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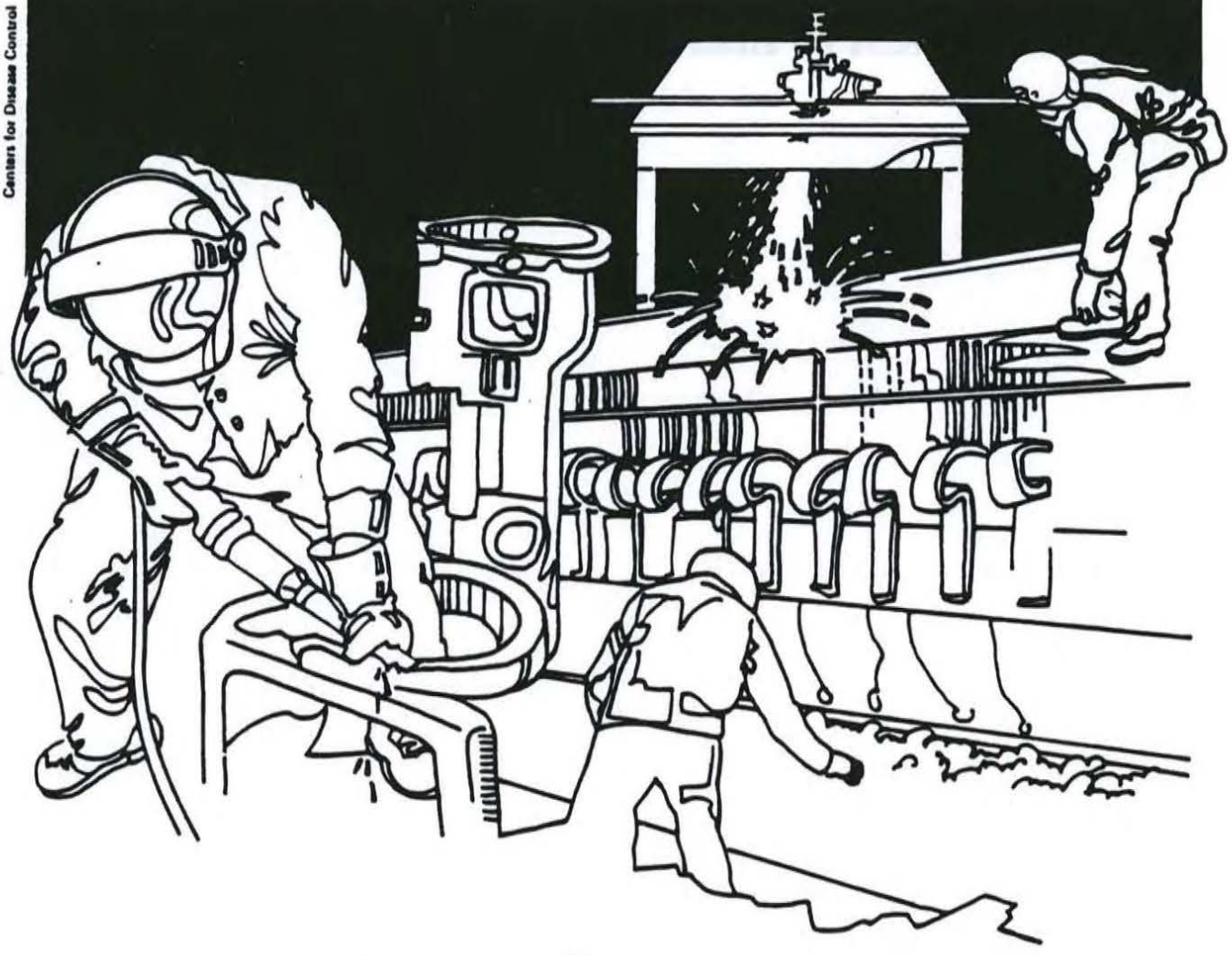

Health Hazard Evaluation Report

HETA 84-500-1751
GENERAL ELECTRIC
LYNN, MASSACHUSETTS

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

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I. SUMMARY

On August 27, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Union of Electronic, Electrical, Technical, Salaried and Machine Workers (IUE), Local 201 to evaluate the occurrence of serious illnesses and deaths, particularly cardiovascular disease, among workers in Building 69 of the General Electric (GE) facility in Lynn, Massachusetts.

