

Forgings, castings present unique military supply challenges

by Stephen J. Baker, DSCR Public Affairs

RICHMOND, Va. – Few things are more loathsome than unfilled orders in a military supply chain, whether for the buyers tasked with procuring the parts or for the warfighters awaiting their arrival. And when it comes to aviation items for America's military that fall in either of those undesirable categories, a disproportionate percentage share a common trait: forged or cast components.

That's where the Aviation Forging and Casting Assistance Team (AFCAT) at Defense Supply Center Richmond, Va., enters the picture. Through the variety of services it provides to industry, Defense Logistics Agency, and its Defense Department customers, AFCAT aims to reduce the confusion, delays and cost associated with the supply of those parts.

Forging is the process of heating and beating a piece of metal into a desired shape, whereas casting is the pouring of liquid metal into a mold or pattern to achieve a similar result. Forged and cast components play a vital role in thousands of critical safety items on U.S. military aircraft – parts that, upon failure, could cause the loss of life or government property.

Last week, AFCAT took 23 employees from DSCR – which manages DLA's aviation demand and supply chain – on the road for a crash course in the fundamentals of forging and metal casting. The employees learned how cast and forged components affect parts.

The group got a first-hand look at both processes during a bus trip that included tours of Cerro Fabricated Products in Weyer's Cave, Va., April 20 and Littlestown Foundry in Littlestown, Pa., April 21.

Cerro Fabricated Products is a forging shop that manufactures aluminum, brass, copper, bronze and other specialized forged and machined parts. Littlestown Foundry is a casting shop that produces primarily commercial aluminum parts. Both are Department of Defense suppliers.

While en route to the destinations, the group learned about AFCAT and the unique issues associated with parts containing cast and forged components.

Crash course on the road

Forging Defense Manufacturing Consortium (FDMC) and American Metalcasting Consortium (AMC) are DLA industry partners that work with DSCR on casting and forging issues. Dale Roberts, AFCAT program manager in DSCR's Value Engineering Branch; Walker George, a contractor representing FDMC; and Michael Bess, a contractor representing AMC, each gave a presentation on the bus as it motored north along the interstate through Virginia, Maryland and Pennsylvania.

"In 2005, we conducted a study and found that even though only three percent of our parts contained castings and forgings, those items accounted for around 10 percent of unfilled orders," Roberts told the group, pointing out related information displayed on monitors above the heads of bus passengers. Among the oldest unfilled orders, the number jumped to 15 percent.

Roberts said the reason those orders seem so difficult to fill is that castings and forgings typically require special tooling that is not readily identifiable. Tooling includes items such as forging dies, casting patterns and molds, and machining and inspection fixtures.

Without that tooling or knowing where to outsource that portion of a contract, suppliers can't bid on solicitations from DSCR to produce needed parts.

On the other hand, contracts are sometimes signed before suppliers realize that tooling is required, resulting in delays due to contract cancellations, waivers and modifications.

Historically, this happened because buyers and bidders had a hard time determining whether items contained cast or forged components. Doing so typically required delving deep into the technical drawings and specifications in item descriptions – a time-consuming prospect when some parts solicitations are only posted for a one- or two-week period.

"When you throw a bid out, it takes real time for suppliers to pull up the drawings and look at them and find issues like this," Roberts said.

Of all the assistance requests AFCAT receives, 13.5 percent of them are made after a contract has been awarded to a supplier.

"We don't want contract failures," Roberts said. "But when they're calling us after a contract award has been made, we're already in trouble."

Instead of giving up a contract, suppliers will sometimes request a waiver to "hog out" a component that is supposed to be forged or cast, meaning it will instead be cut from an existing piece of metal. The problem with hogging out parts is that they're usually weaker than cast or forged components. The process also creates more waste, which represents a significant cost.

"Forging actually changes the physical properties of the metal ... it's the working of the metal that gives it the strength and durability, because that lines up the grain flow," Roberts said. "Plus, imagine that you have to make a metal cup. What would be more efficient and economical: shaping it out of just the right amount of metal or sculpting it out of a big block of aluminum?"

