2016 Heliophysics Explorers Announcement of Opportunity (AO) Concept Study Report (CSR) Evaluation Plan

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(Additions in Bold Red, deletions ~~stricken through~~**)**

Signature Page
Heliophysics Explorers

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Introduction

- The goal of NASA's Explorers Program is to provide frequent flight opportunities for high quality, high value, focused heliophysics and astrophysics science investigations that can be accomplished under a not-to-exceed cost cap and that can be developed relatively quickly, generally in 36 months or less, and executed on-orbit in less than 3 years.
- The purpose of this evaluation plan is to define the ground rules, processes, organizations, and schedules to be used in evaluating the Heliophysics Explorers Concept Study Reports (CSRs).
- 5 SMEX Missions and 2 Missions of Opportunity **(MOs)** were selected for concept studies, which constitute each investigation's Concept and Technology Development Phase (Phase A) of the Formulation process as outlined in NPR 7120.5E, NASA Spaceflight Program and Project Requirements.

Evaluation Plan Overview

- The Explorers Announcement of Opportunity (AO), under which the investigations to be evaluated were selected, is comprised of two solicitations: AO NNH16ZDA005O, entitled Heliophysics Explorers Program 2016 Small Explorer (SMEX), issued July 13, 2016, amended July 20, 2016, and clarified July 29, 2016; and Program Element Appendix (PEA) Q, entitled 2016 Heliophysics Explorers Mission of Opportunity, appended July 13, 2016 to the Second Stand Alone Mission of Opportunity Notice (SALMON-2) AO NNH12ZDA006O, and amended July 20, 2016.
- The Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LaRC) developed this 2016 Heliophysics Explorers AO CSR Evaluation Plan for the Science Mission Directorate (SMD) at NASA Headquarters.
- This CSR Evaluation Plan has been cleared for public release by SMD.
- The Heliophysics Explorers Program Scientist is responsible for validating all evaluation processes, responsibility assignments, assumptions, and ground rules.

Heliophysics Explorers Missions Selected for Concept Studies

- Five SMEX Missions were selected for Phase A Concept Studies. $1.25M was provided for each Concept Study.
  - **Focusing Optics X-ray Solar Imager (FOXSI)** - Steven Christe, PI, NASA Goddard Space Flight Center, Greenbelt, MD - FOXSI is a solar-dedicated, direct-imaging, Hard X-Ray telescope that would detect hot plasma and energetic electrons in and near energy release sites in the solar corona.
  - **Mechanisms of Energetic Mass Ejection – eXplorer (MEME-X)** - Thomas Moore, PI, NASA Goddard Space Flight Center, Greenbelt, MD - MEME-X will map the universal physical processes of the lower geospace system that control the mass flux through the upper atmosphere to space potentially transforming our understanding of how ions leave Earth's atmosphere.
  - **Multi-Slit Solar Explorer (MUSE)** - Ted Tarbell, PI, Lockheed Martin Inc., Palo Alto, California - MUSE will provide data to advance understanding of the difficult problems of mechanisms responsible for energy release in the corona and the dynamics of the solar atmosphere.
  - **Polarimeter to Unify the Corona and Heliosphere (PUNCH)** - Craig DeForest, PI, Southwest Research Institute, Boulder, CO - PUNCH will advance our understanding of how coronal structures fuel the ambient solar wind with mass and energy, and the dynamic evolution of transient structures in the young solar wind (near the source surface).
  - **Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites (TRACERS)** - Craig Kletzing, PI, University of Iowa, Iowa City, IA - TRACERS will fill a fundamental gap in our knowledge of the global variability in magnetopause reconnection by providing an abundant, well-targeted set of new and unique in-situ measurements.

Heliophysics Explorers Missions Selected for Concept Studies (continued)

- Two Missions of Opportunity **(MOs)** were selected for Phase A Concept Studies. $400K was provided for each Concept Study.
  - **Atmospheric Waves Experiment (AWE)** - Michael Taylor, PI, Utah State University Research Foundation, Logan, UT - AWE will investigate how atmospheric gravity waves, including those generated by terrestrial weather, impact the transport of energy and momentum from the lower atmosphere into near-Earth space, a fundamental question in Heliophysics.
  - **Sun Radio Interferometer Space Experiment (SunRISE)** - Justin Kasper, PI, University of Michigan, Ann Arbor, MI - SunRISE will consist of a constellation of cubesats operating as a synthetic aperture radio telescope to address the critical heliophysics problems of how solar energetic particles are accelerated and released into interplanetary space.

