

## On-Orbit Glass Stress Measurement Tool Development

Exposed spacecraft window surfaces on-orbit are vulnerable to a variety of damage mechanisms including impacts. Impacts impart stress into the panes and reduce the remaining life of the window. Spacecraft windows are evaluated before and after flight to determine the minimum strength of the glass prior to launch. Currently, no method exists to accurately evaluate the windows on-orbit. An on-orbit optical system is under development to evaluate spacecraft windowpane material for remaining flight life by directly measuring the stress in the glass. This optical system builds on the industry-standard practice of calculating the amount of impact-induced stress through birefringence measurements. In industry, the birefringence is imaged through the pane with a detector and light source on opposite sides. On-orbit, there is only access to one side of the pane. This system has been designed to image birefringence by reflecting the light off the pane to a detector on the same side of the glass. Previous studies have shown a correlation between material stress distribution and the associated K-value. This system is designed to determine low strength areas which can be caused by defects due to impact damage. Glass samples will be imaged and broken in order to correlate impact-induced stress to the fracture strength of the material. Once this correlation is determined, a quantitative assessment of the stress areas in spacecraft windows will occur prior to and during mission operations to reliably determine the overall strength of the glass.