NIOSH HEALTH HAZARD EVALUATION REPORT

HETA #2005-0197-3010
Transportation Security Administration
Cincinnati/Northern Kentucky International Airport
Erlanger, Kentucky

July 2006

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

PREFACE

The Hazard Evaluation and Technical Assistance Branch (HETAB) of the National Institute for Occupational Safety and Health (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 (OSHA) 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 employers 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.

HETAB also provides, upon request, technical and consultative assistance 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 NIOSH.

ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Chad Dowell and Andrea Markey of HETAB, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS). Field assistance was provided by Randy Tubbs. Desktop publishing was performed by Robin Smith. Editorial assistance was provided by Ellen Galloway.

Copies of this report have been sent to employee and management representatives at the Transportation Security Administration in Erlanger, Kentucky and the OSHA Regional Office. This report is not copyrighted and may be freely reproduced. The report may be viewed and printed from the following internet address: http://www.cdc.gov/niosh/hhe. Copies may be purchased from the National Technical Information Service (NTIS) at 5825 Port Royal Road, Springfield, Virginia 22161.

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.

Highlights of the NIOSH Health Hazard Evaluation

The National Institute for Occupational Safety and Health (NIOSH) received a management request from the Transportation Security Administration (TSA) for a health hazard evaluation (HHE) at the Cincinnati/Northern Kentucky International Airport in Erlanger, Kentucky. TSA submitted the HHE request to see if there was a risk of hearing loss from noise exposure in the B-Bags and T-Drive areas of Terminal 3. NIOSH investigators conducted an evaluation in February and April of 2006.

What NIOSH Did

- We measured screeners' noise exposures in B-Bags and T-Drive areas.
- We measured area noise levels in the T-Drive area.

What NIOSH Found

- Most noise exposures did not pose a risk for occupational noise-induced hearing loss.
- Noise at the shoe in the B-Bags area was higher than NIOSH criteria.
- The high-pitched noise in the T-Drive area was not loud enough to be a health concern, but was very noticeable.

What TSA Managers Can Do

- Perform additional noise measurements at the shoe in the B-Bags area.
- Reduce or eliminate the annoying high-pitched noise in the T-Drive area.
- Replace metal rollers with rubberized or plastic rollers.

What the TSA Employees Can Do

- Report changes in their work environment that result in loud or annoying noise.

What To Do For More Information:
We encourage you to read the full report. If you would like a copy, either ask your health and safety representative to make you a copy or call 1-513-841-4252 and ask for HETA Report #2005-0197-3010

Health Hazard Evaluation Report 2005-0197-3010
Transportation Security Administration
Cincinnati/Northern Kentucky International Airport
Erlanger, Kentucky
July 2006

Chad H. Dowell, MS
Andrea M. Markey, MS

SUMMARY

In April 2005, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from the Transportation Security Administration (TSA) at the Cincinnati/Northern Kentucky International Airport (CVG) in Erlanger, Kentucky. The request asked NIOSH to evaluate screeners' exposure to noise generated by conveyor belts and baggage inspection equipment in the checked baggage screening areas of Terminal 3. In response to the request, NIOSH investigators conducted site visits on February 9, 2006, and April 13, 2006.

The site visit on February 9, 2006, included an opening conference with management and employee representatives followed by a noise survey of the B-Bags and T-Drive checked baggage screening areas. Thirteen employees in the B-Bags and T-Drive screening areas were monitored using noise dosimeters throughout the shift to evaluate their daily noise dose. The noise dose for one employee working in the B-Bags screening area exceeded the NIOSH criteria. The Occupational Safety and Health Administration (OSHA) criteria were not exceeded in any of the 13 employees monitored.

On April 13, 2006, NIOSH investigators returned to measure area spectral noise levels in the T-Drive checked baggage screening area. The area spectral analysis revealed a predominant sound at the third-octave band center frequency of 8.0 kiloHertz (kHz), thought to be from the conveyor motor. This high-pitched noise was not loud enough to be hazardous to the employees' hearing, but was very noticeable to the employees.

