Space Launch
Sample Mission 2.3

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T.O. SM-2.3

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REVISION HISTORY			
REVISION	**DATE**	**SECTION AFFECTED**	**COMMENTS**
Basic	10 May 2012	All	Initial Release
Rev 1	30 May 2012	Header	Removed FOUO
		Para 3.1	CHANGED FROM: **Post-encapsulation Access to Satellite:** The DSCOVR satellite shall require access following encapsulation in the LV payload fairing to the following areas/items on the satellite (reference TRD Enhancement A-4): • Propulsion Fill & Drain Valves • Removal of contamination covers on sensitive optical surfaces • Satellite arming plugs • EGSE umbilical attach points CHANGED TO: **Post-encapsulation Access to Satellite:** The DSCOVR satellite shall require access to the indicated areas following encapsulation in the LV payload (reference TRD Enhancement A-4). Added drawing of access locations and location dimension chart.

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1.0 INTRODUCTION

1.1 OVERVIEW

This document provides the launch vehicle mission requirements for the DSCOVR mission, which shall be launched under the Orbital Suborbital Program–3 (OSP-3) Contract.

The mission is to launch a refurbished and enhanced NASA satellite called the Deep Space Climate Observatory (DSCOVR) to the Sun-Earth L1 Lagrange point (a point approximately 1,500,000 km from Earth). The not-to-exceed (NTE) mass of the DSCOVR satellite will be 750 kg. The satellite includes a propulsion unit for maneuvering once it reaches the L1 point.

The DSCOVR satellite will observe the Earth, and directly monitor space weather around the L1 point. Its primary mission is to provide advanced warning of space weather events that will impact both civilian and military activities on the Earth.

The DSCOVR program is a partnership with the National Oceanic and Atmospheric Administration (NOAA), the National Aeronautics and Space Administration (NASA), and the U.S. Air Force (USAF). The USAF will provide the Launch Vehicle (LV) and launch services. NASA, on behalf of NOAA, will refurbish and enhance the DSCOVR satellite, prepare it for launch, and after launch activate it for long term operations by NOAA.

The mission responsibility of the Launch Services Contractor (LSC) shall end when the DSCOVR Space Vehicle (SV) has successfully separated from the LV and is on a trajectory to the L1 point.

The baseline launch location for this mission shall be from the East Coast of the United States. This will be an OSP-3 Mission Assurance (MA) Category 2 mission, with flightworthiness certified by SMC. This mission has been designated as an Evolved Expendable Launch Vehicle (EELV) New Entrant mission. The Offeror must have submitted a letter of intent to become an EELV New Entrant to SMC/LR in accordance with the EELV New Entrant Certification Guide. The payload for this mission is UNCLASSIFIED.

1.2 SCOPE

This Mission Requirements Document (MRD) is the controlling source and authority for the DSCOVR mission requirements. In addition to specifying mission requirements, this MRD shall:

a. Identify roles and responsibilities and interfaces among the various contractors and Government agencies supporting the mission.
b. Document data to be provided by the agencies furnishing the SV to be used by the LSC in developing the LV configuration, integrating the SV, targeting the LV, processing the flight hardware, and conducting the mission.
c. Identify constraints and environments required by the SV.
d. Identify test-and-analysis requirements to verify interfaces between the SV and LV and to verify required SV characteristics.
e. Define mission-specific DSCOVR requirements in addition to, or in variation from, those described in the OSP-3 Technical Requirements Document (TRD).

This MRD shall be maintained by the USAF SMC Launch Systems Division (SDL) office. In many cases, the detailed requirements and data will be specified in other documentation, which will be referenced herein. This includes documents such as the OSP-3 Performance Work Statemtne (PWS), OSP-3 Technical Requirements Document (TRD), and the LV/SV Interface Control Document (LV/SV ICD), which identifies detailed SV interface requirements and the range requirements documentation developed in accordance with the Universal Documentation System (UDS).

In the case of conflict between this document and any document referenced herein, this document shall take precedence.

1.3 MISSION OBJECTIVES

Specific objectives for the launch segment of the mission are as follows:
Trajectory: The SV will be launched into a trajectory that reaches the Sun-Earth L1 point, with a C_3 value of -0.75 to -0.65 +/- 0.15 km^2/sec^2.
Separation: The SV will separate from the LV using a LV-provided separation system.
Collision Avoidance: The LV shall perform a Contamination/Collision Avoidance Maneuver (CCAM) to minimize payload contamination and preclude re-contact between the deployed SV and the LV.
Environments: The LV will provide a boost environment that does not exceed the levels specified in the LV User's Guide. Specific environments will be defined in the LV/SV ICD.
Telemetry: The LV will telemeter navigation, attitude, and environment information to verify mission requirements and post flight evaluation through all mission events. No SV data will be embedded in LV telemetry.

