Commercial Lunar Payload Services

Attachment A - STATEMENT OF WORK

FINAL DRAFT – MARCH 2018

1.0 Introduction

1.1 Scope

The Contractor shall provide all resources and functions to perform the Commercial Lunar Payload Services identified within this Statement of Work for the National Aeronautics and Space Administration. The Contractor shall select launch opportunities, determine the overall Mission Architecture, and provide the end-to-end service including operations associated with the Launch Vehicle, Launch Site, Spacecraft, Lander, Mission Design and Analysis, Ground Systems, and Payload Support. The Contractor shall be responsible for all taxes, licenses, permits, and approvals necessary to perform the mission. Payload Support includes: physical and analytical integration of NASA-provided payloads, launch and transport of NASA-provided payloads to specified lunar-related destinations, provision of utility resources to the NASA-provided payloads, and other related mutually agreed upon services such as the sale of non-NASA payload data to NASA. NASA may provide facilities, functions, equipment, and technologies, as requested by and negotiated with the Contractor, in

furtherance of the Commercial Lunar Payload Services. The procedures and timing for handover of payload service responsibilities, or for concurrent coordinated operations, will be negotiated with the Contractor on a case-by-case basis. The Contractor shall provide resolution of critical problem areas to minimize or eliminate schedule impacts. Prior to execution of lunar payload missions and services under this contract, the Contractor shall deliver information necessary to enable NASA payload integration planning and complete a Service Readiness review to demonstrate the Contractor's ability to provide end-to-end payload services.

2.0 Use of IDIQ Task Orders

This is an Indefinite Delivery, Indefinite Quantity (IDIQ) type contract. This SOW defines in general terms the scope of activities to be purchased and specifications for the various services available under this contract. Task orders will be negotiated and issued for any services purchased, in accordance with the Task Ordering Clause of this contract. Task orders will reference this SOW for services to be purchased, with additional details, delivery dates, NASA payload needs, payment milestones and final negotiated prices to be included separately in each task order. Due to the anticipated varied nature of NASA payloads, and myriad scenarios resulting from Contractor's Mission Architecture and payload opportunities, NASA Payload requirements will be provided in, and applicable to, individual Task Orders.

3.0 Destinations and Scenarios

This contract is for payload services to lunar surface destinations. Other destinations may include lunar orbital and flyby space, lunar Lagrangian points and other destinations that may result from the Contractor's Mission Architecture. NASA payloads and/or obtained services may utilize any location or feature that the Contractor makes available including on:

a) Launching Vehicle stages
b) Spacecraft
c) Landers
d) Rovers or other mobility systems
e) Sample or payload returns
f) Supporting systems

Many NASA payload/obtained service scenarios may result, including: intact landing on the Moon, operation on the lunar surface, impactor delivery, launch vehicle rideshare, lunar orbit insertion and operations and lunar flyby operations.

4.0 Payload Accommodation Services

Payload accommodation services are those services described below. These payload accommodation services are applicable to NASA payloads on the Contractor's spacecraft mission to the Moon.

4.1 Mission Integration

The Contractor shall perform mission integration for the NASA payload into the Contractor's Mission Architecture. This includes: providing Contractor point of contact for each payload, providing Contractor Vehicle-to-Payload interface definitions, providing Contractor operational details pertinent to the NASA Payload, holding meetings with NASA Payload representatives, planning and communicating Vehicle-to-Payload integration activities and milestones, performing analyses and assessments of Contractor's systems with NASA Payloads to confirm compatibility.

4.2 Analytical Integration

The Contractor shall perform analysis of Contractor's Mission Architecture and its systems to confirm that the requirements specified in the Task Order are satisfied for the NASA Payload. This includes assessing and satisfying agreed-upon: Contractor Vehicle resources provided to NASA Payload, resulting NASA Payload environments, non-interference of non-NASA Payloads with NASA Payloads, and NASA Payload operational timelines within overall Contractor Mission operations.

4.3 Physical Integration

4.3.1 Launch Processing

The Contractor shall receive, handle, and process the payload as specified in the Task Order. This includes all ground processing scenarios such as: standard installation, non-standard installation (e.g., installed at launch pad), and launch scrub turnaround.

4.3.2 Vehicle Integration

The Contractor shall integrate the payload with the Contractor's vehicle(s) as specified in the Task Order. This includes: physical installation, establishment and integration of interfacing resources (e.g., electrical, commanding, data, cooling, cleanliness), performing post-installation pre-flight checkouts, and swap out with backup payload.

4.4 Transport and Operation

The Contractor shall launch, transport, land, deploy, and possibly operate the NASA Payload according to the Task Order. Responsibilities for Orbital Debris and Planetary Protection, as applicable, resulting from NASA Payload content and operations will be specified in the Task Order.

