

Ergonomic Risk Assessment Naval Aviation Depot Jacksonville Navy Facilities East Division

An ergonomic survey was conducted at the Naval Aviation Depot (NADEP) in Jacksonville, FL on March 27 and 28, 2000. The Advanced Composite Shop, Fuel Control Facility, and NIF storage areas were observed in order to determine sources of ergonomic stress. This assessment is based upon interviews with employees, supervisors, and safety personnel as well as evaluation by the Hazard Abatement East Coast occupational ergonomist. The Job Requirements and Physical Demands Survey (JRPD), an ergonomic survey, was also administered to the employees. The results of the JRPD indicate that the Advanced Composite Shop, NIF Storage Areas, and Receiving and Distribution areas of the Fuel Control Facility are Ergonomic Problem Areas. Appendix I, II, and III contain a summary of the JRPD results as well as a description of the methodology. Recommendations are included with as much vendor information as possible to assist in the evaluation of products and services.

I. Advanced Composite Shop

Background

The Advanced Composite Shop employs 55 artisans over three shifts. There have been three recorded injuries in this shop. During the evaluation, employees noted that the most difficult tasks in the shop are loading autoclaves, sanding adhesives, blasting in the blast booth, and moving large, heavy carts and tables. The employees are responsible for the evaluation and repair of composite airplane parts. Three operations were evaluated in this shop: loading and unloading of autoclaves, blasting, and working at standing workstations.

The JRPD was administered to employees in the Advance Composite Shop. The survey results indicate that this operation is an Ergonomic Problem Area (EPRA) with an overall priority score of 8 (on a scale of 1-9, where 9 has the greatest priority). Significant amounts of discomfort and ergonomic risk were found in the leg/torso, back/torso, hand/wrist/arm, and shoulder/neck regions. JRPD results also indicate that employees are experiencing work related pain or discomfort, which does not improve away from work and has interfered with carrying out normal activities. Research indicates that discomfort not relieved by rest has a high probability of resulting in a work related musculoskeletal disorder (WMSDs). According to the ergonomic survey, a significant number of employees have been diagnosed with a Cumulative Trauma Disorder such as Tendonitis, Carpal Tunnel Syndrome, Bursitis, etc. that the employee feels is related to work. Other risk factors for musculoskeletal disorders found through the survey include pre-existing conditions and health problems as well as organizational issues. The specific results of the JRPD are contained in Appendix I for reference.

Autoclave Process

The most difficult task in this shop is the loading and unloading of parts into autoclaves for curing. There are four autoclaves (A through D), which cure parts for 6 to 8 hours at a time. Employees push carts carrying parts to the autoclaves for loading and unloading. Carts can weigh up to 2,000 pounds. Pushing carts can require up to three artisans at a time. The extreme weight of the carts puts the employees at risk of injury.

All four autoclaves have different methods of loading and unloading. Parts are brought to Autoclave A by cart. The operator then has to bend over inside the autoclave and pull the parts in, as shown in figure 1. Pulling parts from a crouched position with a bent back and extended arms places stress on the legs, back, shoulders, and arms.

Autoclave B is larger than A and uses a dual ram elevating platform to lift the table to the height of the autoclave. The table is then pushed into the autoclave. Pushing heavy carts places severe strain on the back and shoulders. The dual ram lift has no safety rails. If the cart is not fully centered on the lift it will roll. A 2,000-pound cart falling from a height of about 3 feet poses an extreme safety hazard and could result in a crushing injury. There is also a personnel trip and fall hazard associated with pulling the cart out of autoclave while walking backward onto the lift platform which is elevated off the floor, figures 2 and 3.

Autoclave C is loaded with a split-level cart. The cart's tabletop is on wheels and can be pushed into the autoclave on guide rails. This cart is still very heavy and requires extreme force in moving, refer to figure 4.

Autoclave D, shown in figure 5, is a small autoclave used for smaller, lighter parts. This autoclave doesn't pose any major ergonomic hazards.



Figure 1: Loading Autoclave A



Figure 2: Unloading Autoclave B onto dual ram lift, employees walk backward toward edge of platform



Figure 3: Unloading cart from Autoclave B's Lift Platform



Figure 4: Unloading split level cart from Autoclave C



Figure 5: Autoclave D

Recommendation:

Split-Level Carts

The extreme weight of the current carts combined with the awkward postures required in loading and unloading autoclaves places the employees at risk of developing musculoskeletal disorders as well as other safety hazards. Lightweight, split-level carts are recommended for autoclaves A, B, and C. The top of a split-level cart can be loaded with parts and pushed directly into autoclave A; thereby eliminating the need for the employee to enter the autoclave and pull the parts in. Since the height of the split-level cart can be equal to the autoclave load height, the elevating platform at autoclave B can be removed. The employees are currently at risk of falling of this platform or being crushed by a falling cart. Autoclave C currently uses a split-level cart, but would benefit from a lighter model to reduce the force required in moving the cart.

Each cart is approximately \$15,000 to \$25,000 and will have to be designed specifically for each autoclave. Contact Karin Lown at American Autoclave Company to work out the engineering design details (253-863-5000). Depending on the design criteria it may be possible to outfit the cart with a winch to pull the split-level table out of the autoclave and eliminate heavy pulling.

Blasting Process

Employees sandblast parts for up to 6 hours at a time. Employees place parts inside the blaster and then stand on a platform with their hands in gloves while watching through a window. The height of the windows and the openings for the gloves are not adjustable. The work heights of each of the four blast machines differ by as much as 12". Given the individual size differences among the employee population, operators are forced into extremely awkward postures for extended periods of time, as shown in figures 6 and 7. The duration of the blasting process may cause fatigue, muscle strain and cramping as well as cumulative trauma.



Figure 6: Blast machine use



Figure 7: Blast machine use

Recommendations:

Platforms

The height of the windows and armholes in the blasting machines are fixed. Operators can adjust their work height by adding or subtracting modular work platforms in order to encourage neutral work heights. Platforms are available in different sizes. The optional anti-fatigue matting for the platforms would help reduce operator fatigue associated with standing for long periods of time. A new blast booth may be a future consideration.

Table 1: Platform Recommendations		
Vendor	Product	Price
C&H 1-800-558-9966	Add-A-Level	\$37.90 each 2'x3'
Global 1-800-645-1232	Stackable Platform Optional Anti-fatigue matting	\$34.95 each 2'x3' \$43.95

Seating

Allowing the operators to sit while blasting would also help reduce fatigue. Due to a lack of legroom and limited reaching abilities, a feasible chair may be difficult to find. If possible, seating options should be obtained for trial evaluation while gathering employee feedback. An optimal solution would allow employees to alternate between standing and sitting while blasting. One seating option is a Sit/stand stools which keep the operator at a similar height as standing but allow resting of the back and legs by leaning against the stool. Chairs are not recommended on platforms.