1.4 ROLES AND RESPONSIBILITIES

The roles and responsibilities of the agencies and contractors that will support the DSCOVR mission are described below:
NOAA: The National Oceanic and Atmospheric Administration (NOAA) is the eventual owner and operator of the SV.
NASA: The NASA Goddard Space Flight Center (GSFC) will be responsible for coordination of the SV activities.
SDL: The Launch Systems Division (SDL) of the USAF's Space Development and Test Directorate (USAF/SMC/SD), located at Kirtland AFB, NM, is responsible for OSP-3 launch systems and launch operations. Its DSCOVR activities and responsibilities include:

- Participation in program management (lead for launch segment)
- Range support
- LV integration
- SV interface and mating

MAC: A mission-assurance contractor, under contract to the SDL, shall provide Mission Assurance and Independent Verification and Validation support for the LV only. Higher-level risks identified by the MAC will be sent to NASA and NOAA in monthly status updates provided by the Mission Manager (MM), and overall risk assessments of the program will be addressed in design reviews and readiness reviews.
SMC/LR: LR is the agency in charge of the EELV program. The Air Force identified the DSCOVR mission as an EELV New Entrant mission for this program. LR will use data and deliverables collected during the mission to evaluate the LSC's readiness to proceed to later stages of the EELV qualification process.

<u>LR EELV Certification Contractor</u>: This FFRDC acts as a Technical Advisor to SMC/LR and provides support to the EELV program for New Entrant activity validation. LR Aerospace may observe activities and evaluate information IAW the OPS-3 PWS Annex 2 "LSC Date for EELV New Entrants" for this mission. LR Aerospace will communicate any risks identified to LR New Entrant Mission Manager.

<u>LSC:</u> A launch services contractor, under contract to the SDL, will provide the LV design, the LV, integration and interface to the SV, vehicle mating, mission planning, and launch of the LV. The LSC shall ensure that Associate Contractor Agreements are completed for the following associate contractors:

- TASC
- Tecolote Research, Inc
- Aero Thermo Technology, Inc

If necessary, the LSC shall also ensure that Non-Disclosure Agreements are completed for the above contractors.

2.0 LAUNCH SYSTEM CONFIGURATION

The proposed LV system configuration will meet the OSP-3 TRD requirements.

CLIN	Required
0001	Yes
0002	Yes
0003	
0004	Yes

The following OSP-3 enhanced capabilities required for this mission (CLIN 0001) are:

Requested	TRD Enhancement #	Title	Details
Yes	A.1	Separation System	
Yes	A.2	Conditioned Air	
Yes	A.3	Nitrogen Purge	
Yes	A.4	Additional Access Panel	
	A.5	Enhanced Telemetry	
Yes	A.6	Enhanced Contamination Control	
	A.7	Secure FTS	
	A.8	Over Horizon Telemetry	
Yes	A.9	Increased Insertion Accuracy	
	A.10	Payload Isolation System	
Yes	A.11	Orbital Debris Mitigation System	
	A.12	Dual/Multi-payload Adapter	
	A.13	Enhanced Performance	
	A.14	Large Fairing	
	A.15	Hydrazine Servicing	
	A.16	Nitrogen Tetroxide Servicing	
	A.17	Poly-Pico Orbital Deployer	
	A.18	Suborbital Performance Modification	
	A.19	Alternate Launch Location	

Mission specific additional performance capabilities will be detailed in the LV/SV ICD.

Per the OSP-3 basic contract, the LSC shall assume an Initial Launch Capability (ILC) 24 months after task order award for this mission. However, for this task order, the LSC may propose an earlier ILC, if desired. The LSC shall specifically state the ILC in the task order proposal.

3.0 SPACE VEHICLE REQUIREMENTS

3.1 SPACE VEHICLE CONFIGURATION

DSCOVR consists of the instrument deck, the observatory upper structure, the SMEX-Lite Spacecraft Bus, modular solar arrays and the propulsion module. The instrument deck supports the EPIC and NISTAR instruments, Faraday cup, and star tracker. The observatory upper structure is a design using traditional aluminum construction. It supports the instrument deck, solar arrays and miscellaneous electronics boxes as shown in Figure 3-1. DSCOVR in the clean room during Integration & Test is shown in Figure **3-2**. The SMEX-Lite Spacecraft bus was designed for the small explorer program and is the main body for the spacecraft. It is a single piece aluminum investment cast structure, A-356 alloy. The modular solar arrays were designed for the small explorer program and are made of composite material. They have a wax actuated deployment system. The propulsion module houses the 28-inch diameter hydrazine tank and propulsion system. The hydrazine tank is a titanium tank. The propulsion module supports a deployable boom for the magnetometer. The propulsion module structure is of traditional machined aluminum construction.

