

Boeing 787: The Dreamliner (B)

In April 2008, Boeing confirmed a delay in the 787-airplane and announced a 14-month delay in delivering Boeing's most anticipated airplane. The Boeing 787-airplane, to be put in service in 2008 initially, has become Boeing's best-selling new plane ever; as of September 2008, the Boeing company had orders for 895 airplanes from 58 customers worldwide with an estimated backlog value of \$151 billion (see **Exhibit 1** for the different 787-airplane configurations that Boeing offers).

Although not a full-blown crisis such as the one faced by Airbus with its A380-airplane delays, the announcement was nonetheless a potentially serious setback for Boeing. Notes the *Wall Street Journal*: "Some analysts believe Boeing could be liable for as much as \$4 billion of concessions and penalty payments to airlines for missed deadlines. Boeing . . . plans to book the first 25 deliveries at zero-profit margin to cover penalties."¹ Analyst estimates indicate that the delay could cost Boeing over \$2 billion dollars in penalties alone, plus additional R&D expenses over the next few years (see **Exhibit 2**).

According to Boeing's revised schedule, the first test flight of the 787-airplane was expected to be carried out in late 2008, and the first deliveries in the 3rd quarter of 2009. The company also planned a dramatically slower ramp-up in production; Boeing's goal now is to produce 10 787s a month starting in 2012, a figure significantly lower than originally planned (see **Exhibit 3**). Notes Boeing's 787 spokesperson, Yvonne Leach, the average delay for all 58 787-customers is expected to be about 20 months.²

Reasons and Response to the Delays

Reasons for the Delay

Boeing attributed its first delay, announced in October 2007, to an unexpected shortage of fasteners – the “nuts and bolts” that hold an airplane together. The job of getting fasteners became more complicated and resulted in further delays because the suppliers who rushed to make them did not properly document their work as required by federal authorities.

Professors Suresh Kotha, Olesen/Battelle Chaired Professor, University of Washington, Foster School of Business, and Richard Nolan, William Harding Professor of Business Administration (Emeritus), Harvard Business School, and Philip M. Condit Professor of Business Administration, University of Washington, Foster School of Business prepared this case. The case was developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

¹ J. L. Lunsford, Boeing CEO Fights Headwind --- Despite Profit Growth, 787 Dreamliner And Tanker Contract Loss Test McNerney. *The Wall Street Journal*, 25 April 2008, B1.

² According to *The Seattle Times* (May 9, 2008) International Lease Finance Corp. (ILFC), the largest customer for the 787 airplanes, was told that it faced an average delay of over 27 months.

In addition to lack of fasteners, reports *The Wall Street Journal*: “Honeywell International Inc. [was] scrambling to complete hundreds of thousands of lines of computer code that will run the airplane’s flight controls, a task . . . that both Honeywell and Boeing [had] underestimated.”³ In January 2008, Scott Carson, CEO Boeing’s Commercial Airplanes division, announced the second delay by noting the following: “[W]e continue to be challenged by start-up issues in our factory and in our extended global supply-chain.”⁴ He assured Wall Street analysts and airline customers that Boeing intended to conduct a “comprehensive assessment of its supply chain and production system capabilities to determine the details of the 787’s flight test program and initial delivery profile.” However, at this time, he refrained from providing details about when customers could expect airplane deliveries. In April 2008, Boeing officials announced the third delay and revised the schedule for the 787-airplane deliveries. In announcing this delay, Carson noted:

Our revised schedule is built upon an achievable, high-confidence plan for getting us to our power-on [in July 2008] and first-flight milestones [in November 2008]. Also, while the fundamental technologies and design of the 787 remain sound, we have inserted some additional schedule margin for dealing with other issues we may uncover in testing prior to first flight and in the flight test program.⁵

From “Bleeding Edge” to “Leading Edge.” In a letter to Boeing employees discussing the third delay facing the 787-dreamliner, James McNerney, Boeing’s CEO, in an open letter to employees had the following to say:

To me, two themes have emerged from the 787 at this early stage in its life. One centers on innovation, the other is on execution. . . . Fundamental, game-changing innovation like that we’re pursuing on the 787 usually has a “bleeding-edge” quality to it – meaning it goes beyond “leading edge” into a realm where both the risks and the potential returns are high. . . . However, our struggle to execute has come at a price, not the least of which is the impact to our customer relations.⁶

