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Behind Boeing's 787 delays

Problems at one of the smallest suppliers in Dreamliner program causing ripple effect

By David Greising and Julie Johnsson | Tribune staff reporters
December 8, 2007

When Boeing Co. announced a costly, six-month delay in the first delivery of the world's fastest-selling airplane, the 787 Dreamliner, it singled out a shortage of bolts and screws as the chief cause of trouble.

But the Tribune has learned that the problems go deeper and are more difficult to solve. Boeing's 787 meltdown also stems from trouble with the daring global manufacturing network it put in place to make the plane, flying in sections of the plane from companies in Japan, Italy, South Carolina and Kansas and "snapping" them together in only three days' time, an audacious idea that promised to revolutionize the way airplanes are built.

Yet the impact of a little-known Texas company that fell months behind building tools needed to assemble the plane highlights how a hiccup can play havoc with Boeing's tight 787 timetable.

The company, Advanced Integration Technology, has fallen short supplying Vought Aircraft Industries, itself the Dreamliner's most troubled supplier. Dallas-based Vought has struggled to fabricate its fuselage sections to Boeing's standards, according to several Boeing suppliers contacted by the Tribune.

Because AIT plays a key role in connecting virtually the entire length of the 787's fuselage, the company's troubles are having a ripple effect, the suppliers say.

The delay of the 787, which has not yet flown, is costing Boeing and its suppliers billions of dollars in penalty payments and cash shortages and raising questions about whether Boeing can meet its revised delivery schedule.

Three major suppliers face a total cash shortfall of \$1.2 billion next year because their payments from Boeing have been delayed along with the initial 787 deliveries, according to a Tribune analysis of financial disclosures.

At least five of Boeing's largest partners say they have demanded to renegotiate their payment terms. Boeing itself expects to take a cash hit of \$2.5 billion in 2008 from paying penalties to antsy airline customers and keeping its suppliers afloat.

The trouble with the bolts and screws, known as fasteners, with AIT and with previously

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disclosed software source code. The daunting challenge, and the scant margin for error, Boeing took on with the 787.

The production problems appear so complex that suppliers and analysts think it is unlikely that Boeing can meet its plan to produce 40 of the new aircraft by the end of next year and 109 total planes by the close of 2009.

Even so, the company on Tuesday is expected to reassure analysts and reporters in a worldwide conference call that it is mending the 787's broken supply chain.

"We're doing what we need to support our partners at this crucial time, but we're not going to get into specific details," a Boeing spokeswoman said in an e-mail Friday.



A critical juncture



The troubles are a jarring turn for an airplane that stirred excitement, and sales topping \$100 billion, after Boeing launched the 787 Dreamliner program in 2004.

The Chicago-based aerospace giant is at a critical juncture, observers say. Boeing's airline customers have built their strategies around on-time deliveries of the new airplane.

Suppliers are facing cash-flow and logistical problems coping with endless tweaks in design and production, while for the first time bearing the cost of those changes, thanks to Boeing's new outsourcing strategy.

The cost of delays has Boeing's suppliers worried about "unk-unks," aerospace jargon for "unknown unknowns." They fret that the supply-chain problems will continue, that unexpected problems will arise during flight tests, and that Boeing's schedule will slip beyond the initial six-month delay.

Any further setbacks could unsettle confidence in Boeing's timetable and create a competitive opening for Airbus SAS, Boeing's European archrival.

Ultimately, Boeing's effort to grapple with the troubles could determine whether its broad vision for a global supply chain can work. Already bearing roughly half the 787's \$10 billion development cost, suppliers might balk on Boeing's next program if delays mount and red ink flows.

"It's proven a good business model for Boeing in the short term," said David Pritchard, aviation researcher at the University of Buffalo. But, he said, "If these risk-sharing

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partners took a financial hit on the 787, are they going to be willing to play the risk-sharing game again?"

The system can work. Last year, after research revealed that a lightning strike might short-circuit the 787's electrical systems, Boeing asked suppliers for design fixes. The solution came from GE Aviation, which is supplying the software that serves as a central nervous system of the 787.

To George Kiefer, head of GE Aviation's 787 program, the fix stood as an example of a supplier helping the entire program.

"It was better for the airplane that we did it within the common core system," said Kiefer.

But it's not just cost and decision-making that Boeing has pushed down the supply chain. Risk has flowed too. And in AIT, Boeing is finding that risks from even a small supplier can flood through the entire 787 program.