Handling of Proprietary Data

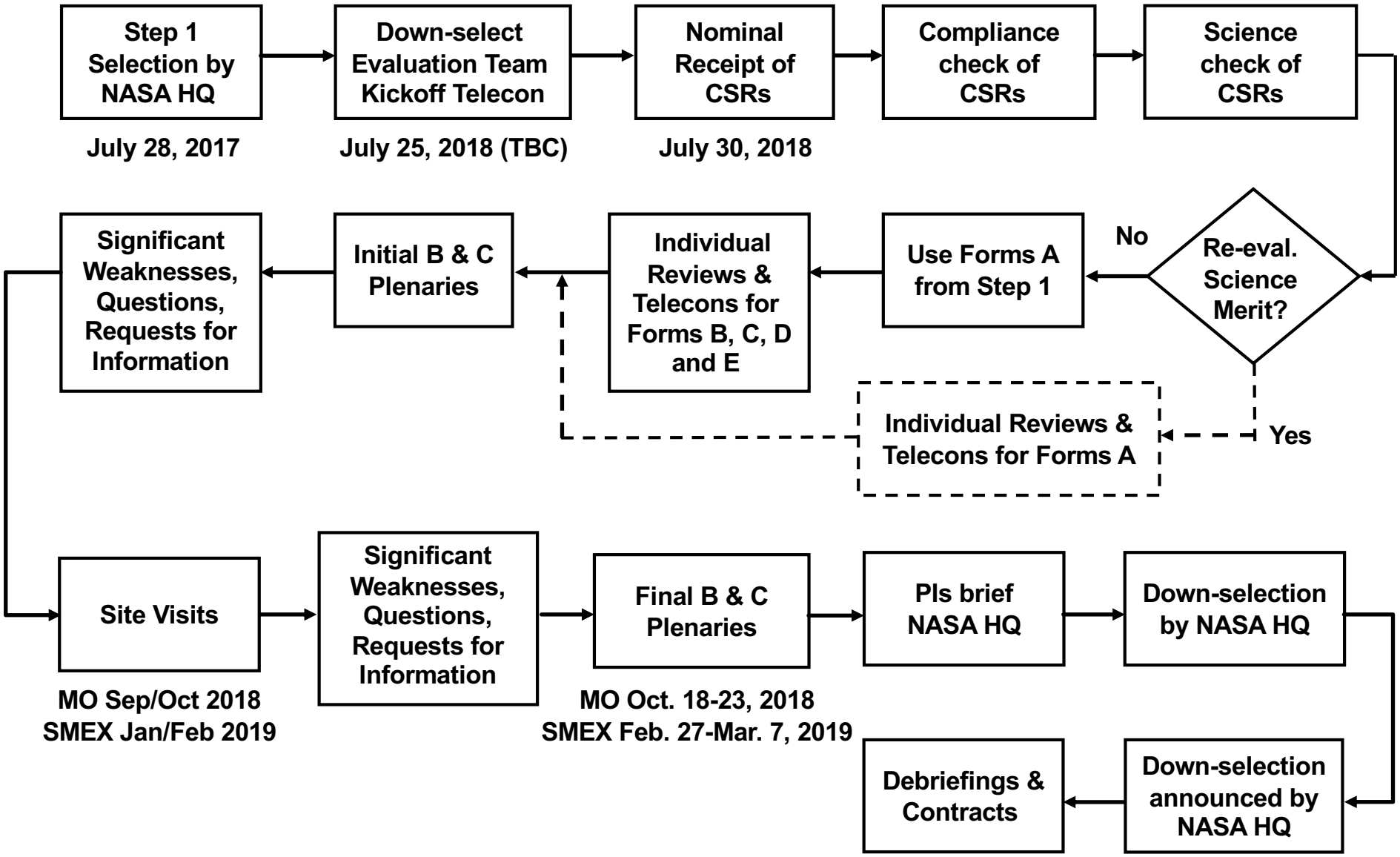
- All CSR related materials will be considered proprietary.
- Only those individuals with a need to know will be allowed to view CSR materials.
- Each non-Civil Servant (CS) or non-Intergovernmental Personnel Act (IPA) Assignee Evaluator will sign a NASA Non-Disclosure Agreement (NDA) which must be on file with NASA Research and Education Support Services (NRESS) prior to any CSRs being distributed to that evaluator.
  - CS and IPA Evaluators are not required to sign an NDA.
- All Report Materials in hardcopy format will be numbered and controlled, and a record will be kept of who has been supplied with what materials, both electronic and hardcopy.
- Evaluators and Observers will be briefed at a Kickoff telecon on how to handle the CSR material. Evaluators will be briefed that they are not allowed to discuss CSRs with anyone outside the Evaluation Panels <u>ever</u>. Evaluators will be briefed to not contact anyone outside of their Evaluation Panel to gain insight on any CSR related matter without expressly getting authorization from the Heliophysics Explorers Program Scientist (Dr. Dan Moses), or the Technical, Management, and Cost (TMC) Panel Chair (Dr. Chauncey Wu) <u>in advance</u> of making the contact.

Handling of Proprietary Data (continued)

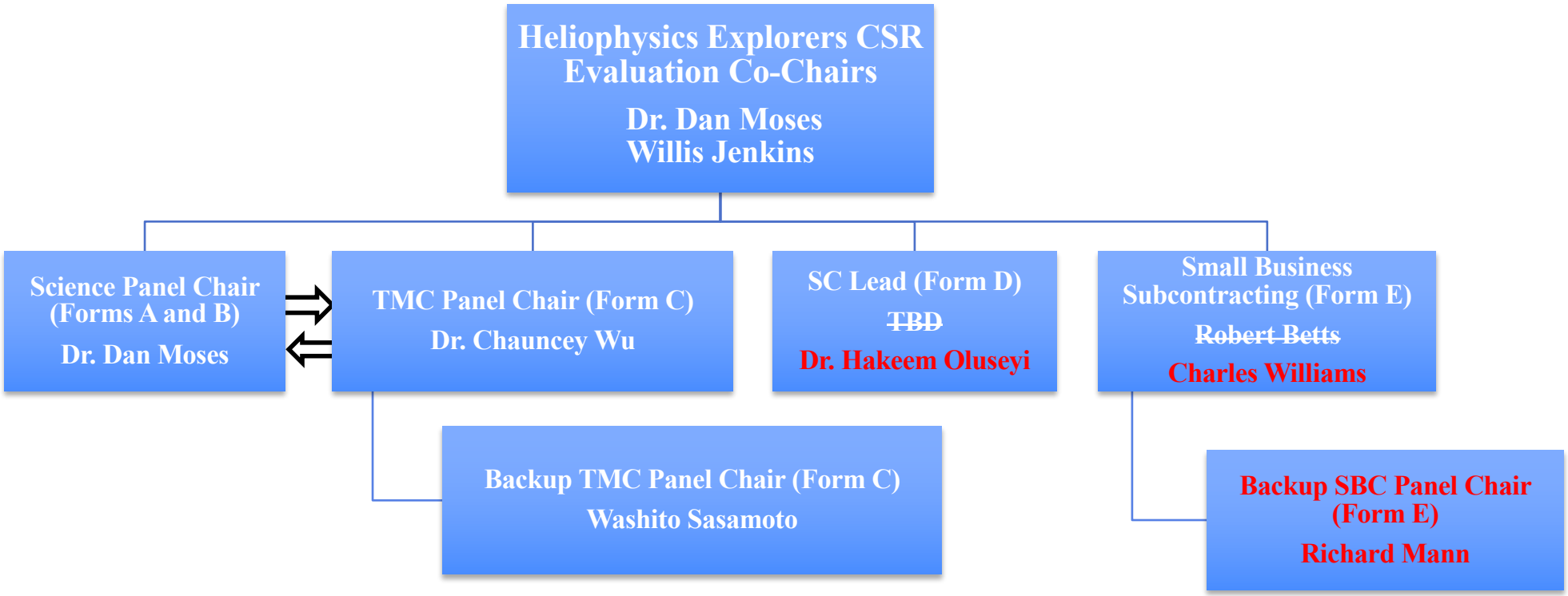
- During the Evaluation, all proprietary information that needs to be exchanged between evaluators will be transferred securely via the Remote Evaluation System (RES) website maintained by SOMA, via the ScienceWorks system maintained by SMD, via controlled WebEx, via NASA's Large File Transfer capability, or via encrypted email, parcel post, fax, or regular mail. Proprietary information will not be sent via unencrypted email.
- Telecon line information is confidential. The phone numbers and pass codes are posted in a file on the Remote Evaluation Site (RES). Participants will be briefed to ensure they do not provide this information to anyone or distribute this information via email.
- When the evaluation process is complete, CSR materials will be collected. Some copies (for archival purposes) will be maintained in the NRESS and SOMA vaults. Also, some CSR material from the down-selected mission(s) will be provided to the Explorers Program Office at GSFC. All other CSR materials will be destroyed.
- Evaluators' electronic and paper evaluation materials will be deleted/destroyed when the evaluation process is complete. Archival copies will be maintained in the NASA Science Office for Mission Assessments (SOMA) vault.

