

PFR-0?? Title: Incorrect Deployment Angles in FGM Design			
Assembly : THM-FGM-MEC-000		SubAssembly :100 and300	
Component : Deployment hard stops.		Units Affected:	Units fixed:
Originator: Alec Plauché, Rob Duck		X X X X X X	X X X X X X
Organization: SSL		Date: 7/22/05	
Phone: 510-643-9855		Email : plauale@ssl.berkeley.edu	
Failure Occurred During (Check one $$) \Box Functional test \Box Qualification test \Box S/C Integration \Box Launch operations X Other (Flight Assy)			
Environment when failure occurred:			
Ambient	\Box Vibration	□ Shock	Acoustic
□ Thermal	Vacuum	Thermal-Vacuum	□ EMI/EMC
Problem Description			

While refining the ICD, the Alignment Repeatability test, and the FGB Elbow Torque Margin test, a design flaw was found in the final deployed angles of the FGM booms. The original design intent was to offset the center of mass ("CM") of the outer arm of the boom such that the centripetal force generated during spacecraft spin would force the arm against its hard stop. Gravity would simulate this force during the above mentioned tests. When the boom was hung in the proper orientation for the test, the arm did not make contact with the hard stop, and swung freely. Therefore, the CM was not in the correct location.

Analyses Performed to Determine Cause

The solid models were analyzed for the error. The CM of the outer boom was found to be within several thousandths of the radial centrifugal force vector through the elbow hinge, therefore the CM provided minimal torque on the hinge in the deployed configuration. However a 2.0° degree offset was specified in the original design. It was found that the 2.0° was designed along the boom axis NOT through the hinge to hinge axis, thus a lower actual offset than the original intent.

Corrective Action/ Resolution

A parametric analysis of the two angles of the deployed FGB was performed and indicated that an additional 1.0° was needed on the shoulder axis deployment angle and 2° on the elbow axis in order to maximize the CM force on both the shoulder and elbow hard stops when deployed. As the hard stop of the shoulder is composed of a simple shim, it shall be remade with a different thickness. The elbow stop is also trivial as a small shim shall be added using existing screw holes. These modifications add little to no impact to the functionality, repeatability, or robustness of the design. The assembly of these shims does not require a disassembly of any other part on the boom. The Alignment test should be repeated for all booms to confirm the new position of the boom, and a Deployment test should be performed on at least one boom to show full functionality of the modified design.

Acceptance:	
MAM: Ron Jackson	; MSE: Ellen Taylor
PM. Deter Harvey	: Cognizent Engineer

Date of Closure_____