MakerSat

MakerSat is a multi-project 1U CubeSat <Wikipedia> that will 3D printed, assembled, and deployed on the International Space Station (ISS). MakerSat aspires to help pioneer space manufacturing by reducing the time, cost, and complexity needed to create a CubeSat.

<< right hand column, pic of MakerSat>>

MakerSat Members:

Dr. Joshua Griffin - adviser

Dr. Stephen Parke - adviser

Aaron Ewing - member

Connor Nogales - member

Grant Johnson – member

Braden Grim - member

Mitch Kamstra - member

Keith Moilanen – previous member

<<Team Pic>>

Mission Objectives:

* Demonstrate space additive manufacturing and assembly on the ISS
* Demonstrate multi-user, multi-project satellite architecture
* Determine the rate of decay in 3D printed polymers in space in outer space
* Capture multiple photographs of Earth

Additive Manufacturing and Space Assembly:

The ISS has recently acquired a 3D printer that is capable of working in a micro-gravity environment, created by Made In Space. This 3D printer will be printing the rails of MakerSat and the other components of the satellite (PCB boards, Li-Ion batteries etc.) will be sent up to the ISS. MakerSat will then be assembled in space by the astronauts inside the ISS using the snap-together/slide-together frame design <photos of assembly process> that is designed to easily and safely be assembled in micro-gravity.

Multi-User Architecture:

MakerSat is designed with four independent design spaces, known as Experiment or Science Boards <picture of science board>. Each Experiment Board is completely separate and independent from each of the other Experiemnt Boards, so the success or failure of any experimental objective has no effect on any other experimental objective. Each of four Experiment Boards will have independent power and communication lines that run through the Hub Board <pic of Hub>. The Hub is the central computer of MakerSat, in charge of requesting power on/off sequences from the Electrical Power System board (EPS) <pic of EPS> designed by Near Space Launch; as well as collecting all data from each Experiment Board, committing data to memory, and transporting all the information to the Radio System <pic of Radio> also designed by Near Space Launch when it is time to transmit the data back to Earth.

The strengths of having four independent experimental systems is remarkable. This would allow different research parties to collaborate together and to share a single CubeSat. The cost could be reduced down ¼ the original cost (up to four independent parties sharing the cost), and the complexity could be reduced by only having to produce a single CubeSat, instead of four possible CubeSat missions. Perhaps the most remarkable improvement in the Multi-User Architecture is the reduction in time to develop, since only a single experiment has to be created. As soon as that is completed, all one would have to do is integrate the experiment onto a MakerSat architecture (which would not be too complicated, since the systems are designed to be integrated easily no matter what each experiment board contains).

MakerSat Experiments:

3D Printed Polymer Degradation Experiment:

Blah blah cantilever blah blah

Earth Imager System:

MakerSat will contain

Flight Opportunities:

MakerSat has a planned launch for December 2017 on flight ELaNA XX by Virgin Galactic. The orbit will be at 500km at a 90 degree inclination polar orbit.

Publications:

<<PDF of poster>>

<<Quad chart>>

Acknowledgements:

* Funding source: Idaho Space Grant Consortium and NNU
* Plexus
* Made In Space, Inc.
* Near Space Launch
* NASA ELaNa program
* Jason Dunn: Made In Space
* Dennis Zattiero: Caldwell ID High School

Who what when where why