CSR Evaluation Flow
Heliophysics Explorers

2016 Heliophysics Explorers AO CSR Evaluation Plan



Organization
Heliophysics Explorers



Plan to Avoid Conflicts of Interest (COIs)

- Members of Evaluation Panels are cross checked against the draft list of organizations and individuals provided by the study teams to ensure no individual or organizational COI exists with the planned evaluators. Evaluators are required to raise any potential COIs.
- After the Concept Study Reports (CSRs) are received, all members of the Evaluation Panels will be cross checked against the final lists of organizations and individuals to ensure no individual or organizational COI exists on the list of evaluators.
- In addition, all evaluators will review the final list of conflicted organizations and individuals. They will be required to divulge whether they have any financial, professional, or personal potential conflicts of interest and whether they work for a profit making company that directly competes with any profit making proposing organization.
- Any potential COI issue is discussed with the Heliophysics Program Scientist and the SMD Deputy Associate Administrator for Research, and documented in the 2016 Heliophysics Explorers Down-select COI Mitigation Plan.
- All Civil Service evaluators will self-certify their COI status by reviewing a combined listing of individuals and organizations associated with the CSRs. The TMC evaluators must notify the SOMA Acquisition Manager, Dr. Chauncey Wu, in case there is a potential conflict. The Science evaluators must notify the Science Panel evaluation manager, Dr. Dan Moses, in case of a potential conflict.

Plan to Avoid COIs (continued)

- If any evaluators with potential organizational COI must be used, their respective organizations must submit a plan, as required by their contract or SMD waiver, addressing the Conflict of Interest and Mitigation Plan. This plan will outline how they will firewall the potentially conflicted evaluator(s) during the evaluation process from the conflicted part of their organization.
- If during the evaluation there is any actual conflict of interest noted, the conflicted member(s) will be notified to stop reviewing CSRs immediately and the Heliophysics Explorers Program Scientist will be notified. Steps will be expeditiously taken to remove any actual or potential bias imposed by the conflicted member(s).
- Community standards for conflicts of interest will be applied to all evaluators as directed in SMD Policy Document SPD-01A, *Handling Conflicts-of-Interest for Peer Reviews*. Standards for financial conflicts of interest as specified in 18 U.S.C. § 208 will be applied to Civil Servant evaluators. The HQ Office of General Counsel will be consulted as necessary.

Evaluation Criteria and Additional Selection Factors

- The Criteria to Evaluate the Concept Study Reports are documented in the 2016 HELIOPHYSICS EXPLORER GUIDELINES AND CRITERIA FOR THE PHASE A CONCEPT STUDY at:
  http://explorers.larc.nasa.gov/HPSMEX/SMEX/programlibrary.html and
  http://explorers.larc.nasa.gov/HPSMEX/MO/programlibrary.html
- Evaluation criteria for the Concept Study: approximate significance of each criterion is indicated by the percent weighting.
  - Criterion A: Scientific Merit of the Investigation (will not be re-evaluated unless it is determined that the science has changed from that described in the Step 1 proposal) (approx. 25%)
  - Criterion B: Scientific Implementation Merit and Feasibility of the Investigation (approx. 20%)
  - Criterion C: TMC Feasibility of Mission Implementation, Including Cost Risk (approx. 50%)
  - Criteria D and E: Quality of plans for small business subcontracting, and optional Student Collaboration (SC), if proposed (approx. 5% combined)
- Additional selection factors
  - NASA budget changes and/or other programmatic factors, including but not limited to changes in scientific mandates, national priorities, and budgetary forecasts that were not evident when the Helio AO and PEA Q were issued. The PI-Managed Mission Cost, as well as other programmatic factors, may be additional selection factors.

Evaluation Criterion A

- **Scientific Merit of the Investigation** - The Heliophysics Explorers Program Scientist will determine whether any issues that may have emerged in the course of the concept study have effected significant changes to the science objectives or other aspects of the proposed Baseline and Threshold Science Missions (see Requirement CS-17 in Part II of the 2016 HELIOPHYSICS EXPLORER GUIDELINES AND CRITERIA FOR THE PHASE A CONCEPT STUDY) in such a manner as to have impacted the basis for the evaluation of the scientific merit of the investigation as determined by the peer review panel for the Step 1 proposal. If there are no significant changes to the proposed investigation that undermine the basis of this rating, the peer review panel rating for scientific merit of the Step 1 proposal will be the rating for scientific merit of the CSR. If there are significant changes, the Heliophysics Explorers Program Scientist will convene a peer review panel to re-evaluate the scientific merit of the objectives in light of these changes. The factors for re-evaluating this criterion will be the same as those used for the Step 1 proposal review (Section 7.2.2 of the Helio AO or Section 6.1 of the PEA Q).

