

Capture 3D

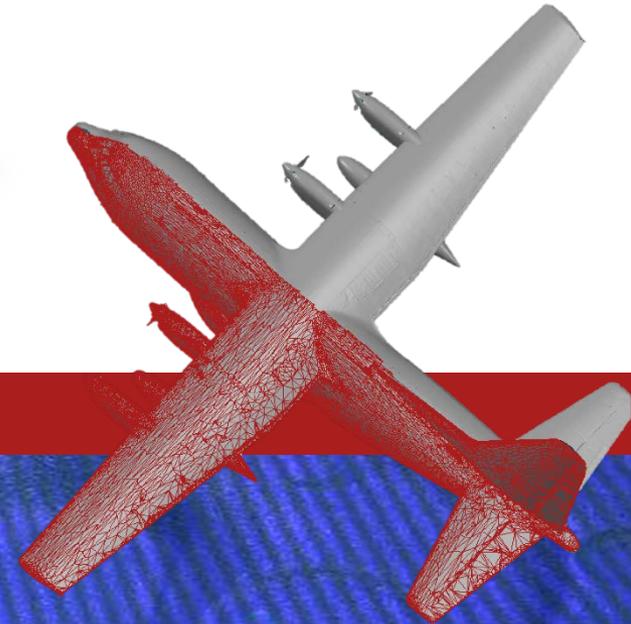
Customer focused.
Precision driven.



Innovative Precision Metrology

When accuracy, quality, speed and reliability matter.

NASA ISIW 2014 - Short range full-field non-contact structured blue light 3D scanning and photogrammetry for rapid and accurate inspection analysis.



Challenges facing manufacturing today...

- “Need it by yesterday.” Requirements for a faster time to market.
- Faster, less-expensive, and with more functionality in a shortened time frame with a decreased workforce.
- Requirements for rapid and accurate measurement data acquisition and instant inspection feedback for quality, dimensional verification, root cause and trend analysis.
- How to quickly decipher measurement data in order to apply the optimal corrective action to achieve true process improvement.
- Domestically re-shore manufacturing.



Capture 3D, Inc.

North American Partner of GOM GmbH Optical Metrology Solutions

- **Over 7,000 GOM optical non-contact solutions installed worldwide**
- Capture 3D established in 1997, headquartered in California with locations in Washington, Minnesota, Michigan, Connecticut, and North Carolina.
- Automation Solutions Center in Michigan facility
- Currently hiring!
 - Application Engineers in CA, MI, CT, and SC
 - Technical Sales Engineer in SC



Background: Steve DeRemer

Technical Application Specialist

- Started with Capture 3D in 2010
- 18+ year career in the metrology field utilizing various types of metrology technologies
- Tasked with helping companies optimize manufacturing processes with metrology, identify unique applications, and collaborate with companies on process improvement techniques.

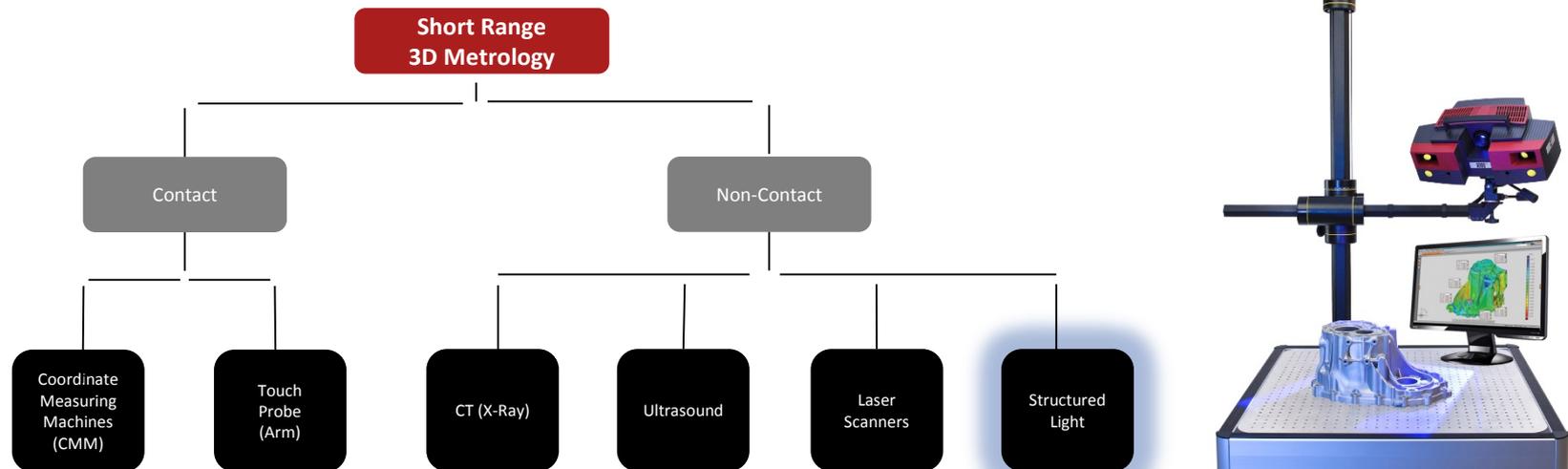


MBA - Walsh College of Accountancy and Business
BS Computer Aided Design - Eastern Michigan University

Our Focus – Innovative Precision Metrology

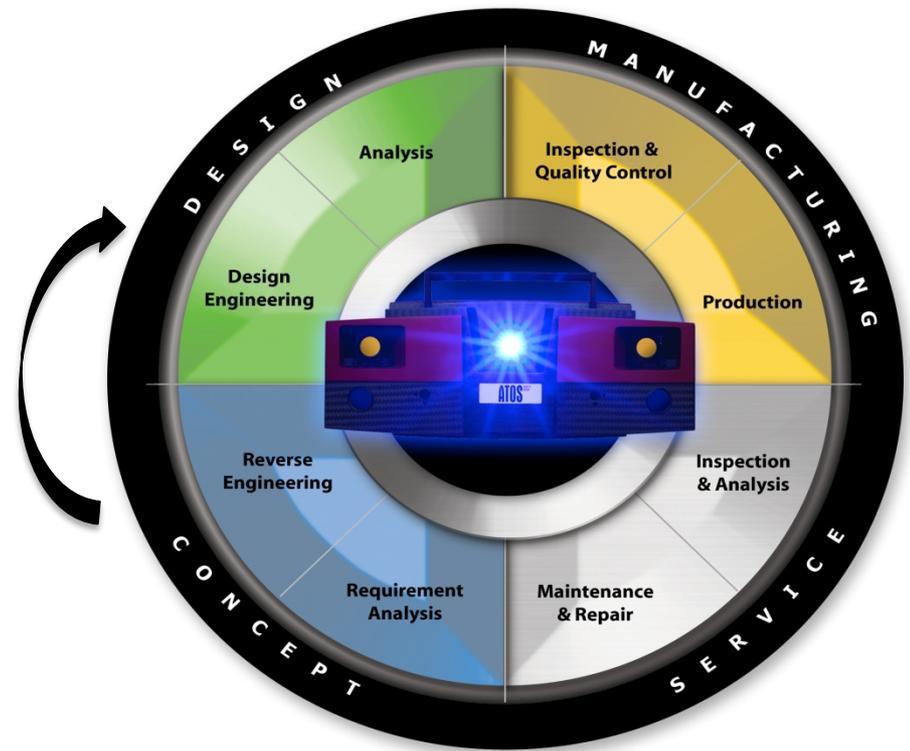
Structured Blue Light 3D Metrology, Inspection, Photogrammetry, and Automation

- Being able to shorten measurement setup and data collection time allows companies to focus on true process optimization. By having high quality color map inspection data on the part, mold, tool, and/or die allows companies to quickly apply the optimal corrective action and accurately predict trends to help speed up time to market, eliminate iterations and save an enormous amount of costs that were once being spent on rework and waste.



Applications: Improving design through manufacturing

- Quality Control / Inspection
- CFD/FEA Analysis
- Rapid and Additive Manufacturing
- Virtual Assembly Alignment and Shimming
- Digital Assembly Analysis
- Material Thickness and Prediction
- Tooling Quantification, Finger Printing and Wear Analysis
- 1st time digital definition / Reverse Engineering
- Material characteristic quantification – e.g. Forming and Stamping – Part Springback
- High volume repetitive measurements
- 3D Visualization



ATOS Non-Contact Structured Light 3D Digitizers

High Quality Structured Blue Light 3D Scanners

- Aerospace certified accuracy
- Advanced hardware and high quality optics coupled with intelligent software
- **Triple Scan Functionality** – 3 Sensors in 1 – Reduces # of scans, improved data on shiny surfaces, and better measurement in deep pockets.
- Rapid high definition data acquisition
- Various configuration possibilities from portable to automated



ATOS Triple Scan



ATOS Compact Scan



ATOS Core

*Available with Triple Scan functionality

Pratt & Whitney

- "We have spent a substantial amount of time effectively testing artifacts and comparing with traditional methods to build confidence in the entire process. **We have certified the ATOS system for our inspection applications and have encouraged our suppliers to use them to improve their processes.** Areas of success for Pratt & Whitney have included Turbine and Compressor Components, Primary Internal & External Component, Production Tooling, and Industrial Gas Turbine Components. With the Automation that Capture 3D has integrated, we have increased our scanning throughput significantly for production applications."



