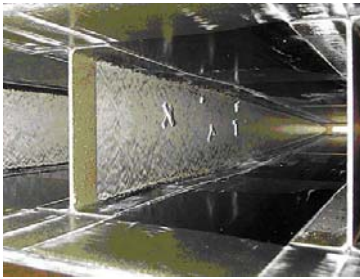


Midas NDT Systems Ltd. have introduced a new patented ultrasonic inspection technique for the analysis of ‘single-shot’ box-section components.

The need to inspect the stringer area of a component has, to date, precluded the single-shot manufacture of box section components. A typical box section needs a primary inspection of the skins and stringers prior to component assembly and a secondary inspection of the bond areas after final component assembly.

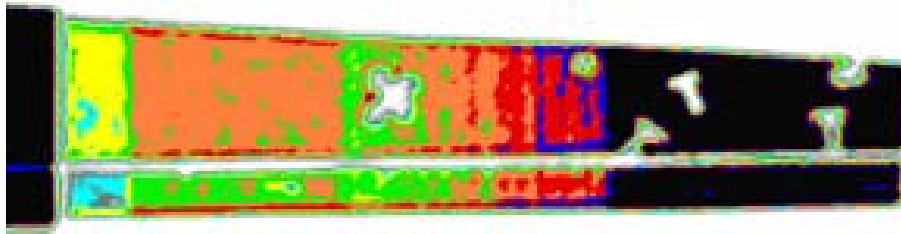
This problem has precluded manufacture of components in a single-shot process due to the lack of access in order to safely inspect the stringer areas. Although many possibilities, such as miniature transducers on long arms, have been tried, to date there has been no acceptable method for achieving 100% inspection of this style of component.



To demonstrate the technique a piece of box section, as illustrated, was cut from an actual aircraft component. A number of artificial defects, manufactured from 16 mm x 3 mm lead tabs were attached to the sample in different configurations. The majority of the defects (five) were located on the stringer, with a single defect being located on the outer skin to prove that the inspection was carried out through the component.

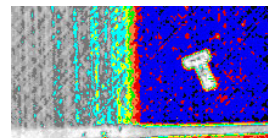


A specialised technique c-scan was carried out at a frequency of 5 MHz using a standard medium pulse transducer and a collimator.



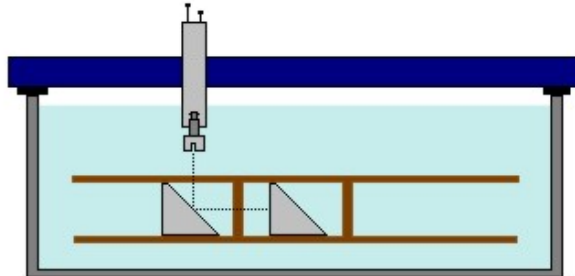
The image above shows the result of the specialist c-scan revealing all five defects in the stringer section of the component and the additional defect in the component skin. Because of the use of an actual component there are also many other features, natural to the component, visible in the inspection.

The image to the right shows a secondary c-scan of the skin area and reveals the defect located on the skin area. Both c-scans were carried out simultaneously and the system is capable of overlaying the data from each record for analytical purposes.



The Technique

The technique utilises a set of internal mirrors creating a prismatic affect to guide the sound wave through the component. As can be seen in the illustration, the component is located in an immersion ultrasonic inspection system with the automated head driving the sensor in a raster pattern over the surface of the component.

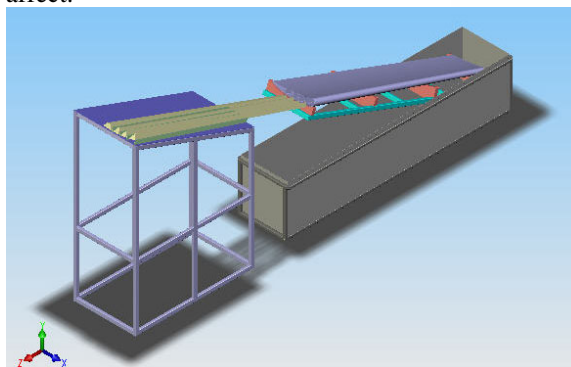
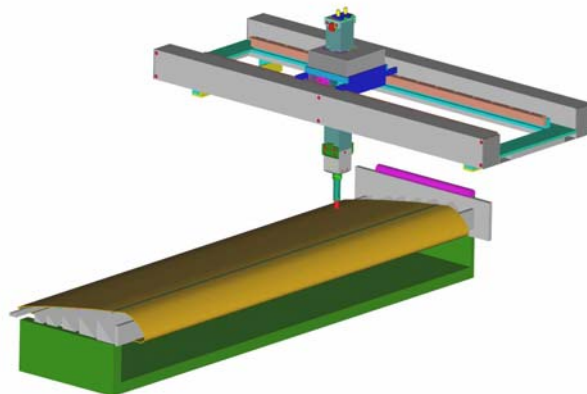


The sound wave from the sensor is injected through the surface of the component onto a primary mirror, this mirror diverts the sound wave to travel at 90° into the support strut. The sound wave travels through the support strut onto a secondary mirror at 180° to the support strut, this secondary mirror diverts the sound wave back through the support strut and onto the primary mirror, the primary mirror in turn diverts the sound wave back through the component outer surface to the sensor for measurement.

In simplicity the prismatic technique allows a sound wave to be sent through the component and received back for analysis, the analysis being carried out by standard accepted methods.

The mirrors for the technique are manufactured from precision-machined stainless steel bar and act as a support frame for the component during inspection.

Each type of part requiring inspection would require a precise engineering drawing of it's structure to allow the bars to be machined. All the bars would be designed to fit the exact shape of the component and produce the necessary angles for the prismatic affect.



The mounting frame is located internal to the immersion inspection system with a pivoting design for component loading and unloading. In certain circumstances a component loading system may be required, a number of options being available to suit the size and geometry of any specific component.