STEREO IMPACT

SEP L1 Detector Mount

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

Assembly: SEP	**SubAssembly: LET**
Component/Part Number: L1 detector mounts	**Serial Number: various (see below)**
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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

Some LET L1 detectors segments were not making connection to their respective electronics analysis chains (PHASIC hybrid channels) after assembly of FM1 and FM2. There are 3 segments per detector and 10 detectors per flight unit. Ten of 30 segments were not connected in FM1 (4 detectors involved) and 5 of 30 were not connected in FM2 (2 detectors involved). Subsequent investigation also revealed that the bias trace on L1-03 was broken. No other bias traces are suspect and this detector will be removed from the flight pool. The listing of the detectors originally in the two flight units and their connection status is:

FM1 (Ahead):	Slot	S/N	Status
	L1A0	L1-24	Segment b (center segment) NOT connected
	L1A1	L1-03	All segments connected; bias trace on back cracked
	L1A2	L1-35	All segments NOT connected
	L1A3	L1-13	All segments connected
	L1A4	L1-37	All segments NOT connected
	L1B0	L1-30	All segments connected
	L1B1	L1-27	All segments connected
	L1B2	L1-54	All segments connected
	L1B3	L1-29	All segments connected
	L1B4	L1-32	All segments NOT connected

FM2 (Behind):	Slot	S/N	
	L1A0	L1-51	All segments connected
	L1A1	L1-05	All segments connected
	L1A2	L1-28	All segments NOT connected
	L1A3	L1-19	All segments connected
	L1A4	L1-09	All segments connected
	L1B0	L1-20	Segments b and c NOT connected
	L1B1	L1-08	All segments connected
	L1B2	L1-12	All segments connected
	L1B3	L1-06	All segments connected
	L1B4	L1-56	All segments connected

Analyses Performed to Determine Cause

Two problem L1 detectors (L1-28 and L1-20) were removed from FM2 and inspected under the microscope. It was found that cracks had appeared in the copper traces on the flexistrips of the mounts that connect the segments to the connector at the end of the flexistrip. The flexistrips are bent into an S shape when the male connector on the end is mated to the female receptacle on the LET board. It appears that the stress of this bending sometimes cracks the traces near the point where the flexistrip leaves the rigid G10 part of the mount in which the detector is seated. These failures occurred on 6/30/04.

Note that even those detectors in the list above that have all segments connected have now been stressed by bending them into position to make the connection to the connector on the LET board, and all should be included in any corrective action that is taken.

Subsequent investigation revealed that the manufacturers of the mounts applied Ni to the Cu traces in the flexi area. This embrittled the Cu and is a contributing factor in the cracking of the traces. Also contributing to the failures was the excessive bending that occurs when the detectors are installed due to the fact that the flexi is longer than intended.

Corrective Action/ Resolution

Rework √ Repair Use As Is Scrap

The repair involves using haywires to replace the signal traces. A small PC board was also bonded to the mount. Wire bonds were used to connect the pads on the detector mounts to pads on the new board and then magnet wires were soldered from the new board pads to the back of the connector at the end of the flexi. A sample was done and fit checks were made. Despite the checking, when the set of ~20 flight mounts were repaired, the strain-relief-epoxy blobs on the new board and on the flexi area were positioned in such a way that not enough slack was left in the wire to account for the changes in the configuration when the detectors are installed into the LET flight unit. As a result, some haywires broke and others were stressed. For the ones that were not stressed, a procedure was agreed upon wherein the epoxy blobs were moved so that adequate strain relief for the haywires was provided. For the 6 units needing new haywires or parts of haywires, an agreed-upon procedure is TBD as of 1/4/2005.

Date Action Taken: Jul 2004-Jan 2005 **Retest Results**: TBD

Corrective Action Required/Performed on other Units Serial Number(s):

Status by serial number as of 1/4/2005:

The following 10 detectors are currently installed in FM1 unit and have had the epoxy blobs moved:

L1 S/N	ACOUSTIC	MOUNT	EDGE	COMMENT
L1-51		Pioneer	Good	L1A0
2250-2-1		Speedy	Good	L1A1
2250-2-2		Speedy	Good	L1A2
L1-12		Speedy	Marginal	L1A3
L1-23		Pioneer	Good	L1A4; small corner crack
2250-1-2		Speedy	Good	L1B0
L1-28		Pioneer	Good	L1B1
L1-34		Pioneer	Marginal	L1B2
L1-49		Pioneer	Good	L1B3
2250-1-3	GSFC	Speedy	Good	L1B4

The following 8 detectors were received 21 Dec 2004 from JPL after having their epoxy blobs moved:

L1 S/N	ACOUSTIC	MOUNT	EDGE	COMMENT
2250-2-3		Speedy	Good	
L1-15		Speedy	Marginal	
L1-17	GSFC	Speedy	Good	
L1-20		Speedy	Good	
L1-22	GSFC	Pioneer	Good	
L1-36	GSFC	Pioneer	Good	
L1-38	GSFC	Pioneer	Good	
L1-41		Pioneer	Marginal	

The following 11 detectors were received 23 Dec 2004 from JPL after having their epoxy blobs moved:

L1 S/N	ACOUSTIC	MOUNT	EDGE	COMMENT
L1-05		Speedy	Bad	
L1-06		Speedy	Bad	
L1-08		Speedy	Bad	
L1-09		Speedy	Bad	
L1-19		Speedy	Bad	
L1-24		Pioneer	Good	
L1-30		Pioneer	Good	
L1-32		Pioneer	Marginal	
L1-35		Pioneer	Marginal	
L1-56		Pioneer	Bad	
L1-57		Pioneer	Bad	

The following 6 detectors from recent acoustic test were delivered to JPL on 23 Dec 2004 for haywire installation after the holidays. We can expect them back by 1/12/05:

L1 S/N	ACOUSTIC	MOUNT	EDGE	COMMENT
2250-3-1	JPL	Speedy	Bad	No cracks in corners
L1-01	JPL	Speedy	Bad	No cracks in corners
L1-02	JPL	Speedy	Bad	No cracks in corners
L1-40	JPL	Pioneer	Bad	No cracks in corners
L1-58	JPL	Pioneer	Bad	No cracks in corners
L1-59	JPL	Pioneer	Bad	No cracks in corners

The following 6 detectors need splicing (L1-03 is currently non-flight, unless it gets an approved haywire fix for the cracked bias trace). They should be back by 1/20/05.(None of these have had an acoustics test.):

L1 S/N	MOUNT	EDGE	COMMENT
L1-03	Speedy	Bad	Needs splice; broken bias trace
L1-13	Speedy	Good	Needs splice
L1-27	Pioneer	Good	Needs splice
L1-29	Pioneer	Good	Needs splice
L1-37	Pioneer	Good	Needs splice; solder flux spot
L1-54	Pioneer	Marginal	Needs splice

Closure Approvals

Subsystem Lead:	Alan Cummings	Date: 1/4/05
IMPACT Project Manager:	_____	Date _____
IMPACT QA:	_____	Date:_____
NASA IMPACT Instrument Manager:	_____	Date:_____