EARTH SYSTEM EXPLORERS

National Aeronautics and Space Administration

NASA

Earth System Explorers Program (ESEP)
2023 Earth System Explorers (ESE)
NNH23ZDA016O

Concept Study Report (CSR)

Evaluation Plan

June 12, 2025

Outline

Approval

Tony Tyler / Dr. Waldo Rodriguez / Renee Lake/ Omar Torres/ Dr. Joe McKenney
Acquisition Managers, Science Office for Mission Assessments

Dr. Cindy Daniels
Director, Science Office for Mission Assessments

Dr. Thorsten Markus
Program Scientist
Earth Science Division, SMD

Eric McVay
Program Executive
Earth Science Division, SMD

Dr. Karen St. Germain
Director
Earth Science Division, SMD

Dr. Michael New
Deputy Associate Administrator for Research, SMD

Approvals recorded in the NASA Partnership Agreement Maker (PAM) system

Introduction

Introduction

- The Explorers Program is the oldest continuous program in NASA. It comprises a longstanding series of space science missions that are independent but share a common funding and NASA oversight/ insight management structure. Initiated with the Explorer 1 launch in 1958 and including the Nobel Prize-yielding Uhuru and Cosmic Background Explorer (COBE) missions, the Explorers Program has launched over 100 missions.
- The Earth System Explorers Program (ESEP) leverages the Explorer Program model to implement MIDEX-caliber, category 2, Class C, Earth science missions.
- The goal of NASA's Earth System Explorers (ESE) is to enable high-quality Earth system science investigations by developing missions that take measurements of one or more observables identified as Earth System Explorers Targeted Observables (TO) in the *2017 Decadal Survey for Earth Science and Applications from Space*.
- The purpose of this evaluation plan is to define the ground rules, processes, organizations, and schedules to be used in evaluating the 2023 ESE Concept Study Reports (CSRs).
- Four investigations 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 7120.5F, *NASA Spaceflight Program and Project Requirements.*

$5M (FY24) and 12 months (post-kickoff) are allocated for each 2023 Earth System Explorers (ESE) Concept Study selected in Step 1.

Evaluation Plan Overview

- The 2023 ESE Announcement of Opportunity (AO) NNH23ZDA016O, under which the investigations to be evaluated were selected, was issued on May 2, 2023 and amended on July 14, 2023.
- The Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LaRC) developed this 2023 ESE Concept Study Report (CSR) Evaluation Plan for the Science Mission Directorate (SMD) at NASA Headquarters.
- This 2023 ESE CSR Evaluation Plan has been cleared for public release by SMD.
- The 2023 ESE Program Scientist is responsible for validating all evaluation processes, responsibility assignments, assumptions, and ground rules.
- Four ESE investigations were selected for competitive Phase A concept studies. These four missions are Class C.

Selected Investigations

The Carbon Investigation (Carbon-I)

PI: Dr. Christian Frankenberg, California Institute of Technology, Pasadena CA

This investigation would enable simultaneous, multi-species measurements of critical greenhouse gases and potential quantification of ethane – which could help study processes that drive natural and anthropogenic emissions. The mission would provide unprecedented spatial resolution and global coverage that would help us better understand the carbon cycle and the global methane budget.

Selected Investigations

Earth Dynamics Geodetic Explorer (EDGE)

PI: Dr. Helen Amanda Fricker, University of California, San Diego CA

This mission would observe the three-dimensional structure of terrestrial ecosystems and the surface topography of glaciers, ice sheets, and sea ice as they are changing in response to climate and human activity. The mission would provide a continuation of such measurements that are currently measured from space by ICESat-2 and GEDI (Global Ecosystem Dynamics Investigation).

Selected Investigations

The Ocean Dynamics and Surface Exchange with the Atmosphere (ODYSEA)

PI: Dr. Sarah Gille, University of California, San Diego CA

This satellite would simultaneously measure ocean surface currents and winds to improve our understanding of air-sea interactions and surface current processes that impact weather, climate, marine ecosystems, and human wellbeing. It aims to provide updated ocean wind data in less than three hours and ocean current data in less than six hours.

Selected Investigations

The Stratosphere Troposphere Response using Infrared Vertically-Resolved Light Explorer (STRIVE)

PI: Dr. Lyatt Jaegle, University of Washington, Seattle WA

This mission would provide daily, near-global, high-resolution measurements of temperature, a variety of atmospheric elements, and aerosol properties from the upper troposphere to the mesosphere – at a much higher spatial density than any previous mission. It would also measure vertical profiles of ozone and trace gasses needed to monitor and understand the recovery of the ozone layer – another identified NASA Earth sciences target.