Most noise exposures to which TSA screeners are subjected during their work activities do not pose a risk for occupational noise-induced hearing loss. However, screeners working the shoe in the B-Bags area do have noise levels high enough to warrant further evaluation. The high-pitched noise generated from a conveyor belt motor in the T-Drive area should be eliminated by an appropriate engineering control. Suggestions for further reducing noise exposures are provided in the Recommendations section of this report.

Keywords: NAICS 488119 (Other Airport Operations), noise, airport, screeners, Transportation Security Administration, TSA

Table of Contents

INTRODUCTION

In April 2005, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from the Transportation Security Administration (TSA) at the Cincinnati/Northern Kentucky International Airport (CVG) in Erlanger, Kentucky. The request asked NIOSH to evaluate screeners' exposure to noise generated from conveyor belts and baggage inspection equipment in the checked baggage screening areas of Terminal 3.

In response to the request, NIOSH investigators conducted site visits on February 9, 2006, and April 13, 2006. The site visit on February 9, 2006, included an opening conference with management and employee representatives followed by a noise survey of the B-Bags and T-Drive checked baggage screening areas. On April 13, 2006, NIOSH investigators returned to measure area spectral noise levels in the T-Drive checked baggage screening area.

BACKGROUND

CVG is the 11th busiest airport in the world, in terms of number of flights. CVG offers 680 daily flights to 140 destinations worldwide. CVG services more than 22 million passengers a year with 16 passenger airlines. CVG is the second largest hub for Delta Air Lines.[1] CVG has three terminals, and Terminal 3 has three concourses.

Checked passenger luggage from Terminal 3 is transferred by a conveyor belt system to either the T-Drive or B-Bags checked baggage screening areas. In the T-Drive area, the bags are transferred by conveyor into the screening room where they are manually loaded into an explosive detection system (EDS). In B-Bags, the luggage arrives on a high-speed conveyor belt into the shoe. Here, the luggage is manually directed onto separate conveyors that feed the EDS. In both areas, bags may be removed from conveyors for additional screening by an explosive trace detection (ETD) system. This requires the manual transfer of the luggage to and from the ETD systems. From the screening areas, conveyors transfer the luggage to the appropriate departure gate.

Screeners in the B-Bags area rotate approximately every 2 hours primarily between four machines located next to one another. However, during push periods, two additional screening machines are operated in an adjacent area, referred to as the pit. In addition to operating the screening machines, there are one or two screeners who work in the shoe. The screeners working in the shoe direct and manually move all incoming bags on the conveyor from the terminal to a conveyor leading to one of the six screening machines.

METHODS

Quest® Electronics Model Q-300 Noise Dosimeters were used to measure the daily noise exposures on screeners who volunteered to participate. The Quest dosimeters collect data that can be directly compared with the three different noise criteria used in this survey, the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) and Action Level (AL), and the NIOSH Recommended Exposure Limit (REL). The dosimeter was secured on the worker's belt and the dosimeter's microphone attached to the screener's shirt, halfway between the collar and the point of the shoulder. A windscreen provided by the manufacturer of the dosimeter was placed over the microphone during recordings. The noise information was downloaded to a personal computer for interpretation with QuestSuite® Professional computer software. The dosimeters were calibrated before and after the work shift according to the manufacturer's instructions.

All screeners working in the B-Bags and T-Drive checked baggage screening areas during the survey were asked to wear noise monitoring devices at the beginning of their work shift. Employees reported to the supervisor's area before being assigned to a screening machine, and the dosimeters were placed on them at this time. The dosimeters were worn for the entire

work shift, through dinner and breaks. The dosimeters were removed at the end of the shift when the employees reported back to the supervisor's area.

An area spectral noise measurement was taken next to the baggage conveyor belt in the general area where the employees worked in T-Drive. The spectral area noise measurement was made with a Larson-Davis Laboratory Model 2800 Real-Time Analyzer and a Larson-Davis Laboratory Model 2559 ½-inch random incidence response microphone. The analyzer was placed on a tripod with the microphone located at ear level for a standing employee. The ½-inch-diameter microphone has a frequency response range (± 2 decibels [dB]) from 4 Hertz (Hz) to 21 kiloHertz (kHz) that allows for the analysis of sounds in the region of concern. One-third octave bands consisting of center frequencies from 25 Hz to 20 kHz were integrated for 30 seconds.

EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for the assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects even though their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increases the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: (1) NIOSH RELs,[2] (2) the American Conference of Governmental Industrial Hygienists' (ACGIH®) Threshold Limit Values (TLVs®),[3] and (3) the U.S. Department of Labor, OSHA PELs.[4] Employers are encouraged to follow the OSHA limits, the NIOSH RELs, the ACGIH TLVs, or whichever are the more protective criteria.

OSHA requires an employer to furnish employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970, Public Law 91–596, sec. 5(a)(1)]. Thus, employers should understand that not all hazardous chemicals have specific OSHA exposure limits such as PELs and short-term exposure limits (STELs). An employer is still required by OSHA to protect their employees from hazards, even in the absence of a specific OSHA PEL.

Noise-induced loss of hearing is an irreversible, sensorineural condition that progresses with exposure. Although hearing ability declines with age (presbycusis) in all populations, exposure to noise produces hearing loss greater than that resulting from the natural aging process. This noise-induced loss is caused by damage to nerve cells of the inner ear (cochlea) and, unlike some conductive hearing disorders, cannot be treated medically.[5] While loss of hearing may result from a single exposure to a very brief impulse noise or explosion, such traumatic losses are rare. In most cases, noise-induced hearing loss is insidious. Typically, it begins to develop at 4000 or 6000 Hz (the hearing range is 20 Hz to 20000 Hz) and spreads to lower and higher frequencies. Often, material impairment has occurred before the condition is clearly recognized. Such impairment is usually severe

enough to permanently affect a person's ability to hear and understand speech under everyday conditions. Although the primary frequencies of human speech range from 200 Hz to 2000 Hz, research has shown that the consonant sounds, which enable people to distinguish words such as "fish" from "fist," have still higher frequency components.[6]

The A-weighted decibel [dB(A)] is the preferred unit for measuring sound levels to assess worker noise exposures. The dB(A) scale is weighted to approximate the sensory response of the human ear to sound frequencies near the threshold of hearing. The decibel unit is dimensionless, and represents the logarithmic relationship of the measured sound pressure level to an arbitrary reference sound pressure (20 micropascals, the normal threshold of human hearing at a frequency of 1000 Hz). Decibel units are used because of the very large range of sound pressure levels which are audible to the human ear. Because the dB(A) scale is logarithmic, increases of 3 dB(A), 10 dB(A), and 20 dB(A) represent a doubling, tenfold increase, and hundredfold increase of sound energy, respectively. It should be noted that noise exposures expressed in decibels cannot be averaged by taking the simple arithmetic mean.

The OSHA standard for occupational exposure to noise (29 CFR 1910.95)[7] specifies a maximum PEL of 90 dB(A) for a duration of 8 hours per day. The regulation, in calculating the PEL, uses a 5 dB time/intensity trading relationship, or exchange rate. This means that a person may be exposed to noise levels of 95 dB(A) for no more than 4 hours, to 100 dB(A) for 2 hours, etc. Conversely, up to 16 hours exposure to 85 dB(A) is allowed by this exchange rate. The duration and sound level intensities can be combined in order to calculate a worker's daily noise dose according to the formula:

$$Dose = 100 \times \left(\frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + ... + \frac{C_n}{T_n} \right)$$

where C_n indicates the total time of exposure at a specific noise level and T_n indicates the reference duration for that level as given in Table G-16a of the OSHA noise regulation. During any 24-hour period, a worker is allowed up to 100% of his daily noise dose. Doses greater than 100% are in excess of the OSHA PEL.

