

Request for Quote (RFQ)

for

**NASA Goddard Space Flight Center (GSFC)
Spacecraft Bus for Low Earth Orbit (LEO) Satellite Servicing Study**

May 6, 2014

1.0 Introduction and Scope

NASA is currently assessing the feasibility of servicing and repairing satellites in Low Earth Orbit (LEO) in order to extend their useful life. To this end, NASA envisions robotic activities for earth observing satellites in LEO that need fuel, repair, or instrument replacement. Extending the mission life of NASA and other government satellites would extend the data collection capability of the spacecraft that support national or agency missions.

In order to continue this overall assessment, NASA/GSFC is seeking companies to perform 45-day studies of the feasibility of using existing spacecraft buses for refueling Government satellites in LEO. For each study, NASA/GSFC plans to award a firm fixed price purchase order valued at up to \$20K. NASA/GSFC plans to order up to approximately four such studies.

NASA is considering servicing at least one national asset by late CY 2017. As a result, studies are limited to spacecraft buses or other flight vehicles for accessing LEO that currently exist and are currently available for a late CY 2015 payload integration to support an October 2017 launch on a U.S. launch vehicle. During these studies, each selected contractor shall conduct a detailed analysis of the technical compatibility and interfaces between its already available spacecraft bus and NASA/GSFC Satellite Servicing Capabilities Office (SSCO) robotic servicing payload for conducting refueling of Earth Science LEO satellites. Additional details for the content of the study are provided in the attached Statement of Work (SOW), along with a list of the information GSFC will provide about the Servicing Payload and the potential client satellites. While the LEO servicing mission schedule cannot be specified completely at this time since no missions have been approved and NASA may or may not decide to move forward with future mission planning as a result of these studies, the following is estimated on the basis of current knowledge of mission development life cycles and the status of potential client satellites:

Milestones (Study Phase)	Due Date
Study RFQ release	<<RFQ release date>>
Study proposals due	RFQ release + 10 Days
Study selections	Proposal Due Date + 5 business Days
Award of purchase orders	Selection + 1 day
Delivery of NASA data package	Award + 1 day
Face-to-Face Meeting 1	Award + 15 days
Face-to-Face Meeting 2	Award + 30 days
Final study report delivery	Award + 45 days
Systems Requirements Review	October 2014 (TBC)
Preliminary Design Review	March 2015 (TBC)
Delivery of spacecraft bus	October 2015
Critical Design Review	November 2015 (TBC)
System Integration Review	September 2016 (TBC)
Launch Readiness Review	July 2017 (TBC)
Launch Readiness Date	October 2017
Check-out and commissioning	Launch + 90 days (TBC)
Servicing campaign Start	Launch + 100 days (TBC)
End of operations	Launch + 1 year (TBC)

This opportunity is being issued to formally conduct studies to help refine a potential servicing mission concept and determine cost, schedule and technical feasibility. Only spacecraft buses are being examined by this RFQ; Servicing Payload hardware/components are not part of this RFQ. If NASA decides to conduct a satellite servicing mission, funding will be available for the standard phases of a mission, and any contracts or agreements for spacecraft or other hardware would be determined through separate acquisition processes.

2.0 Mission Overview

NASA is considering on-orbit refueling as a means of satellite life extension to enable continued data collection of earth science data. With a robotic servicer, based on the legacy of Hubble servicing and bolstered with technology developed by NASA's Satellite Servicing Capabilities Office (SSCO), on-orbit refueling is a feasible, logical recourse. However, near-term propellant exhaustion in several of the candidates for refueling dictates an ambitious schedule based on arriving prior to satellite decommissioning/de-orbit.

Getting a reliable on-orbit refueler to the launch pad by October 2017 will be a challenge. Through these studies, NASA is assessing whether vendors have existing hardware today that might be capable of meeting mission requirements within programmatic constraints of cost and schedule.

More detailed information on the mission parameters of potential servicing candidates and the Servicing Payload will be provided to those selected for the studies. See the SOW for types of information that will be provided.

3.0 Description of Study Support

The study requirements include meeting with the SSCO's Servicing Payload developers and the overall mission engineering team in order to: (1) understand the end-to-end performance requirements, including interfaces between the Servicing Payload and the spacecraft; (2) understand the flight system architecture and concept of operations; and (3) predict performance and quantify risks. Each study shall include cost estimation for all mission phases and other information details defined in the SOW. The period of performance for each study is 45 days.