EARTH SYSTEM EXPLORERS

National Aeronautics and Space Administration

NASA

Handling of Proprietary Data and Avoiding COIs

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 evaluator who is not a Civil Servant (CS) or Intergovernmental Personnel Act (IPA) Assignee will sign a NASA Non-Disclosure Agreement (NDA) which must be on file with the NASA Research and Education Support Services (NRESS) Contractor, or the Evaluations, Assessments, Studies, Services, and Support 3 (EASSS 3) Contractor prior to any CSRs being distributed to that evaluator.
- CS and IPA evaluators are under statutory obligations and are not required to sign an NDA.
- A record will be kept of who has been supplied with what materials.
- Evaluators will be briefed at a Kickoff web conference 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 ever, unless authorized by NASA. Evaluators will be briefed to not contact anyone outside of the Evaluation Panels to gain insight on any CSR-related matter without express authorization from the 2023 ESE Program Scientist (Dr. Thorsten Markus). If authorized by the Program Scientist, the SMD Deputy AA for Research should be notified.

Handling of Proprietary Data (continued)

- SMD Policy Document SPD-17 detailing Observers at Review Panels will be followed. Observers will not have access to CSRs or evaluation materials.
- 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 NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), via the SMD's Sharepoint system, via controlled WebEx, via NASA's Box, or via encrypted email, parcel post, fax, or regular mail. Proprietary information will not be sent via unencrypted email.
- Virtual meeting information is confidential. The meeting numbers and pass codes are posted in a file on the RES or on NASA Box. Participants will be briefed to ensure they do not provide this information to anyone or distribute this information via unencrypted email or text messages.
- When the evaluation process is complete, CSR and evaluation materials will be collected from the evaluators and deleted or destroyed. Some copies (for archival purposes) will be maintained by the Program Scientist at NASA HQ, and in the SOMA vault. Also, all CSR material from the down-selected mission(s) will be provided to the Earth System Explorers Program Office located at NASA's Goddard Space Flight Center. 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 SOMA vault.

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 Phase A Concept 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 again be cross checked against the final lists of organizations and individuals on each CSR to ensure no individual or organizational COI exists on the list of evaluators.
- In addition, all evaluators will review the final lists of conflicted organizations and individuals and 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.
- 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.

Phase A Concept Study Team will be referred to as "study team" throughout the remainder of this document

Plan to Avoid COIs (continued)

- Any potential COI issue is discussed with the 2023 ESE Program Scientist and the SMD Deputy Associate Administrator for Research and documented in the 2023 ESE Downselect 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 TMC Panel Chair in case of a potential conflict. The Science evaluators must notify the Science Panel Chair in case of a potential conflict.
- 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, and also provide a mitigation plan.
- 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 2023 ESE Program Scientist and TMC Panel Chair will be notified. Steps will be expeditiously taken to remove any actual or potential bias imposed by the conflicted member(s). Permissions to access electronic media for the review (NASA Box, RES, NSPIRES) will be revoked until COI is resolved.

Evaluation Organization and Process

Evaluation Organization

Leadership Team

Dr. Thorsten Markus, Program Scientist
Eric McVay, Program Executive
ESD, SMD, NASA Headquarters

Renee Lake, Acquisition Manager
Dr. Joe McKenney, Acquisition Manager
Omar Torres, Acquisition Manager
SOMA, NASA Langley Research Center

Science Panel (Forms A*, B including SEOs)
Chair: Dr. Thorsten Markus
Co-Chair: Eric McVay

TMC Panel (Form C)
Co-Chair: Renee Lake
Co-Chair: Dr. Joe McKenney
Co-Chair: Omar Torres
Co-Chair: Dr. Waldo Rodriguez
Co-Chair: Tony Tyler

