



PHOTO: Boeing is boosting production of all its jetliners, including the 777 line shown here at the Everett, Wash., factory. Production of the 777 will go from seven airplanes per month to 8.3 in the first quarter of 2013. **BOB FERGUSON/BOEING**

The big READY

Commercial Airplanes embarks on epic rate increase

By Mike Barber

From a window above the 777 assembly line in Everett, Wash., Brian Baird, director of 777 Business Operations, paused from a complex production discussion to study the hum of activity on the factory floor below.

Boeing employees, like bees buzzing about a hive, skillfully and methodically were building a new 777. Within and outside the airplane, drawing from banks of parts and tools prearranged and neatly aligned, mechanics, engineers and others conducted an artful manufacturing choreography.

"It is almost miraculous the way we put 3 million parts together to fly safely and efficiently as an airplane at

30,000 feet (9 kilometers)," Baird said, admiring the steady work rhythm.

"It is an incredible feat. Boeing is really, really good at integrating all the systems on an airplane and bringing all those parts together, in sequence, on time. It is humbling at times."

What already is a breathtaking process will become more impressive.

From the supply line to the assembly line, Commercial Airplanes employees are carrying out a historic increase in the production rates of all five major airplane programs. Commercial Airplanes will see a 40 percent increase in manufacturing over the next three years.

The decision to increase production

rates stems from customer demand and market insight. Boeing's 2011 Current Market Outlook foresees a need for 33,500 new airplanes valued at \$4 trillion over 20 years. Key drivers include emerging markets and low-cost carriers. Replacement cycles are under way as airlines favor less fuel-thirsty, more environmentally efficient airplanes. Raising rates also helps Commercial Airplanes address a seven-year backlog and get airplanes to customers sooner.

Commercial jetliners are probably the most complicated mass-produced products in the world. One Next-Generation 737 is composed of more than 300,000 parts, while the 767 and 777 require



PHOTOS: (Above) A 747-8 Intercontinental in final assembly at the Everett, Wash., plant. **BOB FERGUSON/BOEING** **(Far right)** Next-Generation 737 fuselage assemblies arrive by train at the Renton, Wash., plant from Wichita, Kan., for final assembly. Production of the 737 will hit 42 airplanes a month in 2014. **JIM ANDERSON/BOEING**

To respond to the production rate increase and meet emerging needs, Commercial Airplanes since January 2011 has hired more than 5,000 employees and conducted 26 interview and hiring events.

3 million parts. The mighty 747 requires 6 million parts.

Boeing's supply chain handles more than a half-billion parts a year. Across 30 nations, Commercial Airplanes has nearly 1,400 production suppliers, at least half of them small businesses, said Jon Geiger, director of Business Operations for Commercial Airplanes Supply Chain Management & Operations. Supplier Management has nearly 2,600 employees who manage a shifting number of 2,500 to 4,000 suppliers providing parts from around the world.

Ramping up production capacity and capability in a system of that magnitude requires confidence in the production and supply systems.

Boeing's confidence, ironically, stems in part from lessons learned in 1998, when comprehensive rate readiness was attempted unsuccessfully. After a dip in production due to a recession, and supplier consolidations and layoffs, Boeing and its suppliers increased rates up a very steep curve. The strain on the supply chain ultimately shut down assembly lines.

"We got in trouble when we went up

in rate in 1998. Fortunately there is a lot of scar tissue on the organization because of that," Jim Albaugh, president and CEO of Commercial Airplanes, told Boeing investors at a conference in Seattle in May. "We'll learn from those mistakes and get it right this time."

Today, Boeing is in a much different situation, with a healthier supply base and suppliers already in a rate-up situation. The lessons learned from 1998 have evolved into a disciplined system of checks and balances, with production rate decisions integrated across all airplane programs and

the supply chain. Resources are focused on retaining smooth production capacity and capability while avoiding disruptions surrounding rate breaks. Rigorous attention to risk mitigation ensures the right tools, equipment and people are in place to sustain a healthy production system and supply base.

"It is a very dynamic process," said Jenette Ramos, vice president of Operations Supply Chain Rate Capability, Commercial Airplanes Supplier Management. "We are shifting the culture from being reactive to proactive—to one where we seek risks so we can manage them."

Already, airplanes are being built at unprecedented rates for Boeing.

Lean+ practices implemented since 1998, for example, provide the capacity to make rate while enhancing quality and cost efficiency and mitigating waste. A mature Lean+ line is a key reason the Next-Generation 737 program, for example, halved the build time for one airplane from 22 days to 11 days, and why the program recently announced it will increase rate to 42 airplanes a month in 2014.

In addition to Lean+, other significant changes since 1998 that specifically address smooth operations include production rate assessments (PRAs) and strict rate-break rules.

"PRAs were the first steps in lessons learned" after 1998, said Geiger. Teams of specialists evaluate suppliers at all levels, identify gaps and ensure they are filled.

Ramos, who heads an effort to ensure teams are equipped with operational expertise, compares them to referees unafraid to call a penalty.

"It's sort of like playing a game on the field and you have to throw the yellow flag—and you have to be okay with throwing the yellow flag," Ramos said.

Baird, meanwhile, said strict rate-break rules "are heavily integrated across all programs; we didn't use to have that."

The rules prevent more than one program from increasing rate at any given time. For a program to go up in rate, it must select an open window where no other program is breaking rate. A disciplined rate must be maintained for six months before it can be stepped up, with two months' separation from any other program.

To respond to the production rate increase and meet emerging needs, Commercial Airplanes since January 2011



By the numbers

Boeing is boosting production rates for all its commercial jets

- **Next-Generation 737:** From 31.5 airplanes per month to 35 per month in early 2012 to 38 per month in second quarter of 2013 to 42 in 2014
- **747:** 1.5 per month to 2 per month in mid-2012
- **767:** 1.5 per month to 2 per month in mid-2011
- **777:** 7 per month to 8.3 in first quarter of 2013
- **787:** 2 per month to 10 per month by late 2013

has hired more than 5,000 employees and conducted 26 interview and hiring events, according to Boeing Global Staffing, Shared Services Group.

Boeing Fabrication, meanwhile, with 11 sites in Australia, Canada and the U.S., has the strategic capacity for emergent work—making sure parts are available to avoid production delays. The division performs quick turnarounds needed because of redesign, damaged parts or a parts shortage until a supply base stabilizes.

"You really have to be intentional about making these decisions," said Jim Ockerman, director of Business Operations, Boeing Fabrication. "There's a lot of analysis about capability, capacity and tooling to support that rate before

you even start thinking about the people you need in that system."

Like Baird, Ockerman paused to reflect on how meeting the challenge of rate readiness begins and ends with customers.

"If you can visualize millions of pieces coming together through multiple hands all the way until you are sitting on an airplane," he said, "it is an amazing value stream." ■

michael.barber2@boeing.com