National Aeronautics and Space Administration

Radiation Budget Instrument

RBI Government Furnished Equipment (GFE) Information Day

Earth Venture – Continuity
Earth Radiation Budget Instrument

March 14, 2019

www.nasa.gov

Information Transfer Restrictions

- The Radiation Budget Instrument (RBI) is a controlled item under Export Control Classification Number (ECCN) 9A515.g.3. Any technical data or “technology” as defined by Part 772 of the Export Administration Regulations (EAR) that pertains to the RBI (e.g. drawings, specifications, and documentation) would be controlled under ECCN 9E515.f.

This briefing and related material limited to U.S. persons only

Agenda

- Introduction
- Ground Rules
- Radiation Budget Instrument Overview
- RBI Project Status at Termination
- RBI Hardware Available for future use

Introduction

- A listing of Radiation Budget Instrument (RBI) hardware and components has been made available to bidders for the follow-on Earth Venture – Continuity (EV-C) opportunity

- At termination in February 2018, RBI had progressed beyond the Critical Design Review and the RBI flight hardware was in various states of production

Ground Rules

- Questions should be submitted using the EV-C Q&A Portal
  - **Earth Venture Continuity -1 (EVC1)**
    - https://essp.larc.nasa.gov/EVC-1/evc-1_index.html

- Written responses will be posted and available to all potential offerors
  - EAR/ITAR responses will not be posted

Disclaimer

- The Government does not warrant the condition of the items or even that the hardware will work;
- The items will be made available to the selected Earth Venture-Continuity proposers as NASA determines appropriate;
- The Government cannot guarantee the availability or condition of the hardware, so proposers need to address how they will deal with the unavailability or unsuitability of the Government Furnished Equipment (GFE); and
- Some hardware may be made available without the corresponding software, data, drawings or other associated intellectual property

RBI Overview
RBI Goals, Objectives, and Mission Success

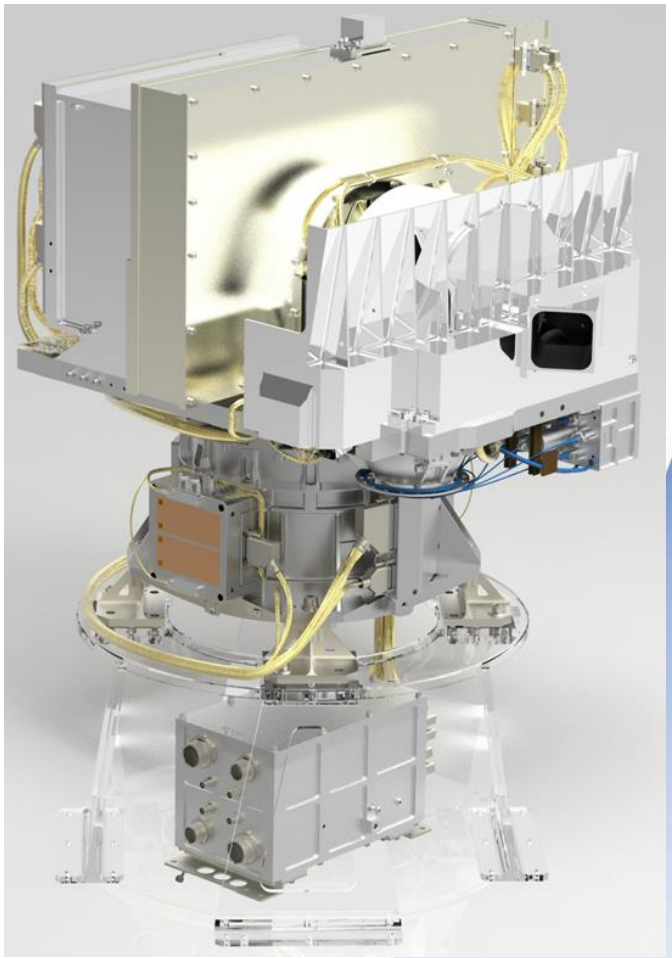
- **Project Goal**
  - Provide an instrument to support global climate monitoring by continuing the sequence of Earth Radiation Budget (ERB) measurements obtained by NASA and National Oceanic and Atmospheric Administration (NOAA) over the past thirty years
- **Science Objectives**
  - Collect the observations necessary to seamlessly continue the Earth Radiation Budget Climate Data Record (CDR) by
    - ***Measuring the temporal and spatial distribution of outgoing*** thermal and reflected solar radiation from the Earth, allowing investigation of the Earth's radiation budget when combined with measurements of solar irradiance
    - ***Tying the RBI observations to those of Clouds and the Earth's Radiant Energy System (CERES) through intercalibration*** while aiding in the development of a quantitative understanding of the links between the radiation budget and the properties of the atmosphere and surface that define it
- **Mission Success**
  - The Mission Success Criteria is equivalent to the threshold science requirement for not less than 6 years of the planned prime mission lifetime