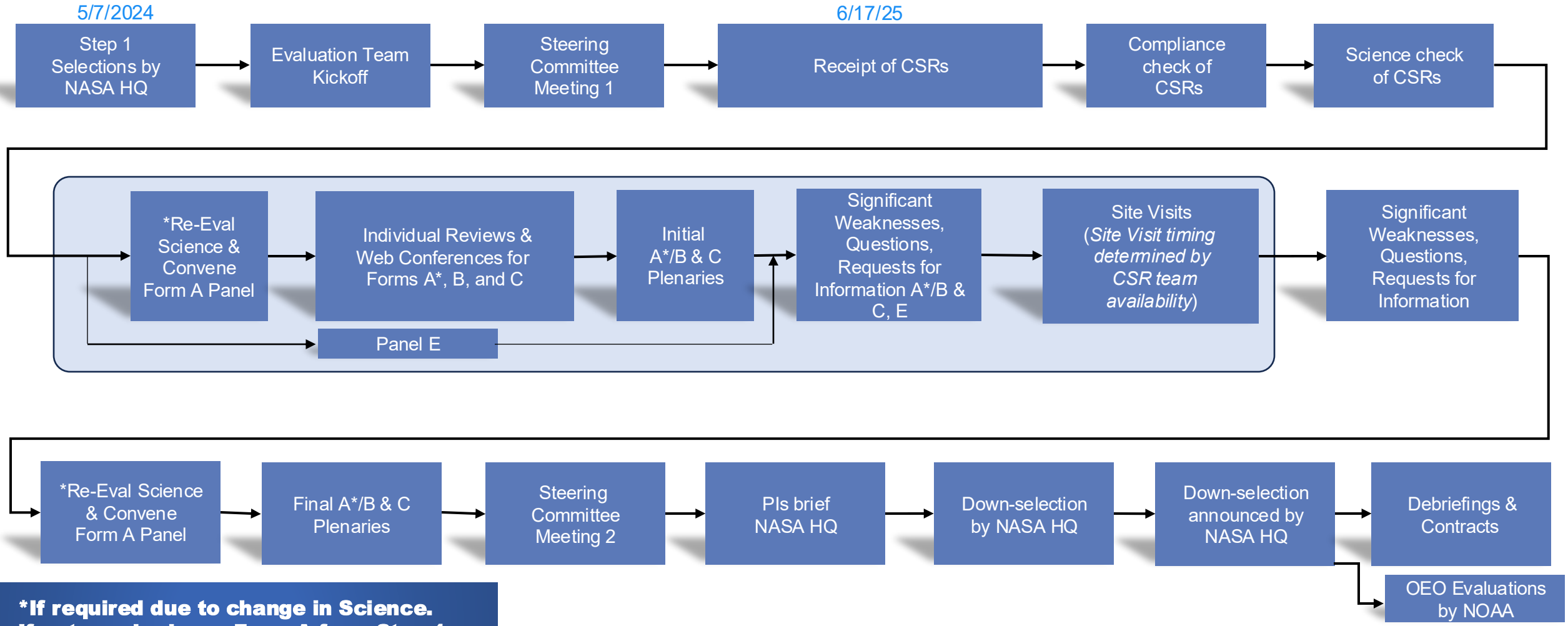
Small Business Subcontracting (Form E)
Co-Chair: Chris Hall
Co-Chair: Tumarrow Romain

National Oceanic and Atmospheric Administration (NOAA) Operational Enhancement Opportunity (OEO)

Evaluated by NOAA after down-selection

** If required due to change in Science. If not required, use Form A from Step 1.*

CSR Evaluation Flow



***If required due to change in Science. If not required, use Form A from Step 1.**

Evaluation Criteria

Evaluation Criteria and Additional Selection Factors

- The criteria to evaluate the CSRs are documented in the 2023 ESE ANNOUNCEMENT OF OPPORTUNITY CRITERIA AND REQUIREMENTS FOR THE PHASE A CONCEPT at:

  https://explorers.larc.nasa.gov/2023ESE/conceptphaseA.html

Evaluation criteria for the Concept Study: approximate significance of each criterion is indicated by the percent weighting.

- Criterion A: Scientific Merit of the Proposed Investigation (will not be reevaluated unless it is determined that the science has changed from that described in the Step 1 proposal) (approximately 20%)
- Criterion B: Scientific Implementation Merit and Feasibility of the Proposed Investigation (approximately 40%)
- Criterion C: TMC Feasibility of Mission Implementation (approximately 40%)
- Criterion E: Small Business Subcontracting (Criterion E) plans will be evaluated as separate factors and considered during the selection process.

- **Additional Selection Factors that may be considered by the Selection Official**

- At the Step-2 down-selection, the Selection Official may consider a wide range of programmatic factors in deciding whether to select any CSRs and in selecting among top-rated CSRs, including, but not limited to, planning and policy considerations, available funding, career development opportunities, programmatic merit and risk of any proposed partnerships, the size and nature of any contributions, distribution of work across NASA Centers and JPL, and maintaining a programmatic and scientific balance across SMD. While SMD develops and evaluates its program strategy in close consultation with the scientific community through a wide variety of groups, SMD programs are evolving activities that ultimately depend upon the most current Administration policies and budgets, as well as program objectives and priorities that can change based on, among other things, new discoveries from ongoing investigations.

Evaluation Criterion A

Scientific Merit of the Proposed Investigation

The 2023 ESE 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-20 in Part II of the 2023 ESE *Criteria and Requirements 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 2023 ESE Program Scientist will convene a peer review panel to reevaluate 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 AO).