Evaluation Criterion B

- **Scientific Implementation Merit and Feasibility of the Investigation** - All of the factors defined in Section 7.2.3 of the AO or Section 6.1 of the PEA Q also apply to the evaluation of the CSR. For missions of opportunity, "mission" should be replaced with "investigation," as applicable. Note that details have been added to one of the subfactors of Factor B-1, Merit of the instruments and mission design. Also, an additional subfactor has been added to Factor B-2, Probability of technical success.
  - Factor B-1. **Merit of the instruments and mission design for addressing the science goals and objectives**. This factor includes the degree to which the proposed mission will address the goals and objectives; the appropriateness of the selected instruments and mission design for addressing the goals and objectives; the degree to which the proposed instruments and mission can provide the necessary data, including details on data collection strategy and plans; and the sufficiency of the data gathered to complete the scientific investigation.

Evaluation Criterion B (continued)

- Factor B-2. **Probability of technical success**. This factor includes the maturity and technical readiness of the instruments or demonstration of a clear path to achieve necessary maturity; the adequacy of the plan to develop the instruments within the proposed cost and schedule; the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks; the likelihood of success in developing any new technology that represents an untested advance in the state of the art; the ability of the development team - both institutions and individuals - to successfully implement those plans; and the likelihood of success for both the development and the operation of the instruments within the mission design. This factor includes assessment of technology readiness, heritage, environmental concerns, accommodation, and complexity of interfaces for the instrument design.
- Factor B-3. **Merit of the data analysis, data availability, and data archiving plan**. This factor includes the merit of plans for data analysis and data archiving to meet the goals and objectives; to result in the publication of science discoveries in the professional literature; and to preserve data and analysis of value to the science community. Considerations in this factor include assessment of planning and budget adequacy and evidence of plans for well-documented, high-level data products and software usable to the entire science community; assessment of adequate resources for physical interpretation of data; reporting scientific results in the professional literature (*e.g.*, refereed journals); and assessment of the proposed plan for the timely release of the data to the public domain for enlarging its science impact.

Evaluation Criterion B (continued)

- Factor B-4. **Science resiliency**. This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Science Mission to the Threshold Science Mission in the event that development problems force reductions in scope. Operational resiliency includes the ability to withstand adverse circumstances, the capability to degrade gracefully, and the potential to recover from anomalies in flight.
- Factor B-5. **Probability of science team success**. This factor will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The role of each Co-Investigator (Co-I) will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is who do not have a well defined and appropriate role may be cause for downgrading of the CSR evaluation.
- Factor B-6. **Merit of any Science Enhancement Options (SEOs), if proposed**. This factor includes assessing the appropriateness of activities selected to enlarge the science impact of the mission; the potential of the selected activities to enlarge the science impact of the mission; and the appropriate costing of the selected activities. The peer review panel will inform NASA whether the evaluation of the proposed SEO(s) impacted the overall rating for scientific implementation merit and feasibility. Lack of an SEO will have no impact on the CSR's overall rating for scientific implementation merit and feasibility.

Evaluation Criterion B (continued)

- Factor A-3 of the AO or the SALMON-2 AO will also be re-evaluated as a factor for Scientific Implementation Merit and Feasibility; it has been renumbered as Factor B-7.
  - Factor B-7. **Likelihood of scientific success**. This factor includes how well the anticipated measurements support the goals and objectives; the adequacy of the anticipated data to complete the investigation and meet the goals and objectives; and the appropriateness of the mission requirements for guiding development and ensuring scientific success.

Evaluation Criterion B (continued)

- A new evaluation factor that is not described in the Helio AO or the PEA Q, and therefore was not evaluated for Step 1 proposals, will also be included. This Factor B-8 below will be evaluated for the CSRs in addition to the factors specified in Section 7.2.3 of the Helio AO or Section 6.1 of the PEA Q (repeated or updated above as Factors B-1 through B-7).
  - Factor B-8. **Maturity of proposed Level 1 science requirements and Level 2 project requirements**. This factor includes assessment of whether the Level 1 requirements are mature enough to guide the achievement of the objectives of the Baseline Science Mission and the Threshold Science Mission, and whether the Level 2 requirements are consistent with the Level 1 requirements. The CSR will be evaluated for whether the requirements are stated in unambiguous, objective, quantifiable, and verifiable terms that do not conflict. The CSR will be evaluated for the adequacy, sufficiency, and completeness of the Level 1 and Level 2 requirements, including their utility for evaluating the capability of the instruments and other systems to achieve the mission objectives. The stability of the Level 1 science requirements and Level 2 project requirements will be assessed including whether the requirements are ready, upon initiation of Phase B, to be placed under configuration control with little or no expected modifications for the lifecycle of the mission.

Evaluation Criterion C

- **TMC Feasibility of the Mission Implementation, Including Cost Risk** - All of the factors defined in Section 7.2.4 of the Helio AO or Section 6.1 of the PEA Q apply to the evaluation of the CSR. All of these factors are interpreted as including an assessment as to whether technical, management, and cost feasibility are at least at a Phase A level of maturity.
- Note that the risk management aspects of Factor C-4, Adequacy and robustness of the management approach and schedule, including the capability of the management team, have been removed from Factor C-4 and included in a new evaluation factor, Factor C-6, Adequacy of the risk management plan.

Evaluation Criterion C (continued)

- Factor C-1. **Adequacy and robustness of the instrument implementation plan**. The maturity and technical readiness of the instrument complement will be assessed, as will the ability of the instruments to meet mission requirements. This factor includes an assessment of the instrument design, accommodation, interface, heritage, and technology readiness. This factor includes an assessment of the instrument hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of the instrument complement. This factor also includes adequacy of the plans for instrument systems engineering and for dealing with environmental concerns. This factor includes an assessment of plans for the development and use of new instrument technology, plans for advanced engineering developments, and the adequacy of backup plans to mature systems within the proposed cost and schedule when technologies having a TRL less than 6 are proposed.

Evaluation Criterion C (continued)

– Factor C-2. **Adequacy and robustness of the mission design and plan for mission operations**. This factor includes an assessment of the overall mission design and mission architecture, the spacecraft design and design margins (including margins for launch mass, delta-V, and propellant), the concept for mission operations (including communication, navigation/tracking/trajectory analysis, and ground systems and facilities), and the plans for launch services (including the approach the PI will utilize to make the flight worthiness determination if proposing non-NASA launch services, ensuring the adequacy of the technical work performed by the launch provider). This factor includes mission resiliency – the flexibility to recover from problems during both development and operations – including the technical resource reserves and margins, system and subsystem redundancy, and reductions and other changes that can be implemented without impact to the Baseline Science Mission. (*n.b.*, this factor will be applied only to the extent that it is appropriate for the MO concept studies).

