

Lean power, all around

Propulsion value stream contributors implement Lean improvements

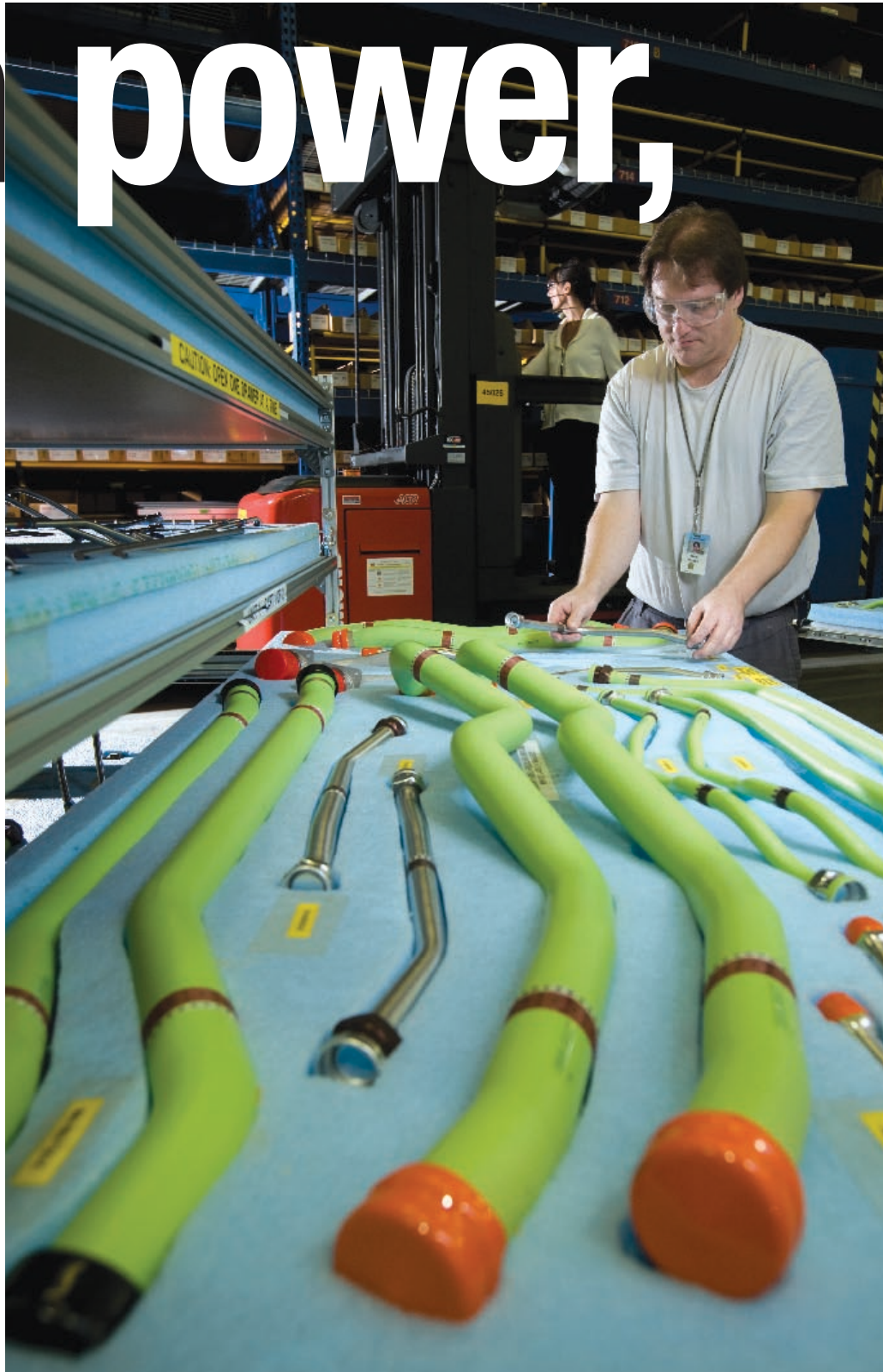
By DEBBY ARKELL

An Engineering team in Seattle uses employee involvement and high performance work team methodologies to create a collaborative, open work environment. A group in Boeing's Tube, Duct and Reservoir Center in Auburn, Wash., creates a parts "supermarket" and begins kitting parts for its customers. And a team in Winnipeg, Manitoba, adopts work cells with moving-line elements into its manufacturing processes.

