

## Boeing 777 Rises While 787 Falls

Written by Nick Sanders

Wednesday, 22 December 2010 08:20

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We've been struck by a barrage of recent news stories about Boeing's commercial aircraft. Unlike the usual one-dimensional "Boeing is evil" or "Boeing is All-American" stories, some of the recent ones were "think-pieces" that caused us to nod our heads in agreement.

Our interest in Boeing's supply chain and program management challenges is well-established, with published articles such as [this one](#) discussing "surprise production delays" to the 787 program, or [this one](#) discussing the 787 program's nightmarish supply chain management problems. We believe that lessons learned too late and too painfully by Boeing's commercial aircraft programs can be used to avoid similar problems on our clients' complex defense programs. So we thought we'd recap some of the recent news stories for your edification.

First, on December 20, 2010, Bloomberg [reported](#) that "Boeing plans to boost output of the 777 jet 66 percent by 2013" to more than 8 aircraft per month. Boeing had previously announced (in March 2010) that 2011 production rates would be increasing from 5 to 7 planes per month.

Bloomberg reported that—

The 777 is offered in a variety of configurations and seats more than 400. The average list price is about \$258.2 million. Boeing has delivered 907 of the 777 aircraft since it entered service in 1995 and has an order backlog of more than 260 planes.

But while the 777 program flies high, the troubled 787 "Dreamliner" program is mired in continued problems. As Bloomberg reported, "delays [are mounting] on the Dreamliner, now about three years behind schedule amid parts shortages, manufacturing mistakes, and redesigns." The article reported that Boeing was preparing "to announce a seventh delay" to the program, which "may be more than six months because of fresh problems...."

On that same day (December 20, 2010), the Seattle Times [reported](#) that "After a good long time of bashing workers in the Puget Sound region,

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Chicago executives are now depending on them to fix the unfolding disaster of the Long Delayed 787 Dreamliner.” Finding silver lining where others saw only ominous clouds, the author (Jon Talton) noted that, “Ironically, [Boeing’s] troubles are providing a backstop for local aerospace employment at a time when Washington [State’s] modest jobs recovery has stalled.” But that fortunate happenstance didn’t detract from the “ominous truth” that “Boeing has bet the company on the Dreamliner and now faces cost overruns of \$12 billion or more,” according to the article.

Going a bit deeper, Mr. Talton probed the Boeing management culture and asserted that it contributed to the precarious 787 program situation. He wrote—

At the least, the experience of doing the 787 on the cheap with a globalized supply chain should shake the foundations of ‘Welchism,’ the brutal management style, intimidating anti-employee bias and mania for quick results of retired General Electric chief executive Jack Welch. Yes, the one once foolishly lionized as the best CEO in history and whose influence has ruined countless companies. GE itself has quietly backed away from many Welch ideas gone sour, not least the financial services play that became part of the global banking panic. Boeing’s executive suite is populated with Welch disciples who long poo-pooed Boeing’s historic careful, engineering-based culture.

Mr. Talton pointed his readers at an “astonishing article” [published](#) in the Seattle Times just a few days before, on December 18, 2010, that provided details of the Dreamliner’s panoply of current problems. The article, penned by Dominic Gates, asserted that—

As Boeing prepares to announce yet another delay for the 787 Dreamliner — at least three months, possibly six or more — the crucial jet program is in even worse shape than it appears. The problems go well beyond the latest setback, an in-flight electrical fire last month that has grounded the test planes. A year after the airplane’s first flight, the cascade of systems failures caused by that fire, as well as two major problems since summer with the 787’s Rolls-Royce engine, have raised red flags with aviation regulators.

A top Federal Aviation Administration (FAA) official 10 days ago warned Boeing that without further proof of the plane’s reliability, it won’t be certified to fly the long intercontinental routes that airlines expect it to serve.

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Meanwhile, on the production side, one veteran employee on the 787 said he's witnessing 'the perfect storm of manufacturing hell.' The global supply chain is at a standstill, and outside the Everett factory the rows of partly finished jets will take many months to complete. ...

Among the 787's lesser ongoing problems is 'rain in the plane,' the term used for heavy condensation dripping inside the jet's composite plastic fuselage. Yet that issue is piddling compared with the major flaws that have brought a wave of successive delays.

Mr. Gates wrote—

Boeing has bet its future on the 787 ... the company aimed to reduce the cost and risk by outsourcing an unprecedented share of manufacturing and design work to partners around the globe. ... Yet the 787 has run into more trouble than any previous Boeing jet. ... The 20 built but incomplete Dreamliners sitting in Everett are emblematic of all that has gone wrong. They are so far from done that the total number of unfinished jobs [tasks] exceeds 105,000. ... Mechanics can complete only about 500 jobs a month out on the field, and perhaps 1,000 jobs a month ... inside the factory.

These jets have no seats or sidewalls, and many interior systems are missing or incomplete. ... Mechanics installed temporary air conditioning units after those fitted initially kept failing. Horizontal tails poorly built by Alenia in Italy are still being reworked. With the workmanship on the tails varying from one plane to the next, mechanics have to painstakingly customize the fixes plane by plane.

