentation Plan</li> <li>• Approach to flight test production, operations (control centers and launch/ recovery sites, mission planning, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• Test Logistics</li> <li>• Preflight Test Procedures</li> <li>• Flight Test Procedures</li> <li>• Launch Commit Criteria (LCC)/Flight Rules</li> <li>• Flight Test requirements verification</li> <li>• Planned Design departures</li> <li>• Training Status</li> <li>• Updates to approach to flight test production, operations (control centers and launch/ recovery sites, mission planning, etc.)</li> </ul>

For Crewed Flight Tests, the flight test plan shall include the following additional information:

<b>CBR</b>	<b>DCR(s)</b>
<ul style="list-style-type: none"> <li>• Joint Test Team (JTT) Integration</li> <li>• Crew Makeup</li> <li>• Ground Team Crew Handover Responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>• JTT updates</li> <li>• Crew Makeup updates</li> <li>• Ground Team Crew Handover Agreements</li> </ul>
<ul style="list-style-type: none"> <li>• Crew Training Plan and template</li> </ul>	

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 110**

**B. DRD Title:** Hazard Reports

**C. Date:** 11/19/13

**D. Purpose / Use:**

The Hazard Reports (HRs) will be used to ensure that hazards inherent in the design have been identified, and that hazard controls and verification methods have been implemented and verified.

**E. Remarks:**

The description below encompasses both hardware and software activities.

**F. Data Requirements:**

The Contractor shall deliver Hazard Reports in accordance with CCT-PLN-1120, *Crew Transportation Technical Management Processes*, and SSP 30599, *Safety Review Process*. The Contractor shall make two (2) final deliveries of each Hazard Report:

- (a) After completion of the NASA Phase II Safety Review
- (b) After completion of the NASA Phase III Safety Review, but no later than (NLT) forty-five (45) days prior to a Design Certification Review (DCR).

Phase III final Hazard Reports shall be maintained current and shall reflect the configuration of the integrated CTS design, operations, and functional capabilities.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 111

**B. DRD Title:** Verification Closure Notices (VCNs)

**C. Date:** 11/19/13

**D. Purpose / Use:**

Provide evidence of closure of each technical requirement within CCT-REQ-1130, Section 3, *ISS Crew Transportation and Services Requirements Document*, and SSP 50808, *ISS to Commercial Orbital Transportation Services (COTS) Interface Requirements Document (IRD)*. Verification Closure Notice (VCN) status will be designated as initial, interim (dated), and as final in the closure field.

**E. Remarks:** None

**F. Data Requirements:**

The Contractor shall provide verification evidence for each CCT-REQ-1130 and SSP 50808 requirement in accordance with the approved Verification and Validation (V&V) plan (**DRD 108 V&V Plan**).

One VCN per requirement shall be submitted in this DRD. Final submittals against a specific requirement shall be made only after dependent verifications are completed and submitted. Partial early submission is encouraged and the Contractor shall identify open work associated with the verification activity and identify as partial submittal in the VCN.

VCN closure rationale shall provide specific description and/or reference to specific evidence to verify and validate compliance to the requirement. Each VCN shall have a unique identifier associated with each "shall" statement in the CCT-REQ-1130 or SSP 50808 requirement it closes. Also, each VCN shall include the requirement statement; and associated V&V Plan method, objectives, and success criteria. The detailed verification methods for the VCN (Analysis, Inspection, Test, or Demonstration) shall be identified on the VCN. The decomposition and interdependencies of the V&V objectives with success criteria shall be identified.

Flowdown of requirements to indentured product baseline shall be identified, where applicable. These lower level requirements shall be identified with associated closure verification. VCN closure is not complete until the lower level requirements are satisfied.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 111

**B. DRD Title:** Verification Closure Notices

**F. Data Requirements (continued):**

The evidence submitted with the VCN for final approval shall include analysis, test reports, demonstration reports, or inspection results with a concise summary. The evidence shall point to the location of clear evidence for verifying the requirement. All evidence shall be delivered as attachment to the VCN. Any associated reference or supporting data shall be made available to NASA during the contract period of performance.

Production and operational verifications associated with recurring verification activities, including acceptance testing, shall include reference to the released procedure or constraint.

Variances to the requirement shall be identified in the VCN.

Signature blocks for the Contractor and NASA shall be included.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 112

**B. DRD Title:** Certification Data Package

**C. Date:** 11/19/13

**D. Purpose / Use:**

The package collectively illustrates, with supporting evidence, that the system has met the operational and design technical requirements.

**E. Remarks:** None

**F. Data Requirements:**

Certification Data Package shall include:

(a) Crew Transportation System (CTS) configuration for Certification, including product definition, such as Drawing Tree and Product Breakdown Structure.

(b) The requirements that the system is certified to, including any applicable system specification, and any variances or waivers.