Propulsion Systems is one of many groups at Boeing that are successfully encouraging and partnering with internal and external suppliers to tackle Lean improvements in support of the Boeing Production System. And suppliers are choosing the methods that work best for them. This activity supports Boeing's Lean+ and Global Sourcing company-wide growth and productivity initiatives.

"Improving performance throughout the value stream and increasing customer satisfaction are at the heart of our activities with Airplane Programs as we transform the Boeing Production System," said Sandy Postel, vice president and general manager, Propulsion Systems. "It's fundamentally important that customers and suppliers work together on continuous improvement."

Indeed, Propulsion Systems has already begun its transformation. Late last year, a Propulsion Systems team moved "shipside" to the Boeing facility in



ED TURNER PHOTO

Dan Rozek (foreground), material process requirements facilitator at Boeing's Tube, Duct and Reservoir Center, finishes assembling a tube kit for 747 strut assembly as Sheila Garcia picks parts from the "supermarket." The TDRC now stores and kits parts for Propulsion Systems as part of a pull-production system.

Renton, Wash., to build up engines alongside the 737s on which the engines will be hung (see Page 24 of the August 2006 *Boeing Frontiers*). Another team is in the midst of moving to Everett, Wash., for similar work on the jetliners assembled there.

“We’ve seen a lot of benefit from our move to Renton, and we’ll see even more once our other crew moves to Everett,” said Ken Balls, Renton Value Stream leader. “By building engines directly in line, we no longer have wait time between shifts, as we’re able to get our engines over to Final Assembly as soon as they’re done.”

This time savings means that having suppliers provide parts only when needed becomes increasingly important. The following stories spotlight a few of the Lean+ improvements in the propulsion value stream—with tremendous results.

SUPPLIER BY DESIGN

Propulsion Systems Engineering has had a Lean plan in place for nearly five years. “We’d begun Lean+ in the factory, but we were grappling with Lean in the

office,” said Vince Robel, Propulsion Engineering Systems leader. “In Operations you can time transactions with a stopwatch click. For Engineering, it’s harder to show that value.”

To apply Lean concepts such as standard work and apply them to engineering processes, the engineering team began focusing on employee involvement and High Performance Work Teams. EI encourages collaboration and innovation in teams; HPWTs develop specific skills for effectiveness in setting, pursuing and achieving common goals.

Robel’s plan included facilitator-led training that teaches his employees to operate as a team. Employees learn how to make decisions, take ownership of the business, and apply Lean+ to accomplishing their specific work statement—and develop a mentality of continuous improvement. Ultimately the teams began using metrics to guide continued improvements, advancing HPWTs through four stages of proficiency. More than 80 percent of Robel’s teams are now in HPWTs.

What’s helped boost Lean+

What’s been helpful in getting teams supporting Propulsion Systems to take Lean to the next level? Here are some insights, from those who witnessed the changes.

“Customer feedback. Following the HPWT [High Performance Work Team] processes, we had to go back and address every issue.”