As an example of the “bleeding-edge” innovation, published reports point to the challenges Boeing has faced with composites – the carbon-fiber technology used for the majority of structural sections of the airplane (see **Exhibit 4**). Notes *Business Week*:

The carbon-fiber technology has presented a daunting challenge for Boeing engineers. If components of the plane are too heavy, the plane loses its energy efficiency. But if they are too light, the parts and even the entire plane might not be structurally sound. That was the case with the center wing box, the critical section of the plane where the wings are attached. It was found to be too light and needed [strengthening]. Engineers devised a patch for the first six aircraft; the seventh will have the redesigned wing box incorporated from the start.⁷

Designing the patch cost the 787-program a month in delays, and redesigning the wing box, primarily the responsibility of Boeing’s partner, was now Boeing’s concern. One analyst

³ J. L. Lunsford, Boeing’ 787 Faces Less Room for Error. *The Wall Street Journal*, September 6, 2007.

⁴ Boeing Press Release, “Boeing Shifts Schedule for 787 First Flight.” January 16, 2008.

⁵ Boeing Press Release, “Boeing Revises 787 First Flight and Delivery Plans. April 09, 2008.

⁶ Boeing Press Release, “Time to Deliver on the 787.” April 21, 2008.

⁷ J. Crown & C. Matlack, Boeing Delays Dreamliner Again. *Business Week*, April 9, 2008.

noted that “is a kind of biggie” and poses residual risk until the airplane flights tests are completed.⁸

Blaming Boeing’s Business Strategy. Many blamed Boeing’s “business strategy” for the delays. Boeing has outsourced an “unprecedented” share of responsibility for the 787 manufacturing to overseas “risk-sharing partners” in Italy, Spain, and Japan (see **Exhibit 5**). According to *Business Week*: “[M]any of these partner companies [first-tier suppliers] have struggled, either in building the components themselves or getting the parts they need from others [second-tier suppliers], in time to meet Boeing’s rigorous construction schedule.”⁹ Further a report in *The Wall Street Journal* noted:

Boeing extolled the business virtues of having suppliers from as far away as Japan and Italy build much of the fuel-efficient new jetliner, with Boeing performing final assembly. . . . But the plan backfired when suppliers fell behind in getting their jobs done, . . . [and] Boeing was forced to turn to its own union work force to piece together the first few airplanes after they arrived at the company’s factory in Everett, Wash., with thousands of missing parts. That fueled both anger and anxiety among union workers.¹⁰

Published reports pinpoint to the botched assembly of the first 787-fuselages at two factories in Charleston, S.C. as a major reason for the delay. At Charleston, S.C., Vought Aircraft Industries manages one factory, and Global Aeronautica (GA), an alliance between Vought and Italy’s Alenia, manages the other. GA is responsible for integrating the large fuselage sections from Italy and Japan with Boeing-furnished parts. According to published reports: “The two factories planted here to build big Boeing 787 Dreamliner fuselage sections began as a disastrous experience in outsourcing. Their incomplete work played a large part in the snafus that snarled the final assembly line in Everett that has delayed the 787’s first flight by 14 months.”¹¹

Elmer Doty, CEO of Vought, had the following to say about such reports:

Vought’s role in the venture became problematic when the supply chain broke down and work that was to be completed by other major suppliers arrived in Charleston unfinished. . . . The problem was Vought had no control over the procurement of those large pieces. Boeing, as the prime contractor was responsible for managing those major partners. . . . To manage the traveled work efficiently, you need that responsibility. . . . That is best done by the prime [contractor Boeing].

For instance, Vought points out that while Israel Aircraft Industries was contracted to supply the 787 plane’s floor grid as a single structure, instead Vought received piece parts. Reports in the media also note that the workforce in South Carolina lacked strong aerospace experience such as that found in Everett, Washington, home of Boeing’s commercial airplane division and this lack of experience of the workforce is responsible for some the

⁸ D. Gates, “The Latest Delay of Boeing 787 Pushes Back First Delivery to Third Quarter of 2009.” *The Seattle Times*, April 10, 2008.

⁹ J. Crown & C. Matlack, Boeing Delays Dreamliner Again. *Business Week*, April 9, 2008.

¹⁰ J. L. Lunsford, “Outsourcing at Crux of Boeing Strike. *The Wall Street Journal*, September 8, 2008.