Evaluation Criterion B

Scientific Implementation Merit and Feasibility of the Proposed Investigation

All of the factors defined in Section 7.2.3 of the 2023 ESE AO also apply to the evaluation of the CSR unless amended in the C&R. Note that details have been added to one of the subfactors of Factor B-1, Merit of the instruments and mission design. *New factors and details added to Step-1 AO factor definitions are highlighted below using blue italicized text for the evaluation of the CSR.*

- Factor B-1. Merit of the instruments and mission design for addressing the science goals and objectives.
- Factor B-2. Probability of technical success.
- Factor B-3. Merit of the Open Science and Data Management Plan (OSDMP) ~~and~~ *including* Data Analysis ~~plan~~, *Data Management Plan (DMP), Software Management Plan (SMP), and Open Science Plan (OSP).*
- Factor B-5. Probability of science team success.
- Factor B-6. *This factor is not applicable to this solicitation in Step 2.*
- *Factor B-7. Likelihood of scientific success.*
- *Factor B-8. Maturity of proposed Level 1 science requirements and Level 2 project requirements*
- *Factor B-9. Scientific Implementation Merit and Feasibility of any Science Enhancement Options (SEOs), if proposed.*

Evaluation Criterion B (continued)

- **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.

- **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.*

Evaluation Criterion B (continued)

- **Factor B-3. Merit of the Open Science and Data Management Plan (OSDMP) ~~and~~ *including* Data Analysis ~~plan~~, *Data Management Plan (DMP), Software Management Plan (SMP), and Open Science Plan (OSP).*** This factor includes the merit of plans for data analysis and data archiving to meet the goals and objectives of the investigation*; to result in the publication of science discoveries in the professional literature;* and to preserve data and analysis of value to the science and societal applications communities. 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 communities; *assessment of societal applications of the mission data, a plan to engage users to facilitate feedback on mission products pre-launch, and accelerate the use of mission products post-launch to inform decisions, and budget adequacy to implement these activities;* 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.

- **Factor B-4. Science resiliency.** This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Science Investigation to the Threshold Science Investigation 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.

Evaluation Criterion B (continued)

- **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 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 during evaluation. The inclusion of career development opportunities to train the next generation of science leaders will also be evaluated.

- **Factor B-6**. *This factor is not applicable to this solicitation in Step 2.*

Evaluation Criterion B – Additional Factors

Factor A-3 of the AO will also be re-evaluated as a factor for Scientific Implementation Merit and Feasibility; it has been renumbered as Factor B-7 below.

- ***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.

B

Evaluation Criterion B – Additional Factors

Two new evaluation Factors B-8 and B-9 are not described in the AO and therefore were not evaluated for Step-1 proposals. These new factors will be evaluated for the CSRs in addition to the factors specified in AO Section 7.2.3 (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 science requirements are mature enough to guide the achievement of the objectives of the Baseline Mission and the Threshold Mission, and whether the Level 2 requirements are consistent with the Level 1 requirements. The Levels 1 and 2 requirements will be evaluated for whether they are stated in unambiguous, objective, quantifiable, and verifiable terms that do not conflict and for whether they are traceable to the science objectives. They will be evaluated for the adequacy, sufficiency, and completeness, 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 to determine 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.*
- ***Factor B-9. Scientific Implementation Merit and Feasibility of any Science Enhancement Options (SEOs), if proposed.*** *This factor includes assessing the potential and appropriateness of the selected activities to enlarge the science impact of the mission and the costing of the selected activities. Although evaluated by the same panel as the balance of Scientific Implementation Merit and Feasibility factors, this factor will not be considered in the overall criterion rating. The panel will provide comments to NASA on their findings for this factor.*

Any impact to the Baseline Science Mission due to the inclusion of SEOs will also be included in the evaluation factors above.

Evaluation Criterion C

TMC Feasibility of the Proposed Mission Implementation

- All of the Technical, Management, and Cost (TMC) Feasibility factors defined in Section 7.2.4 of the AO 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. *New factors and details added to Step-1 AO factor definitions are highlighted using blue italicized text*.
- Italicized text shows details that have been added to several C-factor definitions below for the evaluation of the CSR.
- Note that the risk management aspects of AO 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 here in a new evaluation factor, Factor C-6, Adequacy of the risk management plan. The text deleted from AO Factor C-4 is the basis for the new Factor C-6.
  - Factor C-1. Adequacy and robustness of the instrument implementation plan.
  - Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.
  - Factor C-3. Adequacy and robustness of the flight systems.
  - Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.
  - Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.
  - *Factor C-6 Adequacy of the risk management plan.*
  - *Factor C-7 Ground systems.*
  - *Factor C-8 Approach and feasibility for completing Phase B.*

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 investigation 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 processes, products, and activities required to accomplish development and integration of the instrument complement, *including where applicable the approach to multiple builds*. 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 and plans for advanced engineering developments*, and the adequacy of backup plans* to mature systems within the proposed cost and schedule when systems having a TRL less than 6 are proposed*, as applicable*.

