IBM

For Lockheed Martin Aeronautics, F-22 fighter efficiency starts on the plant floor

"Some jobs were programmed in as little as a tenth of the estimated hours scheduled for conversion to the Henri Line machine."

– Mike Lally, Manager, Manufacturing Engineering, Lockheed

Highlights

■ *The mission is to develop and build the world's most advanced fighter jet, the F/A-22 Raptor, with greater accuracy, in less time and with greater cost efficiencies than ever before.*

■ *The tools of choice are CATIA® V5 computer-aided manufacturing tools and processes, including CATIA V5 for numerical control (NC).*

■ *With CATIA V5 NC, parts programs developed for Lockheed's gantry machines were converted to run the company's new Henri Line high-speed router in as little as 10 percent of the time estimated by the company. Most design times were reduced 66 percent.*

The technological advantage

The new F/A-22 Raptor, under construction by Lockheed Martin Aeronautics for the US Air Force, is easily one of the most advanced fighter jets ever designed. By every measure, the Raptor represents extraordinary technological and engineering breakthroughs in maneuverability, stealth and sensor fusion – a wealth of characteristics that define a new era in fighter capabilities.

To achieve these breakthroughs, the manufacturing engineering personnel at Lockheed Martin have implemented advanced, three-dimensional, model-based numerical control automation using the latest CATIA V5 engineering software from IBM Product Lifecycle Management and Dassault Systemes. The solution provides greater cost efficiency and accuracy for the $43 billion contract to build 300 of the US Air Force's F/A-22 fighter jets.

The solution

The NC programming team at Lockheed Martin is making innovative use of the latest CATIA V5 computer-aided manufacturing tools and processes. A team of NC programmers began to explore its new functionality through a pilot project, seeking to verify it supports sufficient multi-axis capabilities to address Lockheed Martin's critical-tolerance composite panel trim and light-milling applications.

One key move to speed construction of the plane was Lockheed's acquisition of a Henri Line high-speed router to make parts previously run on the company's large gantry machines. The gantry machines would be re-tasked to focus on other metallic part orders for Lockheed Martin's continued F-16 business. A critical question was whether the NC programs created for the gantry machines in CATIA V4 could be converted to V5 and revised to drive the new Henri Line in time to meet the aggressive schedule of the F/A-22.

CATIA

Easy V4 to V5 conversion

With support from the Lockheed Martin manufacturing department, the company's Computer Aided Design (CAD) Development Advanced NC Methods team, working with representatives of IBM and Dassault Systemes, began to develop new CATIA V5-based machine control programs based on the existing CATIA V4 models.

"Once the NC programmers adjusted to the new CATIA V5 interface and learned how to utilise V5's knowledge capture and reuse capabilities, most programs were converted in half to two-thirds the estimated hours," said Mike Lally, Manager of Manufacturing Engineering for Lockheed. "But some jobs were programmed in as little as a tenth of the estimated hours scheduled for conversion to the Henri Line machine."

Capture and re-use of proven know-how

CATIA V5 allows true integration of people, tools, methodologies and resources within the enterprise. Its unique Product/ Process/Resource hub enables a collaborative environment for creating, sharing and communicating 3D product and process definitions. Advanced machine function allows programmers to easily define NC programs for machining complex 3D aerospace parts in a single workbench, including virtual machining technologies from 2.5-axis to 5-axis.

The new CATIA products also offer a high level of automation and standardisation for capturing and reusing proven manufacturing know-how. New features include: tool path verification via material removal simulation and analysis, and associativity with CATIA-created design parts from a single set of data for efficient change management.
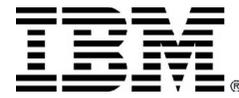
Leading-edge tech for a cutting-edge jet

Lockheed Martin recently upgraded to CATIA V5 Release 10 for the latest NC and 5-axis machining modules. These give Lockheed's manufacturing engineers additional functionality for metallic structural aerospace components.

The F/A-22 Raptor is built by Lockheed Martin in partnership with Boeing, powered by Pratt & Whitney engines and includes parts and subsystems from approximately 1,200 suppliers from 46 states. The Raptor will replace the F-15 Eagle as America's premier fighter jet starting in 2005.

The Raptor has unprecedented fighter and attack capabilities, balancing stealth, supercruise speed and extreme agility. It features advanced integrated avionics and a pilot-friendly cockpit. These attributes make the Raptor truly transformational – a truly remarkable aircraft built with truly remarkable CATIA V5 computer-aided manufacturing tools and processes.

For more information

Contact your IBM Marketing Representative, IBM Business Partner or visit the IBM PLM Web site at: **ibm.com**/solutions/plm

e business solutions