Table 2: Seating Recommendations		
Vendor	Product	Price
Alimed 1-800-225-2610	Portable Sit/Stand	\$299
Alimed 1-800-225-2610	Stand Stool RA75195	\$243
Global Industrial 1-800-645-1233	Lyon Sit-Stand Stool XF244849	\$223
C&H 1-800-336-1331	Lyon Sit-Stand Stool 41-186D	\$219
C&H 1-800-336-1331	Workspace Sit/Stand Stool 41-340A	\$190
Laura Hambrecht 904-269-0658 GSA #GS29F0274H	Hag Capisco Chair* 8106 with extended pneumatic lift and foot ring	\$442

*The Hag Capisco chair is straddled so that the person is leaning on the backrest as front support. The HAG vendor is local to NADEP Jax and will supply samples for trial.



Sit/Stand Stool



HAG Capisco

Standing Workstations

A lot of the equipment used in this shop has been acquired from disposal areas and was not designed for its current use. Airplane wings are currently being transported on carts with foam taped around the cart handles, as shown in figure 8. Figure 9 shows an airplane part placed on a non-adjustable workbench. In addition, operators working at a workbench stand directly on the concrete floor, which can cause fatigue over extended periods of time. The operator is unable to sit at the workbench due to a lack of knee clearance. Some of the workbenches are not equipped with fixtures to hold parts, so the operator has to assume awkward arm postures in order to work on the part directly on the workbench, as shown figure 10. Figure 11 also shows an operator with awkward postures in the upper extremities because a part is placed on a flat surface, in this case the bottom of a sink. Working with raised arms places stress on the arms and shoulders and can lead to cumulative trauma and fatigue.



Figure 8: Cart for transporting parts



Figure 9: Workbench



Figure 10: Working on a part on a flat surface



Figure 11: Working at a wash station

Recommendations:

Height Adjustable Carts

Operators commonly work at standing workstations in awkward postures due to a lack of fixtures and non-adjustability of the work surface. Height adjustable carts with fixtures for holding and orienting parts will allow employees to work at neutral heights. Cart size depends on part size. Multiple carts will be necessary.

Table 3: Cart Recommendations		
Vendor	Product	Price
Alimed 1-800-225-2610	Hydraulic Elevating Carts and Lift Tables	\$449-\$800
C&H 1-800-558-9966	Scissor Lift Tables	\$560-\$1320
Lab Safety 1-800-543-9910	Scissor Lift Carts or Lift Tables	\$462-1352
Alzar GSA 260199, 272770, 260200	Mobile Scissor Lift Tables	\$298-\$468
Global Industrial 1-800-645-1232	Mobile Scissor Lifts or Hydraulic Lift Tables	\$329-\$1047
Vestil 1-800-348-0868	Deck Cart, Hydraulic Cart, or Post Table	\$250-1775

Height Adjustable Workstations

Height adjustable workstations also provide neutral work heights and reduce awkward postures while accommodating workers of all sizes.

Table 4: Workstation Recommendations		
Vendor	Product	Price
Alimed 1-800-225-2610	Hand Crank Adjustable Height Work Tables	\$805-\$1,325
New Dominion 1-800-850-8559 X132	Hand Crank Adjustable Height Table	\$1,123-\$1,325
Lab Safety 1-800-356-0783	Adjustable Workbenches	\$1018-\$1190
Vestil 1-800-348-0868	Adjustable Work Benches	\$965 (30"x60")

Anti-Fatigue Matting

Anti-fatigue matting reduces pain and discomfort associated with standing for extended periods of time.

Table 5: Anti-Fatigue Matting		
Vendor	Product	Price
Global Industrial 1-800-645-1232	Anti-fatigue matting	\$11-\$225
Alimed 1-800-225-2610	Anti-fatigue matting	\$17-\$100
C&H 1-800-558-9966	Anti-fatigue matting	\$15-\$255
Lab Safety 1-800-348-0869	Anti-fatigue matting	\$15-\$230
Matting World 1-800-257-8557	Anti-fatigue matting	\$15-\$200

Fixtures

Fixtures or jigs to angle parts toward the operator, as demonstrated in figure 12, reduce bending of the neck and back as well as awkward elbow and shoulder postures. A fixture can sometimes even replace the work bench and allow the operator to work at a lower height, possibly while seated. The wash stations, carts, blast machines, and workbenches would benefit from fixtures. These parts can be produced in-house.



Figure 12: Part angled toward the operator

II. NIF Storage Area

Background

There are currently two employees in the NIF storage area working 60 hours a week. One employee performs all of the responsibilities of her job, but uses an electric wheelchair to travel around the building due to a pinched sciatic nerve. This same employee was recently injured again reaching to the back of the pallet shelves. A third employee works a later shift.

The JRPD was administered to employees in the NIF Storage Area. The survey results indicate that this operation is an Ergonomic Problem Area (EPRA) with an overall priority score of 9 (on a scale of 1-9, where 9 has the greatest priority). Significant amounts of discomfort and ergonomic risk were found in all five evaluated body regions: the leg/torso, back/torso, hand/wrist/arm, head/eye, and shoulder/neck areas. JRPD results also indicate that employees are experiencing work related pain or discomfort, which doesn't improve away from work and has interfered with carrying out normal activities. Research indicates that discomfort not relieved by rest has a high probability of resulting in a work related musculoskeletal disorder. According to the ergonomic survey, all of the employees have been diagnosed with a Cumulative Trauma Disorder, such as Tendonitis, Carpal Tunnel Syndrome, Bursitis, etc. that the employee feels is related to work. Other risk factors for Musculoskeletal disorders found through the survey include pre-existing conditions and health problems as well as organizational issues. Working in the NIF storage area is physically demanding, is apparent by the employees classifying their job as very hard. The specific results of the JRPD are contained in Appendix II for reference.

NIF Storage Process

Employees are responsible for issuing and receiving airplane assembly parts. Parts come into the NIF storage area in hampers (figure 1), carts (figure 2), or by pallet. Employees have to reach over the sides of the hampers to retrieve boxes, placing strain on the shoulders and back.

