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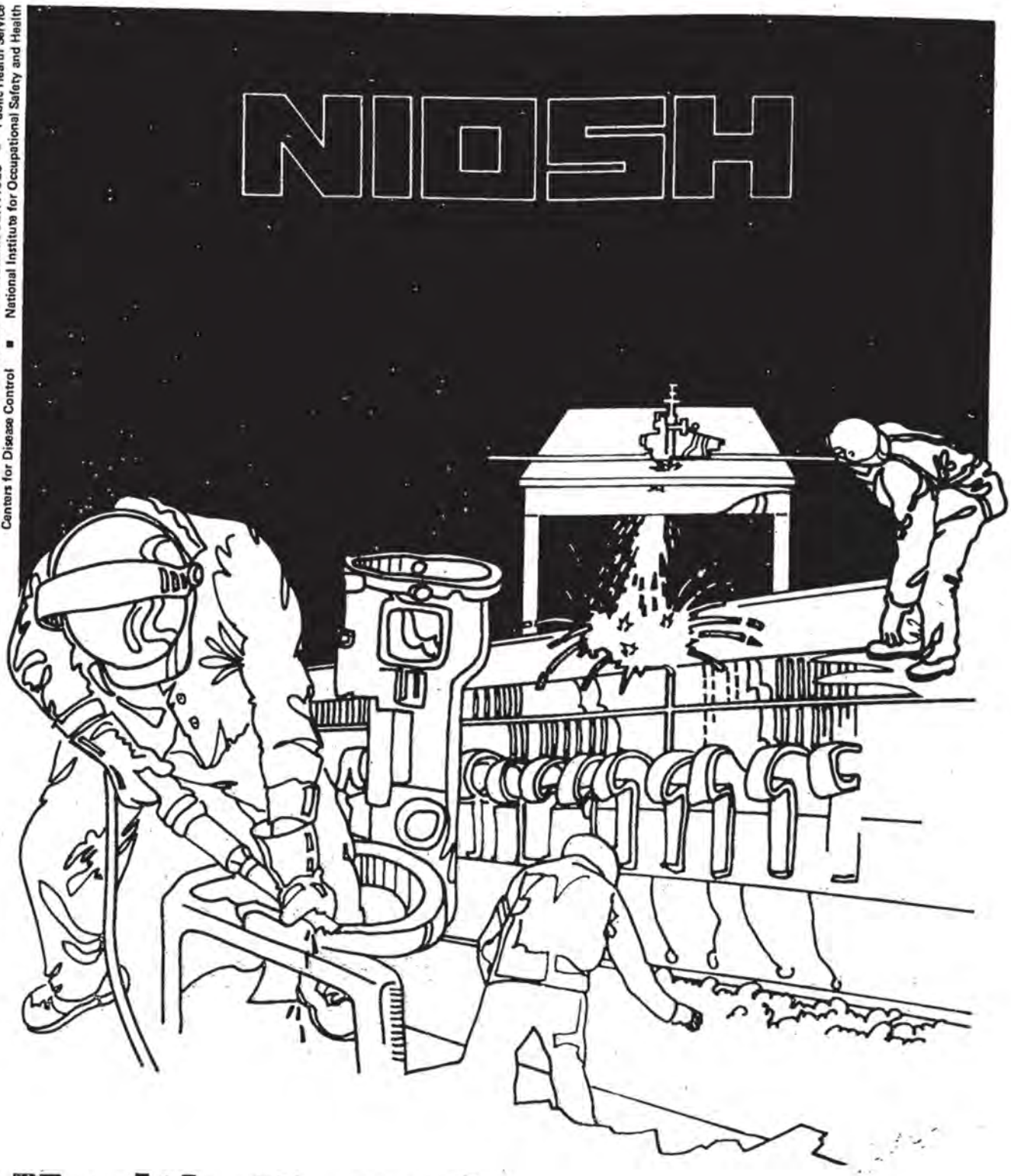

Health Hazard Evaluation Report

HETA 81-261-1085
JEPPESEN SANDERSON, INC.
ENGLEWOOD, COLORADO

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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 81-261-1085
APRIL 1982
JEPPESEN SANDERSON, INC.
ENGLEWOOD, COLORADO

NIOSH INVESTIGATOR:
Bobby J. Gunter, Ph.D., IH

I. SUMMARY

In March 1981 the National Institute for Occupational Safety and Health (NIOSH) received a request from an employee of Jeppesen Sanderson, Inc., Englewood, Colorado, to evaluate exposures to chemicals at a printing facility.

Jeppesen Sanderson, Inc., is the leading provider of worldwide flight navigation information. During the production and printing of flight information and books for pilot training, workers are exposed to solvents that are contained in the printing solutions and to cleaning solutions used for cleaning printing presses.

