Sheet metal mechanic Ken Redman uses a computer numerically controlled tube bending machine to bend a one-inch titanium tube to be used on an F/A-18 Hornet. (U.S. Navy photo)

NAVAL AIR STATION NORTH ISLAND, Calif. - Fuel and hydraulics are just two of the common systems found on all of the aircraft that are serviced by Fleet Readiness Center Southwest (FRCSW).

Ensuring the specifications and quality of the tubing used for delivering these and other systems, is the responsibility of the FRCSW tube and hose shop in Building 472.

Much of the work in the shop involves pressure/hydraulic testing and bending of tubes.

The shop uses computer numerically controlled (CNC) tube bending machines manufactured by Eaton Leonard to bend tubes made of aluminum, stainless steel and titanium.

Blueprint data which includes the tube’s overall diameter, thickness, and the bend angle is entered into the CNC which makes the calculations and bends the tube. Once entered, the information remains in the CNC and may be recalled for future use.

Another CNC device, the Vector Laservision tube data center, uses a laser to analyze
samples and measure angles – to within one-half degree of tolerance – so tube data may be captured without blueprints.

The angle data retrieved by the laser is analyzed by the machines computer, which in turn, feeds the tube bending machine computers to produce the part.

“Just about all of the data for the F/A-18s has been scanned,” noted sheet metal mechanic Ken Redman, who operates the shop.

“But blueprints for the E-2/C-2 airframes, for the most part, are incomplete. Regardless, we have about 95 percent of those tubes already scanned in. Still, we occasionally need to take a sample (tube) off of an aircraft to scan it.”

Redman said that the Vector machine is also used for quality assurance and to ensure the accuracy of the other tube bending machines.

“When a tube is bent, there’s a degree of ‘spring-back’ to it. So after a tube is first bent, it will go to the Vector machine which plots the points of the bend and compares that against the data. The Vector will calculate the spring-back, make any corrections and send that information back to the bending machine for correction. So the next time that particular tube is made, the correct information will already be stored in the computer,” he said.

The CNC machines can bend tubes up to two inches in diameter, and as thin as 3/16 of an inch. Tube fittings/fasteners as high as two and one-half inches are also installed.

In addition to its fuel and hydraulic systems, Redman said that pressure testing of the tubes to an aircraft’s coolant and life and fire protection systems is also performed.

“When an aircraft is here for maintenance, I’ll get about seven or eight tubes at a time, and a week later, three or four and then it slows down,” he said.

“We now pressure test about 95 percent of the tubes at 6,000 psi, but with the Super Hornets, we need to go upward to about 21,000 psi,” he said.

To better handle the Super Hornets and prepare for future MV-22 Osprey workload, Redman said that the shop will add two new pressure/hydraulic test benches.

Certain Osprey tubes, he said, exceed 6,000 psi in pressure testing requirements.

Though that workload has yet to arrive, Redman said the shop remains busy with the existing F/A-18 and E-2/C-2 work.

“We usually average about 10-12 tubes a week, but we’ve started picking up UH-1 helicopters and have two orders equaling 300 hoses, and an order of 150 aluminum tubes,” he said.
FRCSW Tube Shop Supports Vital Aircraft Systems