

HISSD (HISat ISS Deployment) Mission Abstract

NovaWurks has been investigating the cellularization of satellite technology as a way to dramatically decrease the cost of new space assets, while also enabling these assets to be incrementally upgradeable and easily repairable. Basically, a small number of nanosat-scale satellites (satlets) serve as building-blocks for assembling a fully-functional satellite, analogous to how the human body is made up of a fairly limited number of basic cell types. NovaWurks has developed a hyper-integrated satlet, named HISat, which provides complete satellite functionality in a nanosat scale package.

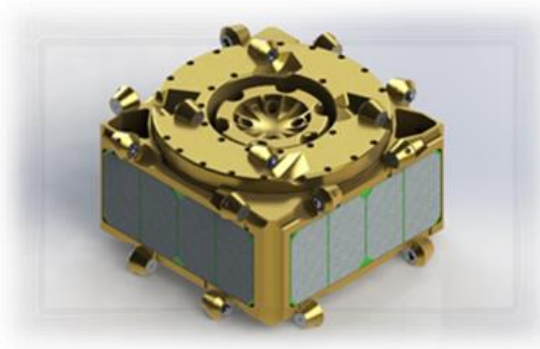


Figure 1 HISat Prototype 4

NovaWurks developed technologies allow its HISats to be configured and aggregated as reliable, flexible spacecraft for a variety of space purposes. The satlet aggregation concept enables a dramatic change to payload accommodation thinking in the aerospace industry. Payloads are currently built or modified to conform to the spacecraft bus which is hosting them. HISats reverse that paradigm by providing a building-block bus that can conform to and accommodate many different payload sizes and shapes providing benefits to payload designers. A satlet cellular approach to satellite development is a means to provide the promise of increased production to lower costs. Satlet production runs of as little as 25 units are predicted to significantly lower cost per satlet. Low production costs, combined with low cost access to space, enable many space-based services to be competitively offered.

Mission Description

As a way to buy-down risk during NovaWurks HISat technology development program, NovaWurks is planning to demonstrate an on-orbit assembly and LEO deployment of the NovaWurks Hyper-Integrated Satlet (HISat) system with a DARPA sponsored communication package (eXCITE). The proposed research utilizes a cargo vehicle flight to the ISS with at least five HISats, an eXCITE radio, and a small interface experiment manifested. To achieve packaging

efficiency in the pressurized area of the ISS cargo vehicle the HISats will be packaged individually. As an added benefit the disassembled cargo vehicle configuration enables a demonstration of the ease of on-orbit HISat assembly into packages, also known as PACs (Package of aggregated cells).

The research goals require exposure to the space environment. HISat space exposure is satisfied by transfer from the cargo vehicle's pressurized area into the ISS for eventual transfer to the ISS exterior (i.e. through the JEM airlock). The HISats will remain in an inactive state upon transfer into the ISS and be stored until an astronaut activity time can be scheduled to assemble the HISats into their flight PAC. HISats are designed to be attached together utilizing their unique edge connector design. This portion of the research seeks to demonstrate and characterize the assembly of HISats into an aggregated system capable of sharing resources and improving selected performance metrics. Figure 2 shows a rendition of the flight PAC.

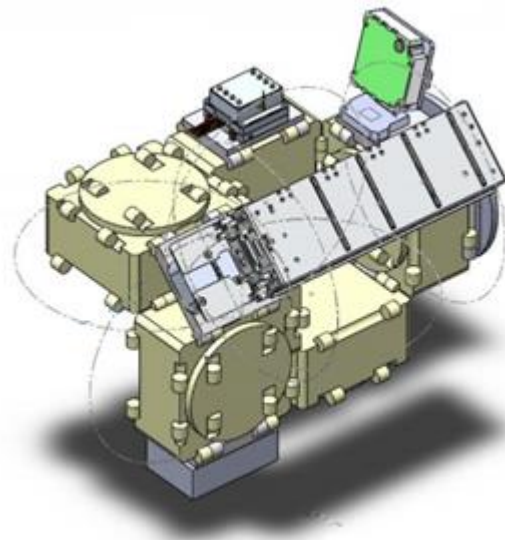


Figure 2 ISS Flight PAC – Assembled

After assembly, the PAC will be mounted on the JAXA Multi-Purpose Experiment Platform (MPEP), and placed on the JEM airlock slide table for transfer outside the ISS. Once exterior to the ISS, the PAC is activated and undergoes checkout.

The final step of the plan is the deployment of the PAC from the ISS for free flying operations. An approach similar to prior cubesat deployments will be utilized where a crewmember operates the JEM Remote Manipulating System (JRMSS) – to grapple and position the PAC for deployment. As a free flyer, the PAC will conduct experiments for at least two weeks with a goal of maintaining operations through the duration of its orbital lifetime. This research will advance understanding of the cellular satellite technologies that NovaWurks has embodied in its HISat design.

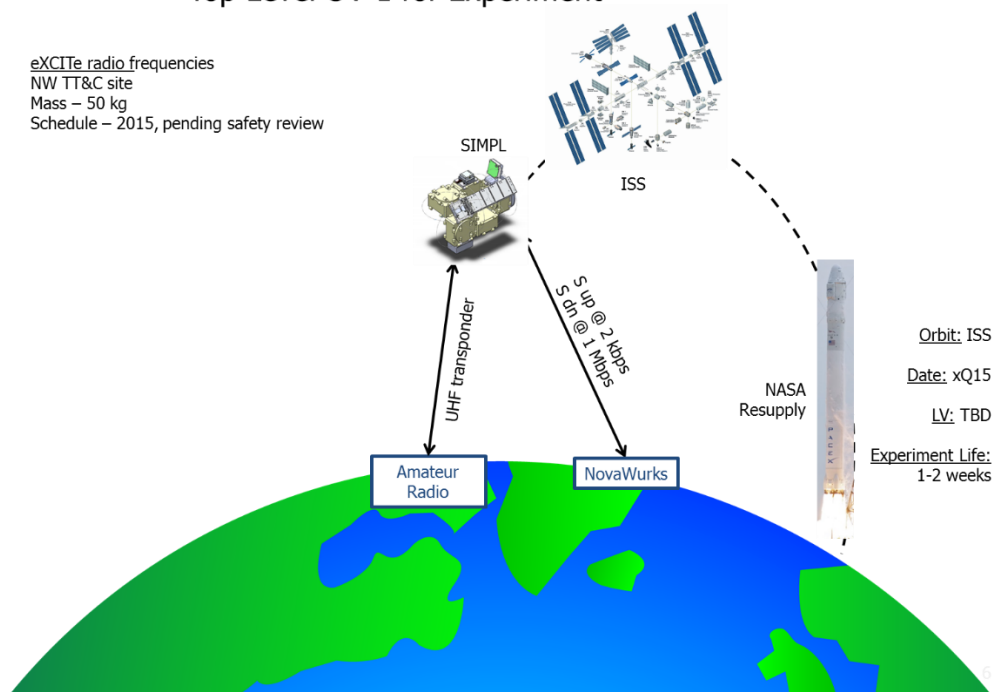
Top Level OV-1 for Experiment

eXCITE radio frequencies

NW TT&C site

Mass – 50 kg

Schedule – 2015, pending safety review



PAC TT&C Communications

The HISat Aggregation has an eXCITE TT&C radio for Ground to space communications. The frequency for uplink from groundstation is 2097.7 MHz and the frequency for spacecraft transmit is 2275.9 MHz (1 MHz total bandwidth for both frequencies). Also included in the PAC is an APRS transponder to serve the amateur community in the global 144.39 frequency.