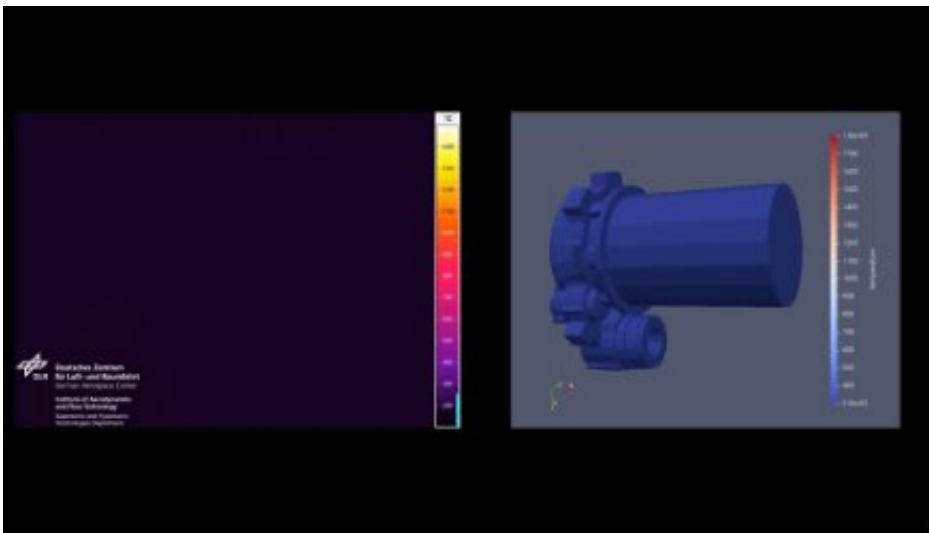


Video: Simulating atmospheric reentry in a plasma wind tunnel

June 23 2021



Correlated SCARAB model and the IR test data. Courtesy of DLR, HTG and KDA. Credit: European Space Agency

Simulating the burn-up during atmospheric reentry of one of the bulkiest items aboard a typical satellite using a plasma wind tunnel.

This Solar Array Drive Mechanism (SADM) has the essential task of keeping a satellite's solar wings trained on the Sun, maintaining mission operations.

But its bulky nature presents a problem in terms of space debris guidelines. When a [spacecraft](#) reenters on an uncontrolled basis, the

spacecraft operator has to prove that the on-ground casualty risk posed by its satellite is lower than 1 in 10 000.

So last year SADM manufacturer Kongsberg Defense & Aerospace (KDA) started an investigation supported by ESA, Hyperschall Technologie Göttingen GmbH (HTG) and the German Aerospace Center (DLR) to demonstrate the 'desmisability' of one of its [satellite](#) products.

They began by modeling such a reentry using ESA's dedicated SCARAB (Spacecraft Atmospheric Reentry and Aerothermal Break-up) software and comparable resources, tweaking the SADM by switching one screw to lower-melting-point aluminium to promote an earlier, higher-altitude breakup.

Then their [software model](#) was compared to observed reality, by melting an actual SADM model inside DLR's [LK3 plasma wind tunnel](#) in Cologne. Arc-heated gas in the test chamber reaching speeds of several kilometers per second, reproducing reentry conditions.

Following assessment of the results, HTG went on to build a model of the SADM using ESA's DRAMA (Debris Risk Assessment and Mitigation Analysis) [software tool](#), which will be available to other DRAMA users in the future.

As part of a larger effort called CleanSat, ESA is developing technologies and techniques to ensure future low-orbiting satellites are designed according to the concept of 'D4D' – Design for Demise.

More information: To read more detail about the test programme [click here](#). To watch a full version of the plasma wind tunnel video, [click here](#).

Provided by European Space Agency

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