Evaluation Criterion C (continued)

- Factor C-3. **Adequacy and robustness of the flight systems**. This factor includes an assessment of the flight hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, *etc.*). This factor includes an assessment of the adequacy of the plans for spacecraft systems engineering, qualification, verification, mission assurance, launch operations, and entry/descent/landing. This factor includes the plans for the development and use of new technology, plans for advanced engineering developments, and the adequacy of backup plans to ensure success of the mission when technologies having a TRL less than 6 are proposed. The maturity and technical readiness of the spacecraft, subsystems, and operations systems will be assessed. The adequacy of the plan to mature systems within the proposed cost and schedule, the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks, and the likelihood of success in developing any new technologies will be assessed.

Evaluation Criterion C (continued)

- Factor C-4. **Adequacy and robustness of the management approach and schedule, including the capability of the management team.** This factor includes: the adequacy of the proposed organizational structure and WBS; the management approach including project level systems engineering; the roles, qualifications, and experience of the PI, PM, Project Systems Engineer (PSE), other named Key Management Team members, and implementing organization, mission management team, and known partners against the needs of the investigation; the commitments of partners and contributors; and the team's understanding of the scope of work covering all elements of the mission, including contributions. This factor also includes assessment of elements such as the relationship of the work to the project schedule, the project element interdependencies, the associated schedule margins, and an assessment of the likelihood of meeting the proposed launch readiness date. Also evaluated under this factor are the proposed project and schedule management tools to be used on the project, along with the small business subcontracting plan including small disadvantaged businesses.

- **If tailoring of program and project management requirements is proposed, evaluators will comment on the CSR team's justification for that tailoring, but will not consider it a part of the risk rating.**

Evaluation Criterion C (continued)

- Factor C-5. **Adequacy and robustness of the cost plan, including cost feasibility and cost risk**. This factor includes elements such as cost, cost risk, cost realism, and cost completeness including assessment of the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work (covering all elements of the mission, including contributions and all elements associated with a non- NASA launch or rideshare provider, such as launch site payload processing and mission unique services). The adequacy of the cost reserves will be evaluated; understanding of the cost risks (including those associated with launch delay and/or launch opportunity uncertainty) will be assessed. This factor also includes an assessment of the proposed cost relative to estimates generated using parametric models and analogies. Also evaluated under this factor are the proposed cost management tools to be used on the project.

Evaluation Criterion C (continued)

- The following evaluation factor has been removed as a subset of Factor C-4 described in the Helio AO or the PEA Q and has been revised for the evaluation of the CSR.
  - Factor C-6. **Adequacy of the risk management plan.** The adequacy of the proposed risk management approach will be assessed, including any risk mitigation plans for new technologies; any non-NASA launch delay, cancellation, and the risk of mission failure attributed to the launch service; any long-lead items; and the adequacy and availability of any required manufacturing, test, or other facilities. The approach to any proposed descoping of mission capabilities will be assessed against the potential science impact to the proposed Baseline Science Mission. The plans for managing the risk of contributed critical goods and services will be assessed, including the plans for any international participation, the commitment of partners and contributors, as documented in Letters of Commitment, and the technical adequacy of contingency plans, where they exist, for coping with the failure of a proposed cooperative arrangement or contribution; when no mitigation is possible, this should be explicitly acknowledged. The stability and reliability of proposed partners, and the appropriateness of any proposed contribution, is not assessed as a management risk but will be assessed by SMD as a programmatic risk element of the investigation.

Evaluation Criterion C (continued)

- The following are new evaluation factors that are not described in the Helio AO or the PEA Q and were not evaluated for Step 1 proposals. These will be evaluated for the CSRs in addition to the factors given in Section 7.2.4 of the Helio AO or Section 6.1 of the PEA Q (repeated or updated above as Factors C-1 through C-6).
  - Factor C-7. **Ground systems**. This factor includes an assessment of the proposed mission operations plans, facilities, hardware and software, processes, and procedures.
  - Factor C-8. **Approach and feasibility for completing Phase B**. The completeness of Phase B plans and the adequacy of the Phase B approach will be assessed. This assessment will include evaluation of the activities/products, the organizations responsible for those activities/products, and the schedule to accomplish the activities/products.
- For the purposes of the CSR, investigation teams are not required to hold reserves against Government Furnished Equipment (GFE) such as a NASA-provided launch service. They should assume the Government will deliver as promised on factors such as Launch Vehicle performance and schedule. The Government is holding separate reserves on its promises.

Evaluation Criterion D

- **Overall Merit of Student Collaboration (SC), if proposed** - The following is a new evaluation factor that is not described in the Helio AO or the PEA Q and therefore was not evaluated for Step 1 proposals. This factor will be evaluated for CSRs.
  - This factor will include an assessment of whether the scope of the SC follows the guidelines in Section 5.5.3 of the Helio AO or Section 5.7.2 of the SALMON-2 AO. The criteria to be used to evaluate the SC component and a discussion of those criteria are described in the document *Explanatory Guide to the NASA Science Mission Directorate Educational Merit Evaluation Factors for Student Collaboration*, which can be found in the Program Libraries.
  - For full missions proposed against the Helio AO, there is no minimum and no maximum allowable cost for a SC. NASA is providing a student collaboration incentive that is defined to be 1% of the PI-Managed Mission Cost. The proposed cost of the SC, up to the student collaboration incentive, is considered outside of the PI-Managed Mission Cost. If the SC costs more than the student collaboration incentive, then the rest of the cost of the SC must be within the PI-Managed Mission Cost.

Evaluation Criterion E

- **Merit of the Small Business Subcontracting Plans** - The following is a new evaluation factor that is not described in the Helio AO or the PEA Q and therefore was not evaluated for Step 1 proposals. This factor will be evaluated for CSRs.
  - This factor will be evaluated on the participation goals and quality and level of work performed by small business concerns overall, as well as that performed by the various categories of small business concerns listed in FAR 52.219-9, except for Small Disadvantaged Businesses (SDBs). Offerors will separately identify, and will be evaluated on, participation targets of SDBs in North American Industry Classification System (NAICS) codes determined by the Department of Commerce to be under-represented industry sectors.