(c) A description of the reference mission and operations plans for which CTS Certification is being requested.

(d) Vehicle interface definition for any crew or cargo interfaces.

(e) A summary of the end-to-end design certification process, with reference to the Certification Plan, and identification of any differences between the certification plan and the certification activities completed. The summary will identify Verification and Validation (V&V) methods employed, general implementation approach, and summary results.

(f) Management systems, including Quality Management and Configuration Management, and the related implementation and control process including identification and tracking of limited life items.

Continued on the next page...



**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 112

**B. DRD Title:** Certification Data Package

**F. Data Requirements (continued):**

(g) **DRD 111 Verification Closure Notices**, which include the evidence necessary to substantiate that the requirement has been met

(h) System Safety assessment to include probabilistic safety analysis, hazard analysis, fault tolerance assessment, human error analysis, software safety analysis, top safety risks, and crew survival strategy assessment.

(i) Integrated risk management and analysis results.

(j) A summary of Operational elements that meet the requirements of CCT-PLN-1120 and SSP 50808, *ISS to Commercial Orbital Transportation Services (COTS) Interface Requirements Document (IRD)*. The summary will identify how facilities, plans, processes, governing standards, and documents will ensure safe execution of all mission phases. The summary shall include success and risks identified in simulated mission phases.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 113**

**B. DRD Title:** Range Safety Data Documentation

**C. Date:** 11/19/13

**D. Purpose / Use:**

This DRD covers the submission of Range Safety-related data and documentation required to be delivered to NASA. This DRD is in addition to the Contractor's responsibility to meet the Range requirements established by the applicable Federal or Range Safety Organizations.

**E. Remarks:**

NASA Procedural Requirement (NPR) 8715.5, *Range Flight Safety Program*, is applicable to all Crew Transportation System (CTS) flights not licensed by the Federal Aviation Administration (FAA).

**F. Data Requirements:**

The Contractor shall make all Range Safety non-conformance requests and associated documentation available to NASA as a Type 4 DRD. The Contractor shall notify NASA of Range Safety non-conformances, or other Range Safety related issues, at the same time the applicable Federal or Range Safety Organization is notified, or as soon afterwards as is practical.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 114**

**B. DRD Title:** Crew Transportation System (CTS) Data Input for NASA Integration and Independent Verification and Validation (IV&V)

**C. Date:** 11/19/13

**D. Purpose / Use:**

To establish data required for the Government to perform ISS integration, stage verification, and Independent Verification and Validation of select analyses used for verification of applicable requirements.

**E. Remarks:**

For ISS integration and stage verification, the requirement in this DRD may be superseded if the Contractor has a Bilateral Data Exchange Agreement List and Schedule (BDEALS) jointly developed with the ISS Program.

**F. Data Requirements:**

The Contractor shall provide the data, documentation, drawings, analytical models, and support services upon request as necessary to support the ISS integration, stage verification, and the Government independent verification and validation of the following integrated analyses to the extent that these analyses are used to verify the applicable requirements. Multiple deliveries may be required during design and development, and the deliveries may be independent of major milestones. The deliveries support Government analytical tool development and perform analyses for ISS integration, stage verification, and Government independent verification and validation. In the event the Contractor has data that is applicable to more than one area listed, the Contractor may combine the data in one delivery and shall specify which areas the data applies to. Final DRD submission shall be coordinated with NASA.

Specifically, the Contractor shall provide data for the following areas:

**(1) For ISS Integration and Stage Verification:**

- (a) Inputs as required per SSP 50964, *Visiting Vehicle ISS Integration Plan*, Appendix F, *Joint Verification Events List*.

**(2) For Flight Mechanics and Guidance, Navigation & Control:**

- (a) GNC stability and performance analysis for all critical mission phases, including ascent, abort, entry, descent and landing.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 114**B. DRD Title:** CTS Data Input for NASA Integration and Independent Verification and Validation**F. Data Requirements (continued):****(2) For Flight Mechanics and Guidance, Navigation & Control:** (continued)

(c) Performance and trajectory analysis as a function of launch date and time (including appropriate abort cases).

(d) Performance capability, margins and reserves, including description of how performance reserve is calculated.

Typical supporting data includes:

- Guidance strategies and detailed algorithm description and/or source code or equivalent;
- Control strategies and detailed algorithm description and/or source code or equivalent;
- Navigation strategies and detailed algorithm description and/or source code or equivalent;
- Analysis/linearization assumptions by flight condition;
- Sequence of events and tracking coverage;
- Design reference trajectories and dispersed trajectories for all mission phases;
- Documentation and characterization of crew piloting interface, where crew piloting affects the flight mechanics, guidance, navigation, and control of the CTS;
- Spacecraft and Launch Vehicle mass, cg (center of gravity), moments and products of inertia including structural reference frames and any appropriate reserve quantities;
- Control effector characteristics (including dispersions) for thrusters, engines, separation mechanisms, parachutes, aero surfaces, actuators and throttles.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 114**B. DRD Title:** CTS Data Input for NASA Integration and Independent Verification and Validation**F. Data Requirements (continued):****(3) For Loads and Structural Dynamics:**

(a) Coupled dynamic loads analysis including all flight/mission events and conditions that cause the greatest loads, deflections, and accelerations on the integrated vehicle.

