

# Turbomeca Reduces Typical Test Analysis Time for New Engines from 2 Months to 1 Week with nCode Automation

## Solution requirements:

- Efficiently handle large test data files
- Reduce time taken to analyze test data
- Improve consistency of analysis so that different tests are analyzed using the same methods

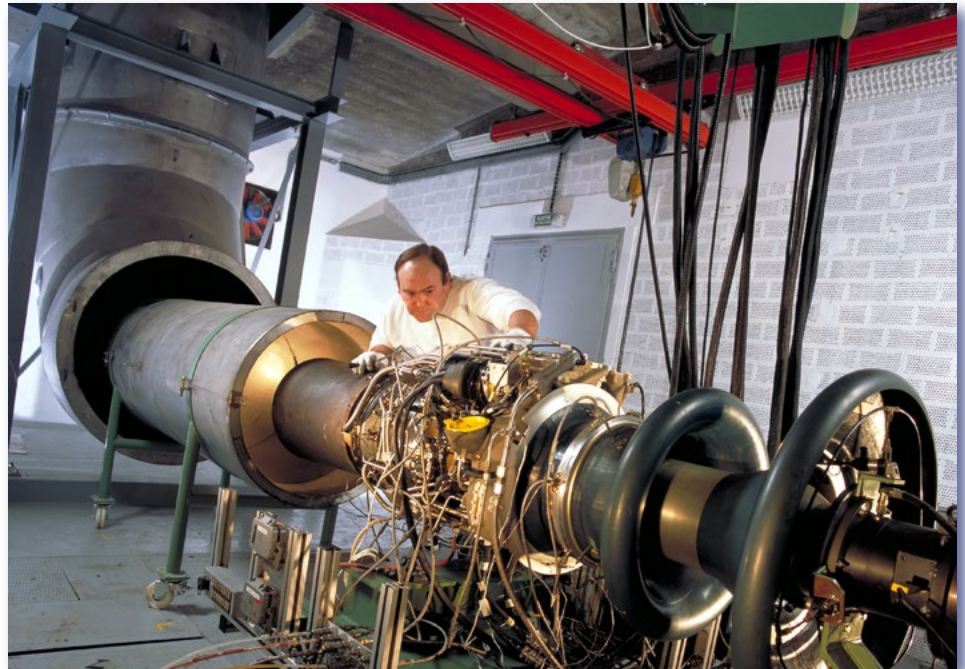
## Turbomeca

Turbomeca (Safran) designs, builds, markets and supports the most comprehensive range of low-to-medium-power gas turbines for helicopters. Extensive physical testing is required for the development of new engines, development of derivative engines and qualification of engines for new applications. In the past it took Turbomeca about two months using Microsoft Excel® spreadsheets to analyze test data for a typical new gas turbine engine program, consisting primarily of filtering, statistical analysis and reporting.

In an effort to improve data analysis efficiency, Turbomeca switched to nCode Automation which more efficiently manages the large data files involved in testing and provides a wide range of data analysis automation tools. Time to analyze data for the most recent new engine was reduced to from months to only one week. "The improvement that we have achieved in data analysis efficiency will make it possible to improve product performance and robustness by increasing the scope of data analysis without lengthening time to market," said Pierre Mialocq, Project Manager at Turbomeca.

## Critical role of testing

Considerable amounts of testing are involved in the development of a new helicopter gas turbine engine. For example, during altitude tests, engineers typically capture 400 channels of data from temperature, pressure, velocity sensors and accelerometers, generating a total of 5,000 different files. The first step in analyzing these files typically involves checking



*Engine inspection on helicopter engine test bench at Turbomeca.*

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for problems with the sensor or data acquisition system. When problems are found, they are then addressed by filtering the time history data. The next step is to perform a variety of different statistical analyses. These may include calculation of the maximum, minimum, mean, standard deviation, difference between channels, etc. In some cases time histories are converted to the frequency domain. Normally, the final step is to collect the most important information and format it as a series of tables so that engineers can quickly evaluate the results.

