Heliophysics Missions of Opportunity

Launch Service Interface Requirements Document (LSIRD) Secondary Payload Supplement

September 3, 2019 Rev. 1

DOCUMENT CHANGE LOG

Date	Pages Affected	Reason for Change	Version/Revision

Document Instructions

About this document – Launch Service Interface Requirements Document (IRD) "boilerplate" for secondary payloads.

This document is intended as a guide to be used by the secondary spacecraft customer in creating a Launch Service Interface Requirements Document (LSIRD) for being manifested with primary missions under the NLS II contract.

Instructions will be in *italics.* Information intended to be provided is identified within the brackets.

An (R) will denote information that is **required** by the Launch Services Program (LSP) in the section title, information that is **desired** by LSP will denoted by a (D).

Section 3.6 is intended for additional secondary Space Vehicle (SV) requirements that may drive Mission Unique Requirements or Non-Standard Services that fall out of scope of the previous (3.1-3.5) sections.

The NASA standard is **metric units**; please provide all units in metric.

For the purposes of this document the SV can be defined such that SV = SC (spacecraft) + payload(s)/instrument(s). SV acronym is synonymous with RPL acronym.

LSP recommended layout of the SV LSIRD can be found below.

Please provide rationale for each of the secondary SV requirements, LSP needs to understand the rationale behind your requirement.

CONTENTS

1 INTRODUCTION & SCOPE

Provide a brief description of the Space Vehicle (SV) and its mission. Include the following items at a minimum:

- *Mission objective*
- *Payload(s) and/or instrument(s) description*
- *NET/NLT Launch target dates*
- *Picture/drawing of SV in Launch Configuration*

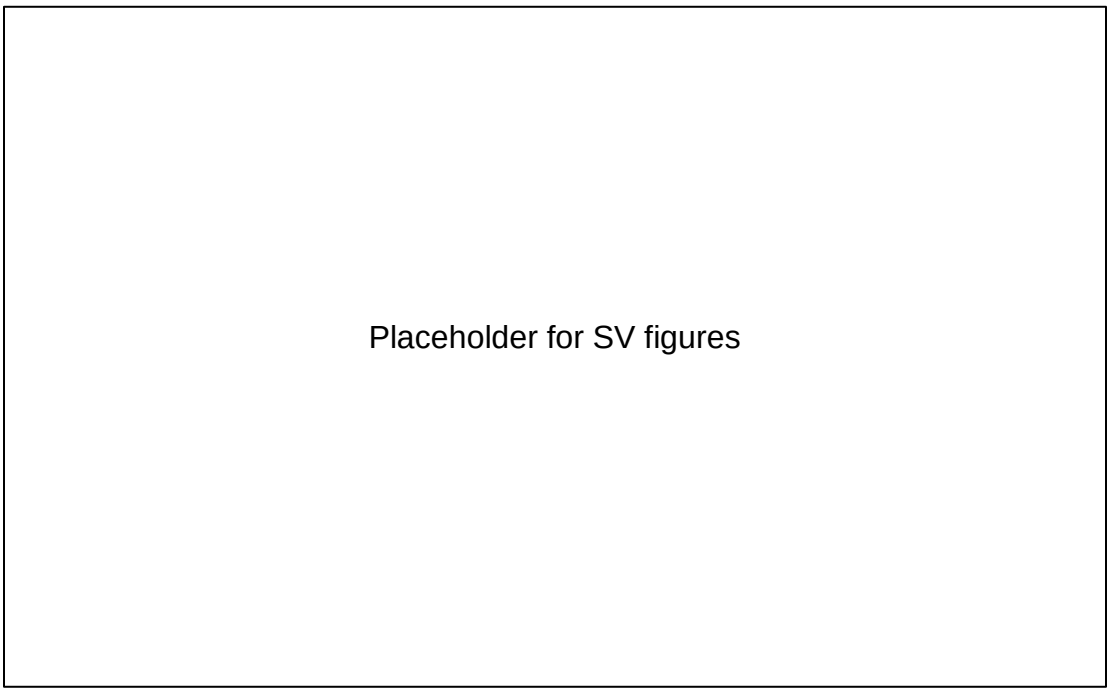

Figure 1-1: Mission of Opportunity Secondary SV Overview

1.1 DOCUMENT PURPOSE

This document defines the Mission of Opportunity to Secondary Payload Adapter (SPA) interface/integration requirements and constraints necessary to assure technical compatibility and to contribute to mission success.

Secondary payloads are those payloads that will have no authority to impact mission integration cycle for the primary mission. This includes but is not limited to launch date, go-no-go call for launch and drive environmental conditions within the fairing.

1.2 DOCUMENT OBJECTIVES

1. To provide a definition of the Mission of Opportunity Space Vehicle (SV) to Secondary Payload Adapter (SPA) integration and interface requirements as necessary to permit their design and implementation.

2 DOCUMENTS

Please list all applicable and reference documents that are pertinent to your spacecraft. Below is a sample of commonly used documents.

