

# 'I had a role here'

F-22 Raptors receive flight-line checks at Elmendorf Air Force Base, Alaska, which becomes the aircraft's second operational base starting this month. The cutting-edge fighter got where it is today not just by technological leaps and bounds but through day-to-day improvements suggested by employees who assemble its Boeing-built components.

ERIC HEHS/LOCKHEED MARTIN PHOTO



## The F-22 team gets involved in finding safer, leaner ways to assemble Raptors

BY DOUG CANTWELL

It started when a couple of F-22 aft fuselage technicians noticed they were tripping over cords and air hoses in their assembly area. Thinking of how the do-it-yourself carwash hangs hoses from a swing arm, they wondered, "Why not here?"

They brought up the idea at the next staff meeting and were surprised to find their

manager not only agreeing with their idea but acting on it. It set in motion wheels of progress that have been rolling ever since.

"As more people saw this happening, it became almost infectious," F-22 Operations Director Jeff Stone said. "It did wonders for morale when they saw major responses to their suggestions on how to make their jobs easier and the manufacturing process more flexible."

Employees want their voices to be heard and their thoughts valued. That's the case on the F-22 Raptor line, where assembly technicians have come forward with ideas on how to streamline production and improve safety on the floor—and their managers have responded. As a first-tier partner in the F-22 program, Boeing builds the wings and

aft fuselage, integrates the avionics, has the lead on pilot and maintenance training and provides a third of the sustainment.

Not only does an involved team tend to take a more active role in improving processes, but employee involvement also plays a key part in the application of Lean principles—as well as the support of Lean+, one of four companywide growth and productivity initiatives. Stephen Bressler, Employee Involvement manager for IDS Puget Sound, said Lean came before Employee Involvement, "but when managers here first tried to implement Lean, they found people needed to learn how to work together before they could effectively apply the principles."

So they introduced the Employee Involvement program, in which an identifiable

crew advances toward the objective of becoming a Stage 4 High Performance Work Team. Put simply, an HPWT forms an identity at Stage 1 of the EI program, develops decision-making and communication skills in Stage 2, acquires the skills to continually improve its processes in Stage 3, and becomes essentially self-directing within its boundaries when it reaches Stage 4.

Dave Pouliot, manager of the F-22 Assembly Center, can't say enough about the HPWTs. "They've empowered the teams with the tools and understanding to work the Lean activities that make their jobs easier," he said. "The cost and quality numbers show that they're delivering in spades." In fact, 13 of Pouliot's teams are among the 41 Integrated Defense Systems groups in the Puget Sound region that have achieved Stage 4 status.

Here's how three HPWTs have made a difference for the Boeing F-22 team.

### THE 'RAPTOR CHALLENGERS'

"Everything here is constantly evolving," said Chris Barger, special projects mechanic and leader of the "Raptor Challengers" HPWT. Ten years ago, each crew member still carried his or her own tools in a pri-

ivate toolbox—until Boeing provided company-owned tools. When the team adopted the "point of use" Lean concept, it elected to get rid of all unused tools and brought the needed tools up "on deck," put them in boxes that have exact-fit cutouts showing where each belongs and whether it's missing, and displayed them out in the open for immediate visibility. Currently, the team is working on eliminating more unused tools and bringing fasteners and other parts up on deck for greater accessibility.

One of the problems that compelled the team to lean out its processes was "stick-building"—laying up an entire wing from basic, incremental parts at a single work position. Barger proposed and rigged a mockup tool that would allow layup of sub-assemblies, such as the trailing edge components, so the large tooling could be saved for joining subassemblies faster—rather than stick-building entire wings at a much slower pace.

The team has reaped the benefits of its bright ideas. The "Challengers" recently set a record for assembling 30 consecutive wings on schedule and under budget with no "traveled" work—uncompleted tasks left to be finished down the line by another team.

### THE 'P5 CLOSERS'

Debbie Johnson, sealing specialist and a member of the P5 Closers HPWT, recalled her success in bringing an idea to life on the floor. She and her colleagues often work with large and cumbersome sealant guns that challenge them ergonomically, especially when they have to work on the undersurface of the wings.

One day they'd gotten tired of grumbling about their aching shoulders, so she sketched out a concept for a wheeled platform that would use hydraulic pressure to elevate the gun until it met with resistance, then hold it firmly against the resisting surface.

"I told my manager about it, and he said run with it," Johnson said. "So I took it to MR&D, and they totally came through."

MR&D, or Manufacturing Research and Development, stands at the ready to work up employees' ideas for ergonomic and/or safety aids, as well as to streamline assembly or mistake-proof a process. They produced a prototype of the rolling hydraulic platform in less than 48 hours, and today the entire crew is outfitted with them. As an afterthought, they've added a mirror to the top of the structure that allows sealers to see where they're injecting sealant



Special Projects Mechanic Chris Barger (left) leads the "Raptor Challengers" High Performance Work Team. Here Barger and fellow mechanics Ron Robertson (center) and Linn Smith lay up a trailing wing edge using new streamlined tooling proposed by Barger. MARIAN LOCKHART PHOTO



Richard Merritt (under wing) of the “Patriots” team said teamwork and morale have improved since High Performance Work Teams were implemented. Here, Merritt and teammates Michael Wright (left) and Jerry Hess put the finishing touches on an F-22 Raptor wing before it gets crated for shipping.