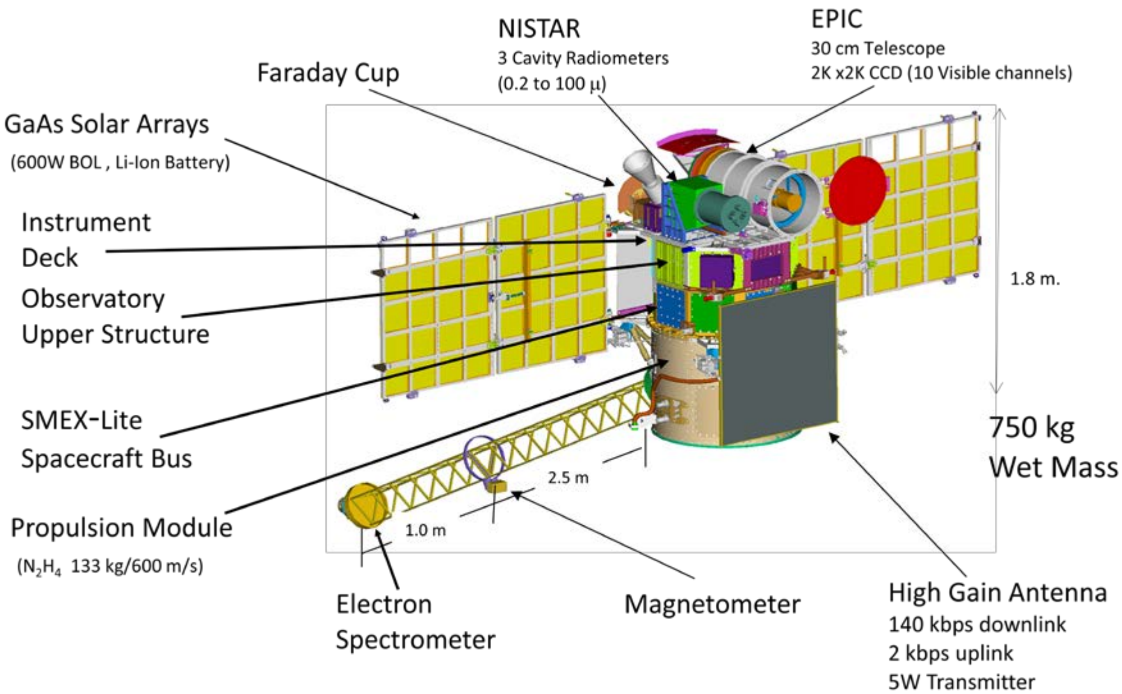
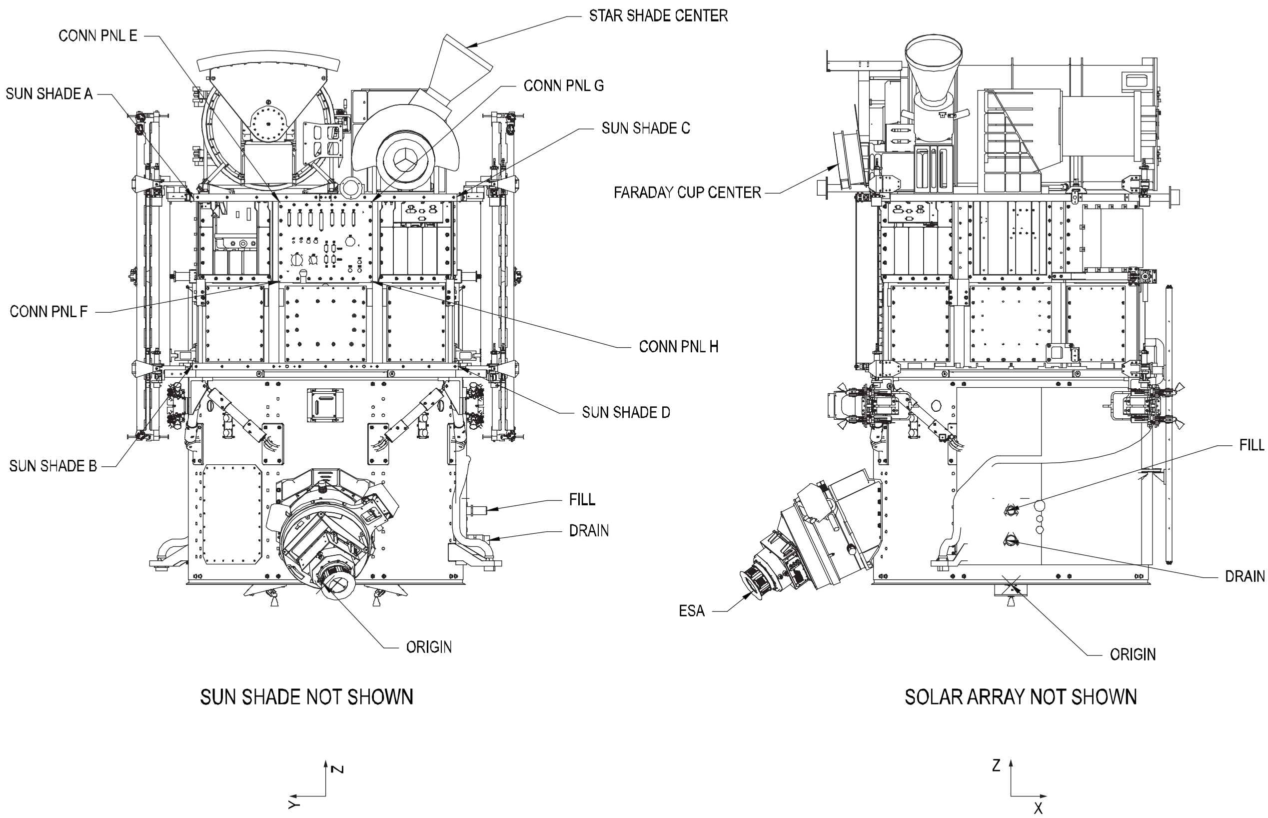


