Deep Space Climate Observatory (DSCOVR)

Level 1 Requirements Document

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U.S. Department of Commerce (DOC)
National Oceanic and Atmospheric Administration (NOAA)
NOAA Satellite and Information Service (NESDIS)
National Aeronautics and Space Administration (NASA)

Document Revision History

Revision	Date	Sections Changed	Author
1	07.19.13	Initial Version for Signature	Q. Viet Nguyen
1.1	08.15.13	Revised per concurrence signature routing at NASA HQ, NOAA OSD/OSPO, NASA GSFC	Q. Viet Nguyen

Contents

1.0 PURPOSE AND SCOPE

This document defines the top-level performance, project management, funding, and schedule requirements for the Deep Space Climate Observatory (DSCOVR) project. These requirements (known as Level 1) define the guidelines for the successful conduct of the DSCOVR project and serve as a basis for project assessments and for the determination of mission success after launch and delivery. Requirements begin in Section 4. Sections 1, 2, and 3 are intended to set the context for the requirements that follow. Changes to information and requirements contained in this document require approval by the signatory officials identified in Section 11.

The DSCOVR project addresses space weather-related objectives of the Department of Commerce (DOC) Goal, "Generating and communicating new, cutting-edge scientific understanding of technical, economic, social, and environmental systems," supporting Objective 14: "Improve understanding of the US economy and environment by providing timely, relevant, trusted, and accurate data and services that enable entities to make informed decisions." It also supports Objective 15: "Enhance weather, water, and climate reporting and forecasting." Specifically, this document supports the DOC Strategic Goal by deriving achievable Level 1 requirements for the DSCOVR project, supporting the desired space weather measurements of: the solar wind magnetic field, and the solar wind plasma ion temperature, velocity, and density identified in the National Oceanic and Atmospheric Administration's (NOAA) Consolidated Observational Requirements List (CORL), thus defining the infrastructure required to maintain the observations for space weather environmental monitoring.

The DSCOVR refurbishment is governed by the DSCOVR Implementation Phase Interagency Agreement (IAA) between NOAA and the National Aeronautics and Space Administration (NASA). The Implementation Phase IAA defines the roles and responsibilities of NOAA and NASA for DSCOVR refurbishment and it also authorizes NOAA to transfer funds to NASA for the refurbishment of DSCOVR and its solar wind sensors, and NASA to act as the refurbishment/acquisition agent on behalf of NOAA. Project implementation authority and its delegation are defined in the NOAA/NASA DSCOVR Project Plan that is being developed as part of the DSCOVR Planning Phase IAA that is currently in progress.

2.0 SCIENCE DEFINITION

2.1 Science Objectives

The primary science objective of the DSCOVR mission is to provide solar wind thermal plasma and magnetic field measurements to enable space weather forecasting by NOAA. There are no primary science objectives for the earth observing instruments as they are secondary measurements designed to operate on a best-effort basis.

Space weather is a critical service for the Nation: without timely and accurate alerts and warnings, space weather events have demonstrated the potential to disrupt virtually every major public infrastructure system, including transportation systems, power grids, telecommunications, and Global Positioning System (GPS). NOAA will provide these critical services using DSCOVR data by supplying geomagnetic storm warnings to support key industries such as commercial airline, electric power, and the GPS industries. Our national security and economic wellbeing, now dependent on advanced technologies, are at significant risk without accurate advanced warnings of impending geomagnetic storms. Aircraft that fly polar routes now include space weather as an integral part of the pilot's weather pre-brief, which provides the current status of the flight environment including potential impacts to critical communication and navigation systems and the potential for hazardous solar radiation exposure to passengers and crew. The frequency and intensity of geomagnetic storms will increase significantly during the current solar maximum and for several years beyond. Strong storms with the potential to impact critical elements of our Nation's infrastructure can occur over 100 times during a solar cycle. The Nation's advanced technology service providers will be looking to NOAA for alerts, watches, and warnings needed to protect lives and livelihood and ensure continuity of critical operations.