For these studies, NASA will identify and provide information about existing on-orbit satellites as potential servicing opportunities, and provide information about a Government-provided servicing payload, including interfaces and characteristics such as mass and volume. The Government-provided servicing payload would be transported to LEO by the spacecraft bus and would include a rendezvous and proximity operations system, robotics, propellant transfer system, and tools.

All study contractors shall make oral presentations of their study results at two face-to-face meetings with SSCO civil servants and support contractors. One oral presentation shall be conducted at the vendor's site 15 days after contract award and one at the GSFC's site 30 days after contract award. The GSFC meeting may be conducted via teleconference at the contractor's request. Presentations will be scheduled in two-hour blocks, with one hour for the presentation and the second hour for questions and answers.

These presentations, along with the final study report shall be delivered with appropriate data rights that will allow SSCO's support contractor(s) to view and use the information to help in assessing the feasibility of a servicing mission.

4.0 Study RFQ Response Instructions

The respondent to this RFQ shall:

- a. Identify the spacecraft bus proposed to meet the requirement. Provide a technical summary/description of the proposed existing spacecraft bus including the following:
 - o Mass of and mass carrying capability of the spacecraft
 - o Power, communication and any thermal control the spacecraft can provide to potential payloads
 - o Power efficiency of system
 - o Ability to survive and operate in sun-synchronous LEO
 - o Ability of system to meet or simplify other mission requirements or challenges the respondent identifies
 - o Compatibility with U.S. launch vehicles
 - o Proven flight heritage
- b. Describe the types of capabilities and cost benefits the proposed spacecraft bus provides for the servicing mission.
- c. Confirm the status and availability of the spacecraft bus
- d. Confirm your authority to utilize the spacecraft bus
- e. Confirm your ability to meet the delivery schedule outlined in this RFQ for a potential servicing mission
- f. Provide a top-level description of expected modifications required to perform the mission, in particular highlight any particularly critical or challenging areas
- g. Describe your approach for performing the study within the 45-day period of performance, including complying with the study requirements described in Section 3.0 above.
- h. Demonstrate an understanding and flight experience in the design, fabrication, integration and testing of the spacecraft bus:
 - o Discuss your company's proven in-space capabilities and experience; provide information from prior or current efforts that demonstrates this capability and experience.
 - o Describe your company's spacecraft quality control and product assurance processes

5.0 General Instructions for Study RFQ Response

Responses to the RFQ shall:

- 1) not exceed 30 pages including images and appendices, and not use a font size for the text smaller than 12 point.
- 2) be specific about the spacecraft bus being proposed for the study
- 3) address all requirements noted in Sections 3.0 through 6.0 of this document.
- 4) identify any other ideas and related activities, which your company is or has been involved with, and the significance of that activity to the servicing mission.

6.0 Selection Criteria for Awarding Study Opportunity

The following are the selection criteria for the studies:

- 1) Spacecraft bus capabilities, availability, and authority for use. The offerors will be evaluated on their responses to items specified in Section 4.0, items (a) through (f).
- 2) Ability to meet the schedule described in Section 1.0 for a potential servicing mission. In addition, the expected level of modifications needed to the spacecraft bus in order to fulfill the requirements of a potential servicing mission will be evaluated for realism and reasonableness.
- 3) Completeness and reasonableness of approach for satisfying the requirements during the study period of performance.
- 3) Proven in-space capability and experience
 - o The offerors' past performance will be evaluated based upon the missions supported and the specific work done in the following areas of complex satellite systems: design, development, integration & test (especially payload integration to a bus), and operation. In addition, recent relevant capabilities and experience that support your ability to build/deliver a highly reliable satellite to orbit on-time will be evaluated.
- 4) Compliance with the model terms and conditions, including the \$20K limit on study funding as well as data rights for delivered study reports.

NASA GSFC reserves the option to not select any contractor under this RFQ on the basis of responses received. NASA may or may not decide to move forward with future mission planning as a result of these studies. No strategy has been finalized nor do details exist at this time for any potential hardware acquisition.

7.0 Acronym List

CSR	Concept Study Report
EST	Eastern Standard Time
GSFC	Goddard Space Flight Center
LEO	Low Earth Orbit
PO	Purchase Order
POC	Point of Contact
ROM	Rough Order of Magnitude
RFQ	Request for Quote
SSCO	Satellite Servicing Capabilities Office
SOW	Statement of Work
TBC	To Be Confirmed
TBD	To Be Determined