dolphicam2

ULTRASOUND IMAGING PLATFORM FOR NDT
MADE IN NORWAY BY
dolphitech

NDT CHALLENGES OF MODERN MATERIALS

AGILE NDT WITH RICH DATA AND POWERFUL ANALYSIS

The evolution of materials has improved production and possibilities within but significantly made it harder to detect damage. With aircraft such as the **Boeing 787** and **Airbus A350**, being made up of more than 50% of composite material. **dolphi**cam**2** is proving to be extremely effective for clients such as United Airlines, as well as impressing new clients throughout the airline industry.

NDT APPLICATIONS FOR

AEROSPACE	AUTOMOTIVE	WIND ENERGY
		

INSPECTION CHALLENGES OF MODERN COMPOSITE AIRCRAFT

Airlines are turning to the latest ultrasonic testing equipment to help check composite aircraft structures for damage from lightning strikes

Lightning strikes can affect airplane operations and cause costly delays and service disruptions. While lightning strikes are common, aircraft have been equipped with lightning protection systems for decades, minimizing delays and interruptions, as well as reducing the significance of the strike. To maintain the effectiveness of these systems, proper inspection and repair procedures must always be in place.

When aircraft are struck by lightning, the outcome can vary from no damage to serious damage that requires extensive repairs and the aircraft taken out of service, disrupting operations and causing delays and high costs. With metal aircraft, electricity can easily be conducted across the skin to a wingtip or other edge from which lightning can easily be dissipated.

However, composite aircraft are built with metal foil, woven wire, or most commonly an expanded metal mesh to dissipate the impact of lightning strikes.

The two aircraft with more than 50% composite material, the **Boeing 787** and **Airbus A350**, use different approaches to lightning strike protection for their composite fuselages. These new materials pose an extra challenging for inspecting the existence and extent of damage.

The frequency in which aircraft are struck by lightning is dictated by many factors, such as geographic areas and the number of times the aircraft passes through critical altitudes in the Landing/ Take off cycles. Due to its unpredictable nature, having the ability and technical means to perform these inspections minimizes the impact these events cause to the overall operation by enabling the return of the equipment to service quicker and safely.

INSPECTION PROCESSES

Aircraft manufacturers, such as Boeing, already have extensive documentation and procedures put in place for inspection that apply to analyzing lightning impact evidence and evaluating the damage. Such procedures highlight areas of interest, and act as a guide for operators.

> *"Clients such as United Airlines are seeing fantastic results with the* **dolphi**cam2

Inspection of composite aircraft poses a challenge for operators. Whereas before, aluminium damage could be rapidly assessed and evaluated, composite airframes add a new level of complexity to this task, as the extent of the damage is not as easily seen. In metal structures, lightning damage usually shows as pits, burn marks, or small circular holes, while in composite aircraft, damage is often in the form of burnt paint, damaged fibre, and composite layer removal.

Composite structures are less conductive than metal, causing higher voltages. This is the type of damage that can occur if a lightning protection finish is not applied or is inadequate.

This has a direct impact on aircraft availability and, in turn, puts great stress on the timely release of aircraft for flights. Having technology and expertise available on hand that enables timely evaluation of impacted aircraft are a vital part of a wellplanned operation.

While many methods are used, ultrasonic inspection is gaining ground, as advancements in the technology and refinement of technique make ultrasonic testing a sound option for operators. From tap testing in the early days, advancements in equipment and techniques have improved the performance of ultrasonic inspection on many applications of composite materials inspections.

AIRLINER APPLICATIONS

Amongst many options in the market, dolphitech's dolphicam2 is showing outstanding results for clients, such as United Airlines, as well as impressing new clients throughout the airline industry.

With major aircraft manufacturers such as Airbus and Boeing already using the dolphicam in their portfolio of techniques and any defect within, giving users consistent and clear data that enables for quick analysis and the best strategy on dealing with any repairs needed.

PORTABLE AND USER FRIENDLY

Small and ergonomic, the transducer modules are available with a wide range of frequencies and couplings materials, enabling optimized configurations for several applications, and the unit itself can display the gathered data in both time of flight and amplitude modes. Large areas, as found on aircraft, can be presented in stitched large area scans, providing more coverage and increasing the probability of detection of any indication in the area.

Software updates are sent out frequently by the manufacturer, considering valid input from end users and the industry, and can be distributed over the internet and installed remotely. New transducer frequencies are being introduced for a range of applications, giving flexibility and extending the reach of what users can inspect with one single kit. Front end coupling materials can be ordered in combination with custom shapes, making it even more customizable by the user.

