

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

Author: Dr. Annamaria Piras
Thales Alenia Space Italia, Italy, annamaria.piras@thalesaleniaspace.com

Mr. Massimo Chiampi
Thales Alenia Space Italia (TAS-I), Italy, massimo.chiampi@thalesaleniaspace.com

Mr. Franco Busà
Thales Alenia Space Italia, Italy, franco.busa@thalesaleniaspace.com

Dr. Enrico Ossola
Italy, enrico.ossola@thalesaleniaspace.com

Mr. Giorgio Cabodi
Thales Alenia Space, Italy, Giorgio.cabodi@thalesaleniaspace.com

WINDOWS FOR SPACE APPLICATIONS

Abstract

Manned modules used for space infrastructure and exploration are requesting more and more frequently windows allowing the crew to monitor EVA activities, docking maneuvers or other critical piloting tasks. Moreover, the presence of a window strongly enhances the habitability of the living / working space providing a direct access to the natural solar radiation and resulting in a improvement of the astronauts physiological health.

Based on the experience gained from the Cupola program and from the new developments pursued in RD context and within MPM ASI project , TAS has designed and tested a new type of Window Assembly that, instead of glass, adopts transparent polymeric materials to the maximum possible extent. The main reasons behind this choice are related to the improvement of the structural integrity, lower density and lower cost, while it is possible to retain the excellent optical properties requested to a space window.

This paper describes the work performed by TAS for the design and development of the innovative Window Assembly, focusing in particular on the specific areas which have required detailed investigation: selection of the best material for each pane function (protection from debris, pressure containment, protection from inadvertent damage induced by the crew), characterization of the pane polymeric material and prediction of its long term creep behavior, design of elastomeric elements acting as seals, compensation of the assembly tolerance. Finally, this article presents the testing activities performed in representative configuration, which have demonstrated the feasibility of the new solution at equipment level.