

**Landsat-9 Systems Engineer**  
**SEAS TASK 30 Mod 1244**  
**Statement of Work**

Modification No. 1244 extends the task period of performance through April 14, 2021 adds additional scope and travel to support the observatory system level verification and environmental testing.

### **1 Background:**

The Landsat program currently has two operational observatories, Landsat-7 and Landsat-8, and the program will continue into the future with the Landsat-9 mission. Landsat satellites provide operational acquisition of moderate resolution multispectral data of the Earth's surface on a global basis, and Landsat data and imagery are used in hundreds of applications for agriculture, education, business, science, and government. The data from the Landsat spacecraft constitute the longest record of the Earth's continental surfaces as seen from space, and is a record unmatched in quality, detail, coverage, and value.

With the selection of the Landsat-9 Spacecraft supplier as the previous supplier of the Landsat-8 spacecraft all flight elements for the Landsat-9 Mission are defined. The ground system for Landsat-9 will be developed by the United States Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS) of Sioux Falls, SD, which currently operates the existing Landsat-7 and -8 observatories. This ground system development will be supported in partnership with NASA/GSFC.

### **2 Summary of Work:**

The contractor shall provide support in the following general areas:

#### **2.1 Systems Engineering Support**

The contractor shall provide systems engineering expertise to the Landsat-9 Mission Systems Engineering Team. In general, the contractor's primary responsibilities are:

- Providing requirements management support
- Supporting Landsat-9 system engineering activities and system level testing, including supporting verifications, and technical evaluation of failures and anomalies.
- Provide support to the Operational Land Imager Instrument Manager

The contractor will directly report to the Landsat-9 Mission Systems Manager.

#### **2.2 Risk Management Support**

The contractor shall provide risk management expertise to the Landsat-9 Mission Systems Engineering Team. The contractor primary responsibilities are:

- Provide Risk Management and mission support services to the Landsat-9 Project Office
- Support Landsat-9 system engineering activities

The contractor will directly report to the Landsat-9 Mission Systems Manager as the Landsat-9 Risk Manager.

### 2.3 Instrument Systems Engineering Support

The engineer will be a critical senior member of the L9 Mission Systems Engineering team with the primary responsibilities of:

- Performing or leading the TIRS-2 level 3 verification and validation effort
- Developing, revising and managing TIRS-2 project level requirements and waivers/deviations
- Coordinating I&T planning and operations and serving as liaison between the TIRS-2, NGIS and L9 projects
- Supporting TIRS-2 and Observatory I&T activities at NGIS as shown in the travel section
- Supporting L9 Project general system engineering activities

### 3 Period of Performance

The period of performance for this task shall be from ~~October 15, 2020~~ ~~March 1, 2020~~ through ~~April 14, 2021~~ ~~October 14, 2020~~.

### 4 Specific Tasks

The contractor's primary responsibilities are as follows:

#### 4.1 Systems Engineering Support

##### 4.1.1 Requirements Definition and Management

- Work with science and engineering personnel to define a system configuration within the confines of cost and influence on future Landsat missions, and support the integration of these activities into the Project's procurement documentation.
- Assist in the capture and management of Project requirements from level-1 mission objectives and science requirements down to level-2 mission requirements.
- Work with science and instrument personnel to develop level 3 design requirements that map back to level 1 and 2 mission requirements.
- Review and update Landsat-9 requirements documents to ensure compliance with the latest version of NASA-GSFC standards and guidelines, such as GEVS, GSFC GOLD rules, etc. for use as the Landsat-9 requirements documents.

##### 4.1.2 Systems Engineering Documentation and Presentations

- Assist the Landsat-9 Project Mission Systems Engineer in the development of project level systems engineering documentation and products. This effort

includes the review and assessment of Landsat-9 supplier documentation and products.