The storage area consists of rows of storage units and one wall of pallet shelves. There is currently not enough storage in this area and parts are stored in boxes on top of the storage units as shown in figure 3. These boxes are unsupported and pose a safety hazard. There is not enough room between the rows of storage units for the drawers to be pulled out. Employees must bend down to the floor and reach above shoulder height to access drawers of parts, as shown in figure 4. Bending and reaching can place strain on the back and upper extremities. The wall of pallet shelves stores larger boxes. Employees have to climb onto the shelves to reach boxes in the back. Higher shelves require the operator to climb up and down a ladder while carrying boxes, which increases the risk of falling. Figure 5 shows an employee twisting her torso to retrieve a box while maintaining her balance on the ladder. Lifting while twisting increases the stress placed upon the spine.



Figure 1: Emptying boxes from hamper



Figure 2: Cart of incoming boxes



Figure 3: Boxes stored on top of shelving units



Figure 4: Reaching into drawer



Figure 5: Employee reaching for box on upper shelf

Recommendations:

Automated Vertical Retrieval System

Automatic Vertical Retrieval systems will allow the employees to maintain neutral work heights, neutral postures, and eliminate carrying loads up and down ladders. Sufficient storage will also eliminate the boxes stacked on top of the current storage system.

Quotes need to be obtained from the individual vendors

Remstar, 1-800-639-5805

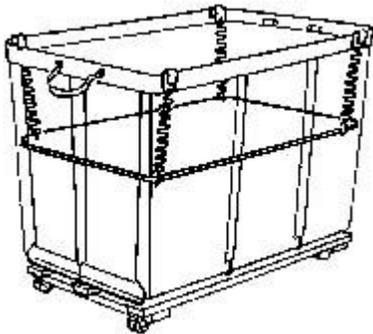
White 615-793-2558 (Gary Taylor)

Kardex - \$99,000 (quote obtained by NADEP)

Hamper

The current plastic hamper should be replaced with one with an elevating base to eliminate bending and reduce back strain. The elevating base raises as packages are emptied.

Table 1: Hamper Recommendations		
Vendor	Product	Price
Postal Products Unlimited 1-800-229-4500	Elevated Basket Truck	\$70-\$85
Postal Products Unlimited 1-800-229-4500	Basket Truck Elevated Spring Platform	\$129-\$218 \$36-\$61
Postal Products Unlimited 1-800-229-4500	Heavy-Duty Spring Loaded Mail Cart	\$349
Grainger	Mail Hamper Spring Platform	\$182-\$335 \$144-\$151
Datamation Systems, Inc 1-201-732-3824	Ergonomic Auto Level Cart	\$935
Charnstrom 1-800-328-2962	Mail Hamper Spring Platform	\$198-\$274 \$60-100



Mail Hamper with Spring Platform
(Platform moves independently)



Elevated Basket Truck
(The entire hamper elevates)

Moving Shelf Ladder

If the large pallet storage racks are not replaced with an automated retrieval system, a moving shelf ladder is recommended. A DC-powered moving shelf ladder allows the employee to place a load on the shelf instead of carrying it up and down the ladder by hand. With the moving shelf ladder, the shelf safely lowers the item to the floor. The order picker allows for a greater range of working heights than the moving shelf ladder, since the operator and the shelf are raised and lowered together. Price depends on ladder height. The ladder height should be determined by the height required to reach loads on the top shelf.

Table 2: Moving Shelf Ladder Recommendations		
Vendor	Product	Price
C&H 1-800-336-1331	Moving Shelf Ladder	\$3148-\$3811
Global Industrial 1-800-645-2986	Powered Shelf Ladder	\$2148-\$3186
Lab Safety 1-800-356-0783	One-Step Entry Order Picker	\$4031.25



Moving Shelf Ladder



Order Picker

III. Fuel Control Facility Bldg. 795 Receiving and Distribution

Background

There are currently 8 employees in the dock operation and storage area of Building 795. Employees can work up to 60 hours a week. The dock is used for receiving and distribution of fuel controls arriving for repair. The storage area is used for repair components.

The JRPD was administered to employees in the Receiving and Distribution areas. The survey results indicate that this operation is an Ergonomic Problem Area (EPRA) with an overall priority score of 5 (on a scale of 1-9, where 9 has the greatest priority). Significant amounts of discomfort and ergonomic risk were found in the shoulder/neck area. JRPD results also indicate that employees are experiencing work related pain or discomfort, which doesn't improve away from work and has interfered with carrying out normal activities. Research indicates that discomfort not relieved by rest has a high probability of resulting in a work related musculoskeletal disorder. Other risk factors for Musculoskeletal disorders found through the survey include pre-existing conditions and health problems as well as organizational issues. The specific results of the JRPD are contained in Appendix III for reference.

Receiving and Distribution Process

Fuel controls come to Building 795 for repairs and distribution. Fuel controls and repair parts come and go through the dock, requiring repetitive material handling and heavy lifting. Items arrive by Buddha truck, figure 1, or by forklift in wire and plastic baskets on pallets. Incoming Buddha trucks are emptied by hand into pallets of baskets stored on the floor or onto shelves placed around the walls of the dock. Parts are then removed from the shelves and baskets and placed on carts to be taken for evaluation, as shown in figure 2. After evaluation and processing, completed fuel controls return to the dock for distribution. Outgoing fuel controls are unloaded from carts and placed into baskets. Loading and unloading fuel controls from baskets at low heights and high shelves places stress on the back, knees, and upper extremities. Employees spend up to an hour a day loading baskets with outgoing fuel controls and about 6 hours a day unloading baskets of incoming fuel controls. Pallets are placed on the dock wherever there is room, refer to figure 3. It is often unclear which pallets are ready for distribution and which have just been received. Empty pallets are often stuck in the middle of the dock, which makes them inaccessible and takes up valuable dock space. Employees often have to move multiple pallets by hand to access the desired pallet.

There are 30-40 carts in the entire area and about 12 of which are height adjustable. Some of the carts end up being used for long-term storage and are unavailable. Parts can weight up to 70 pounds and average about 30 pounds. The NIOSH Lifting Index was used to calculate the Recommended Weight Limit for unloading parts from baskets into carts. According to the NIOSH Lifting Index, the recommended weights are 12.6 and 9.8 pounds for this lift. The actual weight of the parts far exceeds the recommended limit, which places the employees at risk of back injury.

All fuel controls brought in from the dock are inspected to determine the level of rework required. Controls either go to the shop for repairs or into temporary storage to await other materials for building a repair kit. The storage area has rows of fixed height shelving. The tallest shelf is 87" and the lowest is 1.5". Parts range from 8 oz. to 55 lbs. Employees accessing the top storage shelves have to reach above shoulder height to access boxes, as shown in figure 4. Reaching above shoulder height places an employee at risk of shoulder injury. Employees have to kneel or bend over to reach the bottom shelves, which can place strain on the back and knees. Employees have a locking step stool and a ladder for assistance. Use of step stools is not encouraged since it may create fall and trip hazards. Three employees stock shelves from 1 to 6 hours a day, usually 3 or 4 hours. Employees are also responsible for maintaining inventory information on a computer system.