4.4.1 Attached Landed NASA Payloads

Contractor responsibilities for landed NASA payloads shall end after the Contractor's system ceases transport operations, unless otherwise specified in the Task Order. The NASA payload may independently operate after the Contractor's system ceases operations. In the event that Contractor decides to terminate Contactor's system, Contractor will inform NASA of said decision and will negotiate with NASA system-termination-scenarios favorable to the continued operations of NASA payload. Should NASA decide to terminate NASA payload operations in tandem with Contractor's system, the Contractor will be relieved of this obligation.

4.4.2 Attached Non-landed NASA Payloads

Contractor responsibilities for non-landed NASA payloads shall end upon the permanent cessation of the Contractor's system operations, unless otherwise specified in the Task Order.

4.4.3 Deployed NASA Payloads

Contractor responsibilities for deployed NASA payloads shall end upon separation from the Contractor's systems unless NASA payload is dependent upon Contractor's system after deployment (e.g., communications, data relay) as specified in the Task Order. Contractor's system(s) shall issue the deploy command to NASA Payloads as specified in the Task Order. Deployment interface and/or use of a NASA or Contractor furnished deployment mechanism shall be as specified in the Task Order.

4.4.3.1 Deployed Non-NASA Payloads

The Contractor shall inform NASA of any Contractor or other non-NASA deployed payloads sharing a mission with a NASA payload, and manage the deployment of these such that they do not interfere with NASA payloads.

4.4.4 NASA Payload Termination

When defined in the Task Order, the Contractor shall terminate NASA Payload operations. The Contractor shall have no Contract responsibilities after NASA Payload termination with exception of providing previously stored data that may still reside on Contractor's systems.

4.5 Utilities Resources

The Contractor's systems, shall provide utility resources to the NASA Payloads as specified in the Task Order. The Contractor shall specify and provide definitions for which utility resources are available from Contractor's systems on a specific mission.

Standard utilities resources may include, but are not limited to: structural attachment, geometrical volume, mass accommodation, center-of-gravity constraints, electrical power/characteristics, thermal control, telemetry, commanding, physical access, and operational constraints of these.

4.6 Environmental Considerations

The Contractor shall specify and provide definitions for environmental controls or passive protections available from Contractor's systems on a specific mission. These can include, but are not limited to pressure, thermal, aerothermal, aerodynamic, plasma charging, radiation, magnetic field, lighting, and cleanliness.

4.7 Mission Data Provision

Mission data, including engineering data, timing of key events, mission trajectory and location information shall be provided to the NASA payload team as documented in the Task Order.

NASA Payload telemetry provided to the Contractor's spacecraft will be delivered to NASA as specified in the Task Order.

5.0 Purchase of Payload Data and Functions

For Contractor or other non-NASA payloads, the Contractor may make available to NASA, data and/or functions produced by the payload. These data and/or function purchases, and any 3rd party agreements, will be specified the Task Order.

6.0 Other Mission Services

Other Mission Services, from the Contractor or NASA, that may become available during the Commercial Lunar Payload Services term and within the Commercial Lunar Payload Services scope, may be offered by the Contractor or NASA. Other Mission Services will be proposed, negotiated and defined in task orders.

Examples include:

- The use of radioisotope heater units (RHUs) within NASA-provided payloads
- Sample handling and/or return services
- Payload services through the lunar night
- Precision landing
- Synergistic opportunities between NASA payloads and non-NASA payloads; such as a NASA payload provides data to non-NASA payload

7.0 Non Mission Services

NASA may issue task orders that require special services. Examples include:

a) Advance planning and feasibility studies in support of future contemplated missions of projected or existing payloads;
b) Development, fabrication, and test of hardware/software to support planning studies, special tests, and/or flight equipment for NASA Payloads or obtained services

8.0 Service Readiness

The Contractor shall provide evidence of readiness to proceed with performing an initial landed mission under this contract. This readiness evidence shall include:

a. Users Guide - Documentation of the Contractor's payload interface requirements and capabilities as well as descriptions of how NASA Payloads will be processed.

b. Readiness Assessment - Contractor documentation, designs, processes, facilities, and/or implementation materials that demonstrates that the Contractor is ready to proceed with lunar surface missions.

Specifics for each of these will be provided in the Request for Offer for associated Task Orders.

9.0 Capability Updates through Contract effective ordering period

Over the life of the contract, the Contractors shall provide projections of future missions, potential payload opportunities, and any changes to mission capability.

THIS PAGE INTENTIONALLY LEFT BLANK