RBI Overview
Science Performance Requirements

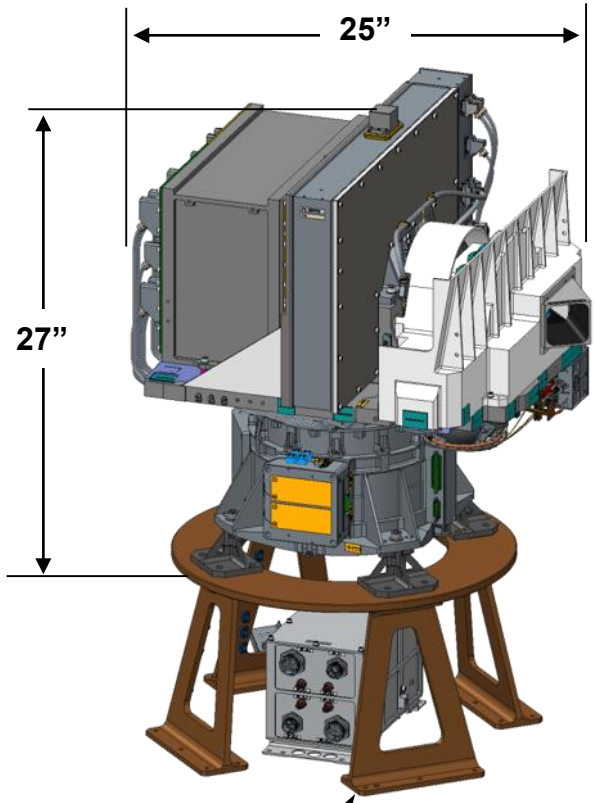
Key Performance Requirements	Baseline Science Requirements	Threshold Science Requirements
Total Spectral Range	0.3 to 100+ microns	0.3 to 50+ microns
Shortwave Spectral Range	0.3 to 5 microns	0.3 to 5 microns
Longwave Spectral Range	5 to 50+ microns	5 to 35+ microns
Total Channel Absolute Radiometric Accuracy	≤ Larger of 0.575 W/m^2-sr or 0.5% (k = 1)	≤ Larger of 0.575 W/m^2-sr or 0.75% (k = 1)
Shortwave Channel Absolute Radiometric Accuracy	≤ Larger of 0.75 W/m^2-sr or 1.0% (k = 1)	≤ Larger of 0.75 W/m^2-sr or 1.25% (k = 1)
Longwave Channel Absolute Radiometric Accuracy	≤ Larger of 0.575 W/m^2-sr or 0.5% (k = 1)	≤ Larger of 0.575 W/m^2-sr or 0.75% (k = 1)
Total Channel Radiometric Precision	≤ 0.2 W/m^2-sr + 0.1% (k = 3)	≤ 0.2 W/m^2-sr + 0.1% (k = 2)
Shortwave Channel Radiometric Precision	≤ 0.2 W/m^2-sr + 0.1% (k = 3)	≤ 0.2 W/m^2-sr + 0.1% (k = 2)
Longwave Channel Radiometric Precision	≤ 0.2 W/m^2-sr + 0.1% (k = 3)	≤ 0.2 W/m^2-sr + 0.1% (k = 2)
Total Channel Linearity	≤ 1.5 W/m^2-sr	≤ 2.5 W/m^2-sr
Shortwave Channel Linearity	≤ 1.28 W/m^2-sr	≤ 2.13 W/m^2-sr
Longwave Channel Linearity	≤ 0.54 W/m^2-sr	≤ 0.9 W/m^2-sr
Point Spread Function	Within 95% of CERES	Within 90% of CERES

RBI Overview

- **Collects upwelling earth radiance over a wide spectral range**
  - Ultraviolet to far-infrared (100μm)
  - Continuous cross-track scans
- **Three spectral bands**
  - Shortwave (SW): reflected solar energy
  - Longwave (LW): emitted earth energy
  - Total: independent check of other bands
- **Precise calibration**
  - Extensive ground calibration program sets the calibration
  - Multiple onboard targets ensure calibration maintained over mission life
- **Ensures legacy CERES data continuity**
  - Point Spread Function (PSF), scan patterns, and bands are virtually identical to CERES



RBI was based on a Modular Architecture



Spacecraft Stand
(In development by Joint Polar Satellite System (JPSS) / Orbital ATK (OA))

Electrical Substitution Radiometer Electronics (VCT)

Solar Calibration Target (SCT)

Electronics Unit (EU)

Twist Capsule Mounting Bracket (CSM)

Twist Capsule (CSM)

Telescopes

Cross-Track Scan Module (CSM)

Infrared Calibration Target (ICT)

Optical Module (OM)

Bench

Laser Diode Assembly (VCT)

