

Geospace Dynamics Constellation Acquisition Process Planning Information

In order to assist the community in its planning for a Geospace Dynamics Constellation (GDC) mission, NASA is releasing its current strategy for the mission's major acquisitions. In this announcement, we summarize those acquisitions, provide major details that would assist community planning, and enumerate the relationships of these procurements to each other.

It is emphasized that this announcement is NOT a Request for Proposal, nor is it an Invitation for Bid. This announcement is subject to revision or cancellation at any time and is not to be construed as a commitment by the Government to enter into a contract or to release an Announcement of Opportunity. Please do not request a copy of the solicitation, as no solicitation exists at this time. When a solicitation is issued, it will be made available through NSPIRES (<https://nspires.nasaprs.com/external/>). It is the responsibility of Offerors and interested parties to monitor the internet sites for the release of the solicitation and amendments, if any, and they will be responsible for downloading their own copy of the documents. NASA Clause 1852.215-84, Ombudsman, is applicable. The Center Ombudsman for potential acquisitions can be found at <https://www.hq.nasa.gov/office/procurement/regs/Procurement-Ombuds-Comp-Advocate-Listing.pdf>.

Any questions about GDC or its acquisition strategy should be directed to Dr. Jared Leisner (jared.s.leisner@nasa.gov).

Planned Procurements

As part of GDC formulation efforts, NASA is planning the following four independent, but related, procurements. These procurements will assemble the GDC science payload, complete the GDC science team, and select the spacecraft provider. In chronological order of solicitation release date, those procurements are:

1. Interdisciplinary Scientists (IDSs): This solicitation will solicit IDSs to join the GDC science team for only Phase A-D activities (with the intention for a second IDS call, closer to launch, for Phase E-F activities; Phase A-D IDSs would be eligible for the second IDS call). IDSs will participate in GDC science team activities as well as execute their own proposed tasks to support GDC and community preparations for the GDC mission. Due to the exclusive natures of the role and responsibilities, NASA does not expect that the IDSs would include individuals with membership in a team selected to provide an instrument to the GDC mission (see *GDC investigations, instruments* below). The information about this procurement will be released on NASA's [NSPIRES website](#).
 - a. Solicitation, draft: February 2021 (no later than)
 - b. Solicitation, final: March 2021 (target)
2. GDC investigations, instruments: This solicitation will select teams to join the GDC science team for Phases A-F, deliver instruments for the GDC observatories, and execute the GDC science operations. Due to the exclusive nature of the roles and responsibilities, NASA does not expect that these teams would include individuals with membership in a selected GDC IDS team (see *Interdisciplinary Scientists* above). This solicitation will be released as a Focused Mission of Opportunity (FMO) via NASA's [Stand-Alone Mission](#)

[of Opportunity-3 \(SALMON-3\) AO](#). Information about this procurement will be released on NASA's [NSPIRES website](#), and relevant information will be available via NASA's [Science Office for Mission Assessment \(SOMA\) website](#).

- a. Solicitation, draft: February 2021 (target)
 - b. Solicitation, final: April 2021 (target)
3. Spacecraft study: This procurement will contract spacecraft providers to conduct focused studies on potential spacecraft designs applicable to the GDC observatories and conducting related assessments. These results will be used to improve the technical and programmatic requirements for use in future procurements (for example, see *Spacecraft procurement* below). Information about this procurement has been and will continue to be released through [beta.SAM](#).
- a. [Solicitation, draft](#): 4 December 2020
 - b. Solicitation, final: Q1 2021
4. Spacecraft procurement: This procurement will select the GDC spacecraft based upon the scientific and technical needs identified through NASA (pre-)formulation activities (for example, see *Spacecraft study* above) and by the selected GDC instruments (see *GDC investigations, instruments* above). Information about this procurement will be released through [beta.SAM](#).
- a. Solicitation, draft: NET Q3 2021
 - b. Solicitation, final: Q1 2022

Interdisciplinary Scientists

NASA intends to assemble an excellent team for GDC and to maximize opportunities for community involvement in the mission. To that end, NASA expects to release a solicitation for Interdisciplinary Scientists (IDSs) to join the GDC science team. Due to the IDSs' role and responsibilities, NASA does not expect that the IDSs would include individuals that are involved in a proposal to any proposal to a GDC mission investigation solicitation (*e.g.*, SALMON-3 PEA).

These IDSs will join the science team for Phase A-D activities and focus on tasks relevant to the mission development and for preparation of Phase E activities. NASA expects that a second solicitation would be released closer to launch to add IDSs to the science team for prime science operations. This arrangement is to follow solicitation best practices and to ensure that the IDS program maximizes both the community involvement in and access to the GDC science team and the incorporation of innovative and emerging science capabilities and research to the mission for Phase E.

IDSs will join the GDC science team and work with individuals selected to provide a GDC instrument. These tasks include, but are not necessarily limited to:

1. Refining the [GDC design reference mission](#) to maximize the science return of selected mission investigations (and the accompanying instruments).
2. Identifying on-orbit measurement validation needs and developing related requirements for ground-based observations.

