

The Measure of Success



News

Non-Contact Measurement Leads the Way

The use of non-contact measurement technology is dramatically changing the quality control market place.

Since the launch of the FARO ScanArm there has been a dramatic shift towards non-contact measurement technology. The system consists of the market leading FaroArm seamlessly fitted with FARO's own Laser Line Probe. Over 30% of all FaroArms are supplied with the non-contact capability.

"The speed of measurement, intensity of data and simple graphical reports are ensuring that non-contact measurement is rapidly taking over from tactile measurement," commented FARO Europe District Manager, Mr. David Homewood.

Contact probes have traditionally been used for inspection, but compared to a laser line probe this is a much slower method, particularly for inspection of three dimensional, free form surfaces.

While a contact probe is still the most accurate method for probing geometric features such as holes and slots, they are simply too slow for measuring large areas. The FaroArm and Scanner combination allows both 'tactile' and 'non-



contact' integration within the one system.

"The FARO ScanArm can be used for Inspection or Reverse Engineering and can be

combined with a number of different software options dependent upon customer requirements," commented David.



Floris Rouw -
International Sales & Distribution Manager

Explosive Growth

FARO Europe achieved an outstanding 43% growth in the 2006 fiscal year. This was helped in part by the superb final quarter, in which the amazing number of 104% growth was registered. This organic growth proves once again that portable measurement technology is the future; independent of time, place or volume.

FARO hereby proudly presents - in cooperation with our local resellers - this FARO News. You now have the possibility to read and learn about several typical applications that are solved with FARO portable measurement equipment. Please feel free to contact your local "Authorised Reseller" to book a demo in your plant, production or quality department.

Please also take a close look at our latest product: the FARO Gage.

It sounds almost too good to be true; nowadays the FARO Gage replaces more and more calipers, traditional hand tools, height gages and even CNC CMM's. All because of the fact that the FARO Gage is a unique tool that combines accuracy, portability and easy handling to make it a truly measure-where-you-make-it piece of equipment.

Lean Measurement at GE Aircraft Engine Services

GE Aviation Services in Caerphilly, South Wales have four portable FARO CMM's including two FARO Platinum Arms and two FARO Gages.

The site is one of the largest engine overhaul and rebuild facilities in the world, serving major manufacturers such as Rolls-Royce, in addition to GE.

GE made the decision to acquire the FARO Platinum Arms to enable in-process inspection of large aircraft engine components on the shop floor.

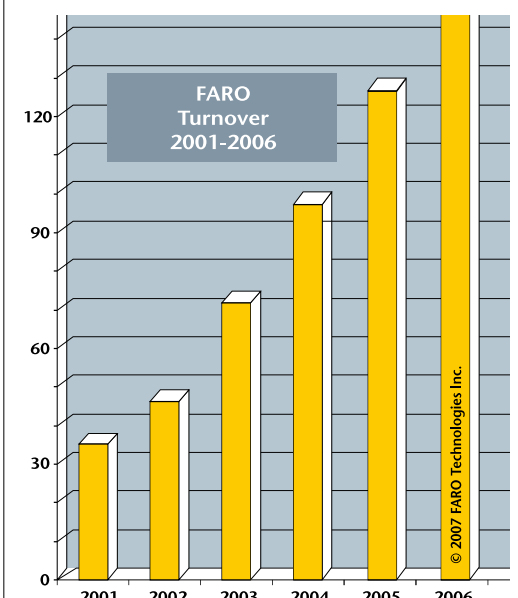
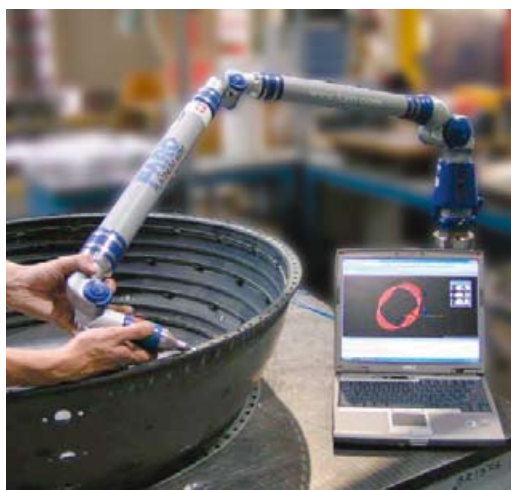
The FaroArm has been implemented in several areas of the factory to improve productivity, and now the operator can efficiently check the part in situ, producing an easy to understand and fully traceable electronic report. In certain instances, the FaroArm has proved to be up to eight times quicker than previous inspection methods. With Soft Check Tools, FARO's unique software that works with digital photographs and a bouncing ball, employees can quickly



inspect relatively complex components, with very little training.

Another area GE have seen the benefits of the FaroArm are with the associated queue times for the CMM area. Prior to purchasing the FaroArm the operator would have to unload the component from the machine, take it to the CMM, wait for it to be inspected and then possibly return it for rework. The operators can now check the component in the machine, without losing valuable break down and set up time, thus avoiding the CMM bottleneck.

Neil Lockwood of GE Aircraft Engine Services commented, "We now have an efficient, portable method of measurement. We have made substantial productivity improvements by employing the FaroArm as an alternative to CMM and hand tools. With Soft Check Tools we can confidently inspect complex components with minimal operator training, giving us full electronic part traceability."



FARO GAGE & FARO POWERGAGE

A Personal CMM!