Evaluation Criterion C (continued)

<u>Factor C-2.</u> 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 and *ground systems, operational scenarios and timelines for each mission phase, operations team roles and responsibilities,* and navigation/tracking/trajectory analysis), and the plans for launch services. 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 Investigation.

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 plans, *processes*, products, and activities required to accomplish maturation, development, integration, and verification of all elements of the flight system. This factor includes an assessment of the adequacy of all elements of flight system resiliency, including flight software/hardware fault management, system and subsystem redundancy, and hardware reliability. *This factor includes an assessment of the adequacy of the plans for spacecraft systems engineering, qualification, verification, mission assurance, and launch operations*. This factor includes the plans for the development and use of new technology, plans for advanced engineering developments, and the adequacy *of ~~those~~ backup plans* to ensure success of the *investigation*~~mission~~ when systems having a TRL less than 6 are proposed. The maturity and technical readiness of the spacecraft, ~~and~~ 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)

<u>Factor C-4.</u> 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 Work Breakdown Structure (WBS)*; *project level systems engineering;* the management approach including the roles, the commitment, qualifications, and experience of ~~any~~ *the PI, PM, PSE, and other* named Key Management Team members, the implementing organization, and ~~the~~ known partners; the spaceflight experience of ~~any~~ *the PI, PM, PSE, and all other* named Key Management Team members; ~~the expected commitment, qualifications and experience of the Key Management Team members not named;~~ *and relevant performance of* the implementing organization and known partners against the needs of the investigation; the prior working relationships of the implementing organization and known partners; the commitments of partners and contributors; and the scope of work covering all elements of the mission, including contributions. ~~Also evaluated under this factor is the adequacy of the identified risks, including any risk mitigation plans for new technologies, any long- lead items, and the adequacy and availability of any required manufacturing, test, or other facilities. The management of 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.~~ 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 effect of the small business subcontracting plan including small disadvantaged businesses*.

Evaluation Criterion C (continued)

<u>Factor C-5.</u> 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 used to develop the estimated cost, *the methods and rationale used to develop the estimated cost*, the discussion of cost risks, the adequacy and allocation of cost reserves by phase, and the scope of work *(covering all elements of the mission, including contributions)*. The adequacy of the cost reserves and understanding of the cost risks will be assessed. This factor also includes an assessment of the proposed cost relative to estimates generated by the evaluation team using parametric models and analogies. *Also evaluated under this factor are the proposed cost management tools to be used on the project. If the project proposes any significant spending prior to KDP-C (Confirmation), the rationale/justification for this spending must also be detailed.*

Evaluation Criterion C (continued)

Three new evaluation Factors C-6, C-7, and C-8 are not described in the AO and therefore were not evaluated for Step-1 proposals. These new factors will be evaluated for the CSRs in addition to the factors given in Section 7.2.4 of the AO (repeated or updated above as Factors C-1 through C-5).

Factor C-6. ***Adequacy of the risk management plan***.
The adequacy of the ~~identified~~ *proposed* risk~~s~~ *management approach will be assessed,* including any risk mitigation plans for new technologies; 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.* The management of 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*.

Factor C-7. ***Ground systems***. *This factor includes an assessment, including heritage and planned new development, of the proposed operations facilities, hardware and software (i.e., those for mission operations and science operations), and a telecommunications analysis, ground network capability and utilization plan, and navigation plans.*

Note that the risk management aspects of AO Factor C-4 have been removed from Factor C-4 and included here in a new evaluation Factor C-6. The text deleted from AO Factor C-4 is the basis for the new Factor C-6.

Evaluation Criterion C (continued)

Three new evaluation Factors C-6, C-7, and C-8 are not described in the AO and therefore were not evaluated for Step-1 proposals. These new factors will be evaluated for the CSRs in addition to the factors given in Section 7.2.4 of the AO (repeated or updated above as Factors C-1 through C-5).

- **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.*

Any impact to the primary mission due to the inclusion of SEO(s) will also be included in the factors above.

The panel evaluating the ~~third evaluation criterion,~~ "*TMC Feasibility of the Proposed Mission Implementation*" criterion will also provide comments to NASA regarding the bulleted items below. While these comments will not be considered in the evaluation, they may be considered during down-selection.

- The extent to which the proposed investigation provides career development opportunities to train the next generation of engineering and management leaders;
- Programmatic risk for which examples include but are not limited to stability and reliability of proposed partners and their contributions, the size and nature of contributions, environmental assessment approvals, and late/non-delivery of NASA- provided project elements.

