



## **Cosmogia Tech Note** **Satellite Reentry Survivability Analysis**

*Prepared By: James Mason*

The Dove 1, 2, 3 and 4 Orbital Debris Assessment Reports include an analysis using NASA's DAS 2.0 software of the risk of casualties on the ground due to atmospheric reentry. While the risk of casualties was always found to be compliant with NASA-STD-8719.14, DAS did suggest a small probability that our optical tube assembly (OTA) would reach the ground. We therefore chose to perform higher fidelity analysis to better quantify this risk. Very few analysis tools exist to model the physics of reentry, so we chose to work with the NASA Debris Program Office who maintains The Object Reentry Survival Analysis Tool (ORSAT). From the ORSAT website:

*"The ORSAT code uses integrated trajectory, atmospheric, aerodynamic, aerothermodynamic, and thermal/ablation models to perform a complete satellite or launch vehicle upper stage component analysis in determining the impact risk" More details on ORSAT's methodology and capabilities can be found online (<http://www.orbitaldebris.jsc.nasa.gov/reentry/orsat.html>).*

Typically this tool is only used after DAS has deemed re-entry risks as non-compliant, however we requested that ORSAT be used for our Invar OTA. The dimensions and a drawing of the tube assembly were provided to Nicholas Johnson of the debris office and he confirmed, via email:

*From: Johnson, Nicholas L. (JSC-KX111) <nicholas.l.johnson@nasa.gov>  
Date: Tue, Jul 10, 2012 at 8:32 AM  
Subject: RE: ORSAT/SCARAB  
To: James Mason <james@cosmogia.com>*

*Mr. Mason,*

*We have assessed the survivability of both the Invar tube and its end plate. We determine with high confidence that both elements will in fact demise, i.e., not reach the surface of the Earth following reentry.*

*Let me know if we can be of any further assistance.*

*Best regards,*

*Nicholas L. Johnson  
NASA*

Upon asking for further details of the analysis results, Mr. Johnson instructed us to refer any questions to him and the NASA Debris Program Office.

### **Contact**

Nicholas L. Johnson

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