(b) Forcing function derivation for conditions that cause the greatest loads, deflections, and accelerations on the integrated vehicle.

Typical supporting data includes:

- Models (FEM (Finite Element Model) and Craig-Bampton) and forcing functions used in loads analysis;
- Description of models, methodology and forcing functions used;
- Evidence supporting model validation via modal test and/or influence coefficient testing;
- The flight events and conditions that cause the greatest loads, accelerations, and deflections;
- Output from each flight event: maximum /minimum tables of payload selected Acceleration Transformation Matrices, interface forces, and internal Load Transformation Matrices;
- Derivation of and use of load indicators which serve as a means of selecting controlling load cases for delivery to structures/stress;
- Description/definition of day-of-launch loads process.

**(4) For Aerodynamics and Aerothermodynamics:**

(a) Aerodynamic analysis for all relevant mission phases.

(b) Aerothermal analysis for all relevant mission phases.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 114

**B. DRD Title:** CTS Data Input for NASA Integration and Independent Verification and Validation

**F. Data Requirements (continued):**

**(4) For Aerodynamics and Aerothermodynamics:** (continued)

Typical supporting data includes:

- Integrated vehicle aerodynamic database and substantiation report;
- Spacecraft separation and free-flight aerodynamic database and substantiation report;
- Integrated vehicle aerothermal database and substantiation report;
- Spacecraft separation and free-flight aerothermal database and substantiation report;
- Wind tunnel test data;
- Integrated vehicle outer mold line Computer Aided Design (CAD) model;
- Spacecraft outer mold line CAD model.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 201**

**B. DRD Title:** Mission Integration and Operations Management Plan (MIOMP)

**C. Date:** 11/19/13

**D. Purpose / Use:**

To describe the various operations and processes, product delivery templates, and organizational interfaces necessary for the Contractor to implement the integration and operations (I&O) activities required for the Contractor's Post Certification Missions (PCMs) to the ISS.

**E. Remarks:**

For the purposes of this deliverable, "cargo" herein refers to cargo, payloads, and supplies.

**F. Data Requirements:**

The Contractor shall keep this document current with established processes, schedules, and interfaces throughout the contract period of performance. The document shall contain integrated text and graphics, as required, to describe and/or illustrate the various aspects of services provided, including process descriptions, schedule flows, facility and tool illustrations, and organizational hierarchies. As changes are made to the MIOMP, the Contractor shall submit updates for NASA review and concurrence according to the DRD type 2 definition. For DDTE, the Contractor shall propose a final submittal, consistent with the test flight to ISS.

The following information shall be included under the corresponding principal function material:

**(1) For Mission Integration and Analysis Support:**

The Contractor shall provide a functional breakdown and description of how it interfaces with NASA to:

- (a) ensure the timely provision of data required in support of mission integration and documentation.
- (b) incrementally mature the mission design (launch window, planned mission profile, back-up opportunities) and flight readiness.
- (c) provide the necessary data for NASA to determine pre-mission status and flight readiness including personnel training and certification, ground accommodation interfaces and service agreements.
- (d) define the procedures, timeline, and constraints associated with crew and cargo through handover for pre-launch and post-landing, including roles and responsibilities and interfaces associated with NASA personnel, equipment, and facilities.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 201

**B. DRD Title:** Mission Integration and Operations Management Plan (MIOMP)

**F. Data Requirements (continued):**

**(2) For Mission Operations Documentation:**

The Contractor shall provide a functional breakdown and description of how the Contractor manages the preparation and utilization of joint operations products in conjunction with NASA.

**(3) For Crew Transportation System (CTS) Systems and Commercial Cargo Operations Training:**

The Contractor shall provide a functional breakdown and description of how it manages the training for CTS and commercial cargo for the flight crews, console operators, and instructors. This includes the approach to (1) development and maintenance of training plans, study materials, and hardware and software aids; (2) development of training requirements and schedules including personnel certification and certification maintenance; (3) development and utilization of training mockups.

**(4) For Ground Facility Utilization:**

The Contractor shall provide a functional breakdown and description of how it allocates facilities to be utilized during all phases of operations including pre-launch preparation, in flight execution, and post flight recovery.

