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DOCUMENT NO. T 5-6785-2

VOLUME _____ OF _____

TITLE Failure Analysis of Delron Inserts in the 60B20217-2 Heat Shield Panel

MODEL NO. Saturn V/SIC CONTRACT NO. NAS8-5608

ISSUE NO. M-19 ISSUED TO R. L. Smurphy

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REV. SYM. _____

S-406-10-3 REV. 1/64

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REVISIONS			
REV. SYM.	DESCRIPTION	DATE	APPROVED

ABSTRACT

The inserts attaching the 60B20219 angle to the 60B20217-2 Heat Shield Panel failed during the incorporation of ECP 0838 at Kennedy Space Center. The panel was rejected on UER270641 and returned to Michoud for analysis and corrective action.

KEY WORDS

Molded-In Inserts

Thread Galling

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LIST OF FIGURES

1.0 OBJECTIVE

Determine the cause of the failure and recommend corrective action.

2.0 BACKGROUND

UER #270641 reported that three of the four bolt/insert combinations which fasten the 60B20219 angle to the 60B20217 Heat Shield Panel failed during removal of the bolts. ECP0838 requires removal of these bolts to add an aluminum shim between the angle and the panel. Two of the three bolts suffered severe galling and seized so tightly that threads were completely removed from the bolt. The third one failed the potting compound and the insert turned in the panel.

The bolts are BACB30BG4, 1/4" dia. passivated A-286 (140,000 PSI tensile). The inserts are Delron 465GE428 series all metal, self locking inserts fabricated of 300 series stainless steel. The inserts are a one piece, molded-in type installed by the Rohr Corporation per specification 60B32535. The insert threads are not lubricated.

3.0 CONCLUSIONS

The primary cause of the failures is believed to be galling between the unlubricated stainless steel bolt and the unlubricated self locking stainless steel insert. The excessively high locking torque found on test specimens would, if typical of the inserts used in production, aggravate the problem. The inadequate fill of the potting compound, which was found on examination of one failed insert, is believed to be of little importance. Since August 1966, 60B32535 has specified the use of BMS5-28 Type I compound which should eliminate the partial fill. Also, although a complete fill of potting compound might change the mode of failure, it would not in all probability, prevent the failure of the assembly.

4.0 RECOMMENDATIONS

(a) Lubricate the bolt threads prior to installation.
(b) Strengthen receiving inspection to insure the compliance of the inserts with Mil-N-25027.

