

Spacecraft Windows Technology

A NEW PARTNERING OPPORTUNITY

Reference No: 80JSC021SWT

Potential Commercial Applications:

Aircraft, automotive, construction, submersibles, aquariums,

Keywords: Glass Windows, Plastic Windows, Acrylic Windows, Polycarbonate Windows, Structural Windows, Optical, Window Panes, Aircraft Windows, Spacecraft Windows, Windshields

Purpose:

NASA JSC seeks to work with a Partner to advance the technology associated with spacecraft windows with the goal of more structurally sound, lighter and less expensive windows while still maintaining required optical properties.

On spacefaring vehicles like the Space Shuttle and the International Space Station that have enabled humans to push the boundaries of exploration, windows have typically been made of multiple panes of glass. However, glass is not an ideal material to use in spacecraft windows. It is a poor structural material. When loads are applied to glass, it loses strength over time and if a micro-meteoroid damages the glass, the strength is immediately and dramatically reduced.

NASA's latest vehicle for carrying humans into space, Orion, includes interior panes of an acrylic plastic material. This material change improves the window structural integrity. In pursuing these types of window technology advancements, NASA and a potential Partner will develop new and improved window features for spacecraft that will also provide additional options for terrestrial applications in multiple industries.

Technology:

Technology goals, include, but are not limited to: improve coatings to reject UV light, preventing degradation caused by UV absorption, reduce flammability, repel dust, accommodate an electrochromic darkening capability, reduce weight, improve impact resistance, and determine the feasibility of self-healing windows and windows as part time display screens.

Research is planned to determine the viability of multi-pane windows constructed solely of lightweight plastics which will include load tests for extended time to ensure significant "creep" does not occur.

R&D Status:

NASA has performed extensive development and testing of spacecraft window panes. This historical data (including flight data) which covers pane optical performance, strength, and material characterization, provides an excellent basis to pursue the technology goals noted above.

NASA is equipped with numerous facilities that will be used to validate these technologies. Optical testbeds will verify that new features do not block or distort the

light passing through the window test articles. Environmental testing will be used to ensure prototypes perform well under temperature variation, vibration, UV light and radiation, impacts, dust and do not emit toxins. Next generation testbeds will be built based on data from existing facility tests to provide a more comprehensive capability for measuring window performance and, also, validate structural and thermal math models.

Intellectual Property (IP):

This Partner relationship may produce new IP that could be jointly owned by NASA and the partner or may become the property of the partner.