

# Crafting the



Building a great jet fighter requires the right mix of automation and highly skilled workers **By Kathy Cook**

**A**s a final assembly mechanic on the F-15 Eagle, Bret Nelson is one of the many Boeing men and women who employ “good ol’ fashioned craftsmanship” to help build this advanced jet fighter that can fly almost three times the speed of sound.

“Building the F-15 is more like building a Rolls-Royce,” Nelson said. “It has to be. It goes close to Mach 3, so everything must be looked at very closely.”

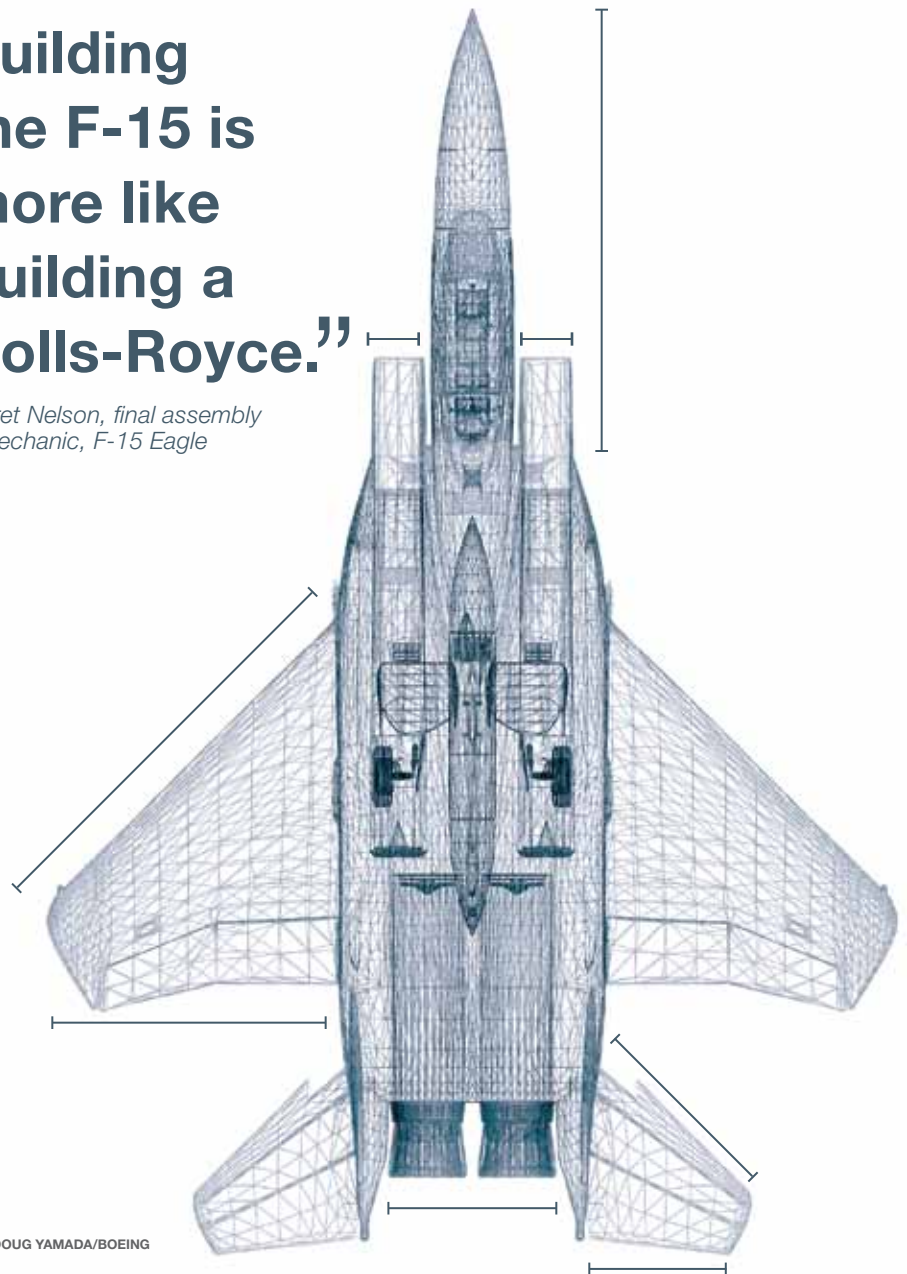
One of the longest-running production lines at Boeing, the F-15 first came off the line at Boeing’s St. Louis facility in 1972. More than 1,600 of the jets have since flown for the U.S. Air Force as well as air forces in Israel, Japan, Saudi Arabia, Singapore and South Korea.

