

Cell technician George Ruschner verifies the position of a baffle in the 787 tailcone assembly. In an ergonomic improvement, an industrial robot will spot weld the baffles in place. JIM COLEY/BOEING



# You say you want a revolution

An Auburn, Wash., team is bringing breakthroughs to parts manufacturing

By Jeff Wood

**Y**ou probably know how implementing a moving line has eliminated waste and increased efficiency at the Commercial Airplanes factories in Renton and Everett, Wash. But an equally profound innovation is changing the way airplane parts are manufactured at the fabrication facilities in Auburn and Frederickson, Wash.

The introduction of product cells is facilitating breakthroughs in cycle time, quality, material usage, productivity and manufacturing cost. Product cells are mini production lines with all the equipment and resources an operator needs to fabricate a particular part, from raw material to deliverable product. A single operator, called a cell technician, is trained on all the equipment and processes in the product cell.

"Product cells are helping us drive down lead times and they also create new opportunities for technicians and mechanics," said Kim Smith, director of Auburn Machining and Emergent Operations, and Advanced Metal Structures Boeing Fabrication, Commercial Airplanes.

## 'U' GOT IT!

In traditional manufacturing, large, complex machines perform the same operation on a wide variety of part families, according to AMS operations leader Matt Eha. A particular part family follows a complex path through the factory, queuing up at each machine. This can lead to process bottlenecks as costly parts compete with inexpensive parts for processing time on the same machine.

The U-shaped product cells help untangle the flow by taking crucial parts out of the queue. "The key concept of product cells is 'no shared resources,'" said Eha. "Self-contained product cells help eliminate traffic jams, simplify scheduling and make product flows more predictable."

A product cell produces one part at a time at a rate keyed to demand for the product. Working on one product at a time, the cell technician can catch defects immediately and correct the problem at its source before more defects are produced.

## CELL TECHNICIANS IN CHARGE

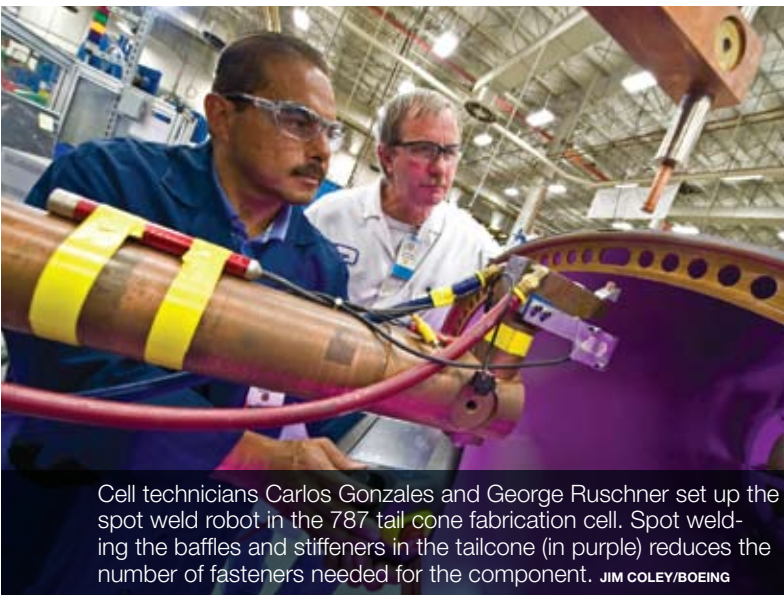
A single cell technician, empowered to perform all phases of the fabrication process and understanding how the cell fits into the overall supply chain, operates the cell. "You have to know how your suppliers work and how your customers are going to use the product," said cell technician Carlos Gonzales.

Cell technician Gerald Roxbury, who's trained to operate multiple cells, said he enjoys the variety. "I can produce several different products in different areas of the building, all in the same day," said Roxbury. "It's fun to work with different product teams and learn more about what goes into an airplane."

Eha estimated that as cellular production expands, fully trained cell technicians will have opportunities to rotate through as many as 20 product cells. "The ability to shift cell technicians increases flexibility to meet variable demand and satisfy urgent requirements," said Eha.

## STRUCTURED INNOVATION

Product cell development is a highly structured team activity involving Manufacturing Engineering, Material and Process Technology, Tool Design, Equipment Engineering and the Moonshine Shop. (From a Lean perspective, "Moonshine" is the practice of resolving issues by creating mockups and performing simulations with inexpensive resources.)