- 1 **1.2 m working volume**
Large enough for all your parts, moulds and assemblies
- 2 **Internal counter-balancing**
User can move fatigue-free FARO Gage easily with one hand
- 3 **Lightweight construction for total portability**
Provides true "measure anywhere" performance

- 4 **Multi-probe capability**
Wide variety of probes including:
 - Various Ball Diameters
 - Touch sensitive
 - Curved
 - Extensions

- 5 **Integrated battery**
Provides true "measure anywhere" capability
- 6 **Universal 3.5" quick mount for mounting on granite or metal surface**
"Mount-it-where-you-make-it" convenience; less downtime

The FARO Gage and Gage-PLUS are the industry's first line of personal Coordinate Measuring Machines (CMMs). With their 1.2m (48") working volume, they are the "mount-it-where-you-make-it", truly portable, cost-effective, 3-dimensional, minimal-training gages for machinists. The FARO Gage line replaces all conventional gaging devices with an expandable library of gaging tools. Save time and money by replacing your cluttered inspection area with the one tool that can do it all.

Features

- ▶ HIGH accuracy, LOW price
- ▶ Portable and easier-to-use than a fixed CMM
- ▶ Mount and measure parts in process
- ▶ Up to .005 mm (.0002") accuracy
- ▶ Generate GD&T & SPC reports

Measure it Where You Make it!

Bringing new power to in-process inspection and CAD-to-part verification, the PowerGAGE includes a high-powered, easy-to-use programmer module, no-train "player" module, and extremely accurate 4-foot measurement arm. Program it once and you're done, even directly use CAD data for nominal. It was designed by and for machinists to speed through measurement challenges and produce the most accurate results available. Shop-hardened and temperature compensated, it allows anyone, anywhere to measure in 3-D with previously unheard of precision.

Features

- ▶ HIGH accuracy, LOW price
- ▶ Write on-machine inspection routines
- ▶ Mount and measure parts in process
- ▶ Up to .005 mm (.0002") accuracy
- ▶ Perform CAD-to-part analysis

Performance Specifications

Model	Measuring Volume	ISO 10360-2	
		E (µm)	R (µm)
Gage-PLUS	1200 mm (48") sphere	5+8L/1000	6
Gage	1200 mm (48") sphere	10+16L/1000	12



A Hat-trick of Gages for Wrayram

Wrayram Engineering, based in Hereford, specialise in manufacturing high performance hydraulic cylinders for a wide range of industries including commercial vehicles, agricultural machinery, material handling, lifting equipment and civil engineering.

As Ken Bayliss, Managing Director of Wrayram, explained, "Before we purchased the FARO Gage, Wrayram relied on traditional measuring equipment. With the introduction of the FARO Gage we are able to measure products and components more accurately and drastically reduce the time involved over traditional methods."

Ken went on to say, "We are continuously looking for ways to reduce manufacturing times and at the same time maintain and improve the quality of our products. The introduction of the FARO Gage has certainly helped us to achieve these objectives."

Wrayram have recently taken delivery of their third FARO Gage. The vision is to have the equipment used throughout the different processes from beginning to end, with operators having the ability to check complex measurements at the click of a button.



Gage reduces Bottle Neck

The introduction of the FARO Gage at H+S Aviation came as a result of the company's ongoing commitment to process improvement and specifically the need to provide high levels of customer service through reduced turn-times within the repair and overhaul business.

Having previously used conventional CMM technology on the component repair side of the business, the FARO Gage technology provided an alternative solution to production and build areas, without the need or facility for dedicated programming.

The simplistic nature and ease of use of the FARO Gage allowed H+S to focus on a known process bottleneck within the Rolls-Royce Model 250 engine inspection of the auxiliary gearbox module. Both the cover and main

housing require a number of features to be inspected as part of the mandatory process, and the process time for both has now been considerably reduced. Initial results indicate that the inspection turn-time has been reduced from a three day queue to a process time of 15 minutes with the FARO Gage, and the ability to manage the process queue to less than a day.

For the future H+S engineering teams will continue to review the suitability of FARO to the varying requirements of the repair and overhaul business. Due to the flexibility of the system, H+S Aviation plan to use the FARO Gage on components and processes that are turn-time sensitive and require a consistent measurement methodology.



FAROARM PLATINUM & TITANIUM



The Platinum FaroArm's ± 0.013 mm (± 0.0005 " accuracy renders traditional CMMs, hand tools and other portable inspection equipment obsolete. Anyone, anywhere can now inspect, reverse engineer or perform CAD-to-Part-analysis on parts, fixtures and assemblies with previously unheard of precision. When you partner that accuracy with its adaptable 3-D measurement technology and customized zero-training SoftCheck Tools (with or without CAD), it is ideal for forming, moulding, fabricating, casting and for assembly facilities needing basic 3D measurements or advanced GD&T and SPC output.

When you want the portable measurement and reverse engineering capabilities of the FARO Plati-