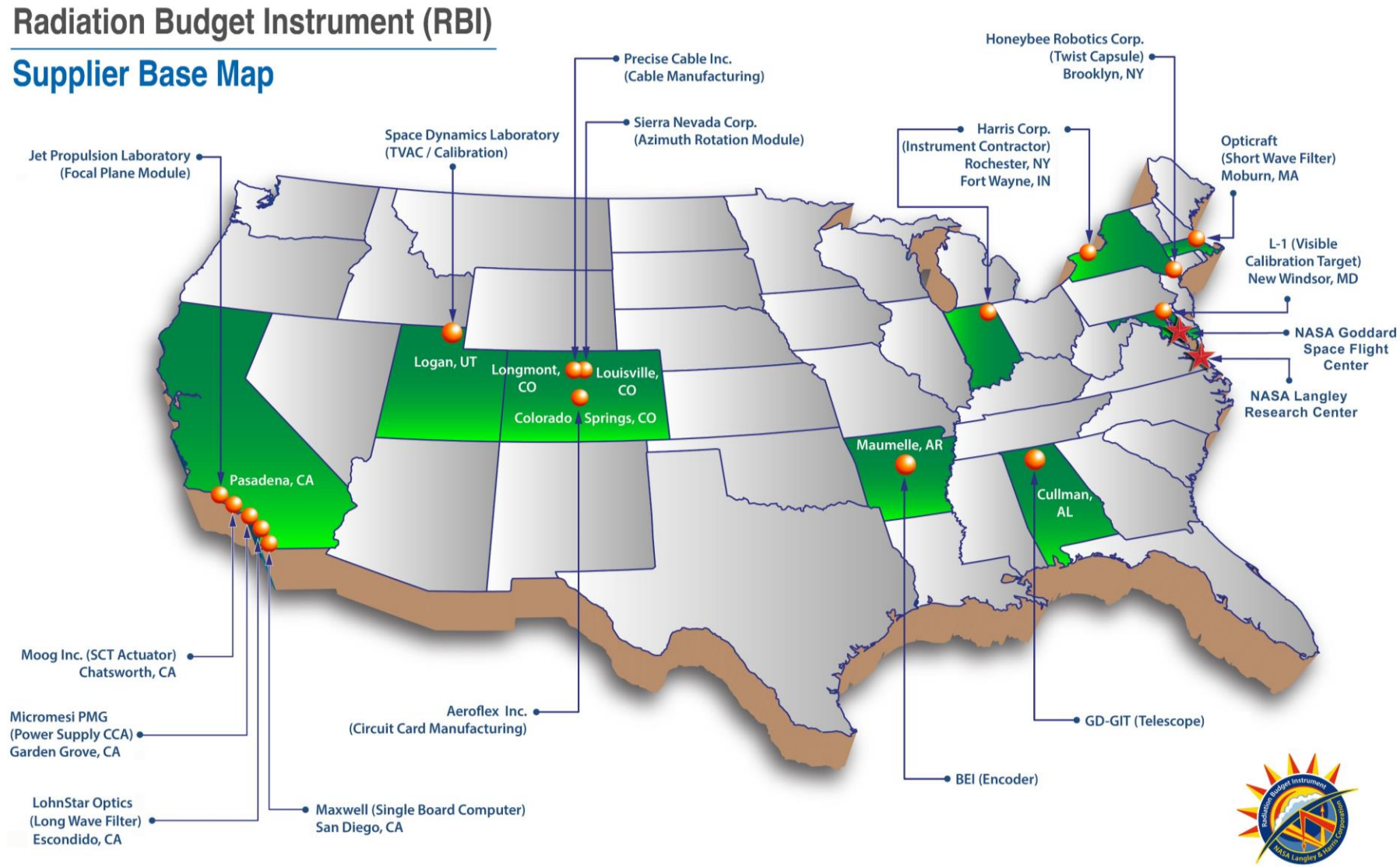
Bench Shroud

External Filter Module (EFM)

Visible Calibration Target (VCT)

Azimuth Rotation Module (ARM)

Large Industry Team Supported RBI Development



RBI Contractor and Subcontractors

Harris Corporation (RBI Prime)
www.harris.com

Honeybee Robotics
www.honeybeerobotics.com

Opticraft
opticraftinc.com

L-1 Technologies and Standards
www.l-1.biz

Cobham
www.cobham.com

Maxwell Technologies / DDC
www.maxwell.com

Lohnstar Optics
www.lohnstaroptics.com

Mircrosemi
www.microsemi.com

General Dynamics Global Imaging Technologies
gdmissionsystems.com/en/imaging-technologies

BEI Sensors
www.beisensors.com

MOOG
www.moog.com

Utah State University Space Dynamics Laboratory
www.sdl.usu.edu

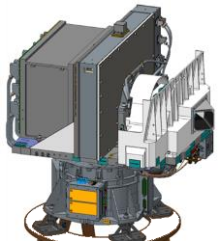
Precise Cable, Inc.
www.precisecables.com

Sierra Nevada Corporation
www.sncorp.com

RBI Progression

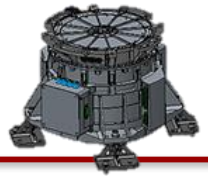
- **The RBI project included two development units, the Radiometric Test Model (RTM) and Engineering Development Unit (EDU), which were used to improve the RBI Flight Unit**

- **The Radiometric Test Model (RTM) was developed for early verification that the RBI design could meet flight performance requirements, demonstrated key calibration functions and was used to improve performance models that would ultimately drive changes for flight**
  - Details are not provided in this briefing
- **The Engineering Development Unit (EDU) was a non-flight unit to used as a pathfinder for calibration, flight build and test execution**
  - Details are noted on the next slide
- **The RBI Flight Unit hardware was in various states of production at the time of termination**



Hardware Status:
Engineering Development Unit (EDU)

- **The Engineering Development Unit (EDU) was developed by Harris Corporation**
  - The Government is in the process of working through the contract provisions to finalize the data rights to the EDU design and recognizes that some documentation may include limited rights data and restricted computer software
- **The purpose of the EDU is to serve as a pathfinder for calibration, flight build and test execution**
- **The EDU was fully assembled, functionally and environmentally (Thermal vacuum (TVAC)) tested**
  - Single electrical side
  - No azimuth rotation
  - Electromagnetic interference (EMI) / Electromagnetic compatibility (EMC) and Vibration Testing were not performed
- **The EDU is stored at NASA LaRC**

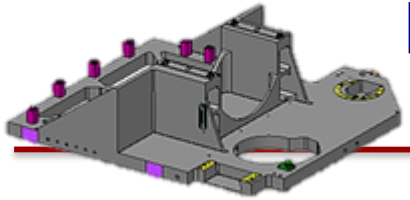


Hardware Status:
Azimuth Rotation Module (ARM)

- **The Azimuth Rotation Module was developed by Sierra Nevada Corporation (SNC)**
  - The ARM data rights are yet to be finalized and the Government recognizes that some documentation may include limited rights data and restricted computer software
- **The purpose of the ARM is to rotate the RBI Optical Bench to perform calibrations and azimuth scans at up to 6 degrees / second**
- **The EDU ARM unit was an Aluminum surrogate not capable of producing azimuth rotation**
- **The Flight ARM unit was Beryllium, fully assembled and functionally tested**
  - Environmental testing was not performed prior to termination
- **The ARM Life Test Unit was not completed**
- **ARM residual hardware includes the ARM flight unit and partial ground support equipment**
- **The Flight ARM is currently stored at LaRC**

Hardware Status:
External Filter Module (EFM)

- **The External Filter Module (EFM) was developed by Harris Corporation**
  - The Government is in the process of working through the contract provisions to finalize the data rights to the EFM design and recognizes that some documentation may include limited rights data and restricted computer software
- **The purpose of the EFM is the power interface between the host spacecraft and RBI and whose primary function is to filter RBI electrical power for electromagnetic compatibility**
- **The EFM electronics chassis was Aluminum for EDU, AlBeMet for Flight**
- **The EDU EFM has one side assembled and tested as part of full EDU**
- **The EFM flight unit was fully assembled**
  - Functional and environmental testing were not performed as of termination
- **The EFM flight unit is stored at NASA LaRC**

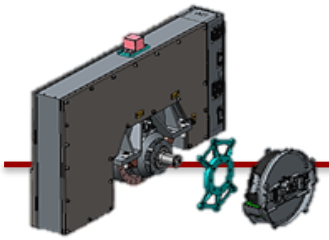


Hardware Status:
Bench

- **The Bench was developed by General Dynamics Global Imaging Technologies under contract to the Harris Corporation**
  - The Government has unlimited rights to the Bench design
- **The purpose of the Bench is to provide a mounting surface for RBI's modular components**
- **The Bench was aluminum for EDU and beryllium for Flight to reduce mass**
- **The Bench was completed and was ready for RBI component integration**
  - Stand-alone bench environmental testing was not planned or performed prior to termination
- **The Bench is stored at NASA LaRC**

