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**THE GODDARD SPACE FLIGHT CENTER  
ERGONOMICS PROGRAM**

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**Introduction**

The Environmental Health Unit, located on-site at the Goddard Space Flight Center (GSFC), is responsible for the implementation of the Center's Employee Environmental and Occupational Health Program. The Health Unit, Health Physics (HP), and Industrial Hygiene (IH) staffs collaborate to provide quality service to the employees at GSFC. The Health Unit staff identifies, evaluates, and ensures the control of occupational hazards on Center. In the past, components of the Industrial Hygiene Program have included the Industrial Hygiene Health Hazard Identification Program (IHHIP), the Hearing Conservation Program (HCP), the Hazard Communication Program, and the bi-annual fume hood survey. More recently, the Environmental Health Unit has expanded its services by adding the Ergonomics Program.

The Ergonomics Program was launched at GSFC in October, 1991, at the request of the Health Unit's Medical Director, John D. Foulke, M.D. Dr. Foulke felt that complaints of discomfort by video display terminal (VDT) users deserved special attention. In addition, he believed that the initiative would be helpful in identifying employees who could be at risk of developing carpal tunnel syndrome (CTS). Initially, the Industrial Hygiene staff evaluated the work stations of employees who had complained of discomfort. However, the staff also decided to launch a Center-wide survey to identify high risk VDT users and to correct work station deficiencies before they became problematic. This service has recently been extended to employees at the Wallops Flight Facility located at Wallops, Virginia.

As of October, 1992, there were 4,209 employees at GSFC; a combination of civil servants and contractors. The Ergonomic Program services are available to all employees on Center, but the majority of the evaluations have been performed at civil servants' work stations since contractors are required to have their own health and safety

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programs. Priority is usually given to individuals who claim that they have developed a cumulative trauma disorder (CTD), complain of pain or discomfort, and those who are referred by the staff of the Health Unit and the Health and Safety Branch. Following is a summary of the Ergonomics Program activities.

### **Program Activities**

#### **1. Work Station and Task Evaluations**

In-depth analyses of work station design and employee tasks are performed. Approximately 100 evaluations have been conducted. These evaluations primarily include surveys of individual employee VDT work stations. Walk-through inspections are conducted in areas such as laboratories where the user population varies or where there are multiple work stations.

#### **2. Illumination Surveys**

Lighting system design and the orientation of luminaries and windows sometimes present unique and challenging problems, particularly in areas where there are multiple VDT work stations. Illumination surveys are, therefore, sometimes performed as part of the Ergonomics Program.

#### **3. Employee Education**

VDT operators are encouraged to assist in modifying their work stations. The Industrial Hygiene staff usually discusses work station deficiencies with the operators and demonstrates how corrections can be made.

#### **4. Work Station Modification**

Upon request, the Industrial Hygiene staff will provide assistance in modifying work stations. The use of resources available on Center is stressed. However, when this is not feasible or practical and it becomes necessary to purchase furniture or equipment, the Industrial Hygiene staff will assist in the selection of ergonomically sound items. This action usually requires collaboration with the VDT operators, their supervisors, and Logistics personnel.

5. **Written Survey Reports**

A report that details the findings of each survey and the recommendations made for correcting the deficiencies found is forwarded to the Head, Health and Safety Branch. Copies of the survey report are sent to the employee and supervisor. Additional copies are retained in a master file and in the employee's building file which is maintained in the Environmental Health Unit.

6. **Collaboration With Private Physicians**

Reports on the VDT work station evaluations performed are made available for review by private physicians who evaluate employees.

7. **Collaboration With Logistics Department**

The Logistics Department is responsible for purchasing VDT work station furniture on Center. The Industrial Hygiene staff has identified and discussed with the Logistics Department personnel the criteria that must be applied in selecting well-designed furniture. Specifically, the Industrial Hygiene staff has developed general guidelines for selecting ergonomically designed chairs. Findings of the VDT surveys conducted, numerous complaints about uncomfortable chairs, and problems encountered with their structural integrity prompted this action.

**Identification of VDT Operators**

There is no comprehensive listing of all of the VDT users on Center; consequently, their identification is not an easy task. In general, operators are identified through referrals made by the staff of the Health Unit, Health and Safety Branch employee complaints and requests, information gathered during building surveys and inspections, and input from the Industrial Hygiene Hazard Identification Program (IHHIP). As part of the IHHIP, employees are required to provide information on job tasks when they report for their baseline physical examination. This information is forwarded to the Environmental Health Unit and serves as a valuable tool in identifying newly hired employees who will be working with VDTs. This data is also used to

generate two lists of VDT users who are classified as programmers and video display terminal users. Since the programmers spend more than four hours per day working at their terminals, they are considered high risk operators.

### **Nature of the Complaints**

Operator complaints appear to be consistent with current data. A review of the surveys completed to date indicates that the usual complaints by VDT users at GSFC are:

1. Persistent pain or soreness in the neck, shoulder, upper back, and lumbar area.
2. Pain in the wrist(s) which may travel up the arm, and decreasing inability to grasp and hold on to objects without experiencing pain.
3. Pain, numbness, and tingling in the fingers; cold fingers.
4. Pain or soreness in the elbow.
5. Problems (latency) in accommodating when shifting eyes from the screen to distant objects.
6. Headaches.
7. Cumulative trauma disorders such as carpal tunnel syndrome and tendinitis.

### **Survey Findings**

Survey findings vary according to work station layout, task design, and individual differences. However, at GSFC some work station deficiencies appear to be more prevalent than others. A summary of these deficiencies follows.

### Frequently Occurring Work Station Deficiencies

1. Abnormal postures due to inadequate work space and poor work station design.
2. Work station is poorly designed for tasks that require alternation of VDT work with other tasks.
3. Poor alignment of work station equipment.
4. Monitor too low.
5. Monitor too high.
6. Glare on screen.
7. Direct glare to operator's eyes.
8. Keyboard at improper height or angle.
9. Wrists unsupported or only partially supported.
10. Chair: Operator's back unsupported or inadequately supported.
11. Chair Seat: Improper height, incorrect size.
12. Chair armrests at improper height.
13. Poor screen character quality.
14. Employee works long hours at the VDT without taking a break.

## **Program Weaknesses**

Time constraints preclude routine follow-up. Visits should be mandatory for employees who have been diagnosed as having a cumulative trauma disorder or who have complained of pain or discomfort. Routine follow-up visits should also be made to evaluate work stations that have been modified.

Standard items such as wrist-rests, anti-glare screens, and foot-rests needed for on-site work station modification are not available on Center.

Pre-screening to identify high risk employees should be performed. The National Institute of Occupational Safety and Health has determined that nearly all individuals who have been treated for carpal tunnel syndrome experience a reoccurrence of the disorder if they resume working at the same job or a similar one.

Emphasis should also be placed on evaluating tools, equipment, facility design, and jobs that involve the performance of tasks unrelated to the use of VDTs.