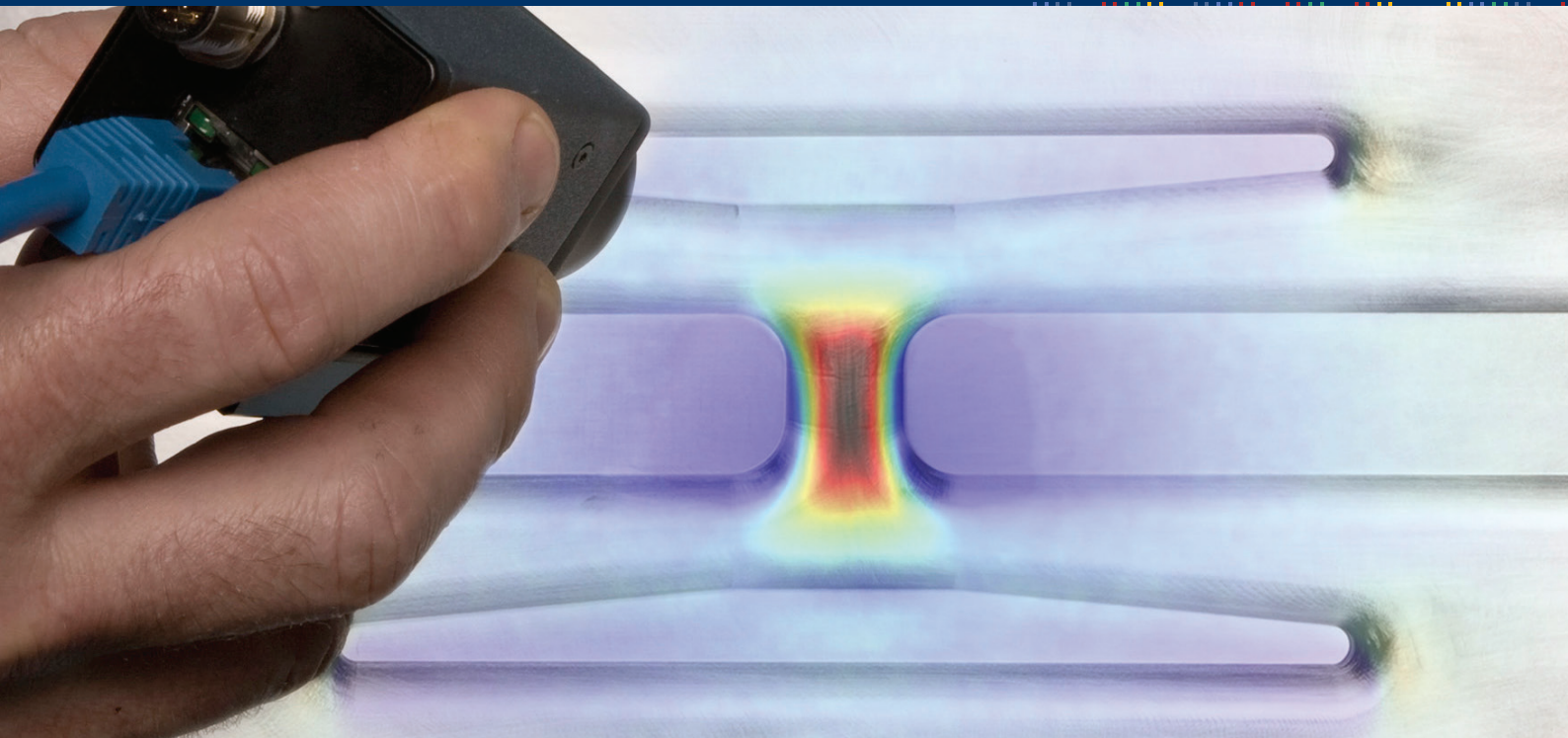




Australian Government

Department of Defence
Defence Science and
Technology Organisation



A Compact Low Cost Stress Imaging Capability

MiTE is a thermoelastic stress analysis capability that exploits recent advances in low-cost microbolometer detector technology to create a highly affordable, rugged, compact and portable means of imaging stress in dynamically loaded structures.

The importance of stress measurement for structural design and structural integrity assessment has not diminished with the growth of finite element modelling. To the contrary, it is set to increase as the flexibility offered by modelling combined with increasingly ambitious performance and efficiency goals lead to more complicated lightweight structural designs. Although finite element analysis (FEA) is highly flexible and relatively cost efficient accurate predictions rely on a good knowledge of boundary conditions, load inputs, material properties, fastener behaviour, and other factors. Knowledge of these is seldom perfect, which creates predictive uncertainties that can only be identified through experimental validation.

As well as providing a low-cost means of validating structural FEA, MiTE can potentially assist in:

- Identification of structural hot spots or areas of structural weakness
- Structural health monitoring
- Detection, monitoring and characterisation of fatigue cracks
- Nondestructive inspection
- Research and teaching in structural mechanics

The MiTE application is available as freeware to registered users from <http://www.dsto.defence.gov.au/mite/>.