Figure 1: Buddha Truck



Figure 2: Wire baskets on pallets and cart for transporting parts



Figure 3: Pallets filling the dock



Figure 4: Employee reaching for parts

Recommendations:

Conveyor

The current congestion and disorganization of baskets on the dock is hindering material flow. Two separate lanes of roller conveyors for the pallets would stabilize incoming and outgoing traffic flow and improve productivity. Empty pallets could be easily removed at each end. Fork lifts or pallet lifters will be required to load pallets onto the conveyor. The height of the conveyor would reduce ergonomic stressors associated with bending to load and unload baskets by encouraging neutral working heights. A height adjustable conveyor system is preferred.

Table 1: Conveyor Recommendations		
Vendor	Product	Price
New Dominion 1-800-850-8559 X132	Pro-Line pop up ball transfer table	\$1,103-\$1,558
New Dominion 1-800-850-8559 X132	Pro-Line height adjustable retractable ball transfer station	\$1,419-\$1,756
New Dominion 1-800-850-8559 X132	Ball Transfer Table	\$30-\$444 per foot
C&H 1-800-558-9966	Steel Pallet Conveyor H-Stand for Conveyor	\$388.70 \$50-\$60
C&H 1-800-558-9966	Ball Transfer Table H-Stand	\$125-\$865 \$34-\$46
Global Industrial 1-800-645-1232	Ball Transfer Table Permanent Leg Supports	\$119-\$825 \$31-\$85

Pallet Mover

A height adjustable pallet mover would allow for loading of the baskets directly onto the conveyor. A height adjustable pallet mover would also allow pallets to be raised to a more neutral height for loading and unloading.

Table 2: Pallet Mover Recommendations		
Vendor	Product	Price
C&H 1-800-558-9966	Pallet Lifter	\$710-\$1318
Alzar Lift GSA Contract	Pallet Lifter	\$432-\$534
Global Industrial 1-800-645-1232	Pallet Lifter	\$675-1200

Height Adjustable Carts

Height adjustable carts will allow employees to work at neutral heights when loading and unloading baskets and reduce the distance the parts are lifted. Parts currently sitting on carts for long periods of time instead of being placed on shelving, should be moved to storage units. Parts should never be stored for extended periods of time on the height adjustable carts in particular.

Figure 5 shows an employee lifting a load from a table and twisting her torso to place the load on a cart behind her. Twisting while lifting increases the biomechanical loading of the spine. When using height adjustable carts, place the cart perpendicular to the table being unloaded and slide the part onto the cart.



Figure 5: Employee loading a cart

Table 3: Height Adjustable Table Recommendations		
Vendor	Product	Price
Alimed 1-800-225-2610	Hydraulic Elevating Carts and Lift Tables	\$449-\$800
C&H 1-800-558-9966	Scissor Lift Tables	\$560-\$1320
Lab Safety 1-800-543-9910	Scissor Lift Carts or Lift Tables	\$462-1352
Alzar GSA 260199, 272770, 260200	Mobile Scissor Lift Tables	\$298-\$468
Global Industrial 1-800-645-1232	Mobile Scissor Lifts or Hydraulic Lift Tables	\$329-\$1047
Vestil 1-800-348-0868	Deck Cart, Hydraulic Cart, or Post Table	\$250-1775

Covered Outside Storage Area

A covered storage area would temporarily accommodate pallets that can't fit on the dock. Currently these extra pallets are placed in the dock's driveway, which forces the employees emptying the buddha trucks to walk over them. A simple platform off the driveway on the grassy area to either side of the dock, a few inches off the ground with a covering would provide designated storage for pallets. This would protect parts from the elements and decrease some of the dock congestion. This product could be manufactured in-house.

Automated Vertical Retrieval System

Automatic vertical storage units in the storage area would allow the employee to store and retrieve parts from a neutral working height and eliminate reaching to top shelves and bending to bottom shelves.

Quotes need to be obtained from the individual vendors
Remstar, 1-800-639-5805
White 615-793-2558 (Gary Taylor)
Kardex – 904-396-2731

Appendix I- Advanced Composite Shop Job Requirements and Physical Demands Survey

Summary

The Job Requirements and Physical Demands Survey (JRPD) was administered to employees in the Advanced Composite Shop. The results of the JRPD indicate that this is an Ergonomic Problem Area (EPRA) with an overall priority score of 8 (on a scale of 1-9, where 9 has the greatest priority). The JRPD looks at five distinct body areas: shoulder/neck, hand/wrist/arm, back/torso, legs/feet, and head/eyes. The overall priority value is based upon the highest priority ranking for a single body area. The results indicate that four of the five body areas have significant priority ratings, leg/torso, back/torso, hand/wrist/arm, and shoulder/neck. Priority scores are based upon assessed ergonomic risk and employee discomfort. The most stressful tasks in the shop, including autoclave loading and unloading, blasting, and sanding contain ergonomic risk factors for the legs, back, and upper extremities. Most of the risk factors associated with these body areas are addressed by encouraging neutral postures at standing workstations and improving the carts used for transporting parts. The respondents indicated experiencing work related pain or discomfort which doesn't improve away from work and has interfered with carrying out normal activities. The JRPD indicates the presence pre-existing work-related musculoskeletal disorders (WMSDs), health disorders, organizational issues and other contributing factors among the employee population, which may have contributed to the overall priority score. The specific results of the JRPD as well as a brief discussion of methodology are as follows:

Population Data

Surveys were completed and returned by 36 of the 55 artisans working in the Advanced Composite Shop, resulting in a **response rate of 65%**. An 80% response rate is desired for statistical significance. For those responding to the background questions, the population surveyed was **97% civilian, 97% male, 3% female**. **8%** of the respondents were between the ages of **21 and 30**, **50%** were between **31 and 40**, and **42%** were **over 40** years old. **94%** of the employees have been with at NADEP Jacksonville and working in the same shop for over a year.

The current work force is predominately male and 42% are over the age of 40. Age is a risk factor for WMSD's. An older work force is at increased risk of developing WMSD's.

Body Regions

The JRPD prioritizes five distinct body regions based upon a combination of ergonomic risk factors and discomfort. Employees are asked to indicate the duration for which they are exposed to different ergonomic risk factors. Ergonomic risk factors include posture, force, frequency, repetition, vibration, contact stress, and restrictive personal protective equipment. Discomfort is assessed through frequency and severity for each of the five

body regions. Table 1 demonstrates the relationship between body region and discomfort and risk. The priority score, from 1 to 9, is also shown for each body region.

