Bell and Ingersoll Machine Tools, Inc. produce main rotor blade 3D Printed Trim Tool on Ingersoll MasterPrint™ the largest 3D printer in the world

A collaborative effort completed to successfully manufacture 22-foot-long vacuum trim tool for production of **main rotor blade components.**

ROCKFORD, IL March 1, 2021

Ingersoll Machine Tools, Inc. and Bell Textron Inc., a Textron Inc. (NYSE: TXT) company, have announced that they have completed a collaborative effort utilizing a large format 3D Printer to successfully manufacture 22-foot-long vacuum trim tool for production of **main rotor blade components**.

The effort utilized Ingersoll's hybrid large format **MasterPrint™** gantry type 3D printer and 5-axis milling machine housed at Ingersoll's headquarters facility in Rockford, IL.

"We are continuously testing and advancing **MasterPrint™** in our Development Center" said Chip Storie, CEO at Ingersoll "Among Ingersoll's short-term objectives is for MasterPrint™ to 3D-print molds for aerospace that preserve the geometrical properties and tolerances, vacuum integrity and autoclave resilience normally obtained with traditional technology, but with the cost and time reduction only additive manufacturing can offer. The relentless progress our MasterPrint process has made in 2020 has finally made this target attainable".

This production tooling effort 3D printed 1,150 pounds of ABS material with 20% chopped carbon fiber fill. The printing process was completed as a single part in a continuous 75-hour operation. After printing, the mold surfaces and tooling location features were machined to finished dimensions by exchanging the print module for the 5-Axis milling head which is changeable on the *MasterPrint™* machine. The machining was completed in one week and the final part achieved full vacuum tightness. The Ingersoll machine utilizes the Siemens 840D CNC control system for controlling both the machining and the 3D printing.

Critical time savings was achieved through the 3D print fabrication and efficient **5-axis machining** operations. The additive and subtractive manufacturing processes were seamlessly co-engineered in the native CAD software format. The traditional build cycle for a typical mold in aluminum such as this using standard methods is typically 4 to 5 months. This manufacturing process was completed in a matter of weeks.

"For many years Bell has utilized composite materials for manufacturing airframe components, including components produced on an Ingersoll Machine Tools Tape Layer machines. These similar materials are now being utilized for manufacturing the molds that form the airframe components**.**

Utilizing this rapid manufacturing equipment will allow Bell. to greatly accelerate our development of tooling for many applications within the Bell organization" said James Cordell, Sr. Manager, Process Stability, Bell.

Ingersoll Machine Tools, Inc. has played an important role in enabling breakthrough airframe production techniques for major aircraft designs around the world and we appreciate the opportunity to support Bell in building their future.

ABOUT INGERSOLL MACHINE TOOLS

Ingersoll Machine Tools Inc is a leader in advanced manufacturing processes and a global supplier of additive and subtractive machine tools for the aerospace, defense, energy and all heavy industrial sectors. The Ingersoll product lineup includes MasterMill™, PowerMill™ and SuperProfiler™ for accurate, reliable, high-speed milling and trimming of large, complex-geometry parts made of aluminum, titanium and hard metals; Mongoose™ and Mongoose Hybrid™, for the composite manufacturing of aircrafts', rockets' and vessels' structures; MasterPrint™, the largest existing thermoplastic 3D printer, capable to produce extra-large, hollow, parts in a single piece for the aerospace and the marine sectors. Ingersoll runs these very same machines at its Development Center to manufacture key-components for many aerospace and defense programs. Together with Innse-Berardi (Lombardy, Italy), Ingersoll is part of the Camozzi Machine Tools division of the Camozzi Group. With 40 subsidiaries in 75 countries, 2930 employees, 5 operating divisions and 25 production sites, the Camozzi Group is a global leader in the supply of components and systems for industrial automation and operates in other strategic sectors: Automation, Manufacturing, Digitalization and Textile Machinery.

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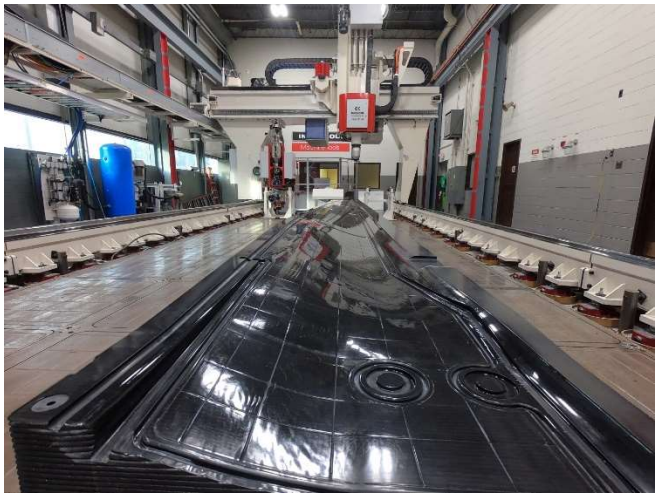
Tool during printing process.


Tooling feature locations being measured.


Tool as printed.


Tool surface after machining is complete, prior to sealing.


During Vacuum Testing


Finished Tool.


Finished machined and vacuum sealed tool.