Orbital Debris Assessment Report Addendum

Agile MicroSat File 0982-EX-CN-2020

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Please indicate what material the reaction wheels are made of.

Provide details on steps taken to design the spacecraft to demise, including consideration of alternative materials/components for those predicted at the design phase to survive re-entry. (re: Casualty Risk for Reentry requirement 4.7-1)

The modelling regarding reentry was not exhaustive in "Agile MicroSat Orbital Debris Assessment Report", November 12 2020. Not with standing, the level of detail analyzed using DAS was to a level that showed compliance to the requirement 4.7-1 at which point the analysis was completed. Analysis that goes beyond the NASA-STD-8719.14 requirement would show a fully demised structure.

DAS analyses shows two AMS spacecraft elements to not fully demise in reentry. The DAS software is overly conservative, each child object starts heating from 300K regardless of the temperature of the parent and does no start heating until the parent has demised. Partial removal of material is also not considered. The software assumes either the material has demised or is the product of the initial dimensions. These assumptions and restrictions are defined in the DAS3.1 User's Guide, section 3.8.

The reaction wheel is an assembly made up of multiple materials. While the bulk of the material by volume is aluminum, the bulk of the material by thermal mass is made of steel. Using aluminum as the primary material would show the part demise but fails the DAS software validity check where the defined mass is evaluated by the material density and the object dimension.

The second item that does not show full demise in DAS are the solar panels. The modelling in DAS of the solar panels is again overly conservative. The DAS model utilized two carbon fiber elements to represent the solar panels, when in reality each element is comprised of 3 composite sections connected by metallic hinges. The panels are a composite made of carbon fiber, epoxy and electrical circuitry. The carbon fiber is supported by the epoxy which has a melting temperature much lower than the carbon fiber. Due to this composite structure, the quantity of the solar panel that would survive entry is expected to be much lower than projected by the DAS software.