¹¹ D. Gates. “Boeing Expertise Speeding up 787 partners.” *The Seattle Times*, June 11, 2008.

delays.¹² Reports also have pinpointed issues at the Spirit Aerosystems Plant, formerly Boeing Wichita, for the delays. Spirit is responsible for the forward fuselage of the airplane including the plane's cockpit installation (see **Exhibit 5**).

Responding to the Delays

Boeing has responded quickly to address such delays. Within days of announcing the first delay in October 2007, the vice president and general manager, who was responsible for all aspects of the 787-program since its inception in 2004, was reassigned. Pat Shanahan was named the vice president and general manager of the 787-program. Shanahan, who joined Boeing in 1986, is most recently credited with turning around the Chinook helicopter, the V-22 Osprey tilt-rotor airplane, and ground-based missile-defense programs at Boeing's Defense division. Responding to the Wall Street analysts' questions, Shanahan noted: "Where do I think the inherent risk is? I think it's in the capabilities of the supply chain to do things that we need to have done. . . . That is the untested part of this production model. . . . That's where our energy and attention is."

Shanahan quickly revamped the 787-executive team and reorganized the responsibilities of Boeing executives in three areas: (1) airplane development, (2) the global-supply chain, and (3) the final assembly and delivery areas. He also took action to comply with McNerney's insistence that the 787-team be more aggressive with suppliers by "sticking their noses into suppliers' operations, including stationing Boeing employees in every major supplier's factory."¹³ For example, he appointed Scott Strode to oversee all development activities with Vought Aircraft Industries in an effort to strengthen management of the supply chain (see **Exhibit 6** for a list of management changes under Pat Shanahan).

To solve the problems in Charleston factories, for example, Boeing bought out Vought's interest in the joint venture and followed it up with changes to speed things along. Now Boeing and ex-Boeing managers run the Charleston plants; Joy Romero, a former Boeing employee with 25 years of Boeing managerial experience manages Vought's plant, and Mario Capitelli, a Boeing executive with significant operations experience, runs GA's plant. Two retired Boeing-plant managers initially brought in as consultants to solve problems now assist Capitelli.¹⁴

Noted Romero, Vought's plant manager:

Vought's Charleston operations has fixed the problems that marred early deliveries and is now approaching Boeing's original concept. . . . The proof is this: Dreamliner No. 1's rear fuselage left the Charleston plant in May 2007 with only 16 percent of its structure completed and none of the systems installed. But when the rear fuselage of Dreamliner No. 4 was delivered to Everett last week (June 2008), it had 98 percent of the structure finished and 87 percent of the systems installed.¹⁵

Also, Vought Industries is now responsible for the assembly of the airplane floor grid, while Israel Aircraft Industries' role will be limited to supplying the floor pieces. Changes such as

¹² D. Gates, June 11, 2008.

¹³ J. L. Lunsford, "Boeing CEO Fights Headwind." *The Wall Street Journal*, April 25, 2008. B1.

¹⁴ D. Gates, "Boeing Expertise Speeding up 787 Partners." *The Seattle Times*, June 11, 2008.

¹⁵ D. Gates, June 11, 2008.

these were being carried out throughout Boeing's global supply chain system in an effort to rationalize the production system, and redraw the areas of responsibility, actions needed to speed up the production of the airplane.

Production delays at the Spirit Aerosystems plant, formerly Boeing Wichita, were also said to be recovering well. Managers at the plant were confident that Spirit, which was working on Airplane #4 (in June 2008), will deliver the next airplane virtually complete. They attributed its success to Spirit's Boeing heritage and the familiarity with tools, processes, and experience gained in past stints in Everett, Washington.¹⁶

Reflecting on the changes and progress, Shanahan remarked in April 2008:

We have addressed the major challenges that slowed our progress while trying to complete the primary structure – the parts shortages, engineering changes, and manufacturing changes – and we are well into the systems installation that is the precursor to putting power on the airplane for the first time. We have also worked closely with our partners to achieve higher levels of completion of their parts of subsequent airplanes, and we will continue to drive improvements in the supply chain and production system performance.¹⁷

Following the revised schedule announced in April, the 787-team, under Shanahan, has successfully completed the “power on” sequence for the first 787-airplane in June 2008. The power on sequence is a complex set of “tasks and tests that bring electrical power onto the airplane and begin to exercise the use of the electrical systems.”¹⁸ It represented a major milestone paving the way for the first flight test of the 787-airplane to be done in November 2008. However, not all things were going according to plan. A new wrinkle appeared on the horizon – a strike called by Boeing's machinists union.