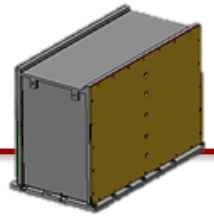
Hardware Status:
Infrared Calibration Target (ICT)

- **The Infrared Calibration Target was developed by Harris Corporation**
  - The ICT design is based on a Harris Corporation design with limited rights assertion
- **The purpose of the ICT is to provide a calibration target in the infrared spectral region**
- **The EDU and Flight ICTs were the exactly the same**
- **The EDU ICT was fully assembled and characterized with the full EDU**
- **The Flight ICT was fully assembled and characterized**
  - Stand-alone ICT environmental testing was not performed prior to termination
- **The ICT is stored at NASA LaRC**



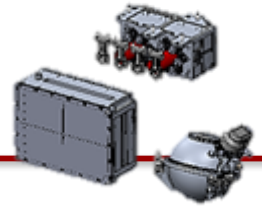
Hardware Status:
Cross-Track Scan Module

- **The Cross-Track Scan Module (CSM) was developed by the Harris Corporation with components provided by Honeybee Robotics (Twist Capsule)**
  - The Government is in the process of working through the contract provisions to finalize the data rights to the CSM design and recognizes that some documentation may include limited rights data and restricted computer software
- **The purpose of the CSM is to provide elevation scan capability of -170º to +140º for the three RBI telescopes**
- **The CSM electronics housing was aluminum for EDU, beryllium for Flight**
- **The CSM Scan Motor Diaphragm was AlBeMet for EDU, Stainless Steel for Flight**
- **The CSM Control Electronics (CE) Circuit Card Assembly (CCA) had green wires for EDU, re-spin of CCA for Flight**
- **The EDU CSM has fully assembled and tested as part of full EDU**
- **The Flight CSM was fully assembled but not fully tested prior to termination**
  - Functional testing was performed
  - Stand-alone environmental testing was not performed prior to termination
- **Life testing**
  - Bearing: Completed during the Crosstrack Infrared Sounder (CrIS) program
  - Encoder LED completed
  - Twist Capsule was stopped post termination
- **The CSM is stored at NASA LaRC**



Hardware Status:
Electronics Unit (EU)

- **The Electronics Unit (EU) was developed by the Harris Corporation with components provided by Maxwell DDC, Microsemi PMG, Cobham, and Precise Cable**
  - The Government is in the process of working through the contract provisions to finalize the data rights to the EU design and recognizes that some documentation may include limited rights data and restricted computer software
- **The purpose of the EU is to provide the RBI spacecraft - instrument avionics interface for command processing, data handling, telemetry processing and control of RBI modules and components**
- **The EU electronics chassis was aluminum for EDU, AlBeMet for Flight**
- **The EDU EU has one side assembled and tested as part of full EDU**
- **The Flight EU was not completed and was partially assembled at termination**
- **The EU components are stored at NASA LaRC**



Hardware Status:
Visible Calibration Target

- **The Visible Calibration Target (VCT) system was developed by the L-1 Technology and Standards Corporation**
  - The VCT system consists of the Electrical Substitution Radiometer Electronics (ESR), the Laser Diode Assembly, and the Visible Calibration Target
  - The Government is in the process of working through the contract provisions to finalize the data rights to the VCT design and recognizes that some documentation may include limited rights data and restricted computer software
  - Fiber optic cables used to connect VCT components were provided by NASA Goddard Space Flight Center (GSFC)
- **The purpose of the VCT is to provide an independent/internal calibration data source, primarily in the visible spectral region with wavelength discrimination provided by 6 laser diodes**
- **The EDU VCT was fully assembled and tested as part of full EDU**
- **The Filter Wheel Life Test completed**
- **The Flight VCT was partially assembled at the time of termination**
- **The VCT components and partially completed subassemblies are stored at NASA LaRC**

Hardware Status:
Solar Calibration Target

- **The Solar Calibration Target (SCT) was developed by the Harris Corporation with actuator provided by MOOG Inc**
  - The Government is in the process of working through the contract provisions to finalize the data rights to the SCT design and recognizes that some documentation may include limited rights data and restricted computer software
- **The purpose of the SCT is to provide a diffuse target to permit viewing the sun or the moon for periodic cross- calibration**
- **The EDU SCT was fully assembled and characterized during the full EDU testing**
- **The Life Testing was completed during the full EDU testing**
- **The Flight SCT was fully assembled at termination but had not undergone characterization nor environmental testing**
- **The SCT is stored at NASA LaRC**

Hardware Status:
Optical Module

- **The Optical Module (OM) was developed by the Harris Corporation**
  - The OM contains components supplied by General Dynamics Global Imaging Technologies (telescopes), Opticraft and Lohnstar Optics (filters), and by the Jet Propulsion Laboratory (detectors)
  - The Government is in the process of working through the contract provisions to finalize the data rights to the OM design and recognizes that some documentation may include limited rights data and restricted computer software
- **The Optical Module contains the three RBI telescopes, detectors, filters, and supporting structure**
- **The EDU Optical Module was fully assembled with Flight like telescopes**
  - Primary and Secondary mirror baffles did not include flight improvements
- **The EDU and Flight Telescopes were beryllium**
- **The Flight Optical Module was partially assembled and has not been fully tested**
  - One of two redundant detectors on the total channel telescope exhibited off-nominal behavior
- **The Spare telescope was assembled for stray light testing**
  - Development of stray light testing plans were complete, however, the testing was not performed as of termination
- **The Optical Module components and partially completed subassemblies are stored at NASA LaRC**