The intuitive user interface gives users confidence to operate the equipment with less training time than when compared with highly sophisticated phased array units. All while still delivering data in a consistent manner. Large amounts of data are processed and displayed in real time, and users can choose between amplitude and time of flight modes, according to their application needs. The color palette of the time of flight mode can give clear "traffic lights" go/no-go returns. Users can see the data in A, B and C scans simultaneously, as well as a 3D representation giving experienced and new inspectors the data they need to make informed and confident decisions.

ENHANCED CAPABILITIES

With the evolution of the materials and innovative techniques of building modern aircraft, inspecting for lightning strikes and impact damage on the ramp has become even more challenging. There is the potential for costly delays as airplanes are kept on the ground for longer in order to be properly inspected and cleared for flight. With the advancement of ultrasonic inspection equipment and techniques driven forward by exponential increases in computing power, it has become a powerful tool for inspecting aircraft and getting the needed data, enabling for a timely action to be taken, expediting return to service for the impacted aircraft.

> *"Having the kits strategically distributed in key locations, enables rapid turn around times in the event of an event happening anywhere in the world.*

These features have been key for major operators, who rely on the dolphicam2 for inspection tasks related to lightning strikes and impact damage. Having the kits strategically distributed in key locations, enables rapid turn around times in the event of an event happening anywhere in the world. Not having to wait for deployment from a maintenance base minimizes aircraft downtime.

The evolution of materials means significant lightning and impact damage is hard to detect and is potentially costly to fix, with aircraft out of the air for extended periods of time. Ultrasound has made progress in NDT inspection and thanks to greater computing power, **dolphi**cam**2** provides an effective, reliable, scalable and rugged solution to meet the long-term requirements in a rapidly evolving and fast-moving industry.

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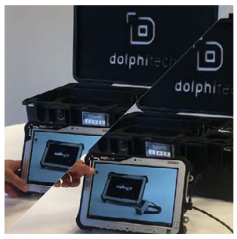
READY TO GO IN 60 SECONDS

dolphicam**2** is an NDT-platform that is lightweight and incredibly powerful. The platform enables you to visualise rich data in real-time to quickly identify and assess any issues. With a 60 second set-up and load time and ergonomically designed transducer. High cost, lengthy delays and downtime are things of the past.

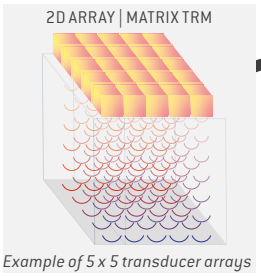
Connect TRM and black box, Toughpad and black box is connected.



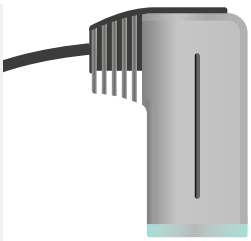
Start the Toughpad and the dolphicam2 software

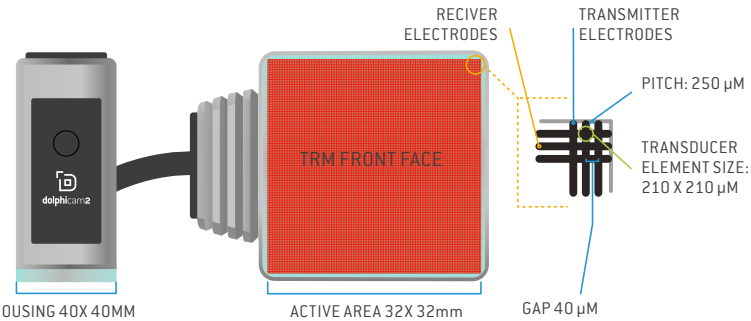
Start start inspecting.

WHAT IS FULL MATRIX CAPTURE



Example of 5 x 5 transducer arrays





The TRM in the **dolphi**cam**2** platform has a 2D array or a Matrix array. With 128 x 128 transducer array, in total 16 384 transducer elements performing scans capturing data at an incredible frame rate. This requires more complex manufacturing processes and more sophisticated software and hardware. However this deliver high-resolution visualizations with high sensitivity to small flaws or damages. You can save this rich data for further inspections later. All of this means a fast go/no-go decision can be made faster than ever which saves you time and money.

NEW FEATURES SOFTWARE UPDATES Q4 2019

TRANSDUCER AREA:
Select between a predefined set of transducer sizes to zoom in on smaller areas and increase the framerate.

CUSTOMISABLE TRANSDUCER PITCH/ VIRTUAL PROBE APERTURE:
The ability to group neighbouring elements results is “larger transducer elements”, this will provide an increased framerate and more penetrating power. This is extremely beneficial for harder samples like GFRP.

