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OO/UC3M/41- DEVELOPMENT OF METHOLOGIES TO STUDY THE DAMAGE TOLERANCE OF AERONAUTICAL AND AEROSPACE COMPOSITE STRUCTURES..

Mechanics of Advanced Materials research group (Department of Continuum Mechanics and Structural Analysis) of the University Carlos III of Madrid (Spain) offers their experience in the analysis and modelization of high and low velocity impact behaviour and damage tolerance of composite structures.

Description and special features

The research group offers:

- Analysis and modelization of laminated and sandwich structures to high and low velocity impulsive loads
- Analysis and modelization of energy absorption structures
- Damage tolerance studies of composite structures to different types of loads
- Innovation and development of experimental methodologies to test structures to impact loads, with special emphasis on the evaluation of the damage tolerance
- Modelization and experimental analysis of the mechanical behaviour of composite materials in dynamic conditions

The research group has a laboratory with several test devices where it is possible to do impact and damage tolerance tests to validate the theoretical models. Among these devices there are:

- 2 Split Hopkinson bars to do tensile, compression, bending and shear dynamic tests
- 3 gas guns with maximum impact energies of 2 kJ to 20 kJ
- 1 high velocity universal testing machine of up to 20 m/s
- 2 instrumented Charpy pendulums with maximum impact energies of 50J and 300J
- 1 drop weight tower with 1000J of maximum energy
  (with a climatic chamber to do tests between –150ºC and 200ºC)
- 1 pneumatic launcher of 1800J and a maximum velocity of 16 m/s
- 2 non-destructive ultrasound evaluation testing devices (1 A-scan and 1 C-scan)
- 1 high velocity camera of 250000 frames per second

The group has a computer laboratory with high performance computers to perform numerical simulation using numerical codes (ABAQUS; LS-DYNA, Autodyn, MARC).

Innovative aspects

Development of specific methodologies for impact tests of thin composite structural elements, evaluating their damage tolerance to different load conditions.

Use of numerical models implemented in commercial codes to analyze the failure of composite and sandwich structural elements, considering the special characteristics of this type of materials.
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Competitive advantages

This technology would let a company the composite structural elements study through high and low velocity impulsive loads by means of numerical models.

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Competitive advantages
Laboratory has a well-equipped experimental laboratory capacities permitting testing of structural elements in a wide range of test velocities and temperatures.

Technology Keywords
Aeronautical technology; Aircraft; Helicopter; Aerospace technology and exploration; Simulation and engineering simulation; Composite Materials

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