Boeing Goes Lean
It’s revamping factories to gain an edge against Airbus

Ken Curtindale, a mechanic at Boeing Co. (BA), was once a skeptic but is now a convert. Inside his sanctuary—a vast assembly plant for 737s in Renton, Wash.—the 13-year Boeing veteran has embraced the doctrine of so-called lean manufacturing: Cutting waste, shrinking factory space, and eliminating unnecessary inventory are the basic precepts.

And they seem to work. No longer does Curtindale have to walk long distances to fetch his parts, or travel in the opposite direction to gather his blueprints and tools—rituals that used to wipe out nearly two hours of the mechanic's day. "The parts come right to you in a kit," Curtindale says. "It's made our jobs easier."

Now, the Seattle conglomerate is counting on a lean philosophy to restore its tarnished reputation in manufacturing. While sales and profits are firm and the order backlog is solid, Boeing's manufacturing operations look frayed next to those of Airbus Industrie, its hard-charging European rival. Most of Airbus' designs and operations are just years old, rather than decades.

A gap like that can be disastrous, as Boeing learned in 1997. Amid unprecedented demand for new planes, Boeing tried to double production overnight. But parts-supply problems and a shortage of workers forced the company to shut down its 747 and 737 assembly lines. Some customers fled to Airbus, and Boeing’s commercial-airplane division was smacked with a $1.6 billion loss, even though it sold a record $24.5 billion worth of jetliners.

Nobody wants to dwell on such low points, however. Three years on, Boeing is retooling some of the world's most complex manufacturing practices, while shaking the kinks out of its supply-chain process. Provided it can sell the philosophy to its workforce, Boeing aims to use lean manufacturing to leapfrog ahead of Airbus' assembly practices. The goal: a companywide implementation of gigantic, moving assembly lines—the first of their kind in commercial aircraft history. Such an advance could speed up production by 50% or more and restore profit margins on commercial plane sales to double-digit levels.

INCHING ALONG. Boeing recognized the potential benefits of moving lines as far back as World War II, when the planemaker first tested the method on smaller military planes. But scaling up production proved difficult. It succeeded in late 1999 at its Long Beach, (Calif.) plant by building its 100-seat 717 aircraft on a "pulsed" system—a stop-and-go approach that falls just shy of a moving line. Every six days, a 20-ton cradle pulls the plane-in-progress a step forward through eight manufacturing stations. At top speed, the plant can put together a 717 in 72 days, one-third quicker than the old way. And company officials say that by next year, when the line speed is increased to a continuous half-inch per minute, 20 days is within their reach.

The work leading up to the Long Beach success revealed that factory processes are just part of the challenge. A moving line also depends on engineers creating more standard airplane designs that can be realized with fewer
parts. Better design and preassembly, meanwhile, require tighter integration with suppliers and just-in-time delivery of their parts. Indeed, without suppliers adapting to lean manufacturing, the entire supply chain grinds to a halt. "You have to include the whole enterprise, from raw material suppliers to the finished product, to make 'lean' work," says Dan Becker, Boeing's vice-president for operations.

**AUTOMATIC REFILLS.** Under a lean regime, suppliers also provision the company differently. They spend time on the assembly line with mechanics to figure out more efficient ways to install their parts. Boeing helps out with symposiums, to coordinate schedules with vendors. Suppliers can check the planemaker's master schedule on a Web-based procurement system. When a vendor sees that Boeing's inventories have hit a preset minimum, refills can be dispatched automatically. Some suppliers make their own just-in-time daily deliveries to Boeing's storage areas.

The latest showcase for these techniques is Boeing's Renton plant, which assembles the company's highest-volume model, the 150-seat 737 jetliner. A sweeping view of Line No. 2 at the Renton plant shows the results of the revamp. Just next to a row of old-style slanted manufacturing bays, a 737 is tugged by a yellow winch at a rate of two inches a minute. As the unfinished plane creeps along, mechanics stay tethered to the jet. They never leave what they now call the "circle," which includes the airplane and its assembly cradle. Support people, called "water spiders", flit to and from the circle, delivering parts and tools to mechanics who call for them via two-way radio, or through various visual signals.

Paralleling the main assembly line are more than 30 feeder lines, where components are preassembled. These staging areas have proved to be big savers of time and cost. For example, mechanics used to take 42 hours to install the 204 parts that make up a "mixer bay assembly," which circulates and filters the cabin air through a 737. Today, thanks to the feeder lines, assemblers need to install only 14 parts. And the job is completed in just 16 hours, cutting flow time by 62%.

This is all excellent news for Boeing. But company planners realize that the lean revolution will never get in gear unless the workforce is behind it. That's why managers such as Mary Dowell, who supervises final assembly of Boeing's 737, are striving to make the implementation a cooperative process. Armed with Boeing's nine-point lean guidelines, called *Tactics to Improve Operational Efficiency*, Dowell has spent two years reshaping the factory floor at Renton. She makes presentations at crew meetings, asks for volunteers to work on the moving assembly line, and encourages feedback. "This whole plan was put together by the people who build the airplanes," Dowell says.

**LAYOFFS?** Sounds democratic, but for many of those builders the new approach has a menacing side. For five decades, building Boeing's big birds has demanded a blend of engineering prowess and creative craftsmanship on the part of skilled line workers. The new process standardizes the workers' efforts, shrinking the contribution of each individual. And what happens when Boeing slashes final assembly time from 18 days to 11--and then collapses the three 737 lines into two moving lines in 2002, as planned? "People just don't know if they are going to be there next year," says Mark Blondin, president of the local Machinist Union, which represents 24,000 hourly workers.

Indeed, many workers still fear that "lean" is just another way of saying "layoffs." Boeing has shed some 25,000 commercial-airplane jobs in the past three years--mostly at the expense of hourly workers. "We're all for the company being efficient and selling more airplanes, as long as our members aren't going to lose jobs," says Blondin.

Boeing hopes the problem will solve itself. Sure, it will take fewer workers to make each plane. But there will be more planes to make, as long as Boeing can pass along the lower costs to help win more orders away from Airbus. The productivity improvements that Boeing has already scored support this theory--and they're showing up on the bottom line. Boeing reported first-quarter operating margins of 10% for the first time in a decade. "They're more efficient at what they do," says Merrill Lynch & Co.'s Byron Callan. Adds Boeing's Becker: "Our performance has really turned around."

Operations are speeding up, too. From a snail's pace of two inches per minute, those 737 lines in Renton will accelerate gradually. And over the next five years, Boeing's other plane assembly lines will also get rolling. The final target: to cut in half the current average time from order to delivery, to six months. It's an ambitious goal. But if Boeing hopes to stay ahead of Airbus, it must make lean manufacturing fly.

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