

DROP TOWER IMPACT TESTING

Compression After Impact (CAI) test

Composite materials are typically composed of a polymer matrix with carbon fiber reinforcements. Carbon fibers are widely used in structural components due mainly to their excellent mechanical properties (i.e. strength and stiffness).

These are similar to or higher than their metallic counterparts, however the composite laminates can exhibit poor tolerance to damage caused by different types of impacts during their manufacture, assembly and life service.



Low energy impacts can be considered the most dangerous since the damage they cause can be complex and affect all plies of the structure from matrix and fiber crack to delamination. The Barely Visible Impact Damage (BVID) can cause significant degradation of structural properties and they may escape detection during a routine visual inspection of the impacted surface.

CAI (Compression After Impact) test is one of the most broadly used methods to understand the performance of Composites, especially in the Aerospace market. Impact testing is a key in gathering knowledge as to how these materials behave and may be damaged when impacted.

CAI TEST PROCEDURE

The Compression After Impact test is a two-step test that was developed to assess the potential damage to composite laminates using coupons. In the first step an impact drop tower is used to induce Barely Visible Impact Damage (BVID) into the panel. This is followed by a compression test of the damaged coupon, using an electromechanical machine, to measure the residual strength of the composite laminate after being damaged by the impact event.

Because the damage resistance of a composite structure is highly dependent upon several factors - such as tup geometry, impact mass, impact velocity - it is crucial to execute accurately the sequence of impact damage events before moving to simulations or compression testing.



FEATURES AND BENEFITS

- Impact energy from 2J up to 70J (and higher)
- Minimum single mass from 1kg to test reduced thickness coupons (<4.0 mm)
- Instrumented tup to acquire the force signal during each single-impact event allowing the analysis of the failure
- Safety enclosure of the test area to avoid that carbon fiber splinters get spread
- Possibility to condition test coupons from -70 °C to +300 °C
- Pneumatic anti-rebound device for avoidance of multiple impacts
- Frictionless linear guidance system to minimize loss of energy and improve data reproducibility
- Innovating 23" touch screen Dashboard with embedded Data Acquisition System and Bluehill Impact software for a quick set up, simple and error-free testing
- High resolution data acquisition chain in compliance with ISO 7500 to ensure the accuracy of the force measuring system
- Machine and accessories in compliance with the most common CAI standards: ASTM D7136M, Boeing BSS 7260 Class II, Airbus AITM 1.0010, AITM 1.0076, AITM 1.0077, prEN 6038 and ISO 18352

INSTRON IMPACT DROP TOWERS

Instron Drop Towers are used to develop, fine tune, and validate material models. Testing materials under real impact conditions is a crucial step prior to product design. Using the characterization data obtained with an Instron 9400 you can have confidence in your results and deliver new materials to your customers faster.



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