The 787's Problems Run Deeper Than Outsourcing

by James Allworth | 7:00 AM January 30, 2013

The 787 Dreamliner was supposed to be a big jump forward for Boeing — notably, the first plane to be made entirely of composites rather than aluminum. It consumes 20% less fuel than an equivalent 767; which, given today's increasing fuel prices and airlines' diminishing profit margins, should make it an extremely desirable aircraft.

Unfortunately, things haven't quite worked out as planned.

While the first 787 was originally scheduled to be delivered back in 2008, a string of delays and cost overruns meant that deliveries didn't start until 2011. Boeing looked to have turned the corner with the 787 once deliveries had started, but since launch it has been plagued with a number of high-profile problems — fuel leaks (http://www.guardian.co.uk/business/2013/jan/13/boeing-787-dreamline-fuel-leaks) , smoke in the cabin (http://online.wsj.com/article/SB10001424127887324734904578244383030183150.html) , and fires (http://www.bbc.co.uk/news/business-20942484) . The troubled plane has been grounded as global regulators investigate whether it's safe to fly.

Now, it is true that problems like these are always a feature of new plane launches (http://en.wikipedia.org/wiki/Qantas_Flight_32) . But the extent to which the 787 has been troubled both in gestation and post-launch suggests that something more is at work. Boeing undertook one of the most extensive outsourcing campaigns that it has ever attempted in its history. That decision has received a lot of press coverage (http://www.reuters.com/article/2009/09/22/us-boeing-outsourcing-analysis-idUSTRE58L4CS20090922) , and the common wisdom is coalescing around this as a cause of the problems.

But Boeing is no stranger to subcontracting. And while outsourcing can certainly lead to problems, I'm not convinced it's the cause of *these* problems. Outsourcing leads to business model risk — you open the door to outsourcing your profits (in fact, a 2001 Boeing paper (https://s3.amazonaws.com/s3.documentcloud.org/documents/69746/hart-smith-on-outsourcing.pdf) that is incredibly prescient and worth the time to read identified exactly this problem). But this isn't the problem that the 787 is suffering from. At least not yet.

Rather, the issues the plane has been facing have much more to do with Boeing's decision to treat the design and production of such a radically new and different aircraft as a modular system so early in its development (http://bus545-boeing.wikispaces.com/file/view/Boeing+787+Case.pdf) .

In the creation of any truly new product or product category, it is almost invariably a big advantage to start out as integrated as possible. Why? Well, put simply, the more elements of the design that are under your control, the more effectively you're able to radically change the design of a product — you give your engineers more degrees of freedom (http://hbr.org/2001/11/skate-to-where-the-money-will-be/ar/2) . Similarly, being integrated means you don't have to understand what all the interdependencies are going to be between the components in a product that you haven't created yet (which, obviously, is pretty hard to do). And, as a result of that, you don't need to ask suppliers to contract over interconnects that haven't been created yet, either. Instead, you can put employees together of different disciplines and tell them to solve the problems together. Many of the problems they will encounter would not have been possible to anticipate; but that's ok, because they're not under contract to build a component — they've been employed to solve a problem. Their primary focus is on what the optimal solution is, and if that means changing multiple elements of the design, then they're not fighting a whole set of organizational incentives that discourage them from doing it.

Conversely, if you're trying to modularize something — particularly if you're trying to do it across organizational boundaries — you want to be absolutely sure that you know how all the pieces optimally work together, so everyone can just focus on their piece of the puzzle. If you've done it too soon and tried to modularize parts of an unsolved puzzle across suppliers, then each time one of those unanticipated problems or interdependencies arises, you have to cross

corporate boundaries to make the necessary changes — changes which could dramatically impact the P&L of a supplier. Lawyers will probably need to get involved. So too might the other suppliers, who could quite possibly be required to change the design of their component, also (chances are, you've already contracted with them, too). The whole thing snowballs.

Historically, Boeing understood that, and had worked with its subcontractors on that basis. If it was going to rely on them, it would provide them with detailed blueprints of the parts that were required — after Boeing had already created them. That, in turn, meant that Boeing had to design all the relevant pieces of the puzzle itself, first. But with the 787, it appears that Boeing tried a very different approach: rather than having the puzzle solved and asking the suppliers to provide a defined puzzle piece, they asked suppliers to create their own blueprints for parts (http://bus545-boeing.wikispaces.com/file/view/Boeing+787+Case.pdf) . The puzzle hadn't been properly solved when Boeing asked suppliers for the pieces. It should come as little surprise then, that as the components came back from far-flung suppliers, for the first plane ever made of composite materials… those parts didn't all fit together (http://articles.latimes.com/2011/feb/15/business/la-fi-hiltzik-20110215) . Time and cost blew out accordingly.

It's easy to blame the outsourcing (https://www.google.com/webhp?hl=en&tab=ww#hl=en&tbo=d&output=search&sclient=psy-ab&q=boeing+787+outsourcing+disaster&oq=boeing+787+outsourcing) . But, in this instance, it wasn't so much the outsourcing, as it was the decision to modularize a complicated problem too soon.

Boeing's experience bears comparing to another company, one which has mastered the art of managing design as an integrated process, while still utilizing outsourcing — Apple. Apple doesn't manufacture their own products; but anyone who has used an Apple device can tell you that having someone else doing the manufacturing hasn't compromised the quality of the product at all. But Apple treats both the design process and its suppliers very differently to the way that Boeing does — or at least did, in the case of the 787.

Two key questions remain:

Has Boeing learned from the mistake? Recent comments from their leadership suggest that they may have: Jim Albaugh, who only just retired as the company's commercial aviation chief after a 35 year career with Boeing, noted that (http://seattletimes.com/html/sundaybuzz/2014125414_sundaybuzz06.html) "in hindsight, we spent a lot more money in trying to recover than we ever would have spent if we tried to keep many of the key technologies closer to Boeing. The pendulum swung too far." The company's Chief Executive, Jim McNerney, said (http://www.reuters.com/article/2009/09/22/us-boeing-outsourcing-analysis-idUSTRE58L4CS20090922) that he "would draw the lines in a different place" — but don't mistake that for ditching the outsourcing, because he also said that he "would still have the same supplier/partner concept."

And why did Boeing decide to do this in the first place? The *New Yorker* provides some context (http://www.newyorker.com/talk/financial/2013/02/04/130204ta_talk_surowiecki) on this question — and it relates to McDonnell Douglas. While ostensibly Boeing took over McDonnell Douglas, what really happened was more akin to a reverse takeover — McDonnell Douglas took over Boeing. Several of the top positions in the merged Boeing were assigned to executives who had previously worked in St. Louis, where the heritage of McDonnell Aircraft had been one of fighter and attack aircraft for the military. The thing about these Government contracts is that they are paid as development proceeds. This is entirely different — and a lot less risky — than the development model for a traditional commercial airliner, where an aerospace company needs to find all the capital. My hypothesis is that McDonnell's mindset from its defense work — minimizing the amount of capital put at risk during R&D — was applied to the 787.

They didn't want to pay full price for the Dreamliner's development, so, they didn't — or at least, that's what they thought. But as Henry Ford warned almost a century earlier: if you need a machine and don't buy it, then you will ultimately find that you have paid for it and don't have it.