

Propulsion Design & Engineering Statement of Work

In support of the Europa Propulsion Subsystem (Code 597)

PoP: 10/14/2020 – 4/14/2021

Mod 7

Task support requested by:

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Summary

The purpose of this task is to provide on-going propulsion design support to the Europa propulsion subsystem at GSFC. This work is being accomplished under the TIDES contract Task 27. The Propulsion Branch and/or a Project will provide the necessary computer to perform this work.

Task Background

The Europa mission is managed by the Jet Propulsion Laboratory (JPL), with the Advanced Physics Laboratory (APL) as deputy and Propulsion Module provider. The propulsion subsystem will be managed by APL and provided by GSFC and MSFC. GSFC has primary responsibility for delivery of the propulsion system, MSFC will support risk reduction activities as directed by GSFC. All reporting shall be conducted through the propulsion subsystem Product Development Lead (PDL) at GSFC in Code 597. Task will be funded per FY due to project funding profile, however, is expected to continue through delivery, currently scheduled for October 2020.

The period of performance for this Task Mod is from 10/4/2020 – 4/14/2021.

Task Requirements

1. The propulsion designer shall provide management of all design and hardware tasks related to the spacecraft propulsion system, these phases include but are not limited to, requirements definition, design, analyses, integration, test, propellant loading, launch & mission operations activities.
2. The designer shall lead the development of propulsion design requirements for the specific program.
3. The designer shall provide a written monthly status report to the Task Monitor summarizing all major activities & issues related to the spacecraft propulsion system. The report may be summarized verbally at the Propulsion Branch meetings or submitted in writing/email to the Task Monitor. The status report shall be provided to the Task Monitor monthly. The report shall include a status of the contractor's certification status and renewal dates as applicable.

Required Skills & Training

The designer requires the ability to perform detailed design of multiple elements of the propulsion subsystem. Must have excellent working knowledge of Pro/Engineer Wildfire 3.0 with specific working knowledge of and experience with the Pro/Piping module. Design responsibilities and specific qualifications including but not limited to the following:

1. Detailed propellant and gas manifold design. Must have experience in producing tube designs and final drawings for manufacturing which includes providing bend tables for automated tube bending machine. Must

have experience in designing propulsion manifold systems with working knowledge of design and fabrications constraints imposed by such considerations as tube bending limitations, cleaning of lines, and welding with Series 10, 8, and 6 weld heads for a Swagelock orbital arc weld machine,

2. Detailed mechanical bracket and line support design. Must have experience designing and producing final fabrication drawings for various support structures including line stand offs, propulsion components mounts, electrical connector brackets, harness mounts, and thermal blanket mounting.

3. Assembly Drawing Design. Must have experience in producing detailed final assembly drawings for various levels of integration space flight systems. Must have working knowledge of specifying NASA design standards for fasteners and fastener assembly specifications, bonding, polymerics, grounding. Must also have experience and/or knowledge of the unique Propulsion Branch (Code 597) manufacturing and assembly capabilities.

4. Working knowledge of manufacturing and assembly techniques used by Code 597 to provide inputs to system level configuration trade studies. Provide manufacturing information to the Propulsion System lead to accurately trade mass and volume versus manufacturing ease.

5. Ground Support Equipment (GSE) Design. Must have experience in designing fixtures for ground fabrication and test of high-pressure fluid and contamination sensitive fluid systems.

The Designer/Engineer shall provide both a preliminary and final drawing of any component, bracket, module, or assembly to the Propulsion Lead and Project CM as needed. All drawings and/or design shall conform to the following standards:

500-PG-8700.2.5B	Engineering Drawing Standards Manual
AFSPCMAN 91-710	Range Safety User Requirements
AMS-QQ-S-763	Pressure Tubing Specification, Stainless Steel
ASME Y14.5M	Dimensioning and Tolerancing
ASTM-A511	Standard Specification for Seamless Stainless Steel Mechanical Tubing
GSFC-STD-7000	General Environmental Verification Standard for GSFC Flight Programs and Projects (GEVS)
MSFC-HDBK-527	Materials Selection List for Space Hardware Systems
NPD 8010.2	Use of the SI (Metric) System of Measurement in NASA Programs
SAE-AIR-5378	Aircraft Tube Bending Methods, Techniques and Tooling
SAE-AS-33611	Tube Bend Radii

Assist NASA engineers in the development, test, and integration of the propulsion subsystems. Responsibilities include

1. Interacting with outside component vendors to specify and identify needed equipment and hardware,
2. Interacting with in-house mechanical fabrication shop,
3. Interacting with JPL (spacecraft) and APL (propulsion module) as necessary to work propulsion subsystem interfaces,
4. Performing system analysis/calculations of dry mass, internal volumes, etc.,
5. Working with electrical and thermal engineer groups (at APL) in defining harnesses routing and blanket attachments,
6. Providing integration anomaly and problem support,
7. Providing detailed printouts for tube fabrication,

8. Other engineer support as needed to complete the subsystems on time.

Must be able to work effectively with the Project Mechanical Design team. Specific design knowledge of propulsion subsystems and knowledge of the drawing configuration management system are highly desirable.

Deliverables

- Brief written progress reports to be supplied to the Task Monitor AND the subsystem lead each month.
- Flight drawings.

Additional milestones will be developed as required by the development schedule and the Task Monitor.