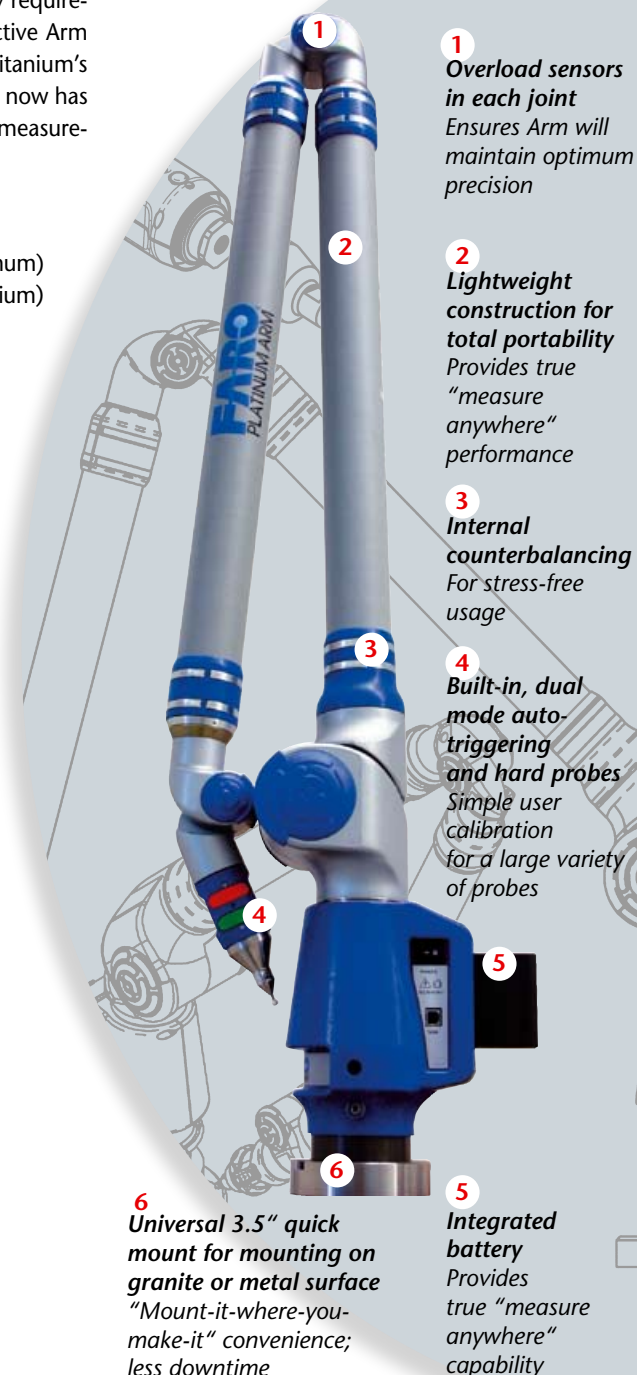
num Arm® — and have flexible accuracy requirements — the choice is FARO's cost-effective Arm series, the Titanium FaroArm®. The Titanium's high precision means that the shop floor now has an affordable solution for most of their measurement needs.

Features

- ▶ ± 0.013 mm (± 0.0005 in.) accuracy (Platinum)
- ▶ ± 0.025 mm (± 0.0010 in.) accuracy (Titanium)
- ▶ 7-Axis availability
- ▶ 6-degrees-of-freedom probe
- ▶ Adaptable 3-D measurement technology
- ▶ Space-age composite construction

Performance Specifications

Model (Measuring Range)	Single Point Articulation Performance Test*		Volumetric Performance*	
	axis			
Platinum 1.2 m (4 ft.)	6	± 0.013 mm (± 0.0005 in.)	7	± 0.018 mm (± 0.0007 in.)
Platinum 1.8 m (6 ft.)	6	± 0.020 mm (± 0.0008 in.)	7	± 0.026 mm (± 0.0010 in.)
Platinum 2.4 m (8 ft.)	6	± 0.025 mm (± 0.0010 in.)	7	± 0.030 mm (± 0.0012 in.)
Platinum 3.0 m (10 ft.)	6	± 0.043 mm (± 0.0017 in.)	7	± 0.052 mm (± 0.0020 in.)
Platinum 3.7 m (12 ft.)	6	± 0.061 mm (± 0.0024 in.)	7	± 0.073 mm (± 0.0029 in.)
Titanium 1.2 m (4 ft.)	6	± 0.025 mm (± 0.0010 in.)	7	± 0.036 mm (± 0.0014 in.)
Titanium 1.8 m (6 ft.)	6	± 0.041 mm (± 0.0016 in.)	7	± 0.053 mm (± 0.0021 in.)
Titanium 2.4 m (8 ft.)	6	± 0.051 mm (± 0.0020 in.)	7	± 0.061 mm (± 0.0024 in.)
Titanium 3.0 m (10 ft.)	6	± 0.086 mm (± 0.0034 in.)	7	± 0.104 mm (± 0.0041 in.)
Titanium 3.7 m (12 ft.)	6	± 0.122 mm (± 0.0048 in.)	7	± 0.146 mm (± 0.0058 in.)



"The FaroArm is truly amazing"

Gestamp Automoción is an international group dedicated to the development and manufacture of metal components and structural systems for the automotive industry. Gestamp Automoción has locations in 12 countries, with 44 production centres and 6 R&D centres, together employing over 8,700 people.

Gestamp UK based in Washington, Tyne & Wear were provided with an on-site demonstration from a FaroArm Account Manager.

Kevin Carr, Quality Engineer at Gestamp Automoción instantly recognized the benefits and purchased an 8ft Titanium FaroArm in November 2006. At present its primary use is to measure welding and assembly fixtures using the latest FARO X1 software with CAD to compare data. The FaroArm hardware is

capable of interfacing not only with FARO's CAM2 Measure X1 software, but also with a wide range of third party software suppliers which adds to the flexibility that the FaroArm can offer.

When trying to find a quick and easy way to measure parts in situ, Kevin commented on the back-log in the inspection department when using conventional gauging methods and how the cost of new gauging was a big concern, "Being able to program the FaroArm using Soft Check Tools and allowing an untrained operator to run full inspection checks using easy to follow pictures was unbelievable. We can actually measure parts on the shop floor now, saving us having to strip down and set-up fixtures - the portability of the FaroArm is truly amazing."



Freedom to inspect anywhere

JM Automatics formed in 1988 specialise in the aerospace and marine industries, producing anything from one off to large batch work, with the ability to work direct from CAD in all aspects from machining to inspection. "Since purchasing a 10ft FARO Platinum Arm we have been able to reduce manufacturing times by inspecting on the machine and reduce the work load on our conventional CMM," commented Managing Director John Moorhead.

The measurement arm is also lowering the number of parts that are "not right first time". Darren Psaila, Inspector at JM Automatics Ltd, found moving from the conventional CMM to the FaroArm a natural progression and

commented on the new found freedom to inspect anywhere on or off-site. "The FaroArm also lets you measure parts a lot easier due to its ability to move in so many ways. Many of our customers have commented on what a fantastic bit of kit we now have, even to the point where they have brought their own inspection items round to us to be measured. The software is easy to learn and results are easy to understand."