For the purpose of the CSR, investigation teams are not required to hold reserves against Government Furnished Equipment (GFE) such as an AO-provided Launch service. They should assume the Government will deliver as promised on factors such as Launch Vehicle (LV) performance and schedule. The Government is holding separate reserves on its promises.

Evaluation Criterion E

The following evaluation criterion was not described in the AO and therefore was not evaluated for Step-1 proposals; however, it will be evaluated for CSRs.

Merit of the Small Business Subcontracting Plans. *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.*

NOAA OEO Evaluation

Merit of the NOAA Operational Enhancement Opportunity. *Shortly after ESE down-selection, NOAA intends to review the OEO concept, if proposed, and decide, with NASA support, whether to request a sole source Request for Proposal (RFP) for the OEO as a modification to the NASA ESE contract, subject to any legal requirements applicable to such a transaction. The evaluation criteria for the OEO sole source proposal will be established at the time of the request for a sole-source OEO proposal, as the criteria may vary depending on the nature of the OEO. NOAA and NASA reserve the right to accept or decline proposed OEO activities at any time during the mission. As these activities are optional and are not included within the baseline investigation, the science enabled by OEO activities is not considered part of the scientific merit of the proposed investigation nor can the OEO science be necessary to achieve the proposed ESE investigation objectives. These OEO concepts and activities will not be part of the body of the ESE CSR and will not be part of NASA's down-selection criteria for ESE.*

The separability of the OEO from the Baseline mission will be evaluated by the Science and TMC panels.

Evaluation Products and Ratings

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 grade reflects the median.
  - A median score that falls between two grades will be reported as the combination of those two grades (e.g., 10 Excellent votes and 10 Very Good votes = Excellent/Very Good grade)

Form C for all CSRs

- Risk rating range: Low Risk, Low/Medium Risk, Medium Risk, Medium/High Risk, or High Risk
- Polling is held for the 5 categories.
- The reported Risk Rating grade reflects the median.
  - A median score that falls between two risk ratings will be “rounded” to the higher risk rating.

CSR Evaluation Panel Products (continued)

Form E (Small Business Subcontracting Plans)

- Grades: 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.

Definitions of Criterion A*/B Findings

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

Minor Strength: A strength that contributes to the Scientific Merit of the Proposed Investigation* / Science Implementation Merit and Feasibility of the Proposed Investigation.

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

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

Unlike in Step 1, minor findings can influence ratings. Significant minor findings are those minor findings that do influence ratings and will be marked as such in the Form A*/B. The term "Significant Weakness" includes both Major Weaknesses and Significant Minor Weaknesses.

If required due to change in Science. If not required, use Form A from Step 1.

Form A* and B Grade Definitions

Excellent: A comprehensive, thorough, and compelling CSR of exceptional merit that fully responds to the objectives of the 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 AO, whose strengths fully outbalance any weaknesses.

Good: A competent CSR that represents a credible response to the AO, having neither significant strengths nor weaknesses and/or whose strengths and weaknesses essentially balance.

Fair: A CSR that provides a nominal response to the 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 AO).

Evaluators are polled on the grades defined above (no half-grades); a half-grade between these defined above may result from an even number of votes.

If required due to change in Science. If not required, use Form A from Step 1.

Criterion C Panel Evaluation Principles

- **CSR Feasibility and Risk Assessment in Step 2:**
  - The Criterion C Panel's task is to assess the feasibility of implementing the mission or investigation based on all the material provided by the study team.
  - *The study team is not 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.

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

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

Unlike in Step 1, minor findings can influence ratings. Significant minor findings are those minor findings that do influence ratings and will be marked as such in the Form C. The term "Significant Weakness" includes both Major Weaknesses and Significant Minor Weaknesses.

Risk Ratings Grade 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	The CSR strongly supports accomplishment of the investigation well within the proposed resource envelope. Benefits associated with the identified strength(s) significantly outweigh the negative impacts associated with any identified weakness(es). The information presented instills high confidence in the team's ability to accomplish the investigation.
Low-Medium Risk	The CSR supports accomplishment of the investigation within the proposed resource envelope. Benefits associated with any identified strength(s) outweigh negative impacts associated with any identified weakness(es). Any identified weakness is considered to be within the team's abilities to correct.
Medium Risk	Accomplishment of the investigation within the proposed resource envelope may be challenging. Benefits associated with any identified strength(s) essentially balance negative impacts associated with identified weakness(es). Identified weakness(es) are considered to be within the team's abilities to correct with effective management and application of engineering resources.
Medium-High Risk	Accomplishment of the investigation within the proposed resource envelope will be challenging. Benefits associated with any identified strength(s) are outweighed by negative impacts associated with the identified weakness(es). One or more weaknesses are of sufficient magnitude and complexity to be considered difficult for the team to correct within the proposed resources.
High Risk	Accomplishment of the investigation is expected to significantly exceed the proposed resource envelope. Benefits associated with any identified strength(s) are significantly outweighed by negative impacts associated with the identified weakness(es). One or more weaknesses are of sufficient magnitude and complexity as to be deemed unsolvable by the team within the proposed resources.

