

Naval Facilities Engineering Command Ergonomic Risk Assessment for Aircraft Maintenance

Introduction

An ergonomic risk assessment was conducted on June 24, 2002. This assessment is based upon interviews with supervisor, safety officer, and employees as well as an evaluation by the Naval Facilities Engineering Command (NAVFACENGCOM) Hazard Abatement Ergonomist. The Job Requirements Physical Demands Survey (JR/PD), an ergonomic survey, was also administered to the employees. The results of the JR/PD indicate that this is an Ergonomic Problem Area (EPRA) with a maximum overall priority score of 9, on a scale of 1-9. The shoulder/neck, head/eye, and back/torso regions were found to contain significant ergonomic risk. Ergonomic risk is based upon ergonomic risk factors associated with the task and employee discomfort.

The electronics operation was observed in order to determine sources of ergonomics stress and make recommendations to reduce the risk of work-related musculoskeletal disorders (WMSDs) and improve safety, health and productivity. Musculoskeletal Disorders (MSDs) are injuries and illnesses that affect muscles, nerves, tendons, ligaments, joints, spinal discs, skin, subcutaneous tissues, blood vessels, and bones. Work-Related Musculoskeletal Disorders (WMSDs) are:

- Musculoskeletal disorders to which the work environment and the performance of work contribute significantly or
- Musculoskeletal disorders that are aggravated or prolonged by work conditions.

Recommendations to the command to further reduce the probability of injury include new equipment¹ and administrative controls². Recommendations are included with as much vendor information³ as possible to assist in the evaluation of products and services. Input gathered from the workers, safety specialists, and other personnel to evaluate equipment before purchasing is recommended. This process will increase product acceptance, test product usability and durability, and take advantage of employee experience.

The command may request additional funds from the Chief of Naval Operations (CNO) Hazard Abatement (HA) Program to abate the risk of injury. Naval Facilities Engineering Command (NAVFACENGCOM) manages the CNO Hazard Abatement Program, which is a centrally managed fund to correct safety and health deficiencies beyond the funding capabilities of the activity. Information about the HA program can be found on the Naval Facilities Engineering Command web site www.navfac.navy.mil/safety and in OPNAVINST 5100.23F. Ch 12 Hazard Abatement.

ELECTRONICS SHOP

Purpose of the Operation

Remove and replace electronic components

Population

15 Active Duty Personnel

Injury Data

There are no recorded injuries, but according to the JR/PD results 1 employee reported having been to a health care provider in the last 12 months for pain or discomfort that he thinks is related to his job.

Description of the Operation

Employees, working over two shifts, are responsible for removing, repairing, testing, and replacing electronics components. Employees work at workstations performing primarily soldering operations, figure 1, with frequent microscope use, figure 2. Employees spend three to four hours per day using a microscope.



Figure 1: Employee soldering part



Figure 2: Employee using microscope

Ergonomic Issue Description

Repair work requires sustained awkward postures of the back, neck, and shoulders as well as repetitive manipulations and awkward postures associated with hand tool use. Microscope use and electronics repair can induce awkward postures and eye strain which may have caused or contributed to the high JR/PD values for shoulder/neck and head/eye regions.

Awkward Postures: Employees routinely sustain awkward postures of the back and neck while leaning over parts, as shown in figure 3. Sustained awkward postures restrict blood flow and can cause muscle fatigue as well as place the employee at risk of

developing Work-Related Musculoskeletal Disorders. Electronics repair requires sustained pinch grips while using tools, figure 4. Awkward postures can fatigue muscles and cause the employee to exert more force than is necessary. Employees repeatedly perform extended reaches while reaching for equipment and tools, figure 5. Extended reaches are examples of awkward postures that require the body to deviate from the neutral in the arms, shoulders, and back. Repeatedly performing tasks in such positions imposes increased stress on the muscles and joints.



Figure 3: Leaning over repair work

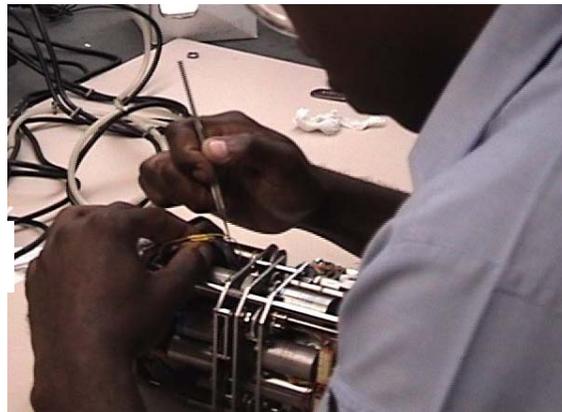


Figure 4: Pinch grip while using tools



Figure 5: Reaching equipment

Contact Stress: Employees are exposed to contact stress to the hands from using small tools, figure 4, and to the forearms from the workstation edge, figure 3. Contact stress results from a compression of the soft tissue by a hard object. A concentrated force can reduce blood flow and nerve transmission as well as cause damage to tendons and tendon sheaths.

