

STEREO IMPACT

PROBLEM REPORT

PR-1014

STE-U FM2 Door2

2004-07-30

PR Numbers: 1xxx=UCB, 2xxx=Caltech/JPL, 3xxx=UMd, 4xxx=GSFC/SEP, 5xxx=GSFC/Mag,
6xxx=CESR, 7xxx=Keil, 8xxx=ESTEC, 9xxx=MPAe

Assembly : STE-U	SubAssembly : Door
Component/Part Number:	Serial Number: FM-2
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Failure Occurred During (Check one)

Functional test Qualification test S/C Integration Launch operations

Environment when failure occurred:

Ambient Vibration Shock Acoustic
Thermal Vacuum Thermal-Vacuum EMI/EMC

Problem Description

After fixing the STE-U FM2 door following the PFR1013 problem (door switch) the door was subjected to 100 cycles at ambient with no trouble. The unit was then returned to thermal vac and cycled cold to continue thermal vac. After reaching the cold operational temperature and starting soak, and prior to starting the associated CPT, the door was opened and closed once and then a procedure to cycle the door 100 times was started. This is the same procedure that has been run on the bench, but this is the first time it has run in vacuum. The door opened correctly but failed to close fully (actuator timed out at 1 second). Before the procedure could be cancelled it again attempted to open the door and failed (again a time out).

Analyses Performed to Determine Cause

A number of attempts were made to open and close the door. All attempts to open failed to fully open the door, while close attempts sometimes worked. The system was warmed up and continued to fail. The system was removed from the chamber and tested on the bench where it continued to fail. Observation showed that the TiNi wire that opens the door was providing little tension, while the close actuator looked OK.

Analysis indicates that the actuator wires do not cool as quickly in vacuum as they do in air. The door cycle test actuates the door every ~5 seconds (previous actuations were minutes apart). So the door open wires were still tense when the door close command was issued; hence that first failure to complete the close motion. Then the door open command was issued while the door close actuator was still tense. Further the door open wires were still warm, and then subjected to another 1 second actuation. This caused the wire to over-heat. Conservative calculations indicate that the wire might take as long as 79 seconds to cool in vacuum (observations at ambient show cooling in ~3-4 seconds).

Corrective Action/ Resolution

- Rework Repair Use As Is Scrap
- Replace both the open and close actuator wires. Test at ambient and cold on the bench.
 - Add software lockout to prevent actuating STE doors sooner than 100 seconds after previous actuation (IDPU software rev 22).
 - Shorten default door actuation timeout to 0.75 seconds (nominal actuation time is ~0.5 seconds). This is managed within the IDPU Command and Telemetry GSE.
 - Repeat last 4 thermal vac cycles. At first operational cold soak run a 20-cycle door test with 100 seconds between actuations.

Date Action Taken: 2004-08-2 **Retest Results:** Success

Corrective Action Required/Performed on other Units Serial Number(s): STE-U FM1

STE-U FM1 was found to also have over-heated actuator wires due to operation in vacuum (post-environments calibrations) with insufficient time between actuation. Actuator replaced, and workmanship vib and 4 thermal vac cycle with 20-cycle door test completed successfully.

Closure Approvals

Subsystem Lead:	_____	Date: _____
IMPACT Project Manager:	_____	Date: _____
IMPACT QA:	_____	Date: _____
NASA IMPACT Instrument Manager:	_____	Date: _____