

DoD Ergonomics Working Group NEWS



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Navy Success Story: Propeller Repair

The Naval Facilities Engineering Command (NAVFAC) established an ergonomics technical support resource in 1998 under the Hazard Abatement and Mishap Prevention Program to provide no-cost ergonomics support services to Navy shore-based activities to reduce the risk of ergonomics-related injuries such as back strain, carpal tunnel syndrome, and tendonitis—known as work-related musculoskeletal disorders (WMSDs).

Many tasks can be improved with simple solutions such as using a cart to move parts to reduce manual materials handling, raising work heights to ease back bending, or using task lighting to lessen neck twisting and eye strain. Sometimes the solution can't be found "off the shelf" and instead has to be designed specifically for the operation.

The **NAVFAC Ergonomics Team** has worked with a number of activities to design fixtures to reduce ergonomics stressors associated with repair work from airframes to micro-electronics. Repair operations can often be unpredictable and physically demanding. Working with large or inaccessible parts can force a worker into awkward postures.

- Awkward posture is an ergonomics risk factor which, when combined with others such as repetition, duration, force exertion, and even vibration from pneumatic tools, can put a worker at risk of injury.
- One way to reduce the risk of developing a WMSD is to encourage employees to work in a neutral posture.
- Neutral posture is the optimal position of the body in order to exert the greatest level of strength and allow blood flow and nerve conduction to work properly.

Continued on page 2

For a standing workstation the neutral posture is best demonstrated by a worker standing comfortably with the back straight and elbows by his/her side at a 90-degree angle. Another way to remember this is ears over shoulders, shoulders over hips, and hips lined up over the knees and ankles. It can be very difficult to maintain a neutral posture in a shop where you have to work with large parts, with hard to see parts and around obstacles. The purpose of ergonomics is to design the workstation to the worker. This frequently involves angling or bringing the work up towards the worker with a fixture. A fixture could be small enough to hold a circuit board or large enough to hold a propeller.

Assault Craft Unit Site Visits

During site visits to Assault Craft Unit (ACU)-4 in Little Creek, Virginia, and ACU-5 in San Diego, California, ergonomists with the NAVFAC Ergonomics Team found workers in the hovercraft propeller repair shop working in awkward postures. Employees were working bent over the propellers, kneeling or reaching up with their hands above shoulder height with neck extended.



Employees bending over propeller and kneeling.

Building a Propeller Fixture

The NAVFAC Ergonomics Team worked with ACU-4 and Anteon Corporation to design and build a propeller fixture for the shop. The fixture is designed to maneuver the propellers from a horizontal position to a vertical position with stops in between to encourage employees to work in neutral postures. If you can bring the work to the worker you can reduce discomfort, fatigue, and risk of injury.



Employee working overhead in unsupported static posture.

There were several design criteria to keep in mind that can be easily applied to other fixture-type designs. The fixture:

- supports a 900-lb. propeller in a fully raised position 6 feet above the platform while maintaining 360 degrees of rotation,
- adjusts vertically and horizontally to allow the workers to maintain neutral postures while positioning the fixture at any height and angle, and
- is lightweight with large casters to be easily pulled throughout the facility.

Anteon Manufacturing designed the platform base with sides that flip up to allow easy passageway yet large enough so the workers won't risk falling off or having to contort their bodies to reach the work. All controls had to be intuitive with clear documented instructions. Safety mechanisms lock the propeller in place and prevent accidental operation. Many lessons were learned during the design and construction phase. Feedback from the safety office, workers, supervisors, and past design projects was integral to the process. The final result is a fixture that reduces injury risk and improves productivity. According to the Propeller Shop supervisor, the prop fixture has resulted in a 33-percent reduction in the time required to repair a propeller and improved sailor health and comfort.



Employee working in a neutral posture.



New adjustable prop fixture.



Raising the height of the propeller.

The fixtures implemented at ACU-4 in Little Creek, Virginia have also been constructed and delivered to ACU-5 in San Diego, California. The site visits, design, and prototype were paid for with funds from the Hazard Abatement and Mishap Prevention Program.

The NAVFAC Ergonomics Team is available for technical support, Hazard Abatement funding assistance, and site visits. Please visit them at www.navfac.navy.mil/safety and click on Ergonomics for more information.