Task Order Statement of Work (SOW)

SOW Change Log	
Mod #	**Change Summary**
1	Journal Entry – 05/16/2018 A no-cost Period of Performance extension has been granted by the vendor through June 11, 2018.
2	This is a Government Administrative modification
3	This is a Government Administrative modification
4	06/12/2018 - 05/21/2019– no change in Technical Requirement
5	This is a Government Administrative modification
6	This is a Government Administrative modification
7	05/22/2019 - 05/21/2020 - Add ILLUMA-T Systems Engineering Lead support
8	This is a Government Administrative modification
9	05/23/2020-8/15/2020 - A no-cost Period of Performance extension through August 15, 2020.
10	8/16/20 – 10/14/20 – Period of Performance extension through October 14, 2020. Mod 8 SOW changed to be subtask 1 and added new work for subtask 2
11	10/15/20 – 4/14/21 – Period of Performance extension

Modification 11
Extension of Period of Performance through April 14, 2021

Modification 10
Extension of Period of Performance through October 14, 2020

Statement of Work
ILLUMA-T's overarching objective is to demonstrate an optical communications user terminal capable of high bandwidth data transfer between Low Earth Orbit (LEO) and a ground station via a geosynchronous (GEO) relay satellite. The ILLUMA-T payload will communicate primarily with the LCRD (Laser Communication Relay Demonstration) payload which will be located in a Geosynchronous Orbit.

Towards this goal, the ILLUMA-T Project Office requires systems engineering leadership, integration and test expertise to guide the optical communications and navigation system definition, design, implementation and verification for various individual space flight projects

Subtask 1:
The contractor shall provide systems engineering support for ILLUMA-T:

1) Lead the systems engineering team which may comprise of specific project systems engineers and/or discipline engineers.
2) Oversee technical aspects of the design, development, and implementation of the overall ILLUMA-T system.
3) Develop a functional requirements structure for and define functional requirements for each ILLUMA-T spaceflight project.
4) Define system interfaces, negotiate and broker interface requirements with ILLUMA-T Project partners, and lead the development of interface control documents with support of ILLUMA-T Project partners.
5) Guide the design of the overall ILLUMA-T optical communications and navigation system with a view towards future mission capabilities, in coordination with ILLUMA-T Project partners.
6) Analyze risk, document and report on risks related to ILLUMA-T
7) Monitor and support subsystem developments as needed.
8) Plan interface testing schedule and guide interface test development with ILLUMA-T Project partners.
9) Support any on-site integration and testing activities as needed.
10) Lead systems engineering team (including systems engineering efforts amongst ILLUMA-T Project partners) in requirements verification and validation efforts.
11) Provide Systems Engineering inputs for ILLUMA-T Project monthly reports.
12) Provide Systems Engineering support for major milestone reviews (SRR, PDR, CDR, PER, PSR)

Subtask 2:
The contractor shall provide integration and test support for ILLUMA-T:

1) Design, develop and integrate Ground Support Equipment (GSE) to support the integration and test of the ILLUMA-T system
2) Develop and integrate necessary for the GSE
3) Support the integration and testing of the ILLUMA-T interfaces with the Project partners
4) Develop plan/procedures to execute the testing and verification of ILLUMA-T
5) Support the integration and testing of ILLUMA-T at GSFC and at partner locations
6) Analyze risk, document and report on risks related to ILLUMA-T integration and test

Travel
Travel is required for this task to coordinate plans with ILLUMA-T Project partner institutions, monitor ILLUMA-T Project partner technical progress, and support face-to-face interface planning and testing. Trips include:

# of Trips	# of Engineers	Destination	Duration (d)	Purpose

2	2	Lexington, MA	3	Technical Interface Meetings with MIT/LL
1	2	Houston, TX	3	Technical Interface Meetings with NASA JSC

Modification 9
No change to the SOW. This is a no-cost extension through August 15, 2020

Modification 7
Add the following:
Statement of Work
ILLUMA-T's overarching objective is to demonstrate an optical communications user terminal capable of high bandwidth data transfer between Low Earth Orbit (LEO) and a ground station via a geosynchronous (GEO) relay satellite. The ILLUMA-T payload will communicate primarily with the LCRD (Laser Communication Relay Demonstration) payload which will be located in a Geosynchronous Orbit.
Towards this goal, the ILLUMA-T Project Office requires systems engineering leadership to guide the optical communications and navigation system definition, design, implementation and verification for various individual space flight projects
The period of performance for Mod 7 is from May 22, 2019 to May 21, 2020.

