National Aeronautics and Space Administration

EXPLORE SCIENCE

NASA Heliophysics Explorers Program Solicitation Highlights

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Explorers Program

The Explorers Program is the oldest program at NASA. Established in 1958, with its first launch, Explorer I on January 31, placing the United States in the space race after the launch of Sputnik. There are over 100 missions flown.

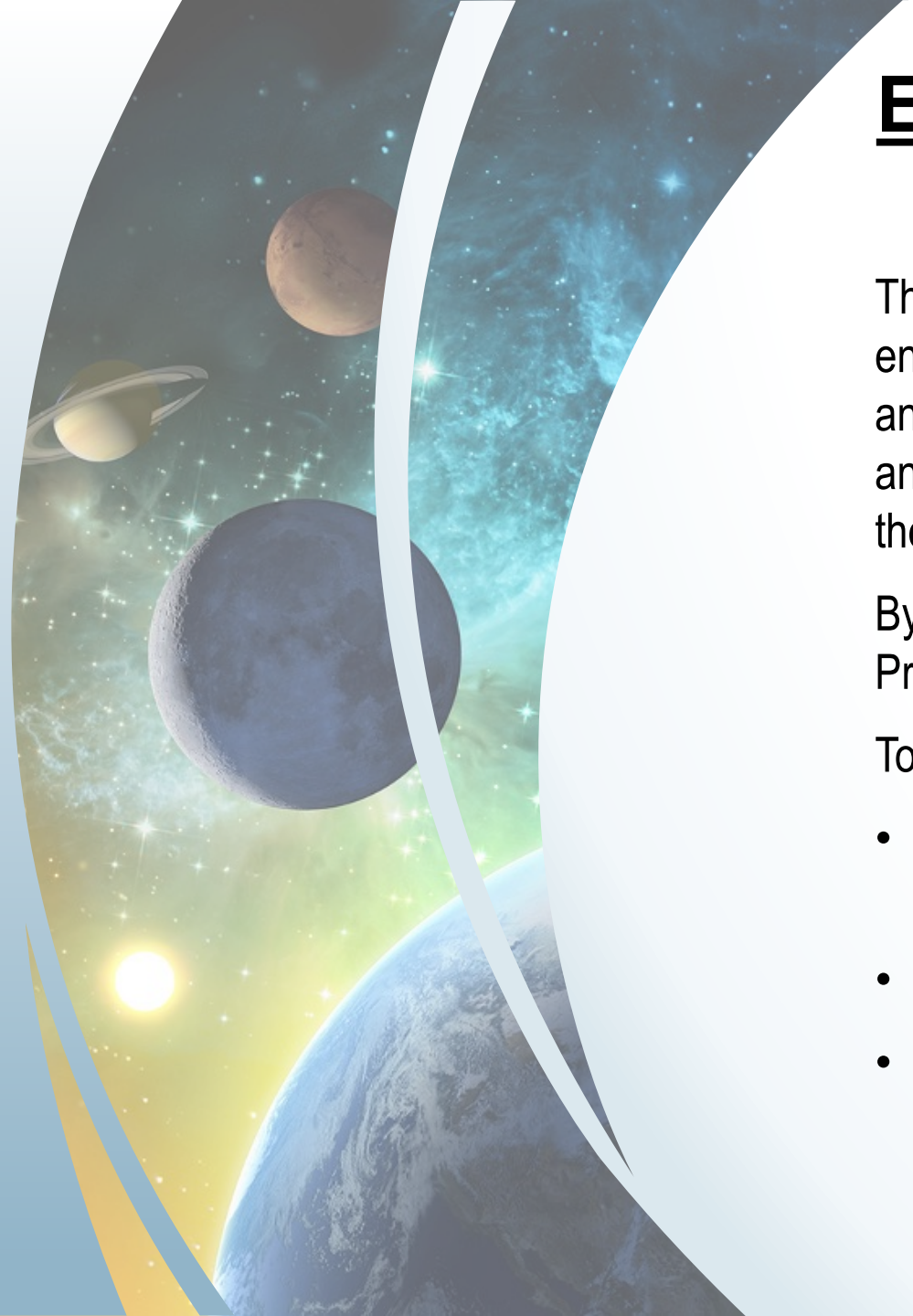
- The Explorers Program science has been cited in two different Nobel Prizes.
- The Explorers Program conducts Principal Investigator (PI) led space science investigations in Science Mission Directorate's Heliophysics and Astrophysics. Divisions
- Explorer investigations are intended to obtain an understanding of the Sun and its effects on Earth and the Solar System and/or to discover the origin, structure, evolution, and destiny of the Universe and search for Earthlike planets.