Pratt & Whitney

A United Technologies Company

Technical Manager

Advanced Manufacturing Metrology

Pratt & Whitney

Tactile vs. Optical Non-Contact Metrology

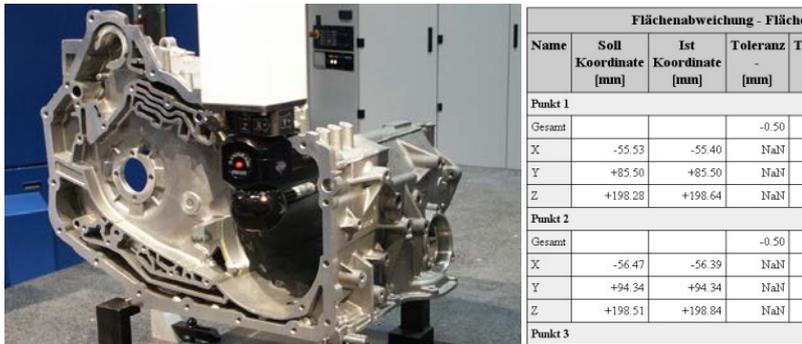
Tactile Methods

Advantages

- Established measurement technology
- Fast measurement of few inspection features
- Potential Accuracy

Disadvantages

- Slow at free form surfaces
- Long action periods, less data
- Contact measurement on pliable parts
- High mechanical effort for large objects
- User dependent alignment



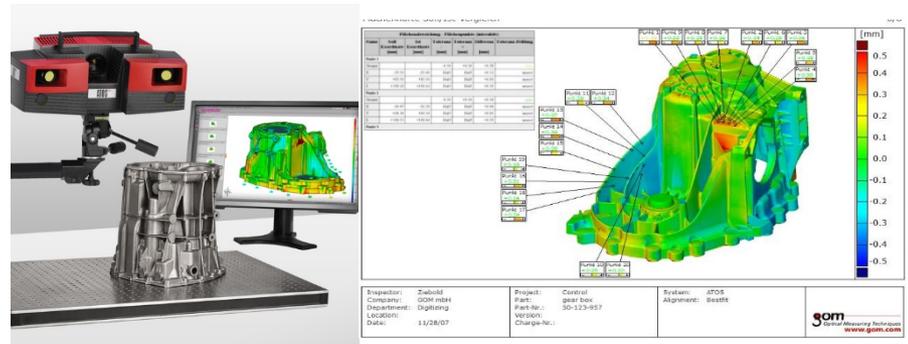
Optical Methods

Advantages

- Fast and surface based measurements
- Full field capturing (volumetric scan)
- High detail resolution
- Non-contact measurement on pliable part
- Mobile – can go to the object
- Flexible – addresses different object sizes
- User independent alignments

Disadvantage

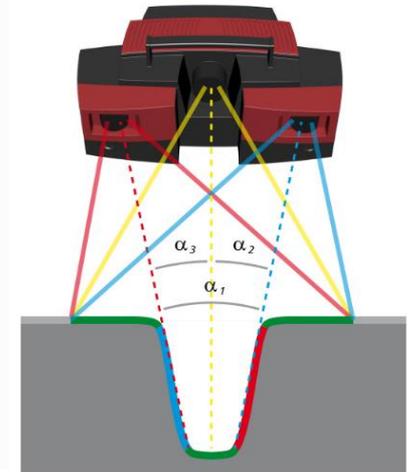
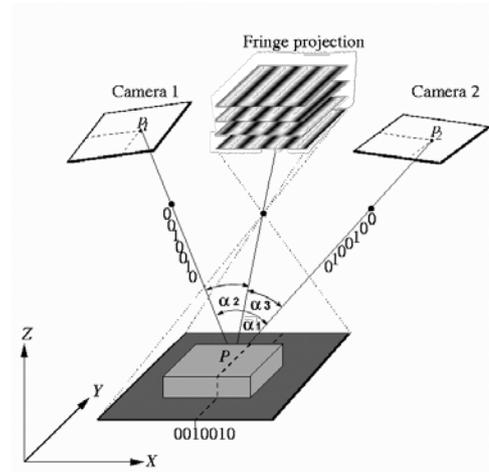
- Overkill for sparse data collection or prismatic parts
- Difficulties with highly reflective surfaces



ATOS Triple Scan with Blue Light Technology

Fringe Projection: Stereo Cameras + Projector

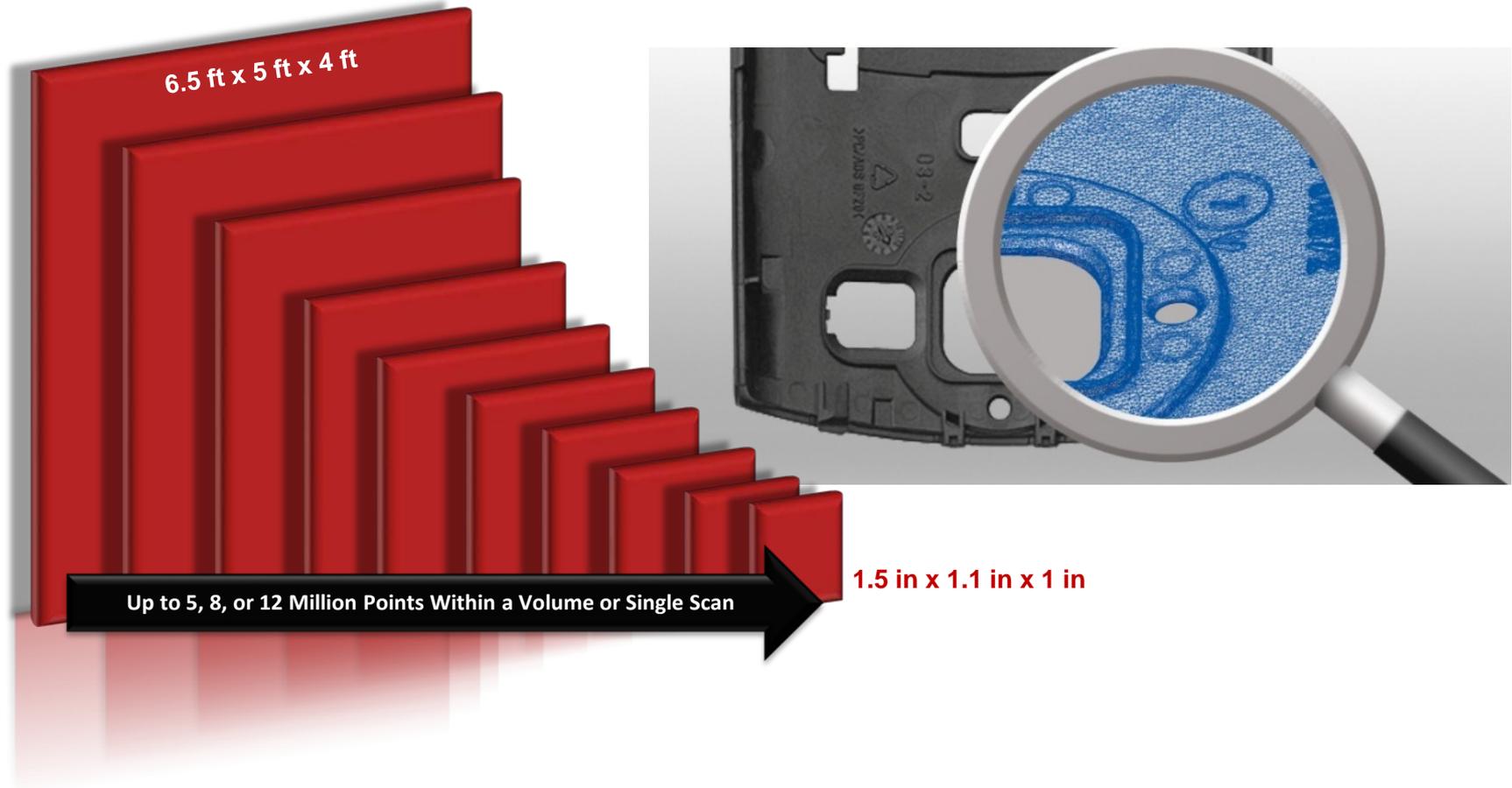
- **Triple Scan** triangulation between all optical elements
 - Two cameras
 - Projector and left camera
 - Projector and right camera
- Uses all three viewing angles from the stereo camera and projector (α_1 , α_2 , and α_3)
- **Benefits**
 - ✓ Guarantee for high data quality
 - ✓ Permanent tracking of sensor status
 - ✓ Online information about movement and reference points
 - ✓ Less measurements are required
 - ✓ Data capture in deep pockets and intricate geometries
 - ✓ More data on shiny parts due to less reflection/hot spots
 - ✓ Less sensitivity for wavy data
 - ✓ Quick Calibration
 - ✓ Online Tracking



ATOS Blue Light technology further improves the scanning of dark or colored surfaces while making it resilient to environmental factors because of its narrow band of blue light.