The only currently operational source of data for geomagnetic storm warnings are solar wind observations obtained near the Sun-Earth line provided by NASA's Advanced Composition Explorer (ACE) – (launched August 25, 1997), located ~240 Re upstream of the Earth, providing a 15-60 minute advance warning. A large increase in geomagnetic storm frequency and severity is expected during the current solar maximum. Without immediate action, the Nation is at risk of losing its most critical observational data source when the 15 year old NASA ACE spacecraft fails. The high risk of space weather data unavailability is perhaps one of the most serious gaps in NOAA's space weather services.

2.2 Science Instrument Summary Descriptions

The history and requirement for solar wind measurements enabling space weather forecasting can be found in "Impacts of National Polar-Orbiting Environmental Satellite System (NPOESS) Nunn-McCurdy Certification and Potential Loss of ACE spacecraft Solar Wind Data on National Space Environmental Monitoring Capabilities" (January 2008). Specifically, DSCOVR will continue the solar wind measurements of the magnetic field and plasma sensors aboard NASA's ACE satellite. To achieve this objective, the DSCOVR spacecraft and Magnetometer and Faraday Cup will be refurbished, tested, and flown as the ACE follow-on mission. DSCOVR will be launched by the Air Force Space Command (AFSPC) launch services and placed at its destination orbiting the first Lagrange Point (L1) between the Earth and the Sun.

The DSCOVR spacecraft has a total of six (6) instruments in its complement. The threshold requirements establish threshold mission success and encompass the primary mission requirements for space weather warning measurements. There are two (2) instruments that will provide mission critical space weather warning measurements and these are called the Plasma Magnetometer (PlasMag) Instrument Suite. The PlasMag instruments are the primary mission instruments.

a) Faraday cup to measure the reduced distribution function of the proton and alpha components of the thermal solar wind (Threshold Requirement);

b) Triaxial fluxgate magnetometer (Magnetometer) to measure the three-dimensional interplanetary magnetic field vector (Threshold Requirement);

The baseline mission includes requirements for Earth observation and solar physics science in support of NASA's Science Mission Directorate (SMD). The baseline requirements exclusive of the threshold requirements are not required for minimum mission success. Realizing that the spacecraft is already designed and that no additional changes will be made to the spacecraft design approach, the secondary instruments will not jeopardize the mission, or cause an increase in cost or delay in launch, and may be de-scoped if deemed necessary. Secondary instrument impacts to the primary instruments' ability to meet mission success will only be assessed during spacecraft integration and test (I&T) if there is a failure with the primary instrument. There are four (4) instruments that provide measurements in support of NASA SMD and are of secondary priority for the mission.

a) Earth Polychromatic Imaging Camera (EPIC) designed to measure the Earth's atmosphere and surface (ozone, aerosols, cloud cover, cloud height, vegetation index, and leaf area index) using several spectrally filtered medium resolution imagery.

b) National Institute of Standards and Technology (NIST) Advanced Radiometer (NISTAR) designed to measure the Earth's area-averaged radiative balance using three active cavity radiometers and a photodiode, plus several band-defining optical filters that can be used with any of the detectors.

c) Tophat electrostatic analyzer (Electron Spectrometer) designed to measure the three-dimensional electron velocity distribution providing a secondary method of determining the solar wind velocity and density along with the magnetic topology of the local solar wind.

d) Pulse Height Analyzer (PHA) designed to provide to measure energy deposited by energetic heavy ions, typically of solar origin, in microelectronic devices.