Figure 3-1: DSCOVR Components

Figure 3-2**: DSCOVR at NASA/GSFC in Greenbelt, MD**

SV-LV Attachment: The DSCOVR mechanical interface is designed to accommodate a payload-attachment fitting matching the Delta II 3712C configuration.
SV Static Envelope: The LV shall provide a minimum payload fairing useable static envelope defined by a cylinder (centered on the LV-SV longitudinal axis) measuring 83.4 in (2117 mm) in diameter and 79.4 in (2017 mm) in height above the SC-to-LV separation plane.
In addition, the LV PLA design shall allow for clearance to the SV components that extend below the LV-SV separation plane inside the volume of the PLA. The clearance volume is defined by a cylinder (centered on the LV-SC longtitudinal axes) measuring 28.2 in (717 mm) in diameter and extending 5.9 in (150 mm) below the LV-SC separation plane.
Solar Arrays: DSCOVR has solar arrays.
Ordnance: N/A
Propulsion System: DSCOVR uses hydrazine thrusters for momentum management and for trajectory course corrections and L1 orbit insertion. DSCOVR has ten 1 lb thrusters. The hydrazine tank is 28 inches in diameter with a diaphragm. The propulsion system was designed and qualified for Space-Shuttle launch, and so is a man-rated Shuttle payload with two-fault tolerant safety systems. All inhibits are maintained until separation from the LV.
Hazardous Systems: DSCOVR uses hydrazine. DSCOVR deployment hazards include: solar array; EPIC cover; and the magnetometer boom.
SV Dimensions: Overall SV dimensions are shown in Figure 3-3. Note that dimensions are provided in inches with the metric equivalent in parantheses.
SV Clocking/Orientation: The SV shall be clocked on the LV such that the SV Propulsion System Fill & Drain valves (SV -Y axis) are facing downward when the integrated LV-SV is in the horizontal orientation to facilitate a contingency propellant offload should such an operation be required. The operation to mate the SV to the LV payload adapter shall be performed with the SV oriented vertically (SV +Z axis pointed up).

Post-encapsulation Access to Satellite: The DSCOVR satellite shall require access to the indicated areas following encapsulation in the LV payload (reference TRD Enhancement A-4).



LOCATION W/ RESPECT TO ORIGIN-DIM IN INCHES			
POINT	X	Y	Z
STAR-SHADE CENTER	10.45	19.58	72.28
FARADY CUP CENTER	57.26	10.82	57.44
SUN SHADE A	21	18	52.88
SUN SHADE B	21	18	29
SUN SHADE C	21	18	52.88
SUN SHADE D	21	18	29
CONN PNL E	18.02	6.34	51.88
CONN PNL F	18.02	6.34	40.88
CONN PNL G	18.02	6.34	51.88
CONN PNL H	18.02	6.34	40.88
ESA	35.2	1.76	.17
FILL	0	21.71	10
DRAIN	0	22.18	6

Mission Logo: NASA shall provide the mission logo to be used on the payload fairing. The LSC shall identify the format to be used to transmit the logo information.