5.0 PROCEDURES AND RESULTS

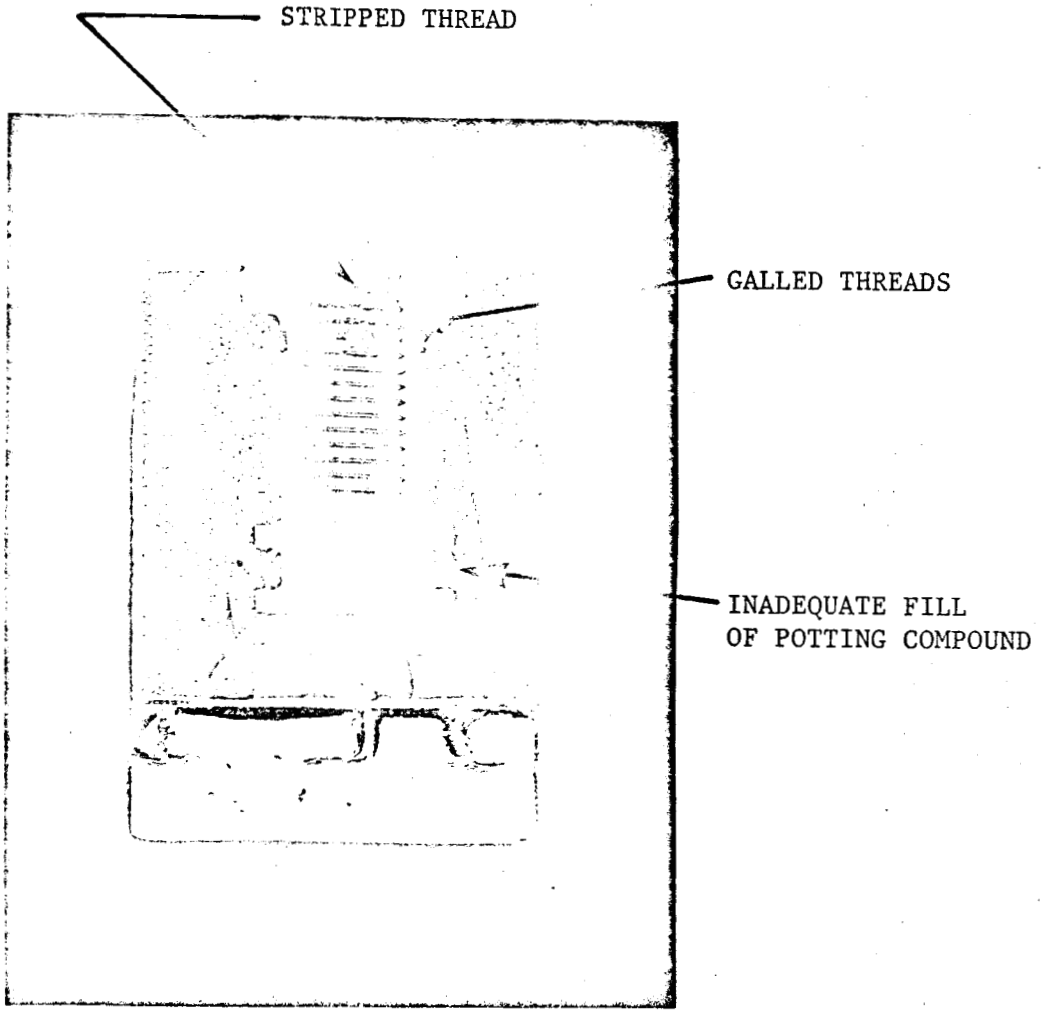
BMS5-28 Type II, which was specified by the original release of 60B32535, is a thick "putty-like" compound and it is very difficult to fill the hole in the panel through the "potting holes" in the insert. The insert which failed by rotating in the panel was sectioned longitudiually to determine the adequacy of the fill of the potting compound. The severe galling of the top threads of the insert (the top thread is completely stripped) as well as the inadequate fill of the potting compound can be seen in Figure I.

Six 465GE428 inserts were obtained from the Delron Company for locking torque evaluation using the BACB30BG bolts.

The first insert was tested by installing the bolt in the insert without any lubricant. The "locking torque" reached 65 in-lbs. during the first installation, but it was possible to remove the bolt at 48 in-lbs. without serious damage to the bolt threads. In the second installation, however, the locking torque exceeded the 100 in-lbs. capacity of the torque wrench used in the test. Removal (break away) resulted in stripping of the bolt threads.

The remaining five inserts were tested with the bolts installed with Kel-F-90 lubricant applied to the bolt threads before installation although all five assemblies had locking torque on first installation above the Mil-N-25027 range of 3.5 to 30 in-lbs. and three of five had break away torque above 30 in-lbs., they all completed fifteen installation/removal cycles without any damage to the threads. After the first run, both locking and break away torques were within specification range. The test data is tabulated in Figure 2.

The Delron standard drawings do not specify that the locking torque shall be per Mil-N-25027 but the engineering department of Delron states that the inserts are made to meet Mil-N-25027 "whenever possible". The use of thread lubricant is specified by Mil-N-25027 for the testing of corrosion resistant steel nuts. Since the use of a different lubricant or a different bolt could alter the locking torque on the first installation, these results should not be considerd absolute evidence that the inserts are "out of specification". The evidence is sufficient, however, to warrant a tightening of receiving inspection.



FAILED DELRON 465GE428 INSERT ON
60B20217-2 HEAT SHIELD PANEL

FIGURE 1

LOCKING TORQUE TESTS

Bolt Number	Installation (Run) Number	Locking Torque in-lbs.	Break Away Torque
1 (No Lubricant)	1	65	48
	2	100 +	--
2 (Kel-F-90)	1	40	15
	7	12	10
	15	9	5
3 (Kel-F-90)	1	35	30
	7	10	7
	15	8	7
4 (Kel-F-90)	1	50	35
	7	10	8
	15	9	7
5 (Kel-F-90)	1	50	45
	7	12	14
	15	10	8
6 (Kel-F-90)	1	55	35
	7	15	14
	15	12	10

Figure 2