Lucy Engineering Support Statement of Work
SEAS Task #66/Mod 9
Jessica Thompson

Period of Performance: 5/1/2017 – 04/14/2021

# 1 Introduction

This Statement of Work describes the effort expected for this systems engineering task in support of Lucy. Lucy is a Discovery class Trojan Asteroid Mission which flies by 6 Trojans. Project Management and Project Systems Engineering are at Goddard Space Flight Center for this PI-led mission. The PI is at South West Research Institute (SWRI).

# 2 Areas of Effort

The contractor shall perform the following work in support of this task:

- Verification and Validation & Risk Management along with systems engineering support
- Systems Test Engineering Support
- Launch Segment Engineering

## 2.1 Project-Level Systems Engineering Support

The contractor shall provide systems engineering support for:

- Development of project-level documentation and reports inputting reports, analyses, risks.
- Interaction on Level 2 and 3 documents with the Lockheed Martin DOORS database.
- Participating in multiple weekly spacecraft and instrument engineering meetings via teleconference
- Providing project-level perspective and representing project interests at those meetings
- Identifying system-level issues and bringing them to the attention of the Project Systems Engineer
- Leading engineering investigations of spacecraft and instrument system-level issues
- Supporting the development of documentation and review packages and presenting as necessary

## 2.2 Systems Test Engineering Support

The contractor shall provide test engineering support for Lucy Instrument level test planning, test execution, and review of documentation and test reports. The contractor shall provide instrument engineering support. This support includes participating in multiple weekly instrument engineering meetings, identifying issues and bringing them to the attention of the Instrument Systems Engineer, leading engineering investigations of instrument-level issues, and supporting the development of documentation and review packages.

The period of performance for this subtask is anticipated to complete on 04/14/2021.

## 2.3 Launch Segment Engineering

The contractor shall provide systems engineering services and support to the Lucy Project Office for launch segment engineering as outlined in section M. Launch Site Preparation and Post-Launch Support of the SEAS contract SOW.

The work will be performed on separate subtasks as identified below. This allows the project to allocate efforts to the proper project WBS elements.

| Subtask | Title | SOW Elements |
|---|---|---|
| 1 | Project-Level Systems Engineering Support | 2.1 |
| 2 | Systems Test Engineering Support | 2.2 |
| 3 | Launch Segment Engineering | 2.3 |

# 3 Period of Performance

April 15, 2017 to April 14, 2021

# 4 Travel

Travel to other US cities will be considered to be within the scope of this task.

## 4.1 Subtask 1 Project-Level Systems Engineering Support Travel

- 4-day trips, 3 per person (6 trips total) to Lockheed Martin in Denver, CO and or Boulder, CO in support of reviews and engineering meetings. TBD after April 2021.

## 4.2 Subtask 3 Launch Segment Engineering

- 4-day trip per month to Lockheed Martin in Denver, CO and/or Boulder, CO in support of reviews and engineering meetings TBD after April 2021.
- 4-day trip per month to United Launch Alliance (ULA) in Centennial, CO or Kennedy Space Center (KSC) in Cape Canaveral, FL. TBD after April 2021.

## 4.3 Subtask 2 Systems Test Engineering

- 4-week trip from IL to GSFC in Greenbelt, MD in support of TVAC-1 testing.
- 2-week trip from IL to GSFC in Greenbelt, MD in support of TVAC-2 testing.

# 5 Milestones, Deliverables, and Dates

## 5.1 Lucy Schedule Overview

Lucy has the following phases planned:

- Phase C/D, underway through 10/14/20

Planned Lucy project milestones:

- Instrument Pre-Environmental Reviews (PERs) Feb – May 2020
- Lucy Systems Integration Review (SIR) – July 2020
- Instrument Pre-Ship Reviews (PSRs) – September 2020
- Lucy Pre-Environmental Review – January 2021
- Lucy TVAC – April 2021

## 5.2 Task Milestones and Deliverables

The following deliverables apply to the task as a whole:

- Monthly Technical Progress Report: The report will include work progress against key milestones, deliverables made, issues, actions, and significant short-term plans. This should be a brief bulletized list. The report is due by the 15th (TBR) of each month.

- Final Task Order Report: The report will contain a comprehensive explanation of task results including the final incurred task order cost. This report is due within 30 calendar days after the task order is completed.