ATOS – Measurement Volumes

- ATOS Triple Scan and ATOS Compact Scan systems have a various range of volumes which can be interchanged to capture a part's finest details. ATOS Core systems have a fixed volume, but can be used in conjunction with other ATOS systems via hot plugging.



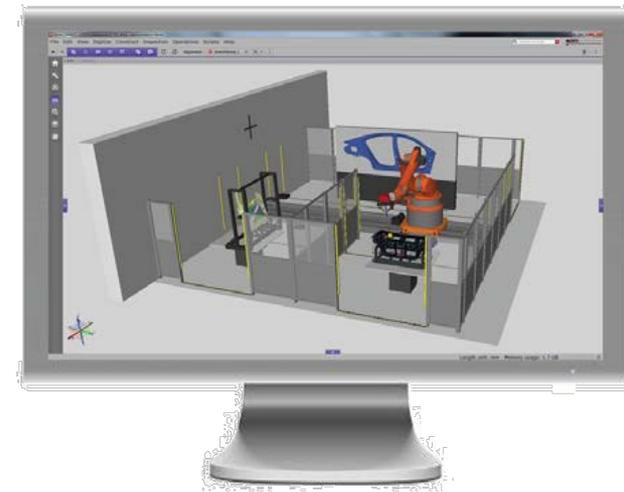
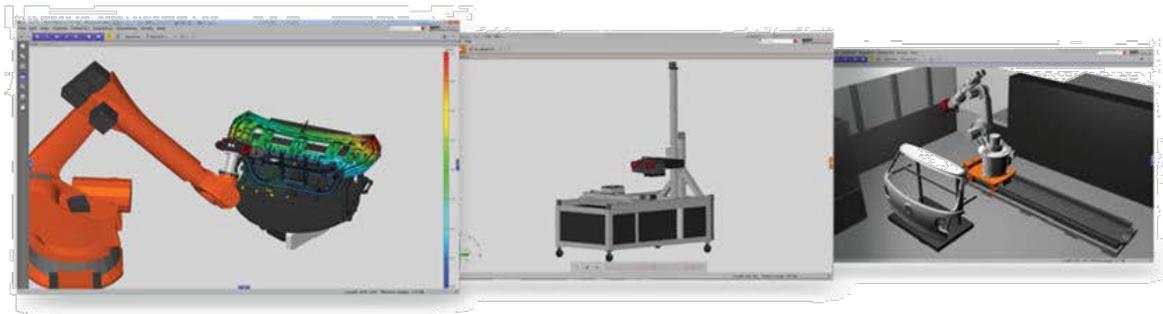
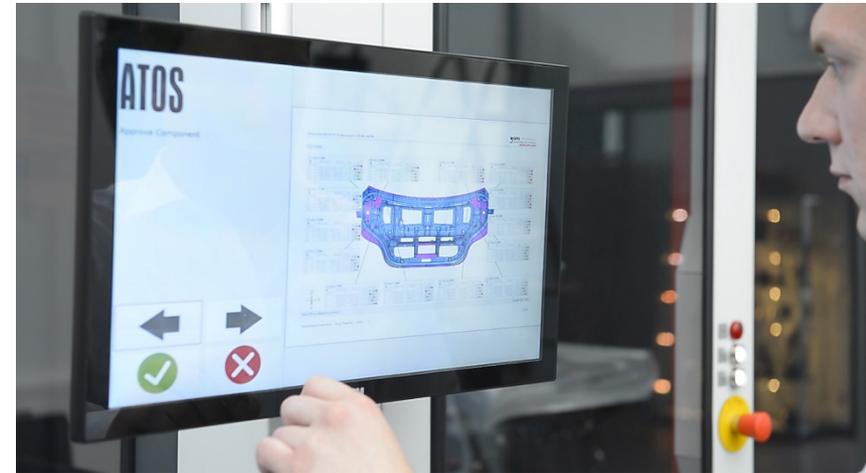
ATOS Industrial Configuration Versatility

- Portable laptop, shop-floor, lab, semi-automation, COTS (commercial off the shelf) automation, and custom automation.

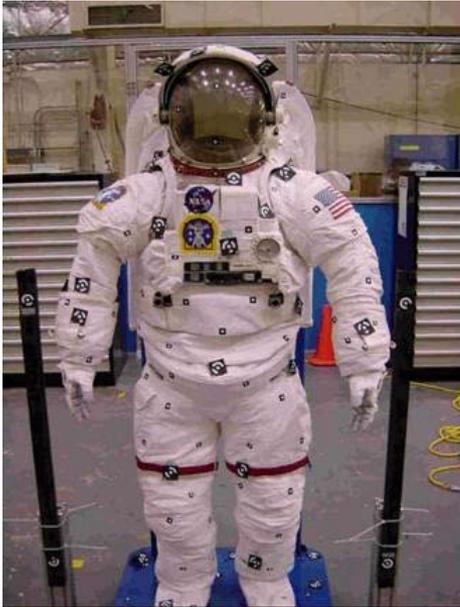


VMR – Virtual Measuring Room Module

- Easy offline and online teaching and programming
- Automatic sensor positioning with collision control and safety
- Design inspection cells virtually on the basis of real requirements (space, dimensions, etc...)
- 3D measurement simulation with guided teaching
- Intelligent software that gives operators immediate feedback on whether holes, slots, trim and spring, CAD surfaces, etc. are recorded correctly from a specific robot position
- Available with Kiosk touch-screen interface, RFID and bar code scanners



ATOS – “As Manufactured” digital definition



ATOS – Intricate Feature Capture

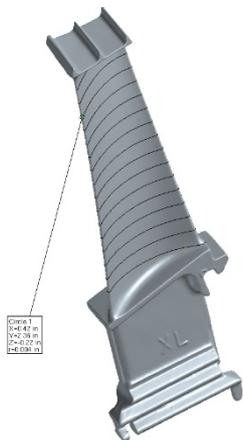
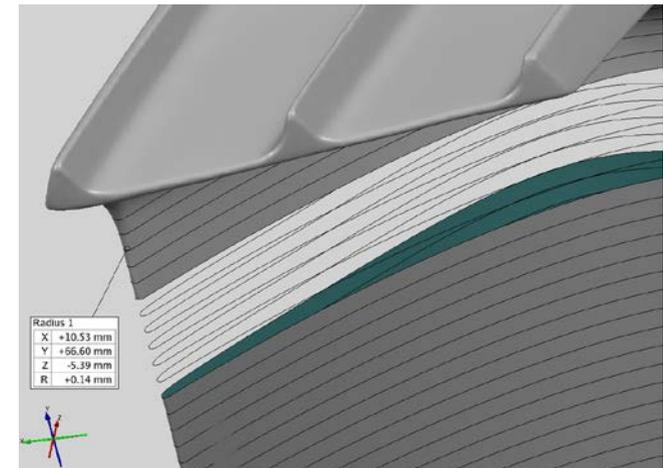
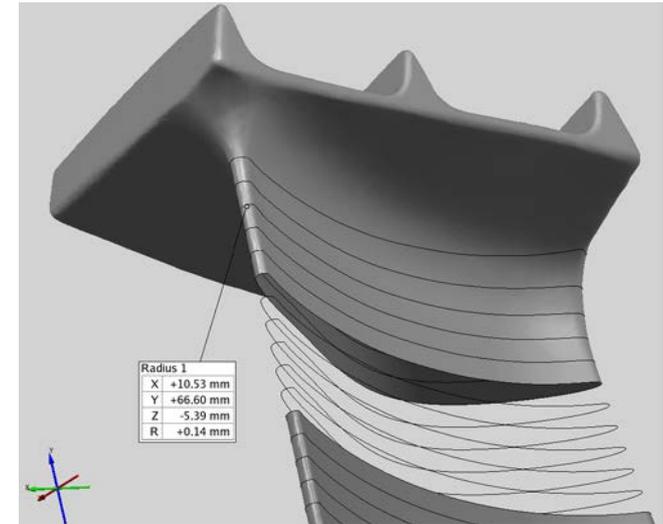
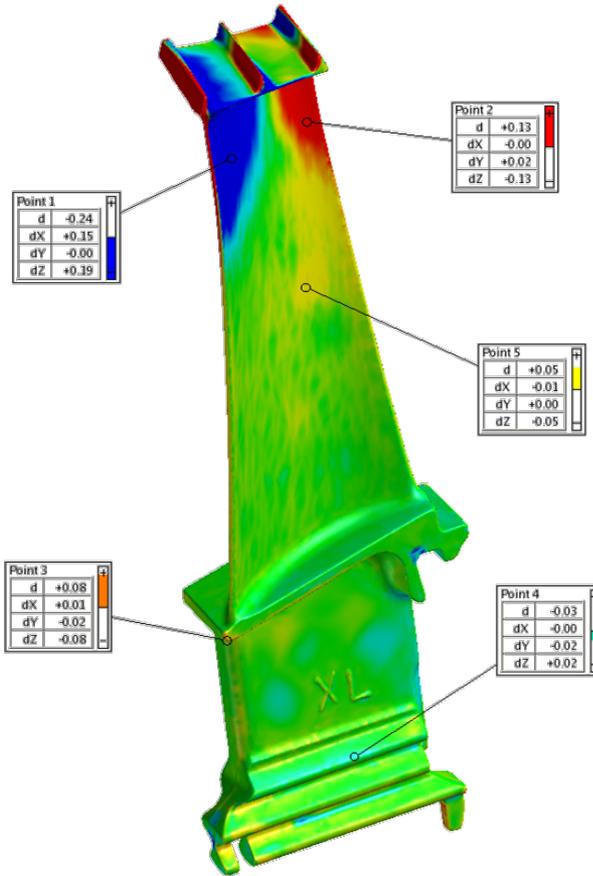
If you cannot capture the features, you cannot accurately RE them.



