

**Geospace Dynamics Constellation
Investigation Implementation Study
*Guidelines and Criteria***

NOTICE: Amended June 27, 2022. This amendment clarifies some aspects of the text, including adding an IIR due date. New text is in bold and deleted text is struck through.

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I. Introduction

Overview

At the conclusion of Geospace Dynamics Constellation (GDC) Mission of Opportunity (MO) Program Element Appendix (PEA) P for the Third Stand Alone Missions of Opportunity Notice (SALMON-3) Announcement of Opportunity (NNH17ZDA004O-GDC) competition, NASA selected five investigations to perform Investigation Implementation Studies (IISs). (In this document, the SALMON-3 AO and its PEA P are collectively referred to as “the PEA”.)

These studies will constitute the early part of each investigation’s Concept and Technology Development Phase (Phase A) of the Formulation process, as outlined in NPR 7120.5E. Documents accompanying this study period are available on the GDC Program Library (hereafter “the Program Library”) at: <https://lws.larc.nasa.gov/gdc/programlibrary.html>.

Investigation Implementation Studies

The implementation studies are intended to provide NASA with more definitive information regarding the ability of each investigation to complete its science objectives and deliver its instrument within cost and on schedule, and of the instrument to provide its measurement capability without driving significant cost increases in the spacecraft development or in their investigation. That necessarily includes addressing the weaknesses identified during the PEA’s Step-1 evaluation process.

This document includes guidelines and requirements for the development of the Investigation Implementation Report (IIR). These build on those within the PEA; but, unless stated otherwise, the PEA’s guidelines and requirements that are not superseded by this document are applied to the IIRs. Unless specifically called for, no information of plans outside of the scope of the PEA is required in the IIR.

Evaluation Process

NASA will assemble an evaluation team of scientific and technical peers to consider each IIR carefully, with an appropriate amount of overlap with the Step-1 evaluation team. Due to the focused nature of these studies, the evaluation team will be provided access to the Step-1 evaluations and will perform their evaluation with the Step-1 forms as a basis. Each IIR will be composed of the Step-1 proposal, with certain modifications made, and a set of additional sections.

NASA may identify points that would benefit from clarification during the IIR evaluation process. If so, these requests for clarification will be distributed to all study teams, with any study team with no requested clarifications being notified of that absence.

Down-selection Process

At the completion of these studies, it is anticipated that the Selection Official, the Associate Administrator of the Science Mission Directorate (SMD), will decide to continue up to two investigations to continue their Phase A activities (hereafter known as “down-selection”). It is not anticipated that NASA would down-select more than one investigation providing the same measurement capability.

Upon a continuation decision, NASA will execute the Bridge Phase option and begin to provide continued Phase A funding for any project that is continued beyond the IIS. During the Bridge Phase, NASA and the continued project will negotiate and sign the contract modification necessary for the remaining portion of Phase A.

Deliverables for the remainder of an investigation’s Phase A will be negotiated during the Bridge Phase, on the basis of information provided in the IIRs (as described in Section IV). For those investigations that are not continued, the contracts will be allowed to terminate without further expense to NASA. Every investigation team will be offered a debriefing of the evaluation of its IIR.

Part II of this document describes the scope of the IISs. Part III provides guidelines and requirements for preparing the IIRs, and describes the structure of the IIRs (an explanation and justification must be provided for any requirement that is not fully addressed). Part IV describes the evaluation of the IIRs and the down-selection process that follows. Part V describes the Bridge Contract Appendix that would be used by the Living With a Star Program Office to implement the down-selection of investigations.

II. Investigation Implementation Study

The Investigation Implementation Study (IIS) is a Phase A study that focuses on deficiencies and risks identified during the Step-1 proposal evaluation process. NASA expects that the IIS will focus on resolving the more significant identified deficiencies and risks, and does not expect that the IIS will resolve all minor findings identified during the Step-1 evaluation process.

At the completion of this study period, any down-selected investigations will be integrated into the GDC project. They will remain in Phase A and complete necessary activities before proceeding into Phase B (these activities include both investigation-specific tasks and GDC project-level tasks, including those discussed in the PEA, Section 2.3.1).

The scope of, requirements for, and constraints on investigations remain unchanged from the PEA unless stated otherwise in these Guidelines. Investigations shall not revise their plans given updated information on the selected GDC science payload, GDC project schedule, or other items not included in these Guidelines.

As part of the Study, investigations are expected to consider the most cost-effective and resource-efficient manner to address identified deficiencies and risks.