**(5) For Data Management:**

The Contractor shall provide a functional breakdown and description of how it manages the CTS command and data. This includes: the approach to development of CTS and data requirements (including requirements for data processing, storage, and distribution); coordination of the method(s) by which this data is integrated into the standard ISS communication and data services; establishment of interfaces with NASA and non-NASA components of the air-to-ground communications network; and coordination of the Contractor's data management plan with NASA.

**(6) For Simulations and Mission Operations Support:**

The Contractor shall provide a functional breakdown and description of how it manages CTS support with the JSC Mission Control Center (MCC), ISS Management Center (IMC), and JSC Mission Evaluation Room (MER) facilities, personnel, and processes during all Joint Integrated Simulations and during real-time mission operations.

Continued on next page...



**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 201**B. DRD Title:** Mission Integration and Operations Management Plan (MIOMP)**F. Data Requirements (continued):****(7) For Cargo Capabilities:**

The Contractor shall define its cargo capability and schedule flexibility in the following table:

**Cargo Capabilities Table**

<b>Cargo Type</b>	<b>Maximum Mass</b>	<b>Maximum Volume</b>	<b>Turnover Schedule</b>
<b>Standard Internal Stow</b>	<b>TBP</b>	<b>TBP</b>	<b>L-TBP</b>
<b>Late Stow</b>	<b>TBP</b>	<b>TBP</b>	<b>L-TBP</b>
<b>Standard Internal Destow</b>	<b>TBP</b>	<b>TBP</b>	<b>Landing+TBP</b>
<b>Early Destow</b>	<b>TBP</b>	<b>TBP</b>	<b>Landing+TBP</b>

TBP: To be Proposed

L-: Launch minus

**(8) For Cargo Manifesting and Integration Support:**

The Contractor shall provide a functional breakdown and description of how it works with the ISS Program Office, Commercial Crew Program (CCP), the Contracting Officer Representative (COR), and cargo hardware developers to establish a mission manifest within the capability of the spacecraft and based on the crew complement. The processes shall include: the collection and documentation of pertinent technical and operational data; establish mission manifests and execution; and physically integrate cargo into and out of the pressurized volume of the orbital spacecraft.

**(9) For Launch and Landing Processing:**

The Contractor shall provide a functional breakdown and description of the processes and schedule for ground processing of crew and cargo at the launch site, the landing site, and return facilities. This section shall include service and facility capabilities, ground safety processes, cargo and crew integration from handover to launch and from return to handover back to NASA, accommodation of NASA personnel (e.g., flight surgeons) and equipment, and high level processing schedule.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 202

**B. DRD Title:** Post Certification Mission (PCM) Work Plan

**C. Date:** 11/19/13

**D. Purpose / Use:**

The Post Certification Mission Work Plan establishes the schedule milestones, payment milestones and completion criteria for each mission. The work plan is expected to be kept current to accommodate changes during PCM preparation and execution.

**E. Remarks:** None

**F. Data Requirements:**

The Contractor shall keep this document current to reflect the latest PCM planning and execution. When changes affecting the content of the PCM work plan, the Contractor shall submit an updated PCM Work Plan for NASA review and concurrence according to the DRD type 2 definition.

For each Post Certification Mission, the Contractor shall submit a PCM Work Plan that reflects the Contract Performance Work Statement and contains:

- (a) Milestones, by name and description of the milestones, corresponding to the payment number;
- (b) Number of months prior to (L-) launch;
- (c) The targeted launch date and associated back-up opportunities;
- (d) An acceptance criteria narrative (i.e., describes progress in terms of activities completed prior to the payment event) and any proposed changes from the Contract PWS;
- (e) The review process, location, deliverables, delivery dates, means and timing for which data will be made available to NASA, and other logistics related information;
- (f) Identification of any critical linkage to Certification and previous mission authorization(s) activities that may impacts planned activities.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 203**

**B. DRD Title:** Vehicle Interface Definition Document (IDD)

**C. Date:** 11/19/13

**(d) Purpose / Use:**

To provide NASA with an understanding of the Contractor's CTS environments (launch, on-orbit, and landing) so that NASA can perform end item certification on crew interfaces and individual cargo items to ensure survivability.

**(e) Remarks:**

For the purposes of this deliverable, "cargo" herein refers to cargo, payloads, and supplies.

**F. Data Requirements:**

The Contractor shall provide a Vehicle IDD that includes allowable crew and cargo mass properties, mechanical interfaces (i.e., mount, ducting), electrical interface, data interface (including command capability), handling, and any spacecraft specific constraint.

The environments shall include: quasi-static load, low frequency loads, random vibration loads, acoustic loads, thermal loads, pressure loads, shock, atmospheric gas concentration, allowable gas release, relative humidity, radiation, electromagnetic, and any other environment constraints deemed necessary. Environments shall be defined as the maximum environments that cargo may be exposed to during ground processing, launch, on-orbit, reentry, and recovery.

