

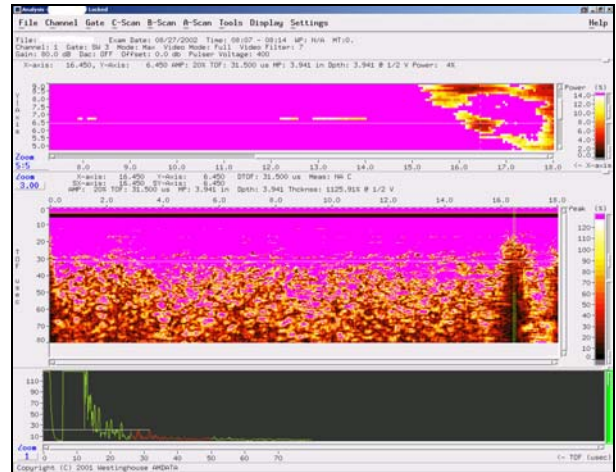
Aircraft Skin to Honeycomb Assemblies

Application Background

Many aircraft structures are composed of aluminum skin adhered to an aluminum honeycomb core. The bond is via an adhesive that fills the voids between the skin and core. In some areas such as points of attachment, multiple layers of skin material exist within the overall structure. In those cases, additional bondlines exist between the metal skins.

Difficulties of the inspection are the acoustic characteristics of the adhesive, the thinness of the skin, the variation of the adhesive thickness, and the complexity of honeycomb cross sections relative to the perpendicular skin. From an ultrasonic method viewpoint, the inspection is complex. The UT signal passing into the honeycomb involves multiple types of UT modes such that the return signal is essentially a bulk wave of energy. Hence there is no backwall that can otherwise be focused upon as occur in most bondline testing applications.

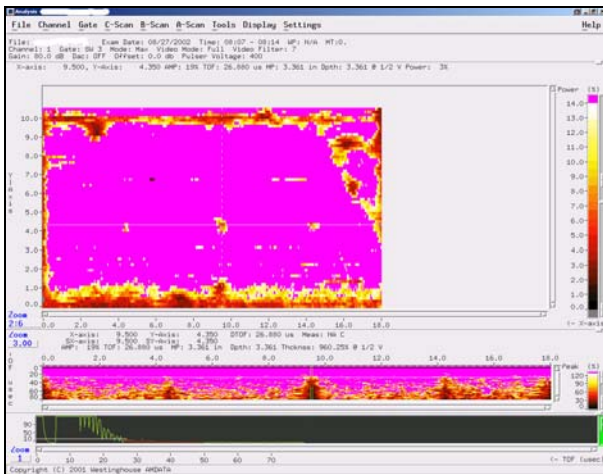
The B-Scan slice shows 3 unbonds, the center of which is the minimum defect size required to be detected. In the B-Scan, the unbonds spread out as the depth of time increases.



Unbond at Doubler Interface

A seemingly difficult flaw to detect is an unbond at the transition interface from a single skin to double skin (doubler). This defect however is easily detected with the Power C-Scan and supported via its B-Scan slice as shown above.

The most difficult defect to find with a single setup is at the trailing edge. Due to its thinness, bulk power levels are lower thereby narrowing the gap between good and unbonds. The image below, however, again detects and verifies an unbond adjacent to the trailing edge. Note that another unbond is located further inboard at the 9.5 position and is more easily detected.



Overall Power C-Scan of Sample with Various Defects

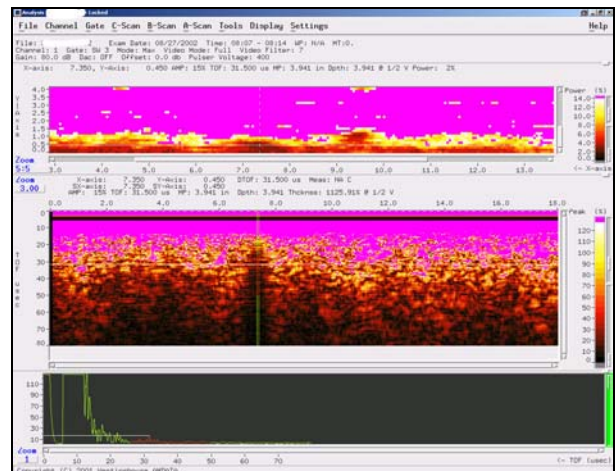
Sample Characteristics

A representative sample of a control surface was scanned. Relative to the image above, the leading (thick) end is on the top, and the trailing edge is on the bottom. A vertical structural member exists at the 10" X-axis location across the part. On the right side of the part, a double layer of skins exist, the beginning of which shows up as the diagonal line.

Power C-Scan Results

The top half of the above image is the C-Scan (plan view) of the sample. The image below the C-Scan is the B-Scan (side view). The bottom image is the A-Scan, which is the individual RF ultrasonic signal at the C-Scan's cursor.

A "Power" C-Scan view is used to analyze the acquired data. It represents the average energy of the C-gated signal and is very useful in detecting unbonds.



Trailing Edge Unbond

| | | | |
|---|---|--------------------------------------|---|
| <p>Metals Testing Company 80 Kimberly Drive, PO Box 69 South Windsor, CT 06074 (USA)</p> |  | <p>Metals Testing Company</p> | <p>TEL: (860) 289-8225 FAX: (860) 289-5970 e-mail: mtc62@aol.com website: www.mtc62.com © Copyright 2002 DELISLE INC.</p> |
|---|---|--------------------------------------|---|