ATOS – NASA Columbia Debris Analysis

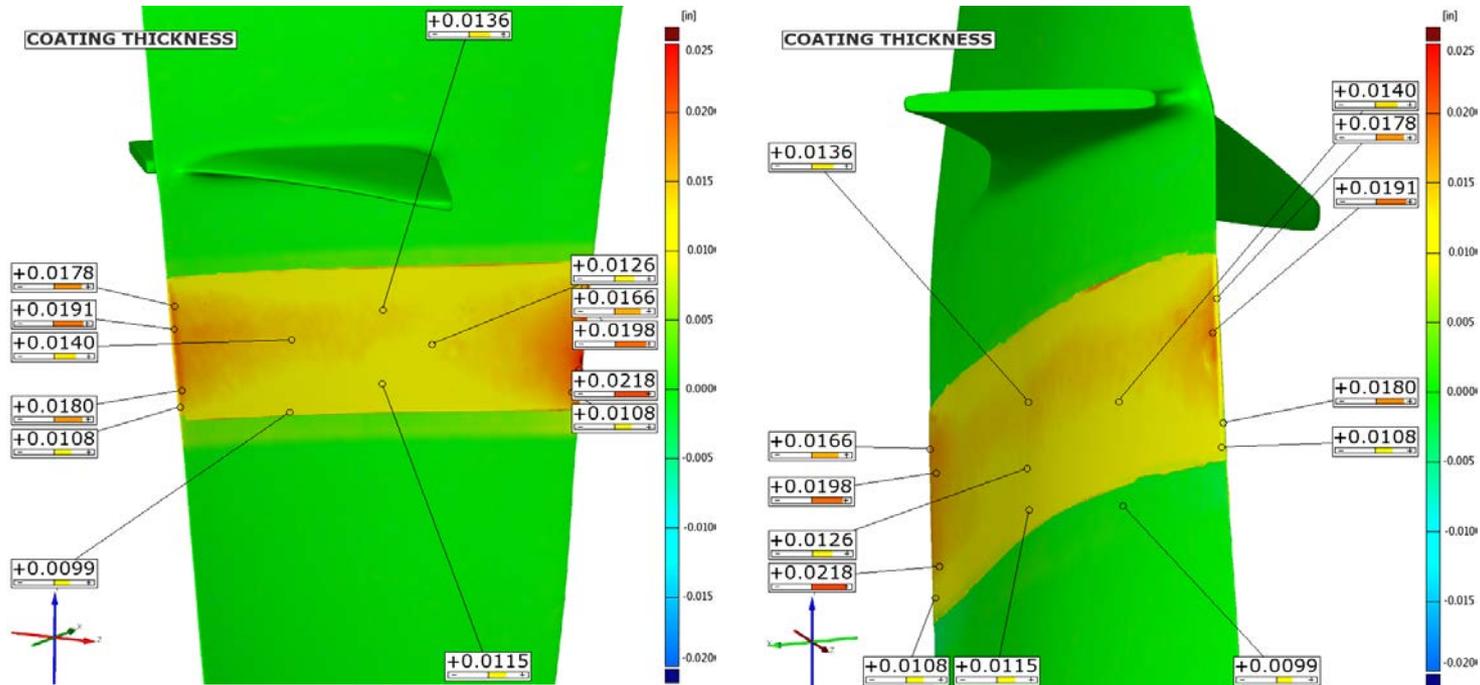


ATOS - IGT, Propulsion, & PMA Airfoil Analysis



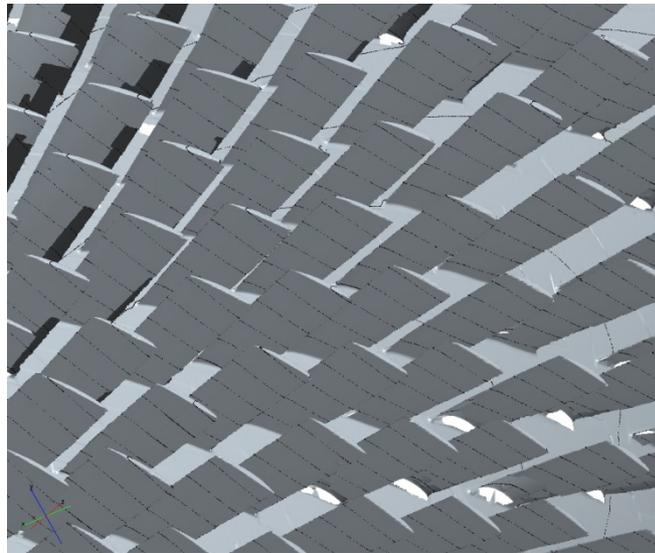
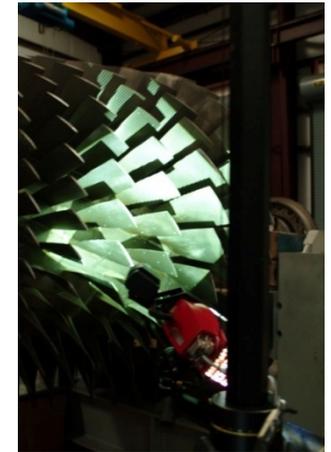
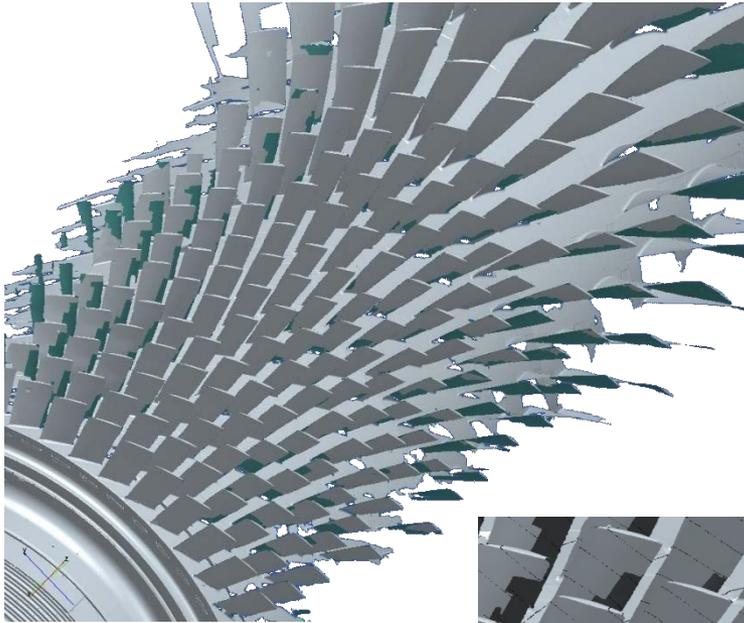
ATOS - IGT, Propulsion, & PMA Airfoil Analysis