Explorers Program (cont.)

The mission of the Explorers Program includes:

- Conduct world-class scientific investigations of modest programmatic scope
- Provide continuing flight opportunities
- Utilize innovative, streamlined, and efficient management approaches that contain costs and improve performance
- Enhance public awareness of space science by incorporating educational and public outreach activities as integral parts of space science investigations
- Explorers Program is managed by NASA Goddard Space Flight Center
- The Explorers Program solicitation evaluations are supported by the Science Office for Mission Assessments (SOMA) at NASA Langley

The current program is made up of Small-class Explorers (SMEX), Medium-class Explorers (MIDEX) and Missions of Opportunity



Explorers Program (cont.)

The SMEX program was started in 1988 as an opportunity to train young engineers at GSFC. The spacecraft bus, system engineering, and integration and test were provided by GSFC. The principal investigator bid the science and instruments that were well developed (Typically having evolved through the sounding rocket or balloon program)

By 1997, the full responsibility of the SMEX missions was given to the Principal Investigators

Today, these competitions are:

- Highly competitive, Principal Investigator led projects, from universities and industry
- Provide continuing flight opportunities
- Frequent announcements of opportunities (SMEX and MIDEX alternate calls approximately every 3 years)

Items Deferred from Step 1 to Step 2

- Independent Verification and Validation of Software (see Section 4.6.1)
- Costing of Conjunction Assessment Risk Analysis (see Section 4.6.4)
- Planetary protection requirements (see Section 5.1.7)
- Science Enhancement Option or its cost (see Section 5.1.8)
- PI-Team-Developed Enhancing Technology Demonstration Opportunity or its cost (see Section 5.2.3.1)
- Applicable maximum channel bandwidth (see Section 5.2.5)
- Critical Event Coverage (see Section 5.2.6)
- Detailed plan for orbital debris and disposal (see Section 5.2.7 and Requirement B-63 through Requirement B-66)
- Mission Operations Tools and Services (see Section 5.2.9)
- Cybersecurity (see Section 5.2.11)
- Naming of Project Manager and Project Systems Engineer (see Sections 5.3.2 and 5.3.3)
- Student Collaboration plans (Section 5.5.2 and Requirement B-53)
- Requirements for real year dollar costs (see Section 5.6.2, Requirement B-13, Requirement B-51, and Requirement B-52)
- Discussion of cost estimate error and uncertainty (see Section 5.6.3)
- Institutional Letters of Commitment from major partners (Section 5.8.1)
- AO-Provided Launch Services storage plans and budget (Section 5.9.2.1)
- Schedule-based end-to-end component of Data Management and Archiving Plans (see Requirement B-24)

References are for the SMEX AO, Explorer MO AO Section 1.1 provides references for MO deferrals

NPR 7120.5 Changes (E->F)

- **NPR 7120.5 is the NASA Space Flight Program and Project Management Requirements**

  Programs and projects including spacecraft, launch vehicles, instruments developed for space flight programs and projects, some research and technology (R&T) developments funded by and to be incorporated into space flight or aeronautics programs and projects

- **7120.5 Revision F (7120.5F) is published to NODIS as of Aug 3, 2021**

Below are noteworthy changes:

- Orbital Collision Avoidance Plan requirement (pointer to NID 7120.132)
- NASA STD 1006A Space System Protection Standard Update – Project Protection Plan developed in accordance with the standard consistent with EPP NPR 1058.1
- Enhanced tailoring guidance added to Appendix C

Collision Avoidance (CA)

Orbital Collision Avoidance Plan Requirements

The NID 7120.132 Collision Avoidance for Space Environment Protection establishes new requirements and operational protocols for space flight missions to minimize the risk of collision and protect the space environment

Programs and Projects will develop an Orbital Collision Avoidance Plan (OCAP)

As more space systems deploy, the space environment becomes increasingly congested. The Orbital Collision Avoidance NID was developed to meet the NASA AA's priorities to effectively manage the collision risk for current and planned NASA systems, and to demonstrate our commitment to other space operators in maintaining a safe space environment for everyone

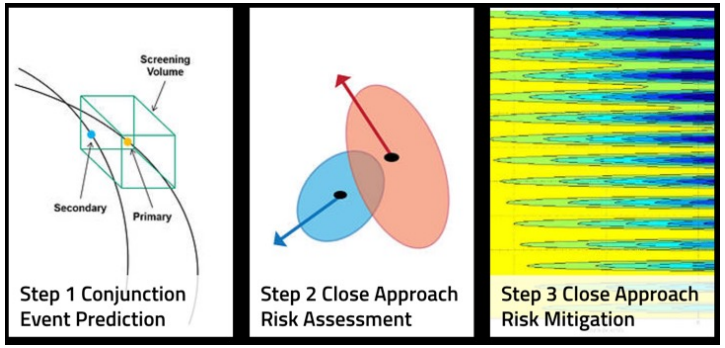
NID 7120.132 effective date is Nov 19, 2020; a future NPR will replace the NID

Conjunction Assessment Risk Analysis (CARA)

- NASA Interim Directive 7120.132 "Collision Avoidance for Space Environment Protection" https://nodis-dms.gsfc.nasa.gov/library/OPD_docs/NID_7120_132_.pdf
- NASA CA Best Practices Handbook https://nodis3.gsfc.nasa.gov/OCE_docs/OCE_51.pdf
- NASA CARA office supports missions under a Conjunction Assessment Operations Implementation Agreement (CAOIA)

Mission responsibilities (Cost Basis of Estimate (BOE) due in Step 2):

- Establish a CAOIA more than 12 months prior to launch (Phase C/D)
- During operations (Phase E) provide to CARA Office:
  1. Ephemeris, or file containing the spacecraft state and specific time increments (typical cadence update: daily)
  2. A predictive covariance file with ephemeris time-step & cadence
  3. Maneuver notifications, (time, size, and type)



NASA STD 1006A and Project Protection Plan

Updated requirement for Project Protection Plan to be developed in accordance with NASA-STD-1006A, Space System Protection Standard and NPR 1058.1, Enterprise Protection Program, Space Asset Protection

Update originated from an AA memorandum *Direction to Protect Command Link and Other Aspects of Robotic Spacecraft*, Feb 1, 2019. The memo was in response to identified threats and vulnerabilities to space systems

Currently included as part of 7120.5E per NID 7120.130 dated July 16, 2020

The update is documented directly into NPR 7120.5F and the NID will be cancelled

VADR Launch Services Considerations

- Venture Class Acquisition of Dedicated and Rideshare (VADR) is a new mechanism for Access to Space. It will utilize existing as well as new launch vehicle providers, with potentially different processes and requirements from your past experiences
- VADR is a FAA licensed mission
- You may not initially know if you are flying as a primary payload or a rideshare. Prepare for either scenario
- As a rideshare, you potentially will have to deal with Do No Harm to the primary mission payload and other secondary payloads
- As a rideshare, attempt to minimize mission unique services because they drive up cost and could reduce available rideshare opportunities
- If you choose a unique orbit, your ability to find a ride may be severely limited – which will be considered during selection

During the proposal phase, it is **essential** to discuss your mission concept with the LSP point of contact called out in the NASA LSP Information Summary

Class D Mission Myths

- Class D missions are typically smaller in dollar value than Class A-C missions, therefore fewer problems will occur and there is less to worry about; "FALSE"
- If a project doesn't share its risks with NASA, it will reduce the burden of effort and save time and money for the project; "FALSE"
- Class D missions are less complex; thus, scheduling is not very important to mission success; "FALSE"
- Class D missions typically have fewer changes between PDR and CDR; "FALSE"
- Class D smaller teams don't need to emphasize communications; "FALSE"
- NASA Science Mission Directorate does not spend as much time managing Class D missions; "FALSE"

Summary

- Explorers has been a highly successful program and the Heliophysics Division (HPD) wants to emphasize its value
- HPD appreciates that the Explorers Program is only successful due to the communities' stellar efforts to bring forward world class Heliophysics science missions
- In an effort to reduce the workload during Step 1, a substantial number of items have been deferred to Step 2
- NASA Space Flight Program and Project Management Requirements, NPR 7120.5 has been updated to revision F
- SMEX AO and Explorer MO are class D missions and will be utilizing the VADR mechanism for launch opportunities
- Class D missions' level of effort should not be underestimated, and HPD recognizes the energy and focus required for mission success

Go Explorers Program!

SLIDE DIVIDER