(Image courtesy of BAE Systems.)

BAE Systems Reduces Costs and Lead Times for Prototyping, Aircraft Tooling and Part Production with FDM Additive Manufacturing

stratasys

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Greg Flanagan
Additive Manufacturing Operations Lead, BAE Systems Air

Case Study

BAE Systems' fourth Stratasys F900 3D printer will serve as an integral aspect of the company's Factory of the Future initiative.

Flying High

UK-based BAE Systems is a leading defense, security, and aerospace manufacturer, serving customers in over 40 countries. Among the company's business groups, BAE Systems Air supports client requirements across the whole life cycle of the air sector - from design, development and production, to provision of aircraft, training, support and maintenance.

The company has been using additive manufacturing over several years to support its "Factory of the Future" initiative, designed to leverage disruptive technologies and pave the way for future military aircraft production and maintenance operations. As a key pillar of this concept, BAE Systems has deployed four large-scale industrial-grade Stratasys F900™ 3D printers at its Samlesbury site to revolutionize manufacturing operations, the first being installed in 2014.

Supplied through Stratasys' local partner, Laser Lines, this battery of FDM®-based 3D printers runs around the clock and is used across aircraft ground equipment operations for a wide range of applications. These span space models and design verification prototypes, tools to support manufacturing, and final production parts.

"Our Factory of the Future program is all about driving the future of combat aircraft production with disruptive technologies. Stratasys FDM additive manufacturing plays an important role in this initiative, as it helps us meet our overall company objectives to reduce costs and time-to-market for new products," explained Greg Flanagan, Additive Manufacturing Operations Lead, BAE Systems Air.

"We installed our latest F900 3D printer towards the end of last year, mainly to bolster our capacity as we increase our use of FDM technology, but also because of the ongoing material advances that give us an advantage when it comes to tooling applications," he added.

Reduced Tooling
Lead Times and Costs

A key challenge for BAE Systems across its demonstrator programs or within future product development is the high non-recurring cost of aircraft tooling. However, according to Flanagan, the company found that FDM technology offers an opportunity to reduce those costs for new products. This is especially true with items such as drill tools, repair tools and other development tools that are often needed in small numbers.

"Stratasys FDM additive manufacturing allows us to transform many of our traditional manufacturing processes, resulting in reduced costs and faster time-to-market for new products," he said.

"Our F900 3D printers are delivering to our needs even when we're asleep in our beds, so we're witnessing some significant benefits," he added. "When using these machines across our operations, we're enjoying significantly reduced costs and lead times compared to those of traditional manufacturing methods."

The range of high-performance thermoplastics available on the F900 enables the company to replace traditionally manufactured – typically metal – tools with 3D printed alternatives. The company predominantly uses tough engineering plastics such as ASA and ABS, but is also exploring the use of carbon-fiber materials like FDM® Nylon 12CF to meet its tooling requirements.

Greg Flanagan, pictured with a 3D printed Typhoon cockpit floor cover, says that Stratasys FDM additive manufacturing helps BAE Systems meet its overall company objectives to reduce costs and time-to-market.

3D Printing Aircraft Ground Equipment Parts

Besides tooling, BAE Systems also employs additive manufacturing for final part production, such as customized aircraft ground equipment. Using robust thermoplastics, the team can replace traditionally manufactured equipment with lightweight 3D printed alternatives.

"A good example of our use of the F900s for production parts is the cockpit floor covers we manufacture for the Typhoon fighter aircraft," continued Flanagan. "Traditionally manufactured versions made from metal and wood are typically heavy. With our F900s, the thermoplastic covers can be made much faster and are a lot lighter and easier to move for the ground crew, so it improves efficiencies within the overall MRO process."

BAE Systems also 3D prints protective collars that cover and shield sharp probes and other exposed areas of an aircraft when on the ground. This is essential to avoid damage as well as protect ground crew while aircraft are static. The durable FDM material provides the strength needed for the protective covers, but also delivers a further important benefit: color.

BAE Systems is replacing traditionally manufactured applications with high-performance 3D printing thermoplastics, including durable ABS and ASA materials for aircraft ground equipment on the Typhoon fighter aircraft.

"Stratasys FDM technology not only enables us to rapidly manufacture customized ground equipment, but also to align the parts with our guidelines for 'remove before flight' components," said Flanagan. "Within aerospace these are colored red as standard, so it's an added bonus that we can produce parts directly in that color with the F900 3D printers."

This use of color also extends to the creation of models or mock-ups that represent different aspects of an aircraft that might be needed at the design stage, or issues that may need addressing. In this instance, better visualization is achieved if the team needs to build a sub-section or show the assembly sequence required.

BAE Systems also leverages additive manufacturing to prevent production hold ups due to supply chain issues. The team 3D prints 'space' models that serve as a temporary representation of the real part, should a particular piece of hardware be delayed. This short-term measure helps maintain production by avoiding work stoppages.

Speeding Into the Future

For Flanagan, the quadruple F900 installation is paving the way for more integrated uses of additive manufacturing technology in the future.

"We can take something from a model at the design stage to a physical part very quickly, and importantly provides a significant enabler to supporting our wider company objectives for improved efficiencies.

"Looking ahead, we're constantly exploring how we can adapt our processes to leverage this leap in technology. By proving additive manufacturing on existing platforms, we can provide the confidence within the organization that additive manufacturing should remain an increasingly fundamental part of our Factory of the Future concept," he concluded.

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