“If a segment of the manufacturing process can best be carried out through automation, such as drilling several holes in a precise formation to a certain depth, we use automation,” explained Dan Schell, director of Assembly and Delivery Operations. “But we also depend on highly skilled artisans. That means people,” he said.

Indeed, the human element is critical in building this complex, technology-packed jet fighter. “Because of what the plane has to do, the designers had to make it light and strong; it requires a lot of small parts. It’s like doing a puzzle—you need hands and eyes to put it together the right way,” said George Louis, sheet metal assembler and riveter on the F-15 aft assembly line. Some of the work areas are so small, according to Kendall Perry, subassembly sheet metal assembler and riveter, there isn’t even room for a machine.

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— Bret Nelson, final assembly mechanic, F-15 Eagle



GRAPHIC: DOUG YAMADA/BOEING

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– Ron Steward, F-15 Quality inspector



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**PHOTO:** Electrician Barry Betz heat shrinks protective wrap over an electrical splice in an F-15 aft fuselage. PETER GEORGE/BOEING



**PHOTO:** Quality inspector Ron Steward checks F-15 assembly work. PETER GEORGE/BOEING

“When I think of what I bring to the F-15, I think it’s the integrity of the aircraft,” Nelson said. “Everything has to fit just right. There are a lot of components in a small space. As a mechanic, we utilize many tools to perform a great many functions. As we install, we check fit and clearances, adding that human factor, bringing quality to the final product,” he said.

“We certainly have new technology—lasers, power-assisted tools; we have programs in the computers that help us,” said Ron Steward, F-15 Quality inspector. However, “More skill goes into building an F-15 than other types of products. It’s not a ‘snap-together’ product like a car. The F-15 requires a lot of skill in making sure everything fits and works together. If you can build an Eagle, you can build anything.”

The F-15 line includes five shops where workers assemble parts into complex sub-assemblies that ultimately become part of larger sections of the aircraft. The subassemblies feed teams who build the fuselage frame before workers move on to the ‘skinning,’ or fastening the metal skin of the aircraft over the framework.

That work goes beyond assembly to include dozens of hours of training, with annual refreshers for critical tasks such as fuel operations or installing pyrotechnics.

As the F-15 has evolved, Boeing also has evolved its manufacturing. Key to these improvements has been input from the people who build it every day.

A primary source of ideas to improve and refine manufacturing processes has been High Performance Work Organizations, or HPWOs. These are groups of co-workers who are responsible for a common function





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or product, share common goals, and who are committed to continuously improving the quality of output. “HPWOs are responsible for a wide range of innovations on the shop floor that go beyond how to safely build the jet and touch on how to improve the capability of the Eagle,” said Andy Stark, superintendent of the F-15 center fuselage line.

“Thanks to HPWOs, we’ve taken the ‘I’ out of it, and now it’s ‘we.’ It’s about the team. It’s more personal, like owning our own business. With ownership, you want the best quality product for your customer,” said Ada Turner, sheet metal assembler and riveter and lead on F-15 Center Fuselage.

“We couldn’t build this plane without the knowledge of our assembly workers,” said Bill Richards, F-15 Final Assembly superintendent. Added Schell: The use of technology where it makes sense, plus “a well-trained and experienced work force, combined with standard work instructions and strict disciplines, results in the high-quality, high-tech products our customers have come to expect from Boeing.”

Don Rogers, superintendent of Flight Operations in St. Louis, sums it up best: “It’s the people who make the Eagle the great plane it is.” ■

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**PHOTOS: (Top)** A Strike Eagle from the U.S. Air Force’s 48th Fighter Wing.

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**(Above left)** Ada Turner, sheet metal assembler and riveter and lead on F-15 Center Fuselage, performs drilling operations. PETER GEORGE/BOEING

**(Above right)** Sheet metal assembler and riveter Matthew Nicol inspects an F-15 under construction. PETER GEORGE/BOEING

**(Right)** Assembly mechanic Sean Koh prepares F-15 structure for skin panels at the Installation and Test Station.

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