

Aerospace Fact Sheet

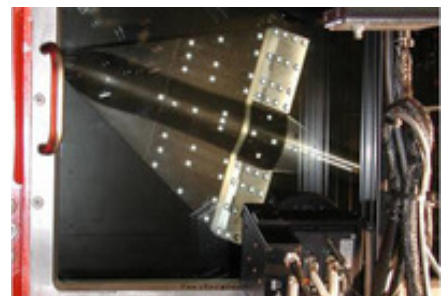
GOM systems support the aerospace industry and their suppliers by providing precise part geometry and material characteristics. These data are precise input for FE simulation and CFD analysis, for simulation verification with real measurements in wind tunnels and climate chambers, as well as for reverse engineering and turbine quality control.

Scan-Xpress supports the aerospace industry sectors such as aero structure, fuselage and cabin and propulsion through solutions support in reverse engineering, quality control, material and component testing. Time-effective data acquisition results in cost-effective, fast and easy integration into downstream processing requirements.

- **Aero Structure**

Wind Tunnel Testing

3D scanning verifies the "as built" vs. "as designed" shape of scale models in wind tunnel testing to ensure that scaling does not cause deviations. In addition, GOM's PONTOS high-speed deformation measurement system analyses vibrations and deflections caused by wind load in the wind tunnel online and in real time. This makes it possible to analyse wing behaviour at specific speeds and in different flight manoeuvres.



Reverse Engineering

Internal and external 3D aircraft scanning supplies 3D CAD information which accurately reflects the current state of build of the airframe and ancillary equipment. The dense point cloud data represents a solid base for CAD modelling, thus allowing reliable planning of aircraft design and electronics.



Digital Assembly

Acquisition of "as built" data and reverse engineering play key roles as links between the physical and digital model environments. Full aero surfaces are vital for scale-model wind tunnel testing, CFD model creation, symmetry checks and finite element methods to ensure that computer simulations are valid.



Measuring the entire aircraft within one coordinate system also supports digital assembly, and capturing various positions of the movable control surfaces is essential to performing motion studies. Time-effective data acquisition results in cost-effective, fast and easy integration into downstream processing requirements.

- **Fuselage & Cabin**

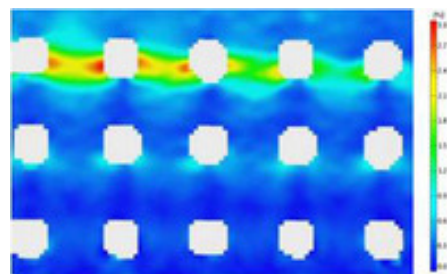
CFD Analysis & CAD Comparison

Computer simulations are used to optimize aircraft design during the development phase. GOM's ATOS 3D digitizer supplies dense and precise polygon mesh representations of an aircraft's "as built" condition to obtain a realistic matching CFD analysis. The 3D data is also valuable for symmetry checks and for detecting damage to working prototypes, caused for example by hard landings.



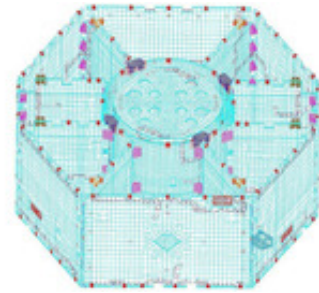
Material, Jointing & Component Testing

Optical metrology analyses the mechanical properties and behaviour of materials, joints and components. GOM's ARAMIS and PONTOS sensors can be integrated into existing test environments, test stands and testing machines. The non-contact sensors measure full-field 3D strain and deformation of soft and rigid materials under mechanical or thermal load. Thus conventional extensometers and strain gauges can now be replaced by GOM's real-time 3D surface deformation analysis.



FEM Deformation Verification

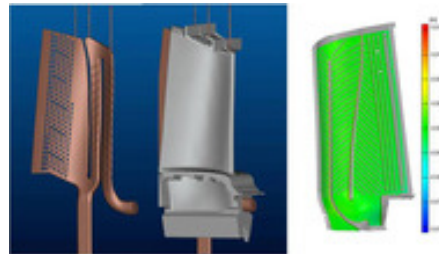
GOM's deformation measurement systems are widely used throughout the aerospace industry to measure and verify deformations in lightweight structures during operation. The systems are easy to integrate into test environments such as climate chambers, wind tunnels, fatigue test stands, etc. In addition, GOM software supports numerical result verification of the captured full-field 3D data.



- **Propulsion**

Efficient quality control for turbine blade manufacturing

Manufacturers and suppliers use optical measurement technology to accelerate production start-up time long before first sample testing actually takes place. What's more, GOM systems provide a full range of control functions during the production process.



- Inspection of ceramic cores
- Inspection of wax models
- Analysis of shrinkage and warp
- Optimization of injection moulds/processes
- Control of cooling tunnel systems (EMP)
- Shape and dimension analysis of cast and forged components

Housings & Components

GOM systems can be used to measure anything from very small turbine blades up to turbine housings and large aggregates, as well as voluminous components for digital mock-ups. Air inlet rings and combustion chambers for assembly control are also easily measured (ATOS 3D Digitizer, TRITOP^{CMM}).



Repair & Maintenance

Maintenance and repairs are enormous cost factors throughout the entire product cycle.

In addition to wear and tear analyses, GOM optical measurement technology supports the planning and control of repair jobs (ATOS 3D Digitizer).

- Digital coordinate measurement of damaged/prepared surfaces
- Verification of material deposition
- Inspection of repair work



Dynamic Deformation Measurement

Dynamic deformation measurement visualizes the behaviour of aerodynamic structures in real use. During running operations, for example, vibration, acceleration, deformation and imbalance can be analysed (PONTOS Dynamic 3D Analysis).