- Thermal Barrier Coating (TBC) Measurements



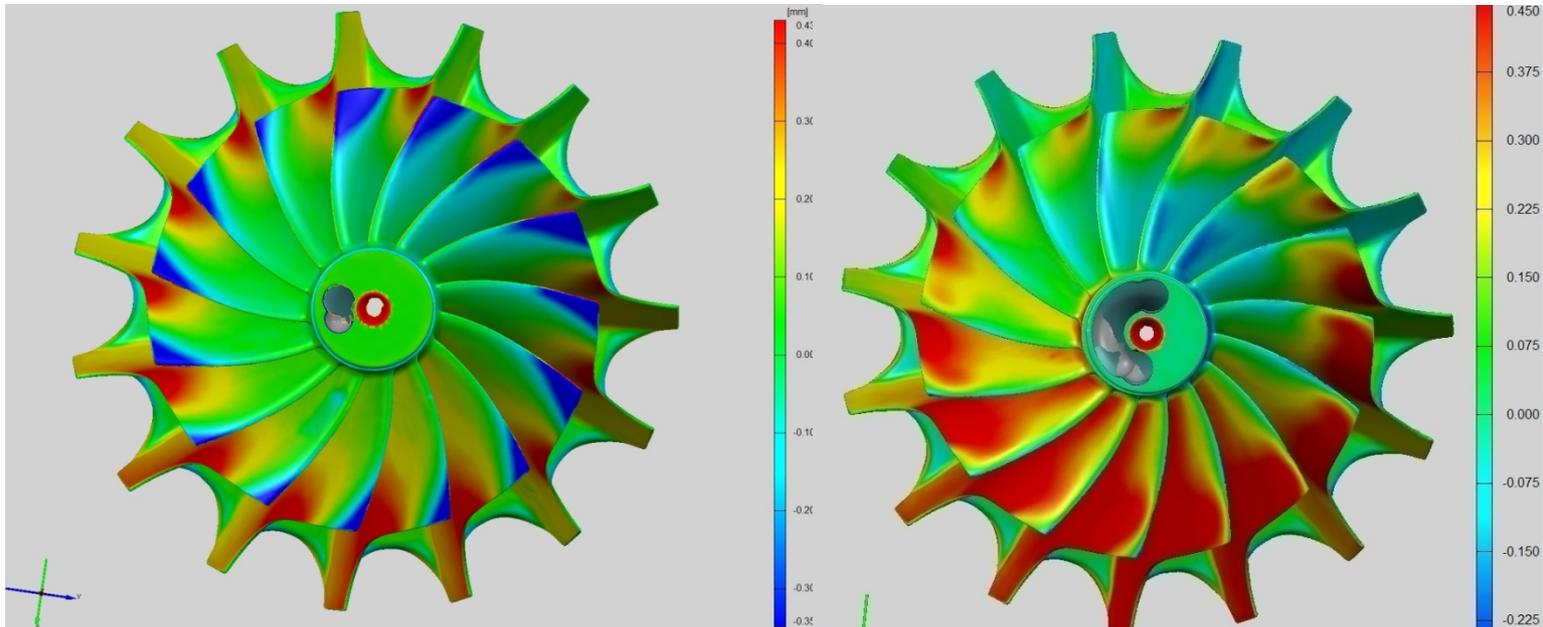
Not a hot side component, example to show concept of TBC thickness measurement

ATOS - IGT, Propulsion, & PMA Airfoil Analysis



ATOS - IGT, Propulsion, & PMA Airfoil Analysis

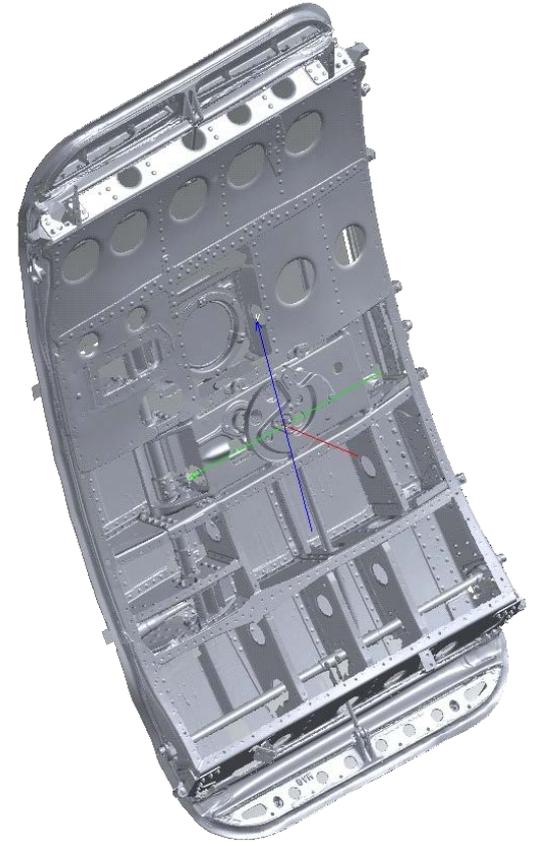
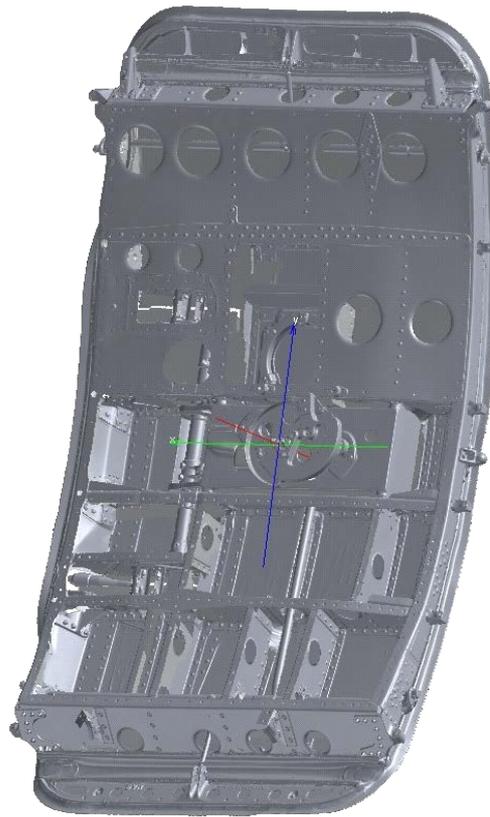
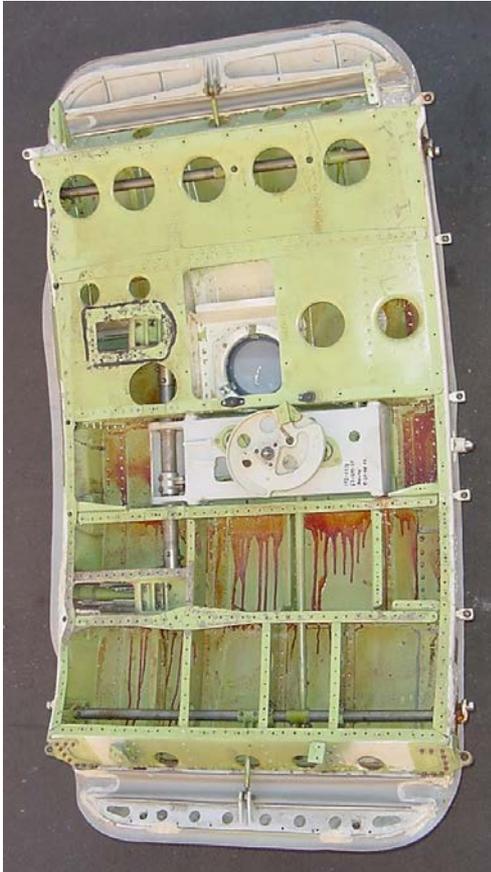
- ATOS inspection results for root cause analysis