Hardware Status:
RBI SDL Calibration Equipment

- **The RBI Calibration Equipment was purchased and characterized by Utah State University Space Dynamics Laboratory (SDL)**
- **SDL TVAC chamber was used to characterize RBI Engineering Demonstration Unit (EDU)**
- **RBI residual hardware for use with the Thermal Vacuum (TVAC) Chamber includes the following:**
  - Long Wave Radiance Source (LWRS) with the following:
    - Long Wave filter
    - MEASURpoint Ethernet Instrument
    - MEASURpoint 48 ch RTD scanner
  - Short Wave Radiance Source (SWRS) with the following:
    - USB silicon CCD Camera
    - Research Arc Lamp Source 450 W Xe UV with Power Supply
  - Space View Simulator (SVS)
  - Sensor Test Package (STP)
  - ACR Pinhole Camera (APC)
  - Spectral Reference Detector (SRD)
  - Chamber Extension
- **The RBI calibration equipment is currently stored near or attached to the SDL TVAC Chamber**

Module/System Summary

Module/System		Assembled	Material	Functionally	Vibration	EMI/EMC	TVAC	Characterization	Life Test	Major Reviews	Spares
ARM	Flight	Fully	AlBeMet	Yes	No	No	No	N/A	Not completed	ARM Critical Design Review	None
	EDU	Fully	Aluminum	No	No	No	Yes w/ full EDU	N/A	N/A		
EFM	Flight	Fully	AlBeMet (electronic chassis)	No	No	No	No	N/A	N/A	EFM CDR	None
	EDU	One side	Aluminum	Yes w/ full EDU	No	No	Yes w/ full EDU	N/A	N/A		
Bench	Flight	Completed	Beryllium	N/A	No	No	No	N/A	N/A	Bench CDR	None
	EDU	Completed	Aluminum	N/A	No	No	Yes w/ full EDU	N/A	N/A		
ICT	Flight	Fully	Various same as EDU	No	No	No	No	Yes	N/A	ICT CDR; Performance Verification Review	None
	EDU	Fully	Various same as Flight	Yes w/ full EDU	No	No	Yes w/ full EDU	Yes w/ full EDU	N/A		
CSM	Flight	Fully	Beryllium (electronics housing)	Yes	No	No	No	N/A	Twist Capsule: Terminated Bearing: Completed during CrIS Encoder LED: completed	CSM CDR	None
	EDU	Fully	Aluminum (electronics housing)	Yes w/ full EDU	No	No	Yes w/ full EDU	N/A			
EU	Flight	Partially	AlBeMet (electronic chassis)	No	No	No	No	N/A	N/A	EU & Power Supply CDRs	* Single Board Computer * Power Supply
	EDU	One side	Aluminum	Yes w/ full EDU	No	No	Yes w/ full EDU	N/A	N/A		
VCT	Flight	Partially	Various	No	No	No	No	No	No	VCT CDR	None
	EDU	Fully	Various	Yes w/ full EDU	No	No	Yes w/ full EDU	Yes w/ full EDU	Filter Wheel completed		
SCT	Flight	Fully	Various	No	No	No	No	No	No	SCT CDR; Performance Verification	None
	EDU	Fully	Various	Yes w/ full EDU	No	No	Yes w/ full EDU	Yes	Completed as part of full EDU		
OM	Flight	Partially	Telescopes - beryllium	No	No	No	No	No	N/A	OM CDR; Focal Plane Module CDR; Detector Electronics CDR	Spare telescope planned for stray light testing
	EDU	Fully	Telescopes - beryllium	Yes w/ full EDU	No	No	Yes w/ full EDU	No	N/A		
EDU		Fully	Various, Single electrical side only	Yes	No	No	Yes	Yes	N/A	EDU TVAC Test Readiness Review (TRR)	None

Differences Between EDU and Flight

Module/Sub-assembly	EDU	Flight
ARM	Aluminum, non-functional (Surrogate ARM)	Use of Beryllium for all structural elements
EU/External Filter chassis	Aluminum	AlBeMet
Instrument Bench / CSM Housing	Aluminum	Beryllium
CCAs/Cables/CSM Encoder	Single-String	Dual-String
CSM Scan Motor Diaphragm	AlBeMet	Stainless Steel
CSM twist capsule	Unused flexes	All flexes used
CSM CE Calibration Circuit card Assembly (CCA)	EDU design green wires	Flight design – flight spin of CCA
CCAs	No conformal coating	Conformal coating
PWBs	No coupons, Not flight quality	Coupons, Flight quality
Electronic Parts	Not all flight quality	Flight quality
SCT motor	EDU quality, Single-string windings	Flight quality
VCT motor	EDU quality	Flight quality
Focal Plane Modules (FPM)	No JPL Seal of Approval for Flight	JPL Seal of Approval for Flight
Testing: Vibration	None	Baseline Sine, Random, Shock
Testing: EMI/EMC	None	Baseline
Testing: TVAC	Reduced Thermal Cycles	Baseline
EDU Lessons Learned resulted in design changes to:	• Telescope Optics – Flight baffles will have higher surface roughness to suppress potential stray light effects • Laser filter wheel system • ESR assembly • Vent screens • Photo diode assembly	

Hardware Listing

- **A listing of RBI hardware and components available to the selected offeror is provided at the following website**
  - **Earth Venture Continuity-1 (EVC-1) Library**
    - https://essp.larc.nasa.gov/EVC-1/evc-1_library.html

- **Any additional hardware identified prior to selection will not be considered for the proposal but will be available to the selected offeror**

Hardware Storage

- **All RBI hardware is being safely stored at NASA LaRC in environmentally controlled or cleanroom facilities unless otherwise noted below:**
  - RBI radiometric calibration equipment is being stored in place at the Utah State University Space Dynamics Laboratory and is being used to support other NASA projects on a non-interference basis
  - An Optical Spectrum Analyzer (OSA) is being used at Photodigm to support another NASA project on a non-interference basis

- **The RBI Hardware is not available for viewing to protect the integrity and cleanliness of the flight hardware**

