F-35 Integral Bladed Rotors Machining Transition

Title of SBIR/STTR Topic:
IBR Machining Transition

Contract Number:
FA8650-08-C-5321

Company Name:
Third Wave Systems

Company Location:
Minneapolis, MN USA

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JPO Associated IPT:
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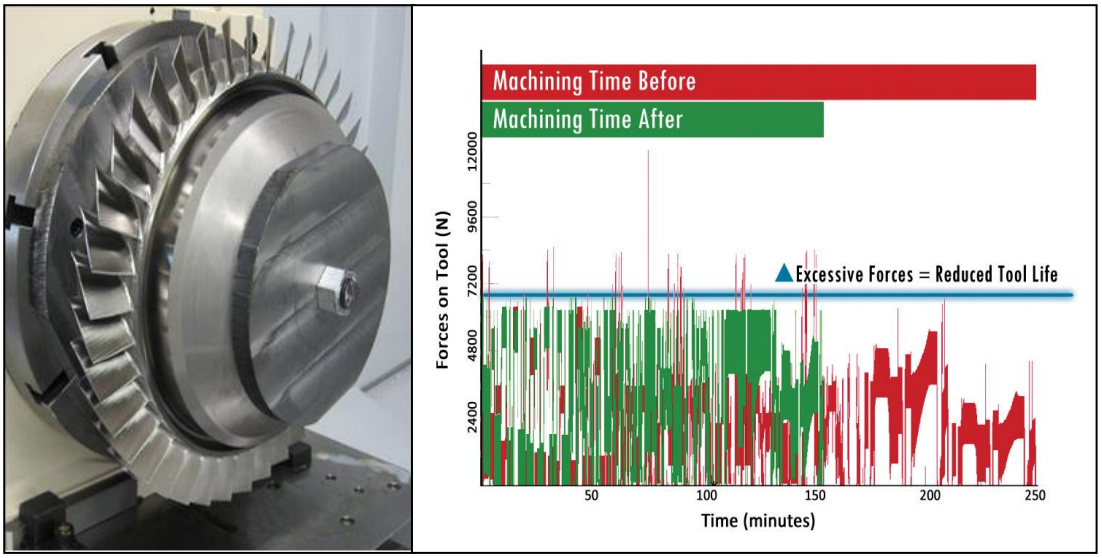


IBR machined at Third Wave Systems for validation using Production Module.

Low Cost Fabrication of Integral Bladed Rotors (IBR)

Third Wave Systems products, AdvantEdge and Production Module, model machining of metal with a physics-based approach that gives users the opportunity to lower cycle time and recurring costs while improving part quality. Third Wave Systems (TWS) SBIR program developed and demonstrated 25-50 percent cycle time reductions on jet engine components, including Integral Bladed Rotors (IBRs) and cases, made of titanium and nickel alloys.

AdvantEdge and Production Module were able to analyze components that had both milling and turning machining operations and allowed manufacturing engineers to improve processes off-line, eliminating the need for expensive trial-and-error testing.

The affordability AdvantEdge and Production Module deliver was demonstrated successfully by several aerospace engine suppliers. Third Wave Systems software products have impacted the warfighter by affordably delivering 20 percent improvements in machining time for turned parts and 35 percent for milling, all while increasing tool life.

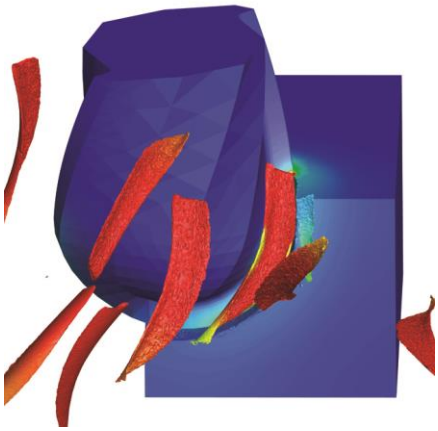
Since the start of the SBIR project, Third Wave Systems has since increased commercial revenues, hired more than 25 new employees and expanded internal Research and Development.

F-35 Requirement:

F-35 engine manufacturing has been faced with high costs and cycle times, threatening the delivery schedule for F135 engines. Third Wave Systems software products reduced machining cycle times by predicting and managing forces and heat during machining through the judicious selection of process parameters. This affordability activity was demonstrated successfully by several manufacturing suppliers.

About the Technology:

Third Wave Systems used its existing software as the technology platform. The software was expanded it to model nickel and titanium alloys relevant for jet engine manufacturing. TWS modeled detailed-level tool-workpiece machining and completed machine testing to validate the model outputs. The model allowed toolpath-level analysis and provided engineers the ability to model CNC machining operations on full part programs. Engineers are able to predict and optimize high forces and temperatures during machining and control them through feed and speed selection.



AdvantEdge simulation.

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F-35 Impact:

Third Wave Systems software products have impacted the warfighter by affordably delivering 20 percent improvements in machining time for turned parts and 35 percent for milling, all while increasing tool life.

More than 50 aerospace suppliers for F-35 and F135, as well as the primary suppliers, are using Production Module and/or AdvantEdge for affordability, quality and delivery on machined metal components. Similar capabilities are currently in development for Ceramic Matrix Composites (CMC) and Organic Matrix Composites (OMC).

Company Impact:

Since receiving the SBIR award, Third Wave Systems has expanded and grown significantly. Commercial company revenues have increased by about 5-times prior to the project. Additionally, TWS expanded its staff from 10 employees to nearly 40 employees and has increased internal Research and Development by 5-times. This project has enabled Third Wave Systems the opportunity to deploy itself into new technology to continue to provide the manufacturing industry with cutting edge solutions.

Delivering the F-35 to the Warfighter

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