- Participate in the preparation and presentation of technical and Project data packages and presentations as necessary. Assist the Landsat-9 systems engineering team in the review and assessment of Landsat-9 supplier documentation and products.
- Provide status of SE weekly reports

#### **4.1.3 Project Technical Execution**

- Assist in the coordination of the technical activities of the Landsat-9 Project to ensure engineering and operational elements achieve mission success.
- Provide oversight and coordination of Landsat-9 Observatory system verification, environmental testing and other duties as may be assigned by the L9 Project Mission Systems Manager. The primary responsibilities include system engineering leadership and technical oversight for the observatory thermal vacuum test. This includes planning, coordination, definition, implementation, equipment configurations and operations to support full system verification and validation of the observatory and mission.

#### **4.1.4 Member of the Landsat-9 Systems Team:**

- Provide input to plan system engineering activities. The contractor will participate in (as necessary and directed) Landsat-9 working group meetings including those for systems engineering and other project engineering groups.
- Attend and participate in technical reviews of the flight and ground elements of the Landsat-9 Mission.

#### **4.1.5 Resident Support at Spacecraft Contractor Facility**

- Provide oversight and support of Landsat-9 Project systems engineering, subsystem engineering and Subject Matter Experts (SME) in the coordination and witnessing of system level test activities and evaluation of test data to verify requirements and validate performance.
- Supply technical evaluation of failures, anomalies and associated corrective action, and evaluate technical progress of subsystem development and system level assembly and test.
- Support system verification activities, coordinating among all mission elements, including launch vehicle, ground system and mission operations

## **4.2 Risk Management Support**

### **4.2.1 Serve as Landsat-9 Risk Manager**

- The contractor shall serve as the Landsat-9 Risk Manager, and report directly to the Landsat-9 Systems Manager.

**4.2.2 Risk Management Plan:**

- The contractor shall develop and revise as needed the Landsat 9 Risk Management Plan. This plan shall be consistent with NASA GSFC accepted practices and be an adaptation of the plan used on the LDCM project and be updated to reflect the current operational activities at NASA/ GSFC.

**4.2.3 Risk Management Database Implementation:**

- The contractor shall implement the project Risk Tool, developing risk templates and metrics, and providing Risk guidance and training to Project personnel as needed. The contractor will work with project personnel to assist them in developing new risks and completing all the needed data entry as necessary. The contractor shall maintain the system and work with the GSFC Center and Code 420 IT personnel and infrastructure to ensure that the system complies with all necessary IT guidelines while providing the needed capabilities for the Landsat-9 project.
- The contractor shall lead a monthly review of new and existing Landsat-9 project risks. This effort includes making recommendations to the Landsat-9 Mission Systems Manager for any risks that should be carried forward as candidate risks on Landsat-9.
- The contractor will coordinate risk management activities with the risk management counterpart at USGS-EROS as directed.

**4.2.4 Risk Management Support:**

- Work performed shall include attending selected project meetings, tracking project risks, preparing presentations on the Project Risk Management process and on Risk status for Project-level reviews, and participating in Project-Level reviews, Joint Confidence Level (JCL) cost/schedule risk reviews, and vendor reviews. Support will also include the preparation for and the presentation of project reviews and presentations to NASA Headquarters, GSFC, and AETD senior management.

**4.2.5 Member of the Landsat-9 Systems Team:**

- At the Project level the contractor will provide input to plan and support system engineering activities. The contractor will participate in (as necessary and directed) Landsat-9 working group meetings including those for systems engineering and other project engineering groups.
- Attend and participate in technical reviews of the flight and ground elements of the Landsat-9 Mission.

**4.3 Instrument Systems Engineering Support****4.3.1 TIRS-2 Interface Requirements**

In this subtask, the contractor shall lead, manage and coordinate the revision of the L9 Level 3 TIRS-2 documents in preparation for the TIRS-2 continuing into the observatory I&T phases. The contractor shall identify potential changes to L9 Level 2

and Level 3 documents in preparation for the Instrument Integration Readiness Review (IIRR) Mission SIR, and Observatory PER and continuing as necessary. This includes the generation, coordination and approval of TIRS-2 or Project requirement deviations and waivers to these documents.