On October 8, 1984, NIOSH investigators conducted an initial walk-through inspection of Building 69. Except for minimal amounts of 1,1,1-trichloroethane, the investigators found no use of known or suspected cardiotoxic substances.

On November 14-15, 1985, the NIOSH medical officer returned to the GE facility to obtain data for an epidemiologic evaluation. It was determined that available records were adequate to perform a proportional mortality ratio (PMR) study of workers who had been assigned to Building 69. Information derived from death certificates was available for deceased employees of the plant's Aircraft Engine Division (which included Building 69) for the period January 1, 1970 to December 31, 1984. Computerized GE personnel files allowed determination of building assignments for 66% of the deceased workers.

The proportion of cause-specific deaths among deceased building 69 workers was compared first to that of the U.S. male population, then again to the deceased workers of the plant's Aircraft Engine Division. No statistically significant excess cardiovascular mortality was observed among the Building 69 workers, but -- in addition to the generic limitations of a PMR study -- this study suffered from a relatively small number of deaths and incomplete, possibly unrepresentative, ascertainment of deaths.

No statistically significant risk of cardiovascular mortality among workers in Building 69 was apparent, but methodologic limitations preclude this from being a conclusive finding. No appreciable exposures to known cardiotoxins were identified.

Keywords: SIC 3724 (Aircraft engines and engine parts), cardiovascular disease, proportionate mortality ratio study

II. INTRODUCTION

On August 27, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Union of Electronic, Electrical, Technical, Salaried and Machine Workers (IUE), Local 201 to evaluate the occurrence of serious illnesses and deaths, particularly cardiovascular disease, among workers in Building 69 of the General Electric (GE) facility in Lynn, Massachusetts.

On October 8, 1984, the NIOSH investigators conducted an initial walk-through inspection of Building 69. On November 14-15, 1985, the NIOSH medical officer returned to the GE facility to determine if a proportionate mortality study of workers who had worked in Building 69 was feasible. Letters reporting the study's progress were distributed to labor and management representatives on October 18, 1984 and December 6, 1985.

III. BACKGROUND

A. Environmental

Building 69, a machine shop where one of-a-kind pieces and developmental prototypes are produced, was constructed between 1942 and 1948. The building was constructed with brick and concrete. Various metal fabrication operations, including machining, grinding, welding, and testing are performed on jet aircraft engine parts made from nickel, chromium, and titanium alloys. The nature of the work requires highly skilled machinists who can work under the pressure of time constraints and stringent product quality specifications.

B. Medical

Medical records were available for 44 of the of 52 employees thought by the union to have significant medical problems. Information adequate to determine the presence or absence of heart disease was present in the records of 37. Sixteen had diagnoses that were compatible with arteriosclerotic heart disease, 3 had evidence of congestive heart failure, 3 had evidence of other heart ailments, 2 had evidence of vascular disease, and 13 had no evidence of heart or vascular disease.

Although this information verified reported cardiovascular illnesses, it did not provide a basis upon which to determine if cardiovascular disease occurrence was in excess. Therefore, on November 14-15, 1985, the NIOSH medical officer returned to the GE facility to determine if records existed that would support an epidemilogic study of workers who had worked in building 69.

IV. EVALUATION METHODS

A. Environmental

The walk-through survey of Building 69, conducted on October 8, 1984, focused on potential cardiotoxins. The names of raw materials used in the shop were gathered, and material safety data sheets were obtained from the company. In addition, at the request of the employees' representative, a bulk sample of a thermoplastic tooling compound known as Rigidwax™ was obtained for qualitative analysis.