Hardware is not supplied. The following is required:

- Notebook computer with Windows 7 or Windows XP.
- Infrared camera. Currently supported devices include the FLIR A325, A315, A615 and A35.
- USB data acquisition unit (NI USB-6008).

Technical Data (FLIR A35)

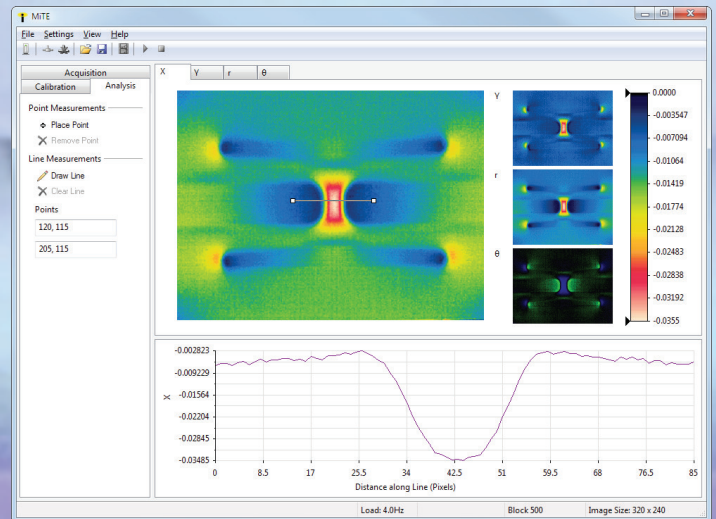
Stress sensitivity: 1 MPa*
Resolution (pixel): 320x256
Spatial resolution (IFOV): 2.78 mrad
Frame rate: 60 Hz
Camera output: Gigabit Ethernet
Camera mass: 200 grams
Camera size: 106x40x43 mm

* typical value for aircraft grade aluminium alloy. Varies with processing time.

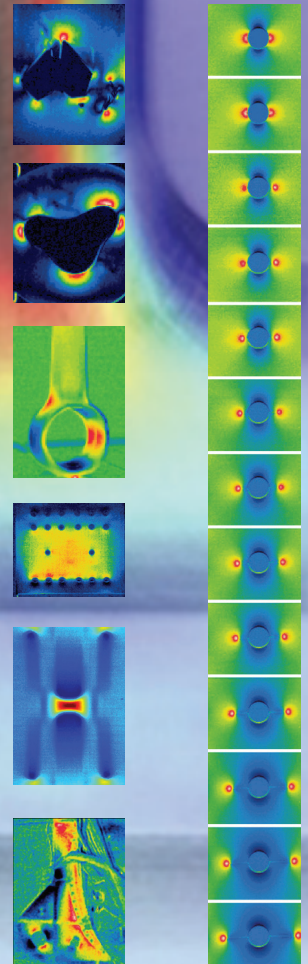
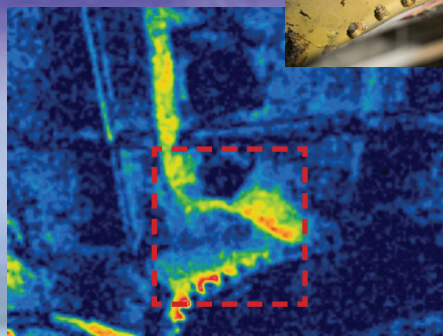
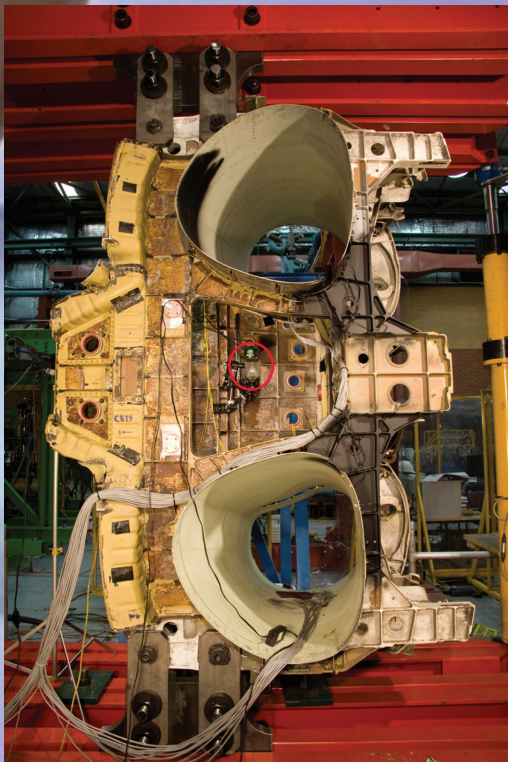
For further information contact :

E: imite@dsto.defence.gov.au
P: 61 3 9626 7193





Screenshot of the MiTE application showing a stress concentration in the lower wing-skin of a fighter aircraft.



Case Study: Aircraft Structural Integrity Assessment

Centre Barrel structure of an F/A-18 fighter aircraft undergoing full scale structural fatigue testing. A microbolometer (circled) attached to the centre bulkhead identifies high tensile stresses in an area prone to fatigue cracking.