From The Start, Dreamliner Jet Program Was Rushed

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NEW YORK (AP) — The 787 Dreamliner was born in a moment of desperation.

It was 2003 and Boeing — the company that defined modern air travel — had just lost its title as the world's largest plane manufacturer to European rival Airbus. Its CEO had resigned in a defense-contract scandal. And its stock had plunged to the lowest price in a decade.

Two years after the 9/11 terrorist attacks, financially troubled airlines were reluctant to buy new planes. Boeing needed something revolutionary to win back customers.

Salvation had a code name: Yellowstone.

It was a plane that promised to be lighter and more technologically advanced than any other. Half of it would be built with new plastics instead of aluminum. The cabin would be more comfortable for passengers, and airlines could cut their fuel bills by 20 percent.

But once production started, the gap between vision and reality quickly widened. The jet that was eventually dubbed the Dreamliner became plagued with manufacturing delays, cost overruns and sinking worker morale.

In interviews with The Associated Press, a dozen former Boeing engineers, designers and managers recounted the pressure to meet tight deadlines. Adding to the chaos was the company's never-before-tried plan to build a plane from parts made around the globe.

The former Boeing workers still stand behind the jetliner — and are proud to have worked on it. But many question whether the rush contributed to a series of problems that led the Federal Aviation Administration last week to take the extraordinary step of grounding the 787. Other countries did the same.

Even before a single bolt was tightened, the Dreamliner was different. Because executives didn't want to risk all of the billions of dollars necessary to build a new commercial aircraft, they came up with a novel, but precarious, solution.

A global network of suppliers would develop, and then build, most of the parts in locations as far away as Germany, Japan and Sweden. Boeing's own employees would manufacture just 35 percent of the plane before assembling the final aircraft at its plant outside Seattle.

The decision haunts Boeing to this day.

The FAA's order to stop flying the Dreamliner came after a battery fire aboard a 787 in Boston and another battery incident during a flight in Japan. It was the first time the FAA had grounded a whole fleet of planes since 1979, when it ordered the DC-10 out of the sky following a series of fatal crashes.

Inspectors have focused on the plane's lithium-ion batteries and its complicated electrical system, which were developed by subcontractors in Japan, France, Arizona and North Carolina.

Boeing declined to comment about the past but said its engineers are working around the clock to fix the recent problems.

"Until those investigations conclude, we can't speculate on what the results may be," the company said in a statement. "We are confident the 787 is safe, and we stand behind its overall integrity."

For decades, Boeing has been responsible for the biggest advances in aviation. The jet age started in 1958 with a Pan American flight between New York and Paris that took just eight and a half hours aboard the new Boeing 707.

In 1970, Boeing ushered in the era of the jumbo jet with the 747. The giant plane, with its distinctive bulbous upper deck, made global air travel affordable. Suddenly a summer vacation in London wasn't just for the rich.

By the start of the 21st century, change was much more incremental. Consolidation had left the world with two main commercial jet manufacturers: Boeing and Airbus.

Boeing executives initially had not considered government-backed Airbus a serious competitor. But in 2003, the unthinkable happened. Boeing delivered just 281 new jets. Airbus produced 305, becoming for the first time the world's biggest plane manufacturer.

American jobs — and pride — were at stake.

And that wasn't all. Airbus was starting to develop its own new jet: the A380, the world's largest commercial plane, capable of carrying up to 853 passengers, or the equivalent of at least five Boeing 737s.

"They were scaring everybody," said Bryan Dressler, who spent 12 years as a Boeing designer. "People here in Seattle have been through the booms and busts of Boeing so many times, even the slightest smack of a downturn makes people very edgy."

Airbus believed that larger airplanes were needed to connect congested airports in the world's largest cities. Boeing executives weren't so sure.

They believed airline passengers would pay a premium to avoid those same congested hubs with long nonstop flights between smaller cities. Now they just

needed to develop a plane that would somehow make such trips economical.

It had been 13 years since Boeing started development of a new plane, the 777. The company had recently scrapped two other major projects: a larger version of the 747 and the Sonic Cruiser, a plane that would fly close to the speed of sound.

A development team with a knack for assigning new planes code names based on national parks had just the thing: Project Yellowstone.

The plane — eventually rechristened the Dreamliner after a naming contest — was unlike anything else previously proposed.

Half of its structure would be made of plastics reinforced with carbon fiber, a composite material that is both lighter and stronger than aluminum. In another first, the plane would rely on rechargeable lithium-ion batteries to start its auxiliary power unit, which provides power on the ground or if the main engines quit.

While other planes divert hot air from the engines through internal ducts to power some functions, the 787 uses electricity. Getting rid of those ducts is one thing that makes the plane lighter.

There were also benefits for passengers. The plane's extra strength allowed for larger windows and a more comfortable cabin pressure. Because composites can't corrode like aluminum, the humidity in the cabin could be as much as 16 percent, double that of a typical aircraft. That meant fewer dry throats and stuffy noses.

Before a single aircraft was built, the plane was an instant hit, becoming the fastest-selling new jet in history. Advance orders were placed for more than 800 planes. Boeing seemed to be on its way back.

"Employees knew this was going to be a game changer, and they were stoked that the company was taking the risk to do something big," said Michael Cook, who spent 17 years as a computer developer at Boeing.

But this was no longer the trailblazing, risk-taking Boeing of a generation earlier. The company had acquired rival McDonnell Douglas in 1997. Many McDonnell Douglas executives held leadership positions in the new company. The joke was that McDonnell Douglas used Boeing's money to buy Boeing.

The 707 and 747 were blockbuster bets that nearly ruined the company before paying off. McDonnell Douglas executives didn't have the same appetite for gambling.

