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Stories

Atomic Oxygen Used to Evaluate Candidate Spacecraft Materials

ITT Space Systems Division

TECHNOLOGY

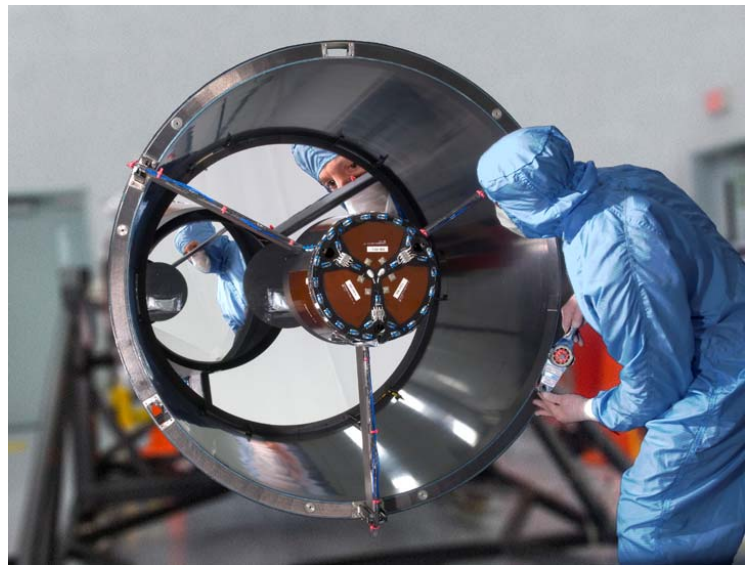
Atomic oxygen can oxidize and remove materials or convert them into oxide layers on the surface. Neither is a desired effect for space-based missions requiring thermal control or optical performance. The removal or oxide formation rate due to atomic oxygen is a function of mission profile and craft orientation. We also have to consider possible re-deposition on or contamination of other portions of the system. To test the effects of such interactions with materials, researchers used atomic oxygen to evaluate changes in candidate materials for space application.

COMMERCIAL APPLICATION

Applications of the results of such studies include thermal control materials and optical materials such as specially designed coatings to maximize mirror or lens performance or provide optical reference surfaces. In all cases, the ongoing and long term health of a spacebourne mission depends on understanding the possible effects of atomic oxygen on exposed surfaces.

SOCIAL / ECONOMIC BENEFIT

Knowledge of the detailed effect on exposed materials used in space-based missions will optimize the selection of material to minimize effects on both the mission lifetime and the degradations modes. Knowing the latter permits the incorporation of mitigation schemes which will improve the cost effective use of materials in such applications.



Primary, Secondary Mirrors and composite metering structure all must survive exposure to atomic oxygen

NASA APPLICATIONS

Atomic oxygen reacts with many spacecraft polymers, optical coatings and thermal control surfaces causing gradual oxidation and thinning. To preserve material performance, NASA Glenn developed atomic oxygen exposure facilities to characterize material degradation in a proper testing environment. The results have proven successful as these characterized and then selected materials are currently used on missions such as the NextView suites of remote sensing satellites.

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