Challenges Moving Forward

A Labor Strike Threatens Progress

On September 6, 2008 the 27,000 Boeing members of the International Association of the Machinists (IAM) walked off their jobs after negotiations between union leaders and Boeing managers failed to reach an agreement on a proposed three-year contract. This was the fourth time in Boeing's history that members of this union have walked off their jobs. The first strike that took place in 1948 lasted for 140 days. More recently, however, a strike in 1995 lasted for 69 days, and one in 2005 lasted for 24 days. Analysts predict that the strike will last between 30 to 60 days. They estimate that the strike is costing Boeing about \$100 million a day in lost revenues.

Boeing's offer to the IAM workers was a 11% wage increase over the life of the three-year contract, as well as a cost of living adjustment. It also agreed to increase workers' monthly pension by \$10 a month to \$80 (a 14% increase) for each year of service. During the first

¹⁶ D. Gates, “Boeing Dreamliner's Front End Gets Finishing Touches at Spirit AeroSystems. *The Seattle Times*, June 13, 2008.

¹⁷ Boeing Press Release, April 09, 2008.

¹⁸ Boeing Press Release, “Boeing Achieves 787 Power on”. June 20, 2008.

year of the contract, Boeing offered to pay a bonus of at least \$2,500 or 6% of a worker's salary, whichever was greater.¹⁹ The union, however, wants a pay raise of at least 13% and a greater increase in pension benefits.

Although wages and benefits were important issues, "job security" emerged as *the* issue for union members. Notes a report in *The Wall Street Journal*:

At the heart of the union machinists' strike against Boeing Co. is a high-stakes showdown over something the aerospace giant once touted as a manufacturing innovation: Its effort to outsource key roles in producing its new 787-Dreamliner jet. . . . Boeing says it needs flexibility in its manufacturing to avoid the problems that have befallen other big industrial companies, while the union is fighting to keep as many jobs as possible. The flashpoint in that debate is Boeing's troubled 787-Dreamliner program, which striking workers point to as Exhibit No. 1 in their case against outsourcing.²⁰

In 2002, during the last contract negotiations with the union, Boeing inserted a contract provision that is at the heart of the current labor dispute. Notes *The Economist*:

The union is worried about a more insidious form of outsourcing, closer to home. A previous agreement allowed Boeing's suppliers to deliver parts straight onto the factory floor at its Seattle sites. The next step, the union fears, is for contractors to start fitting parts onto planes on the line, displacing well-paid workers. It wants job security, with the payroll headcount linked to the number of orders and production rates. It wants a chance to compete formally with outsourcing contracts in a bid to keep hold of the work. But its aggressive pay demands and strike action would seem to work in the opposite direction.²¹

Although the union leaders objected to this provision in 2002, they were unable to muster the required two-thirds support from their members to call a strike. According to Tom Buffenbarger, IAM President, "The union just wants to be able to have a shot at making the case that our workers can do those jobs competitively before Boeing ships them out."²²

While a prolonged strike could negatively impact the delivery of the 787-airplane, some analysts see a silver lining in the strike and resulting work stoppage. Points out an article in *The Wall Street Journal*:

In the short term, some suppliers are taking advantage of the strike to catch up with the backlog that has piled up as they raced to keep Boeing supplied in recent months. . . . 'It's nice to actually get caught up a bit, but it will be a different story if this thing stretches more than a month,' said a supplier who asked that his name not be used for

¹⁹ Under the new proposed contract, the average union member is expected to earn about \$65,000 a year before overtime wages. With overtime workers could take home another \$10,00 a year or more in additional wages. Under the contract that expired, the average wage for a Boeing machinist was about \$27 an hour or \$56,000 a year before overtime wages were included.

²⁰ J. L. Lunsford, "Outsourcing at Crux of Boeing Strike. *The Wall Street Journal*, September 8, 2008.

²¹ "Striking Differences." *The Economist*. September 11, 2008, print edition.