NASA does not expect investigations to expand their investigation science objectives. NASA does not intend to re-evaluate the compelling nature of those objectives unless they are deemed to have significantly changed from the Step-1 proposal.

NASA expects that some deficiencies and risks may be most effectively addressed by the addition, removal, or modification of investigation participants and/or their roles/responsibilities. It is understood that such changes could be accompanied by changes to the investigation budget. The PEA's restriction on assumed use of capabilities on other GDC investigations, GDC Interdisciplinary Scientists, or individuals funded outside of the investigation remains in place for IISs. Any needed capabilities must be provided by the investigation and supported within the investigation schedule and budget. (In addition, NASA requests notification of any investigation team changes ahead of IIR submission to inform the evaluation team recruitment.)

NASA expects that some deficiencies and risks may be most effectively addressed by minor modifications to instrument design and/or spacecraft accommodation plans. For these possibilities, IIRs shall clearly identify the investigation requirement(s) driving the changes, and the impact on the investigation of no change from the original plans. For these impacts, investigations may not assume that they are able to drive significant modifications to the GDC spacecraft, other GDC investigations, or the project concept of operations.

III. Investigation Implementation Report

The Investigation Implementation Report (IIR) consists of the Step-1 proposal, with markings to indicate where content is superseded by the IIR's additional documentation; a document providing updates and refinements to the Step-1 proposal; budget tables, with updates from the Step-1 proposal clearly marked; a description of the investigation management structure, table of participating organizations, and science team; the full versions of any figures and foldouts updated from the Step-1 proposal; and a Bridge Phase Appendix to cover the period between down-selection and full Phase A contract award.

Requirement IIR-1. Investigations shall submit an Investigation Implementation Report (IIR) that consists of the below sections. All modifications from the Step-1 proposal shall be clearly marked by yellow font color or by a yellow-bordered box (labeled "IIR Modified" or "IIR Superseded", as appropriate).

- Step-1 proposal, marked to show where material is modified or replaced by the later components of the IIR. The Step-1 proposal shall not be otherwise modified.
- A section labeled "Modifications to the Investigation" that identifies all parts of the Step-1 proposal that are modified or superseded by the later components of the IIR. This document shall clearly state whether any modifications were made regarding the schedule, budget, investigation management structure, table of participating organizations, and science team. This section is to help organize the IIR and aid the evaluation team's navigation of the Report. No information provided in this section will

be used in the IIR evaluation itself. This section is not expected to exceed one page in length ~~and does not count against the IIR page limit~~, **and is page-limited as stated in Requirement IIR-2. [Amended June 27, 2022]**

- A section labeled “Resolution of Investigation Deficiencies and Risks” that provides additional material beyond that in the Step-1 Proposal. This material is expected to be a combination of new material not included in the Step-1 proposal, modifications to material included in the Step-1 proposal, and replacements of material included in the Step-1 proposal. Further requirements on this section are given in Requirement IIR-3.
- An updated schedule that is structured per PEA Requirement B-34 and marked to show modifications from the Step-1 proposal. ~~This schedule does not count against the IIR page limit.~~ **[Amended June 27, 2022]**
- A set of updated budget tables, in Microsoft Excel format, that is structured per PEA Requirement B-58 and marked to show modifications from the Step-1 proposal. ~~These tables do not count against the IIR page limit.~~ **[Amended June 27, 2022]**
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- An updated Instrument Accommodation Table, in Microsoft Excel format, that is structured per PEA Requirement P-14 and marked to show modifications from the Step-1 proposal. ~~This Table does not count against the IIR page limit.~~ **[Amended June 27, 2022]**
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- A section labeled “Investigation Structure and Composition” that describes the investigation management structure, the table of participating organizations, and the science team. Further requirements on this section are given in Requirement IIR-4.
- A section labeled “Investigation Bridge Contract Appendix” that provides the data necessary for the Living With a Star Program Office and GDC Project Office to modify the contract during the Bridge Phase to add additional Phase A activities to the contract. Further information is given in Section V of these Guidelines.