AIT serves as the "superintegrator" for Vought Aircraft, coordinating the efforts of many suppliers on Vought's factory floor, where Vought builds the rear fuselage section of the 787. AIT also builds equipment essential to the assembly of the fuselage.

In both capacities, say suppliers that have worked with Plano, Texas-based AIT, the company is struggling to fulfill its responsibilities to Vought.

Reaching out for help

The problems with AIT, which has only about \$500 million in annual sales, first became obvious outside of Vought in early 2006, when machine shops in the Puget Sound area of Washington began receiving frantic calls from AIT. The company's plant in Canada had tried to fabricate shape rings, giant hollow cylinders of carbon steel used to maintain the circular shape of the fuselage during assembly.

But AIT's Canadian machine shop could not keep the rings round.

"They were running around with fire in their eyes, looking to do something without a contract, without a purchase order, just anyone who could try to fix this for them," said the foreman for the machine shop that handled some of AIT's work. The company did not want to be identified.

"They told us, 'You can fudge here, you can fudge there.' They had us do all kinds of hocus pocus, and it still didn't fit."

Four months went by, and even as other major Boeing suppliers began production, the AIT cylinders still were traveling back and forth to the company's Canada shop. When the shape rings still did not fit, the Puget Sound company stopped accepting the work.

"It looked like a big, giant, multimillion-dollar disaster well on its way to happening," the foreman said. "AIT is putting Vought in a major bind."

The problem is significant because AIT's shape rings are used from the rear section of the airplane through the last section before the nose.

AIT's chief executive, Edward Chalupa, did not respond to e-mails and phone calls seeking comment.

...one is saying, 'hey, no problem,' said Tom Korman.

Much work to be done

Spirit says it will deliver only two completed nose sections to Boeing this year instead of the 8 to 10 sections it originally was supposed to build. This smaller workload, which Spirit says was done at Boeing's request, prompted Spirit to warn that its 2007 revenue would be about \$100 million lower than it had anticipated.

But if Boeing is to have dozens of planes completed by the end of next year, as its executives have said, the Kansas planemaker will have to ramp up production in a hurry. Spirit says it intends to ship 45 completed sections to Boeing in 2008.

"They've got a huge acceleration coming, presumably," said Paul Nisbet, an aerospace analyst with Rhode Island-based JSA Research. "It's taken them forever to do two."

Boeing has a huge acceleration ahead too. After spending more than six months assembling its first Dreamliner in 2007, it will have to churn out one plane a week by mid-2008, analysts say. That's presuming Boeing still intends to have completed 40 planes by the time the first Dreamliner is delivered, as Chief Financial Officer James Bell said in October.

All but a handful of those planes will be delivered in 2009, meaning that the cash strain for a supplier like Spirit could extend far beyond the initial six-month delay.

Like Boeing, Spirit stands to reap rich rewards from the plane -- eventually. But that payday seems far off now, as everyone involved with the new plane struggles to get its manufacturing back on track.

"It's a major leap in technology and design," Pritchard said of the 787. "Did they just underestimate it?"

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How Dreamliner delay hurts Boeing, suppliers

A six-month delay means Boeing's research-and-development spending increases by \$200 million and cash flow drops by \$2.5 billion. Some of Boeing's suppliers face up to \$1 billion impact.

SUPPLIER: DELAY-ASSOCIATED RISK

Spirit AeroSystems, Flight deck, forward fuselage, engine pylons: 2007 revenue drops \$200 million. \$750 million to \$1 billion** of working capital.*

Hamilton Sundstrand, Electrical power system: \$100 million from Boeing.*

Rockwell Collins, Cockpit displays: \$70 million to \$80 million from Boeing.* \$10 million in extra research and development.

Vought Aircraft Industries, Fuselage: Low on cash; had just \$40 million as of Sept. 30.

Goodrich, Brakes, lighting systems, sensors, cargo-handling system: Will not disclose how much of the \$3 million per plane it receives from Boeing is at risk.

Moog Inc, Flight-control actuators: Some cash payments from Boeing could be delayed, according to company.

Alenia Aeronautica, Fuselage sections: Minimal. It has received advances from Boeing.

* Includes impact of inventory, engineering costs, accounts receivable and accounts payable.

** Boeing payments withheld until 787 is certified, delivered to customers.

Sources: SEC filings, earnings calls

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