

Longitudinally Jointed Edge-wise Compression Honeycomb Composite Sandwich Coupon Testing and FE Analysis: Three Methods of Strain Measurement, and Comparison

Babak Farrokh⁽¹⁾, Nur Aida Abdul Rahim⁽²⁾, Ken Segal⁽³⁾, Terry Fan⁽¹⁾, Justin Jones⁽⁴⁾, Ken Hodges⁽⁴⁾, Noah Mashni⁽²⁾, Naman Garg⁽²⁾, Alex Sang⁽²⁾, Dawn Gifford⁽²⁾, and Mark Froggatt⁽²⁾

⁽¹⁾ NASA Goddard Space Flight Center, Mechanical Systems Analysis and Simulations Branch

⁽²⁾ Luna Innovations, Inc.

⁽³⁾ NASA Goddard Space Flight Center, Mechanical Engineering Branch

⁽⁴⁾ NASA Goddard Space Flight Center, Materials Engineering Branch

Abstract

Three means (i.e., typical foil strain gages, fiber optic sensors, and a digital image correlation (DIC) system) were implemented to measure strains on the back and front surfaces of a longitudinally jointed curved test article subjected to edge-wise compression testing, at NASA Goddard Space Flight Center, according to ASTM C364.

The Pre-test finite element analysis (FEA) was conducted to assess ultimate failure load and predict strain distribution pattern throughout the test coupon. The predicted strain pattern contours were then utilized as guidelines for installing the strain measurement instrumentations.

The strain gages and fiber optic sensors were bonded on the specimen at locations with nearly the same strain values, as close as possible to each other, so that, comparisons between the measured strains by strain gages and fiber optic sensors, as well as the DIC system are justified.

The test article was loaded to failure (at ~38 kips), at the strain value of ~10,000 $\mu\epsilon$. As a part of this study, the validity of the measured strains by fiber optic sensors is examined against the strain gage and DIC data, and also will be compared with FEA predictions.