In the past, Turbomeca performed this analysis by using a mixture of manual and automated methods. The company developed Visual Basic for Applications (VBA) scripts to automate the analysis of the most important 10% of the files. The number of files that could be automated was limited by the long and difficult process required to produce the VBA code for relatively simple data analysis tasks. Additional problems arose from the fact that Excel® is not designed to deal with the very large files frequently produced in measurement applications, sometimes taking 5 minutes to open a large file. The majority of the data analysis process which was done manually took much longer and there were concerns about potential errors or

inconsistent results from different test engineers performing the data analysis their own way.

## Meeting the data automation challenge

"The number of tests that we perform and the size of data files are increasing at a rapid rate," Mialocq said. "Our test data analysis backlog increased to the point that unacceptable delays were incurred. We had deadlines on several critical projects that seemed almost impossible to meet. Physical testing is not only very expensive but also one of the most important parts of the development process. It was unacceptable to have to wait so long for testing results to be converted into actionable information."

Turbomeca made the decision to switch to nCode Automation with the goal of improving test data analysis efficiency and ensuring a repeatable process. nCode Automation is designed specifically for test data so it handles the complete process within a single environment and offers fast analysis of large data files associated with physical testing. nCode GlyphWorks works within nCode Automation to provide a wide range of data

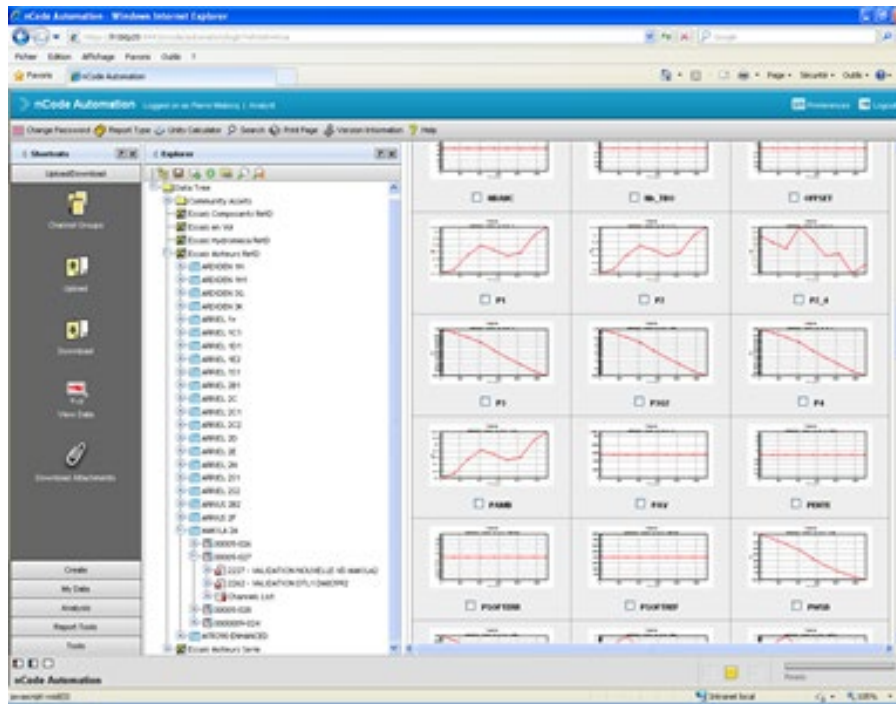
processing capabilities with specialized options such as fatigue analysis, accelerated testing, and rotating machinery analysis. Users can simply create an analysis process referred to as a 'flow' in GlyphWorks by dragging and dropping analysis building blocks. In addition to general signal processing, GlyphWorks provides fatigue analysis capabilities for measured data. Processes created in GlyphWorks can be locked down and distributed, improving the consistency and speed of analysis.