B. Medical

As part of a continuing surveillance program, GE has collected and maintains death certificates of deceased former employees in a death certificate registry. Death certificates have been obtained by GE for employees who died between January 1, 1970 and December 31, 1984. According to the GE epidemiologist, for each deceased employee, a copy of the death certificate and the company's proof of death form are obtained through the Accounting Services Operation in Schenectady, New York. Death certificates are sent to a nosologist for coding of the underlying cause of death according to the 8th revision of the International Classification of Diseases.[1] These activities are performed under the direction of GE's epidemiologist.

A record of a deceased GE employee should appear in the GE death certificate registry if he or she died either while actively employed or after retiring from the company with retirement benefits and continued life insurance coverage. Deaths of former employees other than retirees who did not continue life insurance coverage with the company would not be found in the death certificate registry because there would be no reason for next of kin to report the death to the company.

From the registry, GE provided NIOSH a list of 1,357 hourly white male workers with the pension code F00 (indicating retirement from the Lynn plant Aircraft Engine Group, which includes Building 69 personnel). The list included date and cause of death, and other information. In addition, actual death certificates were provided on approximately 80 deaths, identified randomly by NIOSH, for the purpose of verifying the cause-of-death coding performed by GE. In this sample, NIOSH and GE coding for cause of death were identical in 98% of the certificates.

GE also maintains a computerized personnel file that includes all persons employed over the past 10-12 years. Personnel records in this file are complete to the date of first employment. The list

of 1,357 deceased workers from the Aircraft Engine Group was compared to the computerized personnel file. Of the 1,357 deceased workers, 33 were identified as having worked at least one month in Building 69.

Proportionate mortality ratio (PMR) studies were performed on the 33 deaths identified among persons who worked in Building 69. The cause-specific proportions of these 33 deaths were compared both to the experience of the entire US white male population, and to the experience of the GE Aircraft Engine Group hourly white male population.

V. RESULTS AND DISCUSSION

A. Environmental

A review of the material safety data sheets revealed only one potentially cardiotoxic substance. 1,1,1-trichloroethane was included in the data sheets, but its use in Building 69 was minimal. The shop itself appeared fairly clean, with no visible clouds or mists. Operations and work practices were typical of a machine shop, with no unusual activities evident.

The bulk sample of wax was analyzed by NIOSH in three stages: the wax itself, the volatiles detected when it was heated to 100°C, and volatiles detected when the sample was heated until it smoked. The wax consisted of branched-chain aliphatic hydrocarbons that ranged from C_{19} to C_{30}. A small amount of butylated hydroxytoluene (BHT) was also detected. The major components identified in the sample were consistent with high-molecular-weight aliphatic wax. Both analyses of the heated volatiles contained similar peaks on their chromatograms. Analysis by gas chromatography/mass spectroscopy revealed C_9 - C_{18} aliphatics in addition to the C_{19} - C_{30} aliphatics found in the unheated sample.

B. Medical

Table 1 reports cause-specific deaths among the 33 hourly white males identified by GE as working in Building 69. The expected number of deaths for each cause was calculated from mortality data for white males in the United States in 1976.[2] The numbers of black and female deaths among Building 69 workers were too small for epidemiologic analysis. In addition, because there were only 33 deaths in the analysis, specific cause of death categories were grouped into five general categories: cardiovascular, malignancies, accidents, cerebral vascular, and all other causes.

Compared to the U.S. population, none of the PMR's differ significantly from 100. (A PMR of 100 results when the observed number of deaths equals the number expected based on the reference population. A PMR greater than 100 means that there were more observed than expected deaths, and a PMR less than 100 means that there were fewer observed deaths from a specific cause than expected. Since the calculated PMR is subject to sampling error, a confidence interval is used to express the probable range of the "true" PMR.)