#### **4.3.2 TIRS-2 Requirements Verification**

In this subtask, the contractor shall serve as the lead engineer for TIRS-2 level 3 verification, both prior to launch and on orbit. The contractor shall produce and complete the verification matrix and all necessary verification supporting materials to prove that the verification on TIRS-2 is complete.

#### **4.3.3 Coordinate TIRS-2 Interface Meetings, Attend Project Meetings or Reviews**

In this subtask, the contractor shall either attend in person or via teleconference major L9 reviews. The contractor shall lead instrument working groups (WGs), attend project observatory environmental WGs, or technical group discussions held at the GSFC or NGIS upon L9 project's request. The contractor shall coordinate TIRS-2 meetings and reviews within the context of the larger L9 schedule and ensure to the largest extent that schedule conflicts are minimized.

#### **4.3.4 Support I&T Planning, Operations and Test Technical Execution**

In this subtask, the contractor shall serve as the lead engineer for coordinating I&T planning and operations and serving as liaison between the TIRS-2, NGIS and L9 Projects. The contractor shall represent the Project except where changes to the baseline requirements or decisions require the Project to reconcile proposed changes between the TIRS-2 and NGIS. The contractor shall support I&T activities at NGIS and support L9 Project general system engineering activities. Assist in the coordination of the technical activities of the Landsat-9 Project to ensure engineering and operational elements achieve mission success.

#### **4.1.5 Extended Travel at Spacecraft Contractor Facility**

- Provide oversight and support of Landsat-9 Project ~~TIRS-2~~ instrument systems engineering, coordination and witnessing of system level test activities and evaluation of test data to verify requirements and validate performance.
- Supply technical evaluation of failures, anomalies and associated corrective action, and evaluate technical progress of instrument and system level assembly and test.

## 5 Deliverable Items and Schedules

All review comments and analytical verifications shall be documented in memo form and the deadline shall be in accordance with the Landsat-9 Project schedule. All formal documents shall be prepared according to Landsat-9 conventions and in accordance with the Landsat-9 Project configuration management plan.

### 5.1 System Engineering Support

- Perform various requirements analyses as needed under direction of the L9 systems manager or L9 verification manager
- Review and provide comments including acceptability of verification results for instrument and spacecraft requirements
- Other systems engineering deliverables as defined by the Systems Engineering throughout the period of performance

### 5.2 Risk Management Support

- Review Risk Management Plan and processes to accommodate any NASA/GSFC/Project process or requirement changes
- Ongoing support of risk management database
- Ongoing support of Landsat-9 risk management process and reporting requirements
- Periodic reviews of existing LDCM and Landsat-9 risks vs. project phase as needed.
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### 5.3 Instrument Systems Engineering Support

- Support L9 and TIRS-2 Project reviews and technical inputs for ~~Instrument Integration Readiness Review (11/2019), SIR (1/2020)~~, Observatory PER (104/2020)
- Support TIRS-2 functional testing and Observatory level testing with TIRS-2 mechanical and electrical instrument integration at NGIS (10/2020+2/2019 – 4/20213/2020)
- Perform various requirements analyses as needed under direction of the L9 systems manager or L9 verification manager
- Review and provide comments including acceptability of verification results for instrument requirements
- Other systems engineering deliverables as defined by the Systems Engineering throughout the period of performance

## 6 Travel

The contractor is required to travel under this task. The contractor shall travel to support management reviews and Observatory Integration and Test activities, as needed, through the task period of performance. The contractor shall assume a minimum of five days travel, once per month, to the spacecraft contractor's facility in support of Monthly Program Status Reviews for all personnel working at .5 WYE or higher on the task who are not otherwise planned to travel in support of I&T activities.

