DAMAGE CRITICALITY AND INSPECTION CONCERNS OF COMPOSITE-METALLIC AIRCRAFT STRUCTURES SUBJECTED TO HIGH ENERGY, LOW VELOCITY BLUNT IMPACT

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ABSTRACT

Project Overview
- Project conducted under the contract of the European Aviation Safety Agency (EASA)
- CODAMEIN - Composite Damage Metrics and Inspection

Objectives:
- to improve understanding of impact damage on hybrid composite-metallic aircraft structures with a focus on high-energy blunt impacts
- to investigate key impact parameters that produce significant impact damage with no or minimal visible damage to the impacted surface
- to develop recommendations regarding composite-metallic structure damage tolerance and detection
- Investigate threshold of energy level required for generation of large scale damage (non-visible or barely visible)
- Understand damage mechanisms due to high energy low velocity blunt impact

Introduction
- Advanced carbon fibre reinforced plastics are being used more extensively in the aerospace industry (fuselage, primary structure)
  - high stiffness to weight ratio
  - fatigue resistance
- Composite structures are susceptible to impact damage that may not be visible via a surface inspection
- One of the most important issues is to ensure that there are no compromises in the level of safety
- 80 - 90% inspections are visual
- Aircraft certification requires demonstration of the capacity of structures with manufacturing flaws and structures damaged during aircraft service to carry loads as described in AMC 20-29

Example of missed large damage – A330 horizontal stabiliser
- damage initially detected but aircraft returned to service (external damage was seen and repaired. However, no internal inspection was completed at the time.)
- subsequent inspection discovered severed spar and skin - aircraft grounded