



OO/UC3M/40- ANALYSIS OF THE BEHAVIOUR OF AIRCRAFT AND AEROSPACE STRUCTURAL ELEMENTS UNDER IMPACT.

The Group *Dynamics and Fracture of Structural Elements*, offers its experience in Solid Mechanics analysis for the study of the behaviour of structural elements subjected to impact loads. The Group activities have a strong research component, in which numerical simulation tools as well as sophisticated experimental techniques are employed. These activities could be of interest to aeronautical companies that require non standard analysis.

Description and special features

The Research Group “Dynamics and Fracture of Structural Elements” is formed by engineers of different specialities. They have a large experience in the analysis of the mechanical, impact and fracture behaviour of mechanical and structural elements. The members handle both experimental and numerical simulation methodologies. The activities of the group are developed in connection with research and development projects financed by public institutions, and with projects financed by aircraft and aerospace companies, among others.

The Group points its activities to the generation of scientific and technological knowledge in the research topics matching the strategies and priorities of the national and international Research and Development Programmes. The topics are carefully selected according to their impact, novelty, and scientific and technological interest. Topics proposed by companies, with a direct application to the industry, are also approached.

The activities developed by the Group are:

- Dynamic behaviour of structural elements: simulation and experimental analysis
- Structures for energy absorption
- Structures for impact protection
- Constitutive models for materials at high strain rates
- Fracture mechanics
- Damage mechanics
- Dynamic Fracture testing
- Thermomechanical behavior of materials
- Metal matrix composites

To develop these topics, the Group has experimental facilities, some of them unique in Spain, which allow performing different types of mechanical testing (tension, compression, bending, fracture, impact) within a wide range of strain rates and temperatures. The Group also has commercial and self-made simulation tools, which allow predicting the behavior of solids and structural elements.

The facilities to perform experimental testing are:

- Dynamic universal testing machines (100, 250, 1000 kN)
- High velocity universal testing machine (100 kN)
- Pneumatic launchers to perform high speed impact (up to 10000 J and 1000 m/s)
- Hopkinson bars (tension, compression, bending)
- Instrumented drop weight towers (up to 2000 J)



- Instrumented Charpy pendulum
- Climatic chambers and furnaces for low and high temperature testing
- Extensometry systems
- High sampling rate data acquisition systems

The Group also has commercial Finite Element codes (ABAQUS/Standard, ABAQUS/Explicit, LS-Dyna, AUTODYN-3D) installed in high-performance computers.

Innovative aspects

Application of advanced numerical tools to the analysis of structural problems, in conjunction with the performance of singular experiments carried out in unconventional test machines.

Competitive advantages

The group has simulation tools and experimental facilities to accomplish complex analyses of the behavior of structural elements subjected to impulsive loads.

Technology Keywords

Design and Modelling/prototypes; Metals and Alloys; Composites materials;

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