The Contractor shall provide an instrumentation plan including translation of data from flight instrumentation to the crew and cargo interface of interest. The plan shall include location and type of sensors, sampling rate, and downlink method and bandwidth for each mission phase.

Launch and landing load factors and rotational accelerations shall be provided in the following reference frame:  $N_x(g)$ ,  $N_y(g)$ ,  $N_z(g)$ ,  
 $R_x(\text{rad}/\text{sec}^2)$ ,  $R_y(\text{rad}/\text{sec}^2)$ ,  $R_z(\text{rad}/\text{sec}^2)$

**X:** The longitudinal axis of the spacecraft. Positive x axis extends from the base or bottom of the spacecraft to the nose of the cargo spacecraft.

**Y:** Y axis is perpendicular to the x axis.

**Z:** Z axis is perpendicular to the x and y axes and completes the right-handed coordinate system.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 203

**B. DRD Title:** Vehicle Interface Definition Document (IDD)

**F. Data Requirements (continued):**

Random vibration environments shall be provided in each axis from 20-2000 Hz at the crew and cargo interface to the spacecraft. The overall grms (root mean square acceleration) values shall be reported. The duration of the excitation shall be reported.

Acoustic environments shall be provided 1/3-octave band format, starting from a 31.5 Hz center frequency and extending to a 2500 Hz center frequency, at the cargo/payload interface. The overall acoustic environment shall also be provided. A reference sound pressure level of  $2 \times 10^{-5}$  N/m<sup>2</sup> shall be used to report the acoustic environment in terms of decibels.

Shock environments shall be provided from 10-10000 Hz at the cargo/payload interface. The response shall be reported in units of peak acceleration.

Load spectrums shall be provided which cover the expected loading events for one flight (launch, free-flight, berthing) at the cargo interface. The spectrum shall be divided by a minimum of 10% amplitude tiers.

Pressure and thermal environments for crew and cargo interfaces in the orbital spacecraft shall be provided.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 204

**B. DRD Title:** Mission Resource Allocation Document (MRAD)

**C. Date:** 12/20/13

**D. Purpose / Use:**

To establish the allocation of resources and technical data requirements needed for Post Certification Missions. The associated data will provide the required assessment to confirm compatibility with the spacecraft environments defined in the Vehicle IDD and compatibility with SSP 50808 *ISS to Commercial Orbital Transportation Services (COTS) Interface Requirements Document (IRD)*, and CCT-REQ-1130, *ISS Crew Transportation and Services Requirements Document*.

**E. Remarks:**

For the purposes of this deliverable cargo herein refers to cargo, payloads, and supplies.

**F. Data Requirements:**

The Contractor's format will be acceptable, except for those sections concerned with stowage and labeling data for cargo. The format for stowage and labeling data for cargo shall be compatible with the ISS Inventory Management System (IMS).

The report shall be generated and updated based on progressive maturity of the mission definition and crew and cargo complement. The cargo complement will be defined by NASA at launch minus thirteen (L-13) months, L-5 months, and L-6 weeks. The MRAD shall be delivered at launch minus ten (10) months, launch minus three (3) months, and launch minus one (1) month. The Contractor shall submit any changes or additions to NASA, in a timely manner, for the execution of joint analysis and stage verification. The final MRAD delivery shall be coordinated with NASA. For DDTE, the Contractor shall propose a final submittal, consistent with the test flight to ISS.

The Contractor's response (this MRAD) shall address specific technical and operational issues pertaining to each proposed cargo item and contain recommendations for combining the proposed cargo items into an optimized crew/ cargo configuration. Any technical or operational issues that could not be resolved shall be documented in the report with a recommended forward action plan.

The MRAD shall be the source of accurate data pertaining to the mission-unique mass, volume and other resources allocated to each crew/cargo item. All data shall be updated with the latest crew/cargo complement.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 204

**B. DRD Title:** Mission Resource Allocation Document (MRAD)

**F. Data Requirements (continued):**

The following requirements shall be included in the MRAD:

- (a) Mission physical configuration of the spacecraft pressurized module including ascent, on-orbit, and return stowage configurations (crew and cargo layouts including bag-level IMS bar code/serial number);
- (b) Mission propulsion and power resources and margins for all mission phases;
- (c) Consumables and cargo/supplies for the crew for all mission phases;
- (d) Command and data requirements for cargo;
- (e) Crew and Cargo thermal/environmental assessment;
- (f) Spacecraft vehicle dynamics;
- (g) Spacecraft mass properties. The final mass properties delivery within L-6 weeks is expected to be a weighed, final spacecraft configuration;
- (h) Spacecraft structural math model and thermal math model;
- (i) Spacecraft thruster plume and firing history, propellant types;
- (j) Verification Loads Analysis. This report shall include:
  - (1) Sensitivity of crew and cargo response to spacecraft configuration (location and mass);
  - (2) Expected crew and cargo environment during all phases of flight and associated margins against NASA-provided environmental limits;
- (k) Plan for late access and/or early retrieval;
- (l) Mission-unique hardware and Government furnished equipment (GFE);

