

## ERGONOMIC INNOVATION IN FLAPWELL REPAIR REDUCES RISK OF CUMULATIVE TRAUMA DISORDERS AT NADEP JAX

Experienced, well-trained aircraft sheet metal mechanics that work on Naval Aviation Depot (NADEP) Jacksonville's Patrol Aircraft (P-3) line used to risk leg, neck, shoulder, and low back pain when working on flapwells from the Navy's



**Mechanics used to strain to reach across flapwell**

trailing edges of the flaps are *flight control* surfaces that provide lift during take-off and landing.

Flapwells are approximately four and a half feet wide, in sections that are nine to 12 feet long. Repairs to flapwells often require intensive effort over several working days. Mechanics used to be forced into awkward postures, as shown in the above photo, straining to reach across the surfaces of these large parts while making repairs. Setting the flaps on end seems like an obvious solution. However, *setting on end* could bend or dent the edges of a flap, which would destroy the entire flap and render it useless. The photo at right shows the delicate, lightweight aluminum outer sheets, or skins, that cover the flaps. The skins provide a durable, aerodynamic and exceptionally lightweight surface to enhance the smooth flow of air currents over them.

P-3 *Orion* submarine chaser aircraft. Sheet metal workers also reported that their forearms and wrists ached during *skin removal* procedures, a method used in their shop for detaching the outer metal surface on the flapwells as part of the corrosion control process.

The flapwell is the part on an aircraft wing that extends over the trailing edge of a flap to keep airflow consistent. The flapwells hold the flaps while the pilot positions them to direct airflow. The



**Lightweight skins cover flaps**

Since setting the flaps on end is not an option, NADEP JAX sheet metal mechanics, Mr. Bob Reynolds and Mr. Earl White, along with some of their coworkers, took the matter into their own aching hands. They set about developing an ergonomic innovation that would eliminate the risk of cumulative trauma disorders (CTDs) on the P-3 line.

A work task that requires maintaining an awkward posture for long periods of time can fatigue and stress the muscles and tendons that the body utilizes to hold that position. This over-burdening may lead to a cumulative trauma disorder, or CTD, a name given to a group of disabilities that usually involves muscle weakness and discomfort. The discomfort often improves after discontinuing activities that weaken the affected muscles and soft tissue, and getting medical treatment for the CTD.

Ergonomics is the science of fitting the work to the worker, instead of requiring the worker to adapt to existing working conditions. The goal of an ergonomics program is to reduce the frequency and severity of CTDs by redesigning work tasks or workstations to minimize the risk of CTDs. Ergonomically designed work tasks, equipment, and tools help to reduce the risk of work-related injuries and CTDs by making it easier for the worker to avoid repetitive motions and awkward postures.



***Flapwell fixtures on frames***

*flapwell fixtures* were constructed with frames onto which flapwells are attached with screws, using the existing holes in the aircraft metal. The fixtures, along with an attached flapwell, are then fastened to sawhorses, a workbench, or elsewhere where the flapwell is held safely in place. The fragile flapwell is protected from damage, and a mechanic can work comfortably on any portion of the flapwell in a position that is appropriate for his height and the work task, as shown in the photo below.

Recalling basic ergonomics from a recent safety session, Mr. Reynolds, Mr. White, and their co-workers designed and tested an innovative *flapwell fixture*. Two sets of the

An added bonus to using the *flapwell fixtures* is that both sides of the flapwells are now accessible at the same time. This arrangement reduces the amount of time required for touch-up painting during the corrosion control process. Workers can proceed without waiting for one side of a freshly painted surface to dry before turning the part over to paint the other side.

No new work-related injuries or pains have been reported since the sheet metal mechanics started using the *flapwell fixtures*. In addition, the length of time required for corrosion control on a flapwell has been reduced by an average of 50%, and workers continue to improve on that time. The *flapwell fixtures* allow them to work more accurately and with more endurance since they no longer need to strain to reach across the flapwells to work on them.

Point of Contact: Bob Reynolds c/o Barbara Wright, Ergonomics, NADEP Jacksonville, FL

Telephone: Commercial (904) 542-2641, DSN 942-641

Email: [wrightbl@navair.navy.mil](mailto:wrightbl@navair.navy.mil)



**Mechanic works comfortably on flapwell mounted on *flapwell fixture***