On November 4, 1981, NIOSH conducted an environmental survey. All workers exposed to printing inks and solvents were monitored for airborne exposure to Stoddard solvent, isopropanol, Freon 113, and 1,1,1-trichloroethane. A total of eight air samples were collected for these solvents. Stoddard solvent concentrations ranged from less than 0.1 milligrams per sample to 16 mg/M^3. Concentrations for isopropanol ranged from 85 mg/M^3 to 293 mg/M^3. Freon 113 concentrations ranged from less than 0.02 milligrams per sample to 2 mg/M^3. Concentrations for 1,1,1-trichloroethane ranged from 3 to 15 mg/M^3. All concentrations were well below the evaluation criteria and Occupational Safety and Health Administration (OSHA) standards.

This facility has no local ventilation; however, the general room ventilation is now adequate to keep these solvents at a safe level unless increased production or some change is made to the present layout.

The environmental samples collected during this survey did not demonstrate overexposures to Stoddard solvent, isopropanol, 1,1,1-trichloroethane, or Freon 113 in the printing room. NIOSH has concluded that a health hazard did not exist at the time of this survey. Recommendations on preventing a future health hazard at this work site are included in this report.

KEYWORDS: SIC 2732 (Printing only, books and pamphlets), printing, airline flight training, solvents, Stoddard solvent, isopropanol, 1,1,1-trichloroethane, Freon 113.

II. INTRODUCTION

In March 1981 the National Institute for Occupational Safety and Health (NIOSH) received a request from an employee of Jeppesen Sanderson, Inc., Englewood, Colorado, to evaluate exposures to chemicals at this printing facility. An environmental survey was conducted on November 4, 1981. Workers were briefly questioned in relation to their contact with the printing inks and solvents. None of the printers had medical problems. However, all were interested in knowing what they were being exposed to and at what levels. An interim report was not provided; however, the company was notified of the low levels of airborne contaminants found during this evaluation.

III. BACKGROUND

Jeppesen Sanderson, Inc., is the leading provider of worldwide flight navigation information. For more than 45 years, the company has provided constantly updated flight information to commercial and private pilots. This information has now been computerized and can be provided on magnetic tape for use in sophisticated devices on board aircraft.

During the production and printing of flight information and books for various types of pilot training, workers are exposed to solvents in the printing solutions and cleaning solutions used for cleaning printing presses.

IV. ENVIRONMENTAL DESIGN AND METHODS

Seven breathing zone and one general room air samples for Stoddard solvent, isopropanol, 1,1,1-trichloroethane, and Freon 113 were collected on organic vapor charcoal sampling tubes and analyzed according to NIOSH P&CAM Method No. 127.

V. EVALUATION CRITERIA

A. Environmental

Three sources of criteria used to assess the workroom concentrations of the chemicals were (1) recommended Threshold Limit Values (TLVs) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), 1981, (2) the NIOSH criteria for a recommended standards, and (3) the Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.1000), July 1980.

	Permissible Exposure Limits 8-Hour Time-Weighted Exposure Basis
Stoddard solvent.....	525 mg/M^3 (TLV) 2000 mg/M^3 (OSHA)
1,1,1-trichloroethane.....	1910 mg/M^3 (TLV) (OSHA) (NIOSH)*
Isopropanol.....	980 mg/M^3 (TLV) (OSHA) (NIOSH)
Freon 113.....	4950 mg/M^3 (TLV) 7600 mg/M^3 (OSHA)

mg/M^3 = milligrams of substance per cubic meter of air.
* = NIOSH recommendation for a 15 minute ceiling limit which should not be exceeded.

Occupational health standards are established at levels designed to protect individuals occupationally exposed to toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

B. Toxicological

Stoddard Solvent -- This aliphatic solvent usually does not cause adverse health problems. A bulk sample should be analyzed for aromatic content since they are sometimes contaminated with benzene. From a practical point of view, and in the absence of benzene, the manifestation of exposures to Stoddard solvent include: giddiness, vertigo, nausea, headache, and anesthetic stupor. In cases of acute, high exposure, full recovery without sequelae is the rule.[1] Maintaining the time-weighted average (TWA) for an 8-hour day, 40-hour week below 525 mg/M^3 should eliminate any health risk.

1,1,1-trichloroethane (methyl chloroform) -- This solvent is a colorless liquid with a mild odor similar to chloroform. The current OSHA standard is 1910 mg/M^3 and the NIOSH recommended Ceiling level is 1910 mg/M^3 for a 15 minute period.