3. Identifying additional data sets for production and defining data archiving best practices to maximize the usefulness and usability of the GDC mission science data to the science community.
4. Developing modeling capabilities that would enable or enhance GDC research, encompassing but not limited to those identified in the [GDC Science and Technology Definition Team Final Report](#).
5. Developing analysis techniques and tools that would enable or enhance GDC research.

In addition to the above tasks specified in a proposal, the IDSs will participate in the discussion of cross-investigation coordinations, science trade-offs, and other science team activities. All software developed by an IDS team will be required to be released under a permissive (or less restrictive) open source license.

GDC Investigations, Instruments

NASA's GDC pre-formulation activities built upon the [GDC Science and Technology Definition Team \(STDT\) Final Report](#). NASA intends to solicit investigations as a Focused Mission of Opportunity via NASA's Stand-Alone Mission of Opportunity (SALMON-3) AO, based on that STDT report and subsequent pre-formulation activities.

NASA intends to solicit only investigations that

1. address the highest-priority science objectives identified by the STDT report (see *Science/Science objectives*, below, for that list of objectives and other requirements on proposed investigation science objectives), and
2. deliver spaceflight instrumentation that provides measurement capabilities identified as necessary for the completion of the above science objectives (see *Science/Science measurements* and *Science/Solicited spaceflight instruments*, below, for that and other requirements on proposed instruments).

Proposals that do not meet these requirements will not be eligible for selection and may be returned without review.

GDC will be a cost-capped mission. This solicitation will be released with the intention to acquire cost-effective, resource-efficient mission implementation. NASA expects for proposals to balance instrument performance with resource requirements (including budget) so that mission science can be maximized via increased number of observatories and/or observatory capabilities (see *Cost/Cost cap*, below).

NASA intends for the accommodation study (see *Proposal Evaluation/Instrument accommodation study*, below) and selection process to explicitly include these considerations.

Below are a categorized series of science and technical requirements that define the planning framework for the acquisition of GDC investigations.

Science

Science objectives: Proposals to this solicitation must include only investigations that address the GDC Science Objectives 1.1-1.3, 2.1-2.3, and/or 2.6 (see the GDC report, Chapter 2, for detailed

information on these Objectives; the exact Objectives to be addressed by an investigation are determined by the proposer). Proposals that include investigation objectives that do not address the above list of GDC Science Objectives will not be solicited; proposals that argue a capability for science beyond the above GDC Science Objectives will not receive a more favorable evaluation. (NASA's pre-formulation identified key sub-objectives for the above GDC Science Objectives, and that list will be released with the draft solicitation.)

- All proposals must demonstrate that their investigation objectives can be completed with the current [GDC design reference mission](#). (The design reference mission will be refined during Phase A based on the selected investigations.)
- Proposal Threshold Investigations may not require more than four observatories.

Science measurements: NASA will release with the draft solicitation a Proposal Information Package that contains a table of measurements that flow from the GDC Science Objectives; this table is based on the GDC STDT report (Table 2.5), with small modifications made during NASA's pre-formulation work.

- Real-time data: In addition to providing measurements for full completion of the GDC Science Objectives, NASA recognizes the potential for GDC to contribute to national (pre-)operational space weather needs through the acquisition of real-time data. Every proposal will need to plan for the delivery of real-time space weather data from its instrument. The real-time data requirements will be finalized as part of Phase A/B efforts, but based on previous missions' real-time transmissions and (pre-)operational needs, it is expected that the GDC observatories will have the following real-time data constraints:
 - a. Accept data from each instrument at a cadence of 1 packet every 10 seconds
 - b. Transmit data with a latency of no more than 5 minutes
 - c. Average data rate of 400 bits per second

Open source: All software developed as part of a GDC investigation will be required to be released under a permissive (or less restrictive) open source license.

Solicited spaceflight instruments: NASA will only solicit investigations with instruments that meet the following numbered set of requirements. (This set of requirements flow from a mission formulation strategy to reduce risk; protect the preponderance of science prioritized by the GDC STDT; maximize flexibility in finding a cost-effective, resource-efficient implementation; and maximize opportunities for community competition and involvement.)

1. Investigations must include a single instrument type and may not include an instrument suite. NASA will follow community standards for the identification of instrument suites, and proposals will need to convincingly show adherence to this requirement (as appropriate and necessary for each proposal).
2. Each instrument must be capable of providing at least one measurement identified as relevant to the GDC Science Objectives (see *Science objectives* and *Science measurements*, both above). Investigations that include an instrument that is not capable of providing at least one of these measurements are not solicited.
3. NASA recognizes that multiple instrument types are capable of acquiring the same science measurements and expresses no preference in instrument type. While NASA pre-formulation efforts used a notional payload as part of its technical feasibility study, the

final spacecraft solution will be solicited based upon the actual instruments selected through this solicitation.