Rotor with low vibration

Rotor with high vibration

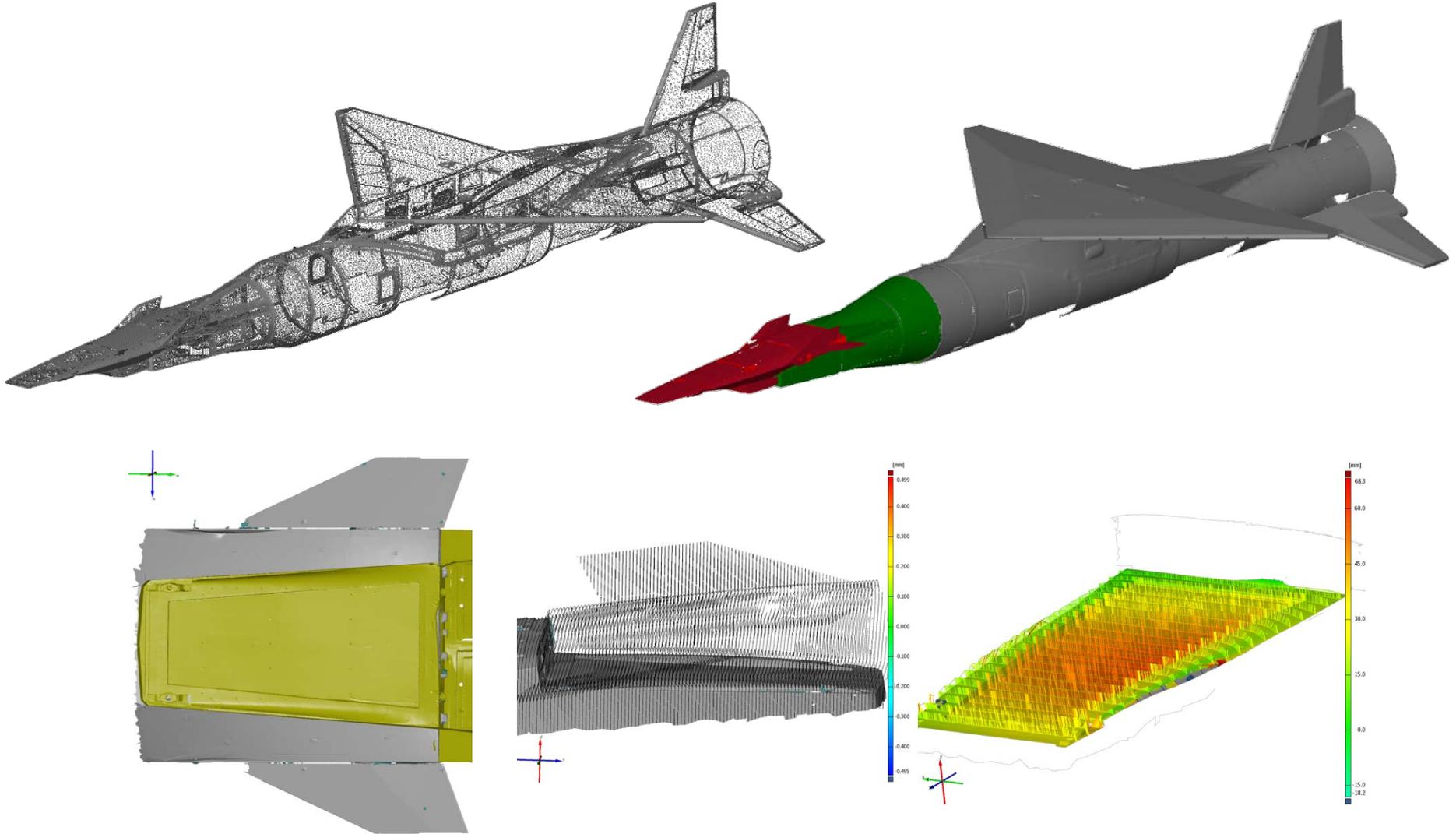
ATOS – Aircraft Door Scan



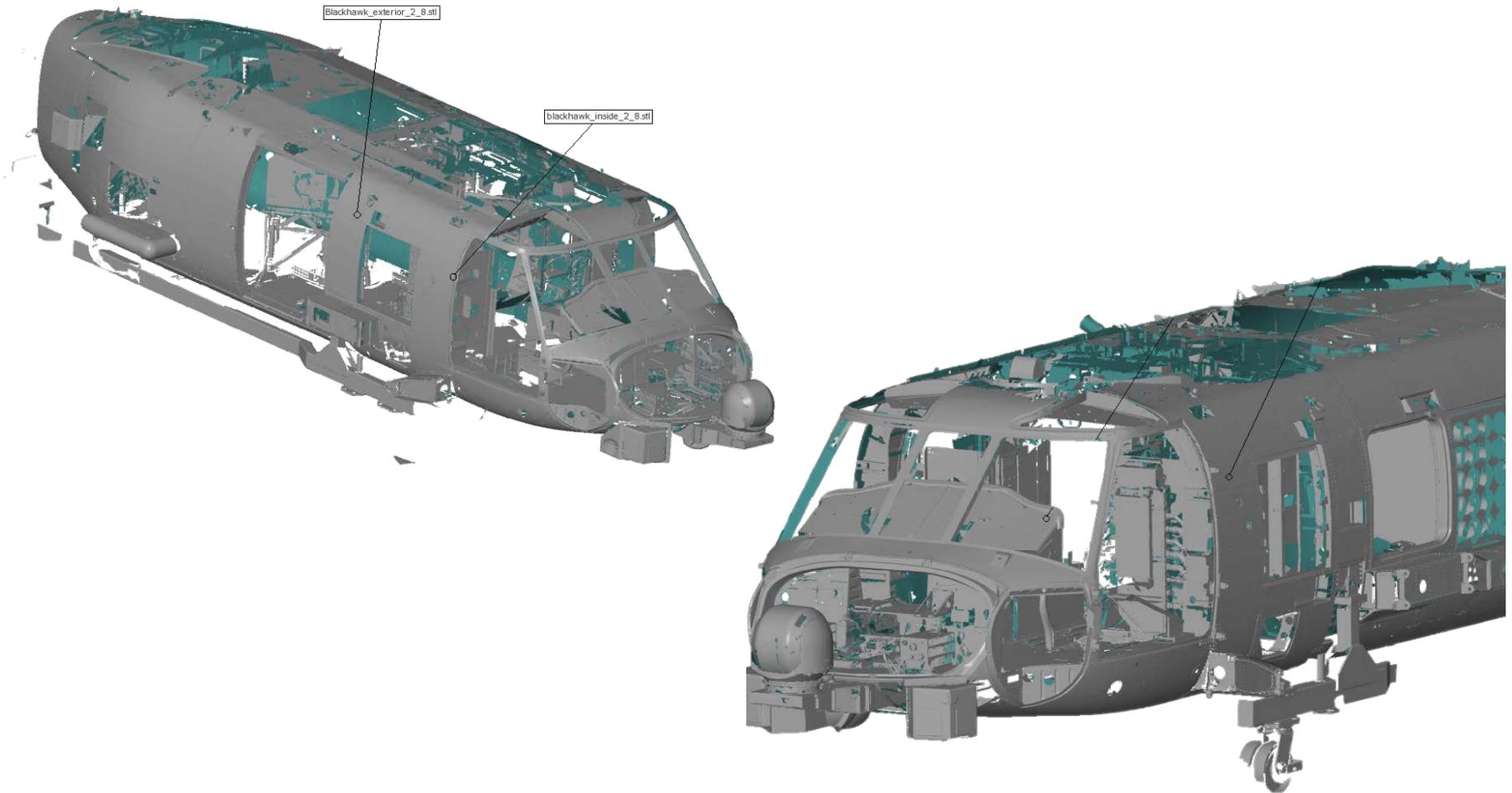
ATOS – Aerospace X43 Hyperstack Analysis



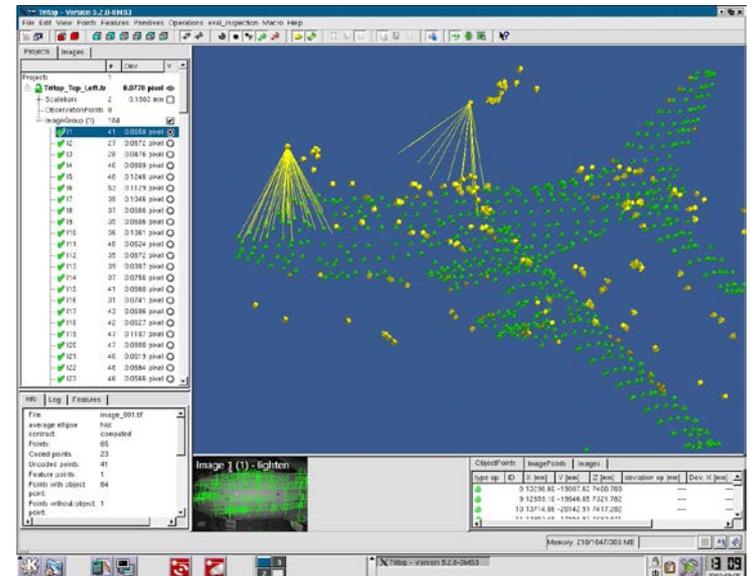
ATOS – Aerospace X43 Hyperstack Analysis



