

# Case Study: GHandI Project

## Advancing Geometry Handling and Integration

### GHandI Project Partners

**Airbus Operations Ltd**

**Aircraft Research Association Ltd**

**Altran UK Ltd**

**BAE Systems plc**

**International TechneGroup Ltd**

**MBDA UK Ltd**

**Rolls-Royce plc**

The ATI funded collaborative R&D project involved key organizations in the UK aerodynamics community, manufacturers, aerodynamic modeling and technology providers, and members of academia. GHandI is one of several UK government initiatives established to tackle the fundamental building blocks for next generation simulation tools in the aircraft industry.

ITI's CADfix team worked with GHandI program partners to develop new capabilities for extracting information from geometry from various sources, including CAD, for use elsewhere in the aerodynamic simulation process.

### About ITI & CAD Interop

ITI & CAD Interop are providing reliable interoperability, validation and migration solutions for product data and related systems. Our customers recognize the value in having a trusted solution partner that provides more than just software. CAD Interop solves complex product data interoperability problems so that the world's leading manufacturers can focus on making great products. You need to keep your engineering initiatives moving forward.

**Maximize technology.  
Drive program success.**

*Create Momentum* >

## CADfix innovations support the next generation simulation tools for aircraft performance

### GHandI - a 3 year UK R&D initiative

The Geometry Handling and Integration (GHandI) project is one of seven major collaborative research and development projects intended to enhance capabilities to support innovation in aerospace technology. GHandI was specifically aimed at improving the methods and processes for generating and manipulating high fidelity aircraft and turbo machinery component geometries and their associated computational meshes.

This initiative explored alternatives for CAD processing for a wide range of geometric components, specifically to substantially reduce the time required to generate airframe geometry and meshes for high fidelity aerodynamic analysis.

### Key challenges

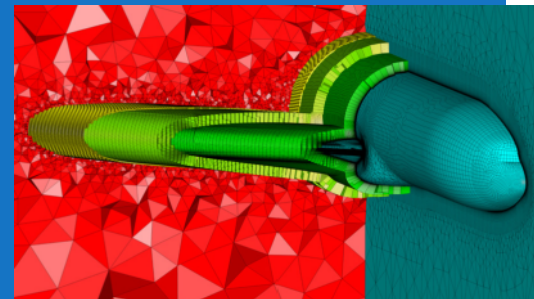
A key challenge in the aerospace industry is creating geometry for complex high quality mesh. This is often a costly, time-consuming and manual process. The GHandI project was established to address a range of complex geometry handling and integration challenges that are key to the UK's future competitiveness in aerodynamic design.

### CADfix contribution

Because the shape of an aircraft body is one of the most fundamental properties affecting the aerodynamic integrity, demands for improved performance and optimization of airframe shape via advanced simulation and analysis continue to increase. The need to explore and optimize the performance of novel airframe shapes rapidly and with robust, efficient processes is increasingly important.

### CADfix Benefits to GHandI

- Advances in the unique CADfix medial object technology
- Automatic partitioning of the air close to the aircraft skin into connected regions for structured meshing
- Creation of a framework for integrating best in class meshing technologies to orchestrate the creation of a high quality hybrid CFD mesh

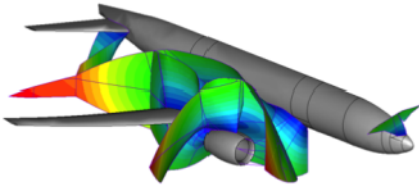


Traditionally creating the geometry for complex high quality Computational Fluid Dynamics (CFD) meshing is a costly, time-consuming and semi-manual process, often suffering from reliability and repeatability issues. The new CADfix capability enables the automatic generation of a high quality CFD mesh for the simulation of the airflow around the aircraft.

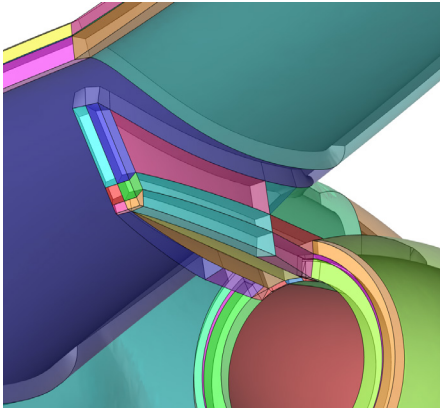


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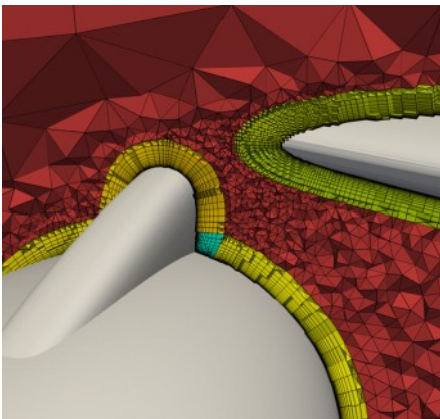
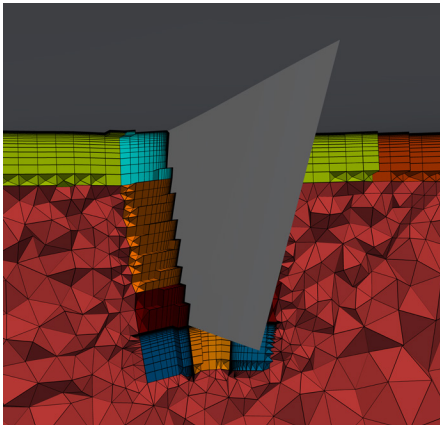
## Advancing Geometry Handling and Integration



CADfix Medial Object of the air volume



Automatically generated partitions



High quality hybrid mesh

### GHandI project achievements

The project successfully demonstrated that the CADfix technology is able to support the required geometry handling and the generation of high quality CFD mesh on typical aerospace geometries, concluding the proof of concept that the technology and long term vision for the next generation simulation tool is viable.

The project results have real applications for all GHandI participants, including improving geometry handling for internal airflow simulation in aero-engines, hypersonic simulation of missiles, and various military aircraft simulations.

### Advances in the unique CADfix Medial Object technology

Leading edge academic theory does not always work in the real world with complex production geometry, but GHandI was successful in the application of one academic theory using CADfix. The application of the Medial Object technology helped engineers get exacting intelligence and high-quality, robust information about the shape of the air around the aircraft. This is just one of several advanced geometry reasoning applications that are only possible with the CADfix Medial Object implementation.

### Automatic partitioning of air domain into connected blocks

The Medial Object technology enables engineers to essentially carve the air into a series of connected partitions to match the shape of the aircraft close to the skin, where the complex physics of the airflow needs to be simulated. The partitions are then filled with high-quality, densely defined mesh that will enable the simulation process to correctly and accurately predict the physical behavior around the aircraft.

### Creation of a high quality hybrid CFD mesh

The new capability enables the automatic generation of a high quality mesh for CFD simulation of the airflow around the aircraft skin. The highly customizable and flexible CADfix analysis framework supported the orchestration of mesh creation, integrating external components and different best-in-class meshing technology from other suppliers in order to optimize the resulting mesh quality.

*“Improving aerodynamic modelling techniques is becoming increasingly important. The results from the GHandI project and the advanced geometry handling and meshing technology developed give us the critical building blocks needed to innovate the next generation of aircraft.”*

- Robin Addison  
Project Leader, GHandI, MBDA UK Ltd.