JM Automatic Ltd have found it possible to take on larger jobs due to more accurate alignment utilising the leap frog method of inspection. "The FaroArm is one of the best purchases we have made in recent years."





FARO Sponsor Team HISAQ in Porsche Supercup



FARO is sponsoring the newly established Team of HISAQ® Competition during the 2007 season of the Porsche Supercup.

Siegfried Buss, Managing Director of FARO Europe explains: "Together with our long-standing customers, Porsche and ALUTEC-Belte, FARO will face the sporting competition in the fastest international cup label. We are looking forward to the Porsche Mobil 1 Supercup races, which will take place in the race program of the Formula 1 season."

The season has started on 15th April 2007 in Bahrain where Richard Westbrook made 2nd place. This as well as the test runs with the Porsche 911 GT3 Cup gives hope for a successful season. Richard Westbrook starts as the current Champion of the Porsche Supercup for the HISAQ® Competition Team 2007. His impressive balance in 2006 included four victories, four pole positions and 11 podium placements in 12 races. In 2006, the second driver, Michael Schrey, proved his great driving potential as best newcomer with the title "Rookie of the Year".

"In addition to the sporting competition we are pursuing by sponsoring the HISAQ® Competition, we are continuing the development of our portable 3-D measurement systems in this industry," explains Siegfried Buss.

"Through the collaboration with our partners, we expect synergy effects within the development of a special mobile measurement system for motor sports."

Visit the web site: www.faro-supercup.com

Top quality for main machining plant of Airbus Deutschland

In order to be able to satisfy the increased demands and to carry out all incidental measurements themselves, the goods inwards department of Airbus in Varel, Germany has acquired a FARO Platinum Arm.

Components from Varel are found in all Airbus aeroplanes. The Varel site is the main machining plant of Airbus Deutschland. Most of the 35,000 components produced in Varel are used in the Airbus fleet, where a certain stability is necessary in order to fulfil the static and dynamic requirements for the aeroplanes. The components range in size from the smallest bush, with a diameter of 4mm, to large components, with a length of 6 to 8m. Structure components are also kept in stock for the Eurofighter and spare parts for the Tornado, as well as the Transall.

With 1,300 employees, the Varel site also houses the Centre of Competence for the production central block. The specialists build and produce devices for all users with which the planes are equipped so that the incurring work can be carried out.

As is common in aerospace technology, Varel's quality assurance is of highest priority. With this, the goods inwards department plays an important role and employs 18 workers. The site receives half of the machined components from sub-suppliers. These are commissioned with provided material according to the rules of the "Quality Assurance Requirements of Category A" (QARA) to machine the components. Up until two years ago, the components were measured by conventional coordinate measurement machines. With the increased volumes of components to be measured – in particular through the A380 and A400M – a requirement for new measurement equipment was identified by the goods inward

inspectors. They decided upon the acquisition of a measurement system which allowed them to quickly measure the geometry and the surface of their components. Airbus quickly recognised that the FaroArm was the most suitable system.

The 10ft Platinum Arm has been used at Airbus since 2005. The Arm is normally used with new components or parts from new suppliers. These already undergo a 100% control, as well as a first-sample check. Airbus trusts the quality of its supplied parts meets its audit requirements, but the goods inwards inspectors play it safe and measure every item anyway. In the past they depended on the competence or the measurement systems of other departments. With the FaroArm they can now carry out the measurements quickly and without problems themselves.

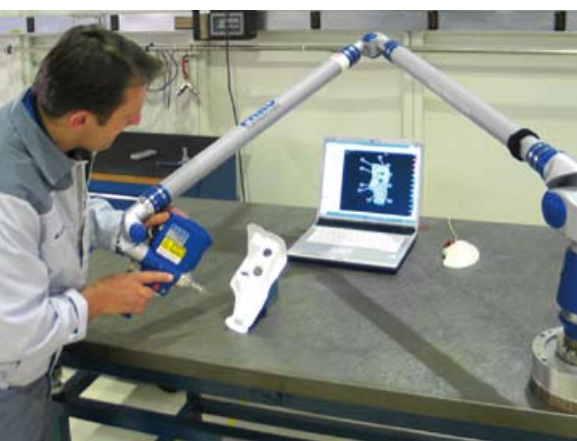
The Arm offers flexibility and mobility, allowing Airbus to carry out comparison measurements and checks of components which are made of aluminium, titanium and steel. Airbus are so satisfied with the service and support from FARO that the wind tunnel model department in Varel has acquired a further FaroArm for the measurement of individual parts as well as of complete models.

"We could implement our goals of realising components for CAD model comparisons with good results relatively quickly. The FARO system is perfect for our applications and has completely fulfilled our expectations," claims Roman Schultze, Goods Inwards Inspector for Airbus Varel.



FARO LASER SCANARM

Productive, Precise and Portable



The FARO Laser ScanArm is the first ever seven-axis contact/non-contact measurement device with a fully integrated FARO Laser Line Probe. Unlike other scanning systems, the ScanArm's hard probe and Laser Line Probe can digitise interchangeably without having to remove either component. Users can accurately measure prismatic features with the Arm's hard probe, then laser scan sections requiring larger volumes of data (more than 19,000 points per-second) — without adding or removing attachments, untangling cabling, or having to use a separate CMM.

Features

- ▶ Fully integrated 7-axis ScanArm
- ▶ Laser scan up to 19,200 points per second
- ▶ Use laser and hard probes interchangeably
- ▶ Take measurements within the same software
- ▶ No attachments or tangled cables

System Performance

Model	1.2m (4 ft.)	1.8m (6 ft.)	2.4m (8 ft.)	3.0m (10 ft.)	3.7m (12 ft.)
Titanium	±.086 mm (±.0034 in.)	±.103 mm (±.0040 in.)	±.111 mm (±.0044 in.)	±.154 mm (±.0060 in.)	±.196 mm (±.0077 in.)
Platinum	±.068 mm (±.0027 in.)	±.076 mm (±.0030 in.)	±.080 mm (±.0032 in.)	±.102 mm (±.0040 in.)	±.123 mm (±.0048 in.)

