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'This Has Been Going on for Years.' Inside Boeing's Manufacturing Mess.

Outsourcing worried engineers and sparked battles over quality before a door plug blew out on an Alaska Airlines plane midflight

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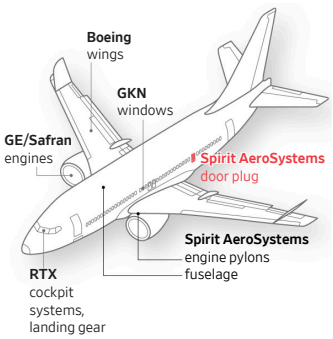
Long before the harrowing Alaska Airlines blowout on Jan. 5, there were concerns within Boeing BA -0.52% ▼ about the way the aerospace giant was building its planes. Boeing, like so many other American manufacturers, was outsourcing more and more of the components that went into its complex machines.

A Boeing aerospace engineer presented a controversial white paper in 2001 at an internal technical symposium. The engineer, John Hart-Smith, warned colleagues of the risks of the subcontracting strategy, especially if Boeing outsourced too much work and didn't provide sufficient on-site quality and technical support to its suppliers.

"The performance of the prime manufacturer can never exceed the capabilities of the *least* proficient of the suppliers," Hart-Smith wrote. "These costs do not vanish merely because the work itself is out-of-sight."

Sum of the Parts

Components of the Boeing 737 MAX 9 are built by a range of suppliers



Sources: Boeing, the companies

The paper became a sensation within Boeing. It was passed among engineers. Posted on factory walls. Hart-Smith, after he later retired from Boeing, said of his warning of excessive outsourcing: "It's common sense."

Two decades later, Boeing is reckoning with the fallout from its outsourcing strategy.

The Alaska accident is the latest in a string of quality problems at Boeing, whose engineering prowess created the 747 that helped usher in the global jet age. The company's reputation has suffered from a pair of fatal 737 MAX 8 crashes in 2018 and 2019 that grounded hundreds of jets for nearly two years. More recently, Boeing has been dogged by issues with various models—misdrilled holes, loose rudder bolts, and this month's MAX 9 door-plug blowout—lapses the company failed to catch.

Many of the problems with Boeing jets since the deadly crashes can be traced back to a production system adopted by Boeing and its aerospace rivals before Hart-Smith's paper. Dozens of factories build key pieces of 737 and 787 jets before they are assembled by Boeing. One of them is a sprawling fuselage plant in Wichita, Kan., that Boeing owned until 2005.

At the time, then-Boeing executive Alan Mulally said selling the factory to a private-equity firm would let Boeing focus on final assembly, where it could add the most value to its airplanes.

A view inside the Alaska AIrlines flight showing the hole in the fuselage following the door-plug blowout. PHOTO: KELLY BARTLETT/ASSOCIATED PRESS

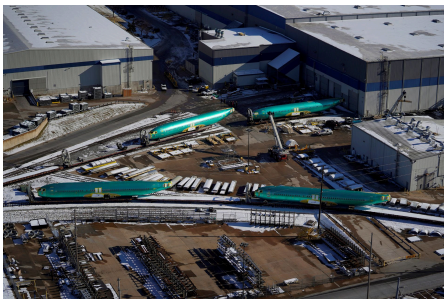
The factory is now run by a public company called Spirit AeroSystems SPR 0.47% ▲ and it has been plagued by production problems and quality lapses since Boeing ceded so much responsibility for its work. Spirit was once held up by Boeing brass as an exemplary partner—where staff pulled together after a tornado ripped through the facility in 2012.

Spirit is the sole supplier of the fuselages used in many Boeing jets, including the Alaska plane that made the emergency landing. It is heavily dependent on Boeing for revenue, and the two companies have battled for years over costs and quality issues. The earlier MAX grounding and Covid-19 pandemic sapped Spirit's finances, and the company slashed thousands of jobs, leaving it short-handed when demand bounced back.

Some Spirit employees said production problems were common and internal complaints about quality were ignored. In a given month, at a production rate of two fuselages a day, there are 10 million holes that need to be filled with some combination of bolts, fasteners and rivets.

"We have planes all over the world that have issues that nobody has found because of the pressure Spirit has put on employees to get the job done so fast," said Cornell Beard, president of the International Association of Machinists and Aerospace Workers chapter representing workers at Spirit's Wichita factory.

Spirit said that it remains "focused on the quality of each aircraft that leaves our facilities." Boeing said it would work to reassure officials that "every airplane that Boeing has its name on that's in the sky is in fact safe."



Spirit AeroSystems sends fuselages by rail from its Wichita, Kan., factory to Boeing. PHOTO: NICK OXFORD/REUTERS

Federal probes

Federal investigators are still trying to figure out what specifically caused an emergency-door plug to detach from the Alaska Airlines jet at 16,000 feet, leaving the MAX 9 flying with a gaping hole. In the wake of the accident, regulators have grounded roughly 170 MAX planes. Airlines are frustrated. Travelers are spooked.

The investigations could take months, though officials have focused their initial efforts on the door plug itself and the bolts and other components that attach it to the fuselage. Alaska Airlines and United Airlines say they have found loose hardware on other MAX 9 jets they have checked, suggesting that problems go beyond one plane.