4. Investigations must deliver one flight unit for integration on each GDC observatory (see *Number of spacecrafts*, below).

Number of spacecraft: The final spacecraft solution will be determined after the selection of the GDC science payload. Based upon NASA pre-formulation activities, the constellation is planned to be comprised of six observatories; however, those analyses have also suggested that a seventh or eighth observatory may be feasible within project resources. Further, to aid NASA in its search of a more cost-effective spacecraft solution, proposals will include the cost of and delivery schedule for flight units for an additional four observatories:

- Planned six observatories: Flight units delivered for integration on these observatories must be delivered on schedule and within the proposed budget.
- Potential seventh and eighth observatories: Flight units that would be delivered for integration on these observatories, if they are added to the GDC mission, must be delivered on schedule and must follow budgeting rules to be released in the draft solicitation.
- Informational ninth through twelfth observatories: For planning purposes, proposals will include the schedule and budget for flight units that could be integrated on these observatories. This schedule will be outside of the mission timeline stated in the draft solicitation.

Team size: NASA requires that each proposal include a science team sufficient to complete the proposed investigation. There will be no direct constraint on team size, but it is understood that the payload cost cap (see *Cost cap*, below) will indirectly constrain the team size. Further, NASA intends to select Interdisciplinary Scientists (IDSs) to participate in the GDC science team during Phase E-F; these IDS teams (in total) are expected to be equivalent in size to the science team of one of the investigations selected through this solicitation.

Technology

Mission lifetime: Proposed instruments must be designed for a lifetime of three years and carry sufficient consumables for five years.

Instrument resource requirements: NASA will not constrain individual instrument resource requirements (e.g., mass, power, volume, data rate), but the entire science payload will be constrained.

Instrument fabrication: The size of and schedule for a GDC mission may present challenges for all instrument providers to meet. Therefore, NASA released a Request for Information (RFI) for organizations that have instrument mass-production capabilities and were interested in partnering with potential instrument providers. NASA strongly encourages potential proposers to consider the most effective instrument development approach, including partnerships with those or other organizations. The list of RFI respondents may be found on SOMA's [GDC Teaming Interest webpage](#).

- Due to the crucial nature of the instrument fabrication process to a constellation mission, NASA will be emphasizing this aspect in the evaluation process. See *Instrument evaluation* in the Proposal Evaluation section of this announcement.

Deployables: NASA expects for the spacecraft to furnish at least one ~1.2-meter boom for the purpose of instrument deployment away from the spacecraft. Investigations are responsible for providing any other deployable that is inherent to the function of the proposed instrument.

Management and Schedule

Mission milestones: Based on GDC pre-formulation activities, NASA is planning the following mission milestones for proposals to meet:

- Instrument deliveries: Investigations will be expected to deliver instruments for integration onto the GDC observatories starting in January 2025 at a rate of one per month.
- Launch readiness date: September 2027

Cost

Cost cap: NASA will not impose a cost cap per investigation but will impose a cost cap on the entire science complement (given below). NASA reminds interested parties of its intent to acquire a complete payload of cost-effective, resource-efficient instruments, and that funds not committed to the science complement would be available to maximize mission science via increased number of observatories and/or observatory capabilities.

- Phase A-D: \$132M (FY21\$)
- Phase E-F: \$60M (FY21\$)

Proposal Evaluation

Instrument accommodation study: To inform the selection of a science payload that would not unnecessarily increase project risk or cost via accommodation requirements and impacts, NASA will conduct an instrument accommodation study after the evaluation against the criteria described in the SALMON-3 AO, Section 7.2, and before the Selection Official identifies the proposals for selection. This study will be conducted using an instrument accommodation worksheet submitted by the proposer (see *Instrument accommodation worksheet*, below).

Instrument evaluation: Based on lessons learned from previous constellation missions and from the GDC STDT report, NASA expects to pay particular attention to:

1. Instrument manufacturing plan, including but not limited to a) repeatable quality and performance standards, b) management of any subcontracted manufacturer, and c) the ability to capture and apply lessons learned to the effective production of subsequent flight units; and
2. Instrument inter- and cross-calibration needs.

Proposal Submission

Instrument accommodation worksheet: In order to better facilitate the execution of an instrument accommodation study to inform NASA's selection process (see *Instrument accommodation study*, above), proposals will be required to include an instrument accommodation worksheet. This worksheet will be based on a NASA-provided template and will be provided separately

from the proposal for NASA's use; this worksheet will also be included as part of the proposal and will not count against the proposal's page limit.

- This worksheet may be used by NASA to guide the enveloping of potential payload resource requirements for public release in preparation for the spacecraft procurement. These requirements would be aggregated and anonymized before release.

Electronic submission: Proposals will be submitted via NSPIRES, as described in the SALMON-3 AO, Requirement 109. Proposals and accompanying documents will be submitted via the NASA Large File Transfer system rather than via CD-ROMs, superseding SALMON-3 AO, Requirement 110.