3.0 PROJECT DEFINITION

The DSCOVR project, as described in this document, is for the refurbishment of the DSCOVR spacecraft and the solar wind sensors and earth science instruments in preparation of the satellite for launch, and for performance of on-orbit spacecraft and instrument checkout and commissioning. The DSCOVR project will also develop and deliver the mission operations system to be used to operate the DSCOVR satellite.

a) NOAA/Office of Systems Development (OSD) will be responsible for the DSCOVR satellite and solar wind sensor refurbishment and delivery to launch vehicle.

b) NASA will act as the implementing agent for NOAA/OSD for the DSCOVR satellite, the solar wind sensors, earth science sensors, the mission operations system, and for the delivery of the satellite for integration with the launch vehicle.

c) The DSCOVR mission refurbishment will be managed by NASA in accordance with the NASA DSCOVR Project Plan.

d) NOAA/OSD will be responsible for coordination of the NASA DSCOVR refurbishment activities along with ground processing and data processing and archiving projects.

e) NASA Goddard Space Flight Center (GSFC) will perform orbital insertion into the L1 orbit in support of NOAA mission operations.

f) NOAA will be responsible for the integration of the DSCOVR mission operations ground system into the NOAA NOAA Satellite Operations Facility (NSOF), along with any new information technology (IT) security requirements beyond those originally required for the Triana project.

g) NASA GSFC shall deliver the DSCOVR ground system mission operations center element into a High-Impact security boundary at the NSOF. The NOAA authorizing official has recognized and accepted in the June 3, 2013 (as revised July 12, 2013), NOAA DSCOVR FIPS-200 Memorandum that gaps exist between the High-Impact security controls baseline to-be target and the implemented as-is baseline of the legacy DSCOVR system. The NASA Security Controls Baseline Addendum (dated July, 11 2013) describes how the DSCOVR MOC element will implement controls consistent with said Addendum within budget and schedule constraints. The jointly approved NASA/NOAA Memorandum entitled "DSCOVR Project FIPS 200 Implementation Interpretations," further clarifies NASA's implementation responsibilities in the said Addendum with the explicit understanding that any additional IT security requirements, including risk assessments or Plan of Action and Milestones (POA&M) development, are the sole responsibility of NOAA. Any additional control requirements on the DSCOVR MOC element resulting from risk assessments or POA&M will be deemed as changes to the baseline.

h) NOAA Satellite and Information Service (NESDIS) - Office of Satellite and Product Operations (OSPO) will operate DSCOVR at the NSOF after spacecraft activation and orbital checkout by GSFC.

i) Data processing algorithm development, calibration, product validation, quality assurance of space environmental measurements, and system lifetime product improvement will be performed by NOAA Space Weather Prediction Center (SWPC), NOAA National Geophysics Data Center (NGDC), and NASA GSFC.

j) NOAA SWPC will make the space weather products (Level 0, Level 1, Level 2) available to external users and ensure user system latency requirements are met (NOAA Administrative Order (NAO) 212-15).

k) NGDC will be responsible for product generation from archived data (NAO 212-15).

3.1 Project Organization and Management

The DSCOVR project implementation authority is delegated from the director of the NESDIS OSD to the director of the Joint Agency Satellite Division (JASD) of the SMD of NASA. The DSCOVR program exists within OSD, and the NOAA DSCOVR program manager and the NASA DSCOVR program executive (PE) in the JASD are the principal points of contact for coordination between NOAA and NASA for programmatic activities that concern requirements, milestones, schedule, and budget. Within NASA, program authority flows from the director of the JASD, to the Reimbursable Projects Program Office (RPPO) program manager at GSFC, and then to the DSCOVR project manager who is responsible for execution of the DSCOVR project. NESDIS is responsible for funding, including any new funding needed for the program (e.g., funding for new requirements/modifications to address IT Security compliance with unacceptable risks), and top-level-management of the DSCOVR program and its solar wind sensors. NESDIS is also responsible for funding and executing mission operations and space weather data record production outside of the DSCOVR project.

3.2 Project Acquisition Strategy

The DSCOVR spacecraft refurbishment will be performed as a GSFC in-house project utilizing a mix of civil servant and support service contractors located on site or near GSFC. No major procurement is anticipated for the refurbishment activities.