Requirement IIR-2. The Investigation Implementation Report (IIR) shall be submitted in adherence with the guidelines below and shall be submitted no later than **September 15, 2022** at 11:59pm Eastern Time. The IIRs shall be submitted via NASA’s Box capability, with the specific Box directions conveyed by NASA to the IIS PIs no later than one week before the submission due date. **[Amended June 27, 2022]**

- The IIR shall include an unredacted and a redacted Step-1 proposal, following the redaction requirements in the PEA and the modifications described in Requirement **IIR-1**, and a single unlocked (e.g., without digital signatures) searchable Adobe Portable Document Format (PDF) file of all remaining sections of the IIR. The IIR shall be composed of the text, figures, and/or tables. The IIR shall not include animations or comment fields. **The redacted IIR shall redact all export-controlled materials. [Amended June 27, 2022]**
- The IIR sections shall be presented in 8.5 x 11 inch format (or A4). Text shall not exceed 5.5 lines per vertical inch and page numbers shall be specified. Margins at the top, both sides, and bottom of each page shall be no less than 1 inch if formatted for 8.5 x 11 inch paper; no less than 2.5 cm at the top and both sides, and 4 cm at the bottom if formatted for A4 paper. Type fonts for text, tables, and figure captions shall be no smaller than 12-point (i.e., no more than 15 characters per horizontal inch; six characters per horizontal

centimeter). Fonts used within figures shall be no smaller than 8-point. The Step-1 proposal included in the IIR volume shall remain in compliance with the PEA formatting requirements and restrictions, and shall only be modified to show where text is superseded by the IIR (per the first sub-bullet of Requirement IIR-1).

- The IIR shall abide by the following page limit for each section. Text, table(s) and figure(s) are permitted, however all material shall be within this page limit.
 - The “Modifications to the Investigation” section shall not exceed two pages in length.
 - The “Resolution of Investigation Deficiencies and Risks” and “Investigation Structure and Composition” combined shall not exceed twelve pages in length.
 - The “Investigation Bridge Contract Appendix” has no page limit.
 - The schedule, budget tables, and Instrument Accommodation Table shall follow the requirements identified in Requirement IIR-1.
- The IIR’s “Resolution of Investigation Deficiencies and Risks” section shall include modifications of any fold-out. Modifications shall be in either text form (e.g., “change the value in Cell D4 from XX to YY”) or as an image (i.e., screen capture of the modified part of the fold-out). Modifications shall be clearly labeled to enable reviewers to easily identify changes in a fold-out. All fold-outs, whether included in part or in whole, shall have modifications clearly marked by the use of yellow font color or by a yellow-bordered box (labeled “IIR Modified”). Fold-outs that do not fit within the 8.5 x 11 inch format will count against the page limit as described by PEA Requirement B-4.
- The IIR shall include complete versions of any fold-out that contains at least three modifications and are encouraged to append any fold-out that contains less than three modifications. The modified part of a fold-out or a new fold-out will be counted against the IIR page limit (per the previous bullet of this Requirement), but the full, updated version of an existing fold-out is outside of this page limit.
- The IIR shall follow the requirements for export-controlled materials given in the PEA. **The redacted IIR shall redact all export-controlled materials. [Amended June 27, 2022]**
- The IIR shall clearly label the texts sections in the “Resolution of Investigation Deficiencies and Risks”. It should identify what Step-1 proposal text is modified or replaced (by proposal section and page), and Step-1 evaluation findings are addressed. Step-1 evaluation findings can be referred to by the following nomenclature “finding [Form]-[factor/section]-[finding type]-[number]”, with the following values:
 - Form: “A”, “B”, or “C”
 - Factor/Section: For Forms A and B, this is the factor number (e.g., 1, 2, 5, 8). For Form C, this is a clear abbreviation of the section (e.g., InstrImplPlan, MSch, Cost).
 - Finding Type: This is a two-letter acronym of the where “m” means Minor, “M” means Major, “S” means Strength, and “W” means Weakness. The four types are MS, mS, MW, mW.
 - Number: This is the finding’s place in its set of findings.
 - *Example:* In this nomenclature, the third Form C Major Weakness on Management and Schedule is denoted as “C-MSch-MW-3”.

Requirement IIR-3. The Investigation Implementation Report (IIR) shall include a section labeled “Resolution of Investigation Deficiencies and Risks”. This material is expected to be a combination of new material not included in the Step-1 proposal, modifications to material included in the Step-1 proposal, and replacements of material included in the Step-1 proposal. This section may include any discussions intended to strengthen aspects of the investigation beyond strictly resolving identified deficiencies and risks. Discussions that directly address findings in the Step-1 proposal evaluation shall be clearly labeled with the relevant finding(s) identified, including using the finding nomenclature described in the Requirement IIR-1 sub-bullet.