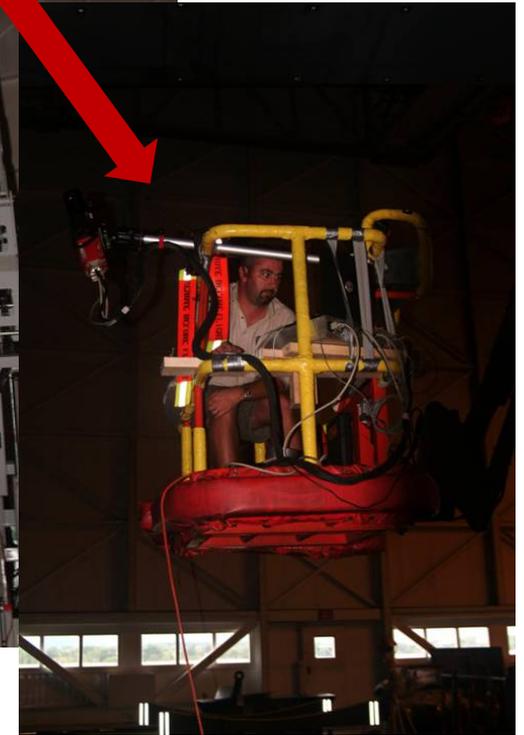
ATOS – Fuselage Exterior Scan for Analysis



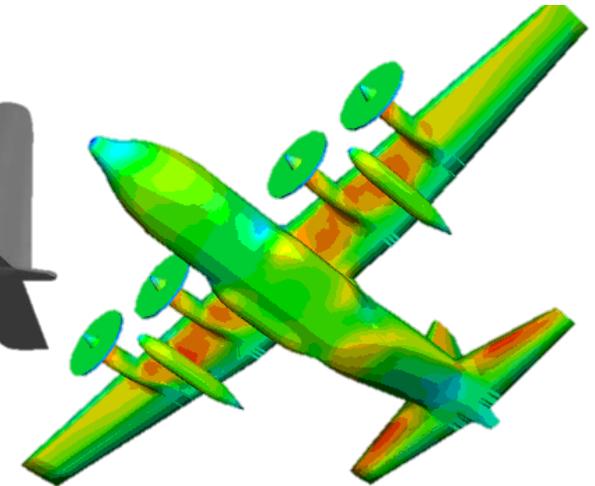
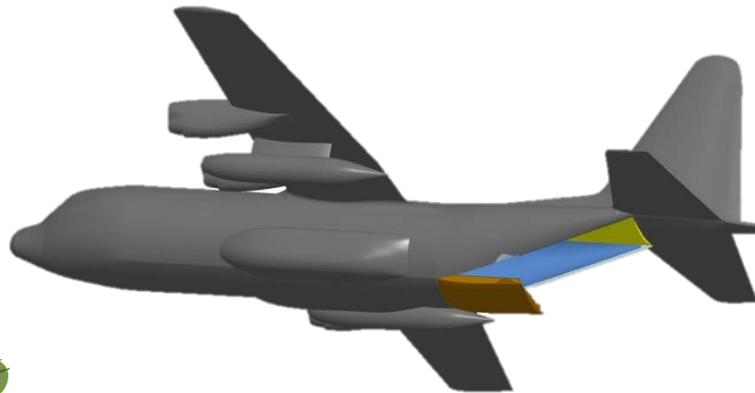
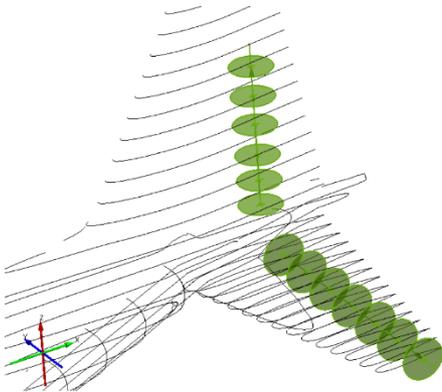
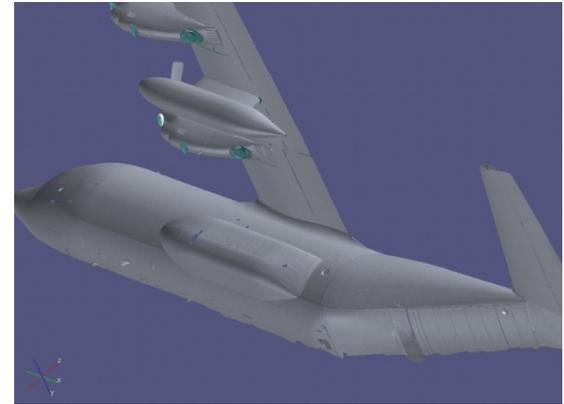
ATOS – NRC C130 Reverse Engineering Analysis



ATOS – NRC C130 Reverse Engineering Analysis

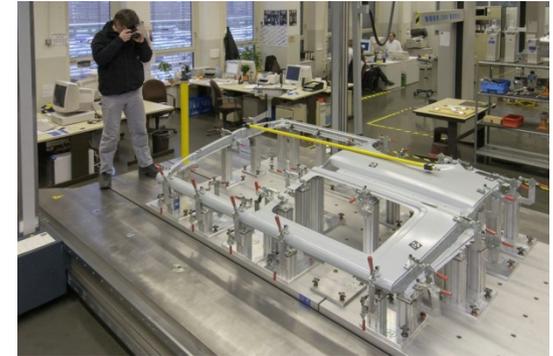


ATOS – NRC C130 Reverse Engineering Analysis



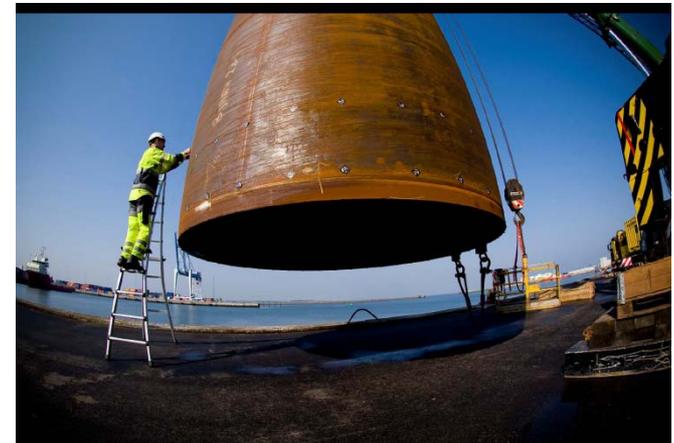
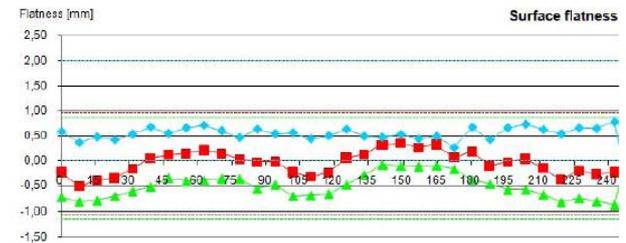
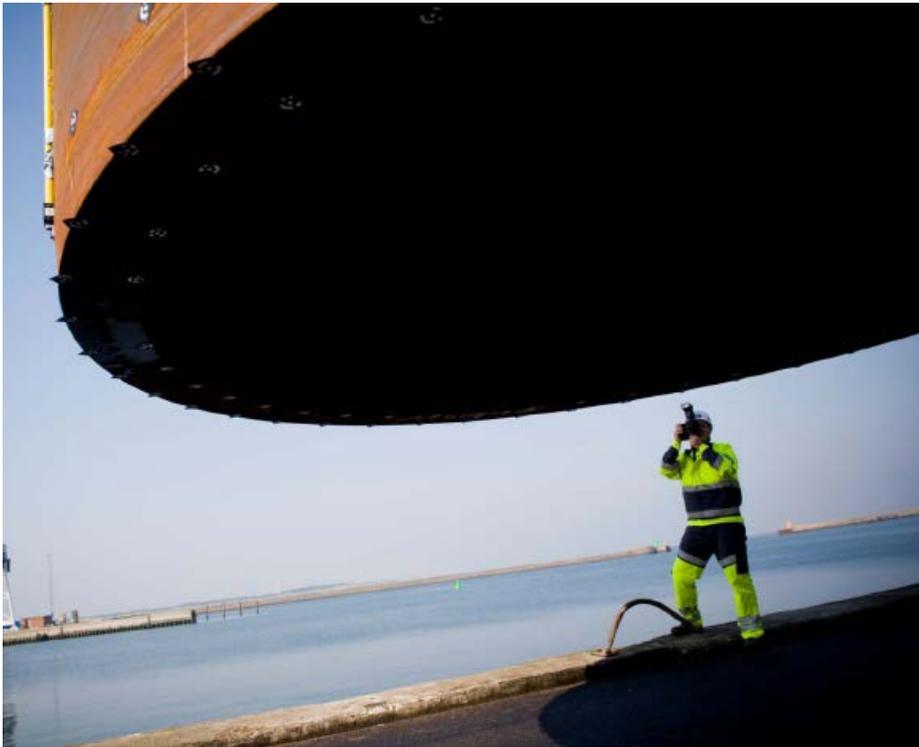
TRITOP Digital Photogrammetry

