**Documentation Sheet**

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| | **National Aerospace Laboratories** | **Class:** Restricted<br>**No. of Copies:** 20 |

**Title:** Integrity Assessment of LCA Drop Tank under Internal Cyclic Pressure

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**NAL Project No.** T-0-197

**Document No.:** ST 0820

**Date of issue:** November 2008

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**External Participation:** ADA

**Sponsor:** ADA Banagalore

**Approval:** Head, STTD

**Remarks:** Nil

**Keywords:** Drop tank, Nose-cone assembly, Centre shell, Cyclic pressure, Residual strength

**Abstract**

A facility and expertise has been developed at NAL to conduct automated internal pressure cycling tests. The hardware and instrumentation includes capturing of pressure on the data logger along with strain gage data. Digital data can be recorded continuously during entire pressure cycle, thus enabling to provide comparative view of reduction in stiffness, if any, in terms of graphs.

The maximum pressure up to which the central shells could be tested was 188.5psi. A maximum strain of 5166 micro strains, at a pressure of 188.5psi, was found near the GFRP bulkhead in the circumferential direction. The integrity of the bulkhead joint appears satisfactory.

The nose-cone, tested for internal pressure cycling between 3 and 11psi did not show any leaks anywhere on the surface or from the filler cap. However, after 1104 pressure cycles, the end flange failed with a loud pop. On inspection, it was found that the failure is due to improper adhesion between the GFRP base material and the aluminum ring holding the end-flange. Subsequently, this ring was joined to the GFRP shell by bolts and the pressure cycling was continued for a further 5000 cycles, as required, without any failure/leaks anywhere on the nose cone.

The nose cone was then subjected to a steadily increasing pressure to verify the residual strength. At about 60psi, leaks were observed around the filler cap and the pressure was continued up to 85psi. At this pressure, the filler cap seal gave-up and a profuse leak sprouted around the cap. This was verified again by replacing the filler cap with a new one that also failed completely at about 85psi pressure.

Presently, it may be concluded that the LCA's GFRP drop tank internal bulkheads of central shell can withstand a pressure of 185psi and the weak link, in the DT assembly, is the filler cap seal that can stand a pressure of only 60psi.