Requirement IIR-4. The Investigation Implementation Report shall include a section labeled “Investigation Structure and Composition” that describes the investigation management structure, the table of participating organizations, and the science team. For clarity, the IIRs should use the same division of these three as used in the Step-1 proposals text, figures, and tables.

- The lists of participating organizations and science team members shall include an identification of whether each identified individual/organization is “existing” (i.e., was identified in and is unchanged from the Step-1 proposal), “modified” (i.e., role/responsibility changed during the IIS), or “new” (i.e., was added during the IIS). For “new” identifications, this section shall fulfill the PEA Requirement B-24; all requirements must be met within this section’s page limit except for the resume or curriculum vitae, which do not count against the page limit. For “modified” identifications, any required additional explanatory or justifying text will be treated the same as for “new” identifications.

IV. Evaluation Criteria

The evaluation of the IIRs is very similar to the evaluation of the Step-1 proposals, as described in Section 7.1 of the PEA. The evaluation criteria are Scientific Merit of the Proposed Investigation; Scientific Implementation Merit and Feasibility of the Proposed Investigation; TMC Feasibility of the Mission Implementation, Including Cost Risk. These evaluation criteria and their factors are specified in Section 7.2.2 through 7.2.4 of the SALMON-3 AO, as modified by Section 7.1 of the PEA.

The evaluation of the IIRs will be based on and will incorporate the Step-1 proposals’ evaluation findings. For each criterion, the evaluation process will consider whether the IIS has successfully resolved any deficiencies or risks identified in Step-1, whether any new deficiencies or risks have been introduced, and whether any additional strengths have been developed.

NASA does not intend to re-review the Step-1 proposal. Any new deficiencies, risks, and strengths will be identified as part of the assessment of the IIR’s modification, clarification, and/or additional support of the investigation design and implementation.

Accommodation Study

If necessary, NASA will conduct an accommodation study as described in the PEA, Section 7.2.1. This study would be independent of the IIR evaluation process and take place prior to the presentation of the final evaluation results to the Selection Official. The results of this study will be one of the programmatic factors considered by the Selection Official.

Down-selection Process

The Selection Official (described in Sections 7.1.3, 7.3) may take into account a wide range of programmatic factors in deciding whether or not to down-select any proposals and in down-selecting among top-rated proposals, including, but not limited to, planning and policy considerations, available funding, programmatic merit and risk of any proposed partnerships, and maintaining a programmatic balance across the mission directorate(s). While NASA develops and evaluates its program strategy in close consultation with the NASA community through a wide variety of advisory groups, NASA programs are evolving activities that ultimately depend upon the most current Administration policies and budgets, as well as programs' objectives and priorities that can change quickly based on, among other things, new discoveries from ongoing missions.

The overriding consideration for the down-selection of investigations to continue in development towards flight as part of the GDC project will be to maximize science return and minimize implementation risk for GDC while advancing NASA's science goals and objectives within the available budget for the program. Therefore, the investigation PI-Managed Mission Cost will be considered in the final down-selection of investigations, including the necessity of any updates to ensure the completion of the proposed investigation objectives and the delivery of instrument flight units for integration onto the GDC spacecraft without driving unanticipated cost growth or schedule delays on either the spacecraft or the investigation itself.

V. Bridge Contract

The Bridge Contract appendix provides data necessary for the Living With a Star Program Office and GDC Project Office to modify the contract during the Bridge Phase to add additional Phase A activities to the contract.

Requirement IIR-5. The IIR shall include a Bridge Contract appendix that provides cost and pricing data for additional Phase A activities, which meet the requirements of the FAR Part 15 Table 15-2. These cost and pricing data are necessary and required to implement the contract. Complete cost or pricing data shall be included with the IIR for each organization participating in Phase A, and must be signed by each organization's authorized representative. This requirement may be satisfied with one form, provided that all institutions involved in Phase A are included and have provided the appropriate signatures. These data are in addition to the data provided in the IIR for evaluation purposes. This appendix shall include the costs in the tables provided in the *GDC Competitive Phase A Bridge Contract Cost Tables* file, found in the Program Library. This appendix shall allocate project costs per the cost categories defined in Table 15-2, but still align at the highest levels with the evaluation data.

Requirement IIR-6. The IIR's Bridge Contract appendix shall provide draft Statements of Work (SOWs) for all potential contracts with NASA. SOWs shall be provided for each contract phase (i.e., the remainder of Phase A through Phase F) and shall clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire mission.