- Non-contact wireless digital photogrammetry system
- Can be used in conjunction with ATOS, or as a stand-alone coordinate measuring system
- High accuracy especially for larger objects
- Independent of environment conditions



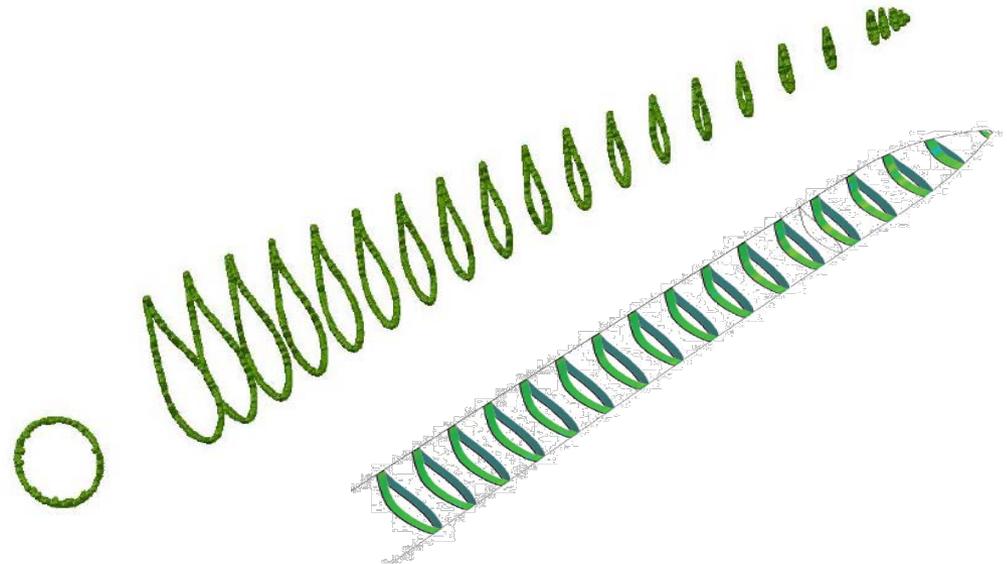
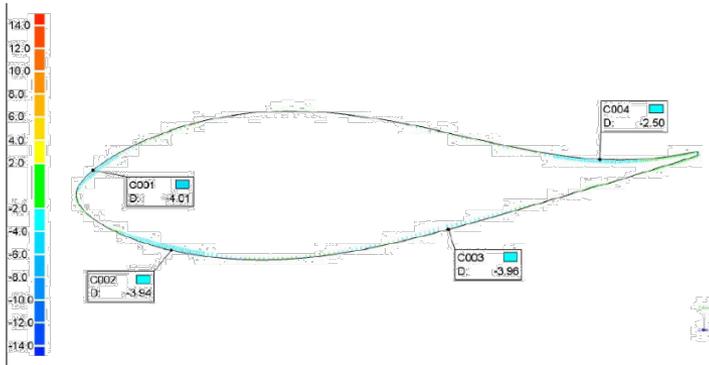
TRITOP Digital Photogrammetry – Large Scale Metrology

- One man
- Two flanges
- Inspection of flatness and tilt
- 50 Minutes

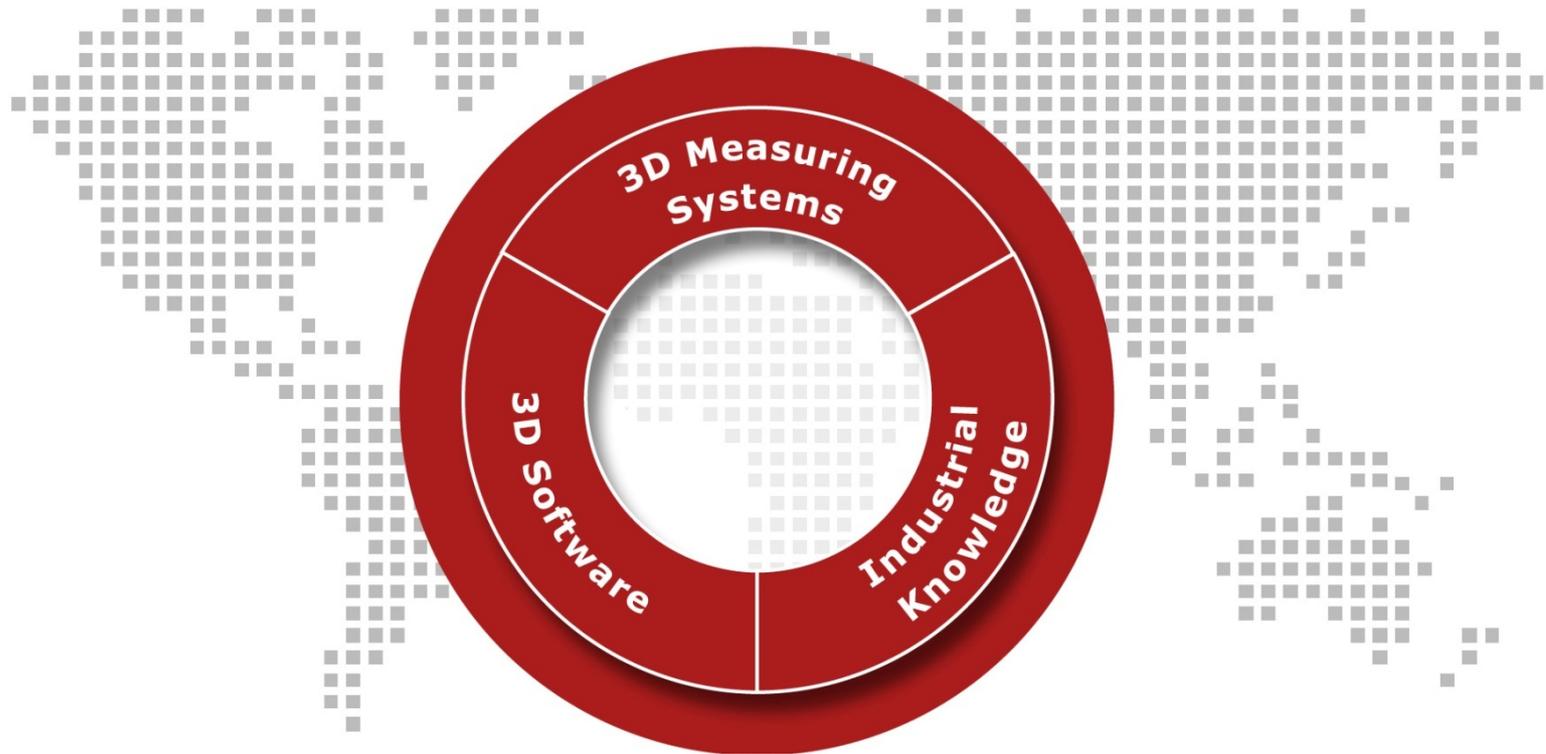


TRITOP Digital Photogrammetry – Large Scale Metrology

- Two men
- Three blades
- Inspection of blades – section analysis
- Four days



Single Source Provider



- **Everything from **one** source (complete 3D metrology solution)** – advanced hardware, intelligent software, technical services, comprehensive training, professional support, maintenance, and automated solutions.

Capture 3D Success



- Commitment to our customer's success
- Industry experience and problem solving skills
- Advanced technology and intelligent software
- Metrology and Automation focus
- Product and process knowledge
- Customer support

V8 Release – Emerging metrology technology

Exciting developments and new features

- **Rapid post-processing of scan data**
- **Enhanced inspection functions** - Local Coordinate System and dimensions, 6 degrees of freedom (DOF), enhanced GD&T, introduction of Timeline for multi-part Trend comparison, industry specific inspection features, new templates, styles, skins, and more.
- **New "Live" software module** for optical part tracking for positioning, back projection of features onto the part's surface for machining and welding, Touch Probe measurements, deformation tracking analysis and more.
- **Updated VMR (Virtual Measuring Room) automation module** including automatic sensor positioning, path optimization, reflection detection, and more.



Capture 3D Innovation Users Conference 2014

View the entire program at www.c3dinnovate.com.



REGISTER NOW
10.14.14

Manufacturing progression starts here.

Innovation2014

Forward thinking 3D metrology for quantifiable process improvement
Guest Speakers | Conference | Courses | 3D Solutions Expo
October 14-16, 2014, Hilton, Costa Mesa, California, USA

A 3D rendering of a crowd of white human figures, with one red figure in the foreground carrying a red briefcase, walking along a checkered path. The scene is set on a grey surface with a black and white checkered line running diagonally from the bottom right towards the center. The red figure is in the foreground, walking towards the right, carrying a red briefcase. The white figures are in the background, following the same path. The overall scene suggests a metaphor for leadership or standing out from the crowd.

Thank you!

"Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it."