The OSHA regulation has an additional AL of 85 dB(A); an employer shall administer a continuing, effective hearing conservation program when the 8-hour time-weighted average (TWA) value exceeds the AL. The program must include monitoring, employee notification, observation, audiometric testing, hearing protection devices (HPD), training, and record keeping. All of these requirements are included in 29 CFR 1910.95, paragraphs (c) through (o). Finally, the OSHA noise standard states that when workers are exposed to noise levels in excess of the OSHA PEL of 90 dB(A), feasible engineering or administrative controls shall be implemented to reduce the workers' exposure levels.

NIOSH, in its Criteria for a Recommended Standard,[8] and ACGIH,[3] propose exposure criteria of 85 dB(A) as a TWA for 8 hours, 5 dB less than the OSHA standard. These criteria also use a more conservative 3 dB time/intensity trading relationship in calculating exposure limits. Thus, a worker can be exposed to 85 dB(A) for 8 hours, but to no more than 88 dB(A) for 4 hours or 91 dB(A) for 2 hours. Twelve-hour exposures have to be 83 dB(A) or less according to the NIOSH REL.

RESULTS

Ten TSA screeners in B-Bags and three in T-Drive wore dosimeters on February 9, 2006. The noise exposure results for each individual are shown in Table 1 and are compared to the three different noise criteria used in this survey, the OSHA PEL and AL, and the NIOSH REL. The OSHA criteria use a 90-dBA criterion and 5-dB exchange rate for the PEL and AL. The difference between the two is the threshold level employed, with a 90 dBA threshold for the PEL

and an 80 dBA threshold for the AL. The threshold level is the lower limit of noise values included in the calculation of the criteria; values less than the threshold are ignored by the dosimeter. The NIOSH criterion differs from OSHA in that the criterion is 85 dBA, the threshold is 80 dBA, and it uses a 3-dB exchange rate. The data in the table are reported as the percent daily dose for each noise criterion as an 8-hour TWA. The noise levels throughout the shift for each individual are shown in Figures 1–13.

The OSHA PEL and AL were not exceeded in any of the 13 dosimeters worn by employees. The dose for one screener in the B-Bags area exceeded the daily allowable dose when compared to the NIOSH criterion. This screener worked in the shoe for part of the shift. Review of the screener's noise data revealed one period where the 1-minute average was 115 dBA. Because NIOSH investigators did not observe this event, it is unknown if this reading was a result of the normal job or an event introduced by interference with the dosimeter's microphone (i.e., something bumping up against the microphone). The data point was replaced with 91.2 (the screener's average sound level) to determine whether this would lower the dose. Following this replacement, the dose still exceeded the NIOSH criterion. Because it is unknown if the event was a normal job-related activity, the higher of the two is reported in Table 1.

The area spectral noise measurement collected on April 13, 2006, was taken to document a specific noise in the T-Drive screening area. The motor below the conveyor belt delivering luggage into the room had a noticeable, high-pitched sound. The area measurement revealed a predominant sound at the third-octave band center frequency of 8.0 kHz (Figure 14). The third-octave band levels on either side of 8.0 kHz were approximately 20 dB less.

DISCUSSION AND CONCLUSIONS

The noise exposures measured in the survey were less than the evaluation criteria with the exception of the measurement collected on the screener working the shoe in the B-Bags area. This measurement exceeded the NIOSH REL as a result of time worked in the shoe. This employee's noise levels appeared higher than the other employees in B-Bags while in the shoe. Additional documentation of noise exposures on the screeners working the shoe in the B-Bags checked baggage screening area should be performed. The testing should be conducted during days and shifts of heaviest baggage demands.

The noise survey documented the high-pitched noise, thought to be from the motor on the conveyor belt, in the T-Drive screening area. Even though the high-pitched noise was not loud enough to be hazardous to the employees' hearing, it was an annoyance that could be eliminated. Management should address the source of the noise and attempt to eliminate it.

Some screeners were observed wearing HPDs. Noise levels in most of the surveyed baggage screening areas were not loud enough to warrant the use of HPDs. Because of the need to communicate with other employees, there is the chance that some HPDs would actually over-protect workers and lead to a loss of important auditory signals that workers need to perform their jobs. If screeners choose to wear HPDs while working, TSA should educate the screeners about flat spectrum, moderate attenuation devices (sometimes referred to as "musician earplugs"). However, TSA management should stress that the noise levels are not loud enough to necessitate the use of HPDs.