The contractor shall:
ILLUMA-T System Engineering.

- Lead the systems engineering team which may comprise specific project systems engineers and/or discipline engineers.
- Oversee technical aspects of the design, development, and implementation of the overall ILLUMA-T system.
- Develop a functional requirements structure for and define functional requirements for each ILLUMA-T spaceflight project.
- Define system interfaces, negotiate and broker interface requirements with ILLUMA-T Project partners, and lead the development of interface control documents with support of ILLUMA-T Project partners.
- Guide the design of the overall ILLUMA-T optical communications and navigation system with a view towards future mission capabilities, in coordination with ILLUMA-T Project partners.
- Manage ILLUMA-T system risks.
- Monitor and support subsystem developments as needed.
- Plan interface testing schedule and guide interface test development with ILLUMA-T Project partners.
- Support any on-site integration and testing activities as needed.
- Lead systems engineering team (including systems engineering efforts amongst ILLUMA-T Project partners) in requirements verification and validation efforts.
- Provide Systems Engineering inputs for ILLUMA-T Project monthly reports.

- Provide Systems Engineering support for major milestone reviews (SRR, PDR, CDR, PER, PSR)

Travel

Travel is required for this task to coordinate plans with LEMNOS Project partner institutions, monitor LEMNOS Project partner technical progress, and support face-to-face interface planning and testing. Trips include:

# of Trips	# of Engineers	Destination	Duration (d)	Purpose
12	1	Lexington, MA	3	Technical Interface Meetings with MIT/LL
2	1	Houston, TX	3	Technical Interface Meetings with NASA JSC
2	1	Denver, CO	3	Technical Interface Meetings with Lockheed Martin

Modification 4

LEMNOS Systems Engineering Lead Statement of Work – Mod 4 May 2, 2018

Statement of Work

The objective of the Laser-Enhanced Mission Communications Navigation and Operational Services (LEMNOS) Project Office is to establish an end-to-end optical communications and navigation system for current and future NASA space flight missions. Towards this goal, the LEMNOS Project Office requires systems engineering leadership to guide the optical communications and navigation system definition, design, implementation and verification for various individual space flight projects. The LEMNOS Project Office currently manages two space flight projects: Orion EM-2 Optical Comm System (O2O) and Integrated LCRD LEO-User Modem and Amplifier Optical Communications Terminal (ILLUMA-T). Both O2O and ILLUMA-T will be developed concurrently in order to maximize efficiencies due to the significant programmatic and technical overlap. The period of performance for Mod 0 is from May 22, 2018 to May 21, 2019.

The contractor shall:

LEMNOS System Engineering.

- Lead the systems engineering team which may comprise specific project systems engineers and/or discipline engineers.
- Oversee technical aspects of the design, development, and implementation of the overall LEMNOS system.
- Develop a functional requirements structure for and define functional requirements for each LEMNOS spaceflight project.
- Define system interfaces, negotiate and broker interface requirements with LEMNOS Project partners, and lead the development of interface control documents with support of LEMNOS Project partners.

- Guide the design of the overall LEMNOS optical communications and navigation system with a view towards future mission capabilities, in coordination with LEMNOS Project partners.
- Manage LEMNOS system risks.
- Monitor and support subsystem developments as needed.
- Plan interface testing schedule and guide interface test development with LEMNOS Project partners.
- Support any on-site integration and testing activities as needed.
- Lead systems engineering team (including systems engineering efforts amongst LEMNOS Project partners) in requirements verification and validation efforts.
- Provide Systems Engineering inputs for LEMNOS Project monthly reports.
- Provide Systems Engineering support for major milestone reviews (SRR, PDR, CDR, PER, PSR)

Travel

Travel is required for this task to coordinate plans with LEMNOS Project partner institutions, monitor LEMNOS Project partner technical progress, and support face-to-face interface planning and testing. Trips include:

# of Trips	# of Engineers	Destination	Duration (d)	Purpose
12	1	Lexington, MA	3	Technical Interface Meetings with MIT/LL
6	1	Houston, TX	3	Technical Interface Meetings with NASA JSC
6	1	Denver, CO	3	Technical Interface Meetings with Lockheed Martin