Boeing Begins Assembly Early on Joint Strike Fighter Forebody

Structural assembly of the first Boeing Joint Strike Fighter (JSF)concept demonstrator began a month ahead of schedule when the company loaded the first parts for the JSF forebody in a ceremony held here today.

Boeing is competing to build the JSF as an affordable replacement for several fighters currently operated by the U.S. Air Force, Navy, Marine Corps and the U.K. Royal Navy.

"This is another good example of the new Boeing applying its full resources and expertise from across the company to create a successful JSF," said Frank Statkus, Boeing vice president - general manager of JSF. "It reflects the level of efficiency and quality we are achieving by applying the leanest design and manufacturing processes this powerful new company has to offer."

The forward fuselage under assembly is for the first of two JSF concept demonstration aircraft, called X-32A and X-32B. Assembly began at a Boeing Phantom Works facility in St. Louis, where assembly mechanics placed three aluminum frames into a simple, low-cost assembly tool.

With these major structural components in place, equipment decks, subsystems and composite skins will be added over the next few months to complete the subassembly. Assembly of the second forward fuselage (or forebody) is expected to begin within the next several weeks.

Jerry Ennis, vice president of Advanced Manufacturing, Prototyping and Produce Processes in the Phantom Works, attributes the aggressive pace of forebody development and assembly to a number of advanced design and manufacturing techniques being used by the Boeing JSF team.

"Our forebody assembly is coming together so well because we used advanced 3-D modeling and simulation tools not only to design structures and tooling but also to define the entire assembly process," Ennis said. "With virtual reality and electronic assembly, we eliminated parts interferences long before we assembled the real parts - guaranteeing a perfect fit the first time. This capability has enabled us to check and refine our assembly process along with our parts."

The use of 3-D modeling and simulation has helped cut forebody design cycle time and cost in half and is expected to cut production cycle time by 25 percent, Ennis said. The tools allow design changes to be made very quickly across an entire assembly, and parts to be fabricated with first-time quality on numerically controlled machines.

The 3-D models for the aluminum frames, for example, were electronically sent to Boeing in Seattle, automatically translated into NC machine language, and used to mill perfect parts the first time -- saving the time and expense of producing tryout parts.

As part of its lean enterprise approach to JSF development, Boeing is using a variety of other advanced manufacturing and tooling techniques as well.

For instance, an automatic fiber placement machine is allowing Boeing to produce the large, complexly shaped, composite inlet duct of its JSF concept as a strong, light, one-piece structure in half the time and cost of using a traditional hand lay-up approach.

A unique tooling approach borrowed from commercial industry is saving time and cost in producing the composite skins for the forebody by allowing up to three differently shaped skins to be produced on one tool, rather than using a single tool for each shape.

And the holding fixture for forebody assembly was significantly cheaper to design, produce and assemble than a traditional jig because self-locating features designed into the structural components themselves provide for a fast, easy and accurate fit.

Final assembly of the X-32A and X-32B is scheduled to begin next year in Palmdale, Calif. The A model of the X-32 will demonstrate conventional takeoff and landing for the U.S. Air Force, and carrier approach flying qualities for the Navy; the B model will demonstrate short take-off/vertical landing for the U.S. Marine Corps and the U.K. Royal Navy.

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