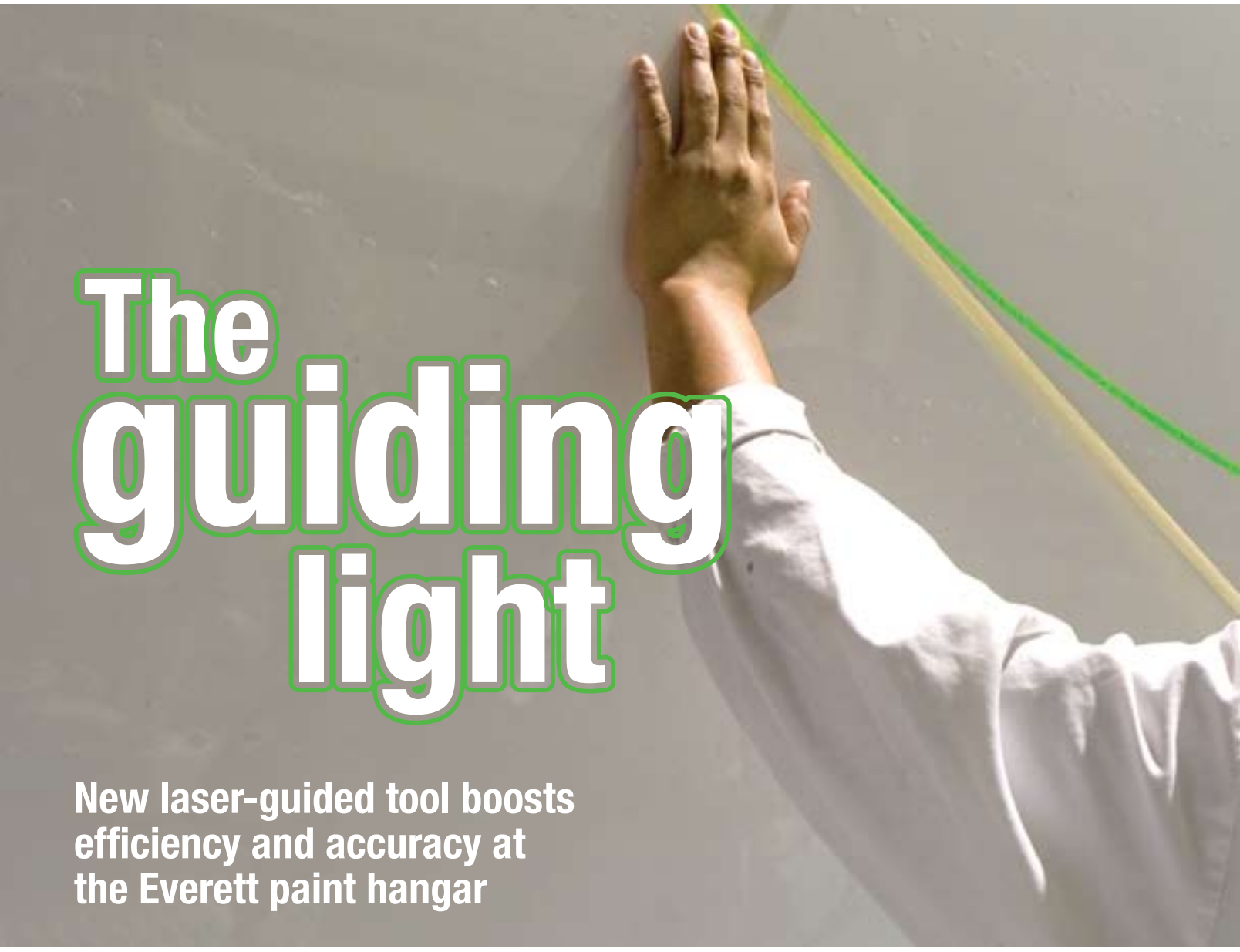

The guiding light

New laser-guided tool boosts efficiency and accuracy at the Everett paint hangar

By Debby Arkell

A commercial airplane's livery is the ultimate expression of an airline brand. With specs down to the hundredths of an inch, quality and attention to detail are critical when applying an airplane's paint scheme.

But a new tool makes that job a lot easier—and more accurate—for painters at the Everett, Wash., paint hangar. The tool, called the Laser Exterior Marking System (LEMS), is a system of networked lasers and computer programs that translate airplane and livery data into laser-light patterns reflected on an airplane's exterior. These patterns show painters exactly where to mask off elements of a carrier's livery—and replaces mylars, a series of plastic templates painters affix to an airplane to guide them through the masking process.

"The idea behind the LEMS tool is to use computer-aided-design tools to design a customer's livery once and store those specifications in a database—using a 3-D approach instead of a 2-D approach—to generate laser-light templates and improve efficiency," said Domingo Mayor, Everett Delivery Center senior project manager.

The benefits of this new approach are many. It helps cut the "touch time" tooling and design engineers need on an airplane. It trims the time needed to create new templates when customers change liveries or add a new model to their fleets. It also reduces storage at Boeing and at customer locations, as all LEMS datasets are stored electronically, not in bulky rolls in huge crates and carts like mylar templates. The tool also is an enabler for the 787 program.

"We knew we wanted a no-mylar system to paint 787s," said Jack Jones, Everett Delivery Center director. "The paint process can be a bottleneck when rates increase. And with the 787's plan

Brian Maglalang, a painter at the Everett, Wash., paint hangar, uses the green laser light from the eye-safe Laser Exterior Marking System to guide him as he masks off an area for painting. The laser facilitates a level of precision 10 times greater than required.