4.0 PROGRAMMATIC REQUIREMENTS

4.1 Science Requirements

4.1.1 Baseline Science Requirement

The science objectives in Section 2.1 can be achieved via the science mission requirements listed here. The baseline requirements encompass the requirements for the entire mission including the space weather warning sensors and earth observation and solar physics. Here the term baseline is defined as the verifiable requirements to which the mission must be designed. Any changes to the science requirements require consultation with the NOAA/NASA Program Management Council (PMC) and shall be approved and concurred by all the signatories identified in Section 11.
The baseline science requirements of the DSCOVR mission that enables real-time space weather forecasting are:

a) DSCOVR shall measure the interplanetary vector magnetic fields in the range of 0 – 100 nT with an absolute accuracy of ±1 nT.

b) DSCOVR shall measure the bulk velocity of the proton component of the thermal solar wind in the range of 200 – 1250 km/s with 20 percent accuracy.

c) DSCOVR shall measure the density of the proton component of the thermal solar wind in the range of 1 – 100 particles/cm^3 with 20 percent accuracy.

d) DSCOVR shall measure the temperature of the proton component of the thermal solar wind in the range of 40,000 – 2,000,000 Kelvin with 20 percent accuracy.

e) DSCOVR shall measure the above parameters with a cadence of one sample per minute or better.

f) DSCOVR shall deliver the above measurements with a system latency of no more than five minutes. The latency is measured as the time of instrument measurement to the time the data are processed to Level 2 and stored on a SWPC server.

The baseline science requirements for Earth imaging and radiometry measurements are:

g) DSCOVR will utilize the EPIC instrument to image the Earth in ten (10) spectral bands that could be used to determine ozone, aerosol, cloud cover, cloud height, vegetation, leaf area indices, and to form true Red-Green-Blue (RGB) pictures of the planet with a spatial resolution of 12 km or better at center meridian.

h) The time cadence of these spectral band images from EPIC will be provided on a best effort basis given existing ground system and network capabilities, and will typically be no faster than 10 spectral band images every 4 hours.

i) DSCOVR will utilize the NISTAR instrument to provide measurements that could be used to determine the Earth reflected irradiance in the wavelength range of 0.2 -100 microns with an accuracy of 1.5 percent or better.

The baseline science requirements for solar physics measurements are:

j) DSCOVR will utilize the Electron Spectrometer to measure the full solar wind electron distribution function in the energy range from 5 eV to 1 keV with a time cadence of one minute or better.

4.1.2 Threshold Science Requirement

This section describes the minimum requirements that are necessary to achieve threshold science. Here the term threshold is defined as the minimum design requirements to which the mission could be reduced prior to launch and still be deemed worth flying. For the DSCOVR mission threshold science requirements are limited to those necessary to accomplish the primary space weather objectives of the mission.

The threshold science requirements of the DSCOVR mission that enables real-time space weather forecasting are:

a) DSCOVR shall measure the interplanetary vector magnetic fields in the range of 0 – 100 nT with an absolute accuracy of ±1 nT.

b) DSCOVR shall measure the bulk velocity of the proton component of the thermal solar wind in the range of 200 – 1250 km/s with 20 percent accuracy.

c) DSCOVR shall measure the density of the proton component of the thermal solar wind in the range of 1 – 100 particles/cm^3 with 20 percent accuracy.

d) DSCOVR shall measure the temperature of the proton component of the thermal solar wind in the range of 40,000 – 2,000,000 Kelvin with 50 percent accuracy.

e) DSCOVR shall measure the above parameters with a cadence of one sample per minute or better.

f) DSCOVR shall deliver the above measurements with a system latency of no more than five minutes. The latency is measured as the time of instrument measurement to the time the data are processed to Level 2 and stored on a SWPC server.