So the only way the board of directors would sign off on the Dreamliner was to spread the risk among a global chain of suppliers. In December 2003, they agreed to take on half of the estimated $10 billion development cost.

The plan backfired as production problems quickly surfaced.

"I saw total chaos. Boeing bit off more than it could chew," said Larry Caracciolo, an engineer who spent three years managing 787 supplier quality.

First, there were problems with the molding of the new plastics. Then parts made by different suppliers didn't fit properly. For instance, the nose-and-cockpit section was out of alignment with the rest of the plane, leaving a 0.3-inch gap.

By giving up control of its supply chain, Boeing had lost the ability to oversee each step of production. Problems sometimes weren't discovered until the parts came together at its Everett, Wash., plant.

Fixes weren't easy, and cultures among the suppliers often clashed.

"It seemed like the Italians only worked three days a week. They were always on vacation. And the Japanese, they worked six days a week," said Jack Al-Kahwati, a former Boeing structural weight engineer.

Even simple conversations between Boeing employees and those from the suppliers working in-house in Everett weren't so simple. Because of government regulations controlling the export of defense-related technology, any talks with international suppliers had to take place in designated conference rooms. Each country had its own, separate space for conversations.

There were also deep fears, especially among veteran Boeing workers, that "we were giving up all of our trade secrets to the Japanese and that they would be our competition in 10 years," Al-Kahwati said.

As the project fell further behind schedule, pressure mounted. It became increasingly clear that delivery deadlines wouldn't be met.

Each success, no matter how small, was celebrated. The first delivery of a new part or the government certification of an engine would lead to a gathering in one of the engineering building atriums. Banners were hung and commemorative cards — like baseball cards — or coins were handed out.

Those working on the plane brought home a constant stream of trinkets: hats, Frisbees, 787 M&Ms, travel mugs, plane-shaped chocolates, laser pointers and lapel pins. Many of the items can now be found for sale on eBay.

"It kept you going because there was this underlying suspicion that we weren't going to hit these targets that they were setting," said Matt Henson, who spent five and a half years as an engineer on the project.

The world got its first glimpse of the Dreamliner on July 8, 2007. The date was chosen not because of some production milestone but for public relations value. It was, after all, 7/8/7.

Tom Brokaw served as the master of ceremonies at an event that drew 15,000 people. The crowd was in awe.

It was "beyond experiencing a rock star on stage," said Dressler, a former Boeing designer. "This thing is so sexy, between the paint job and the lines and the fact that it's here now and you can touch it."

But like so much of show business, the plane was just a prop. It lacked most flight controls. Parts of the fuselage were temporarily fastened together just for the event. Some savvy observers noted that bolt heads were sticking out from the aircraft's composite skin.

Boeing CEO Jim McNerney told the crowd that the plane would fly within two months.

Instead, the company soon announced the first of what would be many delays. It would be more than two years before the plane's first test flight.

To overcome production problems, Boeing replaced executives and bought several of the suppliers to gain greater control. Work continued at breakneck pace.

"We were competing against time. We were competing against the deadline of delivering the first airplane," said Roman Sherbak, who spent four years on the project.

Then on a cold, overcast morning in December 2009, it all came together.

A crowd gathered at Paine Field, the airport adjacent to Boeing's factory. The Dreamliner climbed deftly into the sky for a three-hour test flight.

But there were still plenty of glitches, including an onboard fire during a November 2010 test flight. Smoke had entered the cabin from an electronics panel in the rear of the plane. The fleet was grounded for six weeks. This month's safety problems appear unrelated.

Deliveries were pushed back yet again.

Passengers wouldn't first step aboard the plane until Oct. 26, 2011, three and a half years after Boeing first promised.

That first, four-hour journey — from Tokyo to Hong Kong — was more of a party than a flight. Passengers posed for photos as they climbed stairs into the jet. Alcohol flowed freely. Boeing executives were on hand, showing off the plane's new features. Everybody, it seemed, needed to use the bathroom if only to check out the bidet and giant window inside.

More airlines started to fly the plane. Each new route was met with celebration. Travelers shifted itineraries to catch a ride on the new plane.

Boeing had hoped by the end of 2013 to double production of the Dreamliner to 10 planes a month. There are 799 unfilled orders for the plane, which carries a $206.8

million list price, although airlines often negotiate deep discounts.

Then, this month, all the progress came to a jarring halt.

First, a battery ignited on a Japan Airlines 787 shortly after it landed at Boston's Logan International Airport. Passengers had already left the plane, but it took firefighters 40 minutes to put out the blaze.

Problems also popped up on other planes. There were fuel and oil leaks, a cracked cockpit window and a computer glitch that erroneously indicated a brake problem.

Then a 787 flown by Japan's All Nippon Airways made an emergency landing after pilots learned of battery problems and detected a burning smell. Both Japanese airlines grounded their Dreamliner fleets. The FAA, which just days earlier insisted that the plane was safe, did the same for U.S. planes.

Each new aircraft comes with problems. The A380 had its own glitches, including an in-flight engine explosion that damaged fuel and hydraulic lines and the landing flaps. But the unique nature of the 787 worries regulators.

American and Japanese investigators have yet to determine the cause of the problems, and the longer the 787 stays grounded, the more money Boeing must pay airlines in penalties.

"It's been a very expensive process, and it's not going to let up anytime soon," said Richard Aboulafia, an aerospace analyst with the Teal Group. "At this point, the aircraft still looks very promising. I don't think anybody is talking about canceling orders but people are nervous about the schedule."

As investigators try to figure out the cause of the plane's latest problems the world finds itself in a familiar position with the Dreamliner: waiting.