CSR Evaluation Panel Products

- Form A (if necessary) and Form B for all CSRs
  - Grades: Excellent, Very Good, Good, Fair, or Poor
  - Polling is held for the 5 categories above
  - The reported Science grade reflects the median
- Form C for all CSRs
  - Grades: Low, Low/Medium, Medium, Medium/High, or High
  - Note half-grades (e.g., Low/Medium, etc.) are allowed
  - Polling is held for the 5 categories above
  - The reported Risk Rating grade reflects the median
- Form D (Student Collaboration) if proposed
  - Separable from the main mission: Yes, or No
  - Grades: Meritorious, or Not Meritorious
- Form E (Small Business Subcontracting Plans)
  - Grades: Acceptable, or Needs Work

Grade Definitions - Forms A and B

- Form A and B Grade Definitions
  - **Excellent**: A comprehensive, thorough, and compelling CSR of exceptional merit that fully responds to the objectives of the Helio AO as documented by numerous and/or significant strengths and having no major weaknesses.
  - **Very Good**: A fully competent CSR of very high merit that fully responds to the objectives of the Helio AO, whose strengths fully outbalance any weaknesses.
  - **Good**: A competent CSR that represents a credible response to the Helio AO, having neither significant strengths nor weakness and/or whose strengths and weaknesses essentially balance.
  - **Fair**: A CSR that provides a nominal response to the Helio AO, but whose weaknesses outweigh any perceived strengths.
  - **Poor**: A seriously flawed CSR having one or more major weaknesses (*e.g.*, an inadequate or flawed plan of research, or lack of focus on the objectives of the Helio AO).

Evaluators are polled on the grades defined above.

Definitions of Criterion A and B Findings

Major Strength: A facet of the response that is judged to be well above expectations and substantially contributes to the Science Implementation Merit and Feasibility of the Investigation.

Minor Strength: A strength that substantiates the Science Implementation Merit and Feasibility of the Investigation.

Major Weakness: A deficiency or set of deficiencies taken together that are judged to substantially detract from the Science Implementation Merit and Feasibility of the Investigation.

Minor Weakness: A weakness that detracts from the Science Implementation Merit and Feasibility of the Investigation.

Note: Unlike in Step 1, minor findings can influence risk ratings.

Science Feasibility Impact

- The Science Feasibility Impact of Criterion B Major Weaknesses will be considered.
  - Factors B-1 to B-7:
    "This weakness is anticipated to have a {small, modest, serious} impact on the ability of the proposed mission to achieve {some, all} of {one, several, all} science objective(s)."
  - Factor B-8:
    "This weakness is anticipated to have a {small, modest, serious} impact on the ability to measure progress of the proposed mission in achieving {some, all} of {one, several, all} science objective(s)."

- Goal is to be clear on the severity of a Criterion B Major Weakness.

Risk Ratings Definitions - Form C

The following definitions are indicators of risk. Evaluators must consider these definitions and input available for their consideration (e.g., cost model applicability, uncertainty of the cost models error bars and schedule analyses, uncertainty of the cost threats, mitigating factors such as major strengths, etc.) together with their judgement in determining the appropriate risk for a particular investigation.

Rating	Definition
Low Risk	Resources for technical, management, schedule, and cost are at or above the appropriate levels, with at least one resource significantly above, even after taking into account any problems that have been identified in the Phase A evaluation. No risks with unquantified cost threats* have been identified.
Low/Medium Risk	No problems have been identified in the Phase A evaluation that reduce the technical, management, schedule, and cost resources below the appropriate levels. Any identified risks with unquantified cost threats have a low probability of occurrence.
Medium Risk	Problems have been identified in the Phase A evaluation that reduce one of the resources slightly below the appropriate levels for: technical, management, schedule, or cost. Sound management and effective application of engineering resources will be required to solve the problems. Any identified risks with unquantified cost threats have a probability of occurrence that is not high.
Medium/High Risk	Problems have been identified in the Phase A evaluation that reduce one or more of the resources below the appropriate levels for: technical, management, schedule, and/or cost. The problems identified may not be solvable within the resources proposed, even with the use of sound management and effective application of engineering resources.
High Risk	Problems have been identified in the Phase A evaluation that reduce one or more of the resources significantly below the appropriate levels for: technical, management, schedule, and/or cost. The problems identified are deemed unsolvable within the resources proposed.

***Risks with unquantified cost threats** are defined in the grades above as those major weaknesses whose cost to fix cannot be quantified, but is large. The impacts of these risks are significant because they could lead to not achieving the baseline mission with the resources available.

Criterion C Panel Evaluation Principles

- Basic assumptions for Step 1:
  - Proposing team is the expert on their proposal.
  - Proposing team's task is to provide evidence that the project is Low Risk.
  - Criterion C Panel's task is to try to validate proposing team's assertion of Low Risk.
  - Proposing team given the benefit of the doubt.
- CSR Feasibility and Risk Assessment in Step 2:
  - Tasks are the same as for Step 1, but expectations are higher.
  - Study team's task is to provide evidence that the project is Low Risk.
  - Criterion C Panel's task is to try to validate study team's assertion of Low Risk.
  - **The study team <u>is not</u> given the benefit of the doubt in the down-select.**
- All CSRs will be reviewed to identical standards.
  - All CSRs shall receive same evaluation treatment in all areas.
- The Criterion C Panel is made up of evaluators who are subject matter experts in the areas of the CSRs that they evaluate.
- The Criterion C Panel develops findings for each CSR that are based on individual comments and reflect the general agreement of the entire panel.
  - Comments that are *as expected* are not included as findings. Comments that are *above expectations* result in strengths. Comments that are *below expectations* result in weaknesses.

Definitions of Criterion C Findings

Major Strength: A facet of the response that is judged to be well above expectations and can substantially contribute to the ability to meet technical commitments on schedule and within cost.

Major Weakness: A deficiency or set of deficiencies taken together that are judged to substantially affect the ability to meet the proposed technical objectives within the proposed cost and schedule.

Minor Strength: A strength that is substantial enough to be worthy of note and brought to the attention of study team in debriefings.

Minor Weakness: A weakness that is substantial enough to be worthy of note and brought to the attention of study team in debriefings.

Note: Unlike in Step 1, minor findings can influence risk ratings.