### 5.2.1 Project-Level Systems Engineering Support

The following deliverables apply to the project-level systems engineering support effort within the task:

- Mission Requirements Document, Environmental Requirements Document, Interface Control Documents - inputs as needed
- Imports and exports of requirements into and out of the DOORS requirements database as needed by project personnel
- Monthly and weekly systems-team reports as directed by the Lucy Project Systems Engineer
- Inputs into L/V ICD and IRD
- Inputs into Mission and Level 3 trades
- Documentation and review presentation material as directed by the Project Systems Engineer
- Review analyses, test plans, procedures and test results in support of verification activities
- Manage Risk Management Process Project Wide on Lucy including scheduling and conducting risk reviews with each of the element leads, culminating in a Project wide Risk Management meeting.
- Continue to provide imports and exports of risks into and out of the TDMS database as needed by project personnel
- Manage Verification and Validation Process during Phases C/D of Lucy within the DOORS Database.
- Continue to provide burn-down plots of Level 2 verification modules on a monthly basis as part of the PIMRs
- Continue to provide updates to Systems Qualification Plan and Test and Analysis Matrix as needed
- Review appropriate CDRLs, CCRs and SCoREs in TDMS as notified by the systems team
- Assist with mission or subsystem RFAs/ Advisories, GOLD rule waivers, single point failures, TLYF exceptions, and any technical issues as requested
- Continue to manage closure of major review actions in the GRM database and with the SRB Review Manager
- Continue to hold V&V Technical Interchange Meetings (TIMs) as needed
- Continue to support working groups that pertain to V&V and ATLO

### 5.2.2 Systems Test Engineering Support

The following deliverables apply to the system engineering test support effort within the task:

- Work with the stakeholders, scientist, product development leads/subsystem leads, cognizant and subject matter expert engineers, etc. to define the scope of instrument tests, the objectives, and the pre-work/activities needed prior to execution of the test
- Work with stakeholders and Instrument Systems to ensure that instrument testing covers the appropriate goals, objectives, requirements, ICD, IRD, ERD, etc.
- Provide input to Instrument I&T regarding what GSE (Mechanical, Electrical, Thermal, Optical, etc.) is needed to support test.
- Support instrument level testing, including, but not limited to, serving as Test Director, Test Conductor, or Responsible Engineer when applicable.
- Serve as responsible engineer for Instrument CPT, and other test activities as requested by the Lead Instrument Systems Engineer
- Support the technical coordination of a major instrument test campaign and the integration of all the individual test elements, e.g. GSE, measurements, data products, data review, scripts, etc. for

each test as requested by the Lead Instrument Systems Engineer

### 5.2.3 Launch Segment Engineering

The following deliverables apply to the Launch Segment Engineering effort within the task:

- Primary Project Office interface with the Launch Services Program, the Launch Services Provider (ULA), and the Commercial Payload Processing Facility Provider to ensure the successful planning and execution of the launch campaign
  - Oversee development of launch site requirements documentation (Launch Site Support Plan and ground ops section of the Launch Vehicle ICD) in the lead-up to the launch campaign
  - Oversea the launch site facility preparations and certifications in preparation for the start of the launch campaign. Coordinate with Project Contamination Engineering with regard to facility certifications and walk-downs leading up to the start of facility occupancy.
  - Coordinate development of the Project Launch Site Staffing Plan with Project Support, I&T Lead and Systems Engineering. Review and approve updates prior to and during the launch campaign.
  - Project lead for the Launch Operations Working Group process.
  - Project lead for successful execution of the launch campaign activities.
  - Coordinate Project Support Staff Activities at the launch site with Project Management
  - Maintain awareness of Guest Operations activities and actions

# 6 Performance Metrics

- Review support and studies: technical performance will be based on content of written report, value of expertise to the team, and timely follow-up and closure of actions. Acceptable performance is achieved when the ATR is satisfied that the material reflects the proper level of technical expertise, the objectives of the activity have been met, and the issues are properly closed. Reports shall be delivered to the ATR in electronic format.
- Project-level systems support: technical performance will be based on the content and quality of the system-level documentation and the timeliness of its delivery
- Project-level spacecraft systems support: technical performance will be based on accuracy and utility of written deliverables and on the ability of the contractor to identify spacecraft systems issues and lead the resolution of those issues, without burdening the spacecraft developer.