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 204

**B. DRD Title:** Mission Resource Allocation Document (MRAD)

**F. Data Requirements (continued):**

(m) Flight operations support, standards for console time, and plan for Certification Status of support personnel;

(n) Crew Equipment Interface Test Date(s);

(o) Any design changes that may affect the requirements in CCT-REQ-1130 and SSP 50808 and associated analytical products necessary for the Contractor's spacecraft;

(p) Trajectory data to be delivered for assessments: within one month and again within one week of launch; within one month and again within one week of departure; and near real-time updates during flight for key events such as maneuvers monitoring. This shall include:

(1) Timeline of free-flight activities (e.g., launch insertion, appendage configuration, jettisons, major mode changes);

(2) Spacecraft maneuver plan. For each maneuver, insertion through entry, includes inertial and relative state vector, attitude at time of burn, burn components by axis, spacecraft mass at time of burn, and time of burn;

(q) Spacecraft ephemeris including time, position, velocity, and covariance.

(r) Atmospheric and drag characteristics for the ISS and Spacecraft that are used in the analysis.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 205**

**B. DRD Title:** Spacecraft Computer-Aided Design (CAD) Models

**C. Date:** 11/19/13

**(a) Purpose / Use:**

The three-dimensional (3-D) CAD models will be accurate geometrical depictions of the exterior and interior of the spacecraft. The CAD models will be used to support mission design, procedure development, clearance analysis, cargo integration, Extra-vehicular worksite analysis (if required), solar array shadowing, Aerodynamics/Mass Properties Data Book development, and Neutral Buoyancy Lab reconfiguration. The CAD models will also be used to validate hardware interfaces, to ensure hardware will mate on-orbit with International Space Station and performing Intra-Vehicular analysis. .

**E. Remarks:** None.

**F. Data Requirements:**

For DDTE, the Contractor shall propose a final submittal, consistent with the test flight to ISS.

The 3-D CAD models shall be of sufficient detail that the external and internal geometry shows an accurate depiction of the spacecraft. 3-D CAD models are required of the end items up to the major assembly. The 3-D CAD models shall include:

**(a) For Exterior CAD models**

Examples of the required detail (but not limited to) for exterior CAD models are docking aids, antennae, cables, cable clamps, debris shields, Extravehicular Activity (EVA) aids, sensors, thrusters, handrails, vents, cameras, lights, targets. All objects that deploy rotate or otherwise move shall be appropriately modeled with location and limit parameters described.

**(b) For Interior CAD models**

CAD models of the interior of the spacecraft shall require the following (but not limited to) internal pressure shell, standoff, hatches, ports, stowage compartments, rack attachments, vents, lights, handrails, seat tracks, emergency equipment. All objects that deploy rotate or otherwise move shall be appropriately modeled with location and limit parameters described.

Continued on next page...



**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 205

**B. DRD Title:** Spacecraft Computer-Aided Design (CAD) Models

**F. Data Requirements (continued):**

**Format:**

- Models shall be full scale in English (inches) units.
- Models shall be constructed to nominal dimensions.
- Models should be built with respect to element local coordinate system.
- Models shall be supplied in one of the following formats: Unigraphics (preferred), Computer-Aided Three-Dimensional Interactive Application (CATIA), PTC Pro-Engineer, Parasolid, Stereo Lithography (SLA), Virtual Reality Modeling Language (VRML), or Product Vision (JT).
- Solid Models Only—Models may be unparameterized “dumb solids” meaning tolerance data; model history, material properties, etc. need not be included.
- Model parts should be individual entities and not fused together. This will allow CAD team to update the model based on hardware measurements.
- Description on movement limits for any articulating items should be provided.
- As-designed and as-built (validated and final) models shall be delivered and validated for areas of close clearances to ISS and/or crew access.
- Interior models shall be delivered either separate from exterior models or as an appropriately documented assembly such that interior models can easily be separated leaving both interior and exterior features intact.
- Where interior subassemblies are supplied as separate models, sufficient documentation shall be provided to support correct geometrical integration of each subassembly into its larger interior element.
- A model tree shall be provided which documents the element model assembly architecture as well as model and subassembly titles.
- Models shall be under configuration management so that the pedigree and source of models are documented and retained.
- Models and associated assembly trees and configuration data shall be delivered electronically.

**Maintenance**

Updates to CAD models shall be delivered to NASA within seven (7) days of drawing release.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.:** 206

**B. DRD Title:** Internal Cargo Interface Control Agreement (ICA)

**C. Date:** 11/19/13

**D. Purpose / Use:**

The Internal Cargo Interface Control Agreement (ICA) is designed to provide the spacecraft to cargo item requirements definition and interface details. This is required for complex internal cargo, which are typically all except soft-bags. It defines the mission requirements and interfaces as they are known. The Internal Cargo ICA will evolve as mission requirements are identified.