Laser Line Probe Specifications

Accuracy:	50µm (.002")
Repeatability:	±50µm, 2σ (±.002")
Stand-off:	95mm (3.75")
Depth of Field:	85mm (3.35")
Effective Scan width:	Near Field 34mm (1.34") Far Field 60mm (2.36")
Points per line:	640 points/line
Scan Rate:	30 frames/second 30fps x 640points/line = 19,200 points/sec.
LASER:	660nm, CDRH Class II/IEC Class 2M <ul style="list-style-type: none"> • Temperature resistant, dimensionally stable optics • Direct compatibility with FARO 7-Axis Arm

1 Ergonomic removable handle
Provides comfortable stress-free usage

2 Compact sealed design
Versatile and durable in harsh manufacturing environments

3 Thermal Stabiliser
Ensures optimum working conditions throughout operating temperature range

4 Repeatable quick-mount
Allows for quick probe disconnect without repetitive calibration

5 Dual Laser Head and Hard Probe
Digitise interchangeably without having to remove either component

FaroArm Platinum 7 axis

Portable measurement just keeps growing



With the need for portable measurement growing, two ex-FARO employees, Jason Timms and Marcus Green, saw that there was a gap in the market for a portable measurement/scanning and full engineering bureau service. This is how 3DScantech was formed.

The company purchased their first FaroArm and Laser Line Probe scanning system which runs with Geomagic and CAM2 Measure X1 in September 2006. Due to a busy workload and the success of the system, 3DScantech purchased a second system in November 2006. With the company going from strength to strength, 3DScantech are now able to offer an experienced service to all their customers.

As Managing Director Jason Timms explains, "The portability of the purchased system allows us to produce an inspection report or CAD model directly on-site at the customer's facility without the need to leave the factory. Even now after leaving FARO we still see the WOW factor from both the Arm and the Laser Line Probe, both of which have played a big part in the growth of 3DScantech."

LSNW Group companies grow with FARO

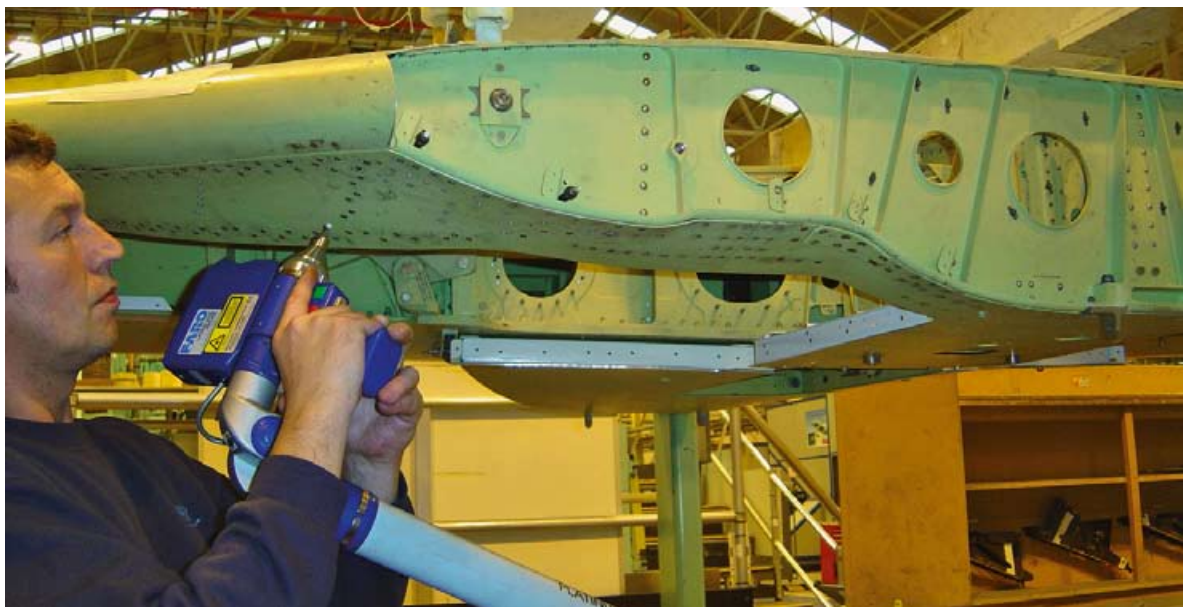
LSNW (Lofting Services North West) was formed by two brothers, Richard and David Fielding, in 1997 to supply printed mylars (Lofts) to the local aerospace companies, and in 1998 they purchased their first CNC milling machine. Since then they have sustained a steady growth over the past 8 years and acquired a 3 acre site close to the M60 motorway in Denton Manchester. In 2006 they built a brand new, state-of-the-art, 30,000 sq ft manufacturing facility, and are currently developing a further two factory units to allow for rapid growth.

The Design Department of the LSNW group "CAD CAM Engineering" has sustained steady growth for the previous 2 years, but since the introduction of the FaroArm and Laser Line Probe (LLP) their workload has tripled. The increase in turnover has largely been attributed to their new Reverse Engineering Capabilities with the help of the FARO Laser Line Probe (LLP). Managing Director, Richard Fielding, and Quality Manager, Simon Kelly, first saw the FARO 7 axis Platinum Arm & LLP at a local FARO Open House and immediately saw the opportunity to reduce costs and

improve lead times dramatically. Following the Open House they arranged an on-site demonstration which involved the inspection of a complicated aerospace intake mould tool (while still on the CNC machine) and the LLP in which the reverse engineering capabilities were demonstrated.

