ANALYSIS OF DYNAMIC TEST CRITERIA FOR SIDE-FACING AIRCRAFT SEATS

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ABSTRACT

In the field of business jets, side-facing seats are increasingly used today. This has the reasons that business people, who are among the main users of such jets want to sit opposite their interlocutors at meetings, which are held during a flight. During long-distance flights, some passengers want to have the opportunity to sleep on a side-facing seat pulled out to length. Owing to their sitting position opposite the patient, it is easier for persons who accompany sick people during transportation to care for and look after their patients while sitting.

These side-facing seats are designed to accommodate a single or up to three occupants. Passengers seated on side facing seat experience a different dynamic response compared to that in forward or aft facing seat in an event of crash. In side facing seats, the Occupant dynamic response not only depends upon the restraint system but also the position of the bulkhead (divider panel) from the seat and also the number of occupants on the side facing seat. FAA demands equivalent level of safety for the side-facing seat compared to forward and aft-facing seats, but it not specified any injury criteria or certification procedure. Yet the customer demands for such seats cannot be accommodated since these seats cannot be certified.

In this thesis, a study is made on the response of an occupant in a side facing seat of an aircraft and the standard test criteria of side facing aircraft seats were also analyzed. This standard establishes requirements for side facing aircraft passenger seats to assure an equivalent level of safety for those seats when compared with forward facing passenger seats.

DOT SID as main ATD and Hybrid II as the second ATD. The main areas of interest A series of dynamic sled tests Conducted as per FAR 25.562 Test - 2 at CAMI with an iron seat fixture representing a typical executive aircraft side-facing seat. A rigid barrier was utilized as well as occupant-to-occupant contact. SID was used for measuring all the injury parameters. Hybrid II was used as the second occupant (A TD) for occupant-to-occupant contact cases. A three-point polyester restraint system configuration, manufactured by Aircraft Belt Inc., was used in all the tests. Test conditions are O-degree yaw for the seat relative to the sled axis, impact velocity of 44 ft/sec, triangular pulse, peak acceleration of 16G. Parameters that were varied during these tests are Single occupant (SID), multiple occupants (Hybrid II as Second Occupant), AID distance to the barrier and Distance between ATDs. Dynamic tests were conducted according to the test matrix proposed to CAMI (Civil Aero Medical Institute) and the prudent decisions based on the test results. Three tests were conducted per each configuration based on the test results.

Using crash simulation software MADYMO, analysis was carried out using U S DOT SID as main ATD and Hybrid II as the second ATD. The main areas of interest were response of the head, chest and pelvis of the dummies. The same 16-G decelerating pulse with an initial velocity of 44 ft/sec that was used in CAMI testing was also used during MADYMO simulation. The contact forces between occupant-to-occupant and occupant-to-side wall were determined. The MADYMO simulations were are also carried for 10-degree yaw angle. Parametric studies were performed on couch type side-facing aircraft seat with varying belt spacing.

The experimental test results conducted at CAMI showed good agreement with computer simulations using MADYMO.