**E. Remarks:**

For the purposes of this deliverable, “cargo” herein refers to cargo, payloads, and supplies.

**F. Data Requirements:**

For DDTE, the Contractor shall propose a final submittal, consistent with the test flight to ISS. The internal cargo ICA shall define, to the extent required by each specific complex internal cargo: the hardware interfaces and resource requirements; ground processing requirements; safety and interface verification requirements; and operational requirements of each complex internal cargo item identified for the Post Certification Mission. It shall also include any other Contractor-furnished hardware and services required, such as transportation or analytical support services. Depending on the complexity of the payload and its interfaces, two types of Internal Cargo ICAs shall be available. These are:

**(1) Interface Control Document (ICD)**

Cargo, such as active payloads or hard mounted Orbital Replacement Units (ORUs), that require crew operation or resources (e.g., power, cooling, command and data), shall utilize ICDs. Once baselined, each ICD shall be under configuration control. The ICD shall include all figures or the figures must be available for delivery, if requested.

**(2) Stowage Interface Agreement (SIA)**

Cargo, such as passive payloads, with ground handling constraints and/or verification requirements, shall utilize SIAs. Once baselined, each SIA shall be under configuration control. The SIA shall include all figures (if any) or the figures must be available for delivery, if requested.

**Maintenance**

Cargo-specific Internal Cargo ICAs shall be maintained throughout the mission preparation and execution.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 207**

**B. DRD Title:** Integrated Cargo Phase III Hazard Report

**C. Date:** 11/19/13

**D. Purpose / Use:**

The ISS Safety Review Panel (SRP) will use the Integrated Hazard Reports and System Description to assess the design and operation of ISS element hardware configuration for preflight assessments.

**A. Remarks:** None

**F. Data Requirements:**

(a) Submittals shall consist of Integrated Hazard Reports and System Descriptions for all crew equipment and cargo that will be integrated into the spacecraft.

(b) Hazard Reports and System Descriptions shall be provided in accordance with SSP 30309, *Safety Analysis and Risk Assessment Requirements*.

(c) System Description: The Contractor shall provide a description of the launch and on-orbit configuration of the hardware in accordance with SSP 30599, *Safety Review Process*. Functional diagrams shall be submitted and supplemented with descriptions of interfaces and operations.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 208**

**B. DRD Title:** Flight Readiness Review (FRR) Data Package

**C. Date:** 11/19/13

**D. Purpose / Use:**

The FRR data package establishes the data required for NASA to evaluate readiness and provide approval to conduct crewed missions.

**E. Remarks:** None

**F. Data Requirements:**

The Contractor shall provide to NASA:

(a) Flight Readiness Review Data Package per CCT-PLN-1120, *Crew Transportation Technical Management Processes*, Appendix F, *CTS FTRR/FRR Milestone Data*.

(b) Documentation showing all acceptance, checkout and integration testing has been completed.

(c) Status of all Review Item Dispositions (RIDs), actions, and open work from Mission Review Milestones.

(d) Documentation that Mission support team is defined, has been trained, and is in place.

(e) Evidence that all operational supporting and enabling capabilities necessary for nominal and contingency operations have been tested and delivered/installed at the site(s).

(f) Plans, procedures, and training for nominal and contingency operations for the Crew Transportation System (CTS) have been completed.

(g) Evidence that systems, hardware, software, personnel, and procedures are in place.

(h) Plan and schedule of preplanned forward work.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 209**

**B. DRD Title:** Post Flight Assessment Report

**C. Date:** 11/19/13

**D. Purpose / Use:**

This report provides NASA a comprehensive post-flight summary of the Crew Transportation System (CTS). This post flight assessment report will support the NASA Contracting Officer's mission success determination.

**E. Remarks:** None

**F. Data Requirements:**

For DDTE, the Contractor shall propose a final submittal, consistent with the test flight to ISS.

After each launch, the Contractor shall deliver a Post Flight Assessment (PFA) report no later than (NLT) fourteen (14) days after docking with ISS, an updated PFA report NLT fourteen (14) days after landing and a final PFA report NLT sixty (60) days after landing. This report shall provide a comprehensive post-flight summary of the Crew Transportation System (CTS).

The Post Flight Assessment Report shall provide the following data as it pertains to the CTS:

- (a) Predicted and actual vehicle system, subsystem, and component performance data;
- (b) Comprehensive flight reconstructions, to include predicted and actual trajectories and communication coverage;
- (c) Determination of actual flight environments;
- (d) Explanation of significant differences between the predicted and actual flight environments;
- (e) When applicable, mishap investigation and resolution documentation, responses and implementations to the mishap board's recommendations and return to flight activities;
- (f) Problem identification, anomalies, and malfunctions from post Flight Readiness Review (FRR) through landing and recovery; their impact on the CTS, crew, cargo, and the overall mission.