An order was quickly placed for a 10ft Platinum FaroArm, LLP, Geomagic software for Reverse Engineering and PowerINSPECT for inspection. In the first 7 months of owning the measurement arm it has travelled thousands of miles to and from customers sites to scan press tools, form tools, aircraft wing skins and car body panels.

For BAE Systems Hawk aircraft over 60 tools have already been remodeled, enabling CNC machining and much reduced lead times giving cost savings to the customer. When not scanning on customers sites, the Arm is set up in the inspection department and the inspectors that previously favoured the fixed bed CMM are now firm believers that the FaroArm is the way forward - so much so that they are now pushing to buy a second one!



FARO LASER TRACKER X & Xi

Xtreme Measurement Range!

1 **XtremeADM® and Interferometer now twice as accurate as before**
 Meet the most challenging accuracy requirements

2 **Self-Comp**
 Quick automatic compensation ensures high accuracy

3 **Integrated Weather Station and Precision Level**
 Included as standard equipment



4 **Instant-On, Smart Warm-Up & Active Thermal Compensation**
 Are part of the full featured standard equipment

5 **Mounts vertically, horizontally, or upside down**
 Total versatility in confined areas

The FARO Laser Tracker X is a portable, contact measurement system that uses laser technology to accurately measure large parts and machinery across a wide range of industrial applications. It has a 70m (230ft) diameter range, achieves 0.025mm (0.001") 3-D single-point accuracy, and is rugged enough for the shop floor environment.

The system measures 3-D coordinates with its laser by following a mirrored spherical probe. High-accuracy, angular encoders — along with XtremeADM — Absolute Distance Measurement, reports the 3-D position of the probe in real-time.

The Tracker Xi can run in two modes: XtremeADM (Absolute Distance Measurement) and Interferometer; making it the most accurate and flexible Laser Tracker system.

meADM (Absolute Distance Measurement) and Interferometer; making it the most accurate and flexible Laser Tracker system.

Features

- ▶ 70m (230ft) range
- ▶ Up to 0.025mm (0.001") accuracy
- ▶ Automated compensation
- ▶ Instant-on laser
- ▶ XtremeADM instant beam acquisition
- ▶ High-resolution interferometer (Xi)

System Specifications

Head size: 280 x 554 mm (11 x 21.8 in)
 Head weight: 22 kg (48 lbs)
 Controller size: 160 x 180 x 280 mm (6 x 7 x 11 in)
 Controller weight: 5 kg (12 lbs)

Range

Horizontal envelope: +/- 270°
 Vertical envelope: +75 to -50
 Minimum working range: 0m
 Maximum working range: 70m (230ft) diameter

Environmental

Altitude: -700 to 2,450 meters
 Humidity: 0 to 95% non-condensing
 Operating Temperature: 5°F to 122°F (-15°C to 50°C)

Angle Measurement Performance*

Angular accuracy: 18µm + 3µm/m
 Maximum angular velocity: 180°/sec
 Optional Precision Level Accuracy: +/- 2 arcseconds

Distance Measurement Performance

XtremeADM

Resolution: 0.5µm
 Sample rate: 10,000 samples/sec
 Accuracy: 10µm + 0.4µm/m
 R0 Parameter: 10 µm

Interferometer

Resolution: 0.158µm
 Accuracy: 2µm + 0.4µm/m
 Maxim. radial velocity: 4m/sec
 R0 Parameter: 10 µm

HONDA ENGINEERING

Drive forward with FARO

Honda Engineering Europe Ltd is part of the Honda Motor Group and was set up to support Honda of the UK Manufacturing Ltd in mass production of automobiles in Europe by developing tooling, automation, new manufacturing methods, and strengthening engineering technical skills across the group. Honda produce both the 3- and 5dr Civic, and the new CRV at their plant in Swindon. The company splits into three departments: 'Body' supporting Weld, Paint and Assembly, 'Powertrain' supporting Engine Plant, 'Die Cas-

ting and Die Centre' supporting Honda's own Press Plant.

The support starts from ideas either conceptual or based on previous or existing equipment, from these ideas Honda Engineering Europe then carry out full design, including any research and development required on totally new concepts. Whilst the main focus of Honda Engineering Europe Limited is the support of Production at Honda of the UK Manufacturing, support is also provided to Honda's other production plants in Europe

(Motorcycle in Italy and Spain, and Power Equipment in France).

In December 2006 the company took delivery of a FARO X Tracker which will enhance their capability of accurate and speedy tool production and support, enabling accurate installation of new automation equipment for robot off-line simulations and programming, and thus support in their ultimate goal of increased customer satisfaction by reducing the lead times of introduction of new automation equipment and new future models.



UNITE

Raise their Expectations with FARO

UNITE Modular Solutions is a strategic arm of UNITE Plc, producing off-site manufacturing solutions for its parent company. UMS has seen a substantial growth in the past five years since its inception and now produces Modular Solutions for over 50% of UNITE's growing pipeline.

UNITE's business is simple and unique; they develop, manage and rent student accommodation. It sounds easy but there are over 1,000 UNITE employees across the country delivering an exceptional customer experience to some 35,000 customers whilst continuously evolving their product and growing the business.

UNITE was created in 1991 in Bristol by its founder, Nicholas Porter, who saw an opportunity in regenerating old office blocks, that stood on prime city locations, into student accommodation. Since then, UNITE have achieved a lot in a very short period of time. In 2002 Europe's biggest steel modular manufacturing facility - UNITE Modular Solutions - was built in Stroud and commissioned. Currently it produces 3,500 fully furnished bedrooms and kitchens a year and UNITE manages over 125 properties located across the country from Aberdeen to Plymouth.

UNITE Modular Solutions decided to purchase the FARO Laser Tracker for measurement purposes. UNITE were required to extend the height of their current building structures for high-rise buildings. With the prospect of building even higher modular buildings than ever before in mind, the modular units had to be produced to a controlled tolerance. Now with the ability to measure their modules, UNITE Modular Solutions can use the information gained and feed back to the build lines for continual process improvement.

