This proposal seeks to gain funding for the first Washington State University (WSU) Cougs In Space (CIS) Vacuum Arc Thruster (VAT) division. This funding and support are requested for materials testing and implementing VAT on CougSat 2, WSU’s CIS 2nd Cube Satellite. The following proposal will explain the rationale, design, cost, and implementation of a VAT on CougSat 2.

(*Photo of VAT*)

The reasons for building a VAT include but are not limited to

* Direct thrust control on CougSat 2
* Experimentation with propellant velocities
* Experimentation with nozzle size and shape
* Optimization of power consumption
* Understand how magnetic fields can be used to control spot formation and increase thrust
* Experience for CIS members to build, design, and implement an electronic propulsion device
* Establish connections with industry
* Refine documentation skills for future use

The basic principle of any propulsion system, whether chemical, electric, or some other method, is to exert a thrust on a spacecraft to move it in the desired direction. A Vacuum Arc Thruster is a specific type of Electric Propulsion that produces thrust by releasing the plasma. As with many other Electronic Propulsion systems, a VAT has relatively low thrust and, if developed right, will have a high ISP or efficiency. The high efficiency is due to the low power it takes to accelerate the propellent to high velocity.

Cougs in Space is currently developing a Triggerless Vacuum Arc Thruster. There are 2 types of VAT triggered and triggerless. Triggerless VATs tend to have a slightly shorter life while greatly reducing the overall size and mass of the thruster. CIS has chosen a triggerless VAT which is what this proposal will focus on. A triggerless VAT system consists of 3 main electrical sub-systems, an induction coil, a capacitor, and an Anode/Cathode pair.

The estimated cost for a VAT is around 1000$ for a cube satellite due to the high cost of the copper cathode, cathode material, and wet tantalum capacitors. However, for the prototypes, that cost can be reduced by using aluminum as the anode and less energy-dense cheaper capacitors.

The current timeline is the production of the prototype WSU arc thruster by March for integration on the spaceport America payload.

Cougs in space currently can test VATs in a high vacuum chamber and is currently developing techniques to estimate the thrust of the VAT.

RND sources

Michael Bretti, Applied Ion Systems, <https://appliedionsystems.com/>

Images:

