



Technology

## Manufacturing 101: Becoming Part of the Aerospace Industry

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### What You Need to Know:

Many shops may run the same equipment and have good machinists who are capable of making parts that meet similar dimensional requirements, but can they handle the standards and red tape?

Aerospace shops must have a good quality management system certified to AS9100D requirements, with the AS9100:2016 registration being the most recent international management standard.

When it comes to equipment, the requirements will depend on which subcategory of the aerospace industry a shop wants to specialize in, so choose wisely.

Despite the opportunities in aerospace, manufacturing job shops can often face another hurdle: finding the right machinists for the potential work, which can mean developing training programs.

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**Not sure if aerospace is right for your shop? Here's what you need to think about and plan for based on the real-world experience of a small manufacturer that invested and succeeded in aerospace.**

If your shop needs more work or is looking to increase its production of parts and componentry—and make a nice profit at the same time—aerospace is a good place to be.

“Aerospace is a pretty active market segment right now—the global economy is strong and there are a lot of people traveling,” says Reid Leland, founder and CEO of *LeanWerks*, a precision machining and engineering shop in Ogden, Utah. “Airlines are buying new planes, which is creating big backlogs and a need for spare parts, so there’s work to be had.”

But aerospace is not a good market for shops that have processes and approaches to work that just don’t fit, he says.

“You have to be good at dealing with a high degree of paperwork and understand how to sort through flow-down requirements, government regulations, and company auditing and tracking—there’s just a lot of red tape with it,” he says. “But if you’re set up to handle all those administrative and paperwork processes, it’s a good market.”

According to Leland, many shops run the same equipment and have good machinists who are capable

of making parts that meet similar dimensional requirements—whether it's a jet engine part or a tractor part. The difference is the amount of oversight, red tape and administrative requirements.

"You've got to have a lot of processes in place on the shop floor, too, that are more about validation and confirmation than they are about actually making the feature," he says. "Those are kind of built-in insurance policies that the industry requires, to make sure that you have calibration processes and certifications and all that it takes to meet the requirements of the industry."

## Career Opportunities with Training and Industry Certifications

Aerospace machinists can start working in a shop having only a high school diploma or a two-year degree. From there, many career opportunities are available through on-the-job or classroom training.

Gretchen Schultz, director of workforce development at ToolingU-SME, is part of the **Aero-Flex** Unilateral Apprenticeship Committee, a Southern California-based group that has created a flexible model for implementing a "pre-apprenticeship" program in advanced manufacturing, specifically for aerospace careers. Aero-Flex is in the process of becoming a national program.

"The idea started out as a way to generate interest among high school and community college kids – taking them into a facility, such as Northrop-Grumman or Spirit Aerospace – so that they actually get to see what it's like to work in this environment for a short time," says Schultz. "It starts out teaching employability and life skills, which manufacturing companies say are the hardest skills to recruit and train for," Schultz says.

After this level, each aerospace company can tailor their curriculum from the over 500 training classes offered through the **ToolingU-SME catalog**, depending on the particular positions they need to hire for.

"Many of those basic skills, like safety, quality, math and precision machining, cut across different advanced manufacturing industries, including aerospace," she says.

In addition to SME certifications in machining technology, lean manufacturing, and advanced manufacturing, all the ToolingU-SME curriculum maps to the **Manufacturing Skill Standards Council (MSSC)**, **American Welding Society (AWS)**, and the **National Institute of Metalworking Skills (NIMS)** certifications, so that it helps prepare employees to sit for those national certifications

More information about training and industry certification for careers in aerospace manufacturing and machining can also be found at the **American Society for Quality**, **Society of Automotive Engineers** and **Learn.org**.

**What Are the Requirements to Become a Successful Aerospace Operation?**

Aerospace shops must have a good quality management system certified to AS9100D requirements.

The AS9100:2016 registration is the most recent version of the international management standard for the aircraft, space and defense industry, based on the ISO 9001:2015 quality standard. The AS9100 registration helps to ensure a product's quality, conformity, safety, airworthiness and reliability. Shops that get the AS9100 audit are certified to both standards.

"The quality management people in an aerospace shop need to understand the requirements for shipping and receiving, and accounting," says Leland. "More than for the oil and gas industry, there are some nuances, for example, such as notifications for shipping completed parts, including pre-shipment requests and approval to ship."

Quality managers have to understand the specific aerospace requirements, Leland says, and to the extent those requirements need to be addressed by the machinists, they need to be trained on them as well. A good example is the exacting method for filling out an inspection report.

"If you're writing it manually with pen and paper, there are certain requirements for writing down measurements and how to change them if needed," Leland says. "So, for example, you're not allowed to scratch something out and write a new number—you have to make a single strike-out and write your initials and the date next to the change—if you don't, you're not in compliance with the standard."

## **What Are the Equipment Requirements for an Aerospace Manufacturing Shop?**

From an equipment standpoint, the requirements will depend on which subcategory of the industry a shop will specialize in.

"For a production part that goes on an airframe, you need good CNC equipment, such as a turning center and milling center," Leland says. "You probably need some automation, such as a flexible manufacturing system (FMS), which is typically a horizontal machining center with a material handling system for higher-volume work."

But he says there's a good subniche opportunity for shops that want to provide one-off parts using manual equipment.

"A lot of military platforms don't have active supply chains for spare parts," he says.

"Someone may need to retrofit an A-10 [plane] and there's a gadget that goes on it that is no longer supported, or the company that originally built it is no longer in business," Leland says. "They may send out a 40-year-old drawing package, and a lot of times it's a project in and of itself to develop a consensus interpretation of the drawing—and sometimes the material is no longer available, so you have to get alternate materials approved."

This type of shop might be awarded a contract to build two brake rotors, axles or pistons.

"It could be done on a CNC, but you also could do it on a good set of manual equipment with the help of high-end journeymen machinists," he says.

In addition to aerospace parts, a company may choose to do defense and weapons systems work, which has similar requirements, making it a good crossover market.

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Reid Leland

Founder and President, LeanWerks

## Training Aerospace Machinists

Despite the opportunities in aerospace, manufacturing job shops can often face another hurdle: finding the right machinists for the potential work. For many seasoned machinists, it is a welcome challenge, as it allows for additional learning and to build new parts and components. But it could mean needing to hire new employees, too, and developing programs for training.

“Even though there are good training opportunities at vocational and trade schools in our area, a number of years ago we were faced with the challenge of finding skilled machinists, so we decided to take control and create our own training program that dovetailed with the local schools,” Leland says.

To accomplish this, LeanWerks hired Paul Harbath, a lean-manufacturing expert with 27 years of industry experience, to become the director of quality and continuous improvement. Harbath had a unique *vision* for a way to deliver aerospace training.

“He recognized that new kids coming into the workforce today are internet savvy, so we should build our training around that,” Leland says.

The result is a unique, in-house program hosted on a WordPress website, with the LearnDash plug-in, which turns the site into a learning management system. LeanWerks calls it the Technical Excellence Training (TEtX) program.

The TEtX administrator can upload and organize all the content, including topics, lessons and courses on the website, so employees can log on with their credentials and view the training content. The administrator controls an employee’s progression through the content so that as they complete one section, a new one opens up and the TEtX program tracks their progress in real time.

To validate on-the-floor training, a mentor signs a card verifying that the employee has successfully demonstrated each skill or ability and scans the card into the TEtX system.

“The program has been especially helpful for our aerospace customers because some of them only want qualified personnel to run their parts,” Leland says. “Because we can track employees as they go through the program, we have a ready-made list of everyone who is qualified to work on certain parts.”

*Have you explored aerospace manufacturing as a new venture? Tell us how you entered the field in the comments below.*