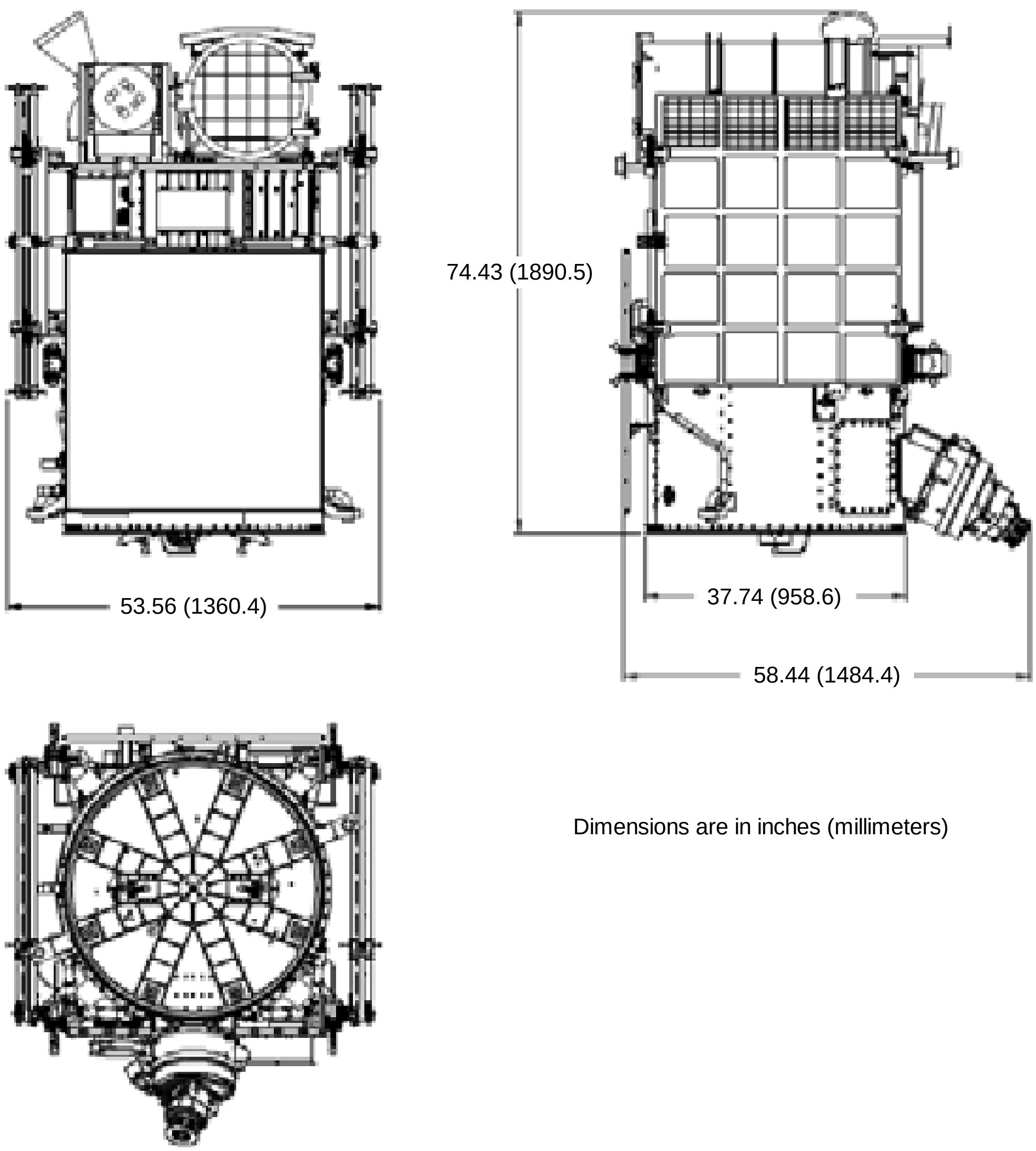


Figure 3-3 : DSCOVR Dimensions

(Note: Dimensions are in inches with metric equivalent in parantheses)

3.2 MASS PROPERTIES

Mass: The current best estimate (CBE) separated mass of the DSCOVR satellite is 570 kg. The NTE value will be 750 kg.

Coordinate System: The SV Coordinate System is shown in Figure 3-4. The origin of the SV Coordinate System is located in the SV-LV separation plane.

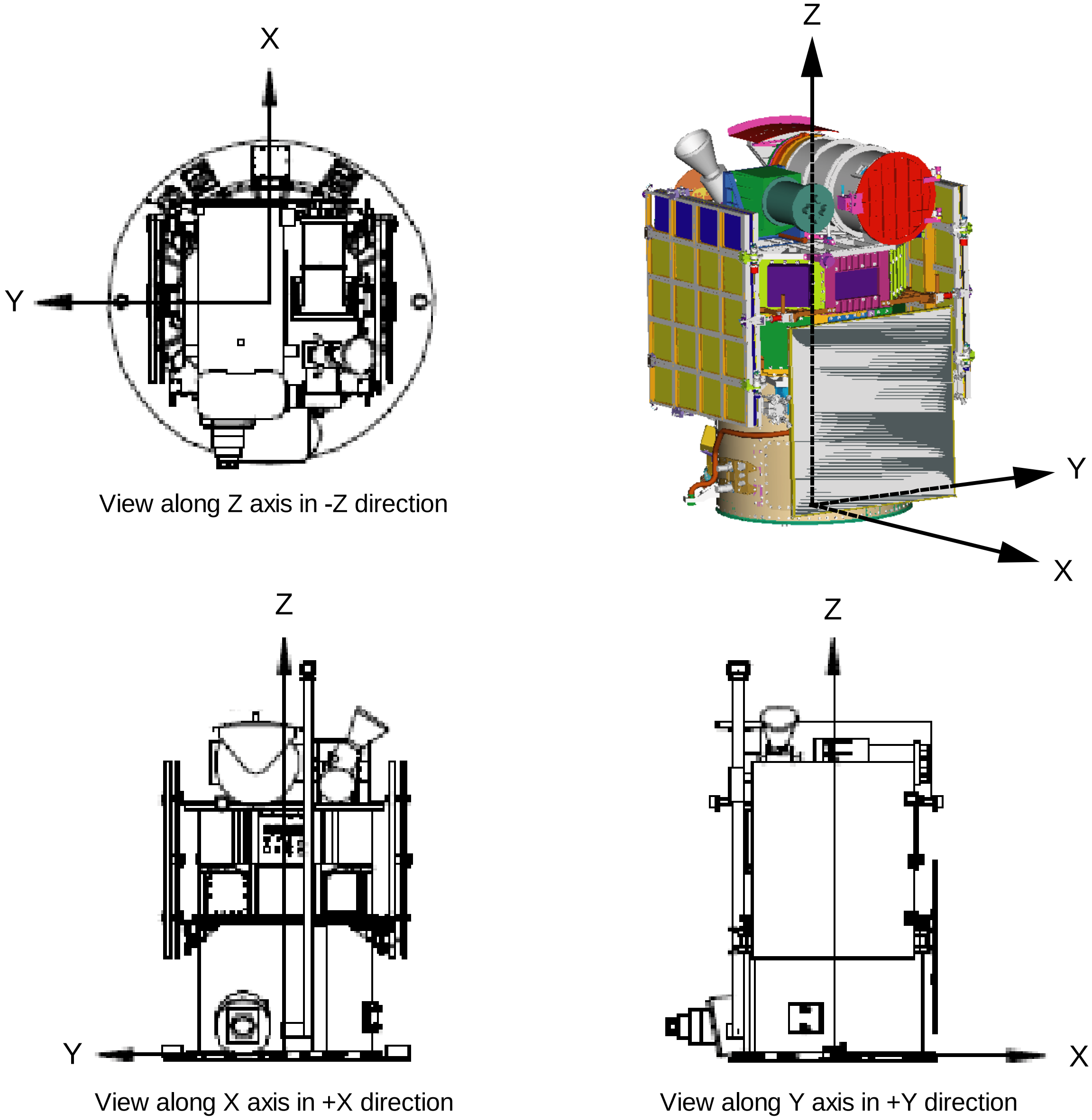


Figure 3-4 : DSCOVR Coordinate System

<u>Center of Gravity:</u> The approximate location of the center of gravity (in meters) at launch is as follows:

X	Y	Z
-0.0109 m	0.0020 m	0.7963 m

Table 3-1: DSCOVR Payload Center of Gravity

<u>Inertia Matrix:</u> The approximate inertia matrix about the DSCOVR satellite center-of-gravity (kg-m^2) at launch is:

	X	Y	Z
X	185.748	3.350	1.410
Y	3.350	186.362	0.661
Z	1.410	0.661	92.698

Table 3-2 : Inertia Matrix

3.3 SPACE VEHICLE ENVIRONMENTS AND STRUCTURAL CHARACTERISTICS

An initial Finite Element Model (FEM) of the SV shall be provided to the LSC for use in the Coupled Loads Analysis (CLA). The FEM will be test-verified to ensure the FEM used for the CLA is accurate.
The DSCOVR SV has been test qualified to the Flight Limit Loads shown in Table 3-3 below. The test loads in the X and Y axes were applied simultaneiously.

Nx (g's)	Ny (g's)	Nz (g's)
+/- 4.9	+/-2.8	+/-8.2

Table 3-3: Flight Limit Load Factors

The DSCOVR SV has been subjected to the following random vibration testing in each of three orthogonal axes for a duration of one minute:

20-45 Hz	+10.0 dB/Oct
45-600 Hz	0.06 g^2/Hz
600-2000 Hz	-6.0 dB/Oct
Overall	7.7 grms

Table 3-4: Random Vibration Testing

The DSCOVR SV has been subjected to the following acoustic testing for a duration of one minute:

1/3 Octave Band Center Frequency (Hz)	Sound Pressure Level (dB)
31.5	125.0
40	127.0
50	128.5
63	130.0
80	131.0
100	131.5
125	132.0
160	132.0
200	131.5
250	130.0
315	129.0
400	128.0
500	126.0
630	124.5
800	123.0
1000	120.5
1250	119.0
1600	117.0
2000	115.0
2500	113.0
OA	141.0

Table 3-5: Acoustic Testing

The LSC shall identify any exceedances to the above tested loads, vibration levels, and acoustic loads. The LSC and the SV provider will work to resolve any minor exceedances. For significant exceedances, the LSC is required to propose a mitigation plan.

3.4 SPACE VEHICLE ELECTRICAL INTERFACES

3.4.1 Space Vehicle Separation Signals

The separation system is LV-provided and will be separated via primary and redundant commands from the LV. The LV shall detect a positive indication of SV separation and include a separation confirmation in the LV telemetry data, through a minimum of two loopbacks. The DSCOVR mechanical interface is designed to accommodate a payload-attachment fitting matching the Delta II 3712C configuration.

The payload adapter mass is not included in the satellite mass figures provided in this MRD.

3.4.2 Communication Interfaces

The SV will not require communication with the LV. The LV will provide pass-through circuits for SV communication with SV Electrical Ground Support Equipment (EGSE).

3.4.3 RF Sources

The LV and the SV will include the RF sources and receivers identified in the following table. The SV transmitter will be powered off at launch and will be powered on sometime following separation of the payload fairing and before 10 minutes (TBD) prior to SV separation from the LV. The LSC will verify compatibility of the selected frequencies for any pre-launch periods in which simultaneous operation is present or implement procedures so that no simultaneous operations occur.

SOURCE	FREQUENCY (MHz)
LV	
Telemetry Transmitter	To Be Determined
C-Band Radar Transponder	To Be Determined
Transmit	To Be Determined
Receive	To Be Determined
GPS Transmitter	To Be Determined
Command/Destruct Receiver	To Be Determined
DSCOVR PAYLOAD	
GN Receiver	2039.65 MHz, phase modulated with a 16 kHz subcarrier, PSK modulated with 2 kbps of NRZ-L command data
GN Transmitter	2215.00 MHz, 5 Watts RF output power, phase modulation with 800 kHz ranging channel; variable data rates up to 240 ksps (including Reed Solomon and Rate ½ Convolutional Encoding)

Table 3-6: Radio Frequency Sources

3.4.4 Satellite Umbilicals

The launch system shall provide pass through umbilical wiring for the SV Electrical Ground Support Equipment (EGSE) to provide power and commanding to the SV and receive telemetry from the SV while mated to the LV. Per TRD Paragraph 3.2.2.2.3, this capability shall consist of two separating umbilicals containing a minimum of 60 wires each (20 AWG twisted shielded pairs). These umbilicals shall remain connected to the SV starting with SV mate to the LV payload adapter through in-flight separation of the SV from the LV.

The maximum round-trip resistance for the SV umbilical power circuits between the LV to SC Inflight Disconnect (IFD) and the umbilical interface to the SV EGSE room shall be 2.0 ohms, or less, when shorted at the opposite end.

The SV power circuits shall accommodate the following requirements at the SV EGSE interface:

Source Voltage: 40 VDC maximum
Source Current: 20 Amps maximum

3.4.5 SV Lightning Protection

The LVwill provide lightning suppression protection in the spacecraft umbilical circuits to protect the SV from damage due to lightning-induced e-fields when the SV is mated to the LV on the launch pad.

3.4.6 Space Vehicle Initialization Signal Sequence

DSCOVR uses redundant loop back break wires, located at the LV/SV separation plane, to sense satellite separation from the LV.

3.4.7 LV-supplied Supplemental Power to the SV

The LV shall provide the SV with supplemental power beginning at L-15 minutes and continuing through SV separation from the LV to power the SV solar array, hinge damper assembly heaters. The power shall be provided via the LV-SV umbilical harness. The line voltage shall be 28 +6/-7 VDC with a peak current draw of 0.7 amps at 28 VDC. The average power draw from the heaters for the duration of the LV mission shall not exceed 16 watts.