Cost Evaluation

- All information from the entire evaluation process will be considered in the final cost assessment.
- An independent cost verification of the proposed cost for Phases A-D will be performed using three independent cost models.
- An independent cost verification of the proposed cost for Phase E of Full Missions will be performed using at least one cost model.
- The evaluation will assess the cost risk, cost realism, and cost completeness, including the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work.
- The likelihood and cost impact of significant weaknesses and cost analysis findings will be assessed.
- Cost threat impacts to the proposed unencumbered reserves will be assessed (see Cost Threat Matrix slide 38).
- The adequacy of the remaining unencumbered reserves will be assessed.
- Draft Forms C and Cost Evaluation Summaries (CESs) will be completed on all CSRs prior to the Initial Form C Plenary.
- During the Form C Plenaries, the entire panel will participate in Cost deliberations.
- All significant Cost Findings will be included on the Form C and considered in the TMC Risk Rating.

Cost Threat Matrix

- The *likelihood* and *cost impact*, if any, of each weakness is stated as "This finding represents a cost threat assessed to have a Unlikely / Possible / Likely / Very Likely / Almost Certain likelihood of a Very Minimal / Minimal / Limited / Moderate / Significant / Very Significant cost impact being realized during development and / or operations, which results in a reduction from the proposed unencumbered reserves."
- The *likelihood* is the probability range that the *cost impact* will materialize.
- The *cost impact* is the current best estimate of the range of costs to mitigate the realized threat.
- The Cost Threat Matrix below defines the adjectives used to describe the *likelihood* and *cost impact*.
- Cost threats that are less than 1% of the Cost Impact are ignored.
- The minimum cost threat threshold for Phase E is set at $1M **for Full Missions, and $0.25M for MOs**.
- Each percentage in the CTM is converted to dollars according to the associated PI-Managed Mission Cost, on a CSR-by-CSR basis.

			Cost Impact (CI) **% of PI-Managed Mission Cost to complete Phases A/B/C/D, or** **% of Phase E cost, not including unencumbered cost reserves or contributions**					
	Likelihood of Occurrence	**Weakness**	**Very Minimal**	**Minimal**	**Limited**	**Moderate**	**Significant**	**Very Significant**
			1% ≤ CI ≤ 2.5%	2.5% < CI ≤ 5%	5% < CI ≤ 10%	10% < CI ≤ 15%	15% < CI ≤ 20%	CI > 20%
Likelihood (L, %)	Almost Certain (L > 80%)							
	Very Likely (60% < L ≤ 80%)							
	Likely (40% < L ≤ 60%)							
	Possible (20% < L ≤ 40%)							
	Unlikely (L ≤ 20%)							

Grade Definitions - Form D, Student Collaboration (SC)

- The merit of any Student Collaboration (SC) will be given a Yes/No grade and one of two adjectives: Meritorious, or Not Meritorious
  - **Is the SC separable from the main mission?** (Yes/No)
  - **Meritorious:** The student collaboration proposed has achievable education goals and objectives and an implementation/oversight/management approach that will provide students with a rich hands-on education experience.
  - **Not Meritorious:** The student collaboration proposed has not articulated achievable education goals and objectives and/or the implementation/oversight/management approach limits the likelihood of success for student's opportunities for hands-on experience.

Grade Definitions - Form E, Small Business Subcontracting (SBC)

- The merit of the Small Business Subcontracting Plans will be rated as either Acceptable, or Needs Work
  - **Acceptable**: The subcontracting plan adequately addresses all required elements of a subcontracting plan, and the proposed subcontracting percentage goals and the quality level of the work to be performed by small business concerns is sufficient.
  - **Needs Work**: The subcontracting plan does not address all required elements of a subcontracting plan, or the proposed subcontracting percentage goals and quality of work to be performed by small businesses is not sufficient, and further participation must be negotiated if this mission is selected.

Criteria B & C Panel Evaluation Processes

- Evaluation panel members review assigned CSRs and perform an individual review before discussing findings with other members of the panel.
- The SOMA Remote Evaluation System (RES) will be used for:
  - Entering individual evaluation panel member's comments for Criterion C.
  - Developing draft and final Forms C for each CSR.
  - A repository for all final Forms for the evaluation (Forms B, C, D, and E).
- The SOMA Remote Evaluation System (RES) will be used for:
  - Entering individual evaluation panel member's comments for Criterion B.
  - Developing draft and final Forms B for each CSR.
- Only Form C Evaluators that have participated in the Form C Initial Plenary, and the Form C Final Plenary, may participate in polling on Form C. Note that several Form B evaluators will also be designated as Form C evaluators by the Heliophysics Program Scientist.
  - Participation is defined as in person or via telecon.
  - Specialist Evaluators* are not polled.
- Only Form B Evaluators that have participated in the Form B Initial Plenary, and the Form B Final Plenary may participate in polling on Form B. Note that several Form C evaluators will also be designated as Form B evaluators by the Heliophysics Program Scientist.
  - Participation is defined as in person or via telecon.

* Specialist Evaluators (to provide special technical expertise to Criterion B/C/D/E Panels) and External/Mail-In Evaluators (to provide special science expertise to the Criterion B Panel) may be utilized, respectively, based on the specific technology and science that is proposed.

B & C Panel Evaluation Processes (continued)

- Consistency Review for Form C findings and Form B findings.
  - Form C consistency
    - A Form C Consistency Group will review all Form Cs and questions at the Initial Plenary, and all Form Cs at the Final Plenary.
    - Form C Evaluators will review all CSRs for Full Missions, Missions of Opportunity, or both. Specialist Evaluators may review a subset of CSRs for Full Missions, Missions of Opportunity, or both.
  - Form B consistency
    - Form B Consistency Checker(s) will review all Form Bs and questions at the Initial Plenary, and all Form Bs at the Final Plenary.
  - Form B and Form C consistency
    - At least one Form B Evaluator for each CSR will participate in the Form C discussions for each mission at the plenary meetings
    - Some Form C instrument experts will participate in Form B discussions.
    - Consistency of findings between Forms B and C will be reviewed and adjudicated at the Initial and Final Plenaries.