"Components that are cast often have intricate internal geometry that can't be replicated by either forging or hogging out metal," Roberts said.

Problem solver

One of AFCAT's most significant functions is to highlight items requiring castings or forgings by working with industry as they conduct in-depth research on DSCR-managed items and tag those that might – or definitely do – have cast or forged components.

"Once we know there are either suspected or confirmed castings or forgings, we put a standard text object in the item description within EBS [Enterprise Business System] to alert buyers and bidders that special tooling or sourcing is – or may be – needed to produce the part," Roberts said.

By working with industry and within DLA, AFCAT has identified close to 80,000 National Inventory Item Numbers (NIINs) as items suspected or confirmed to contain castings or forgings. About 7,300 of those NIINs have been confirmed and include one of the following text tables in EBS:

- A1202 – parts that potentially contain a casting and/or a forging.

- ZD003 – parts that contain a casting.
- ZD004 – parts that contain a forging.

Another 17,000 that have been confirmed will soon be updated with the appropriate EBS text table. The AFCAT representatives cautioned DSCR buyers not to remove these tables when putting together solicitations.

“That text becomes part of the solicitation,” Roberts explained to the employees. “It tells the bidders how to find sources through AFCAT by providing them with links to the suppliers and the tooling.”

Roberts said that once suppliers see and read the notice, they will know casting or forging is involved in producing the part. At that point, they can either locate the required tooling or choose not to make a bid.

“Providing this information up-front reduces contracts that can’t deliver,” Roberts said.

Forging and casting matchmaker

AFCAT also provides direct support to buyers and bidders by maintaining databases that help match up DSCR parts with the companies that have the required tooling, sourcing and proprietary rights to make cast and forged components.

“We’ll search our databases and attempt to find existing tooling sources; and if we find them, then it’s a big win for everyone,” Bess said.

Kim Licence, a procurement supervisor in Aviation and Airframes Division I, had used AFCAT’s services before going on the casting and forging trip. Last fall, her team was still struggling to fill a purchase request received in January 2008 for a critical safety item on an Air Force T-38 Talon aircraft.

“The part was a structural support. Because of casting issues, we were getting a lot of no-quotes from vendors,” Licence said. Her division chief, who had been on one of the 14 previous casting and forging trips, recommended checking with AFCAT.

After almost two years of no bids, Licence took the advice and was amazed by the results. “We got the list of suggested casting sources from AFCAT on Nov. 3, 2009, and a contract award was processed on Nov. 24, 2009,” she said.

AFCAT currently has about a 27 percent success rate in locating tooling for DSCR or suppliers, but Bess said that the supply base of foundries and forge shops is diminishing.

“In comparison to other supply chains, we have so many items that are critical to flight safety,” he said. “But some of our weapons systems are so old that the sources for items with cast and forged parts have either become fragmented or non-existent.”

Roberts said a prime example is the B-52 Stratofortress bomber, which the Air Force first brought into service in 1955. He said that certain parts of the aircraft, like major structural members in the wings, were never designed to be replaced.

“But nobody in their right mind back when the B-52 was being built ever thought it would still be operating in 2010,” Roberts said, explaining that many of the companies that made original parts for aircraft like the Stratofortress are now out of business.

Cost of tooling

When sources for tooling aren't available, new tooling must be manufactured to make needed items even if a purchase request calls for just one part. And the cost can be significant.

"Until I went on this trip, I didn't know what suppliers were talking about – I didn't really know what tooling was until now," said Arla Allen, an Aviation and Airframes Division I procurement supervisor at DSCR responsible for buying safety-related parts for ejection seats, seat belts and the like.

"When contractors would quote \$50,000 for tooling, I'd say 'holy cow!' But now I know why they quote \$50,000. It's what they call an 'additive line,' and it's a one-time tooling charge they need for the set up," Allen said.

George said one of the best things about the trip is that employees "really get a feel for what's going on" and become more familiar with the requirements for manufacturing tooling.

"I have more of an understanding now of why quotes are priced high when they come in, because I know what goes into the making of just one piece of the part," Licence said.

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