

# State of the Art Dynamic Seat Simulation

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## Abstract

Full scale dynamic certification testing of aircraft seats is one of the most expensive and time consuming stages when certifying an airplane. During the last 10 years the National Institute for Aviation Research has developed procedures and testing protocols that allow industry to decrease the cost and time it currently takes to dynamically certify aircraft seats by the use of finite element methods (FEM) in a process known as Certification by Analysis (CBA) [1] [2]. The process and guidelines for CBA are described in advisory circular AC20-146 developed by the FAA.

This paper describes NIAR's procedures and testing protocols and shows the prediction and validation correlation results after applying those to an actual 3-places commercial seat using the finite element explicit code LS-DYNA.

Three different testing configurations were dynamically tested and evaluated as per AC 25.562 and AC 20-146. Each one of this sled test configurations was repeated three times to allow for test to test variability analysis. The three sled test configurations analyzed on this paper are:

- 1) 16g's structural horizontal test with floor deformation
- 2) 14g's structural vertical test
- 3) 16g's horizontal head path test

## References

- [1] Olivares, Gerardo, Acosta, Juan Felipe, and Yavad, Vikas, "Certification by Analysis I and II" 12<sup>th</sup> FAA Joint Advanced Materials and Structures (JAMS) Center of Excellence – Review Meeting (2010)
- [2] Dhole, Nilesh, Yavad, Vikas, and Olivares, Gerardo, "Certification by Analysis of a Typical Aircraft Seat" 12<sup>th</sup> International LS-DYNA Users Conference (2012)