

ASSAULT CRAFT UNIT FOUR, LITTLE CREEK, VA PREVENTS INJURIES WITH ERGONOMIC INTERVENTION IN PROPELLER REPAIR SHOP

A Landing Craft, Air Cushion (LCAC) is an amphibious vehicle that is supported on a cushion of air ejected downwards by the craft's propellers so that the craft *hovers* just above water or land like a civilian hovercraft. An advantage the LCAC have over other landing craft is that they can travel at high speeds over surfaces such as gently sloping land, shallow water, or marshland and hardly touch the surface. LCAC are used primarily to drop-off and retrieve personnel and equipment from locations where other means of transportation may not be practical or efficient.



An LCAC from the amphibious assault ship, USS IWO JIMA, lands on the shore at Biloxi, MS in the aftermath of Hurricane Katrina.

Propellers from Navy LCAC, periodically removed for routine maintenance and repair, are worked on at the Propeller Shop at Assault Craft Unit Four (ACU- 4), Little Creek, VA. Each propeller weighs approximately 900 pounds and is handled multiple times during the maintenance and repair processes.



Prior to ergonomic intervention, Sailors had to assume awkward postures to work on a propeller.

A propeller, scheduled for repair or maintenance, used to be transferred from the craft via an overhead crane to a pallet that was then transported to the Propeller Shop. Once in the shop, an overhead hoist was used to lift the propeller from the pallet and place it in a horizontal position on a stationary fixture for shop technicians to perform their work on the propeller.

Shop technicians were forced to either stand and work in a bent-over position, kneel, or sit and reach overhead to work on a propeller. The configuration of the workspace forced technicians into awkward postures that overburdened and fatigued the muscles and soft tissue of the back,

neck, shoulders, and arms. Prolonged work in such postures increased the risk of injuries and work-related musculoskeletal disorders (WMSDs). [A musculoskeletal disorder (MSD) is included in a broad category of injuries which are not usually caused by acute trauma, but occur slowly over time due to repeated trauma to the soft tissues (muscles, tendons, ligaments, joints, cartilage and nervous system. A WMSD is an MSD caused or made worse by work methods and environment. WMSDs occur when the physical capabilities of the worker do not match the physical requirements of the job.

Examples of WMSDs are tendonitis, back strain, carpal tunnel syndrome, and bursitis.]

When work tasks and workstations are not adequately configured to accommodate the worker's physical requirements, the worker is at an increased risk for occupational injuries and WMSDs. Ergonomics is the science of fitting the task to the worker rather than requiring the worker to adapt to existing working conditions. Ergonomic work tasks, equipment, and tools are designed to fit the task to the user. The benefits of fitting the work task to the worker include increased productivity and efficiency as well as a decreased risk of work-related injuries and disabilities.



Prior to introduction of the propeller fixture, a Sailor is shown kneeling beneath a propeller and reaching overhead. Prolonged work in such postures can increase the likelihood of WMSDs

Ergonomic risk factors are often resolved by introducing ergonomic interventions. These may take the form of equipment that moves or adjusts heavy or awkward items instead of requiring workers to overexert themselves to manipulate the items manually. Interventions may also exclude the need for workers to assume awkward postures and/or employ repetitive motions to carry out their work assignments. The goal of the Navy's *Ergonomics Program* is to reduce the frequency and severity of WMSDs by redesigning work tasks or workstations through the introduction of procedures and tools that minimize ergonomic risk factors.

Through the Navy Ergonomics Program, the Little Creek Safety Office and ACU-4 collaborated with a manufacturer to develop and produce a height-adjustable, rotating mobile fixture for transporting LCAC propellers and working on them in the Propeller Shop. The fixture was designed to adjust vertically and horizontally to allow technicians

maximum access to all parts of a propeller with minimum discomfort or exposure to ergonomic stressors.

The propeller fixture supports a 900-pound propeller in a fully raised position, six feet above the platform, which allows Sailors to rotate and examine the propeller through 360 degrees. The fixture is lightweight with large casters and fold-up sides that make it easy to manually tow the fixture out of the shop when not in use.



A 900 pound propeller is transported on a lightweight fixture to the Propeller Shop for repair and maintenance.

A propeller can now be transferred directly from an LCAC onto the propeller fixture and remain on the fixture during the entire repair process. This eliminates multiple transfers, which reduces the risk of damaging propellers, increases productivity, and decreases the risk

of injuries and WMSDs associated with propeller maintenance and repair operations.



Propeller fixtures designed to adjust vertically and horizontally promote neutral postures during propeller repair work by allowing Sailors to work in a standing position with the propeller angled toward them, reducing exposure to ergonomic stressors.

According to the Propeller Shop supervisor, the propeller fixture has resulted in a 33% reduction in the time required to remove, repair, and reinstall a propeller. It also improves shop technician safety and health.

As a result of ACU- 4's success with the propeller fixture, ACU- 5, San Diego, CA has since acquired propeller fixtures.

Estimated Payback/Cost Avoidance: The risk of injury was high in this area due to the frequency and duration of the exposure to ergonomic risk factors. According to Bureau of Labor Statistics data for 2002, the average cost of a WMSD was \$13,811.00. A return on ACU- 4's investment of 223 days was calculated based upon the improvements in productivity and the statistical probability of the avoidance of at least one work-related injury or WMSD.