STEREO IMPACT Boom Peer Review (10/02)

Peer Review Issues:

1. Current engineering model development status
2. Can tube-to-ring bond lined survive the predicted temperature of 25 degrees Kelvin?
3. Verified the boom deployed frequency (stiffness measurement).
4. Verified the boom alignment requirement
5. Verified the deployment accuracy and repeatability.

1. Currently, there exist a partly functioning boom that is used as an engineering model (EM). The boom includes five composite tube sections with bonded (no screws) rings. All deployed latching mechanisms were included. A 1-kilogram deployment force stacer boom with dampener spool was also included. Each tube has a single groove molded in the outer surface. The purpose of the groove is to prevent the tube from rotating and align the tampered latching pins in the deployed configuration. Plans are to have three grooves in the flight booms

   The following flight design items were not included in the EM:

   a. **Harness w/stowage mechanism**, plan on integrating to EM in 01/03
   b. **Stowed latching mechanism**, completion date unknown at this time
   c. **Launch Lock mechanism**, completion date unknown at this time
   d. **Instrument mass mockup (SWEA, STE, Magnetometer)**
   e. **Spacecraft structure interface flexure**

2. A thermal cycle test was performed on a carbon fiber tube section with rings attached. There were four rings, two internal and two external. Each ring was secure to the tube with both adhesive and screws. A different adhesive was use at each bond interface. The tube was mounted in a cantilever fashion with a ten-pound weight suspended on the free end.

   The test was successful. The ring screws were removed and load test was performed with no apparent bond line degradation. All four adhesive pass the test. The plan is to select one of the adhesive and use it in conjunction with the screws for flight booms.

3. Boom stiffness measurement (load vs deflection) was made. The stiffness values were used to calculate first mode frequency of 1.80 Hz (requirement is >0.5 Hz). The boom was positioned vertically with each boom section weight off-loaded by a counterbalance weight system. The latching tampered pins were engaged manually. The current EM is not capable of engaging all pins (24) after deployment. Not having all pins engaged will result in a lower deployed frequency and nonlinear (dead band) performance. The misalignment issue is

being worked. *The test must be repeated after the deployment and pin engagement issue are resolved.*

4. No boom alignment measurements were performed. Berkeley stated that requirement should not be a problem for the boom.

5. No deployed accuracy and repeatability measurements were performed. Berkeley stated that requirement should not be a problem for the boom.

Action Item/Recommendations

Action Items

- Verify first mode frequency with spacecraft interface bracket. The current frequency test setup does not include flight design interface bracket.

- Include rotational loads resulting from magnetometer attachment to inner tube.

- Generate a new schedule from now (CDR) to flight boom deliver (1/04). Include intermediate milestones and identify critical path.

- Identify alternative if boom development schedule slips. Does the project require a fully functional (include all flight components) engineering model boom prior to the start of flight build?

Recommendation

An estimated total frictional force is unknown at this time. In addition, there may be additional deployment resistive forces from the proposed gravity negation system. In selecting the flight design spring (stacer) force, include additional margin for deployment testing, 3-groove system, and unknown harness friction .

Provide method for inspecting harness during final flight stowage. The plan is to route the harness in the center of the stacer. Repeated deployment may result in damage to harness insulation for stacer's spring sharp edges.