Lighting: Lighting levels were measured in the work area at 50 foot candles. According to NAVAIR 01-1A 23 Standard instruction, lighting levels should be at least 93 foot candles. A lack of task lighting can increase eye strain and induce awkward postures as employees try to adequately view a part.

Recommendations

- Six workstations and chairs are recommended to reduce ergonomics stressors. Workstations should have a pedestal base, height adjustable ESD surface, electrical outlets and task lighting. Please refer to vendor table 1.
- Encourage workers to take stretching breaks during the day to relieve discomfort and encourage muscle movement². The following web sites include exercises that can be printed and posted. Sources should be cited when reproducing information. Web site links updated Jan 2002.

http://www.steelcase.com/servlet/ToolsInsightsServlet?ACTION=5&CONTENT_ID=202

www.shelterpub.com/fitness/office_fitness_clinic/OFC_online_stretches.html

<http://www.ucsc.edu/opers/wellness/pages/officestretches.html>

www.safety.duke.edu/Ergonomics/90_seconds.htm

- In order to reduce contact stress, workstations should have an edge protector and microscopes should be equipped with a forearm rest. Please refer to vendor table 2.
- Employees should be trained in proper setup and adjustment of microscope workstations as well as ergonomic risk factors and signs and symptoms of WMSDs. Information can be found in the following websites:

<http://www.microscopyu.com/articles/ergonomics/ergointro.html>

<http://www.niehs.nih.gov/odhsb/ergoquid/chap11.htm#microscopy>

<http://www.cdc.gov/od/ohs/Ergonomics/labergo.htm>

- Equip each workstation with a fixture for holding repair parts. Raising and angling the parts towards the worker will promote neutral postures and reduce bending of the back and neck. The fixture can be fabricated in-house.



Example Fixture (www.panavise.com)

Table 1: Workstation recommendations			
Vendor	Description	Estimated Cost	Figure
Peak Logix 703-819-6061	6 Pro-line Heavy Duty Pedestal Workstations with ESD Laminate Top and electrical outlets and overhead lighting	\$14210.00 (includes shipping)	
Ergosource 952-404-1969 www.ergosource.com	Levitech workstation-pricing done to spec		
Grainger 904-636-8896 www.grainger.com	Pro-Line Workstations-pricing done to spec		
Global Industrial 1-800-645-1232	Effortless Stool-completely adjustable XF252374 Casters optional	\$252	
C&H 1-800-558-9966	Workspace, Bevco, and Krueger Stools	\$226-\$243	
Lab Safety and Supply 1-800-356-0783	Biofit and Bevco	\$206-322	
Alimed www.alimed.com 1-800-437-	2966 Advantage Surgeon's Chair JA93-1001	\$2,495 (chair) \$599 (armrests)	
Hag www.haginc.com Ken Krauss/Bonnie Momsen Chicago, IL (312)321-0761	Hag Capisco*	\$442	

ErgoResource Charles Hartman (919) 661-0300 (GSA Contract)	Hag Capisco*- Vinyl Cover Seat Height Adjusts from 16" to 20"	\$436.25	
	Seat Height adjusts from 20" to 27" (ideal for bench work)	\$445.74	



*The Capisco can be straddled and used to support the chest and upper extremities.

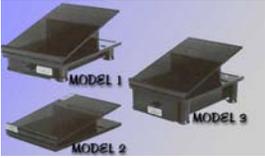
Table 2: Microscope Recommendations			
Vendor	Description	Estimated Cost	Figure
Alimed 1-800-437-2966	SoftEdge (30" in length) #JA70459	\$17.95	
	Deluxe Edge Rest (22" in length) #JA73075	\$29.95	
Scopeease http://www.imebinc.com/IMEB/pages/scopeease.html 1-800-543-8496	Scopeease Microscope tilter and arm supports	\$159-\$259	
Alimed www.alimed.com 1-800-437-2966	Microscope Arm Support #JA73911	\$120-\$180	
Ergosource http://www.thomasregister.com/olc/ergosource/rests.htm	Labtop-Adjustable forearm support A5000, A6000	\$300	

Table 2: Microscope Recommendations			
Vendor	Description	Estimated Cost	Figure
R&D Ergonomics www.morencyrest.com	Microscope Rest in ESD Vinyl	\$120	

*Information contained in this report that is specific to the command has been removed.

Notes

¹ Equipment purchase without proper and repeated training will not mitigate risk and may in fact increase hazards.

² Administrative controls are management-controlled work practices and policies designed to reduce exposures to work-related musculoskeletal disorders (WMSDs) hazards by changing the way work is assigned or scheduled. Administrative controls reduce the exposure to ergonomic stressors and thus reduce the cumulative dose to any one worker. Examples of administrative controls that are used in the ergonomics context are employee rotation, employer-authorized changes in the pace of work, and team lifting.

³ This report does not constitute an endorsement of any particular product. Rather, it is a recitation of how Navy personnel have addressed a particular work place safety issue. Neither the Navy nor its employees and agents warrant any product described in this report for any use, either general or particular.
