

Debris in Space Autonomous Removal Mechanism (DISARM)

Test Plan

Team Members

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DISARM Autonomy Requirement Tests

- 1) **CNSY-01** System shall track and locate debris up to a max debris size of 27 cubesat unit.

TEST CASE 1	TEST CASE 2	TEST CASE 3
Testing tracking algorithm with a debris size over 27 cubesat unit.	Testing tracking algorithm with a debris size at exactly 27 cubesat unit.	Testing tracking system with a relatively small debris size 10 cubesat unit) to test accuracy of tracking.

- 2) **CNSY-02** System shall autonomously perform the welding process

TEST CASE 1	TEST CASE 2
Autonomous welding performed on a 27 cubesat unit debris, observing system capability of maintaining a weld orientation that follows the desired trajectory, performing seam tracking, and changing weld parameters in real time.	Autonomous welding performed on a 10 cubesat unit debris, observing previous variables as well as the time it takes to perform the weld.

- 3) **CNSY-03** System shall transfer collision data

TEST CASE 1	TEST CASE 2	TEST CASE 3	TEST CASE 4
Verify with interface if algorithm is measuring the angular rate and range rate of debris (direction and velocity)	Verify with interface if the algorithm can detect the object mass.	Verify if the interface is displaying and the algorithm is measuring the strain on the system upon collision on a max debris size of 27 cubesat unit.	If no collision, checking that the system is not displaying incorrect data due to the zero-gravity environment.

- 4) **CNSY-04** System shall turn off in the existence of problems with the weld

TEST CASE 1	TEST CASE 2
Welding should stop if debris size is larger than max capacity or if there is an uneven heat transfer.	Welding should stop if the process is creating even greater debris. This can be verified by measuring increasing velocities and momentum of debris.

DISARM Manual Requirement Tests

- 5) **CNSY-08** Users can manually cancel or shut off the welding process

TEST CASE 1	TEST CASE 2
Manually shutting off the system before weld completion of a 27 cubesat unit debris.	Manually canceling debris weld before the welding begins

DISARM Simulation Requirement Tests

- 6) **CNSY-09** The simulation shall demonstrate all the forces and stresses acting on the welding system.

TEST CASE 1	TEST CASE 2
Observe forces and stresses upon welding on a 27 cubesat unit debris.	Observe forces and stresses upon welding on no debris at all, to verify if the system is working properly when no gravitational forces are acting on it.

- 7) **CNSY-10** The simulation shall display the algorithm's ability to adapt to different debris.

TEST CASE 1	TEST CASE 2
Demonstrate algorithms ability to seam track a 27 cubesat unit debris.	Demonstrate algorithms ability to seam track a target 10 cubesat debris surrounded by other orbited debris.

- 8) **CNSY-11** The simulation shall demonstrate the weld in action and the thermal changes on the system.

TEST CASE 1	TEST CASE 2
Verifying automatic vertical and horizontal correction of the weld path caused by thermal distortion on a 10 cubesat unit debris.	Verifying automatic vertical and horizontal correction of the weld path caused by thermal distortion on a 27 cubesat unit debris.