Methyl chloroform may enter the body by inhalation, ingestion, or through the skin. Effects of short-term exposure include headache, dizziness, drowsiness, unconsciousness, irregular heart beat, and death. Methyl chloroform is very irritating to the eyes. Complaints about eye irritation when you have workers exposed to this solvent are routine and consistent. Long-term exposures may cause dermatitis. Reproductive abnormalities have been reported in animals receiving high exposures. At high concentrations methyl chloroform causes liver changes in animals. Attention should be given to the skin, liver, and eyes on the pre-employment and annual physical examinations. This solvent is presently considered to be one of the safest to use as an industrial degreaser.[2]

Isopropyl Alcohol (isopropanol) -- The current OSHA standard for isopropyl alcohol is 400 ppm or 980 mg/M^3. NIOSH recommends 400 ppm (980 mg/M^3) and a 15 minute ceiling concentration of 800 ppm (1900 mg/M^3). Isopropyl alcohol can affect the body either by inhalation, ingestion, or skin contact. Exposure to high concentrations of isopropyl alcohol may cause irritation of the eye, nose, and throat.

Drowsiness, headache, and incoordination may also occur. Ingestion of isopropanol may cause drowsiness, unconsciousness and death. Gastrointestinal pain cramps, nausea, vomiting, and diarrhea may also occur. The only long term health hazard from exposure to isopropanol is the possibility of defatting dermatitis. It is very rare to find an overexposure to isopropanol in an industrial situation.[3]

Freon 113 -- Fluorocarbon compounds may produce mild irritation to the upper respiratory tract. Dermatitis occurs only rarely. Decomposition products may also be the cause of these effects.

Mild central nervous system depression may occur in cases of exposure to very high concentrations of fluorocarbons. Symptoms from acute exposure may manifest themselves in occasional tremor and incoordination. It has been reported that dizziness had resulted from an exposure of 5 percent dichlorodifluoromethane and unconsciousness from exposure to 15 percent. Cardiac arrhythmias, with sudden death, have occurred from breathing some of these chemicals. Typically, fluorocarbons have very low levels of toxicity, and their predominant hazard is from simple asphyxia.[4]

VI. ENVIRONMENTAL RESULTS

One general room and seven breathing zone air samples were taken to measure for Stoddard solvent, 1,1,1-trichloroethane, Freon 113, and isopropanol. Stoddard solvent concentrations ranged from less than 0.1 milligrams per sample to 16 mg/M^3. Isopropanol concentrations ranged from 85 mg/M^3 to 293 mg/M^3. Freon 113 concentrations ranged from less than 0.02 milligrams per sample to 2 mg/M^3. Concentrations for 1,1,1-trichloroethane ranged from 3 mg/M^3 to 15 mg/M^3. Average concentrations were: 8.25 mg/M^3 for Stoddard solvent; 7.5 mg/m^3 for 1,1,1-trichloroethane; 229 mg/M^3 for isopropanol; and 1 mg/M^3 for Freon 113. These results are well below the evalution criteria and the OSHA standard for these solvents. (Refer to Table 1.)

VII. DISCUSSION AND CONCLUSIONS

The environmental samples collected during this survey did not demonstrate overexposures in the printing room at Jeppesen Sanderson, Inc. NIOSH concluded that a health hazard did not exist to printers and other workers using this room.

This facility has no local ventilation; however, the general room ventilation is now adequate to keep these solvents at a safe level unless increased production or some change is made to the present layout.

VIII. RECOMMENDATIONS

1. Smoking and eating should be prohibited in the printing room.
2. Workers should be informed of the toxicity of all chemicals with which they work.

IX. REFERENCES

1. Hamilton, A. and Hardy, H.L., Industrial Toxicology, Third Edition, Publishing Sciences Group, Inc., Massachusetts, 1974, pp. 264-265.

2. NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards, Department of Health and Human Services, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 81-123, (1978).

3. Ibid.

4. Occupational Diseases - A Guide to Their Recognition, Revised Edition, June 1977, DHEW (NIOSH) Publication No. 77-181, pp. 204-205.

X. AUTHORSHIP AND ACKNOWLEDGMENTS

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. 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. Jeppesen Sanderson, Inc.
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Colorado Department of Health.
5. State Designated Agency.

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

TABLE 1

Breathing Zone and General Room Air Concentrations of
Stoddard Solvent, 1,1,1-trichloroethane, Isopropanol, and Freon 113

Jeppesen Sanderson, Inc.
Englewood, Colorado

November 4, 1981

Sample Number	Job Classification	Sampling Time	mg/M³ Stoddard	1,1,1-trichloroethane	Isopropanol	Freon 113
100	Superintendent	8:00 AM - 12:00 N	15	3	85	*
101	Pressman	8:02 AM - 12:45 PM	10	6	241	1
102	Pressman	8:05 AM - 12:40 PM	16	10	236	1
103	Binder Operator	8:08 AM - 12:40 PM	4	5	222	1
104	Binder Operator	8:15 AM - 12:10 PM	4	15	255	2
105	Binder Operator	8:17 AM - 10:10 AM	*	7	293	*
106	General Room	8:25 AM - 12:35 PM	7	6	236	1
107	Binder Operator	10:10 AM - 2:10 PM	10	8	262	2
EVALUATION CRITERIA			525	1910	980	4950
LABORATORY DETECTION LIMITS mg/sample			0.1	0.02	0.01	0.02

* = below detection limits