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**Title:**

Assessment of lumbar tension loads in a forward facing seat configuration using both Hybrid II and FAA Hybrid III ATDs

**Abstract:**

A dynamic sled test series was conducted at Collins Aerospace in Winston-Salem, NC to support development of advanced safety solutions for front row seats in an infinite setback configuration using FAA Hybrid III ATDs. Specifically, lumbar tension loads were of interest in anticipation of future regulations.

Impact sled tests were carried out using a typical premium economy seat configuration with standard 2-point lapbelts. The tests were conducted per 14 CFR 25.562, 16g, 44ft/s, horizontal impact, without yaw. In addition to the standard injury data used to assess criteria published in the FAA Regulations, extra data such as lumbar tension and femur moments was also collected to assess anticipated future regulations. The data was then reviewed against test video to assess trends and correlations.

During testing a strong relationship was observed between lumbar tension and locking of the lower legs about the knee stops. Damage to the knee stops was observed posttest. FEA studies were conducted to facilitate assessment of the lumbar tension measures and also to assess structure of knee stops. Further tests were conducted with and without knee stops, and with reinforced knee stops. Similar tests were also run with a Hybrid II ATD for comparison purposes.

The results were reviewed to evaluate lumbar measures, ATD biofidelity, and assess potential modifications to the ATD knee stops to be more applicable to the infinite setback loading condition.