Table 1: Results by Body Part						
		Shoulder/ Neck	Hand/ Wrist/ Arm	Back/ Torso	Leg/ Torso	Head/ Eye
Risk	Prevalence	33%	61%	58%	47%	25%
	Rating	Medium	High	Medium	Medium	Low
Discomfort	Prevalence	53%	53%	61%	61%	36%
	Rating	Medium	Medium	High	High	Medium
Priority Score		5	7	8	8	3

Risk prevalence is determined by the percentage of respondents indicating a specific number of ergonomic risk factors for a duration greater than 2 hours a day. Ratings are determined by prevalence. Low ratings represent less than 30% prevalence, medium is 31% to 60% and high is greater than 61%.

Discomfort is categorized by the terms discomfort, fatigue, numbness, and pain. The following combinations of frequency and severity indicate discomfort prevalence. Discomfort rankings are determined by the percentage of respondents with prevalent discomfort. Table 2 contains the discomfort criteria based upon frequency and severity.

Table 2: Discomfort Criteria			
	Mild	Moderate	Severe
Daily	*	*	*
Weekly		*	*
Monthly			*

The body regions are prioritized based on the following ranking matrix. Table 3 demonstrates the relationship between discomfort and risk, which determines priority.

Table 3: Ranking Matrix	Discomfort			
		High	Medium	Low
Risk Factor	High	9*	7*	4
	Medium	8*	5*	2
	Low	6*	3	1

The ranking of a body part determines its priority. A ranking greater than 4, indicated by an *, is significant. The overall priority ranking is equal to the highest value, in this case 8.

Organizational Information- Medium

Organizational factors can also be ergonomic stressors. The organizational score for this area was medium, which indicates that job stress factors may be present. Survey respondents were asked if they understood their job responsibilities, if their workload was too heavy, if they are able to get pertinent information, etc. This score can be improved by providing workers with more autonomy and improving discussion and feedback between employees and supervisors.

Physical Effort- 8.61

Survey results indicate an average physical effort score of 8.61. Respondents were asked to describe the physical effort required of their job on a scale of 1 to 15 where 1 is no exertion at all and 15 is maximal exertion. A value of 8 is somewhat hard.

Health Care Provider Score- 25

According to the health care provider score, twenty-five employees reported having been to a health care provider in the last 12 months for pain or discomfort that he thinks relates to his job.

Recovery Time Score- 63.89

64% of the survey respondents reported having experienced work-related pain or discomfort that does not improve when he is away from work overnight or over the weekend. This score indicates a likely ergonomic problem area.

Activity Interruption Score- 75

75% of the respondents indicated that in the past 12 months, work-related pain or discomfort has caused him difficulty in carrying out normal activities (e.g. job, hobby, leisure, etc.). This score indicates a likely ergonomic problem area.

Previous Diagnosis Score- 66.67

The survey asks if “a health care provider ever told you that you have any of the following conditions which you think might be related to your work?”

Tendonitis/Tenosynovitis	Ganglion Cyst	Trigger Finger
Epicondylitis (Tennis Elbow)	Bursitis	Carpal Tunnel Syndrome
Thoracic Outlet Syndrome	Back Strain	Knee or Ankle Strain
Overuse Syndrome”		

67% of respondents indicated affirmatively. Pre-existing work-related musculoskeletal disorders can contribute to an employee’s pain and discomfort levels; thereby affecting the overall priority score. Working conditions may exacerbate a pre-existing disorder.

Contributing Factors- 36.11

Respondents were asked if they had ever had one or more of the following conditions:

Wrist Fracture

Hypertension

Kidney Disorders

Thyroid Disorders

Diabetes

Gout

Rheumatoid Arthritis

36% of the respondents indicated affirmatively. These health conditions are contributing factors and may increase one's risk of developing a musculoskeletal disorder; thereby affecting overall priority.

Routine Task Distribution

The following tasks were noted by the more than 50% of the employees as being routine (performed on three or more days per week):

Baking

Cleaning by hand

Cutting/shearing

Gluing/laminating

Hammering

Riveting/bucking

Sawing

Wrenching/ratcheting

Bolting/Screwing

Coating/immersing

Drilling

Grinding/buffing/polishing

Lifting

Sanding

Transporting loads on non-powered carts

Process Improvement Opportunities

This section allows employees to write in responses to questions. All statements are included as written by the employee. The employees in this area provided a great deal of feedback. Employee input is extremely important and should be shared with the appropriate supervisors, process engineers, and safety personnel.

1. Which tasks are the most awkward or require you to work in the most uncomfortable position?
 - Drilling honeycomb cells for moisture. Especially on intake walls. Constantly leaning forward and hand vibrating from the tools used.
 - Removing old film adhesive with a hand held belt sander in large and small areas where honeycomb core is to be replaced, Removing numerous fasteners from components for disassembly. Removing bonded skins from components. Blasting Aluminum and Titanium skins (large areas) Loading Autoclaves
 - Pushing/Pulling large, heavy tables 2-3,000 lbs. Drilling honeycomb core for moisture removal
 - Pushing Pulling moving heavy in excess of a 1,000 lbs. wheeled carts
 - Sanding Components and moving components around shop for different processes
 - Procedures that require prolonged bending such as sanding & grinding
 - Leaning forward from your waist while standing up
 - Back
 - Sanding/grinding/riveting/beed blasting
 - Standing on concrete all day or leaning forward to long
 - Drilling for moisture on an inlet wall
 - Moving heavy loads by hand, sanding, and having to lean over for hrs. at a time to do it
 - Sanding components
 - Standing and bending over job for hours
 - Blasting, sanding, sawing, cutting, sitting at work benches
 - All
 - The braking down of aircraft components in the first stages of repair
 - All
 - At workbench
 - Sanding large components, having to lean forward sanding for long time frames.
 - Pushing the clave tables into the claves
 - Loading autoclave operations (fixtures tables). Sanding booth operations (carts, fixtures). Blasting operations (standing at a leaning position). Work benches (due to lighting and height). Moving component to areas (carts poor condition) (wrong cart for component)
 - Sanding or drilling for a long period

- Reaching across large components with heavy blind rivet guns for long periods. Pushing bake tables into autoclaves. Pushing components from one building to another.
- Bending at waist caused by low carts
- Pushing heavy tables around, in and out of the autoclaves and clean room.; Lifting heavy components that we do not have slings made for.
- Moving parts, sanding parts
- Moving baking fixtures i.e. large metal tables pushing, pulling loading into autoclaves.
- Pushing carts/heavy bake tables. Sanding/drilling at workbench or on carts in sanding booth. Bagging parts/loading in Autoclaves.
- Grinding or sanding
- Moving heavy