John Burrin, Head of Engineering at UNITE Modular Solutions, commented: "At the end of the day, without the ability to measure our 8m volumetric rooms accurately, we could never have built Europe's tallest modular building at Bond Street in Bristol."



FARO SCANNER LS 880 / 840 / 420

Designed for high performance: See it - Digitise it!



Designed with user friendliness in mind, the high performance of the Scanner can be used with minimal training to capture 3D point cloud data. Whether documenting a 50,000 square foot building or accurately capturing the scene of a crime, the possible applications are almost unlimited. The scanner offers:

Photorealistic 3D images

The FARO Laser Scanner LS produces three dimensional black and white images where every pixel has an X,Y,Z coordinate. For enhanced realism, colour, through an upgrade option, can be added to the pixels. Measurements can be made directly in the point cloud and 3D objects can be generated. These can be used to create dimensionally accurate CAD models.

High speed

In less than a minute the FARO Laser Scanner LS can take an 8 Mega pixel scan of the surrounding area. This is over 100 times faster than conventional scanners, thus reducing the time needed for

capturing data on-site, increasing the efficiency and profitability of the data capture.

Modularity

The FARO Laser Scanner LS is constructed of interchangeable modules - the distance sensor, mirror module and PC module. This makes the unit easy to maintain and has the added advantage that additional modules can be purchased to benefit from future developments such as a long range module or a high accuracy module. This secures the investment and ensures that cutting edge technology remains affordable.

Proven technology

Many years of experience in the practical application of the technology can be seen in the design. The Scanner is compact with sealed units, push-button operation and can be geo-referenced making it suitable for daily operation in difficult environments.

New Products, Accessories and Software for the Scanner LS

- 1) With **GPS** connection you can position and orientate your scans for outdoor use.
- 2) The **FARO WLAN** - Now you can control your FARO Laser Scanner with your notebook computer or PDA from any point within the range of your WiFi network.
- 3) **PDA** - Together with our new WLAN (WiFi) connection, the PDA controls your FARO Laser Scanner wireless.
- 4) Our new **Colour Bracket** allows you to take colour scans without any parallax error.
- 5) With the **FARO LS Backpack**, your Laser Scanner will go wherever you can go!
- 6) The light-weight **carbon fiber tripod** gives you the necessary mobility, with full stability - despite it's weight of only about 3.5kg.

- 7) Surveying tunnels, bridges and road profiles, the **TIGER** allows you to capture the environment while your scanner drives along it's path.
- 8) **FARO Scene V4**: Now all FARO Laser Scanner Software is being offered in the languages of English, German, French, Italian, Spanish, Chinese and Japanese. More features have been added with improved exports via .dxf, intelligent contrast control, Registration with levelling sensor etc.
- 9) **FARO Laser Scanner LS Software Packages** for Architecture, Historical Preservation, Forensic Investigation, Tunnel & Mining, Product Design and Quality Assurance, as well as Process and Power Plants, Re-Engineering and Asset Management.

The most versatile and most mobile laser scanner on the market, which can be served most simply!

1 **High resolution**
7 - 700 million
3-D pixels/scan

2 **Fast**
120,000 3-D measurements
per second

3 **Accurate**
±3 mm systematic distance error at 25 m

4 **Surrounding field of view**
360° horizontal and 320° vertical

5 **Universal quick mount**
For mounting on a surface or tripod

6 **Stand alone operation**
Data recording on internal
hard disk

Large Scale Scanner Captures History

Following the success of the work carried out by Geo Spatial Survey Solutions Ltd (GSS) and Deri Jones & Associates Ltd (DJA) on Tean Mill, the team were asked to carry out a LS880 laser scan of an 8 bedroom manor house in the English/Welsh Marches south of Ludlow.

With elements of the house dating from Norman times, Orleton Manor was the original seat of the Mortimer family, one of the most powerful 'Marcher Lord' families, who played an important role in the history of the Kings of England over a period of some 400 years.

Sitting on 9.3 hectares (23 acres) of land, the manor house is laid out in a U shape, having developed from the original single-story long house. Constructed from large oak posts and beams, it is a classic example of the English Tudor timbered building. It has a panelled main