²² Quoted in Lunsford, September 8, 2008.

fear of violating confidentiality agreements with Boeing.²³

The progress being made by the 787-team is clearly threatened by the continuation of the labor strike. Published reports note that the workers are angry enough to stay out until the end of 2008.”²⁴

Despite the concerns being raised by workers, Boeing’s senior management is confident that its “business strategy” of outsourcing is indeed sound. While McNerney, Boeing’s CEO, admitted that Boeing has had problems executing its new strategy he sees no reason for change. McNerney reiterated his commitment to Boeing’s current approach:

The global partnership model of the 787 remains a fundamentally sound strategy. It makes sense to utilize technology and technical talent from around the world. It makes sense to be involved with the industrial bases of counties that also support big customers of ours. But we may have gone little too far, too fast in a couple of areas. I expect we’ll modify our approach somewhat on future programs – possibly drawing the lines differently in places with regard to what we ask our partners to do, but also sharpening our tools for overseeing overall supply chain activities.²⁵

Potential Strike by Engineers

In September 10, 2008, Boeing engineers’ union, The Society of Profession Engineering Employees in Aerospace (SPEEA), representing 21,000 workers presented a proposal to Boeing for a new three-year labor contract since their existing contract is scheduled to expire on December 1, 2008. In addition to seeking wage increases and changes to pension and healthcare plans, the proposal was “proposing limits to Boeing’s use of contract labor.”²⁶ In the past, Ray Goforth, SPEEA’s executive director, has called Boeing management “to correct its flawed reliance on global partners and bring the work back [inside Boeing]. ... Sending engineers around the world to help suppliers simply transfers all of the aerospace knowledge to other companies in other countries.”²⁷ Stan Sorscher, SPEEA’s director of research, has noted while outsourcing design for say sneakers may work, outsourcing an airplane design cannot because it requires a tight community of experienced mechanics and engineers working together to overcome the inevitable challenges. He noted: “We thought the 787 would be the test case for this. . . . The results are in.”²⁸ In this judgment, Boeing’s current approach with the 787-airplane was flawed and needed re-examination.

In a moment of introspection, the former head of 787-program, Mike Bair, noted that Boeing might axe the “global-spanning supply chain that has caused its recent problems.” He was candid in noting that some engineering design work was pulled back inside Boeing because

²³ J. L. Lunsford and D. Michaels, “Boeing Strike Rattle Key Suppliers.” *The Wall Street Journal*, September 12, 2008.

²⁴ J. L. Lunsford and D. Michaels, September 12, 2008.

²⁵ Boeing Press Release, “Time to Deliver on the 787.” April 21, 2008.

²⁶ S. Ray. “SPEEA demands return of outsourced work.” *The Seattle Post-Intelligencer*, Thursday, September 11, 2008.

²⁷ Quoted in D. Gates, “Latest deal of Boeing 787 pushes back first delivery to third quarter of 2009.” *The Seattle Times*, Thursday, April 10, 2008.

²⁸ D. Gates, “IAM: Contract talks in trouble.” *The Seattle Times*, July 30, 2008.

some of the partners couldn't deliver. He commented that Boeing found that some first-tier contractors promptly turned around and outsourced their design engineering work to second-tier contractors, which exacerbated the problems. He said, "There are a couple of [the supplier partners] where I could see us going back to a build-to-print solution [as apposed to build-to-design followed by the 787-program]. . . . The right way to do this would be to have all those partners across the street [a kind of supersite] so you could just roll them in. . . . We'll see on the next airplane programs whether we can accomplish something like that."²⁹

Boeing engineers belonging to SPEEA have gone on strike two times in the recent past: once in 1993 for a day, and again in 2000 for 40 days. Notes Harley Shaiken, a labor-relations professor at University of California Berkeley: "The whole underlying issue of job security is proving to be pivotal to what's taking place at the bargaining table, and it reflects the success that Boeing is having. . . . Both the Machinists and the engineers want to see that continue, but they want a successful Boeing to mean more jobs, not a smaller manufacturing presence."³⁰ The crux of the problem for both labor unions is Boeing's business strategy employed in the 787-airplane program and its use in future programs.

Three Strikes and You Are Out . . .

Notes Richard Aboulafia, a respected analyst with the consulting firm Teal Group: "I think there's an awful lot riding on this [the 787-airplane]. It is one of those three-strikes-and-you're-out scenarios from the standpoint of management, from the standpoint of a lot of people who are needed to keep the faith."³¹ On the brighter side, the 787-airplane is the only new midsize plane available in the marketplace; the Airbus' A350-airplane, being built with a goal of slowing the 787's market penetration won't be delivered earlier than 2013, at best. Thus, airline customers have little choice other than to wait for the 787-airplane. However, it is clear from analysts' reports and customers' growing concerns that Boeing can ill-afford another delay, for a prolonged delay had the potential to turn into a full-blown crisis similar to the one faced by Airbus with A380 airplane. And as McNerney noted in his open letter to employees in April, there is price to be paid, the least of which is the impact on Boeing's customer relations. Is it time, as the two labor unions asserted, to fundamentally modify Boeing's business strategy for new plane development?