2. Which tasks take the most effort

- Lifting inlet walls on to bonding tables and rolling them into the autoclaves. They are very heavy and not much room to maneuver.
- Removing film adhesives with the hand held belt sander. Removing bonded skins. Removing numerous fasteners. Blasting component skins. Loading Autoclaves.
- Moving carts that weight over 1 ton. Using parts blasters for anything over 10-15 minutes.
- Pushing pulling moving heavy in excess of a 1,000 lbs. wheeled carts.
- Moving components into Autoclaves
- Moving components and loading/unloading autoclaves.
- Sanding- you are bending from your waist some time where the piece of work sits (bench) might be to low
- Sanding/grinding/riveting
- Leaning forward looking down
- Pushing autoclave fixture tables
- Pushing heavy carts, lifting plates
- Opening oven doors, loading autoclaves, pushing and pulling carts, sanding carrying metal and hardware
- Most of them
- In the 2nd stage when the components are being prep for baking
- Most
- Shift rotation, riveting, moving dollies loaded with aircraft components, moving components form one surface to another such as from/to dolly and work bench.
- Sanding loading autoclave
- Loading autoclave operations (fixtures tables). Sanding booth operations (carts, fixtures). Blasting operations (standing at a leaning position). Work benches (due to lighting and height). Moving component to areas (carts poor condition) (wrong cart for component)
- Moving or turning large or heavy components
- Reaching across large components with heavy blind rivet guns for long periods. Pushing bake tables into autoclaves. Pushing components from one building to another.
- Pushing autoclave tables. Lifting heavy components
- Lifting components by hand
- Moving parts, sanding parts
- Moving baking fixtures i.e. large metal tables. Pushing, pulling loading into autoclaves
- Pushing carts/tables
- Removing skins

3. Are there any tools or pieces of equipment that are notoriously hard to work with?
- Bead blast machines only reason their hard to work with is because they rarely work
 - Dynaflex Sander (belt sander). Skin removal wedge. Empire Blast Cabinet. Zero Blast Cabinet. P&G Pram Machine
 - Again, heavy fixture tables. Autoclave "B" elevator, balancing load. Getting carts/tables in + out of Clave C + A
 - Heavy wheeled carts
 - Autoclave tables and Inlet Walls
 - Aluminum blaster. You have to crouch or stoop down while operating
 - Not so much the tools, But not having the tool to do the job, like when you have to mill down Honeycomb core you almost always have to do it by hand
 - Beed Blast booths don't work worth (deleted). You have to stand in awkward positions to see what you are doing
 - Autoclave fixture tables
 - Baking tables, F-14 Horiz. Stab carts
 - Blast booths, autoclave tables
 - Heat tables, blasting machine, workbenches, fixtures, all most all tools in the composite and honeycomb trade because of the icemetric handling
 - Blind rivet guns
 - Air hoses that don't flex easily
 - Sand blasters and band saws- either 2 low or 2 high for many people- carts ladders and strap just get in the way and cause trip hazards.
 - Tables for autoclave bakes, blasting operations, pasa jell tank, carts
 - More carts with larger wheels, 1 cart for each person
 - NADEP manufactured Bake tables
 - Autoclave tables
 - Autoclaves loading and unloading
 - Large/heavy (2 tons or more) bake tables, fixtures
 - The bead Blaster

4. If you could make any suggestions that would help you do your job more easily or faster or better, what would you suggest.
- Adjust height of blast booths. Away of mechanically loading autoclaves
 - It would take a lot of time and thought to come up with suggestions for the things I have mentioned. An ergonomics tech could aid
 - Ergonomic chairs to rest. Tables that you can sit +work at. Carts (small) to move parts from point A to B that are new, not taken from the junk yard. (ie working with round wheels). Air/hover table
 - Installation of ventilation system over an open acid tank in immediate work area that in non-ventilated and poses a health threat from long term exposure.
 - More ergonomically designed carts benches tools and lighting
 - On the spot or superior performance awards incentive program
 - More advance tools. Better cart to transport component
 - Have someone else do my sanding/grinding and riveting
 - Eng. Assistance faster
 - Mechanical assistance when moving fixtures/components
 - Hiring some industrial engineers with some common sense this building is brand new but very poorly designed
 - Having proper hardware in shop, rivet guns, pullers, pneumatic, and squeezers, better shop equipment, about 60% of our equipment is junk that we have given to us or found in junkyard
 - Better equipment and information. Plus some who will lesson to what the work has to say and understand what he is trying to do! Without someone pushing him or her aside and doing it their way!!
 - Listen to the mech. (that knows how the job is realistically done
 - Some kind of fixture for large components to lock into so components can be turned at any angle to ease sanding operation.
 - Get organized. Use 5 axis milling machines to precut core for honeycomb components. Instead of using pasajell to clean, purchase dip tank (will reduce HAZMAT and give better bonds.) Purchase raw materials before inducing work not after.
 - Make doorways in a straight line connecting all parts of the shop without opening a door, unless you go outside the shop
 - Height adjustable work tables. Adequate moving carts (maybe adjustable also)
 - High component carts
 - Locate downdraft sanding booths in immediate work area
 - Design a way to move baking tables such as work horse with hitch mechanisms or latch.
 - Autoclaves with easier access. Ergonomically correct tooling i.e. drills, palm sanders, workbenches, work carts.

Based upon employee input a ventilation study and tool balancers are suggested. The engineering and tooling staff should work with the Advanced Composite Shop to ensure the quality and safety of the tools.

Appendix II- NIF Storage Job Requirements and Physical Demands Survey

Summary

The Job Requirements and Physical Demands Survey (JRPD) was administered to employees in the NIF Storage Area. The results of the JRPD indicate that this is an Ergonomic Problem Area (EPRA) with an overall priority score of 9 (on a scale of 1-9, where 9 has the greatest priority). The JRPD looks at five distinct body areas: shoulder/neck, hand/wrist/arm, back/torso, legs/feet, and head/eyes. The overall priority value is based upon the highest priority ranking for a single body area. All five body regions were found to have significant priority scores. Priority scores are based upon assessed ergonomic risk as well as employee discomfort. The NIF Storage operation is a physically demanding task, as noted by the employees' evaluation of physical effort as being very hard. The operation requires repetitive material handling with heavy lifting. An automated vertical retrieval system would alleviate some of the ergonomic stressors associated with this job. All three respondents indicated that they have seen a health care provider regarding pain or discomfort that they felt was work-related. Respondents also noted experiencing work related pain or discomfort which doesn't improve away from work and has interfered with carrying out normal activities. Other risk factors, which could have contributed to the overall priority score include high organizational issues and pre-existing Work-Related Musculoskeletal Disorders (WMSD's). The specific results of the JRPD as well as a brief discussion of methodology are as follows:

Population Data

Surveys were completed and returned by all of the 3 employees in the NIF Storage area, resulting in a **response rate of 100%**. An 80% response rate is desired for statistical significance. The population surveyed was **100% civilians, 67% female and 33% male**. **100%** of the respondents were **over the age of 40**. All of the employees have been in their current position between **more than 1 year**. An older work force is at increased risk of developing WMSD's.

