Determined to find a better way

In this Lean assembly idea, implemented on the 777 line in Everett, the part becomes a tool

By Chuck Cadena

"Chance favors the prepared mind." That phrase, widely attributed to 19th century chemist Louis Pasteur, proved true for two Commercial Airplanes employees who leveraged an opportunity to apply Lean principles to improve 777 manufacturing.

James Stockard and Jon McKenzie, who work in Manufacturing Engineering at the Everett, Wash., facility, both had the idea of applying a process called determinant assembly to improve the assembly of 777 floor grids. McKenzie had the idea from his previous work with floor grid assembly on the 767 Program. Stockard began considering determinant assembly when he purchased a bookshelf that was ready to assemble out of its box without the aid of tools.

"I thought if it can be done with furniture, why can't we do this with airplanes," Stockard said.

Determinant assembly is a process that allows for quicker assembly by using features of the parts, such as drilled holes, to quickly align components without the use of additional tooling to aid with alignment. Lego toys or an Erector set are simple examples of determinant assembly.

'WE WENT FORWARD IMMEDIATELY'

Stockard and McKenzie had an opportunity to use their ideas when their group was asked to support the relocation of 777 floor grid tooling, which was in an area that will eventually be used for 787 production.

"We didn't wait for someone to ask us about our ideas," McKenzie said. "We went forward immediately with a detailed plan that included a favorable cost analysis."

The cost of the proposed improvements was relatively small compared to the benefits. By having some holes predrilled by the supplier and replacing outdated machinery, 777 floor grid assembly and installation was significantly transformed.

One idea improved the way seat tracks are attached to clips on the floor beams. Previously, the holes necessary to attach seat tracks to the clips were hand drilled after the supplier delivered the floor beams. Because employees had to do this work while the floor beams were loaded vertically in a three-story tooling structure, it was time-consuming and prone to error if the equipment was out of alignment. It also required employees to work in awkward positions.

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> —James Stockard, with Manufacturing Engineering, on applying a process called determinant assembly

Stockard and McKenzie proposed a straightforward solution: Have the suppliers drill the holes in the floor beam clips and mate seat tracks prior to delivery. This allowed for quicker assembly of the floor grids, eliminated the need for the massive tooling structure and improved ergonomics for mechanics assembling the floor grids.

"The changes made the work much easier," said Mike Shannon, a lead mechanic in the group that assembles the floor grids. "The old way required a lot of prework to load the detail parts of the floor grid and drill the holes."

With the need for a tooling structure eliminated, the 777 floor grid work was combined in the same area where 767 and 747 floor grids are assembled. That allowed the team to make an additional improvement by replacing an outdated numerically controlled machine with a newer one to drill floor panel holes into the seat tracks before they are attached to the floor beams and installed in the airplane.

"By predrilling the holes, it allows the mechanics more time to work on the airplane," McKenzie said. "We eliminated the need for them to exit the airplane and wait while a portable (numerically controlled) machine was put on the airplane to drill holes into the seat tracks after they were installed with the floor beams."

To make their ideas work, Stockard and McKenzie held workshops and collaborated with cross-functional teams within Boeing and the suppliers. They admit to meeting some resistance initially to the proposed changes. "Moving away from tooling was a cultural shift," Stockard said. "A lot of people had to stretch to make this happen, including Jon and me."

As Stockard and McKenzie's ideas proved successful, the idea of applying determinant assembly began to win acceptance. "I was skeptical at first," said Shannon, who helped develop the new assembly method. "But that changed over time as I saw how much the change improved the way we work."

Stockard and McKenzie's ideas have visibly transformed the efficiency of 777 floor grid assembly. One example: The square footage required for the new 777 Accurate Floor Grid–Determinant Assembly Process is less than one-fourth the square footage of the previous method.

"We found a better way that contributes to the overall effort to transform 777 manufacturing," Stockard said. "With determinant assembly, the part becomes your tool. Essentially you are using a new tool, in the form of the part, each time you assemble them. Quality improves because the fit is right each time, assembly is quicker and you save money because you have no tools to maintain." ■

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The new 777 Accurate Floor Grid–Determinant Assembly Process provides mechanics easier access during assembly. Here, mechanics Mike Sheary (left) and Dana Dowell assemble 777 floor grids.