—Sedrick Chachere, Engineering support organizations manager

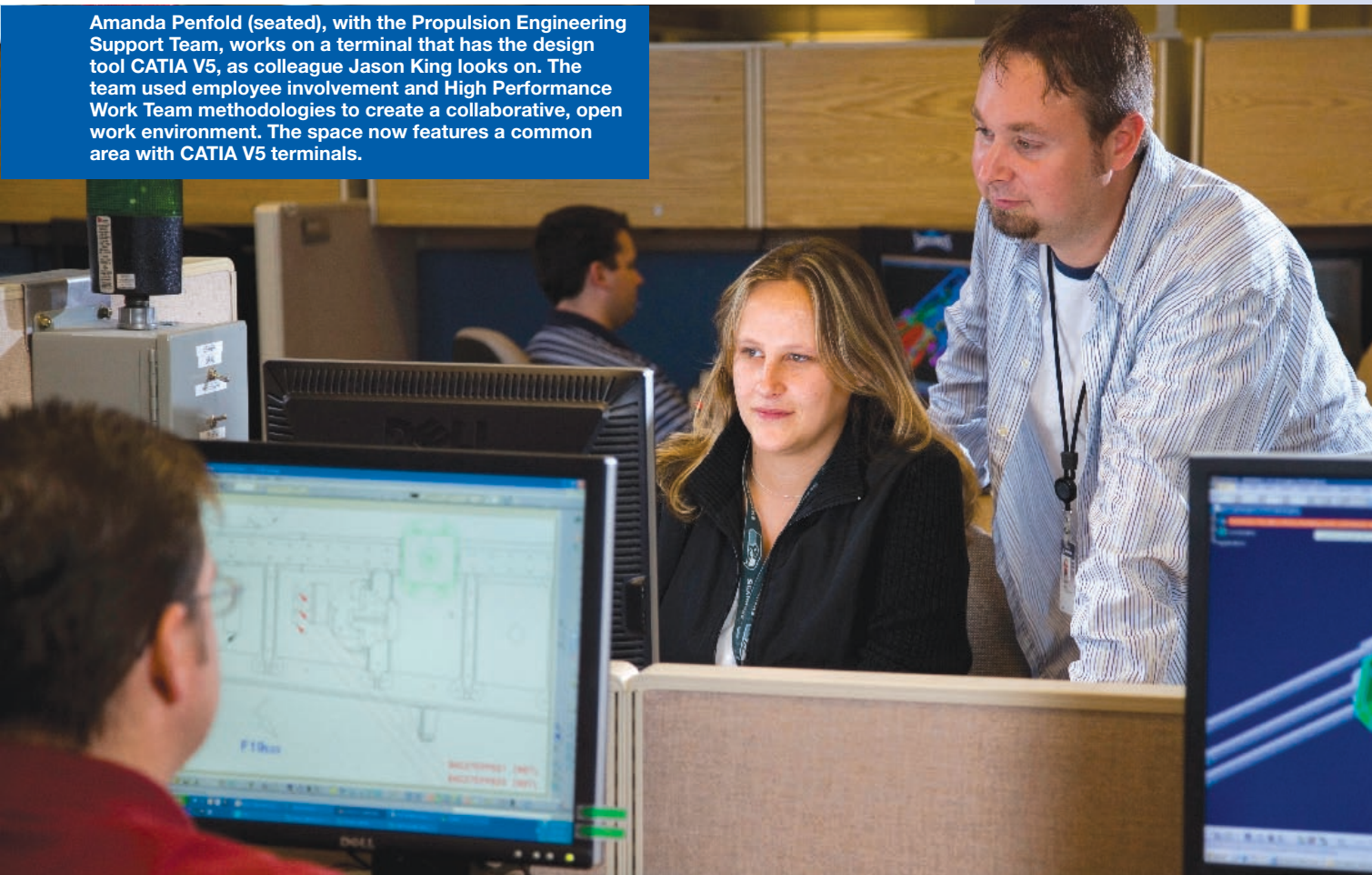
“Connecting our mechanics, materials management and Lean support personnel with theirs [in Propulsion Systems] creates ownership, pride and trust.”

—Tom Rich, Lean manager, Boeing Fabrication Division’s Tube, Duct and Reservoir Center

“We’ve successfully integrated Lean+ [concepts] and manufacturing teams that weren’t cohesive before. Employees see the benefits of Lean and having resources in one place.”

—Steve Mardero, Lean/Boeing Production System manager

Amanda Penfold (seated), with the Propulsion Engineering Support Team, works on a terminal that has the design tool CATIA V5, as colleague Jason King looks on. The team used employee involvement and High Performance Work Team methodologies to create a collaborative, open work environment. The space now features a common area with CATIA V5 terminals.



ED TURNER PHOTO

Boeing Canada Technology in Winnipeg, Manitoba, has rearranged 737 strut assembly processes into work cells, using Lean+ to promote one-piece flow. This has reduced travel, cycle and lead times significantly. Here, Assembly Technician Francisco Arlegue works on a 737 engine strut forward fairing assembly for Propulsion Systems.



MARION FRISDALE PHOTO

Among the productivity improvements attributable to EI and HPWTs: New employees said they feel more comfortable sooner and they feel like their voices are heard. As a result, they quickly become active contributors to the group's work.

"It used to take up to three years for a new employee to feel fully productive in the group," Robel said. "We now see full productivity after just six months."

Employees who come up with their own solutions feel empowered to make a difference—however small, Robel noted: "Small, incremental changes—that's what Lean is all about."

PROCESSES THAT 'FLOW'

Fabrication Division's Tube, Duct and Reservoir Center provides commodities to

Propulsion Systems and other programs. This internal supplier has significantly changed the way it delivers its products, applying techniques such as kitting and point-of-use delivery to establish just-in-time inventory and pull production.

In the past, TDRC's completed parts were shipped in batches to the customer's finished-goods warehouse and stored until Propulsion Systems workers kitted and delivered them to mechanics.