²⁹D. Gates, "Boeing may junk worldwide assemble for next jet. *The Seattle Times*, November 7, 2007.

³⁰ Quoted in S. Ray, 2008.

³¹ Quoted in D. Carpenter, "Boeing 787 Launch to Be Delayed Again. *The Associated Press*, Thursday, April 10, 2008.

Exhibit 1: The Three Proposed Model Configurations of the 787 Airplanes

	787-8	787-9	787-3
Passengers	210-250	250-290	290-330*
Range (Nautical Miles)	7,650 to 8,200	8,000 to 8,500	2,500 to 3,050
Cabin width	18 feet, 10 inches	18 feet, 10 inches	18 feet, 10 inches
Wing span	197 feet	208 feet	170 feet
Length	186 feet	206 feet	186 feet
Height	56 feet	56 feet	56 feet
Cruise speed	Mach 0.85	Mach 0.85	Mach 0.85
Maximum takeoff weight (pounds)	484,000	545,000	364,000
Total cargo volume (cubic feet)	4,400	5,400	4,400
Entry into service	2009	2012	2010
Price (millions)	\$157 to \$167	\$189 to \$200	\$146 to \$151.3
	Considered the base model, this model is aimed at replacing midsize jets such as the 767 and Airbus A330.	This stretched version is aimed at replacing midsize jets such as the 767 and Airbus A330.	Optimized for shorter-range flights, this plane is aimed at replacing the Airbus A300, Boeing 757-300, Boeing 767-200 and -300.

* One-class configuration

Source: Boeing Corporation and The Seattle Times

Exhibit 2: Penalty Costs Estimates Associated with the 787-airplane Delays

	Original Deliveries		Revised Deliveries (optimistic case)	
2008	37	Assumes about 5 planes a month	0	
2009	75	Assumes a little over 6 planes a month	40	Deliveries start in October
2010	132	Assumes a little over 10 planes a month	65	Assumes a little over 5 planes a month
2011	164	Assumes a steady state to 14 planes a month	85	Assumes about 7 planes a month
2012	164	Assumes a steady state to 14 planes a month	120	Assumes a steady state to 10 planes a month
	572		310	
5,014 (Total Month of Delays)	X	\$0.5 (Monthly Penalty, millions)	= \$2,507 (millions)	Penalty for the first 310 planes

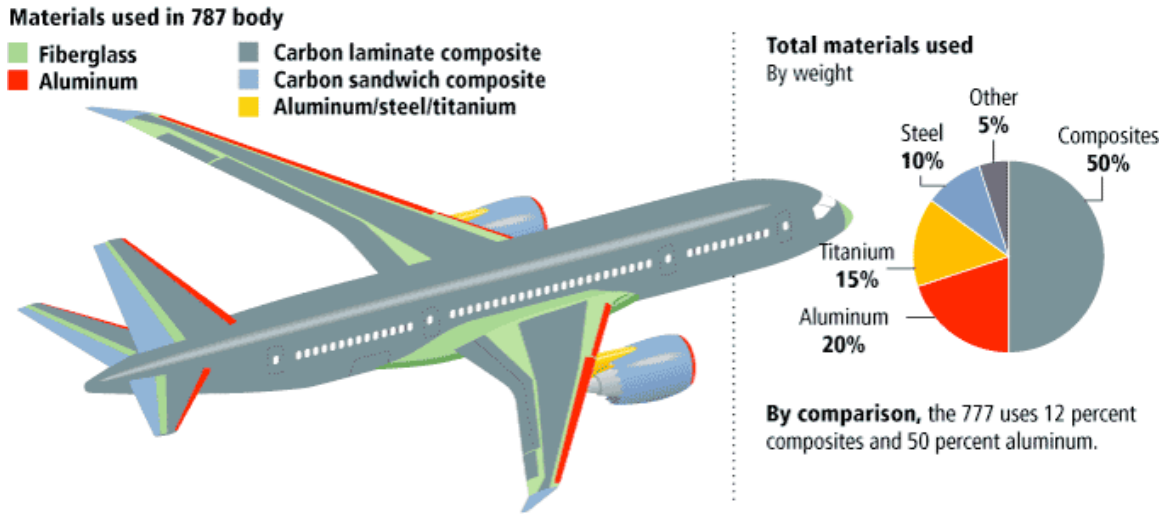
Source: Jefferies & Associates, 2008.

