



**Thursday November 8, 2012 - Crashworthiness of Aircraft Structures:
Computational methods to support design and certification**

The workshop presented by leading international experts will give an overview of the current state of the art in design, analysis and test of crashworthy aircraft structures. It will present a methodology based on the test/simulation pyramid adopted for aircraft structures in which test and analysis methods for crashworthy structures are developed and validated at levels ranging from materials test specimens through structural elements up to full scale aircraft. The focus is on application of dynamic nonlinear explicit FE codes for metallic and composite materials at different structural levels. Special attention is given to advanced composite materials having high specific energy absorption where design rules are still under development.

8:00 INTRO: Purpose of workshop, What will be accomplished – Gerardo Olivares

8:10 Session 1: Crashworthiness and Certification Requirements

- FAA/EASA future requirements – Joseph Pelletiere (FAA); Wim Doeland (EASA)
- CMH-17 Crashworthiness Working Group – Mostafa Rassaian (Boeing)

9:30 BREAK

9:45 Session 2: Experimental and Numerical Methods: Crash energy absorption in structural elements

Speakers: Alastair Johnson (DLR); Juan Acosta, Suresh Raju Keshavanarayana (NIAR/WSU); Mike Pereira, Amos Gilat (NASA)

- Experimental methods: material characterization coupon to component level (NIAR)
- Advanced deformation and failure models for impact in metals (NASA)
- Materials damage and delamination failure models in composites (DLR)
- Validation of advanced models for structural elements (All)

11:00 Session3: Design and FE simulation of EA composite subfloor structure

Speakers: Rodney Thomson (ACS-A); Matthew David (DLR)

- Design concept for EA helicopter frame in composites
- Fabrication and crash test of demonstrator structures
- FE simulation of crash tests to validate methodology
- NASA sub-structural level? Karen Jackson?

12:15 LUNCH

1:15 Session 4: Progress on development of full aircraft FE crash models

Speakers: Gerardo Olivares, staff (NIAR/WSU)

- Full-scale FE airframe models: State of the art and analytical mode limitations
- Enhanced FE models with cabin, seats, PAX, etc.
- FE models suitable for accident reconstruction

- Full Scale Testing Programs Overview – Allan Abramowitz (FAA)

2:30 BREAK

2:45 Session 5: Lessons Learned

- Airbus A380 Double Deck Simulation – Alan Melling (Airbus)
- 787 Program – Mostafa Rassaian (Boeing)
- Commercial Aircraft - Boeing, Airbus
- Business Aircraft - Hawker Beechcraft, Bombardier Learjet, etc.

4:00 Session 6: Open forum discussion

Gerardo Olivares (NIAR/WSU); Mostafa Rassaian (Boeing)

- Q&A - Industry Panel

Friday, November 9 - Aircraft Seat Dynamic Performance Standards: Testing and Analysis

This workshop will present the history and background behind the seat dynamic performance standards contained in Part 23/25/27/29.562. This will include the basis for the regulation, followed by a quick introduction to Anthropometric Test Devices, instrumentation and photometric analysis as contained in SAE J211. Attendees will also be exposed to a demonstration sled test detailing how a test is setup including dummy positioning. After the hands on portion, attendees will then learn how analysis can be included in the certification process by reviewing current recommended practice and guidance material with particular attention paid to model validation.

8:00 – 11:00

Aircraft seat dynamic performance standards – Joseph Pelletiere (FAA), EASA

- History and basis for the regulation
- ATD and Injury criteria review
- Photometric review
- Instrumentation review

11:00-12:00

Seat Modelling Techniques, AC 20-146 and Certification by Analysis: Joseph Pelletiere (FAA); Gerardo Olivares (NIAR/WSU)

12:00-1:30 Lunch

1:30-5:00 (1 or 2 groups)

Test Demonstration

- Part 25.562 test demonstration
- Review ATD positioning
- Floor warping

- Review test results

Analytical Model Demonstration

- Example Analysis Sled Test – Vikas Yadav, Nilesh Dole, Luis Gomez (NIAR/WSU)
 - ATD Positioning
 - Numerical Seat Model Definition
 - Overview Component Level :
 - Cushion
 - Seat Belt Webbing
 - Analysis
 - Error Metrics Evaluation