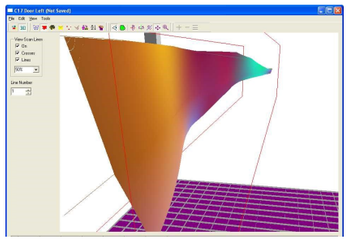
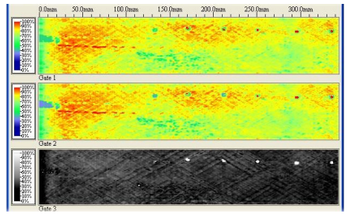
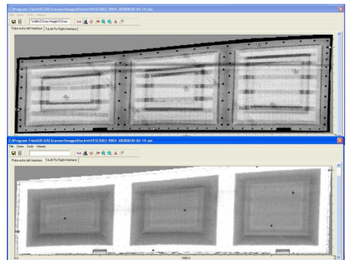
Software features

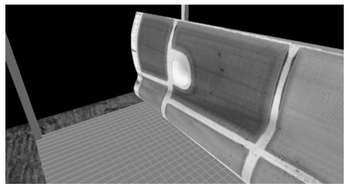
Whatever the system, USL provides an integrated software package which combines all the necessary functions to scan, generate images and analyse the data. Because we write all our own software we can take full advantage of all the capabilities of the hardware.
The following brief list describes some of the functions.

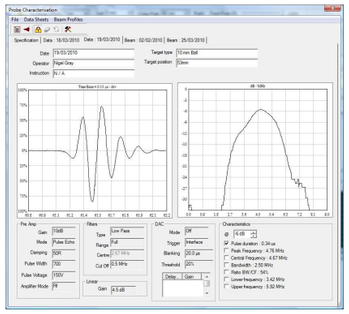
- Seamless control of multiple scanning axes for rectilinear, polar and complex geometry scanning.
- Scan speed automatically optimised using ”look ahead” for sharp surface changes.
- Input of scan profiles by start point and end point for simple geometries, by “teach and learn” and by input of data from CAD systems, such as CATIA.
- Special “one key” routines to simplify teach and learn, including automatic normalise, auto water path, “move to” command of receive probe to align with transmitter and “auto-find” best position for through transmission.
- 3D visualisation of scan profiles with respect to the scanner.
- Three point correction to rotate complex scan profiles so that they exactly match the true position of the part in space.
- “Brain” function to compensate for deviations from the expected shape of the part, due to springback from the moulding tools, for example.
- Simultaneous through transmission and pulse echo inspection from two sides, where appropriate.
- Simultaneous acquisition from logarithmic and linear amplifiers.
- Generation of multiple C scan and time of flight (thickness) images during a single scan, with no reduction in scanning speed.
- Automatic correction of probe angle on distorted products to ensure normal beam incidence in immersion testing.
- Full waveform capture, including pre-trigger data.
- A complete range of image analysis and measurement tools, including size / distance measurements which allow for curved surfaces.
- “Go to” motion functions for accurate return to desired positions.
- Wireless joystick controller, fully CE compliant.
- Re-scan over selected areas within total scan profile.
- Histogram functions for sizing of defect dimension and area.
- Defect analysis relative to background or operator set thresholds.
- 3D visualisation and rotation of scan images.
- Auto defect identification and numbering on metallic products.
- Pre-scan calibration procedures using defect standards.
- System calibration by injection of test pulses from built-in function generator.
- Optional routines for probe characterisation.
- VPN (virtual private network) capability for remote monitoring.

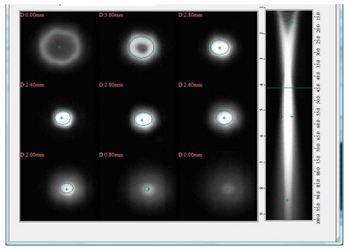




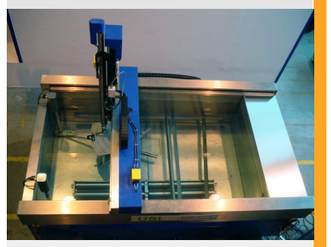








USL Ultrasonic Sciences Ltd



NDT applications in aerospace

For 25 years the aerospace manufacturing industry has been a major user of USL’s ultrasonic testing systems. During this time we have introduced many innovations which are now standard features and we continue to include new developments as the technology matures.
This is an introduction to some of the applications, including inspection of the raw materials destined for aerospace products, testing of composite structures and control of fabricated assemblies.

Innovative designs

From the start, USL has been tasked with producing systems which place great demands on the design engineers. We have combined electronic, mechanical and software design to implement solutions to difficult problems which others were reluctant to attempt. The continuing use of the resulting systems, often in demanding production environments, is proof of our success. Some examples of this innovation are:

- The first immersion system in Europe for non contact, dual curvature, contour following in a production environment.
- The first company to manufacture ultrasonic, data acquisition and motion control products specifically for ultrasonic testing, in the form of PC expansion boards.
- The first company to manufacture through transmission systems with two completely independent 5 axis horizontal manipulators.
- The first company to introduce a PC based ultrasonic unit combining linear and logarithmic amplifiers, used simultaneously.
- A linear array scanning system specifically designed for very high speed inspection of composite structures.

We can offer highly reliable systems in almost any configuration, designed to suit your range of products.

World wide application

USL systems are installed at aerospace manufacturing companies throughout the world, including Europe, USA, China, Australia, Malaysia and India. Users include BAE Systems, Alcoa Europe, Rolls-Royce, Airbus, GKN Composites, Fokker, Sonaca, NLR, Firth Rixson Forgings, CTRM, Hafei Aviation, Goodrich and GE Aerospace. Many of these systems have been in almost continuous operation 6 days per week for more than 10 years.