4.2 Mission and Spacecraft Performance

DSCOVR shall have the following mission requirements.

a) DSCOVR shall be a Category 2 project as defined in NASA Procedural Requirement (NPR) 7120.5, NASA Space Flight Program and Project Management Requirements.

b) The DSCOVR spacecraft payload risk classification shall be Class-D as defined in NPR 8705.4, Risk Classification for NASA Payloads.

c) The DSCOVR satellite shall maintain an orbit at the Sun-Earth L1 point with maximum distance of 650,000 km from the sun-earth line and a goal of approximately 390,000 km, and a minimum distance sufficient to avoid solar radio interference with data reception.

d) The DSCOVR satellite shall have a two year design life and shall have sufficient propellant for a five year mission. The two year design life is measured from launch of the Observatory.

e) DSCOVR mission shall create space weather data products at least 96 percent of the time, measured over the design life for the normal operations phase, excluding periods of planned Observatory and instrument calibration and orbit maintenance activities.

f) DSCOVR mission shall plan all activities with no gaps in the creation of space weather data products of more than 15 minutes in duration during a Critical Space Weather day. Critical Space Weather days are declared by the director, or a designated representative, of the SWPC.

4.3 Launch Requirements

AFSPC will provide the launch vehicle services with the appropriate escape velocity and trajectory to enable insertion of the DSCOVR spacecraft into a Lissajous orbit at the L1 Lagrange point.

4.4 Ground System Requirements

The DSCOVR ground system shall be compliant with NOAA and NESDIS IT security policies and procedures (NOAA Administrative Order 212-13 "Information Technology Security Policy") for all space and ground components. These policies include processes for defining the system authorization boundary, as well as, selecting and tailoring cost-effective and adequate security controls to protect system confidentiality, integrity, and availability. The process allows for maintenance of the control requirements baseline in accordance with the established configuration management and change control procedures that would include security impact analysis of changes, other requirements in this document and existing DSCOVR interagency agreements.

Compliance with the requirements will be effected in the following manner: The DSCOVR ground system will be implemented at the NSOF within a High-Impact security boundary. Within DSCOVR budget and schedule constraints, the ground system architecture will utilize controls consistent with the Federal Information Processing Standard (FIPS)-200 IT security controls baseline addendum for DSCOVR and associated NIST Special Publication 800-53 ("Security and Privacy Controls for Federal Information Systems and Organizations"). The prioritized list of implemented controls and those unable to be implemented – addressed with Plans of Actions & Milestones (POA&Ms), will be documented for NOAA management review at the Key Decision Point (KDP)-C.

For the ground system, the following requirements are applicable.

a) DSCOVR shall consolidate all housekeeping telemetry and PlasMag data received by the Real Time Solar Wind Network (RTSWnet), the Air Force Satellite Control Network (AFSCN), or the NOAA Wallops and Fairbanks Command and Data Acquisition System (CDAS), at the NOAA SWPC in Boulder, CO.

b) DSCOVR shall provide all real-time housekeeping and PlasMag science data received by NOAA Wallops and Fairbanks CDAS, RTSWnet, and AFSCN to the NOAA SWPC in real-time.

c) DSCOVR shall provide all real-time housekeeping data received by NOAA Wallops and Fairbanks CDAS, Space Network, Deep Space Network (DSN), or Near Earth Network to the NOAA NSOF in real-time.

d) DSCOVR shall provide composite RGB images from DSCOVR EPIC images to the public.

4.5 Mission Data Requirements

For space weather, the mission data requirements are as follows:

a) NOAA SWPC shall process the real-time housekeeping and PlasMag data to meet NOAA's space environment products user accuracy requirements.
b) Space weather data shall be archived by NGDC in Boulder, CO, in accordance with NOAA policies for the management of environmental and geospatial data and information.

4.6 Mission Success Criteria

The DSCOVR mission is successful if it provides measurements of solar wind conditions impacting Earth that result in "Minor" or greater geomagnetic storms as defined by the NOAA Space Weather Scale for Geomagnetic Storms (G1 or greater) 96 percent of the storm time periods during normal spacecraft operations, for a period of at least 12 months after spacecraft checkout.

5.0 NASA MISSION COST REQUIREMENT

5.1 Cost

The total cost of the DSCOVR project for spacecraft refurbishment, ground system development, shipment to launch site, and payload processing, shall be specified in the KDP-C Decision Memorandum along with the associated budget profile.