Continued on next page...

**Data Requirement Document** (Continuation Sheet)

**A. DRD No.:** 209

**B. DRD Title:** Post Flight Assessment Report

**F. Data Requirements (continued):**

(g) Status of corrective actions and anomaly resolutions. This would include model and predicted environment updates due to collected flight data.

(h) Assessment of the adequacy of training, both for flight and ground personnel.

(i) Analysis demonstrating that the Mission Success Criteria has been met.

**Data Requirement Document**

(Note: Please see DRL for Data Deliverable Type and Submission Frequency)

**A. DRD No.: 210**

**B. DRD Title:** Imagery and Associated Cataloging

**C. Date:** 11/19/13

**D. Purpose / Use:**

To provide imagery of docking interfaces, crew interfaces, connectors, Extravehicular Activity (EVA) and Extravehicular Robotic (EVR) interfaces of the spacecraft vehicle. Also, to capture all ISS interfaces on the spacecraft and cargo transported to the ISS.

**E. Remarks:**

For the purposes of this deliverable, “cargo” herein refers to cargo, payloads, and supplies

**F. Data Requirements:**

For DDTE, the Contractor shall propose a final submittal, consistent with the test flight to ISS.

**(1) Preflight Imagery Plan (PFIP)** (Data Type 2)

A Contractor provided Pre-Flight Imagery Plan (PFIP) shall be constructed as described in SSP 50502, *ISS Hardware Preflight Imagery Requirements*, to facilitate Contractor planning and submittal of imagery. The PFIP shall define imagery requirements for the “before integration”, “during integration”, and “after integration” phases of the integration. The PFIP shall be submitted to NASA for review and approval. The imagery plan shall specify the imagery to be captured by the Contractor. The PFIP shall also be used for evaluation purposes to approve Contractor imagery submittals. The final PFIP shall be submitted to NASA at launch minus six (L-6) months.

The Contractor PFIP shall include the following imagery:

- Docking/ berthing interfaces
- Connectors (cables and fluid) between the spacecraft and the ISS including clocking and pin configuration
- Extravehicular Activity (EVA) interfaces
- Extravehicular Robotic (EVR) interfaces
- Intravehicular Activity (IVA) interfaces as related to cargo operations

Continued on next page...

**Data Requirement Document** (Continuation Sheet)**A. DRD No.:** 210**B. DRD Title:** Imagery and Associated Cataloging**F. Data Requirements (continued):****(1) Preflight Imagery Plan (PFIP)** (continued):

Complex payload hardware, installed or mounted in the orbital vehicle pressurized module, shall require imagery of ISS attach points, connectors, fluid lines, and crew interfaces. The PFIP shall list all hardware to be imaged, the type of view (close up, normal, wide view) and the integration stage of the hardware (before, during or after integration onto the module and/or carrier).

**(2) Imagery Requirements** (Data Type 3)

The Contractor shall provide imagery of docking interfaces, crew interfaces, connectors, Extravehicular Activity (EVA) and Extravehicular Robotic (EVR) interfaces of the spacecraft vehicle. This imagery shall capture all ISS interfaces on the spacecraft and cargo transported to the ISS. The two (2) categories of imagery that comprise this task are Spacecraft Imagery and Pressurized Cargo Imagery. Within these two (2) categories, the imagery shall provide for:

**(a) Spacecraft Imagery**

Potential problems during on-orbit operations require imagery of all spacecraft to ISS interfaces. For docking interfaces, detailed close up and overall wide view imagery documenting ISS interfaces are required. Cable and fluid lines that connect to the ISS after docking require final configuration imagery of the connectors. This imagery shall provide the clocking and pin configuration of all ISS connections. This imagery shall be included in the PFIP.

**(b) Pressurized Cargo Imagery**

Pressurized cargo imagery shall be taken to support cargo unloading and loading operations and crew training. All Flight Support Equipment (FSE) attach points, connectors and crew interfaces shall be imaged before, during and after integration. This imagery shall be included in the PFIP to ensure requirements are defined and communicated to the integrator.

**(3) Imagery Submittals** (Data Type 3)

The minimum resolution for the PFIP digital still imagery shall be no less than six (6) megapixels. Images downloaded from the camera shall be native or raw format for maximum image resolution. Final imagery shall be submitted to NASA nominally at L-2 months but no later than launch. Image cataloging data with enough detail to support subsequent retrieval shall be submitted for incorporation into the NASA-JSC Digital Imagery Management System (DIMS) database. The preferred submittal method consists of submitting the imagery and data on Compact Disk – Read Only Memory (CD-ROM) or Digital Video Disc (DVD).