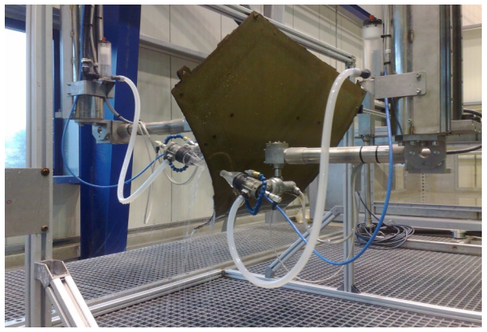
SQUIRTER SYSTEMS

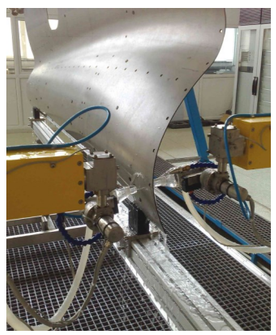
Aerospace composite structures are becoming increasingly complex, placing severe demands on the ultrasonic inspection technology. This requires not only sophisticated ultrasonic equipment but also highly accurate, multi-axis motion mechanisms. This is especially true in squirter through transmission inspections, where the precise normalisation and alignment of the probes is crucial. USL manufactures systems which meet these requirements whilst scanning at high speeds, giving you the optimum combination of product throughput with reliable defect detection and sizing.

Various designs are available based on twin tower, gantry, flatbed and robotic configurations. In the **tower** type, the manipulators are mounted on horizontally opposed arms to give the maximum flexibility for inspection of complex parts. The **gantry** or **portal** type has vertical manipulator columns—this is preferred when the part shape requires inspection on a turntable or in an immersion tank. Multi-channel **flatbed** systems are ideal for rapid inspection of multiple flat parts without the need for fixturing. **Robotic** systems offer flexibility, often at lower cost and with reduced timescales.

The USL systems, entirely designed and manufactured in-house, offer features specifically designed to simplify the setup and implementation of scanning routines.

- Generation of scan paths from CATIA data.
- Simple "teach and learn" routines where CAD data is not available.
- Motorised, programmable holding fixtures.
- Compensation for "springback" and distortion.
- Automatic, dynamic control of water flow rate.
- Logarithmic amplifier with more than 90dB instantaneous dynamic range.
- Simultaneous through transmission and pulse echo acquisition.
- Measurements compensated for surface shape.
- Analysis routines for Airbus and Boeing specs.





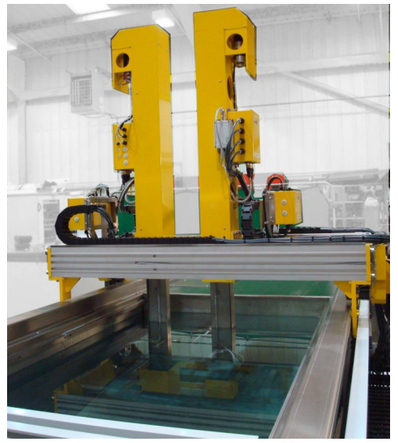
Ultrasonic Sciences Ltd, Unit 4 Springlakes Industrial Estate, Deadbrook Lane, Aldershot, Hants, GU12 4UH, England.
Tel + 44 (0)1252 350550 Fax + 44 (0)1252 350445
www.ultrasonic-sciences.co.uk info@ultrasonic-sciences.co.uk

IMMERSION SYSTEMS

Immersion systems are available for inspection of plates, discs, bars, forgings and fabricated structures. Standard designs are available or systems can be tailored to meet the requirements of each customer. Mechanical scanners range from simple 2/3 axis tanks to complex systems having up to 12 axes, for inspection of contoured parts in through transmission and pulse echo modes. All systems incorporate USL's state of the art ultrasonic electronics, data acquisition and motion control.

The **ultrasonic** system can be chosen from the range of USL modules, all having exceptional sensitivity, signal to noise ratio and immunity to external noise sources:

- Single channel units for pulse echo and through transmission.
- Multiplexed electronics configurable up to 32 channels, or more if needed.
- Linear and logarithmic amplifiers, used simultaneously when required.
- Phased Array systems in conventional and high speed formats.

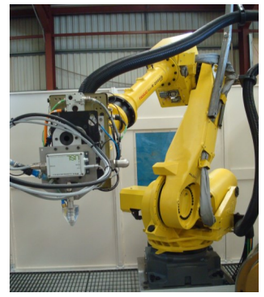


1

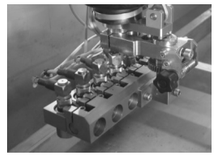
2

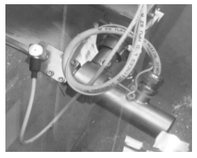
3

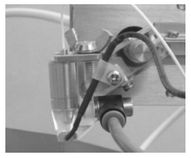
4



5







Typical systems are shown above

1. 12 axis system for simultaneous through transmission and pulse echo inspection of complex composite parts.
2. 25 x 5 metre, 32 channel system for plate inspection, including automatic surface tracking and probe normalisation. **3.** Multi-channel systems for inspection of titanium plates and forgings **4.** Multi-purpose machine for testing bonded drive shafts, electron beam welds, titanium forgings and composite tubes. **5.** Robotic system for thickness mapping. **Lower images** show various manipulator designs for immersion systems.