The contractor also shall assume ten days travel, once per month, to the spacecraft contractor's facility in support of Observatory I&T for Systems Engineering personnel (not Risk Management) working at .5 WYE or higher on the task. Below are anticipated trips under the task. Contractor personnel serving in the role of L9 Instrument Systems Engineering Liaison to TIRS-2 under this task is required to maintain a sustained presence at the Spacecraft Contractor's facility in Gilbert, Arizona. As such extended travel to the Spacecraft contractor's facility will be necessary to fulfill this task requirement. Extended travel costs will be reimbursed in accordance with NASA Procedural Requirements (NPR) 9750.1. The contractor shall assume return travel to GSFC once every other month (6 trips per year).

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Location	Duration (days)	Dates	Purpose
Gilbert, AZ	8	12/13-20/2019	TIRS-2 E-box Mechanical I&T

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Location	Duration (days)	Dates (Month/Year)	# of Travelers	Labor Cat (Traveler)	Purpose	Company
Gilbert, AZ	3	March 2019	1	SSE-2	MPSR	
Gilbert, AZ	3	May 2019	1	SSE-2	MPSR	
Gilbert, AZ	3	July 2019	1	SSE-2	MPSR	
Gilbert, AZ	3	September 2019	1	SSE-2	MPSR	
Gilbert, AZ	3	November 2019	1	SSE-2	MPSR	
Gilbert, AZ	3	January 2020	1	SSE-2	MPSR	
Gilbert, AZ	3	March 2020	1	SSE-2	MPSR	
Gilbert, AZ	3	May 2020	1	SSE-2	MPSR	
Gilbert, AZ	3	July 2020	1	SSE-2	MPSR	
Gilbert, AZ	3	September 2020	1	SSE-2	MPSR	
Gilbert, AZ	3	November 2020	1	SSE-2	MPSR	
Gilbert, AZ	3	November 2019	1	SSE-2	MPSR	
Gilbert, AZ	3	November 2019	1	SSE-2	MPSR	
Denver, CO	3	October 2019	1	SSE-2	LV PDR	
Lompoc, CA	4	April 2020	1	SSE-2	GOWG	
Gilbert, AZ	14	September 2019	1	SSE-C	I&T Support	
Denver, CO	3	September 2019	1	SSE-C	Launch Vehicle Support	
Gilbert, AZ	14	October 2019	1	SSE-C	I&T Support	
Lompoc, CA	4	October 2019	1	SSE-C	Launch Vehicle Support	
Gilbert, AZ	12	November 2019	1	SSE-C	I&T Support	
Gilbert, AZ	13	December 2019	1	SSE-C	I&T Support	
Gilbert, AZ	10	January 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	January 2020	1	SSE-2	I&T Support	
Gilbert, AZ	14	February 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	February 2020	1	SSE-2	I&T Support	
Gilbert, AZ	6	March 2020	1	SSE-2	I&T Support	
Gilbert, AZ	13	March 2020	1	SSE-C	I&T Support	
Gilbert, AZ	13	March 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	March 2020	1	SSE-C	I&T Support	
Greenbelt, MD	5	March 2020	1	SSE-C	Ground Systems Support	
Gilbert, AZ	6	April 2020	1	SSE-C	I&T Support	
Gilbert, AZ	14	April 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	April 2020	1	SSE-2	I&T Support	
Gilbert, AZ	6	May 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	May 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	May 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	May 2020	1	SSE-C	I&T Support	
Gilbert, AZ	6	June 2020	1	SSE-C	I&T Support	
Gilbert, AZ	13	June 2020	1	SSE-C	I&T Support	
Gilbert, AZ	13	June 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	June 2020	1	SSE-2	I&T Support	
Greenbelt, MD	5	June 2020	1	SSE-C	Ground Systems Support	
Gilbert, AZ	6	July 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	July 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	July 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	July 2020	1	SSE-2	I&T Support	
Gilbert, AZ	6	August 2020	1	SSE-C	I&T Support	
Gilbert, AZ	13	August 2020	1	SSE-C	I&T Support	
Gilbert, AZ	13	August 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	August 2020	1	SSE-2	I&T Support	
Lompoc, CA	4	August 2019	1	SSE-C	Launch Vehicle Support	
Lompoc, CA	4	August 2019	1	SSE-C	Launch Vehicle Support	
Gilbert, AZ	6	September 2020	1	SSE-C	I&T Support	
Gilbert, AZ	14	September 2020	1	SSE-C	I&T Support	
Gilbert, AZ	7	September 2020	1	SSE-C	I&T Support	
Gilbert, AZ	6	September 2020	1	SSE-C	I&T Support	
Greenbelt, MD	5	September 2020	1	SSE-2	Ground Systems Support	
Gilbert, AZ	7	October 2020	1	SSE-C	I&T Support	
Gilbert, AZ	6	October 2020	1	SSE-C	I&T Support	
Lompoc, CA	5	October 2019	1	SSE-C	Launch Vehicle Support	
Lompoc, CA	5	October 2019	1	SSE-C	Launch Vehicle Support	
Boulder, CO	6	March 2019	1	SSE-C	OLI-2 EMC testing	
Boulder, CO	3	March 2019	1	SSE-C	OLI-2 MPSR	
Gilbert, AZ	2	March 2019	1	SSE-C	SC MPSR	
Greenbelt, MD	1	March 2019	1	SSE-C		
Boulder, CO	14	April 2019	1	SSE-C	OLI-2 TVac Testing	
Boulder, CO	3	April 2019	1	SSE-C	OLI-2 MPSR	
Gilbert, AZ	2	April 2019	1	SSE-C	SC MPSR	
Greenbelt, MD	1	April 2019	1	SSE-C		
Boulder, CO	14	May 2019	1	SSE-C	OLI-2 TVac Testing	
Boulder, CO	3	May 2019	1	SSE-C	OLI-2 MPSR	
Gilbert, AZ	2	May 2019	1	SSE-C	SC MPSR	
Greenbelt, MD	1	May 2019	1	SSE-C		