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 at least three independent cost models.
- An independent cost verification of the proposed cost for Phase E will be performed using at least two cost models.
- 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 47).
- 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 Evaluation

- A comparison of the cost of analogous missions* will be assessed if:
    1. The TMC Base ICE does not validate the proposed cost for a given WBS level or at the total of modeled WBS levels.
    2. The WBS level is one for which the TMC Base ICE error bars are unusually wide, regardless of validation results.
    3. There is direct system-level heritage for a WBS level, and that heritage corresponds to an actual data point that is outside of the TMC ICE Error Range as shown in the pre-evaluation cost study results.

**Analogous missions will be chosen based on contents of the CSR and the experiences of the TMC evaluators.*

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 an 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 cost 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 threat. A weakness with an *unquantified cost threat* represents a risk for which the cost of retiring cannot be quantified. The impact of a weakness with an *unquantified cost threat* may be significant since the identified risk may prevent the accomplishment of the baseline investigation within the proposed resource envelope.
- The cost threat matrix defines the adjectives that describe the *likelihood* and *cost impact*.
- The minimum cost threat threshold is $1M for Phases B/C/D and *2.5% for Phase E*.

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

Note: For each CSR, the percentages in the above table will be converted to dollars by the cost estimator.

Evaluation Procedures

Criteria A*, 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.
- NASA Box will be used for:
  - Entering individual evaluation panel members' comments for Criteria A* and B.
  - Developing draft and final Forms A* and B for each CSR.
- Evaluation and polling on Forms A* and B will be restricted to Form A* and B Evaluators.
- Only Evaluators who have participated in the Form A*/B Initial Plenary, the Site Visits, and the Form A*/B Final Plenary may participate in polling on Form A*/B.
  - Participation is defined as in-person or virtually
  - Specialist Evaluators** are not polled
  - Note that Form C evaluators may also be designated as Form B evaluators by the 2023 ESE Program Scientist.
- The SOMA 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 A*, B, C, and E).
  - Only Evaluators who have participated in the Form C Initial Plenary, the Site Visits, and the Form C Final Plenary may participate in polling on Form C.
  - Participation is defined as in-person or virtually.
  - Specialist Evaluators** are not polled.
  - Note that some Form B evaluators may also be designated as Form C evaluators by the 2023 ESE Program Scientist.

* *If required due to change in Science.*

** *Specialist Evaluators (to provide specific technical expertise to Criterion B/C/E Panels) may be utilized, based on the specific technology and science that is proposed.*

Criteria B & C Panel Evaluation Processes (continued)

Consistency Review for Form C findings and Form B findings to ensure similar findings are treated the same across different CSRs (*e.g.*, major vs minor for similarly worded findings) or conflicts between strengths and weaknesses within an individual form.

- **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. Specialist Evaluators may review a subset of CSRs.
- **Form B consistency**
  - Form B Consistency Evaluators 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 A (if needed), 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).
- The Significant Weaknesses, Questions, and Requests for Information List (SQRL) will be sent to each Study Team at least 7 days prior to its Site Visit.
- Criterion E (Small Business Subcontracting) is reviewed as required by Criterion-specific panels prior to the Initial Plenary. Site Visit questions for Criterion E are prepared and provided no later than the Initial Plenary to the 2023 ESE Program Scientist.

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

- **Site Visits SQRLs**
  - All SQRLs developed at the Initial Plenary, and by the Form E panel, will be sent to each study team at least 7 days prior to its Site Visit, excluding federal holidays.
  - Significant weaknesses are 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, E rating.
- **The 2023 ESE Program Scientist will approve all SQRLs that are developed.**
- **Three types of responses are planned for Site Visit SQRLs. These types may be used for any given Significant Weakness (SW), Question (Q), or Request For Information (RFI).**
  - **Early Written Response Only**: SQRLs provided to the study team that may be addressed in writing prior to the Site Visit. The nature of some SQRLs require data that must be reviewed prior to the Site Visit.
  - **Presentation Only**: SQRLs that may be addressed the day of the Site Visit by way of presentation.
  - **Early Written Response and Presentation**: A combination of the two response types.

