# Make it come true

## How sites within BCA's Fabrication Division are supporting the 787

By Deborah Banta Dustman

Using robotics. Machining complex parts. Winning new business through innovative approaches.

These are just a few of the many tactics and strategies that Boeing Fabrication—the largest supplier to Boeing Commercial Airplanes—is following to secure roles on high-potential programs. The most notable of these programs is the Boeing 787 Dreamliner, which has tapped seven Fabrication business units to perform development, test and part-production work.

Fab's role on the 787 program validates its strategy of producing complex, critical and "best value" parts. The division's parts-production work is focusing on areas of excellence with specific manufacturing capabilities. Fab's plan is to invest strategically in these areas so that plant, equipment and skills match up with the critical capabilities Boeing needs to support final assembly.

That investment, along with the skills of Fab's teammates, has led to Fab sites securing work on the 787 program. Here's a look at some of this 787 work. ■

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### AUBURN, WASH.: TOMORROW IS TODAY

The Advanced Metal Structures manufacturing business unit at Boeing Auburn is capitalizing upon robotics and other new technologies and skills to execute its role on the 787 propulsion and fuselage team.

Dave Papenfuss, new product implementation manager for Advanced Metal Structures, said it's as if all of their dreams about the ideal components-manufacturing system—including technology, Lean manufacturing and intellectual property—have come together on the Dreamliner. "That's a fancy way of saying our combined capabilities now provide a competitive advantage that's difficult to beat," Papenfuss said.

This new combination of capabilities will enable the Auburn team to reduce production costs, meet delivery schedules, ensure quality and provide new and challenging work for employees.

Leading their new work is production of the 787 tail cone muffler and aft engine-strut heat shields, set up in Lean cells to make best use of both robotics technology and technicians' skills.

In the tail-cone-muffler assembly cell, technician Sherry Durham will use an 1,800-ton press operating at 1,500 degrees Fahrenheit to form tail cone parts; a carbon dioxide six-axis laser to cut the parts; and a robot integrated with a spot welder to locate and weld parts together to build the 5.5-foot-tall tail cone. "With robots and other advanced equipment we're investing in, I'll be able to single-handedly build a 787 tail cone muffler from start to finish with fully Leaned-out processes," Durham said.

In another production cell, a laser will be used to scribe a complex pattern on maskant (coating) that will define a diffusion bond between two pieces of titanium—eventually becoming part of the heat shield that protects the engine strut from intense heat emitted by engine exhaust.

In final assembly of the heat shield, a cell technician will preload more than 30 "details," or pieces, into a heavy jig, which then will be picked up by two robots working together to load the assembly into the automated cell. The two futuristic "Rosie the Riveters" will then swap out lifting fixtures to complete the heat-shield assembly by drilling and riveting nearly 1,000 fasteners per day—a task that would disable a human worker in a short time.

Beyond robotics, the Auburn Advanced Metal Structures team is embracing the opportunities and challenges of other new technologies. Among them: fine-grain titanium (a new type of material with properties that allow for much better low-temperature forming), friction stir welding and non–tank line processing to achieve special surface treatments.

These new technologies augment the site's highly specialized capabilities of diffusion bonding, laser welding, and superplastic forming—making Boeing Auburn the home of two of the world's biggest


JOE BEAL PHOTO

**Sherry Durham, Advanced Metal Structures assembly cell technician at Boeing Auburn, and a spot welding robot position and weld parts to build a tail cone muffler for the 787 Dreamliner.**

SPF presses. Superplastic forming is a process used to create formed metal parts under conditions of elevated temperature and applied pressure, where material is stretched on dies to obtain the desired part configuration, then trimmed to size.

"We're able to build critical 787 parts that otherwise couldn't be made using conventional methods," said Peter Comley, an engineer in the superplastic-forming Materials & Process Technology group at the site's Advanced Metal Structures site.

Expanded specialty capabilities that support new product development demonstrate the newly nimble posture of Boeing Auburn. In 2003, the site began focusing on emergent manufacturing capabilities to meet rapidly changing customer needs, including specialty manufacturing processes that aren't sufficiently mature in general industry to support time- and cost-critical production.


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**Above: From left, Boeing Oak Ridge 787 lead design engineer Richard Vonhatten and 787 assembly mechanics Joe Moore and Terry Thomas worked together to design, manufacture and deliver the first 787 forward panel support.**

**Left: The 787 flight deck console designed by Boeing Oak Ridge is a monolithic machined structure that offers reduced build complexity, weight and costs, with increased quality.**

## OAK RIDGE, TENN.: DREAMING BIG DREAMS

The Boeing Oak Ridge team has been dreaming of hitting the big time since 1981. Now it looks like they have, and celebrating the site's 25th anniversary this year seems that much sweeter, now that employees have plenty of work on substantial new development programs.

The dream-turned-reality for Boeing Oak Ridge includes a role on the 787. That job was earned by its revolutionary design concept and role as engineering, build and systems integrator for flight deck modules for the all-new airplane.

The airplane's flight deck console houses the "brain and eyes" of the airplane—a key part of the system that enables safe, effective, ergonomic and comfortable airplane operation. The innovative "look and feel" of the 787 flight deck is a major factor differentiating the 787 from other commercial airplanes.

Oak Ridge's innovative design features a monolithic, machined structure assembled using significantly fewer parts. That means reduced build complexity, weight and costs, along with increased quality. Richard Vonhatten, Oak Ridge lead design engineer for flight deck structural assemblies, said other advantages include fewer assembly tools, reduced foreign object debris, a stronger structure and a more flexible design that's adaptable to all Boeing models.

For Boeing Oak Ridge, winning work on the 787 was the catalyst to transitioning site strategy from a "build-to-print fabrication shop" to the strategy of a systems integrator with responsibility for design, build, and electrical control systems integration and test. This role is a significant move up the value chain, helping align the internal supplier with the 2016 Vision statement emphasizing large-scale systems integration as a Boeing core competency.

The Boeing Oak Ridge partnership with the 787 program also paved the way for the site to land other new contracts that fit its integrator strategy. Among these pacts: complex parts production and assembly work on the P-8A, a military derivative of the Next-Generation 737-800 aircraft.

## PORTLAND, ORE.: HEAVY METAL

Parts production for the Boeing 787 is moving at a quick pace at Boeing Portland, which is responsible for manufacturing three complex-components work packages for the world's largest industrial program.

Last August, the Boeing Portland team took on the task of machining a new, high-strength titanium alloy to manufacture side-of-body chords—complex parts that provide structural load-bearing at the primary joint between the airplane's wings and body. Boeing Portland expects to deliver the first shipset of side-of-body chords in August to program partner Fuji Heavy Industries of Japan.

With production on its second 787 work package well under way, Boeing Portland has delivered 100 percent on-time performance on all 10 shipsets of engine mounts to Rolls-Royce and General Electric. The 787 program-propulsion-systems partners will use the engine mounts as part of the test and certification program for engines designed for the Dreamliner.

In June, Boeing Portland started fabricating the first component in its third 787 work package: flap-actuation mechanisms that help move the airplane's wing flaps during takeoff and landing. Boeing Portland's first part delivery is scheduled for August to 787 program partner Hawker de Havilland, a Boeing subsidiary and Fabrication business unit with sites in Australia. ■