Table 2 also reports the cause-specific deaths among the 33 hourly white males from Building 69, but this analysis uses the 1357 deaths among all hourly white male GE workers (pension unit code F00) to generate expected numbers of cause-specific deaths. (This comparison population includes the 33 deaths among Building 69 employees.) Again, none of the PMR's differ significantly from 100. For both cardiovascular disorders and malignancies (cancer), the two analyses yielded similar PMR's.

To determine the completeness of the data base on which the PMR was conducted, we examined a number of union-reported deaths to see if they appeared in the data base. Of 14 union-reported deaths, 10 (71%) were found in the data base.

The union-reported deaths not appearing in data base may have occurred in individuals who were not current employees at the time of death or did not continue life insurance with GE upon retirement. It is also possible that a worker's final pension code number was not F00. This may have occurred because the worker transferred to a different pension code group before death or retirement, or it could have resulted from a coding error.

The PMR is only an estimate of the true risk experienced by a population. It is possible that under certain circumstances genuine excesses of death can go undetected in this type of study. In addition to this general limitation of the PMR, in this study of Building 69 workers there are some additional factors that might have obscured an observation of excess disease. First, the study population was small. When only 33 deaths are being examined, a few missed deaths can make a large difference in the outcome of the study. Then, there is the problem of considering only deaths that occurred during active employment or after retirement. A large number of deaths among former workers who terminated employment prior to retirement have undoubtedly occurred but were not counted in this study. This problem is partially accounted for by the analysis which compared the 33 deceased persons who worked in Building 69 to an internal comparison group of deceased workers

from the plant. In that analysis, the control group was under the same restriction as the study group as far as entry into the study population is concerned. However, this correction remains less than the ideal of having all deaths counted. Unfortunately, this sample of deaths is all that was available to the NIOSH investigators.

Acknowledging these shortcomings, we found no statistical evidence of an excess of death from cardiovascular disease to be apparent. This, combined with the inability to identify a cardiotoxin in the work environment, leaves no evidence of a workplace-induced cardiovascular problem.

VI. REFERENCES

1. National Center for Health Statistics. Eighth revision international classification of diseases, adapted for use in the United States. Washington, DC: National Center for Health Statistics, 1968 (Public Health Service publication no. 1693).

2. National Center for Health Statistics. Vital statistics of the U.S., 1976, vol. II -- mortality. Hyattsville, MD: National Center for Health Statistics, 1980 [DHHS publication no. (PHS) 80-1101].

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VIII. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. General Electric Co.
2. IUE Local 201
3. NIOSH, Region 1
4. OSHA, Region 1

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Table 1

Proportionate Mortality Ratios (PMR) for 33 Deaths
among Hourly White Male Building 69 Workers
Compared to All U.S. White Males Dying in 1976

General Electric
Lynn, Massachusetts

HETA 84-500

Cause of Death	Observed Deaths	Expected Deaths	PMR	95% Confidence Interval (2-sided)
Cardiovascular	15	10.95	137	77-226
Malignancies	8	7.40	108	47-213
Cerebral Vascular	2	1.46	137	15-495
Accidents	4	3.12	128	34-328
All Other Causes	4	10.06	40	11-102

Table 2

Proportionate Mortality Ratios for 33 Deaths among
Hourly White Male Building 69 Workers Compared to
All Hourly, White, Male, Aircraft Engine Group Workers
Dying Between January 1, 1970 and December 31, 1984.

General Electric
Lynn, Massachusetts

HETA 84-500

Cause of Death	Observed Deaths	Expected Deaths	PMR	95% Confidence Interval (2 sided)
Cardiovascular	15	13.13	114	64-188
Malignancies	8	6.80	118	51-232
Cerebral Vascular	2	0.46	443	49-1570
Accidents	4	2.05	195	52-500
All Other Causes	4	10.52	38	10-97

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