5.2 Cost Management and Scope Reduction

Where possible, DSCOVR will use tailored budget reserves and planned schedule contingency per Goddard Procedural Requirement (GPR) 7120.7, Schedule Margins and Budget Reserves to be Used in

Planning Flight Projects and Tracking their Performance, to maintain cost control and meet performance requirements. Any changes to the requirements in this document require consultation with the NOAA/NASA PMC and shall be approved and concurred by all the signatories identified in Section 11.

5.3 Schedule Requirements

The DSCOVR launch readiness date (LRD) shall be specified in the KDP-C Decision Memorandum. The DSCOVR spacecraft shall be commissioned and transferred to NOAA after spacecraft commissioning and checkout.

6.0 MULTI-MISSION NASA FACILITIES

The NASA Space Network will be required to monitor critical launch and early orbit activities. The NASA DSN and Near Earth Network will be required to support initial checkout and cruise phase operations, and DSN will be used for ranging, tracking, maneuver operations, and backup/contingency support.

7.0 EXTERNAL AGREEMENTS

a) NASA and NOAA cooperation with respect to the DSCOVR project implementation is authorized by the DSCOVR Implementation Phase Interagency Agreement (IAA).

b) NASA, NOAA, and AFSPC cooperation with respect to the LV for the DSCOVR project is authorized by the tri-agency DSCOVR Launch Vehicle Memorandum of Agreement (MOA) (in process).

c) All agreements between NASA and each non-NASA mission partner shall be coordinated through NASA SMD and the NASA Office of External Relations.

d) If there is evidence prior to Observatory delivery that the secondary instrument(s) may impact the performance or success of the primary instrument(s), the Approving signatories in Section 11 will convene to determine the path forward with the intent to protect the primary mission objectives of providing space weather early warning.

8.0 PUBLIC OUTREACH AND EDUCATION

There is no NASA-sponsored public outreach and education for the DSCOVR project.

9.0 SPECIAL INDEPENDENT EVALUATION

No special independent evaluation is required for the DSCOVR project.

10.0 TAILORING

DSCOVR will tailor the procedural requirements of NPR 7120.5 for Earned Value Management (EVM), and Cost Analysis Data Requirements (CADRe). See Project Plan for detailed justifications for tailoring.

11.0 REQUIRED APPROVALS AND CONCURRENCES

APPROVAL:

Mary E. Kicza
Assistant Administrator
NOAA Satellite and Information Service

27 August 2013
Date

John Grunsfeld
Associate Administrator, Science Mission Directorate
NASA Headquarters

Date

CONCURRENCES:

Suzanne Hilding
Director
NOAA/NESDIS Office of Systems Development

20 AUG 13
Date

John Murphy
Director, Office of Science and Technology
NOAA National Weather Service

23 Aug 13
Date

Brent Gordon
Acting Director
NOAA/NWS Space Weather Prediction Center

8/22/2013
Date

Vanessa Griffin
Director
NOAA Office of Satellite and Product Operations

8/22/2013
Date

CONCURRENCES (Continued):

08/21/13

Eric Kihn
Acting Director, NOAA National Geophysical Data Center
Date

08/20/2013

Michael Simpson
DSCOVR Program Manager
NOAA/NESDIS Office of Systems Development
Date

8/22/13

Doug A. Biesecker
DSCOVR Program Scientist
NOAA/NWS Space Weather Prediction Center
Date

Marcus Watkins
Director, Joint Agency Satellite Division
NASA Headquarters Science Mission Directorate
Date

Michael Freilich
Director, Earth Science Division
NASA Headquarters Science Mission Directorate
Date

Victoria Elsbernd
Acting Director, Heliophysics Division
NASA Headquarters Science Mission Directorate
Date

Quang-Viet Nguyen
Program Executive, Joint Agency Satellite Division
NASA Headquarters Science Mission Directorate
Date

11.0 REQUIRED APPROVALS AND CONCURRENCES

APPROVAL:

______________________________ Date

Mary E. Kicza
Assistant Administrator
NOAA Satellite and Information Service

______________________________ 8/23/13
Date

John Grunsfeld
Associate Administrator, Science Mission Directorate
NASA Headquarters