Hardware Storage: Location #1

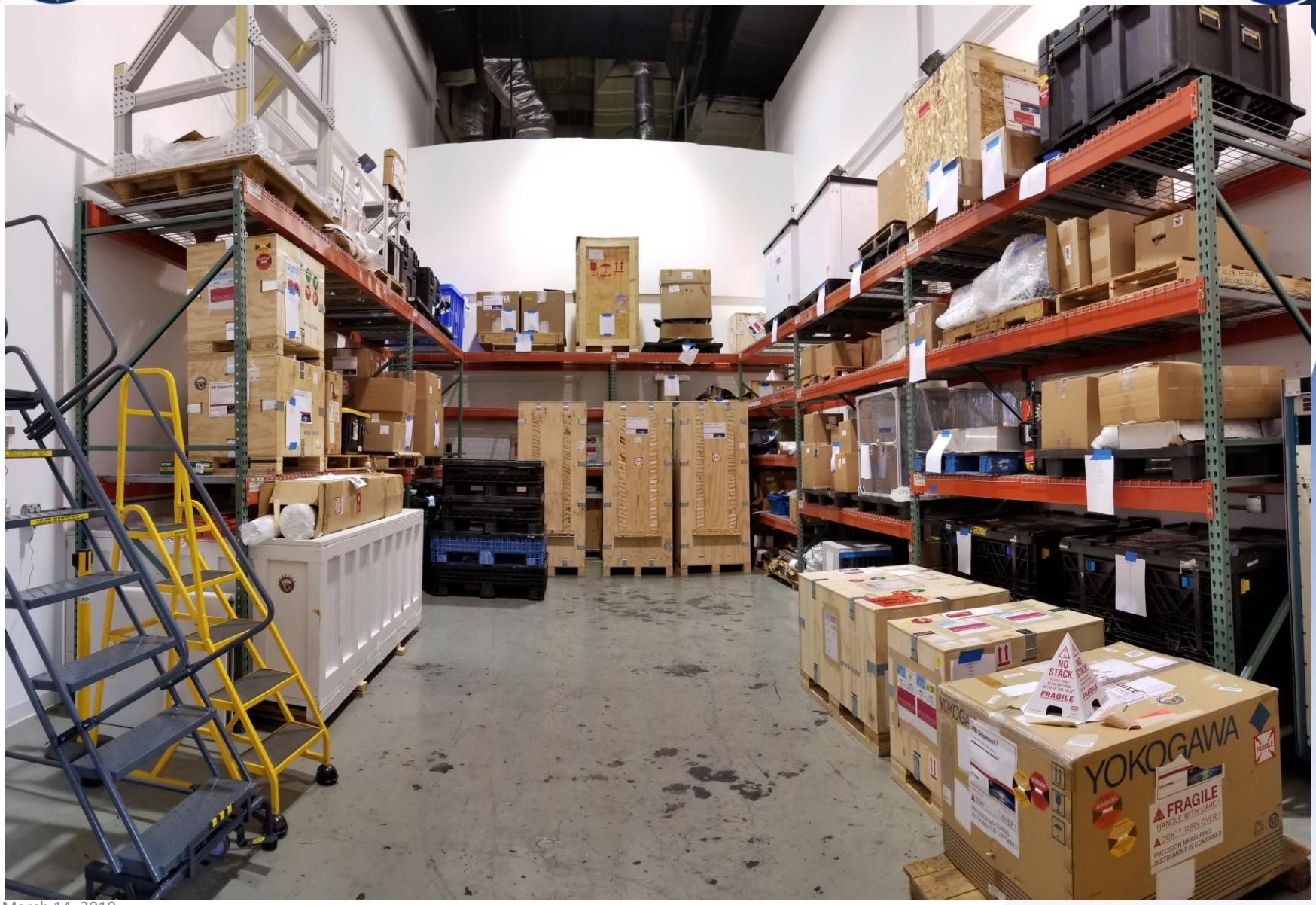
10 Rolling Cabinets (back to back)

