GDC Proposal Information Package

Robert Caffrey • GDC Payload Manager
GDC Project Office • NASA GSFC

GDC Pre-Proposal Conference
June 16, 2021
Overview

• Proposal Information Package (PIP) addresses technical and programmatic topics for GDC
  – GDC PEA policies described in the Overview of the GDC PEA
  – GDC PIP information will be incorporated into the evaluation described in Science Review and TMC Review
  – GDC Program Library contains the referenced documents

• PIP contains labeled requirements for investigations [GDC-PIP-<#>]
  – Compliance assessed in evaluation process, per GDC PEA Requirement P-1

• Topics summarized in this presentation:
  – Technical PIP requirements (21), see PIP Appendix B
  – Deliverables (69 CDRLs + 27 IMAR DIDs), see CDRL and IMAR documents.
  – Schedule (notional timeline included)
  – GDC project structure (notional org chart included)
Geospace Dynamics Constellation

GDC Instrument Technical Overview
GDC Mission Drivers

• Pre-formulation work outlined a mission implementation that minimizes risk while retaining flexibility to maximize mission science return

• Project-level risks that drive requirements on instruments:
  – Constellation size and spacecraft bus to be finalized
  – Science payload composed of multiple providers, potential instrument cross-interference
    • e.g. electromagnetic/-static cleanliness, contamination
  – Science payload resource constraints, meeting science requirements within likely spacecraft resources
  – Instrument quantities per provider
  – Instrument performance verification (calibration)

• Requirements developed using information on potential spacecraft and instruments
  – Spacecraft: Combined internal GSFC work and external market survey, used common elements
  – Instruments: Flight heritage from successful missions, multiple options per payload component to avoid provider-specific bias

Note: Payload = collection of GDC instruments
Instrument Accommodation

- Accommodation risks relate to the integration & operations of the science payload
  - PIP identifies both instrument requirements and instrument challenges
- Accommodation requirements must be met by the proposals
  - Described in GDC PIP; captured by GDC-PIP-4.1, GDC-PIP-4.2
  - Identified in risk-rated findings in the evaluation process (see TMC Review)
- Based on the potential spacecraft options, accommodation challenges are potential issues that will be considered in the evaluation and selection process (see Overview of the GDC PEA)
  - Described in GDC PIP, Section 4.3 – this list of challenges is non-exhaustive, captures major potential issues
  - Instruments need to **a)** fit on the spacecraft; **b)** operate where they fit; and **c)** ensure their operation doesn’t impact the spacecraft or the other instrument’s operations.
  - May be identified by non-risk-rated findings in the evaluation process (see TMC Review)
  - Assessed in the Pre-Selection Accommodation Study (see GDC PEA, Section 7.2.1)
  - Considered in the Selection Process (see Overview of the GDC PEA)
• Pre-Selection Accommodation Study will consider the following elements:
  – Instrument Accommodation Worksheet
  – Findings generated by TMC review

• Study will be conducted on the entire payload, not instrument-by.instrument
  – Assess ability for the complete payload to be accommodated on a spacecraft
  – Assess potential interference or contamination from one instrument to another

<table>
<thead>
<tr>
<th>Critical Parameters</th>
<th>Estimated Spacecraft Resources</th>
<th>Maximum Expected Values (MEVs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Instrument</td>
<td>Entire Payload</td>
</tr>
<tr>
<td><strong>Mass</strong> (Includes Sensor and Electronics)</td>
<td>7.7 kg</td>
<td>33.6 kg</td>
</tr>
<tr>
<td><strong>Volume</strong> (Includes Sensor and Electronics)</td>
<td>0.02 m³</td>
<td>0.30 m³</td>
</tr>
<tr>
<td><strong>Power</strong> (Average)</td>
<td>26.9 W</td>
<td>68.3 W</td>
</tr>
<tr>
<td><strong>Data Rate</strong> (Average)</td>
<td>10.5 kbps</td>
<td>25 kbps</td>
</tr>
<tr>
<td><strong>Deck Mounting Area</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ram</td>
<td>0.12 m²</td>
<td>0.90 m²</td>
</tr>
<tr>
<td>Nadir</td>
<td>0.06 m²</td>
<td>1.40 m²</td>
</tr>
<tr>
<td>Zenith</td>
<td>0.06 m²</td>
<td>1.14 m²</td>
</tr>
<tr>
<td>Anti-Ram</td>
<td>0.01 m²</td>
<td>0.04 m²</td>
</tr>
</tbody>
</table>
GDC Instrument Deliverables Overview
Instrument Deliverables

