

ELaNa-22 LAICE ORSAT reentry survivability analysis (6 Sept 2017)

A reentry risk analysis was performed for the Lower Atmosphere/Ionosphere Coupling Experiment (LAICE) cubesat and its components to determine risk to ground population during reentry. The analysis was performed with the Object Reentry Survival Analysis Tool (ORSAT), version 6.1.

The initial conditions of the parent body were taken from information provided by the designers and the Orbital Debris Assessment Report (ODAR) which covers relevant mission details. Based on the LAICE mission documentation, an inclination angle of 51.6° was used.

The ORSAT model is based on the 'reentry.csv', ODAR, and a Bill of Materials (BOM) provided by the NASA Launch Services Program (LSP), Virginia Tech, and the University of Illinois.

As modeled in ORSAT 6.1, a total of 8 components survive atmospheric reentry. Table 1 lists the surviving components and the associated kinetic energy at impact and debris casualty area (DCA). Six out of the eight components impact the ground with less than 15 J of energy and therefore are not included in the total DCA. The accommodation chamber and collector plate survive reentry and contribute to the total DCA of 0.93 m^2 . Assuming an orbital life of 2.2 years, the final casualty risk is 1:65,000. This satisfies the 1:10,000 requirement.

Table 1: ORSAT Results

ORSAT Components	KE (J)	DCA (m^2)
Antennae	0.29	0
Accommodation Chamber	189	0.473
T-Baffle	11	0
Release Mech Cover Plate	8.36	0
Latch Arm	8.28	0
Aperture Plate	8.72	0
Collector Plate	30.89	0.455
SPS Release Cap	2.27	0
Total DCA		0.928