

## **NADEP JACKSONVILLE CONQUERS ODD SHAPES AND AWKWARD POSTURES IN ITS CANOPY SHOP**

Sheet Metal Mechanics in the Naval Aviation Depot (NADEP), Jacksonville, FL Canopy Shop repair, polish and reinstall acrylic transparencies into the metal frames of aircraft canopies. An aircraft canopy surrounds and shields the pilot in a Navy fighter plane and other tactical aircraft. The canopies are fragile and need protection as they are lifted, rotated, and set down during maintenance and repair. Workers used to risk injuring their shoulders, necks, backs, and arms while manually lifting and rotating canopies. Mechanical hoists were available, but were not used because they lacked suitable coupling attachments to protect the curved, tapered canopy from damage due to shifting or slippage while being hoisted.

Finding a way to lift and rotate the canopies without damaging them or risking injury to workers posed a challenge for ergonomic improvement. Ergonomics is the science of fitting the work to the worker, instead of requiring the worker to adapt to existing work conditions. Work tasks such as repairing and polishing aircraft canopies

used to require repetitive motions using the same group of muscles each work shift. Constant or repetitive use of the same muscle group tends to overburden and fatigue those muscles quickly. This overburdening may lead to a cumulative trauma disorder, or CTD, a group of disabilities that usually involve weakness and discomfort in the affected muscles and supporting tendons and ligaments. Weakness and discomfort are especially severe when a worker continues the movement that brought on the CTD. The discomfort often improves after receiving medical treatment for the CTD and discontinuing activities that weaken the affected muscles and surrounding soft tissues.

Until recently, when NADEP initiated ergonomic improvements, an aircraft canopy was manually lifted by six to eight mechanics who, coordinating their movements, lifted and maneuvered a canopy onto a padded wooden sawhorse. A mechanic then polished the inside and outside of the glass portion of the canopy, readjusting, as needed, the angle or position of the canopy on the sawhorses.



**Mechanic having difficulty working on underside of canopy before ergonomic improvements**

Reaching over or under the canopy was strenuous work; the mechanic had to squat or kneel under the canopy and work overhead to polish the canopy's underside. He had to keep his arms over his head for extended periods of time while repairing or hand polishing the canopy. Working in such awkward positions put a lot of stress on the muscles and ligaments of the legs, knees, neck, back, arms, and shoulders. Holding these awkward postures while working increased the risk of neck, back, shoulder, and leg injuries and CTDs.



**Working overhead fatigued worker before ergonomic improvements**

The goal of an ergonomics program is to reduce the frequency and severity of CTDs. This is done either by redefining work assignments or redesigning tasks and workstations using procedures, equipment, and tools that minimize the risk of work-related injuries and CTDs. Work tasks, equipment, and tools that are ergonomically designed make it easier for the worker to avoid cumulative trauma by eliminating excessively repetitive motions, awkward positions, and unnatural postures.

NADEP Safety Specialist, Ms. Barbara Wright, who was specially trained in Ergonomics, examined the relationships between Canopy Shop work tasks and the injuries and CTDs associated with them. Using that information, she targeted high-risk work tasks for ergonomic improvement. During an ergonomics training session, Mr. Robert Kolosky, a Canopy Shop employee, indicated that they needed a piece of equipment that would allow them to work under an aircraft canopy while in a reclining position. After reviewing available ergonomic products and technology, Ms. Wright determined that the *industrial positioner* met the Canopy Shop's needs. NADEP purchased an *industrial positioner* as a prototype for use in the Canopy Shop. It turned out to be everything the Canopy Shop workers needed, and more.



**The tilting seat of the *industrial positioner* provides proper body support**

The *industrial positioner* provides proper body support for working on hard-to-reach sections of a canopy. The tilting seat, with adjustable back, shoulder, neck, and head supports, allows safe and convenient access to the underside of a canopy. The *industrial positioner* also has lockable wheels and an extender that enables a worker to adjust the seat height from 16 inches to 22 inches from the floor, in one-inch increments. *Industrial positioners* have been so successful that NADEP has installed them in several other shops.

Another ergonomic improvement was needed to lift and rotate the curved, tapered aircraft canopy without damaging its delicate fitting points or its fragile, 200-pound, distortion-free glass surfaces. Shop workers used to lift and transfer a canopy manually from a transport cart to padded wooden sawhorses, then manually tilt or rotate the canopy every time a mechanic had to work on a portion of the canopy that was difficult to get reach.



***Flip-Rite* positions aircraft canopy on sawhorses**

Ms. Wright again researched and came up with an unusual ergonomic solution. She located a piece of equipment called a *Flip-Rite*, a self-leveling, web-strapped lift-and-rotate machine that had originally been designed to lift and turn railroad cars upside down during production.

bands that are placed around a canopy. As the hoist lifts the canopy, the bar levels the load while the bands rotate, slowly turning the canopy over onto its back. The *Flip-Rite* can lift and rotate a canopy to any desired angle, then either place it onto the cushioned sawhorses, or suspend it in air where a mechanic can work on it in a comfortable and ergonomically safe position.

The *Flip-Rite* was tested on site to ensure that it would securely support the Navy's aircraft canopies regardless of shape, angle, weight, or sizes. Canopy Shop mechanics also had to make certain that the *Flip-Rite's* straps would not damage any

NADEP's *Flip-Rite* is suspended from an overhead crane. It consists of a motorized, self-leveling spreader bar with two web mesh



***Flip Rite* securely cradles an aircraft canopy**

portion of a canopy and that rotation could be stopped and held at any given point. The *Flip-Rite* passed all of these tests with flying colors and is now used with a variety of canopies and other aircraft components that are maintained and repaired at NADEP.

No new CTDs have been reported in the Canopy Shop since the *industrial positioner* and the *Flip-Rite* were introduced. Other benefits of these ergonomic improvements include needing fewer people to maneuver canopies, freeing up workers for other work tasks; and improved canopy repairs.

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