According to the article, Boeing has developed a controversial work-around plan to address the 20 problem planes needing work. That work-around plan is to—quite literally—work around the problems. As Mr. Gates reported—

With its parked Dreamliners many months from completion, Fancher said Boeing is likely to skip over earlier planes that need more work and move up the delivery of some later-built, more completed jets.

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'You may see us hopping around a bit,' he said, adding that it's a matter of balancing the most efficient way to finish the work with the customers' need to get a specific jet by a specific date.

The worker dealing with the backlog puts it differently: 'They've dug a hole so deep, they have no choice but to go around it and leave the hole there.'

In addition, Mr. Gates reported on several significant problems with the 787 engines—designed and build by Rolls-Royce. He reported that, "the engine and electrical issues have also raised crucial questions late in the program about the plane's reliability, potentially affecting regulators' certification of the airplane." Reportedly, the FAA has warned Boeing executives that, "in the current state of the program, the jet cannot be certified for long-distance transocean and transpolar flights,"

Mr. Gates also noted that, "Also drawing separate FAA scrutiny is repeated poor-quality workmanship in the 787 fuel tank, including issues with fasteners." He reported that latter problem "reaches back into the 787 supply pipeline, which continues to stutter." According to the article, Boeing has had to halt movement of planes on its final assembly line, as well as halt deliveries of "major sections" of the aircraft to Everett, in order to create a "balancing act" that allows "some suppliers to catch up with others and to slow the flow onto Paine Field of new planes needing to have the latest fixes applied."

To sum up his article, Mr. Gates reported that—

Employees working on the 787 complain about insufficient oversight of suppliers and a management system that the senior engineer called 'totally broken.' 'This program is not like anything we've seen,' said the veteran 787 employee. 'It's a screwed-up mess.'

Normally we would stop there, but there's one more thought-provoking article to bring to your attention. It discusses a problem that may be far worse than any reported in the Seattle Times or Bloomberg. Mr. Michael Mandel wrote an article with the interesting title, "[Knowledge Capital Writedown at Boeing?](#)" in the Wall Street Pit online publication.

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Mr. Mandel postulated that, “What’s going on here is a breakdown of Boeing’s outsourcing strategy, and a possible breakdown of Boeing as well.” He noted that, “In the short run, outsourcing may have increased the risks and costs [of the 787 Dreamliner program] rather than decreased them.” According to Mr. Mandel, “Part of the problem is low quality of parts from partners who were supposed to shoulder a lot of the burden.” But Mr. Mandel asserts that the supplier quality problems are not the real long-term issue, because “these problems can all be fixed, at a cost.”

In his view, the real problem with Boeing’s strategy is the loss of its intellectual property—the knowledge of how to design and build commercial aircraft.

Mr. Mandel cites a year-old Harvard Business Review blog post by Dick Nolan, who is a professor at the University of Washington. Mr. Mandel quotes Professor Nolan as follows—

In trying to keep down Airbus, Boeing may be creating a much more dangerous competitor, one that likely will come from Japan, China, or India — countries that will own the markets for new airplanes in the near future and are in various stages of building their own commercial-airplane-manufacturing industries.

To finance the development of the 787 and secure global orders, Boeing agreed not only to outsource an unprecedented amount of the plane’s parts to partners in Europe, Japan, and China, but also to transfer to them unprecedented know-how. Before the 787, Boeing had retained almost total control of airplane design and provided suppliers precise engineering drawings for building parts (called ‘build to print’). The only exception was jet engines, which have long been designed and manufactured by suppliers such as GE, Rolls-Royce, and Pratt & Whitney.

The 787 program departed from this practice. Boeing effectively gave Tier 1 suppliers a large part of its proprietary manual, ‘How to Build a Commercial Airplane,’ a book that its aeronautical engineers have been writing over the last 50 years or so. Instead of ‘build to print,’ Boeing provided suppliers with performance specifications for parts and components and collaboratively worked with them in the design and manufacturing of major components such as the wing, fuselage section, and wing box

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According to Mr. Mandel, one of the beneficiaries is the Commercial Aircraft Corp. of China, who has just “taken its first set of orders for the C919, a potential competitor to the ... Boeing 737.”

Taken together, these recent stories present a picture of an utter failure of a supply chain management strategy. It seems clear (in hindsight) that Boeing pushed design responsibility down to suppliers that were unready to take it, relied on the quality and workmanship of untried and possibly untrained foreign workforces, and failed to compensate for the lack of a quality-focused culture by implementing rigorous quality inspections at every hand-off. As a result, Boeing has experienced long schedule delays, huge cost overruns, and a production nightmare that it may not be able to overcome in the short term. And in the long term, it may have sold off its intellectual property “crown jewels” for a pittance, and given its competitors the means they needed to compete against it in the global marketplace.

And yet, as we ponder those Boeing executives who blessed the failed strategy, who trumpeted the cost and risk reductions from global outsourcing, and who presided over the failure of that strategy—we’re confident that they all received very nice salaries and large incentive compensation packages.