

Never missed a beat

How the F-15 team modernized its factory without disrupting production of this fighter jet

By Kathy Cook and Terence Williams

Perhaps the one thing more challenging than building and delivering F-15 fighter aircraft to air force customers worldwide is to do so while radically modernizing the factory where the aircraft is built.

Yet the F-15 team in St. Louis did exactly that: In a major project that took a mere 11 months and ended in December, the team revamped the aircraft's entire production line and equipment to speed production, cut costs and boost competitiveness—all while maintaining a stringent schedule to build and deliver 24 F-15s to the Republic of Singapore. Their story exemplifies how Boeing teams can use the Lean+ growth and productivity initiative to meet performance goals.

"The F-15 is a great aircraft," said Mark Bass, vice president, F-15 program. "Customers across the globe want the capability it brings to their air forces. But we're always looking for ways to reduce its cost to make it even more attractive. The top priority while making these changes was to make sure we delivered high-quality aircraft on time."

Toward that end, the team, led by High Performance Work Organizations, took lessons from St. Louis' F/A-18 assembly team, which had already transitioned to a more efficient setup known as a pulse line. (An HPWO is a group of co-workers who are responsible for a common function or product, share common goals and exercise self-determination in continuously improving the quality of their output and the efficiency of their processes. The teams are part of Boeing's employee involvement and engagement efforts.) They even borrowed one of the key architects of that project, Doug Cook, an industrial engineer who was able to help them accomplish in essentially one year what took two years on the F/A-18. The C-17 team in St. Louis, which makes seven major assemblies for this aircraft, also helped by giving up storage space. That gave the F-15 crew ample room to set up the new pulse line.

In the F-15 team's old configuration, work was not divided evenly among stations; tooling was duplicated at various positions on the line; and the aircraft had to be moved by crane



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between tooling frames. By contrast, the new pulse line divides work evenly between 10 stations; the tools and parts at each station are unique to that station; and the aircraft is moved while within the frame. (The frame includes a floating sled base to allow for easy movement.)

The biggest change was to the shape of the assembly line itself—from a U to an L—which reduced the number of crane lifts and made it easier to maneuver the center fuselage through the line.

Thanks to their actions, the team met the plan’s goal for reducing the time the aircraft spends in each of 10 workstations (beginning with the aircraft’s center fuselage) to 18 days, a 25 percent improvement. In the new configuration, once a jet moves into station 1, it goes through the pulse line without stopping.

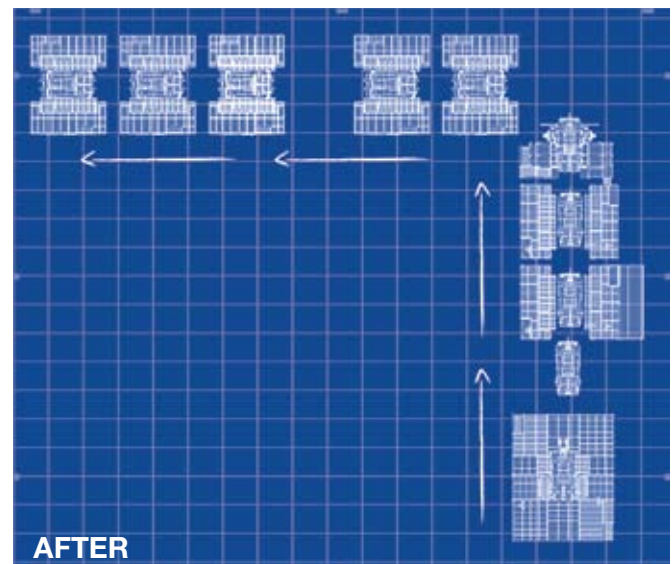
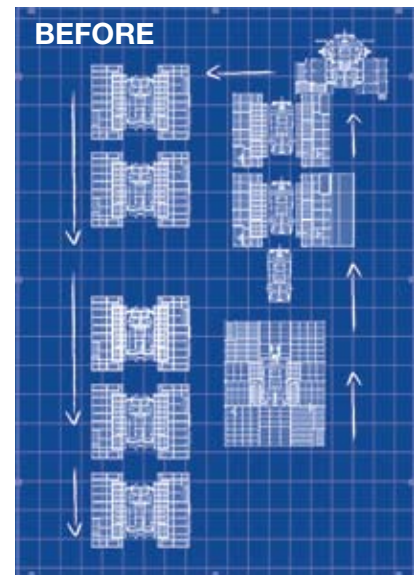
The value of a pulse line comes from its consistent work flow: Assembly work is performed continually, unlike the old system, where an aircraft could sit idle at one position while work was completed at a previous position.

One challenge in setting up the new pulse line was that the work had to be completed backward, in a sense, according to Cook. “Ideally, when you do something like this, you’d like to build station 1 first, then 2 and so on,” he said. But space constraints meant they had to build stations 8, 9 and 10 first “because that was the area we were able to clear out first.”

Lean+ integrator Rich Schilf said this change is just one part of a larger effort to streamline the F-15 line and continually improve both the quality of the product and the safety of the work area. Other efforts under way include changing to monolithic parts, changing from sheet metal to machined parts, redesigning tools and work areas to be more ergonomic, using lasers to better align parts and working with suppliers to reduce lead times. ■

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The diagrams above depict the path of the F-15 line before and after its recently completed modernization. The top diagram shows how the assembly had to undergo a tight U-turn; the above diagram reveals how the turn is now in an L-shape, which helps cut time and costs.

PHOTO: The F-15 program’s work in revamping its factory configuration while staying on its production schedule shows how Lean+ can help Boeing teams meet performance goals.
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