Both Boeing and Spirit say their staff are cooperating with investigators and ensuring all aircraft meet safety requirements before they return to service.

On Friday, the Federal Aviation Administration said it would increase oversight of Boeing's manufacturing, including an audit of MAX 9 production.

FAA chief Mike Whitaker, who was confirmed to his job in October, said in an interview that an initial examination of MAX 9 problems would extend to other aircraft—and how the agency regulates Boeing production.

"Whatever's happened over the previous years—because this has been going on for years—has not worked," he said. "All indications are it's manufacturing" that led to the Alaska accident, he added, not a design flaw.

Federal investigators with the door plug that fell out of the Alaska Airlines flight. PHOTO: NATIONAL TRANSPORTATION SAFETY BOARD

A few days after the near-catastrophe, Boeing Chief Executive David Calhoun told staff at the Renton, Wash., plant that assembles 737s that they were fortunate that the Alaska pilots were able to save the passengers and the company needed to take responsibility for "our mistake."

He didn't specify what he meant but made clear that whether the problem originated with work done by Spirit or Boeing, Boeing ultimately is responsible for checking planes that leave its plants. At the same meeting, Stan Deal, head of Boeing's commercial airline business, said: "We build the airplane and we have to own it."

It was the first admission that Boeing saw itself as being at fault for the safety lapse and that Calhoun hasn't been able to clean up the company's manufacturing since he took the helm in early 2020. The longtime Boeing director and former General Electric executive was brought in following the ouster of the prior CEO in the wake of the MAX 8 crashes.

At the Boeing all-hands meeting, Calhoun, 66 years old, said he had worried about the Alaska passengers in the seats next to the hole. "I've got kids, I've got grandkids and so do you," he said. "This stuff matters. Every detail matters."

Outsourced parts

Much modern manufacturing has become atomized. From hot tubs to iPhones, machines are built in small pieces by different companies, then delivered to another factory for final assembly. The system has sliced costs from the process by letting production lines maximize output and eliminate waste. But the strategy also stretches oversight and adds risks, since the final product is only as good as the least-good supplier.

"If we're not successful, they're not successful," Spirit CEO Pat Shanahan said in an interview last fall. The former Boeing executive took over as Spirit's leader in October.

Top, the lower section of a door plug in a different 737 MAX 9 awaiting inspection. Bottom, a door plug on a MAX, also awaiting inspection. PHOTO: LINDSEY WASSON/ASSOCIATED PRESS(2)

Boeing is proud of its supply chain. It says it can bring in the best technology from around the globe while reducing costs and maintaining flexibility. A poster in its South Carolina assembly plant features a diagram of a 787 showing what companies and countries supply the various parts.

Yet Boeing executives regularly evaluate whether to move production of major components, including fuselages, back in-house. They opted to build the aft section of the 787 at the company's South Carolina factory.

Calhoun last year shot down suggestions that the jet maker might acquire Spirit after the production flaws from the supplier led to delivery delays. "I don't think you acquire a company to solve it," he said at a press conference last year.

European rival Airbus follows a similar manufacturing approach, sourcing from factories across the globe—including fuselages and other key parts from Spirit. Last year, Airbus faced a major problem with an engine supplier whose metal contamination is sidelining hundreds of Airbus jets worldwide for repairs.

Airbus CEO Guillaume Faury, in a June interview, said the plane maker faces similar risks with its own suppliers—many of which Boeing shares. But he said Airbus has largely been able to avoid major problems with its quality-assurance approach.

Top, Pat Shanahan, now CEO of Spirit AeroSystems, shown in 2019. Above, Boeing CEO David Calhoun, who told workers that the company needs to take responsibility for 'our mistake.' PHOTO: ASSOCIATED PRESS, BLOOMBERG NEWS

"We are quite intrusive on what suppliers are doing," Faury said. "We always have to remain very prudent and very humble—you don't know what could hit you tomorrow."

Boeing doubled down on the outsourcing approach in the 2000s with the 787 Dreamliner, which was the first jet in its history that was heavily designed by suppliers. To lower costs and risks of a new design, Boeing authorized dozens of suppliers to design and build major sections of the 787, including mostly completed fuselage sections. The strategy sped up development of the new model but resulted in production delays and billions in unplanned costs.

In 2011, former Boeing executive Jim Albaugh said that the approach had backfired. "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," he said in an address at Seattle University. "The pendulum swung too far."

The MAX is not a brand-new jet design. It is the latest major version of the 737, a single-aisle workhorse that first entered service in 1968. More than 11,000 737s have been delivered to airlines over the decades. The MAX had new engines that promised to boost fuel savings and range. It entered service in 2017, but was grounded in 2019 and 2020 after the accidents.

The distributed manufacturing system was tested during the pandemic, when factories were short-handed, demand was distorted and transportation was tangled. Those disruptions were acute in the aerospace business. Travel stopped. Planes were grounded. Factories were stalled. Then, the industry struggled to restart quickly enough to meet resurgent travel.

