

Technology/Process: **Acousto-Ultrasonic inspection of complex structures**
 Responsible: **Creo Dynamics AB**
 Partners: **Creo Dynamics AB, Saab AB**
 Work package: **4.5 – “Testing integrated stiffeners”**



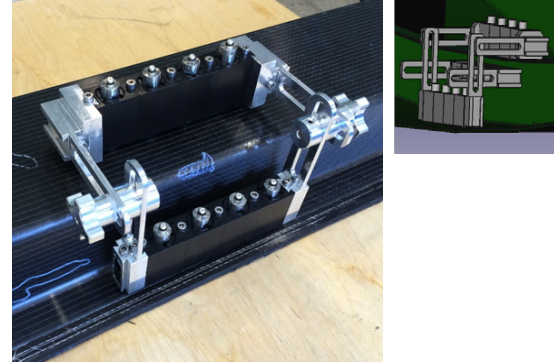
Description of Technology/Process:

Acousto-Ultrasonic Tomography (AUT) is an innovative NDT technique based on low frequency ultrasonic plate-like waves. Defect detection is performed by comparing the signals obtained on a reference structure (i.e without defect) with the AU signal obtained on the component under inspection. Instantaneous defect detection and imaging of the area within the sparse array is performed by tomographic reconstruction of the damage indexes from each sender-receiver pairs.

Before:

The proposed inspection concept is new and innovative. The basic principles were formulated (TRL 2).

Illustration:



Keywords:

Composite,
 NDT,
 automation

Benefits:

- The technology reduces scanning and interpretation time by providing an instantaneous imaging of the area within the array.
- Compared to classical UT, the technique is less limited by geometrical constraint, potentially leading to decreased down-time.

Work performed:

Hardware:

Probe development and manufacturing for contact generation and detection of plate waves in the 100-200 kHz range.
 Modular sparse array for flat and complex structures .
 Reconfiguration of commercial ultrasonic multichannel system.

Software:

FEM based validation and optimization of the concept.
 Acousto-ultrasonic tomography algorithm.
 System user-Interface.

Procedure:

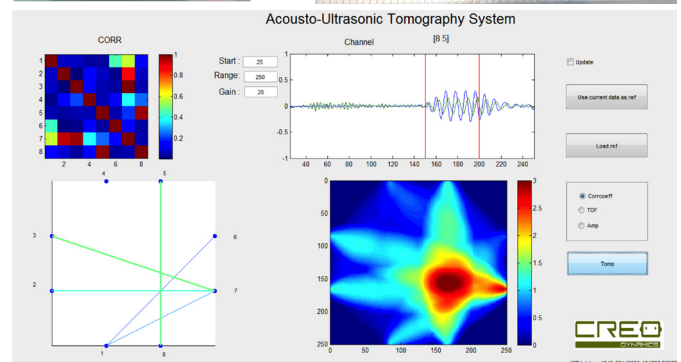
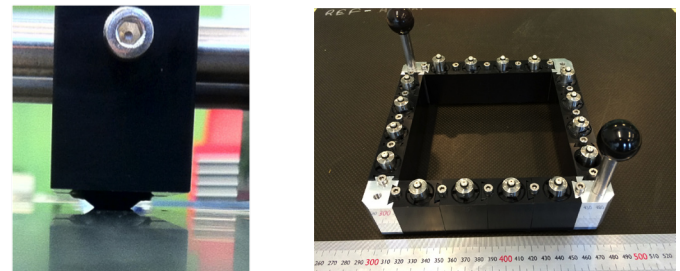
Instantaneous detection of delamination within a 30cmx30cm sparse array area on flat and curved laminate.

Validation

Sensitivity study for delaminations (> 12mmx12mm):
 Proof of concept for imaging on flat laminate and in stringer

Speed was estimated at 150 mm/sec and overlap of 20% was allowed.
 By integrating SAUL into non-contact probes automated in a robotic system, the fastest process of all researched methods is achieved. Hardware + Software acquisition + 64 element probe + SAUL = ca 138k euros.

TRL4: Component and system validation in laboratory environment



Future developments & exploitation:

The system is under evaluation on a number of relevant 3D CFRP structures (Automotive and aerospace structures).

One patent applied during the project, a second patent under preparation
 Contact taken with OEMs and system developer for further development.