Sample: Rolling Storage

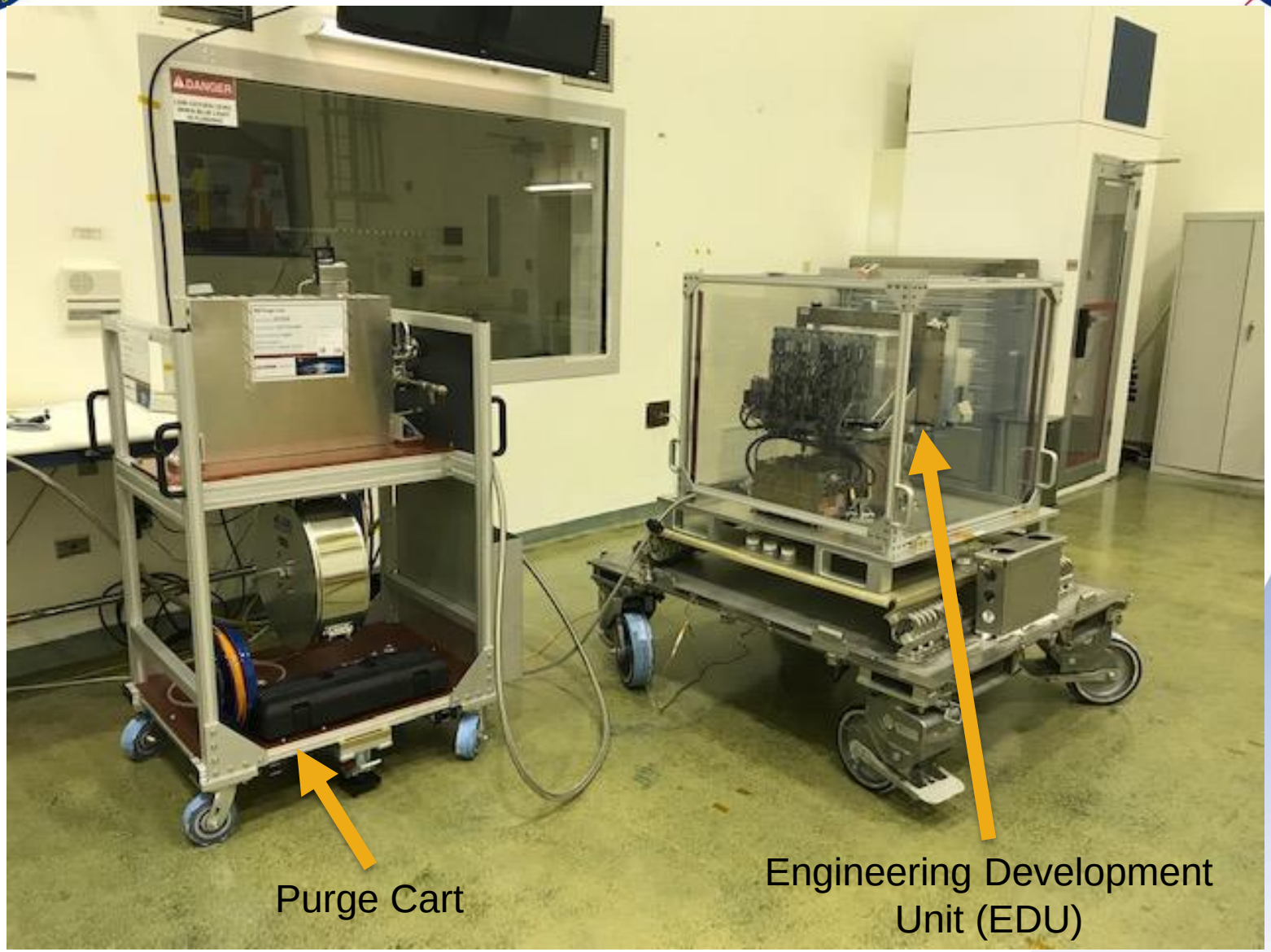
12 Vidmar Cabinets

Sample: Drawer Bin Storage

Hardware Storage: Location #2



Cleanroom: RBI EDU



Cleanroom: Cabinets

RBI Desiccant Cabinet
(Contains flight and EDU Detectors)

RBI Cabinet
(Contains flight optical hardware)

Documentation

- **The documentation is available at the following website:**
  - **Earth Venture Continuity-1 (EVC-1) Library**
    - https://essp.larc.nasa.gov/EVC-1/evc-1_library.html
- **The following RBI documentation is available & abstracts are on the subsequent slides:**

Title	Document Number	Revision Date
RBI Statement of Work (SOW)	Contract # NNL14AQ00C, Exhibit A, SOW	Rev L 11/08/2017
RBI Contract Data Requirements List/Data Requirements Descriptions (CDRL/DRD)	Contract # NNL14AQ00C, Exhibit B, CDRL/DRD	Rev F 10/23/2017
Performance Requirements Document (PRD)	472-00267 (Contract # NNL14AQ00C, Exhibit C, PRD)	Rev E 10/16/2017
Mission Concept of Operations Document (MCOD)	RBI-MCO-07-001	Rev - 9/14/2016
National Oceanic and Atmospheric Administration (NOAA)-NASA Clouds and the Earth's Radiant Energy System (CERES) RBI Agreement	N/A	Ver 3.7 7/16/2014
Inter- Project Agreement Between NASA Radiation Budget Instrument (RBI) Project, the Radiation Budget Measurements Project (RBM) and the Earth Science Data and Information System (ESDIS) Project for Science Data Processing, Archive and Distribution Support	423-IPA-005	Rev - 11/2016
RBI Science Data Management Plan	RBI-SDMP-09-003	Rev - 1/08/2018

- **Additional documentation will be made available to the selected offeror**

Documentation Abstracts 1 of 3

Title	Document Number	Abstract
RBI Statement of Work (SOW)	Contract # NNL14AQ00C, Exhibit A, SOW	This document **defines the work required of the Contractor**. This includes development and delivery of 1) one fully qualified RBI flight instrument; 2) one Radiometric Test Model (RTM) to validate the performance of the sensor, including optics and electronics; 3) one non-flight Engineering Development Unit (EDU) that has the same form fit and function as the RBI instrument and is used for ground-based qualification; 4) critical spaceflight qualified spare parts; and 5) nominal consultation to the Government in its performance of mission Phases D and E, observatory integration and test and on-orbit operations. Appendix A contains a list of RBI contract deliverables. The Government has responsibility for performing all Instrument post-delivery support activities following the Contractor's successful completion of the Instrument Bench Acceptance Test at the Spacecraft integration facility. This **SOW details the requirements for business and technical management, design, engineering analyses, data reduction, data presentations, technical reviews and related Government discussions, development, fabrication, integration, test, evaluation, delivery, and support of the RBI instrument in support of the JPSS 2 mission**. This SOW defines the roles, responsibilities, and obligations between the Government and the Contractor.
RBI Contract Data Requirements List/Data Requirements Descriptions (CDRL/DRD)	Contract # NNL14AQ00C, Exhibit B, CDRL/DRD	This document contains the Radiation Budget Instrument (RBI) Contract Data Requirements List (CDRL) and Data Requirement Descriptions (DRDs) that **define the requirements for data, models, and documentation to be delivered by the Contractor**. Section 1 includes definitions and instructions for submission of DRD Items. Table 1 presents the CDRL. Section 2 provides the DRDs which describe each deliverable, how the Government will use the deliverable, the content requirements and other required preparation information. The CDRL and DRDs are grouped as follows: PM: Project Management; RE: Reviews; SE: Systems Engineering; MA: Mission Assurance; AM: Analyses and Models; SW: Software; IT: Integration and Test; CV: Calibration / Validation; OO: On-Orbit
Performance Requirements Document (PRD)	472-00267 (Contract # NNL14AQ00C, Exhibit C, PRD)	This Joint Polar Satellite System (JPSS) Radiation Budget Instrument (RBI) Performance Requirements Document (IPRD) **specifies the Level 3 functional, design, performance, interface, integration, verification, test, and delivery requirements for the RBI**. The requirements in this document are applicable to the RBI, ground support equipment (GSE), and ground and flight software. The RBI flight model #1 Instrument is planned for use on the JPSS-2 Observatory.