2.1 APPLICABLE DOCUMENTS

SIS 9-3-19 rev3	*Launch Vehicle Secondary Payload Adapter System Interface Specification for Heliophysics Missions of Opportunity*

2.2 REFERENCE DOCUMENTS

3 INTERFACE REQUIREMENTS

This section establishes the Secondary Payload Adapter (SPA) interface design requirements for the Missions of Opportunity project.

This document is to be used in conjunction with the Launch Vehicle Secondary Payload Adapter System Interface Specifications (SIS) for Heliophysics Missions of Opportunity. The SIS provides the baseline for requirements the RPL will need to meet for environments, standard services/configurations supported. The mission unique section of this document (section 3.6) is intended to be used for the RPL to define their requirements which differ from the information/guidelines in the SIS for Heliophysics missions of opportunity. Common example sections titles are provided. In addition, in some cases, the primary SV on the mission will drive requirements the secondary SV must meet/accept (example: primary has tighter contamination restrictions than the secondary. The secondary will be required to meet cleanliness levels of the primary to ensure “do not harm” restrictions are met).

3.1 MECHANICAL INTERFACES

3.1.1 Structural Interfaces

The structural interface between the secondary SV and LV Secondary Payload Adapter consists of the secondary SV/LV SPA interface at the base of the secondary SV, electrical connections, and purge connections.

3.1.1.1 SPA Interface (R)

Provide enough detail of the secondary *SV/SPA interface; include drawing of* secondary *SV mechanical interface to the SPA if available, so LV can define the appropriate separation system*

If your interface is already designed, please define desired SPA interface.

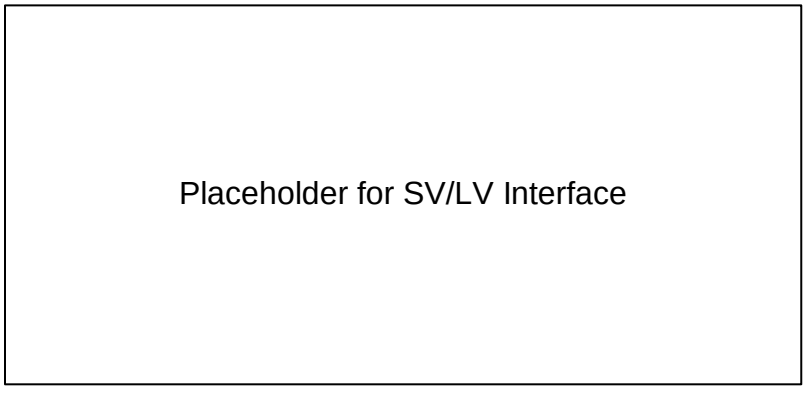

Figure 3.1.1.1-1: Spacecraft LV Interface

3.1.1.2 SV Coordinate System (R)

Secondary SV shall use coordinate system defined below

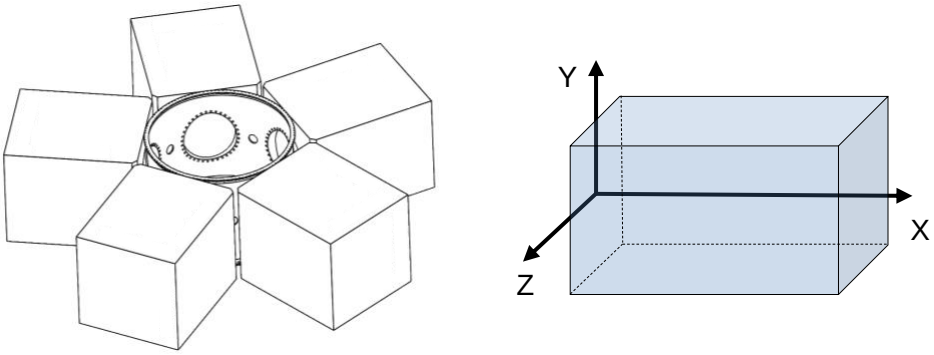

Figure 3.1.1.2-1: SPA and secondary SV Coordinate System

3.1.1.3 SV Maximum Dimensions (R)

Provide maximum envelope for the secondary SV in length, width and height.

3.1.1.4 Hardware past the Separation Plane (D)

Identify any spacecraft hardware that protrudes past the SPA interface plane including inboard of the separation system.

3.1.2 Mass Properties

3.1.2.1 Not to Exceed Mass (R)

Define the secondary SV Not to Exceed (NTE) mass.

Example: The spacecraft shall not exceed a mass of XXX kg.

3.1.2.2 Stiffness (R)

Define RPL SV primary fundamental frequency in the SPA axial and lateral axis.

