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CONCORDE

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TECHNICAL BULLETIN

Subject: Thermal Runaway

November 12, 1997 | Number: 2

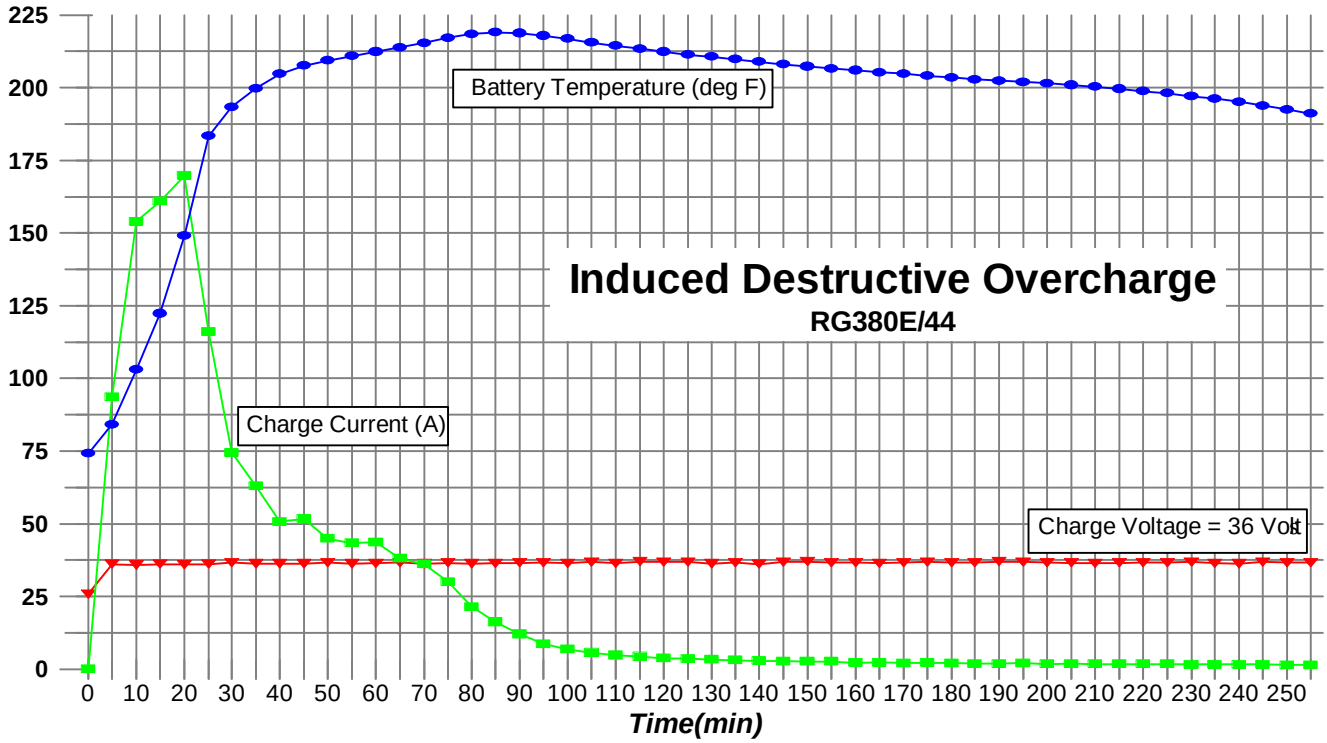
All battery systems may be driven into thermal runaway if severely overcharged for a prolonged period at high temperatures. The valve regulated lead-acid battery, when driven into thermal runaway, will fail in such a manner that the aircraft is not endangered.

All battery systems in thermal runaway will produce large amounts of hydrogen and oxygen gas which must be vented outboard of the aircraft.

A nickel cadmium battery in an uncontrolled thermal runaway may get so hot that the battery separator melts causing shorts within the cells and the cell containers melt causing ground shorts to the outside stainless steel container. The result of these shorts are that the battery may catch fire, explode, or the resultant arcing may burn holes in the outer stainless steel box and surrounding aircraft structure. For this reason, the nickel cadmium batteries are equipped with temperature sensors and temperature warning systems.

The valve regulated lead-acid battery in thermal runaway will reaches only a relatively moderate internal temperature (approximately 260°F) at which point the water in the electrolyte vaporizes and the battery vents steam. As the separator is glass, it is unaffected by this low temperature. The loss of water caused by the venting reduces the conductivity between the battery plates and the battery ceases to accept further charge. The battery slowly cools.

To demonstrate this, the Induced Destructive Overcharge Test in IEC standard 952-1:1988 is conducted. In this test, the battery is intentionally driven into thermal runaway by charging the battery at 3.0 volts/cell and continuing to charge until the battery fails. The battery must contain any flame within the battery both during and after the test, not release any electrolyte from the battery casing, and contain any debris resulting from an explosion either during or after the test. A graph of the typical result is shown below:


Induced Destructive Overcharge
RG380E/44
Battery Temperature (deg F)
Charge Current (A)
Charge Voltage = 36 Volt
225
200
175
150
125
100
75
50
25
0
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250
Time(min)