3.5 THERMAL ENVIRONMENT

The LSC shall maintain the SV within a thermal and humidity-controlled environment of a temperature range of +10° C to +25° C and relative humidity value of < 60% at all times starting with roll-out from the encapsulation facility through launch, with possible interruptions during transport and integration phases. NASA will specify the set point for the payload fairing environmental control system and may request adjustments, within the temperature range specified above, in support of DSCOVR satellite testing operations. NASA will evaluate the expected conditions during periods when strict environmental control is difficult to maintain (transport and integration), and may define more relaxed environmental control criteria for limited periods. SV thermal heat load from DSCOVR core electronics will be defined in the LV/SV ICD.

To minimize thermal effects on the payload, the temperature of the payload fairing blankets and/or interior surfaces during ascent shall not exceed 90°C. Fairing jettison shall not occur until the theoretical free molecular heating for a flat plate normal to the free stream is below 1135 Watts/m^2 (based on 1962 U.S. standard atmosphere).

The LV shall roll the SC about its Z-axis at a rate of 2 ± 1 deg/sec during coast periods. This requirement does not apply to the periods required for the LV upper stage to maneuver to the thermal condition attitude or maneuver from the thermal condition attitude to the restart and/or separation attitude.

During coast periods, the LV shall maintain orientation of the SC Z-axis perpendicular (+/- 30 degress) to the Sun-Earth vector. This requirement does not apply to the periods required for the LV upper stage to maneuver to the thermal condition attitude or maneuver from the thermal condition attitude to the restart and/or separation attitude.

3.6 CONTAMINATION

The LSC shall provide for enhanced contamination control for the DSCOVR SV consistent with the requirements of Enhancement A-6 of Appendix A of the OSP-3 Technical Requirements Document (TRD) #1. In addition to the enhancements identified in the TRD, NASA requires the placement of witness plates inside the payload fairng following encapsulation that will be removed shortly before launch for later analysis.

The LV shall provide for a clean work environment in the vicinity of the payload fairing during the periods when the mission unique access doors are removed for access to the SV in order to minimize the potential for contamination inside the payload fairing.

The LSC shall provide for a Gaseous Nitrogen (GN2) instrument purge to the DSCOVR satellite beginning at SV mate to the LV payload adapter and continuing through final close-out of the payload fairing prior to launch (Disconnect Time TBC). (Reference Enhancement A-3)

3.7 ELECTROMAGNETIC INTERFERENCE/ ELECTROMAGNETIC COMPATIBILITY (EMI / EMC)

The LSC shall describe the maximum radiated and conducted emission levels that the LV might generate. These levels will be documented in the LV/SV ICD. The LSC shall also establish maximum levels the SV can conduct or radiate while mated to the LV. The SV shall not radiate any time after encapsulation in the fairing and prior to separation of the fairing in flight. Any required deviations to this requirement shall be coordinated with the LSC and documented in the LV/SV ICD.

3.8 SATELLITE ACCESS SUPPORT

The LSC shall provide the access accommodations for SV personnel and equipment necessary to support SV processing operations starting with the mate of the SV to the LV payload adapter. This shall include access to the locations of the mission unique access doors on the payload fairing following encapsulation of the SV. Access may be required to the SV when the LV is oriented in both the horizontal and vertical configurations (if applicable to the launch provider). This requirement shall include LV support to assist with a contingency SV propellant offload should it be required. Location and timing of access will be documented in the LV/SV ICD.

3.9 ELECTRICAL GSE ACCOMMODATIONS

The LSC shall provide accommodations for the SV EGSE in the proximity of the LV following integration of the SV to the LV to support SV testing, monitoring, and battery charging operations. These accommodations shall consist of a minimum of 10 m^2 of conditioned work area with direct access to the LV-SC umbilicals. The SV EGSE requires technical power supplied via a Uninterruptable Power Supply (UPS) system. Electrical power interfaces shall include 120 VAC, 30A, 60 Hz and 208 VAC, 3-phase, 30A, 60 Hz. Specific interface connectors (plugs and receptacles) will be identified in the LV/SC ICD. (TBD)

3.10 PAYLOAD PROCESSING FACILITY (PPF)

The SV provider will provide a PPF for testing and processing the SV prior to encapsulation. Facility requirements are TBD. The PPF will have the capability to accommodate payload encapsulation and may be used by the LSC to support payload encapsulation activities.

4.0 VERIFICATION REQUIREMENTS

Unless otherwise stated, the OSP-3 PWS verification requirements apply. The below requirements reflect mission-specific verification requirements.

4.1 DESIGN VERIFICATION TESTS

For all Design Verification Tests performed by the LSC, the LSC shall conduct the testing at LSC facilities, with the greatest amount of SV team participation practicable. The LSC and SV provider will provide flight-representative hardware to support conduct of the testing.

4.1.1 Launch Vehicle / Space Vehicle Mechanical Interface Verification

The mechanical fit check shall also include a separation shock test involving firing of the separation system for the purposes of verifying shock levels at the LV-SV interface. Two separation system firings will be accomplished. NASA will provide flight representative hardware to support the fit check. The mechanical fit check will be performed at NASA GSFC.