Exhibit 3: Announced 787-Airplane Cumulative Delays

	First Flight	First Delivery	Number of planes to delivered by 2009
Original Timeline	Aug-07	May-08	112
October 2007 Revision	Mar-08	Nov-Dec 2008	109
January 2008 Revision	Jun-08	Not Specified	-
April 2008 Revision*	Oct-Dec 2008	July-Sept 2009	25

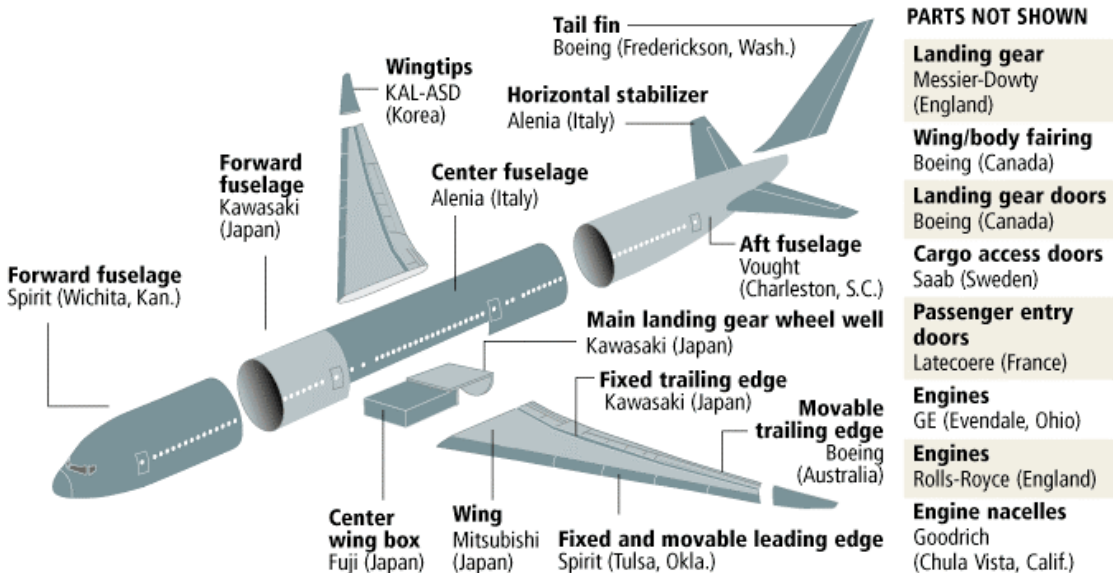
* Boeing also changed the timing of the introduction of two 787 derivatives -- the 787-9 and 787-3. The 787-9 a larger variant of the airplane will be the first derivative of the baseline 787 with delivery planned for early 2012 while the 787-3, a shorter-range model previously slated to deliver in 2010, will become the second derivative of this family.

Exhibit 4: Materials Employed in the 787-Airplane's Structure



Source: The Seattle Times

Exhibit 5: Major Risk-Sharing Partners Involved in the 787 Program



Source: The Seattle Times

Exhibit 6: List of Leadership Changes under Pat Shanahan

Changes made after assuming leaders in November 2007:

Scott Strode, a VP formerly in charge of the 787-airplane production, is reassigned to oversee all development activities with Vought Aircraft Industries.

Mark Jenks, formerly in-charge of the 787-wing team, is promoted to head the 787 Development and is responsible for airplane definition, certification and delivery of the first 787-airplane.

Bob Noble will continue as VP responsible for the relationship with Boeing's global partners and will lead the 787 Supply Chain group.

Steve Westby will remain as VP of manufacturing and quality, leading the 787 Final Assembly and Delivery.

Jeff Stone, most recently, production operations leader on the F-22 Raptor jet-fighter program will support 787 Body Structures group.

Kathy Moodie will lead the interiors installation and be responsible for preparing the airplanes for flight

Additional changes made in January 2008:

Howard Chambers, formerly head of Boeing's Space and Intelligence Systems, was named as deputy to Pat Shanahan in January 2008.

John Van Gels, former VP of operations and supplier management at Boeing's defense division was asked to oversee management of the 787 supplier partners as well as the final assembly operation in J

Source: *The Seattle Times* and Boeing Press Releases.