Cell technicians Carlos Gonzales and George Ruschner set up the spot weld robot in the 787 tail cone fabrication cell. Spot welding the baffles and stiffeners in the tailcone (in purple) reduces the number of fasteners needed for the component. JIM COLEY/BOEING

The team uses advanced lean techniques to break the manufacturing process down into a detailed series of steps, or transformations, said AMS support manager Brian Hughey. For example, cutting a piece of raw material to size would be one transformation; drilling holes would be another. "The goal is to simplify the product design and the production process, together," Hughey explained.

With a map of the sequence of transformations, the team identifies "right-size" equipment—equipment that's no bigger and no more complex than is needed for a given transformation. The team then determines whether to build the equipment in house, purchase it off the shelf or purchase and modify. According to Hughey, right-size equipment generally costs less, requires less specialized training to operate and is easier to maintain than general-purpose equipment.

Before obtaining any equipment, the team puts the proposed product cell through a "try-storming" exercise. Using a scale model or full-scale mockup built by the Moonshine Shop, the

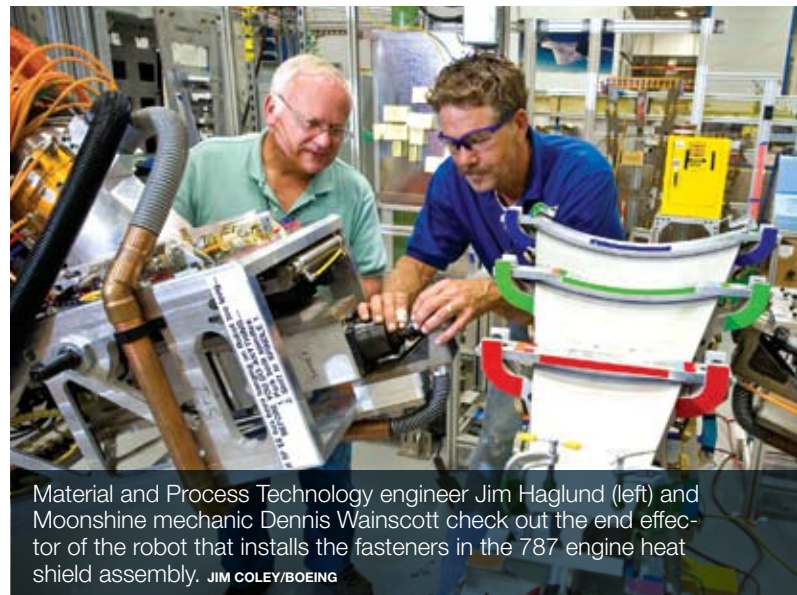
team tries out all imaginable operational conditions—including when things go wrong. "This provides confidence that the new product cell will deliver the promised improvements and that the cell will integrate with supplier and customer processes," said AMS Lean practitioner Leon Schloer.

## MOONSHINE MECHANICS' ROLE GROWS

The Moonshine Shop at AMS has evolved into a process improvement laboratory that serves the Boeing enterprise and even Boeing suppliers, according to Auburn site director Dave Moe.

Originally focused on relatively simple items such as point-of-use carts, bins, and storage racks, the group's experience and creativity quickly earned opportunities to engage in more challenging problem-solving. "At AMS, the Moonshine Shop is central to breakthrough improvement efforts," said Moe. "Today, the Moonshine Shop gets involved in implementing robotic processes and redesigning the production flow for a whole building."

"The collaboration between the technical community and op-



Material and Process Technology engineer Jim Haglund (left) and Moonshine mechanic Dennis Wainscott check out the end effector of the robot that installs the fasteners in the 787 engine heat shield assembly. JIM COLEY/BOEING

erations is key," said Rob Larsen, Technical Fellow with Material and Process Technology. Added Moonshine mechanic Ronald Potts: "It's a real give-and-take between equipment engineers, Site Services and equipment operators to hammer out a solution that works on the factory floor."

Hughey said double-digit improvements are typical. For example, the 787 tailcone cell cut lead time by 66 percent and the number of units in production by 80 percent. "The breakthrough improvements in lead time and cost have helped AMS win competitive bids for parts production contracts," said Hughey. "Product cells and integrated lean improvement teams are making it possible for the Auburn fabrication facility to take on new business while meeting customer expectations for existing products." ■

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