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## POSTFLIGHT INVESTIGATION OF ASTROBIOLOGICAL FACILITIES EXPOSE-E AND EXPOSE-R

**Abstract**

The EXPOSE facilities on the european EUTEF platform placed outside of the Columbus module, EXPOSE-E, and the Zvezda module of the space station, EXPOSE-R, returned to earth after one and half years. This article details the postflight investigation of the facilities and discusses design improvements for new astrobiological facilities.

EXPOSE-E was one of nine experiments placed on EUTEF. The experiment was conceived and operated by the German Space Agency (DLR) in Cologne. It exposed bacteria, fungi, lichens and seeds to vacuum, temperature cycles and space radiation. At the end of the mission the experiment container was brought down to earth in the cargo bay of the Discovery shuttle and shipped to a facility outside of the Italian village of Tortona for disassembly.

The first impressions were:

- Streaks on the covers presumably arising from water condensation in the honeycomb
- Alodine bleaching caused by radiation and chemical reactions
- Iridescence of motor housings due to electrical discharge

The trays were removed with following observations:

- No structural damage occurred to any of the outer windows or filters
- A 30% drop in bolting torque during un-torque operation was measured. This loss is due to loading/unloading cycles of the screws during launch vibration and due to thermal cycling
- Lid and motor movement were nominal
- All electrical components were intact
- Bubbles were present underneath three of the foil heaters
- Darkening of the white ceramic coating of all frames
- Lid inspection revealed two pock markings of the inner side. The markings result from high velocity particle impact and show crater like features

Trays were then transported to Cologne for disassembly in gloveboxes. Of particular interest were the large windows which were inspected using dark light microscopy. Traces of particle impacts and an embedded micrometeorite were found. Worrisome was the loss of transparency in the ultraviolet region of up to 40% in the magnesium fluoride windows. Further tests indicated formation of a condensed layer on the inside of the windows and a correlation between loss and position in the facility. Since this condensed layer was not duplicated on earth nor did it occur in the fused silica windows it is assumed to be an effect of photochemical reactions in the VUV region.

The EXPOSE-R facility will be downloaded this March and subject to similar testing. High resolution pictures indicate extensive condensation and outgassing