NEW DIGITAL FILTERS:
Three new filter types: Analog Low Pass Filter, Digital FIR Filter and Digital High Pass Filter. Increasing control of signal processing and better image quality on challenging applications such as GFRP inspections.

ANNUAL CALIBRATION:
Checkup and analysis of the state of the transducer without sending it offsite.

IMPROVED ENCODER STITCHING:
Allowing to perform X and Y movement at the same time. So you can scan the area of interest more efficiently.

FILE HANDLING IN SOFTWARE:
Easier to rename and delete custom settings or Full Matrix Capture files.

DRILLED HOLE MEASURE TOOL:
More efficient round hole inspections.

TECHNICAL SPECIFICATION DOLPHICAM2

SYSTEM/PLATFORM

GENERAL	Weight (black box + TRM + Toughpad)	3045 grams (6.7 lbs.)
	Toughpad 10.1”	Windows 10 – **dolphi**cam**2** Software
	black box Battery life	5-6 hours of continuous scanning
	Communication	USB C 3.0, USB A 2.0, Ethernet
	Transducer ports	2 x Quadrature Encoder & GPIO DSUB-9 (for X-Y scanning)
ENVIRONMENTAL	Operating Temperature	0˚C to +40˚C (32˚F to 104˚F)
	Operating Temp with Degrading	-20˚C to +50˚C (-4˚F to 122˚F)
	Storage Temperature	-20˚C to 65˚C (-4˚F to 149˚F)
	Max operating altitude	2000 meters (6562 feet)
	Ingress Protection	IP66
	Decreasing linearity to 50% relative humidity at 40˚C	Maximum relative humidity 80% for temperatures up to 31˚C. Decreasing linearity to 50% relative humidity at 40˚C.
	EMC	EN61326, FCC part 15B, FCC part 18
	Vibration and Shock	Mil-STD810G 516.6
	Electrical Safety	IEC-61010-1:2010
TRANSDUCER TECHNOLOGY	Transducer	Matrix (2D-array) 128 x 128 = 16 384 elements
	Element size/pitch	210 µm/250 µm (10 mils)
	TRM frontface/ active area	40 x 40 mm/32 x 32 mm
	Receiver Channels/Bandwith	32 (parallel acquisitions)/ 0.5MHz to 15MHz
	Acquisition/Frame Rate	5 to 50 frames/sec
	Digitizing (Sampling) Rate	50 to 65 MHz (Up-sampled to 200 MHz)
	A-scan resolution	12 bits (+/- 2048) Up sampled to 16 bits (+/-32 768)
	Transmit Pulse	0-70 V square wave
	Rise/Fall time	~ 5 ns

FUNCTIONALITY

GENERAL	Scans/visualisation-modes	A-, B-(horizontal/vertical), C-, 3d-scan (Amplitude & Time-of-Flight),Stitching
	Measurements	Depth B-scan, Depth & Amplitude (C-scan), Rectangle (Width, Height, Area),Circular (Diameter, Circumference, Area), Drilled Hole(Andgle Diameter, Circumference, Area)
	Data	Images & settings, FMC-data.
	Full Matrix Capture (FMC)	Save & Load FMC – Post process on FMC
	Configuration Settings	Save & Load
	Others	Colour Focus, Reset settings to default, Save screenshot, Activate scan button, Expanded view
TRANSDUCER	Gain	-40dB to 0dB
	Time Corrected Gain (TCG)	0 to 10 dB/µs
	Transmit Elements (Aperture)	1 – 32
	Averaging	1 – 16
	Pulse length	5 – 635 ns (5 ns increments)
COVERAGE	Delay	1 – 82 µs (delay between transmit and acquisition)
	Depth	1 – 120 mm @ 6000 m/s
	Speed of Sound	100 – 20 000 m/s (Preset list)
	Gates	Up to 3 separate gates
	Amplitude Threshold	The threshold for each gate
	Capture Method (for C-Scan)	Max Absolute, Max Negative, Max Positive
	A/B Scan Mode (RF)	Full, Absolute, Envelope
	Colour Palettes	Jet, Grey, Grey-inverted, Autumn, Bone, Winter, Rainbow, Ocean, Summer, Spring, HSV, Pink, Hot
	Image Filter	None, Gaussian, Median
	TRM Calibration/Balancing	Amplitude, Time-of-Flight
	Measurement Unit	Millimeters, Inches, Mils
	Stitching	Manual, GridTool, Encoder (X and Y)

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