CONCURRENCES:

______________________________ Date

Suzanne Hilding
Director
NOAA/NESDIS Office of Systems Development

______________________________ Date

John Murphy
Director, Office of Science and Technology
NOAA National Weather Service

______________________________ Date

Brent Gordon
Acting Director
NOAA/NWS Space Weather Prediction Center

______________________________ Date

Vanessa Griffin
Director
NOAA Office of Satellite and Product Operations

CONCURRENCES (Continued):

Eric Kihn — Date
Acting Director, NOAA National Geophysical Data Center

Michael Simpson — Date
DSCOVR Program Manager
NOAA/NESDIS Office of Systems Development

Doug A. Biesecker — Date
DSCOVR Program Scientist
NOAA/NWS Space Weather Prediction Center

Marcus Watkins — 19 August 2013 — Date
Director, Joint Agency Satellite Division
NASA Headquarters Science Mission Directorate

Michael Freilich — 16 Aug 2013 — Date
Director, Earth Science Division
NASA Headquarters Science Mission Directorate

Victoria Elsbernd — 8/16/13 — Date
Acting Director, Heliophysics Division
NASA Headquarters Science Mission Directorate

Quang-Viet Nguyen — 8/16/2013 — Date
Program Executive, Joint Agency Satellite Division
NASA Headquarters Science Mission Directorate

CONCURRENCES (Continued):

Richard Eckman ______________________________ 8/16/2013

Richard Eckman | Date
Program Scientist, Earth Science Division
NASA Headquarters Science Mission Directorate

______________________________ ____________

Christopher J. Scolese | Date
Director
NASA Goddard Space Flight Center

______________________________ ____________

Thomas McCarthy | Date
Reimbursable Projects Program Manager (Acting)
NASA Goddard Space Flight Center

______________________________ ____________

Albert Vernacchio | Date
Project Manager
DSCOVR Project, Reimbursable Projects Program
NASA Goddard Space Flight Center

______________________________ ____________

Adam Szabo | Date
Senior Project Scientist
DSCOVR Project, Reimbursable Projects Program
NASA Goddard Space Flight Center

CONCURRENCES (Continued):

Richard Eckman
Program Scientist, Earth Science Division
NASA Headquarters Science Mission Directorate

Date

Christopher J. Scolese
Director
NASA Goddard Space Flight Center

8/19/13
Date

Thomas McCarthy
Reimbursable Projects Program Manager (Acting)
NASA Goddard Space Flight Center

Date

Albert Vernacchio
Project Manager
DSCOVR Project, Reimbursable Projects Program
NASA Goddard Space Flight Center

8/15/13
Date

Adam Szabo
Senior Project Scientist
DSCOVR Project, Reimbursable Projects Program
NASA Goddard Space Flight Center

8/15/13
Date

12.1 Appendix A – References

R1. Implementation-Phase Interagency Agreement (IAA) between NOAA and NASA for the Deep Space Climate Observatory (DSCOVR), approved July 2, 2012.

R2. Deep Space Climate Observatory (DSCOVR) The Serotine Report, NASA/GSFC, February 2009.

R3. Summary Report on Solar Wind Monitoring Continuity Options and Recommendations, September 30, 2009.

R4. Impacts of NPOESS Nunn-McCurdy Certification and Potential Loss of ACE Spacecraft Solar Wind Data on National Space Environmental Monitoring Capabilities, January 2008.

R5. NOAA Consolidated Observational Requirements List (CORL), Solar Wind and CME Imagery-Related Observation Requirements, dated August 31, 2010.

R6. Severe Space Weather Events – Understanding Societal and Economic Impacts: A Workshop Report, National Research Council 2008.