"The combination of GlyphWorks' graphical environment and its specialized test data analysis tools together with nCode Automation has simplified the process of automating the test data analysis process to the point that we are able to automate almost all of the different types of files that we typically analyze," said Mialocq. The number of different 'flows' that needed to be made were reduced by creating flexible flows that are able to handle many different tasks. For example, one flow analyzes all of the company's endurance tests by providing engineers with the option to either use a generic flow or to enter specific parameters that can be applied to the analysis process.



Steering and data acquisition from the bench control room.

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*nCode Automation enables departments, sites and project partners at Turbomeca to manage, share and analyze thousands of channels of measured data.*

## Speeding up test data analysis

The speed of Turbomeca's test data analysis process was substantially improved due to the flows created in GlyphWorks and its ability to handle large data files efficiently. Large files that once took five minutes to open now take only ten seconds to open and the typical time required to perform analysis with VBA scripts has been reduced by about two-thirds. Speed is also considerably greater in processes that were once performed manually, typical time required to perform analysis now takes one minute rather than one hour. Besides time savings, automating processes also provides assurance that the analysis is performed exactly the same way every time so that data from different tests or projects can be compared with each other with confidence knowing that each file was analyzed using exactly the same methods.

The result is that the product development process has been significantly improved. "Test data analysis can now be performed faster and more efficiently," Mialocq said. "We can analyze more tests and larger data sets in a fraction of the time that was required in the past - this helps us in several different ways. Because

test data analysis was often a bottleneck in the past, we can now perform more tests and longer tests with a greater number of channels. The result is that we learn more about our proposed design and so we now have the potential to make significant improvements in performance. Increasing the volume of testing also provides greater confidence in our results which helps improve the robustness of our designs. Finally, increasing test data analysis efficiency also offers the potential of reducing time to market" Mialocq continued.

## Test data collaboration

Turbomeca will continue to implement nCode Automation as an environment for sharing test data and associated information throughout their organization. "In the past we stored data files on a shared drive which made it hard to find tests," Mialocq said. "I may have analyzed a test and six months later a colleague in the design department might run the same analysis again because he was not able to find my report. nCode Automation will make it easy to search for files and control who accesses or

makes changes to them. nCode Automation will also store all of our different flows to make them easier to find." Turbomeca is also planning to move to a different data acquisition system that will record directly in the nCode S3T format, eliminating the need for the translation from CSV to S3T which is currently the first step of nearly every data analysis flow.

"The excellent support provided by HBM-nCode has been an important factor in the success of this project," Mialocq concluded. "The technical expertise of their support team is outstanding, much better than other suppliers of data analysis software that we have dealt with in the past. nCode product support is also very responsive to our requests for technical service and in other areas such as adding needed features to their software. It's a very good relationship and the results have been very positive. The project of automating our test data analysis is very important and is having a major impact on our product development process. We are already seeing results in terms of improving the speed and quality of our process and we are expecting even greater results in the future."

## About Turbomeca (Safran)

Turbomeca (Safran) is the world's leading helicopter engine manufacturer and has produced 70,000 turbine engines since the company was founded. Turbomeca serves 2,500 customers in 155 countries. The company has 17 sites, 28 Certified Maintenance centers and 18 repair and overhaul centers around the world. Turbomeca turbines power civil, parapublic and defense helicopters for all the leading helicopter manufacturers. Microturbo, a subsidiary of Turbomeca, is the European leader in turbojet engines for missiles, drones and auxiliary power units.



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-Pierre Mialocq, Project Manager, Turbomeca

## About us

nCode products are provided by HBM, a world-wide technology and market leader, offering products and services across the entire measurement spectrum, from virtual to physical. Since 1982, nCode is the leading brand for durability and data analysis solutions. Its technologies help customers understand product performance, accelerate product development and improve design. The power and ease of use of HBM technologies is a direct result of its world-class development process, expertise and in-depth experience of a broad range of industries. nCode product development is ISO9001 certified. Product support is available through HBM-nCode offices in Europe, North America and Asia.

For more information, please visit our website at [www.hbm.com/ncode](http://www.hbm.com/ncode) or find 'hbmncode' on:

