National Aeronautics and Space Administration

EXPLORE SCIENCE

Heliophysics

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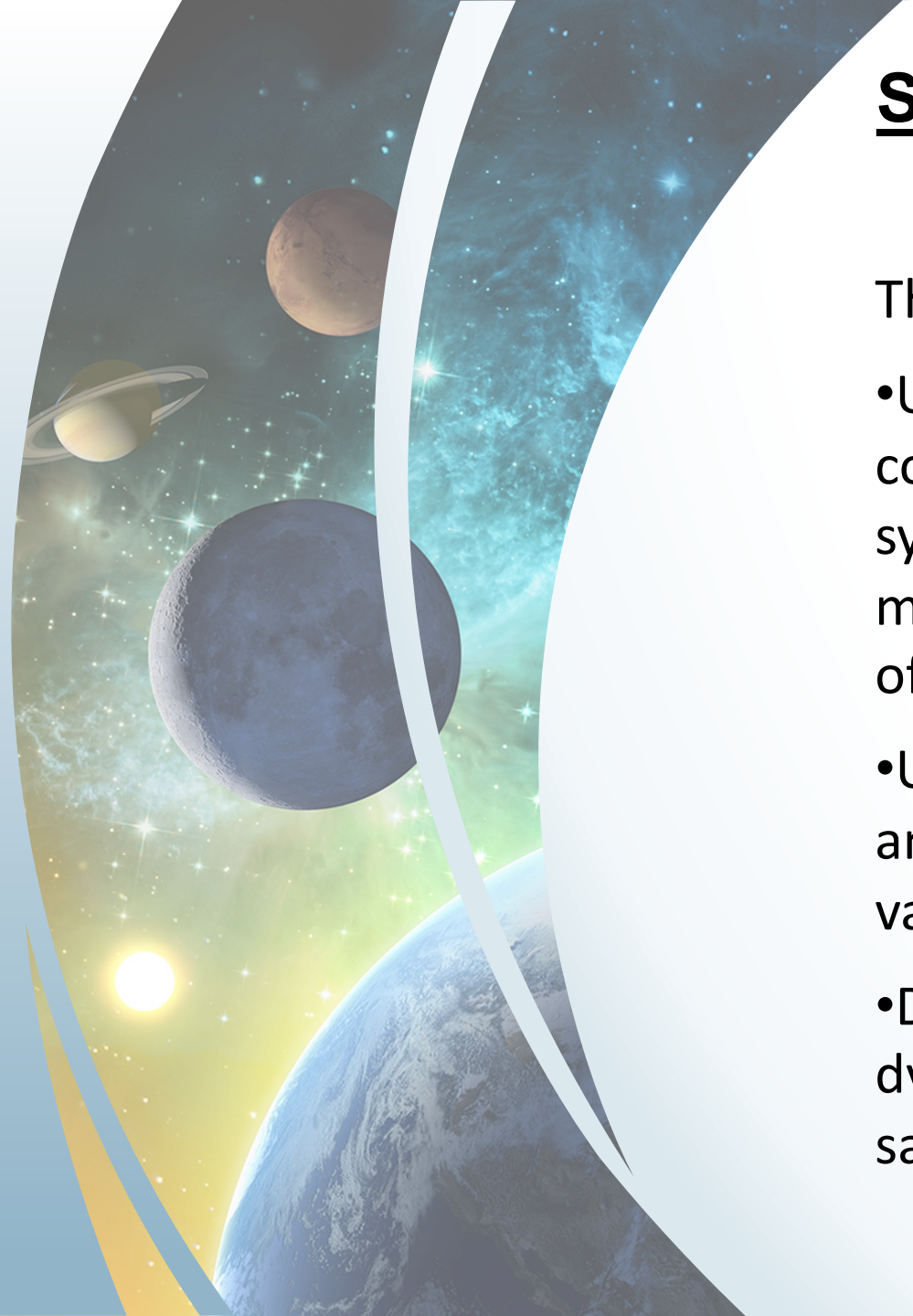
Solar Terrestrial Probe Program

DYNAMIC Pre-proposal Conference

Date: 6/6/23

Solar Terrestrial Probes Program

- The Solar Terrestrial Probes (STP) Program addresses fundamental science questions about the very nature of space itself, and the flow of material and energy throughout the solar system -- from the Sun to Earth to other planets to the interstellar boundary.
- STP missions study the Sun-Earth system to answer such questions as:
  - how the system evolved so as to produce and sustain life
  - what will happen to this unique environment through the course of time, and how that will affect us.



Solar Terrestrial Probes Program (cont.)

The STP Program objectives are to:

- Understand the fundamental physical processes of the complex space environment throughout our solar system, which includes the flow of energy and charged material, known as plasma, as well as a dynamic system of magnetic and electric fields.
- Understand how human society, technological systems, and the habitability of planets are affected by solar variability and planetary magnetic fields.
- Develop the capability to predict the extreme and dynamic conditions in space in order to maximize the safety and productivity of human and robotic explorers.

Solar Terrestrial Probes Program (cont.)

STP missions focus on specific scientific areas required to advance our fundamental understanding of the sun and its connection to the solar system. Successive missions target the “weakest links” in the chain of understanding. The missions use a creative blend of in situ and remote sensing observations, often from multiple platforms, to understand the causes and effects of solar variability over the vast spatial scales involved in planetary and heliospheric responses.

Missions in Development/Implementation

- Interstellar Mapping and Acceleration Probe (IMAP)
- Carruthers – (Global Lyman-alpha Imager of the Dynamic Exosphere)

Missions in Operations

- Magnetospheric Multiscale (MMS)
- Solar Terrestrial Relations Observatory (STEREO)
- Hinode (Solar-B)
- Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics (TIMED)

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 1006 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

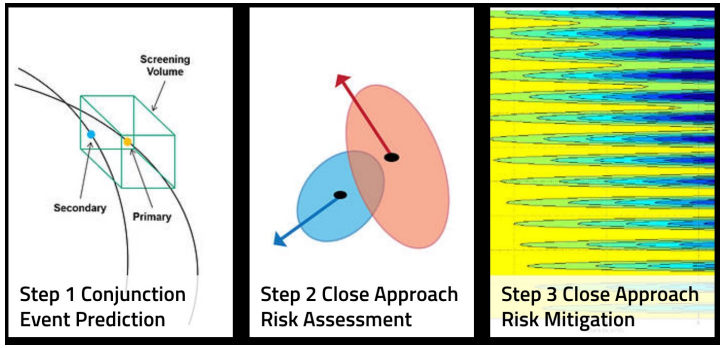
NID 7120.132 effective date is Nov 19, 2020; a future NPR will replace the NID

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 1006 and Project Protection Plan

Updated requirement for Project Protection Plan to be developed in accordance to **NASA-STD-1006, 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

- 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

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

- STP has been a highly successful program and the Heliophysics Division (HPD) wants to emphasize its value
- HPD appreciates that the STP Program is only successful due to the communities' stellar efforts to bring forward world class Heliophysics science missions
- NASA Space Flight Program and Project Management Requirements, NPR 7120.5 has been updated to revision F
- DYNAMIC is a class D mission and a rideshare configuration should be provided for launch opportunities, but it is also encouraged to describe your payload’s flexibility to fly as a primary payload as well.
- Class D missions' level of effort should not be underestimated, and HPD recognizes the substantial energy and focus required for mission success

Go Solar Terrestrial Probe Program!