ED TURNER PHOTO

to significantly reduce Final Assembly flow, we knew that we needed a new approach. That philosophy was a big driver for this new tool."

PAINTING WITH PRECISION

The system got its start several years ago when Mayor was talking with a Tooling manager whose team was having difficulties completing mylars. As flow times were being reduced and moving lines were implemented, it was getting harder for the Tooling team to get access to specific airplane models to ensure measurements were accurate. Competition for touch time on the airplane was fierce—and bound to get worse.

Engineering, Tooling, Manufacturing and Material and Process Technology (M&PT) all agreed that there had to be a better way to make templates.

M&PT began working with state-of-the-art CATIA V5—an engineering design tool that easily moves between two- and three-dimensional design—to develop a way to merge airplane data with customer livery data and create 3-D renderings of those liveries. They ended up integrating a system of laser-light projectors with common Boeing software and a commercial off-the-shelf application. Initial tests on a spare fuselage section yielded promising results, giving them the confidence to test the LEMS in the rudder shop prior to building up an entire system in the paint hangar.

"Lasers aren't unique, but they've never been used on this scale and networked together before," said Sean Grier, Everett Delivery Center project manager. "The interface is very simple, and painters operate the LEMS completely on their own."

From the outset the team had good success, Grier said.

"Tooling is currently working with M&PT and Engineering to validate data sets, when-

ever we can catch an airplane in the factory or in the hangar to check those sets," he said. "We're finding that they are projecting light with a great degree of accuracy."

The first customer aircraft painted using LEMS was an Air France 777 in February 2007. Since then, Everett site painters have painted more than 20 777s, the first 787, and the rudder for ANA's 787.

"We're expecting to be able to paint 40 to 50 airplanes a year using this tool," Grier said. "And we're finding already that the tool enables us to apply complex paint jobs more quickly, more easily and more accurately than before."

MASKING WITH MYLARS

To fully appreciate LEMS, it's important to understand the process it's replacing.

Generally speaking, airplanes have been painted the same way for decades via a labor-intensive and time-consuming process. Once customers define their liveries and design engineers generate the engineering data, Tool Engineering and Tool Fabrication use that data to create mylar template tools.

Tooling Operations Manager Franz Ruijters said to produce mylar templates, Tooling must first go to the factory and gain access to an airplane of the same model. They then use 2-D drawings of the airplane in the planned livery to carefully measure, lay out and temporarily mark areas of the design on the aircraft exterior.

"Tooling must constantly measure and check to ensure the dimensions and indexing are correct per the customer's intent," Ruijters said. "It's truly a balance between artist's intent and tooling precision."

Once the lines are defined, toolmakers put mylar plastic on the airplane and copy the tape-line pattern created by hand and eye. What's more, each customer livery requires a set of mylars for each model in its fleet. And every time a customer orders a new model or modifies its livery, the process is repeated, taking up to 22 months from artist's concept to mylar completion.

As Boeing shortens flow times, implements the Boeing Production System in its factories and puts engineering design tool enhancements into place, the need for tools or systems that enable a moving line is critical. At the very least, it stands to reason that for airplanes built on a moving line, the traditional process of creating mylars would be extremely difficult.

ADVANTAGES, BIG AND SMALL

The Everett site has installed the LEMS in two of its three paint hangars (the third is due to be operational by June). Today's twin-aisle Boeing airplanes are painted using either all mylars or all LEMS. Grier said the team is transitioning from legacy tools to LEMS data as new customer liveries are introduced.

Though legacy work remains, painters at the Everett site already are seeing how LEMS will help them. Thanh Ly has been a painter for 18 years and is well-versed in the use of mylars, but finds the new tool beneficial. "I'm still getting used to the new tool, and even though it's a little harder now, I can see how it'll be an improvement down the line," he said.

One area of improvement is accuracy—which has increased tremendously.

"Our accuracy with LEMS is to a 30-thousandths-of-an-inch level of tolerance," said Paul Solecki, M&PT engineer. "Paint tolerances are much looser than that, but with LEMS we are able to work to a level of accuracy that is 10 times greater than what's allowable."

LEMS also creates many efficiencies. It lets painters mask both sides of the aircraft simultaneously, since mylars are produced only for one side of the airplane (painters remove them and flip them over for use on the aircraft's other side). Also, painters no longer need to repeatedly leave the painting platform to get templates, said Decorative Paint Operations Manager Bill Dill. And since mylars aren't created for every aspect of a livery, toolmakers don't have to compete with factory workers for precious touch time on an aircraft in production. (Painters still may need mylars for liveries that extend into areas LEMS can't reach.)

Also, Jones noted that the time needed for customers to make livery decisions has been cut from 220 days to 90—and that several airline customers have expressed interest in this tool. Airline customers also keep sets of mylars for use in their Maintenance, Repair and Overhaul businesses.

"It's important to note that this tool will not mean that we need a reduction in labor," Jones said, adding that the goal is to have 80 percent of paint processes covered with this new tool. "It simply allows our painters, toolmakers and engineers to work more efficiently."

The team that created the Laser Exterior Marking System tool isn't resting on its laurels. It's already looking at ways the tool can be improved and further integrated into paint processes. Enhancements under consideration include developing ways to use the tool to paint highly curved engine cowling surfaces and how to use LEMS in the Clean, Seal, Paint and Test area for wing painting. ■

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Painter Thanh Ly prepares the exterior of a 777 in the Everett, Wash., paint hangar, prior to activating the Laser Exterior Marking system.

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