Ergonomic Evaluation of Postural Assessment Among Aviation Maintenance Workers at ERAU

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Abstract

There are several factors playing a significant role in ergonomics, and these factors determine the health, safety, comfort, and efficient performance at a workplace. Musculoskeletal disorders (MSDs) are the most common problem reported by aviation mechanics. The study presents assessments of the working postures of aviation mechanics at ERAU fleet maintenance hangar in Daytona Beach, FL. Our research objective is to propose innovative engineering controls for ergonomic hazards associated with aviation maintenance work. The aviation mechanics are subjected to awkward postures like bending, twisting, heavy load carrying, etc. Evaluation of these postures was carried out using the ergonomic assessment tool, Rapid Entire Body Assessments (REBA). By assessing postural using the REBA tool, the score of 9 placed it at a high-risk level. However, there are other factors contributing to the existence of MSDs such as prolonged standing and repetitive movement. These parameters are not considered in the REBA analysis. We recommend engineering controls such as chairs, mats, and equipment handling tools to positively impact aviation mechanics' risk.

Introduction

The aviation maintenance mechanics face a multitude of ergonomic hazards each day due to the complex nature of the work they perform on aircraft. The most common problem reported by aviation maintenance mechanics was musculoskeletal disorders (MSDs). Studies have shown that aviation maintenance mechanics suffer MSDs, most often affecting the back, head, neck and lower extremities. MSDs often result from risk factors involving heavy physical work, lifting, forceful movements and awkward postures. Chronic lower back pain was prevalent among aviation maintenance mechanics. They also experienced cervical problems, hand/wrist problems and lumbar problems. Additionally, repetitive tasks, task duration, awkward body postures and tool vibration are contributors to MSDs faced by aviation maintenance mechanics. Similar ergonomic risk factors include "torso forward bending, squatting or kneeling, and awkward postures". Many of the studies conclude that the use of lift platforms, scissor lifts, manual material handling and resting periods can have a significant effect on reducing MSDs.

Methods

Subject: Aviation Maintenance Mechanics
Location: ERAU Fleet Maintenance Hangar, Daytona Beach, FL
Task: Maintenance of a Diamond Engine

Ergonomic Tools Used:
Tool: Rapid Entire Body Assessment (REBA)
•This ergonomic assessment tool uses a systematic process to evaluate whole body postural MSD and risks associated with job tasks.
•Using the REBA worksheet (Figure 1), the evaluator will assign a score for each of the following body regions: wrists, forearms, elbows, shoulders, neck, trunk, back, legs, and knees.
•The assessment score compiles the risk factor variables, generating a single score that represents the level of MSD risk (Figure 2).
•REBA Score and analysis: 9; high risk, investigate and implement change.

Rapid Entire Body Assessment (REBA)

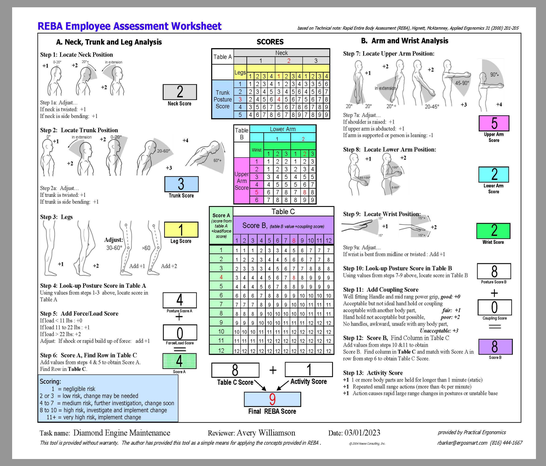

Figure 1. REBA Assessment for maintenance of a Diamond engine

REBA Score	Significance and MSD Risk
1	Negligible risk
2-3	Low risk, change may be needed
4-7	Medium risk, investigate. Change soon
8-10	High risk, investigate. Change soon
11+	Very high risk, implement change

Figure 2. REBA Assessment risk levels

Photos of REBA Assessment

Figure 2. Demonstration of the engine maintenance process assessed by the REBA.

Figure 3. Additional ergonomic postural issues found during air conditioning overhaul the REBA assessment.

Results & Conclusions

Results:
- Receiving a score of 9 on the REBA indicates that the subject is at a high risk of work-related Musculoskeletal Disorders.
- Interventions are recommended in order to reduce the risk of harm to the aviation maintenance mechanics.

Conclusions:
- In order to reduce the potential of work-related MSDs, interventions are necessary, and change is needed.
- Some recommendations include utilizing ergo chairs, anti-fatigue mats, and ergonomically designed tools.
- There is a common theme of poor posture and lack of ergonomic friendly tasks throughout the worksite.
- Although we are focusing on engineering controls, other controls like administrative controls, are necessary in addition to the ones suggested here.
- If improvements are not seen after implementing recommended solutions, then we will consult with an expert in musculoskeletal disorders for alternate solutions to reduce the level of MSDs.

Recommended Solutions

Solution	Reasoning	Reduced Risk
Ergo chair or adjustable height work seat and backrest that adjusts up, down, back and front.	Mechanics perform awkward work tasks requiring them to bend or contort their body while working on aircraft engines while standing for long durations.	Reduces back and neck pain and minimizes awkward positioning, allows mechanics to move more comfortably throughout the day keeping body and mind fresh and focused, minimizing pain associated with servicing aircraft engines.
Anti-Fatigue Mats	Maintenance work that must be performed while standing, puts pressure on the back, and strain on feet, ankles, knees, hips and legs.	The mats aids in increasing circulation, improving posture, and decreasing joint compression in the feet, ankles, knees, hips, and lower back, thus decreasing pain and discomfort.
Ergonomically designed tools such as pliers with molded plastic handles that fit your fingers, drills with a textured handle for a better grip and rivet guns with extra padding.	Replace tools to transfer strain away from the mechanic and onto the equipment.	Reduced strain and trauma to the wrist, hand and arms, while minimizing strain to back and neck.

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