Destination Location	Duration (days)	Dates (Month-Year)	# of Travelers	Labor Cat (Traveler)	Purpose	Comapny
Gilbert, AZ	7	Feb-2020 (from DEN)	1	SSE-C	I&T Support	
Greenbelt, MD	4	Feb-2020 (from DEN)	1	SSE-C	IT & badging	
Gilbert, AZ	13	Feb-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	13	Mar-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	16	Mar-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	14	Apr-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	10	Apr-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	13	May-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	12	May-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	14	June-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	13	June-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	13	July-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	13	July-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	7	Aug-2020 (from DEN)	1	SSE-C	I&T Support	
Greenbelt, MD	4	Aug-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	13	Aug-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	8	Sept-2020 (from DEN)	1	SSE-C	I&T Support	
Lompoc, CA	4	Sept-2020 (from DEN)	1	SSE-C	LV Support	
Gilbert, AZ	14	Sept-2020 (from DEN)	1	SSE-C	I&T Support	
Gilbert, AZ	10	Oct-2020 (from DEN)	1	SSE-C	I&T Support	

**7 Work Location**

This work will be primarily performed at the Goddard Space Flight Center with some work performed at the Spacecraft contractor’s facility in Gilbert, Arizona. In addition the task work involves planned travel between GSFC and the Spacecraft contractor’s facility.

**8 Reporting Requirements**

The contractor shall report status to the Landsat-9 project on a daily to weekly basis. No presentation slides are required except for special occasions. The contractor shall report to the Technical Representative (TR) or designated alternates on a tri-monthly basis. Reports shall include, but are not limited to, informal presentation of interim results, and status of development activities. The contractor shall deliver all documents in electronic document format (PDF or Word) to the TR.

## **9 Qualifications and Experience**

### **9.1 Systems Engineering Support**

The work requested under this task order for systems engineering support requires a team of experienced systems engineers with 15+ years of experience working with NASA/GSFC spaceflight missions and instruments requirements, development, verification, and operations.

### **9.2 Risk Management Support**

The work requested under this task order requires an experienced risk manager with 10+ years of experience working with NASA/GSFC spaceflight missions and instruments requirements, development, verification, and operations.