Welders and machinists at the University of Arizona's Machining and Welding Center have been recognized by NASA with an award for "extraordinary dedication and contributions" to the James Webb Space Telescope project.

It's the first time the UA has been given the James Webb Space Telescope Significant Achievement Award.

Over the past few years, the crew at the Machining and Welding Center – which is part of the UA Research and Instrumentation Center – has been busy building various parts of JWST's Near Infrared Camera, also called the NIRCam, which is the space telescope's prime instrument. NIRCam will peer deeper into the universe than any other instrument before.

"To me, the award is a validation of what we do," said Doug Myers, a machinist and one of URIC's instrument maker/designers who has been fabricating and refining NIRCam parts since 2005. "You could say that NIRCam is the glamour project here at our shop, but we're here to support research across the University."

The team at the Machining and Welding Center prides itself on being a one-stop shop for researchers who need any type of equipment or fine instrument for their work, providing design from scratch and handling manufacturing and repair.

"Our customers may know the form and the fit of the parts they are looking for and what features they want, but usually have no idea of how to make the part," said Victor Gasho, URIC director. "Some come to us with fully fleshed-out drawings of what they need from us, others pull out a napkin sketch and ask, 'Can you please build this for me?'"

Five machinists work in the shop, with two of them taking on the welding jobs. They rely on five manual lathes, five manual mills, one CNC lathe and four CNC mills. CNC stands for computer numerical control and allows machinists to make parts with great precision and maintain the same accuracy when producing duplicates. In a mill, the tool spins while the part to be manufactured remains fixed, and a lathe rotates the part against a stationary tool. According to Gasho, CNC makes the work more efficient for machining, but welding still is a fully manual job. Two student workers support the team: Marcos Gonzales, a pre-physiology major, and Shawn Iles, an undergraduate in optical sciences and engineering.

"The people who work here are part craftsmen and part artists," said Gasho. "In addition to knowing how to program and type code into a CNC machine, our guys are well-versed and have the skills and experience of working with a manual machine as well. Many have been machining since a young age. They have the background and an intuitive feel. The unique challenges that we take on bring in our talent."

"We do the very large to the very small," Gasho said about the type of projects his team takes on.

His team has built everything from tiny motors for medical applications to supporting structures for telescopes.

"We built the descent imager for the Huygens probe that landed on Saturn moon Titan," Myers said, "the camera for the Mars Pathfinder rover, the camera for the Mars Polar Lander, the focal assembly for the Mars Reconnaissance Orbiter and instruments that have flown on the space shuttle."

"NASA's Weebie award recognizes the machine shop's ability to produce flight quality parts in exotic metals like titanium and molybdenum on short notice," said Marcia Rieke, a Regents' Professor at the UA's Steward Observatory and the principal investigator on the NIRCam project. "They contributed greatly to keeping the final assembly of NIRCam on schedule."

Recently, the URIC team was able to build a critical part on very short notice and ship it to NASA's Goddard Space Flight Center, where NIRCam is currently being tested and prepped for installation into the telescope structure at Goddard.

"It saved NASA from delaying an important vibration test, in which the instrument is subjected to a simulated rocket launch," Gasho said. "The award is certainly a testament to the URIC team's skill and dedication in the work that they do."

Myers has years of experience making the mounts for the imaging chips that will form the heart of the James Webb Space Telescope. The mounts are made from a special molybdenum alloy to ensure they expand and contract at the same rate as the bonding material used to affix the imaging sensor chips. After the telescope is deployed in the cold depths of space, below minus 370 degrees Fahrenheit, everything must work flawlessly.

"Once it's up there, it has to work. If something breaks, you can't go up and fix it," Myers said.
He describes the material’s properties as similar to those of cast iron. It tends to chip and flake around the edges and it's very abrasive, chewing up the machining tools very quickly.

Once Myers has finished the machining on the mounts, he turns them over to his colleague Ryan Willwater, who runs them through all the required inspections and takes care of much of the documentation as required by NASA.

"Multitasking is a fact of life here in the shop, because there are so few of us," Myers said. "There have been times when I had the CNC lathe running, two vertical mills and was working on the manual lathe, all at the same time. We are juggling things in order to get stuff out the door in time, because we are a small outfit."

In addition to the URIC team, the NIRCam team at Steward Observatory was also recognized with a NASA award recently for successfully delivering the NIRCam instrument to NASA’s Goddard Space Flight Center. (Read more about the NIRCam in this UANews article).

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