MARIAN LOCKHART PHOTO

without squatting down and bending their necks at an uncomfortable angle.

As an HPWT that’s attained Stage 4, the Closers are considered self-functioning. As Johnson said, “no one has to step in and make decisions for us.”

### ‘THE PATRIOTS’

“The buck stops here,” said Richard Merritt, team leader of “The Patriots,” the wing final assembly HPWT. The team has 10 days to complete a wing, which includes finishing any “traveled work.”

Merritt said the HPWT initiative has improved things. “We’ve become true team players,” he said. “We no longer think in terms of ‘my job, his job, her job.’”

He cited the “choreography” of final assembly: moving the wings between work stations as they approach the end-of-the-line area where they get crated for shipment. The Patriots had found they were losing minutes by moving wings singly and without an overall synchronizing.

So at their next meeting they agreed they’d move the wings at all three work stations in unison during the last half hour of

the shift. “That way,” Merritt said, “we’d keep it all in synch and make life easier for the swing-shift guys by having the wings set up, ready for them to go to work.”

As for work safety and ergonomics, Merritt recalled getting mobile carts that allowed them to work on the undersides of wings without hunching over or craning their necks. “They were a godsend and saved our backs, but the wheel design made them unstable, so we put our heads together and figured out a better configuration.”

Once again, at MR&D their idea got nearly instant turnaround. “Those guys replaced the single wide wheel with a pair of narrow ones, and it made all the difference. Now we’re not distracted by the threat of possibly rolling the carts over while we’re working,” Merritt said.

Another way the Patriots have improved their flow time is by assigning one of their members to be “problem solver” during the shift. This person’s job is to pull himself off whatever he’s doing and attend to any problem that arises. “It used to be a half dozen of us would all stop, wander over and give our opinion,” said Merritt, “which ate up time

and didn’t usually solve the problem.”

These and other changes resulting from the HPWTs have cut lag time enormously, Merritt said. Instead of 1,500 hours to get a pair of wings through final assembly and out the door, “now we’re down to 640,” he said, “and still trimming.” The HPWTs have also had a major impact on morale. “We get along with each other really well these days,” he said, “and as a result, nobody wants to leave here.” ■

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### It’s our future

Actions cited in this story show how employees are applying concepts of the Boeing Management Model to support the company’s business strategies. Here’s how.

- **Growth and productivity: Lean+ continuous improvement, through engaged and involved employees.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.

# What's in your jar?

## F-22 Assembly Center manager explains link between Lean+ and employee involvement

One might describe F-22 Assembly Center Manager Dave Pouliot's spare, wiry appearance as "lean"—which is fitting, since his Seattle-based teams have earned recognition for leaning out their processes and work spaces.

Pouliot has a unique way of demonstrating how Boeing's Employee Involvement program helps keep Lean+ initiatives in motion once they've been rolled out and implemented.

He produces a gallon jar from a shelf in his office, then fills it with egg-sized rocks from a bucket. These are the big cost-reduction initiatives, he says, the multidisciplinary measures that cost megadollars and take months to implement.

"So is the jar full now?" he asks.

Well, sure, you say.

"Is that all we can do," he asks, "to cut waste and streamline manufacturing?"

Pouliot then produces a bucket of white sand and fills the jar with a lot more sand than you'd have guessed could go in there.

"Think of the sand as employee involvement: the individual initiatives we can take on a day-to-day basis to lean-out our workspaces—either by reducing clutter, mistake-proofing a task, improving safety or storing tools closer to their point of use," he says.

Pouliot was not through with the jar. He held it aloft and asked, "What do you see now?" A jar full of sand, you say—though a minute ago you'd have sworn it was a jar full of rocks. His point: It's surprising to find out how much room

is left for the little day-to-day measures we can take individually, yet these actions are the most tangible and the most visible improvements we see in our workspaces.

But wait. He begins pouring in a 20-ounce bottle of water. You're startled to find that there's still room in the jar for all of it.

When Lean activities first came to Boeing, Pouliot recalls, he went along with the program, got his teams trained and convinced them of their value. "Then we said, 'OK, we've got this Lean thing done; now let's go build airplanes.'"

His point in adding the water to what seemed to be a full jar, however, is that the Lean and Employee Involvement activities are by nature ongoing pursuits.

As an example, consider the team's "Give the Factory a Bath Day" tradition. As team members closed out their results for 2005, Pouliot recalls, he felt confident that they'd leaned out

their workspaces and removed all clutter. Yet data from Boeing's annual employee survey caught him by surprise: Nearly 20 percent still claimed that their workspaces were not "safe and free from hazard" or "not well organized."

So he rolled out a new tradition: "Give the Factory a Bath Day." The team was allotted a half shift to gather anything that cluttered its members' respective areas. The first "bath" yielded 2 1/2 semi-trailer loads of clutter; the second, six months later, filled 1 1/2 trailers; the third, 2/3 of a trailer. The fourth and most recent still required two cubic-yard tubs.

But Pouliot intends to continue holding "bath" days. "We'll shift the focus from here on to concentrate more on the five S's (a five-component Lean+ process for maintaining workspaces)," he said, "but the tradition is here to stay."

—Doug Cantwell



F-22 Assembly Center Manager Dave Pouliot (right) fills a jar with rocks and sand to help illustrate that employee involvement and Lean improvements are continuous processes. Watching are teammates Gary Christenson (left) and Annette Williamson.  
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