4.1.2 Integrated Thermal Analysis

The LSC shall perform an Integrated Thermal Analysis (ITA) to predict the maximum and minimum SV temperatures that can be expected by the SV during the LV mission. The ITA will begin with LV power-up on day of launch and continue through SV separation from the LV. The SV will provide a reduced thermal model of the SV for use by the LSC in performing this analysis.

4.2 LAUNCH VERIFICATION TESTS

4.2.1 Space Vehicle Post-Mate Checks

The SV post-mate checks will include the SV operational assurance tests and a compatibility test of the LV and SV systems, and the GSE interfaces. These checks will be conducted at the launch site by NASA, after SV mating with the LV is performed by the LSC. SV data flows will be conducted to the NASA Mission Operations Center (MOC) and coordinated with the LV processing. The spacecraft shall be operated with the MOC to verify complete system compatibility. Spacecraft modes, configurations, and data rates shall be exercised. End-to-end science data transfer and storage shall be demonstrated.

4.2.2 Mission Dress Rehearsal

A SV data flow to the MOC will be performed during the Mission Dress Rehearsal.

5.0 ORBITAL TARGETING REQUIREMENTS

5.1 FLIGHT PROFILE

The SV is to be placed on a trajectory to the Sun-Earth L1 Lagrangian point. The SV on-board maneuvering system, under the control of NASA, will place the SV in an orbit around that point.

5.2 ACCURACY

f. Enhanced insertion accuracy is required by the SV (TRD Enhancement A.9). This capability may or may not be required depending upon the generic performance of the launch provider with regard to the required L1 injection orbit. The DSCOVR SV requires a pointing accuracy of <1.0 degree for the final insertion maneuver performed by the LV.

5.3 SEPARATION REQUIREMENTS

The required LV and SV separation attitude and rates are as follows:

LV Parameter	SV Parameter	Nominal Value	Tolerance (3 σ)	Note
Attitude Control +XLV Axis	+ZSV Axis	Aligned with + Zenith	1º half cone angle	Just prior to LV-SV separation
Attitude Control +YLV Axis	+YSV Axis	Constrained by X & Z axis Requirements	1º half cone angle	Just prior to LV-SV separation
Attitude Control -ZLV Axis	+XSV Axis	Aligned to Positive Orbit normal	5º half cone angle	Just prior to LV-SV separation
N/A	Angular Tip-off Rates	0 deg/sec/axis	± 1.0 deg/sec/axis	Immediately following LV-SV separation

Table 5-1 : Separation Attitude and Rates

5.4 MISSION SPECIFIC C/CAM REQUIREMENTS

TBD

6.0 ACRONYM LIST

ACS	Attitude Control System
AFSCN	Air Force Satellite Control Network
AVE	Aerospace Vehicle Equipment
C/CAM	Contamination/Collision Avoidance Maneuver
CCAFS	Cape Canaveral Air Force Station
CG	Center of Gravity
CLA	Coupled Loads Analysis
DO	Delivery Order
DSCOVR	Deep Space Climate Observatory
EGSE	Electrical Ground System Equipment
EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
EPIC	Earth Polychromatic Imaging Camera
FEM	Finite Element Model
FRR	Flight Readiness Review
GFE	Government Furnished Equipment
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
IBR	Integrated Baseline Review
ICD	Interface Control Document
IFPP	Integrated Field Processing Procedure
ILC	Initial Launch Capability
IRRT	Independent Readiness Review Team
IV&V	Independent Verification and Validation
L1	Lagrangian Point 1
LEO	Low Earth Orbit
LRR	Launch Readiness Review
LV	Launch Vehicle
LSC	Launch Services Contractor
MAC	Mission Assurance Contractor
MDR	Mission Design Review
MGSE	Mechanical Ground Support Equipment
MGSE	Mechanical Ground System Equipment
MM	Mission Manager
MOC	Mission Operations Center (NASA/NOAA)
MOI	Moment of Inertia
MRD	Mission Requirements Document
MRR	Mission Readiness Review
NASA	National Aeronautics and Space Administration
NGDC	National Geophysical Data Center

NISTAR	National Institute of Standards & Technology Absolute Radiometer
NOAA	National Oceanic and Atmospheric Administration
NRO	National Reconnaissance Office
NSOF	NOAA Satellite Operations Facility in Suitland, MD
OSP-3	Orbital Suborbital Program Contract - 3
OSPO	Office of Satellite Products and Operations NOAA
PER	Pre-Environmental Testing Review for the SV
PFR	Post Flight Review
PlasMag	Plasma Magnetometer suite that provides solar wind and geomagnetic storm data
PSR	Pre-ship Review
RAAN	Right Ascension of the Ascending Node
RF	Radio Frequency
RSLP	Rocket Systems Launch Program
SD	Space Development and Test Directorate
SDL	Launch Systems Division
SE	Support Equipment
SHAR	System Hazards Analysis Report
SMC	Space and Missiles Systems Center
SOCC	Satellite Operations Control Center
SOH	State of Health
SRR	Systems Requirements Review
SV	Space Vehicle
SWPC	Space Weather Prediction Center
TBD	To Be Decided
TDM	Technical Direction Meetings
TIM	Technical Interchange Meetings
TRD	Technical Requirements Document
TSIS	Total Solar Irradiance Sensor
UDS	Universal Documentation System
USAF	United States Air Force
VAFB	Vandenberg Air Force Base

7.0 REFERENCES

Reference documents are listed in the OSP-3 PWS.