• Investigations are responsible for deliverables described in the PIP, Instrument Mission Assurance Requirements (IMAR), & Contract Data Requirements List (CDRL) documents
  – IMAR Document Identifiers (DIDs): 27
  – CDRLs: 69

• Requirements were developed to reduce complexity and minimize risk
  – Clear division of responsibilities between investigations and Project Office
  – Testing requirements, as defined in the PIP
  – All Flight Hardware deliverables and qualification requirements identified
    • See Table 8-1 (next chart)
## Instrument Deliverables

<table>
<thead>
<tr>
<th>GDC PIP Table 8-1</th>
<th>Control Electronics Engineering Test Unit</th>
<th>Instrument Engineering Test Unit</th>
<th>Flight Units</th>
<th>Instrument Flight Spare</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity</strong></td>
<td>1</td>
<td>1</td>
<td>n</td>
<td>1</td>
</tr>
<tr>
<td><strong>Delivery Date</strong></td>
<td>ICDR</td>
<td>ICDR</td>
<td>As stated in PEA</td>
<td>1 month after final flight unit delivery</td>
</tr>
</tbody>
</table>

- All Flight Units and spare flight units to be tested to proto-flight qualification levels prior to delivery.
- $n = \text{number of instrument copies to be delivered for flight (excluding the spare)}$
- Note: PIP 8.1.3.4 – Flight Spare Electronics: Build and test spare PCBs for complex boards and kit parts for simple boards.
Instrument Deliverables

- Instruments are currently expected to be integrated onto the GDC observatories as they are delivered (one/month, starting October 2025; see next section, PIP Sec. 8.3)

- Investigations are responsible for supporting the integration of delivered instruments, per PIP Section 8.4.3
GDC Instrument Schedule Overview
Notional Mission Development and Implementation Timeline

Key Dates:
- Instrument Proposals Due: 9/1/2021
- Instrument Selection: 1/2022 (target)
- Instrument Quantity Decision: Q1 2023
- First Instrument Delivery: 10/2025 (1/month)
- Launch Readiness Date: 9/2027

Note: Spacecraft vendor not yet selected, so specific dates not available.
## Notional Review/Meeting Schedule

<table>
<thead>
<tr>
<th>Event</th>
<th>Definition</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick Off</td>
<td>---</td>
<td>~1 month after award</td>
</tr>
<tr>
<td>IMRs</td>
<td>Instrument Monthly Reviews</td>
<td>Monthly</td>
</tr>
<tr>
<td>TIM</td>
<td>Technical Interchange Meeting</td>
<td>As needed (at a minimum quarterly)</td>
</tr>
<tr>
<td>Peer Reviews</td>
<td>---</td>
<td>As required</td>
</tr>
<tr>
<td>ISRR</td>
<td>System Requirements Review</td>
<td>~4 months after award</td>
</tr>
<tr>
<td>IPDR</td>
<td>Instrument Preliminary Design Review</td>
<td>~9 months after SRR</td>
</tr>
<tr>
<td>ICDR</td>
<td>Instrument Critical Design Review</td>
<td>~9 months after PDR</td>
</tr>
<tr>
<td>ITRR</td>
<td>Instrument Test Readiness Review</td>
<td>As needed, prior to planned test</td>
</tr>
<tr>
<td>IPER</td>
<td>Pre-Environmental Review</td>
<td>Prior to instrument level environmental testing</td>
</tr>
<tr>
<td>IPSR</td>
<td>Pre-Ship Review (~Oct 2025)</td>
<td>Prior to instrument delivery</td>
</tr>
</tbody>
</table>
Geospace Dynamics Constellation

GDC Project Structure
Questions?

Answers to previously submitted questions:

https://lws.larc.nasa.gov/gdc/faq.html

(Questions & Answers tab on SOMA’s GDC Acquisition Homepage)

Questions accepted up to 21 days before the proposal due date [PEA Sec. 9]

jared.s.leisner@nasa.gov