Initial Plenary

- The Initial Plenary is used to identify significant issues related to Criterion B and Criterion C based on the initial evaluation of the CSR. Initial Form Bs and Cs are reviewed.
- The Goal of the Initial Plenary is:
  1. Identify the Major Weakness, Minor Weaknesses, Major Strengths and Minor Strengths of each CSR.
  2. If necessary, develop questions and/or requests for information in addition to the Significant Weaknesses to give each study team an opportunity to clarify any misunderstanding.
- The main topic areas are the implementation issues in Criterion B and Criterion C.
- No polling on grades occurs at the Initial Plenary (Criterion B and Criterion C)
- A Significant Weaknesses, Questions, and Requests for Information List will be sent to each Study Team 6 days prior to its Site Visit.
- Criterion D (Student Collaboration) and Criterion E (Small Business Subcontracting) are reviewed as required by Criterion-specific panels prior to the Initial Plenary. Site Visit questions are prepared and provided no later than the Initial Plenary to the Heliophysics Explorers Program Scientist.

Significant Weaknesses, Questions, and Requests for Information List (SQRL)

- Significant Weaknesses, Questions, and Requests for Information List (SQRL)
  - A SQRL developed at the Initial Plenary will be sent to each Study Team 6 days prior to its Site Visit.
  - The SQRL is preliminary and may change based on Site Visit information and further discussion by Evaluation Panels.
  - Questions may also be sent to the study team or verbalized during the Site Visit.
  - Questions must be of significance to a Form A, B, C, D, or E rating.
- The Heliophysics Explorers Program Scientist will approve the SQRL developed at the Initial Plenary. Three types of responses to a SQRL are planned. These types may be combined for a given SW, Question, or RFI.
  - Written response prior to Site Visit: SWs, Questions, or RFIs provided to the Study team that must be addressed in writing prior to the Site Visit. The nature of some SWs, Questions, or RFIs require data that must be reviewed prior to the Site Visit.
  - Written response at Site Visit: SWs, Questions, or RFIs that require documentation, but not extensive review.
  - Oral presentation at Site Visit: SWs, Questions, or RFIs that must be addressed the day of the Site Visit by way of presentation.
- Evaluation Team members may ask questions during the Site Visit to ensure they understand the response to a SW, Question, or RFI, or to clarify any significant issues.

Site Visits

- Site Visits with Oral Briefings will be used to clarify implementation details and commitments. The Study Team may addresses weaknesses identified in the Concept Study, and provide updates on the Concept Study developed after submission of the Concept Study Report.
- Any additional information provided to NASA by the investigation team at the Site Visit, in response to the NASA-identified weaknesses and questions, or in response to NASA requests for additional information, will be treated as updates and clarifications to the CSR.
- Site Visit locations and dates are negotiated with the PI.
- Briefings at each Site Visit will be limited to 7 hours with 1 additional hour for a site tour, 15 additional minutes for SC if necessary, 1 hour for lunch, and 15 minute breaks in the morning and afternoon. Suggest a schedule of 8:30 a.m. – 6:00 p.m. (or 6:15 p.m. if SC is submitted)
- All Site Visit presentations/briefings should be in a plenary session with all Evaluation Team members attending – no splinter sessions – unless authorized by the Heliophysics Explorers Program Scientist or TMC Panel Chair.
- A written Significant Weaknesses, Questions, and Requests for Information List (SQRL) will be submitted to the PI 6 days before the Site Visit. All teams will have the same lead time.
- NASA may send additional SQRLs to Study Teams the day after their respective Site Visits, and possibly during the Final Plenaries (October 18-23, 2018 for the MOs, and February 27-March 7, 2019 for the SMEXes), if necessary to resolve any issue or clear up potential misunderstandings. Responses will typically be due within 4 days for the former, and within 24 hours for the latter.
- All information provided by the Study Team is relevant to the evaluation. Information contained in the CSR, information presented during the Site Visit; and information provided in response to SQRLs will all be considered during the evaluation.

Final Plenary Products

- Finalize all evaluation Forms based on the information in the CSRs and clarifications.
- Both Major and Minor Strengths and Weakness will be considered in the Grade for all Forms.
  - Form B
    - Polling will be held twice on the Form B grade. The final polling is recorded and reported. For the final polling, the individual grades are recorded and the median grade is calculated and recorded as the final polling. A median score that falls between two defined grades will be reported as the combination of those two grades (e.g., 10 Good votes and 10 Fair votes = Good/Fair grade).
    - If there is a divergence of opinion, there may be additional rounds of discussion and polling.
    - Significant Weaknesses, Questions, and/or Requests for Information generated during the Final Plenary may result in additional rounds at or after the Final Plenary.
  - Form C
    - Form C will be reviewed three times. Polling will be held twice on the Form C risk rating. The final polling is recorded and reported. For the final polling, the individual grades are recorded, the median calculated and the final grade recorded which reflects the Form C risk rating of the median of the polling. A median score that falls between two risk ratings will be “rounded” to the higher risk rating.
    - If there is a divergence of opinion, there may be additional rounds of discussion and polling.
    - SWs, Questions, and/or RFIs generated during the Final Plenary may result in additional rounds at or after the Final Plenary.
  - Form D, Student Collaboration (if necessary)
    - Representatives from the SC Panel will consider the Merit of any proposed Student Collaboration.
  - Form E, Small Business Subcontracting
    - LaRC Small Business Office will evaluate this factor.

Observers and Transition Briefing

- The SMD Deputy Associate Administrator for Research may invite Civil Servants, Intergovernmental Personnel Act Assignees, and Contractors with downstream implementation responsibilities to participate as observers to panel meetings and Site Visits.
  - Observers must comply with SMD Policy Document SPD-17, *Statement of Policy on Observers at Panel Reviews of Proposals*. This policy will be provided to all approved observers.
  - Invited Observers: Nick Chrissotimos, Greg Frazier, and Christine Hinkle (all Explorers Program Office); are invited due to their positions in organizations which will oversee implementation of the down-selected mission(s). Their participation as Observers will provide early knowledge of any potential implementation challenges for the down-selected mission(s).
- After down-selection is announced, a Transition Briefing will be provided by a subset of the Evaluation Team to Civil Servants and Intergovernmental Personnel Act Assignees at NASA Headquarters (including OCE, OSMA, and OCFO personnel) and in the Explorers Program Office who have implementation responsibilities.