BUSINESS ANALYTICS SERVICES

ON TIME INSIGHTS
FOR MAXIMUM ASSET UPTIME

LET'S TALK APPLICATIONS

AEROSPACE & DEFENCE

HCL Predictive Maintenance Analytics solution helps a world-class manufacturer of aircrafts predict component failure and optimize service management.

CLIENT BACKGROUND

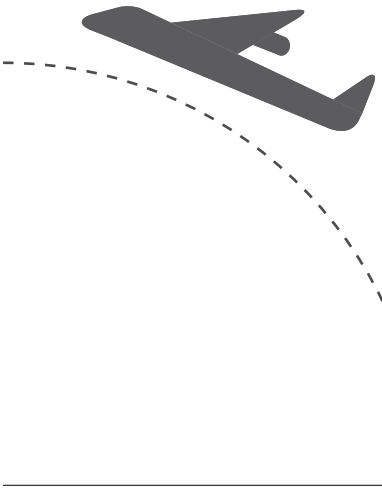
The client is a world-class manufacturer—designing, building and supporting safe, efficient and high performing aircrafts. They have operations in a wide range of countries, with design and manufacturing concentrated at a smaller number of plants. Safety and reliability are critical to their customers, and hence the client runs a large support network to respond rapidly to their service needs.

BUSINESS CHALLENGES

The sensors deployed on various on-board systems in an aircraft, produce a large data stream. It is used to generate alerts based on known thresholds and performance parameters. However, the analysis of the data stream is limited to a particular aircraft or even a part. This presents an opportunity to combine data sets from multiple sensors as well as integrate other data to create a more holistic view.

For example, data that will help in forecasting components likely to require maintenance assists so that that spares are available at the right location. Similarly, historical test flight data facilitates design refinements. To make use of these opportunities the client required well-managed data sets, tools to handle data large volumes, and processes to ensure that the analysis targets real value, in a controlled environment.

Currently, the client has a range of data sets and a few in-house analysis tools. However, they knew that there was more value to be gained from a broader use with the help of tools designed to handle larger data volumes and additional data types.



ENGAGEMENT MANDATES

Some of the engagement mandates were:

- The data was confidential or potentially commercially sensitive and hence had to be handled securely

- The tools should be designed for use by a range of roles, from aerospace engineers, production support personnel to the administrators of fleet operators
- The outcomes have to be clearly expressed and traceable back to the source, to ensure the correct understanding of complex systems
- The results have to be actionable

AREAS OF ENGAGEMENT

HCL was engaged to take data from its initial, relatively raw form through to the demonstration of actionable outcomes, covering:

Pre-Load Data Cleansing: The raw data was in a format designed for the sensor network, rather than for analysis. There was an initial data analysis and cleanse stage, to make it suitable for loading. There was also the need to perform Text analytics to understand certain parameters in order to link more than one data set together.

Data Load: The data was loaded into the SAP HANA platform to manage the volume and allow flexible access for interactive use.

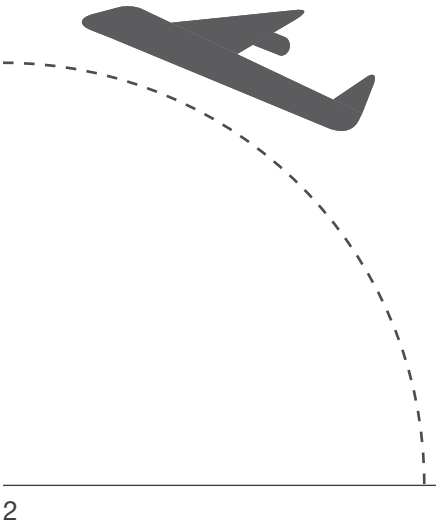
Further Data Cleansing: Analysis that is more flexible was possible, once data was uploaded to the SAP HANA platform. For example, sometimes it was necessary to assess certain components individually and at other times, it may be important to consider the entire aircraft.

Therefore, this stage involved a team capable of working with the technology and the client's engineers to understand domain specific issues and the details of sensor performance.

Business Data Layer: Raw sensor data will undergo the same interpretation for many different analyses. Therefore, a range of common calculations, described in common aerospace terminology was built into the HANA platform for reuse.

Statistical Analysis: The statistical tools built into HANA (such as integration with the statistical package 'R') were used to derive a range of previously invisible patterns in the data including time series analysis, to indicate the evolution of the system and component performance over time. This is a key step for forecasting the likely evolution of these components.

SAP Analysis Tools and InfiniteInsight: The SAP InfiniteInsight tool was used to derive data based models of the relationships between the parameters and to identify exceptional or clustered values as well as predict component failure. Lumira was used to deliver a user defined set of reports as well as allow users to perform their own analysis.



User Interface: A modern, web-based user interface that integrated results from multiple tools (Lumira, InfiniteInsight, HANA, and Visual Enterprise) was created to allow casual users to see the performance of the aircraft, either individually or across a fleet.

HCL DIFFERENCE

HCL collaborated with the client to deliver several key outcomes. The tools were broadly selected from the SAP product suite and HCL brought knowledge of these tools (such as SAP HANA), and more critically, the expertise to translate business and domain knowledge into executable solutions.

Similarly, we were able to take a broadly expressed business problem and

turn it into a set of focused (and role based) solutions. Although there was a single core system, different users saw the outcome as something tailored to their own business requirements.

The HCL solution was focused on designing a data loading procedure to handle complex data areas and drawing insights from the huge volume by utilizing powerful visualization tools embedded in HANA. In addition, it offered a customized predictive maintenance solution at the engine component level to reduce operational cost and engine downtime.

Moreover, the HCL solution provided operational benefits by improving communications within different data systems with quantitative models, including semi-structured (sensor readings, flight alerts) and unstructured data (textual maintenance records).

BUSINESS BENEFITS

This was the start of a business benefits roadmap, which is expected to deliver more outcomes and functionalities in the future. Some of the immediate benefits include:

- Re-use of historical flight data for further analysis, reducing the need for extra test flights
- Visibility of the scope of the available data
- Ability to compare data easily across flights and aircrafts
- Understanding of how the flying style and geographic usage of an aircraft can impact performance characteristics. (For example, jet engines perform differently in diverse ambient temperatures and the solution allows this at a granular level).

KEY SUCCESS FACTORS

The key success factors revolved around data, tools, and business requirements:

- **Data:** Understanding the data in the aerospace domain was essentially to distinguish statistically interesting features from those of real engineering insight
- **Tools:** The technology tools in use are very powerful, but without a good grasp on their use it is difficult to implement them in an easy to use way
- **Business requirements:** It is easy to become swamped by the data in a situation with this much data volume and complexity. It was important to remain focused on the valuable business outcomes, by understanding the business operation of the client