Body Regions

The JRPD prioritizes five distinct body regions based upon a combination of ergonomic risk factors and discomfort. Employees are asked to indicate the duration for which they are exposed to different ergonomic risk factors. Ergonomic risk factors include posture, force, frequency, repetition, vibration, contact stress, and restrictive personal protective equipment. Discomfort is assessed through frequency and severity for each of the five body regions. Table 1 demonstrates the relationship between body region and discomfort and risk. The priority score, from 1 to 9, is also shown for each body region. The shoulder/neck and back/torso regions have maximum priority scores.

		Shoulder/ Neck	Hand/ Wrist/ Arm	Back/ Torso	Leg/ Torso	Head/ Eye
Risk	Prevalence	100%	100%	100%	100%	100%
	Rating	High	High	High	High	High
Discomfort	Prevalence	67%	67%	33%	67%	67%
	Rating	High	High	Medium	High	High
Priority Score		9	9	7	9	9

Risk prevalence is determined by the percentage of respondents indicating a specific number of ergonomic risk factors for a duration greater than 2 hours a day. Ratings are determined by prevalence. Low ratings represent less than 30% prevalence, medium is 31% to 60% and high is greater than 61%.

Discomfort is categorized by the terms discomfort, fatigue, numbness, and pain. The following combinations of frequency and severity indicate discomfort prevalence. Discomfort rankings are determined by the percentage of respondents with prevalent discomfort. Table 2 contains the discomfort criteria based upon frequency and severity.

	Mild	Moderate	Severe
Daily	*	*	*
Weekly		*	*
Monthly			*

The body regions are prioritized based on the following ranking matrix. Table 3 demonstrates the relationship between discomfort and risk, which determines priority.

Risk Factor	Discomfort			
	High	Medium	Low	
High	9*	7*	4	
Medium	8*	5*	2	
Low	6*	3	1	

The ranking of a body part determines its priority. A ranking greater than 4, indicated by an *, is significant. The overall priority ranking is equal to the highest value, in this case 9. All body regions were found to have significant risk.

Organizational Information- HIGH

Organizational factors can also be ergonomic stressors. The organizational score for this area was high, which indicates that job stress factors are of significant concern. Survey respondents were asked if they understood their job responsibilities, if their workload was too heavy, if they are able to get pertinent information, etc. This score

can be improved by providing workers with more autonomy and improving discussion and feedback between employees and supervisors.

Physical Effort- 10.67

Survey results indicate an average physical effort score of 11.67. Respondents were asked to describe the physical effort required of their job on a scale of 1 to 15 where 1 is no exertion at all and 15 is maximal exertion. A value of 12 is very hard, indicating a difficult operation.

Health Care Provider Score- 3

According to the health care provider score, all three employees reported having been to a health care provider in the last 12 months for pain or discomfort that he/she thinks relates to his or her job.

Recovery Time Score- 66.67

67% of the survey respondents reported having experienced work-related pain or discomfort that does not improve when he/she is away from work overnight or over the weekend.

Activity Interruption Score- 66.67

67% of the respondents indicated that in the past 12 months, work-related pain or discomfort has caused him or her difficulty in carrying out normal activities (e.g. job, hobby, leisure, etc.).

Previous Diagnosis Score- 66.67

The survey asks if “a health care provider ever told you that you have any of the following conditions which you think might be related to your work?”

Tendonitis/Tenosynovitis	Ganglion Cyst	Trigger Finger
Epicondylitis (Tennis Elbow)	Bursitis	Carpal Tunnel Syndrome
Thoracic Outlet Syndrome	Back Strain	Knee or Ankle Strain
Overuse Syndrome”		

67% of respondents indicated affirmatively. Pre-existing work-related musculoskeletal disorders can contribute to an employee’s pain and discomfort levels; thereby affecting the overall priority score. Working conditions may exacerbate a pre-existing disorder.

Contributing Factors- 0

Respondents were asked if they had ever had one or more of the following conditions:

Wrist Fracture	Hypertension	Kidney Disorders
Thyroid Disorders	Diabetes	Gout
Rheumatoid Arthritis		

0% of the respondents indicated affirmatively. These health conditions are contributing factors and may increase one's risk of developing a musculoskeletal disorder; thereby affecting overall priority.

Routine Task Distribution

The following tasks were noted by the more than 50% of the employees as being routine (performed on three or more days per week):

Calling (telephone use)	Cutting/Shearing
Lifting	Loading (pallets, trucks, carts, aircraft)
Mousing	Packing/Packaging
Scanning (using bar code readers)	Stapling
Transporting loads on non-powered carts	Typing/Keying
Writing/illustrating	

Process Improvement Opportunities

This section allows employees to write in responses to questions. All statements are included exactly as written by the employee.

1. Which tasks are the most awkward or require you to work in the most uncomfortable position?
 - Issuing parts
 - Sorting Issue cards, checking thousands of card by hand, this bad on my eyes, my back, my wrist it can take 2 to 3 hrs
2. Which tasks take the most effort
 - Receiving + issuing parts
 - Manually, performing verification of daily issues by checking of NIMMS 501s Issues
3. Are there any tools or pieces of equipment that are notoriously hard to work with?
 - No
4. If you could make any suggestions that would help you do your job more easily or faster or better, what would you suggest.
 - Better management
 - Hurry and implement MRPII for this NIF store, to eliminate so much untimely paperwork and man hours

Appendix III- Receiving and Distribution of Fuel Controls Job Requirements and Physical Demands Survey

Summary

The Job Requirements and Physical Demands Survey (JRPD) was administered to employees at the Fuel Control Facility. The results of the JRPD indicate that this is an Ergonomic Problem Area (EPRA) with an overall priority score of 5 (on a scale of 1-9, where 9 has the greatest priority). The JRPD looks at five distinct body areas: shoulder/neck, hand/wrist/arm, back/torso, legs/feet, and head/eyes. The overall priority value is based upon the highest priority ranking for a single body area. The shoulder/neck regions has a significant priority score. Priority scores are based upon assessed ergonomic risk and employee discomfort. Working in the dock and storage areas requires heavy lifting of fuel controls at extreme low and tall heights. A raised conveyor system on the dock and automated retrieval storage units would reduce ergonomic stressors by promoting neutral work heights. There respondents indicated experiencing work related pain or discomfort which doesn't improve away from work and has interfered with carrying out normal activities. The JRPD indicates the presence pre-existing work-related musculoskeletal disorders and contributing factors among the employee population, which may have contributed to the overall priority score. The specific results of the JRPD as well as a brief discussion of methodology are as follows:

Population Data

Surveys were completed and returned by 4 of the 8 employees in Receiving and Distribution area of Building 795. One of the surveys was eliminated since only 14 of the 122 questions were completed. The remaining three surveys resulted in a **response rate of 38%**. An 80% response rate is desired for statistical significance. The population surveyed was **67% female civilians and 33% male civilians. 100%** of the respondents were **over 40** years old. **100%** of the employees have been in their current position at the same base **over 1 year**. An aging work force is at increased risk of developing WMSD's.

Body Regions

The JRPD prioritizes five distinct body regions based upon a combination of ergonomic risk factors and discomfort. Employees are asked to indicate the duration for which they are exposed to different ergonomic risk factors. Ergonomic risk factors include posture, force, frequency, repetition, vibration, contact stress, and restrictive personal protective equipment. Discomfort is assessed through frequency and severity for each of the five body regions. Table 1 demonstrates the relationship between body region and discomfort and risk. The priority score, from 1 to 9, is also shown for each body region. The shoulder/neck region has a significant priority score.

		Shoulder/ Neck	Hand/ Wrist/ Arm	Back/ Torso	Leg/ Torso	Head/ Eye
Risk	Prevalence	33%	0%	33%	0%	0%
	Rating	Medium	Low	Medium	Low	Low
Discomfort	Prevalence	33%	33%	0%	0%	33%
	Rating	Medium	Medium	Low	Low	Medium
Priority Score		5	3	2	1	3

Risk prevalence is determined by the percentage of respondents indicating a specific number of ergonomic risk factors for a duration greater than 2 hours a day. Ratings are determined by prevalence. Low ratings represent less than 30% prevalence, medium is 31% to 60% and high is greater than 61%.

Discomfort is categorized by the terms discomfort, fatigue, numbness, and pain. The following combinations of frequency and severity indicate discomfort prevalence. Discomfort rankings are determined by the percentage of respondents with prevalent discomfort. Table 2 contains the discomfort criteria based upon frequency and severity.

	Mild	Moderate	Severe
Daily	*	*	*
Weekly		*	*
Monthly			*

The body regions are prioritized based on the following ranking matrix. Table 3 demonstrates the relationship between discomfort and risk, which determines priority.

Risk Factor	Discomfort			
		High	Medium	Low
High		9*	7*	4
Medium		8*	5*	2
Low		6*	3	1

The ranking of a body part determines its priority. A ranking greater than 4, indicated by an *, is significant. The overall priority ranking is equal to the highest value, in this case 5.

Organizational Information- Medium

Organizational factors can also be ergonomic stressors. The organizational score for this area was medium, which indicates that job stress factors are of some concern. Survey respondents were asked if they understood their job responsibilities, if their workload was too heavy, if they are able to get pertinent information, etc. This score

can be improved by providing workers with more autonomy and improving discussion and feedback between employees and supervisors.

Physical Effort- 7.33

Survey results indicate an average physical effort score of 6.36. Respondents were asked to describe the physical effort required of their job on a scale of 1 to 15 where 1 is no exertion at all and 15 is maximal exertion. A value of 8 is somewhat hard.

Health Care Provider Score- 1

According to the health care provider score, one employee reported having been to a health care provider in the last 12 months for pain or discomfort that he or she thinks relates to her job.

Recovery Time Score- 33.33

33% of the survey respondents reported having experienced work-related pain or discomfort that does not improve when he or she is away from work overnight or over the weekend.

Activity Interruption Score- 33.33

33.33% of the respondents indicated that in the past 12 months, work-related pain or discomfort has caused his or her difficulty in carrying out normal activities (e.g. job, hobby, leisure, etc.).

Previous Diagnosis Score- 33.33

The survey asks if “a health care provider ever told you that you have any of the following conditions which you think might be related to your work?”

Tendonitis/Tenosynovitis	Ganglion Cyst	Trigger Finger
Epicondylitis (Tennis Elbow)	Bursitis	Carpal Tunnel Syndrome
Thoracic Outlet Syndrome	Back Strain	Knee or Ankle Strain
Overuse Syndrome”		

33% of respondents indicated affirmatively. Pre-existing work-related musculoskeletal disorders can contribute to an employee’s pain and discomfort levels; thereby affecting the overall priority score. Working conditions may exacerbate a pre-existing disorder.

Contributing Factors- 33.33

Respondents were asked if they had ever had one or more of the following conditions:

Wrist Fracture	Hypertension	Kidney Disorders
Thyroid Disorders	Diabetes	Gout
Rheumatoid Arthritis		

33% of the respondents indicated affirmatively. These health conditions are contributing factors and may increase one's risk of developing a musculoskeletal disorder; thereby affecting overall priority.

Routine Task Distribution

The following tasks were noted by the more than 50% of the employees as being routine (performed on three or more days per week):

Calling (telephone use)	Copying
Filing/general administrative	Lifting
Loading (pallets, trucks, carts, aircraft)	Monitoring (visual displays)
Mousing (for computer work)	Opening/closing heavy doors
Packing/packaging	Scanning (using bar code readers)
Stapling	Transporting loads on non-powered carts
Typing/twisting/wrapping	Typing/keying
Wheeling loads	

Process Improvement Opportunities

This section allows employees to write in responses to questions. All statements are included exactly as written by the employee.

1. Which tasks are the most awkward or require you to work in the most uncomfortable position?
 - Moving heavy fuel controls (85lbs) There is no good way to pick them up
2. Which tasks take the most effort
3. Are there any tools or pieces of equipment that are notoriously hard to work with?
 - The carts in our area that we use to move parts from workcenter to workcenter are old/bearings are shot/ and with the workload we have crowded in here you can't maneuver them around the control center very well.
4. If you could make any suggestions that would help you do your job more easily or faster or better, what would you suggest.
 - I have been in the building since last July. I asked for a lift or hoist of some sort to assist, Larry Giggey had pictures done. Barbara (safety) came down. NO RESPONSE. MRPII and the volume of work we have plus the number of times we have to move it (physically and electronically) if we had some sort of hand held device to do electronic moves we would not have to physically move all of the units numerous times.