



737 Empennage Mechanic Samuel Mezgebu installs an antenna on a vertical fin. The new 737 vertical fin production line “pulses” forward every six hours.

A LEAN tail tale

737 empennage team prepares for moving line

By SANDY ANGERS

The phrase “moving your tail” took on new meaning as employees who assemble the empennage of 737 airplanes in Renton, Wash., recently completed the first phase of a Lean transformation.

The goal of the transformation is to build the vertical fins and horizontal stabilizers for the 737’s empennage, or tail section, on continuously moving assembly lines, a hallmark of a Lean production system.

The first step, said former Empennage General Supervisor Mark Blakeley, was to eliminate fixed tools that held the parts during assembly. “This initial step was to incorporate a fundamental Lean philosophy: Make the product flow, not the people,” he said.

Vertical fins and horizontal

stabilizers used to sit on stationary tools in no particular order as employees moved from position to position, bringing along their tools and equipment.

By implementing Lean manufacturing techniques such as staging parts and equipment at the point of use and by redesigning how the products flow through the area, employees have reduced assembly time and the number of tools required.

Today four tools hold the vertical fins; that’s down from six. Meanwhile, the number of tools needed to accommodate the horizontal stabilizers has been cut from eight to six. Stabilizers are built up in three days instead of five, and later this year vertical fins will be built in four days rather than five.

All tools are on wheels and both lines are now sequenced in straight lines, which move in a pulse fashion every six hours. Everything mechanics need—tools, equipment and support personnel—is located nearby. The goal, Blakeley said, is to treat the mechanic like a surgeon in an operating room.

The dimly lit 737 empennage area also

What's new

Teammates who assemble the empennage of 737 airplanes in Renton, Wash., recently finished the first phase of a Lean transformation. Here's a look at some of the changes that have supported improvements and increased efficiency:

- **Make the product flow.** Instead of having workers move around fixed tools that hold horizontal stabilizers and vertical fins, these tools now are on wheels and move in a line to mechanics. That reduces the number of tools needed. This arrangement also helps mechanics by permitting whatever they need—tools, equipment and support personnel—to be stationed nearby.

- **Improve the work area's appearance and layout.** The work area floor is now white, which reflects light and improves visibility. A new overhead utility rack with swing arms feeds power and hydraulic cords into each position—and eliminates cords on the floor, which were trip hazards.

- **Work with suppliers to improve packaging.** Empennage teammates are working with certain suppliers to modify shipping containers. The goal: to unload parts directly into the production area.

received a makeover. The area is brighter, clean and more organized. The floor under the empennage tools has been painted with a white epoxy designed to reflect light and improve visibility. A new overhead utility rack with swing arms feeds power and hydraulic cords to each position. The utility rack eliminates cords on the floor, which were trip hazards.

“The changes have made everybody's job easier,” said Doug Newkirk, who seals stabilizers and fins. “Everything we need is right here, and the area is bright and easier to keep clean.”

Team leader Tim Davis likes the new, organized layout. “The parts have a more direct route into and out of the area, and it's easier to find what you're looking for,” he said. “I think it's a better area to work in.”

The redesigned look and layout of the empennage area also is helping employees who support production.

“I can recall times when Tooling folks picked up the wrong fin, or quality inspectors had a hard time figuring out which part was ready for inspection because the parts weren't in a sequence. Obviously those kinds of issues go away, because it's easy to see which part is complete and ready for inspection or pickup,” Blakeley said.

The Tooling employees and others who support production not only benefit from the change, but they play a part in it as well. Dave Hagen, 737 Empennage manager, said

the Tooling organization is now staging tools and parts right next to the production line.

“That's been a big benefit. Often we would call for parts and then wait and wait while they were being retrieved from across the manufacturing site,” Hagen said.

Suppliers, too, are playing an integral part in the empennage transformation. For instance, suppliers ship rudders in huge wooden containers. Tooling employees then remove the rudders from these containers and put them on dollies to transport them into the production area.

Empennage employees are working with the rudder suppliers to modify the shipping containers so the parts can be unloaded directly in the production area, eliminating transportation dollies, multiple handlings and the potential for damage during transportation.

The Lean transformation has also meant moving some processes out of the building. One example is the assembly of the dorsal fin fairing, which attaches to the vertical fin.

Employees used to assemble the dorsal fin next to the empennage in Renton's 4-20 building, and then send it to the nearby 4-86 building to be painted. From there, employees would deliver the dorsal fin to the 4-81 final assembly building for installation onto the airplane. The whole process used to take six days: three for assembly, one to move the dorsal fin from the 4-20 building to the 4-86, and two for paint.

Today, the dorsal fin is built up and painted in the 4-86 building and then transported to the final assembly building for installation, eliminating a day from the process.

All these changes are designed to eventually support continuously moving production lines, and customer demand will determine the rate of movement, also known as takt time. The target for implementing the moving lines is early 2007.

Now that the new 737 vertical fin production line “pulses” forward every six hours, employees are preparing to implement a continuous moving line.

“When we achieve the goal, it will mean the manufacturing process will have dramatically changed from stationary positions to moving lines within a span of eight months. It's amazing, when you think about it,” said Blakeley, who now is charged with spreading the Lean transformation to the wing assembly area. “Everybody is focused on flow time reduction, which drives you to process improvement, reducing costs and improving quality and safety.”

Hagen also points out that the Lean efficiencies have allowed the Empennage area to increase production rates without having to add more people. More important, they have made the organization more competitive today and for the future.

“At one time there was consideration for moving some processes to external suppliers, but plans changed because of our increased efficiency,” Hagen said. “Although I know there are no guarantees, the work remains, and that has been a big hit with employees.” ■

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