R7. NOAA Administrative Order 212-15 "Management of Environmental and Information," http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_212/212-15.html

R8. NOAA Administrative Order 212-13 "Information Technology Security Policy," http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_212/212-13.html

R9. Federal Information Processing Standards (FIPS) 199, Standards for Security Categorization of Federal Information and Information Systems

R10. FIPS 200, Minimum Security Requirements for Federal Information and Information Systems

R11. NIST SP 800-53, Recommended Security Controls for Federal Information Systems and Organizations

R12. NOAA Space Weather Prediction Center (SWPC), Space Weather Scale for Geomagnetic Storms: http://www.swpc.noaa.gov/NOAAscales/NOAAscales.pdf

R13. NOAA Solar Wind Ion Sensor Project, Solicitation DG133E-07-RP-0090, 2007.

R14. NASA SMD Mission Success Criteria Guidelines, in the SMD Scienceworks Requirements Management System (RMS) Archive, Dec. 2011.

R15. NOAA DSCOVR FIPS-200 Memorandum from J. Klimavicz and M. Kicza entitled "Approval of the Federal Information Processing Standard 199 Security Categorization Addendum and the 200 Security Controls Baseline Addendum for the Deep Space Climate Observatory within the Geostationary Operational Environmental Satellite Ground System (NOAA5003)," June 3, 2013.

R16. NOAA DSCOVR FIPS-200 Memorandum from J. Klimavicz and M. Kicza entitled "Approval of the Federal Information Processing Standard 200 Security Controls Baseline Addendum for the Deep Space Climate Observatory within the Geostationary Operational Environmental Satellite Ground System (NOAA5003)," July 12, 2013.

R17. NASA Memo from A. Vernacchio entitled "DSCOVR Project FIPS 200 Implementation Interpretations," Aug. 2013.

12.2 APPENDIX B - Acronyms

Acronym	Definition
AA	Assistant Administrator
ACE	Advance Composition Explorer
AFSCN	Air Force Satellite Control Network
AFSPC	Air Force Space Command
AU	Astronomical Unit (the mean distance between the Earth and the Sun)
CCD	Charge Couple Device
CCOR	Compact Coronagraph
CDAS	Command and Data Acquisition System
CME	Coronal Mass Ejection
CORL	Consolidated Observational Requirements List
CSESMO	Committee for Space Environmental Sensor Mitigation Options
DLR	German Aerospace Center
DOC	Department of Commerce
DSCOVR	Deep Space Climate Observatory
DSN	Deep Space Network
EPIC	Earth Polychromatic Imaging Camera
ESA	European Space Agency
ESA	Electron Electrostatic Analyzer
ESPC	Environmental Satellite Processing and Distribution
ESPDS	Environmental Satellite Processing and Distribution System
FWHM	Full Width – Half Maximum
GPS	Global Positioning System
GSD	Ground Systems Division
GSFC	Goddard Space Flight Center
IAA	Inter Agency Agreement
IT	Information Technology
L1	Lagrange Point 1
L1RD	Level 1 Requirements Document
LER	Lambert Equivalent Reflectivity
MK	Mega-Kelvin
MMC	Mission Management Center
MOU	Memorandum of Understanding
NAO	NOAA Administrative Orders
NASA	National Aeronautics and Space Administration
NESDIS	NOAA Satellite and Information Service
NGDC	National Geophysical Data Center
NiCT	National Institute of Information and Communications Technology
NIST	National Institute of Standards and Technology
NISTAR	NIST Advanced Radiometer
NOAA	National Oceanic and Atmospheric Administration
NOSC	NOAA Observing Systems Council
NSOF	NOAA Satellite Operations FacilityNSSDC National Space Science Data Center
nT	Nanotesla

Acronym	Definition
NWS	National Weather Service
OSD	Office of Systems Development
OSPO	Office of Satellite and Product Operations
PHA	Pulse Height Analyzer
PlasMag	Plasma Magnetometer
PMC	Program Management Council
RAL	Rutherford Appleton Laboratory
Re	Earth Radius
RRA	Radio Research Agency
RTSWnet	Real-Time Space Weather Network
S/C	Spacecraft
S.H.	Southern Hemisphere Station
SPDF	Space Physics Data Facility
SWPC	Space Weather Prediction Center
USAF	United States Air Force