Wreckage in Ethiopia in 2019 from one of two fatal 737 MAX crashes. PHOTO: TONY KARUMBA/AFP/GETTY IMAGES

Spirit itself was hard hit. The company, which had 15,900 workers in four U.S. factories at the end of 2019, laid off thousands of people in Wichita at the height of the pandemic. When it needed to ramp back up, not only did Spirit have fewer people on site, the company had lost years of expertise. There were fewer experienced mechanics, but also fewer experts who could inspect the quality of their work.

Shanahan, the Spirit chief, said the quick production ramp-up and the earlier MAX grounding left the company short of experienced workers. "When you have disruption, you have instability," he said.

Boeing's Calhoun said he has confidence in Shanahan. "I know that Pat knows the seriousness," he said in an interview on CNBC. "I also know he knows how to interrogate a manufacturing process."

Spirit struggles

For more than a decade, Spirit and Boeing battled over costs, quality and the pace of production. Boeing's demands for lower prices left Spirit strapped for cash as managers panicked over meeting increasingly demanding deadlines. Boeing routinely had employees on the ground in Wichita and conducted audits of the supplier.

The result, some current and former employees say: a factory where workers rush to meet unrealistic quotas and where pointing out problems is discouraged if not punished. Increasingly, they say, planes have been leaving Wichita with so-called escapements, or undetected defects.

"It is known at Spirit that if you make too much noise and cause too much trouble, you will be moved," said Joshua Dean, a former Spirit quality auditor who says he was fired after flagging misdrilled holes in fuselages. "It doesn't mean you completely disregard stuff, but they don't want you to find everything and write it up."

His account is included in a shareholder lawsuit filed in December against Spirit that alleges the company failed to disclose costly defects.

A Spirit spokesman said the company strongly disagrees with the assertions and intends to defend against the suit.

Spirit AeroSystems employees with a section of a Boeing 787 made at the company's Wichita, Kan., factory in 2007. PHOTO: BO RADER/THE WICHITA EAGLE/ASSOCIATED PRESS

After being laid off during the pandemic shutdown, Dean returned to Spirit in May 2021. By then, he said, the company had lost many of its most experienced mechanics and auditors.

Spirit already was under more intense scrutiny from Boeing. The jet maker placed Spirit on a so-called probation, in which the company more closely scrutinized the supplier's work. To get off probation, Spirit needed to reduce the number of defects on the line.

At one point, Dean said, the company threw a pizza party for employees to celebrate a drop in the number of defects reported. Chatter at the party turned to how everyone knew that the defect numbers were down only because people were reporting fewer problems.

On the Spirit factory floor, some machinists building planes say their concerns about quality rarely get conveyed to more senior managers, and that quality inspectors fear retaliation if they point out too many problems.

Union representatives complained to leaders last fall that the company removed inspectors from line jobs and replaced them with contract workers after they flagged multiple defects. "This is leaving them with great quality and safety concerns," one of the representatives wrote in an email to union officials. "Also feeling retaliated against for doing their jobs."

The union also has clashed with Spirit over whether machinists should ever be responsible for checking their own work. Workers say having separate inspectors sign off on individual work is critical for quality control; Spirit and Boeing executives say that technological advances have reduced the need for separate inspectors in some cases.

Spirit AeroSystems has been supplying Boeing with fuselages from its Wichita, Kan., facility for years.
A Spirit employee inside a 737 fuselage in 2010, before Boeing started producing the MAX models.
PHOTO: DANIEL ACKER/BLOOMBERG NEWS

Regulatory runaround

Boeing's latest manufacturing mess first came to light after the two MAX 8 jets crashed five years ago. Crash investigators blamed the accidents, which took 346 lives, in large part on a faulty flight-control system designed by Boeing—not production problems.

The ensuing congressional hearings featured testimony from a former production manager at the 737 factory in Renton. U.S. House investigators revealed a memo the manager wrote complaining of production pressures leading to dangerous factory flaws.

"Frankly right now all my internal warning bells are going off," Ed Pierson wrote to a Boeing executive July 19, 2018. "And for the first time in my life, I'm sorry to say that I'm hesitant about putting my family on a Boeing airplane."

Soon thereafter, the FAA launched a probe of Boeing's factory quality and tightened its oversight by revoking the company's ability to perform final safety checks on newly produced airplanes on regulators' behalf. Delegating certain FAA authorities is common in aviation.

In the years since, manufacturing problems have emerged not only in the 737 but at other factories where Boeing makes its 787 Dreamliner, a U.S. military refueling tanker and Air Force One replacement jets, as well as at some of its key suppliers.

As some problems on both the 787 and 737 were traced back to Spirit, Boeing executives said in 2023 that the plane maker would be ratcheting up oversight of the supplier it once owned.

"There'll be some residual activity that we do that is important from a quality-management system," Deal, the Boeing commercial chief, said at a May 2023 press conference. Boeing would bolster training and inspections with more boots on the ground with suppliers, he later said, because that "always becomes an area of risk."

Federal investigations into the exact causes of the Alaska Airlines door-plug blowout could take months. PHOTO: MATHIEU LEWIS-ROLLAND/GETTY IMAGES

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