

## **SUPREME Plasma Thruster: Cryogenic System Preliminary Design**

**Code:** 21/28

**Company:** Neutron Star Systems UK Ltd.

**Location:** United Kingdom (Home Office Remote Working)

### **Company Description:**

Neutron Star Systems UK Ltd is a space start-up pioneering the use of High-Temperature Superconductors for spacecraft applications. NSS main product is an exciting new electric propulsion technology. Our SUPREME thruster is an Applied-Field Magnetoplasmadynamic thruster (AF-MPD), which has been researched globally for over 60 years but has been held back by the high mass of the electromagnets needed to generate strong magnetic fields. New technology in the form of super-powerful high-temperature superconducting magnets promises to overcome this issue and revolutionise the economics of space operations. Three key advantages are offered by AF-MPD technology: (i) Very low propellant costs (ii) Enormous scalability with minimal mass and volume penalties (iii) A wide throttleability range over several operating conditions.

The company has built a knowledge network and partnerships with other specialist technology businesses over the past 3 years from its parent base in Germany. Neutron Star Systems UK Ltd. is the company's UK office, focussed on the development of the superconducting coils, cryogenic systems, and power electronics for the thruster. NSS UK is currently participating in the Westcott Business Incubation Programme.

### **Project Description:**

Using Neutron Star Systems own literature database plus specialist material available online (eg ESA), the applicant will research candidate cryogenic technologies for use with the NSS SUPREME thruster.

The goal for the applicant is to establish the outline requirements for the cryogenic system and how these requirements will differ over a range of thruster power classes (e.g., 5kW, 20kW, 50kW, 100kW). The applicant will identify the various components utilised in different cryogenic system technologies and define the preliminary design and parameters of such components for the various power classes. In addition, the applicant may explore system integration considerations of the cryogenic system within the thruster and supporting technologies which can improve the performance of the system.

This will require developing an understanding of:

- How cryogenic systems operate to provide low temperatures for cryogenic components.

- How different cryogenic technologies are suitable for different applications depending on the operating temperatures and heat loads.
- How the needs of different thruster power classes impact the requirements of the cryogenic system.
- How different design considerations and enabling technologies on the side of the superconducting coil can affect the requirements of the cryogenic system.
- How the cryogenic system can be integrated within the thruster and also within an overall spacecraft system.

The applicant needs to prepare written reports and evolve written specifications, starting with on-going rough working notes on-line and regular reviews and discussions at least weekly with his/her supervisor in a friendly, supportive manner via video and telephone calls.

### **Applicant Specification:**

An enthusiastic engineer or physicist in any of the following disciplines: Mechanical Engineering, Aerospace Engineering, Thermodynamic Engineering, or Physics with Thermodynamics

### **Minimum Requirements:**

- Thermodynamics and/or Physics Background (practical or academic), Final Year Bsc or Masters Student
- Self-starter attitude and initiative; someone who recognises and is excited by involvement in a start-up space business and will readily adapt themselves to whatever challenges arise.
- Excellent Communications Skills both written and verbal.
- Team player who enjoys interaction with the other team members.
- Good skills with standard office software (eg Excel, Word, Powerpoint or equivalent). At ease with on-line meeting tools such as Microsoft Teams.
- Fluent in English, verbal and written
- Access to an on-line working environment and good internet connectivity

### **Preferred Additional Requirements:**

We are looking for a person who shows enthusiasm, determination, a willingness to work hard and find ways of overcoming difficulties. Also, a friendly individual who enjoys being part of a team.

Any previous experience in the fields of thermodynamics, cryogenics, or electric propulsion would be beneficial.

### **Further details:**

8 weeks minimum fixed term contract to be agreed with successful candidate. Virtual Induction Event to be held on 21 June, 2021. Ideally to complete before the start of the next academic year. Salary is £1,300 per calendar month gross.

**Closing Date for Applications: 5pm Friday 14 May**

Applications should be made through the online form attaching a CV, before the closing date. Please note that elements of the form left incomplete will be deemed to render the application ineligible. They will be checked for eligibility and forwarded to the employer.