What's Causing Huge Delays for the Boeing 787 Dreamliner?

Two years ago, Pat Russell, director of global supply at Vought Aircraft, made this comment about the bold global outsourcing program in place for the Dreamliner 787. "What Boeing is trying to do will really set the standard for how you reduce time to market, from design to implementation."

This summer Boeing announced it is buying the key Vought assembly plant in South Carolina in an effort to reel in that supply chain. Supply chain and design problems have contributed to a two-year delay — so far.

The Dreamliner roared on to the scene as one of the most revolutionary concepts ever — a composite-bodied aircraft that would dramatically change the economics of air travel. As if the engineering challenges weren't daunting enough, Boeing also made the decision to outsource 60 percent of the design and production — a move maybe just as radical as the aluminum-to-plastic switch for the fuselage and wings.

Boeing contracted with more than 50 suppliers, 28 of them outside the U.S. The airliner's wings were going from Nagoya, Japan to Everett, WA. Fuselage Section 43 was going from Nagoya, Japan to Charleston SC, to Everett, WA. Fuselage Section 46 went from Grottagli, Italy to Charleston, SC, to Everett, WA, and so on.

Initially, the move was lauded as visionary and brilliant. Investment costs in tooling and inventories were shifted upstream — seemingly reducing risk to Boeing. Vought, for example, invested in equipment needed to produce one-piece composite fuselages. Much of that technology has been developed on the fly, and the risk was huge, and the risk was Vought's.

(See Boeing 787 Dreamliner Represents Composites Revolution for a discussion of the tremendous technical leaps required in tooling and autoclaves.)

In the Dreamliner supply chain model, Boeing functions as the final assembler and integrator. Supply and logistics information needed to be synchronized across multiple partner tiers so key components arrived at the company's Everett, WA, facility at just the right time for final assembly over a three-day period.

It was a leap of faith. Design engineers at Tier One locations, such as Vought, did not

traditionally collaborate across multiple supply tiers to develop coordinated designs.

The bad news began to roll in early in the process, starting with the announcement that companies such as Alcoa could not supply fasteners quickly enough to meet early production demand. Plant capacities were slashed following the reduction in demand in 2003-2004, and had not ramped up to meet demand for an ambitious aircraft program.

Then the bad news just kept coming — delays at various plants around the world.

"In addition to oversight, you need insight into what's actually going on in those factories," says Scott Carson, who heads Boeing's Commercial Airplanes unit. "Had we had adequate insight, we could have helped our suppliers understand the challenges."

Virtual Model Failed

At times, those issues were design related. One example is the failure of wing joints on both sides of the plane to perform as predicted in virtual models meant to speed the development process, and allow for concurrent engineering.

"We do testing for a reason. And that's because models aren't perfect," says Scott Fancher, Boeing 787 program general manager.

Patrick Shanahan, vice president and general manager, Airplane Programs, Commercial Airplanes, adds, "We'll go back and look at where the model failed to predict this situation (wing stress). And (then) tune them up."

Teams of design engineers from Fuji, Mitsubishi and Boeing are working collaboratively to develop a fix, which involves18 small locations on each side of the airplane.

More recently, it was announced that Boeing's Italian subcontractor was told to halt production because of failures of composite skin on the fuselage. The fix requires a patch, adding yet a bit more weight to a design that is already much heavier than specifications promised to customers.

The electronic design backbone for the Dreamliner outsourced design team has been three levels of Dassault Systèmes software. The electronic commercial backbone has been Exostar. The 787 airplane was the first Boeing program to deploy the Exostar Supply Chain Management Solution, which uses E2open software to oversee the complete order life cycle and returns process, while also tracking planning schedules, consumption and

managing replenishment for the Boeing partner-managed Inventory program.

The Exostar program is designed to allow Boeing and its partners to collaborate on planning schedules, issuing purchase orders, tracking purchase order changes, exchanging shipping information, managing returns and managing inventory consumption across the multiple tiers involved in the manufacturing process. The system also monitors process exceptions that occur between partners providing notification and an evaluation of the potential impact against schedules.

Tim Opitz, director of 787 Production and Support Tools in Boeing Commercial Airplanes, commented early in the process. "By helping us proactively flag any business process exceptions as they occur among our network of partners, and providing a consolidated view of all material movements across the supply chain, the Exostar solution is expected to tighten our efficiency in the way airplanes are manufactured," he said.

It's not clear whether the overall breakdown of the Dreamliner design and manufacturing was a matter of communication, execution or something else.

Early in the Dreamliner development process, Boeing officials such as Opitz made considerable comments through interviews and presentations.

Today, it's a far different story.

Dreamliner spokesperson Lori Gunter declined to provide any officials for interviews to *Design News*, or to provide answers to any questions. "We're focused on other priorities right now," Gunter said. "We have answered these kinds of questions before and have nothing new to say on this front."