Documentation Abstracts 2 of 3

Title	Document Number	Abstract
Mission Concept of Operations Document (MCOD)	RBI-MCO-07-001	This Mission Concept Operations Document (MCOD) **describes the systems, operational concepts, and organizations required to develop, implement, and conduct the Radiation Budget Instrument (RBI) mission**. The objective of the MCOD is to document the functionality of the RBI operations and to define system segments, associated functions, and operational descriptions. The MCOD represents the operational approaches used to develop the mission requirements and provides the operational framework for execution of the major components of the RBI mission. Following an operational handover that occurs approximately 90 days after a successful launch and a post on-orbit activation and check-out period, the RBI will become the responsibility of the Earth Radiation Budget Science Team (ERBST), formerly the Radiation Budget Measurement Program (RBMP). The MCOD is **not a requirements document, but rather it provides a functional view of the RBI mission based upon high-level project guidance, stakeholder expectations, and systems analysis**. All functions, scenarios, figures, timelines, and flow charts are conceptual only and are subject to change. They are not intended to provide actual design definition. Therefore, while the objective of the MCOD is to capture all necessary functionality of the RBI operations, some functions may ultimately be modified or allocated to different segments at a later time.
National Oceanic and Atmospheric Administration (NOAA)-NASA Clouds and the Earth's Radiant Energy System (CERES) RBI Agreement	N/A	The scope of this IAA encapsulates and **defines the roles and responsibilities for NASA and NOAA NESDIS associated with the science data processing of Clouds and Earth's Radiant Energy System (CERES) Flight Model (FM)-6 data products from the Joint Polar Satellite System (JPSS)-1 satellite, as well as the development and build of the CERES successor instrument, the Radiation Budget Instrument (RBI), and its accommodation on the JPSS-2 satellite, along with operation and data generation**. All content of this IAA is subject to the approval of annual budget appropriations. The NASA implementing organizations are as follows: the Science Mission Directorate (SMD) Earth Science Division (ESD); and its agents - the NASA Goddard Space Flight Center (GSFC) Earth Science Data and Information System (ESDIS), and the NASA Langley Research Center (LaRC) Science Directorate; the NASA Joint Agency Satellite Division (JASD), and the NASA Joint Polar Satellite System (JPSS) Program. The NOAA implementing organizations are as follows: the NOAA NESDIS, the NOAA JPSS Program Office, the NOAA Office of Satellite and Product Operations (OSPO), the NOAA Center for Satellite Applications and Research (STAR); the NOAA National Climatic Data Center (NCDC) and the National Weather Service (NWS).

Documentation Abstracts 3 of 3

Title	Document Number	Abstract
Inter- Project Agreement Between NASA Radiation Budget Instrument (RBI) Project, the Radiation Budget Measurements Project (RBM) and the Earth Science Data and Information System (ESDIS) Project for Science Data Processing, Archive and Distribution Support	423-IPA-005	This Inter-Project Agreement (IPA) serves to **establish the high-level responsibilities that support the transfer of NASA Radiation Budget Instrument (RBI) data products to the Earth Science Data and Information System (ESDIS) project for processing, archive and distribution to the Earth science community**. This agreement defines the responsibilities for transfer of RBI Instrument and telemetry data from the Joint Polar Orbiting Satellite System (JPSS) Common Ground System (CGS) to the Atmospheric Science Data Center (ASDC) for data processing, archive and distribution via ESDIS' Science Data Segment (SDS). The ASDC has been assigned responsibility for ingest , processing, archive and distribution of the RBI Mission data on behalf of the ESDIS Project. The RBI Mission is designed to extend the Earth's radiation budget data record provided by the Clouds and the Earth's Radiant Energy System (CERES) instruments . Therefore, the approach outlined in this document is designed to leverage existing CERES infrastructure and approach to the maximum extent possible. This IPA will enter into force on the date that the document is signed. This agreement may be modified only upon mutual agreement between the RBI, Radiation Budget Measurements (RBM) and ESDIS Projects. This IPA will remain in force until the ASDC has received and processed all the RBI data to be archived and or a date jointly agreed to be the signatories.
RBI Science Data Management Plan	RBI-SDMP-09-003	The RBI Science Data Management Plan (SDMP) serves to document data supporting and produced by the RBI instrument. The purpose of this document is to **identify the data that will be created by the mission, and how that data is created and dispositioned during and after the mission**.

Summary

- **Questions should be submitted to:**
  - **Earth Venture Continuity - 1 (EVC-1) PEA Questions & Answers**
    - https://essp.larc.nasa.gov/EVC-1/evc-1_qas.html
- **This RBI GFE Information Day presentation will be posted within 1 week to:**
  - **RBI GFE Information Day Web Conference**
    - https://essp.larc.nasa.gov/EVC-1/evc-1_inddaywebex.html
- **Additional documentation and data will be made available to the selected offeror upon award**
- **Thank you for your interest in proposing to EV-C**

National Aeronautics and Space Administration

Radiation Budget Instrument

Backup

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Acronyms

APC	ACR Pinhole Camera
ARM	Azimuth Rotation Module
CCA	Circuit Card Assembly
CDR	Critical Design Review
CDR	Climate Data Record
CDRL/DRD	Contract Data Requirements List/Data Requirements Descriptions
CE	Control Electronics
CERES	Clouds and the Earth's Radiant Energy System
CSM	Cross-Track Scan Module
EAR	Export Administration Regulations
ECCN	Export Control Classification Number
EDU	Engineering Development Unit
EFM	External Filter Module
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ERB	Earth Radiation Budget
ESDIS	Earth Science Data and Information System
ESR	Radiometer Electronics
EU	Electronics Unit
EV-C	Earth Venture – Continuity
FPM	Focal Plane Modules
GFE	Government Furnished Equipment
GSFC	Goddard Space Flight Center
ICT	Infrared Calibration Target

JPSS	Joint Polar Satellite System
LW	Longwave
LWRS	Long Wave Radiance Source
MCOD	Mission Concept of Operations Document
NOAA	National Oceanic and Atmospheric Administration
OA	Orbital ATK
OM	Optical Module
OSA	Optical Spectrum Analyzer
PRD	Performance Requirements Document
PSF	Point Spread Function
RBI	Radiation Budget Instrument
RBM	Radiation Budget Measurements
RTM	Radiometric Test Model
SCT	Solar Calibration Target
SNC	Sierra Nevada Corporation
SOW	Statement of Work
SRD	Spectral Reference Detector
STP	Sensor Test Package
SVS	Space View Simulator
SW	Shortwave
SWRS	Short Wave Radiance Source
TVAC	Thermal vacuum
VCT	Visible Calibration Target