3.2 ELECTRICAL INTERFACES

3.2.1 Airborne Interfaces

3.2.1.1 Electrical Connectors (D)

At a minimum, provide needed electrical pin count, power loops, and data loops

Table 3.2.1.1-1: Electrical Connector Requirements (D)

Power	
Data	
Separation loops on SPA/LV side (SV use)	
Separation loops on SV side (LV use)	

3.3 ENVIRONMENTAL INTERFACES

3.3.1 Contamination (D)

Provide details on your contamination control requirements

3.4 MISSION DESIGN

3.4.1 Orbit Insertion Requirements (R)

Below are terms you may use to define your orbit. Fill in Table 3.4.3-1 as applicable to the secondary SV or define your own orbit.

Table 3.4.3-1: Injection Orbit Characteristics in Coordinates

Parameter	Value	Tolerance
Semi-Major Axis (km)		
Eccentricity		
Inclination (deg)		

3.4.2 Separation Requirements (D)

For each of the separation parameters/requirements, include allowable tolerances. The separation system will be provided by the launch vehicle.

Table 3.4.8-1: Separation Requirements

Parameter	Value
Attitude of SV (X_{SV}, Y_{SV}, Z_{SV}) axis	
SV spin rates	
Angular acceleration	
Separation velocity	

3.5 GROUND PROCESSING REQUIREMENTS

3.5.1 Spacecraft Hazards (R)

Identify any secondary SV hazards such as propulsion type, nuclear, lasers, etc…

3.6 MISSION UNIQUE REQUIREMENTS (D)

Provide details on Mission Unique requirements that the secondary SV may have

Ex. Handheld restrictions,

3.6.1.1 SV RF Susceptibility

Table 3.3.5.3-1: SV Radiated Susceptibility

Frequency Range	E-Field Limit (V/m)

3.6.1.2 SV Magnetic Sensitivity

Describe any secondary SV magnetic sensitivity requirements.

3.6.1.3 SC Propulsion System

Describe type of propulsion system and any fueling requirements

3.6.1.4 SC T-0 or drag on GN2 purge

Describe flow rate, pressure, cleanliness, purity and location of purge

3.6.1.5 SV Environments

Provide environmental limits which the secondary SV needs to be addressed which exceed the limits defined in the Heliophysics SIS (examples, shock, acoustics, and temperature)

3.6.1.6 Serial Telemetry

Describe your telemetry needs; does the secondary SV need data up to T-0 or after? If the secondary SV needs data after T-0, then fill out Table 3.2.2-1 below.

Table 3.2.2-1: Interleaved Telemetry Requirements

Interleaved Telemetry Information	
Data line channel quantity	
Data rate per channel (kbps)	
SV Data format (example: NRZ-L)	

Appendix A – Common Acronyms and Abbreviations

C	Celsius
CBOD	Clamp Band Opening Device
CCAM	Collision and Contamination Avoidance Maneuver
CCR	Configuration Change Request
CG	Center of Gravity
deg	Degree
ECS	Environmental Control System
EGSE	Electrical Ground Support Equipment
ERB	Engineering Review Board
ESPA	EELV Secondary Payload Adapter
F	Fahrenheit
ft	Foot
GN2	Gaseous Nitrogen
GSE	Ground Support Equipment
HEPA	High-Efficiency Particulate Air
hr	Hour
Hz	Hertz
ICD	Interface Control Document
I/F	Interface
IFD	In-Flight Disconnect
in	Inch
IRD	Interface Requirements Document
ISO	International Standards Organization
kbps	Kilobits per Second
km	Kilometer
KSC	John F. Kennedy Space Center
l	Liter
lb	Pound
LRD	Launch Readiness Date
LSP	Launch Services Program
LSTO	Launch Services Task Order
LV	Launch Vehicle
LVC	NASA Launch Vehicle Contractor
m	Meter
MGSE	Mechanical Ground Support Equipment
MIT	Mission Integration Team
MLT	Mean Local Time
mm	millimeter
NASA	National Aeronautics and Space Administration
NLS	NASA Launch Services
NLT	No Later Than
NRZ-L	Non-Return to Zero – Phase L

NTE	Not to Exceed
NVR	Non-Volatile Residue
OASPL	Overall Sound Pressure Level
OPM	Orbital Parameters Message
PAC	Percent Area Coverage
PAF	Payload Attach Fitting
PLA	Payload Adapter
PLF	Payload Fairing
Psia	Pounds Per Square Inch Absolute
Psig	Pounds Per Square Inch Gauge
PPF	Payload Processing Facility
PTC	Passive Thermal Control
RF	Radio Frequency
RLSP	Request for Launch Services Proposal
RPL	Rideshare Payload = SV
SIS	System Interface Specification
SPA	Secondary Payload Adapter
SV	Space Vehicle or Spacecraft
SVC	Space Vehicle Contractor
SCAPE	Self-contained Atmospheric Protective Ensemble
SCFH	Standard Cubic Foot Per Hour
SCFM	Standard Cubic Foot Per Minute
SI	Systeme International d'Unites
SOW	Statement of Work
SRS	Shock Response Spectrum
SSF	Spacecraft Structural Frame
SV	Space Vehicle
TML	Total Mass Loss
TOD	True of Date
VDC	Volts – Direct Current