

# ESA ALERT

<b>Title:</b> Tin-whisker growth on tin-plated electronic components		<b>EA No:</b> EA-1998-MAT-03-B
<b>Originating project:</b> Various		<b>Ref to PAI No:</b> Not applicable
<b>Manufacturer and Address:</b> Various	<b>Part number:</b> Various	<b>Specification:</b> ECSS-Q-60, ECSS-Q-70-08 and ECSS-Q-70-71
	<b>Part description:</b> Various	<b>Other part identifications:</b>
	<b>Lot/Date code or serial number:</b> N/A	
<p><b>Failure / problem description</b></p> <p>Unwanted growths of tin whiskers create defects that are known to severely jeopardise the reliability of electrical circuits. This is particularly true if the whiskers are long (in the order of 1 or 2 mm) and produce electrical short-circuits in low-voltage equipment.</p> <p>Requirements in ECSS-Q-60, ECSS-Q-70-08 and ECSS-Q-70-71 stipulate that pure tin plating is not permitted on any items assembled onto ESA spacecraft or ground support equipment. It is permitted to fuse or pre-tin tin such platings with tin-lead solder by a procedure such as that detailed in ECSS-Q-70-08 in order to avoid the phenomenon known as tin-whisker growth. These growths will typically have a diameter of 2-4 microns. After plating, there is an incubation period of between 1 and 50 weeks before whiskers appear.</p> <p>Several laboratory investigations have attributed to tin-whisker growth as the cause of electronic failures; these include a recent spacecraft flight unit. The average tin whisker can sustain a current of 32 mA (in air). Their growth inside electronic packages has caused electrical short-circuits leading to, at worst, circuit malfunction and the possible loss of a military aircraft. A spacecraft pyrotechnic switching unit suffered intermittent shorts attributed to tin whiskers. At best, they create "noise", or are burnt out (fuse) by high currents.</p> <p>Some manufacturers/users consider that such problems will only be encountered in low-level current applications, and not in high current (e.g. above 1A) ones. This is not the case for electrical units operating under vacuum where an arc caused by fusing of tin whiskers initiated sustained plasma. Simulations showed these plasmas occurred for 12 to 14 milliseconds and approximately 250 Amperes flowed when the plasma was active.</p>		
<p><b>Suspected cause</b></p> <p>Tin plating is often in a stressed condition, and in order to relax the metallic grains eject material in the form of a whisker-like filament.</p>		
<p><b>Corrective/Preventive actions by manufacturer</b></p> <p>Not applicable.</p>		
<p><b>Recommended actions by users</b></p> <p>Vigilance is needed to avoid incorporating tin-plated items onto spacecraft or ground support equipment. Items such as tin-plated chip devices, relays, packages, crimp barrel terminations, solder lugs, etc. are not always shown on project Declared Material Lists.</p>		
<p><b>Date Manufacturer notified (dd/mm/yyyy) :</b></p> <p><input type="checkbox"/> Manufacturer replied, correspondence attached</p> <p><input type="checkbox"/> Manufacturer did not reply</p>		<p><b>Manufacturer's contact points</b></p> <p>N/A</p>
<p><b>Contact Point for additional technical information relating to this alert</b></p> <p>Name, Organisation, Tel., Fax : B. D. Dunn, , ESTEC/TEC-QMM +31 71 565 3900, Barrie.Dunn@esa.int</p>		
<p><b>Contact Point within ESA for questions regarding this alert and the ESA Alert System in general</b></p> <p><b>ESA Alert Focal Point :</b> Mr E. Rouvier, ESTEC/TEC-QQM, Tel +31-71-565 4343,</p>		
<p><b>Release by ESA Alert Committee:</b></p> <p>Date: 26/09/2005      Name: Mr.J. Bosma, ESTEC/TEC-Q      Signature: </p> <p>Function: Chairman of the ESA Alert Committee</p>		

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