Today, TDRC products are completed and kitted in one location. Customers return empty containers for refilling as needed. This pull-production system replaced the old "push" system of building and shipping parts to the warehouse when completed, regardless of immediate need. Now TDRC can replenish its own

"supermarket" as customers use parts.

"With Propulsion Systems moving line-side [in Everett], it's very important for us to deliver frequently and just when the parts are needed," said Tom Rich, TDRC Lean manager. "Sure, it's extra work for us to organize the parts, but there's a huge benefit to our customers, so the trade-off is worth it."

Another key benefit is a notable reduction in stored inventory along the value stream. Lead time to obtain parts is down as well. Propulsion Systems also sees savings in transaction—or handling—costs, as many of the transactions required from part completion to kit receipt have been eliminated by leaner processes.

"Our delivery and quality performance has become a Lean+ enabler," Rich said.



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+, through using Lean practices such as streamlining processes and involving teammates in improvements, and through building a culture of continuous improvement; Global Sourcing, through efforts by Boeing to improve supplier performance.**

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

First was Renton; next comes Everett

Boeing Commercial Airplanes' Propulsion Systems took its first steps to becoming a fully integrated value stream late last year when the team supporting 737 engine buildup collocated with Final Assembly in Renton, Wash. (See Page 24 of the August 2006 *Boeing Frontiers*).

Now the organization has set its sights on Everett, Wash. The Everett Value Stream Team—the team supporting engine, strut and auxiliary power unit buildup for Boeing twin-aisle models—will move to Everett by year-end, with work moving into the nearby 40-54 building.

The plan to create engine buildup feeder lines has led to Lean+ benefits and stronger working-together relationships between the groups—even before the move. Indeed, Propulsion Systems and Everett Manufacturing already are planning to leverage efficiencies from the site's processes for handling hazardous materials and from its just-in-time standards storage and point-of-use delivery processes. Additionally, several Everett airplane programs have decided to move some engine work upstream to Propulsion Systems buildup to minimize disruption and to optimize Final Assembly flow. According to Wayne Kerley, one of the key leaders of the Everett move, the team is “looking forward to receiving earlier and more direct customer feedback and offering a breadth and depth of skills that can help more quickly resolve problems in the factory and field.”

Propulsion Systems' Administrative and Engineering teams will complete the “Move to the Future” in mid-2008, when they move to BCA Engineering's 10-20 office building in Renton. Like their manufacturing counterparts, Propulsion Systems and BCA Engineering teams are expected to benefit mutually from closer proximity.

—Debbly Arkell

“Our customers no longer have a buffer of finished-goods inventory on hand. As a result, we're focusing on our production system even more to ensure we can always meet our customers' needs, understanding that poor quality or missed deliveries will now have even greater impact. There is no room for error.”

STRUTTING THEIR STUFF

Boeing Canada Technology in Winnipeg has been on a Lean journey for nearly a decade. For it, as for other Boeing groups, reducing cost, improving quality and pushing to do better with less is paramount. And like other suppliers, leaders there know that when it comes to whom they work with, customers have choices.

To that end, Boeing Winnipeg is leaning out its strut-build processes by moving to manufacturing work cells, as well as *chaku chaku* and moving lines. (*Chaku chaku*, which is Japanese for “load load,” is an efficient style of production in which all machines needed to make a part are situated in the correct sequence very close together.)

“Trim, fill, cure and layup each used to be its own department with responsibility for mixed product,” said Steve Mardero, Lean/BPS manager. “We've found that right-sized process centers integrated into the manufacturing work cell help us reduce waste and increase productivity.”

Boeing Winnipeg employees began by reorganizing their work into cells focusing on 737 strut-assembly processes. Within each cell, employees perform a clearly defined statement of work that flows in just one direction. With the help of Lean consultants from Shingijutsu, they developed their own right-size equipment. They then located all of the needed machinery and people right next to the product—including management, tech support, schedulers and more.

“Since then, we've seen an approximate 80 percent reduction in travel time and lead time in our 737 processes, and we've gained a 15 to 20 percent improvement in cycle time reduction,” said Mardero.

The 737 work cells are in their final implementation stages. Lessons learned are being applied to 777 strut assembly, and work is progressing well; Boeing Winnipeg also is preparing to support the 747-8.

“Because these changes reduce the amount of work needed, as we ramp up we simply must implement Lean+ from the beginning,” Mardero said. “We're working on the 747-8 value stream now so we can ensure Lean techniques are built into manufacturing processes right from the start.” ■

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