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Near Earth Asteroid Scout Solar Sail Engineering Development Unit Test Program

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The Near Earth Asteroid (NEA) Scout project is a 6U reconnaissance mission to investigate a near Earth asteroid utilizing an 86m² solar sail as the primary propulsion system. This will be the largest solar sail NASA has launched to date. NEA Scout is currently manifested on the maiden voyage of the Space Launch System in 2018. In development of the solar sail subsystem, design challenges were identified and investigated for packaging within a 6U form factor and deployment in cis-lunar space. Analysis was able to capture understanding of thermal, stress, and dynamics of the stowed system as well as mature an integrated sail membrane model for deployed flight dynamics.

Full scale system testing on the ground is the optimal way to demonstrate system robustness, repeatability, and overall performance on a compressed flight schedule. To physically test the system, the team developed a flight sized engineering development unit with design features as close to flight as possible. The test suite included ascent vent, random vibration, functional deployments, thermal vacuum, and full sail deployments. All of these tests contributed towards development of the final flight unit.

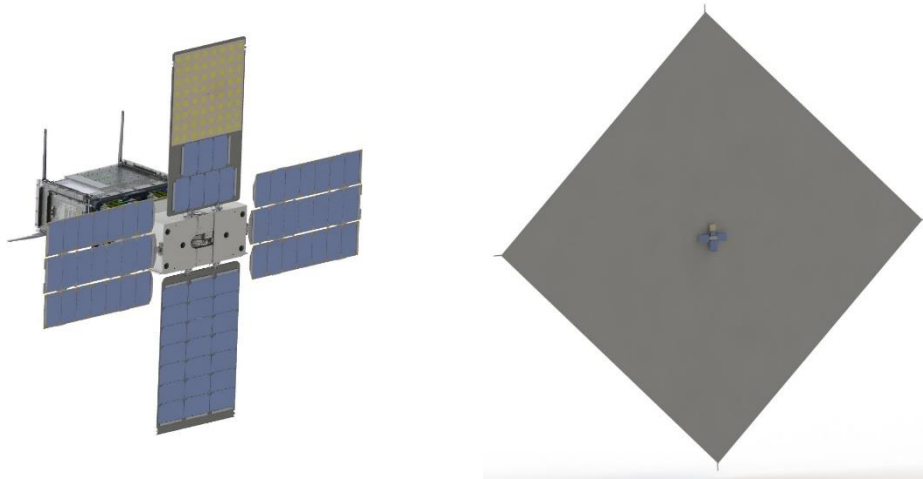


Figure 1 Near Earth Asteroid Scout Flight Unit (left) and deployed sail configuration (right). Credit NASA, Jet Propulsion Laboratory

This paper will address several of the design challenges and lessons learned from the NEA Scout solar sail subsystem engineering development unit. Testing on the

component level all the way to the integrated subsystem level. From optical properties of the sail material to fold and spooling the single sail, the team has developed a robust deployment system for the solar sail. The team completed several deployments of the sail system in preparation for flight at half scale (4m) and full scale (6.8m): boom only, half scale sail deployment, and full scale sail deployment. This paper will also address expected and received test results from ascent vent, random vibration, and deployment tests.

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