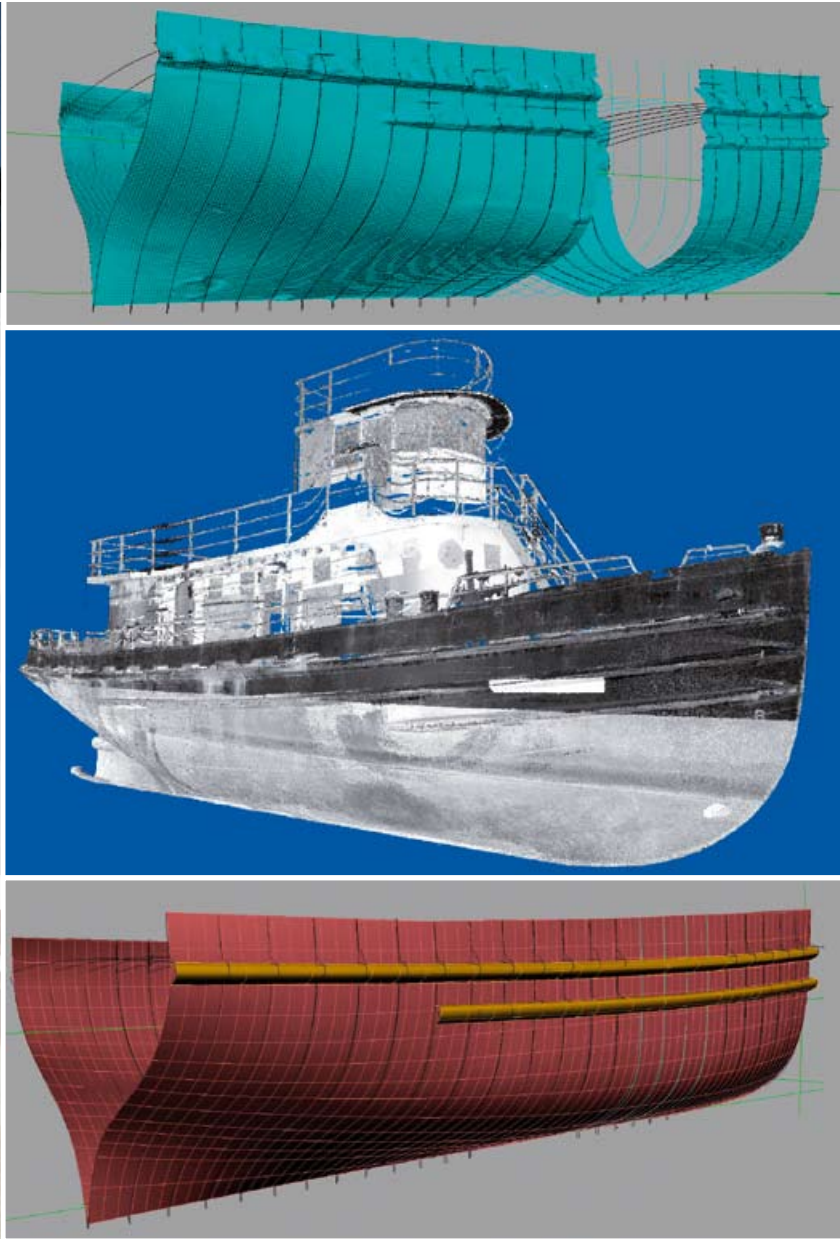
living room and a grand, vaulted ceiling master bedroom with further oak panelling, both of which are relatively modern additions from the 17th Century. The purpose of the LS880 survey was to create a detailed 3D model of the house for use by the architects and other consultants on the project. The scans would also act as a full colour record of the house as it stood prior to the renovation and also allow identification of hidden spaces and discussion of the manner and sequence of construction - an important factor in the planning of the renovation.

DJA worked on site for 3 days with the LS880, completing 54 full colour scans of all aspects of the house and combining these with dimensional control data to build a detailed 3D data set of the house. Inaccessible and dark areas such as cramped attic spaces and unlit cellars posed no problems to the scanner, due to the self illuminating nature of the infra red laser and use of remote flash control. The compact nature of the scanner allowed working amongst the beams and pillars of the attic and the wheeled tripod allowed fast set up times outdoors, making it possible to dodge the downpours of a British Autumn.

Back at the office, DJA collated the six gigabytes of scan data and six hundred photographs collected over the three days on site into a rational model. FARO's SCENE software was used to align the scans to a master reference file containing the location of each of the eighty four reference spheres used, with accuracy of scan location typically being +/- 3mm. The scans were then filtered to remove sky data and erroneous points, with the dark timbered areas being cleaned manually to preserve reflection data.



Steamboat Willy - Laser Scanning a 65ft American Tugboat



Using the FARO LS880 Laser Scanner, Geospatial Survey Solutions Ltd (GSS) and Deri Jones & Associates Ltd (DJA) were asked to carry out a 3D survey of an existing tugboat hull in preparation for extension and re-modelling. A day was spent scanning the vessel and a CAD model accurate to within +/- 3mm created from the scan data. This model was then used as a reference to create the plating, frames and girders required to extend the vessel.

Once the point cloud had been correctly

located in space, it was cleaned and meshed to create a high density STL file – the level of detail visible in this was very impressive, with details such as plate seams, valve inserts and the distortion that happens between frames due to welding clearly visible. Sections were taken through this mesh to create a traditional Naval Architects linesplan, showing transverse and longitudinal sections at different offsets on the hull.

Using VX, the high resolution STL model

was used to create a detailed IGES surface model of the centre section of the hull to allow further investigation of the split point and the best method of creating the infill piece for the extension. Once the best location had been identified, a new CAD surface was created that provided a fair surface to use as a reference CAD model. This captured the proposed solution for the extension and would be used to design the frames, girders and other structural requirements for the hull extension.

Drax Power Station digitally captured by LS Scanner

Drax power station is the largest coal-fired power station in the UK supplying 7% of the country's electricity needs. Alstom is a major contractor working with Drax Power and together they are keen to continually develop their technology, improve efficiency and lower emissions.

Deri Jones & Associates (DJA Ltd) and Geospatial Survey Solutions (GSS) were tasked with producing a 3D survey of one of the six steam turbines within the four hundred metre long turbine hall. Two days onsite scanning captured the required data to allow the production of a detailed 3D point cloud model representing levels and machinery spaces around the surveyed steam turbine.

Working with the LS880 FARO Laser Scan-

ner, operators were able to scan the 60m steam turbine within two days producing 37 individual scans on four different levels. During the survey all generation machinery was constantly running, producing a challenging operating environment. Heavy machinery operation resulted in high levels of noise and structural vibration. However neither of these difficulties prevented the LS880 from rapidly scanning the elements of the turbine. Its relatively light weight and ability to work from a portable battery pack independent of a computer system allowed two operators to quickly move the scanner around the turbine.

Once the data had been returned to the office the point cloud files were processed using the FARO Scene software to remove

extraneous data and leave a clean point cloud of the turbine and surrounding spaces. Then the 37 scans were tied together in the FARO Scene software using the 62 reference spheres placed during the survey. This allowed the production of a single combined point data file, from which our engineers were able to produce accurate plans of platform levels and cross sections along the turbine shaft. From these it was possible to see the extent of space around the turbine and allow the planning of future machinery installation.

For further details of the laser scanning services available, please contact Deri Jones on +44(0)870 762 0089 or by email at: info@djaweb.co.uk



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