- Evaluation Team members will ask questions during the Site Visit to ensure they understand the response to a SQRL, or to clarify any significant issues.
- **Post-Site visit SQRL responses will be Written Only.**

* *If required due to change in Science.*

Site Visits

- Site Visits with Oral Briefings will be used to clarify implementation details and commitments. The study team may address significant weaknesses identified in the CSR and provide updates on the CSR developed after submission of the CSR.
- Site Visits for the 2023 ESE down-select will be hybrid [in-person/virtual].
- Briefings at each Site Visit will be limited to 7 presentation hours and up to 1 additional hour for an optional tour/demonstration. Breaks are not included in the 7-hour maximum time for the Site Visit presentations/discussions or the 1-hour maximum time for an optional tour/demonstration. Break durations (up to two) will be limited to a maximum of 15 minutes each. Lunch should be scheduled for 1.5 hours near mid-day.
- All Site Visit presentations/briefings should be in a plenary session with all Evaluation Team members attending – no splinter sessions – unless authorized by the 2023 ESE Program Scientist.
- Written SQRLs for Form C will be submitted to the PI at least 7 days before the Site Visit. All teams will have the same lead time, excluding federal holidays, with 'Early Written SQRL' responses due within 5 days. A draft of the Site Visit presentation slides must be provided to the 2023 ESE Program Scientist via Box at least 20 hours before the Site Visit. After providing the draft Site Visit presentation, CSR teams may update the presentation before the Site Visit as needed.
- During the Site Visit, NASA may ask additional SQRLs. The team has the option to answer these during the site visit if possible or include them with the responses to the additional SQRLs sent to the team mid-day the day after the Site Visit concludes.
- As part of the Site Visit process, NASA may send additional SQRLs to the study teams at mid-day the day after Site Visit concludes*, with responses due within 5 days. Additional SQRLs may be sent once during the time period of **October 16-22, 2025**, with responses due within 48 hours (exact dates for this set will be communicated to each study team). A final set of SQRLs may also be sent during the time period of **October 27 November 7 , 2025**, with responses due within 24 hours.
- 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 treated as updates to the CSR and will be considered during the evaluation.

*** To avoid providing study teams SQRLs during a possible government shutdown, NASA may delay SQRLs that are scheduled to be provided 5 days or less prior to the start of the fiscal year. NASA will provide SQRLs on the first business day of the fiscal year or end of a government shutdown, whichever is earliest.**

Final Plenary Products

- At the Final Plenary, the evaluation panels finalize all evaluation Forms based on the information in the CSRs, as well as updates and clarifications to the CSRs (*i.e.,* information presented during the Site Visit, and information provided in response to the SQRLs).
- 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. 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 grades will be reported as the combination of those two grades (e.g., 10 Excellent votes and 10 Very Good votes = Excellent/Very Good grade). If there is a divergence of opinion, there may be additional rounds of discussion and polling.
- SWs, Qs, and/or RFIs generated during the Final Plenary may result in additional rounds during 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.
- Evaluator discussions are held after each round of polling, which may lead to additional rounds of polling.
- SWs, Qs, and/or RFIs generated during the Final Plenary may result in additional rounds during or after the Final Plenary.

Form E, Small Business Subcontracting

- Representatives from the Small Business Subcontracting Panel will evaluate this criterion.

Observers and Transition Briefing

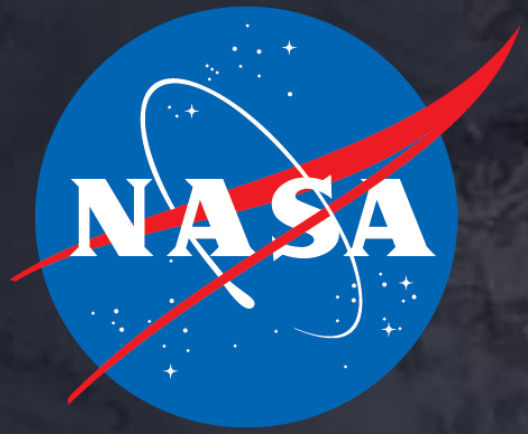
- Civil Servants (CSs), Intergovernmental Personnel Act Assignees (IPAs), and Contractors with downstream implementation responsibilities may be invited to attend panel meetings and Site Visits as Observers.
- All invited observers must be approved by both the SMD Program Officer and the Deputy Associate Administrator for Research.
  - 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.
- Approved Observers include: (this list will be updated as Observers are approved):

Name	Affiliation
Leigh Forbes	ESEP Office/ESE Program Manager
Emily Strube	ESEP Office/Deputy PM (acting), Earth Science Projects Division
Robin Minor	ESEP Office

  The above listed individuals 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, Transition Briefings will be provided by a subset of the Evaluation Team to CSs, IPAs, and Contractors in the Program Office and at NASA HQ who have implementation responsibilities.

Change Log

Rev #	Date	Change
-		Released


NASA