RECOMMENDATIONS

Based on the findings and observations of this evaluation, the following recommendations are

offered to TSA to improve the work environment of their screeners.

1. Perform additional noise exposure measurements on screeners working the shoe in the B-Bags checked baggage screening area, where the level exceeded the NIOSH REL. If the evaluation criteria are consistently exceeded, TSA management should implement a hearing conservation program that meets the OSHA requirements for employees working in this area.[7]

2. Reduce or eliminate the annoying high-pitched noise in the T-Drive screening area. This can be accomplished by one of the following methods: replace the motor with one that does not produce the high-pitched noise, install noise dampening material around the motor (this may be as simple as placing a heavy plastic curtain around the bottom of the conveyor belt or a box around the motor), or move the motor to the other side of the wall where employees do not usually work.

3. Replace metal rollers with rubberized or plastic rollers. As metal rollers wear or new rollers are added, TSA should specify rubberized or plastic rollers to eliminate noise caused by metal-on-metal contact.

4. Create a procedure for employees to report changes in their work environment that result in loud or annoying noise exposures. The reporting mechanism should identify any loud baggage-handling machinery and ultimately lead to repairs that reduce or eliminate unnecessary noise.

REFERENCES

1. Robinson WT, Crist RD, Chairmen [2005]. Cincinnati/Northern Kentucky International Airport 2004 Annual Report. Cincinnati, OH: Kenton County Airport Board.

2. NIOSH [1992]. Recommendations for occupational safety and health: compendium of policy documents and statements. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 92-100.

3. ACGIH® [2006]. 2006 TLVs® and BEIs®: threshold limit values for chemical substances and physical agents. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

4. CFR [2003]. 29 CFR 1910.1000. Code of Federal Regulations. Washington, DC: U.S. Government Printing Office, Office of the Federal Register.

5. Ward WD, Royster LH, Royster JD [2000]. Anatomy & physiology of the ear: normal and damaged hearing. Chapter 4. In: Berger EH, Royster LH, Royster JD, Driscoll DP, Layne M, eds. The noise manual. 5th ed. Fairfax, VA: American Industrial Hygiene Association, pp 101-122.

6. Suter AH [1978]. The ability of mildly-impaired individuals to discriminate speech in noise. Washington, DC: U.S. Environmental Protection Agency, Joint EPA/USAF study, EPA 550/9-78-100, AMRL-TR-78-4.

7. CFR [2003]. 29 CFR 1910.95. Code of Federal Regulations. Washington, DC: U.S. Government Printing Office, Office of the Federal Register.

8. NIOSH [1998]. Criteria for a recommended standard: Occupational noise exposure (revised criteria 1998). Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 98-126.

Table 1
Personal Noise Dosimeter Data
Transportation Security Administration
HETA #2005-0197-3010
February 9, 2006

	Sample Time hh:mm	*8-hour PEL % Dose*	*8-hour AL % Dose*	*8-hour REL % Dose*
B-Bags				
Screener #1	7:16	3.5	30.6	70.3
Screener #2	7:22	1.6	18.8	46.5
Screener #3	6:06	14.3	43.1	419.0
Screener #4	8:03	0.7	14.3	34.5
Screener #5	7:14	2.2	17.7	45.2
Screener #6	7:08	1.9	16.9	44.7
Screener #7	7:16	2.3	23.2	53.2
Screener #8	6:08	4.3	22.1	60.3
Screener #9	7:17	5.2	19.6	67.6
Screener #10	7:20	2.2	23.2	52.6
T-Drive				
Screener #11	9:48	0.1	0.8	6.6
Screener #12	3:30	0.3	1.8	10.1
Screener #13	7:27	2.1	7.3	25.8

Sampling time is reported as the hours and minutes that the device was on the worker. All percent dose criteria, Permissible Exposure Limit (PEL), Action Level (AL), and Recommended Exposure Limit (REL) values, have been extrapolated to an 8-hour time-weighted average for each worker.

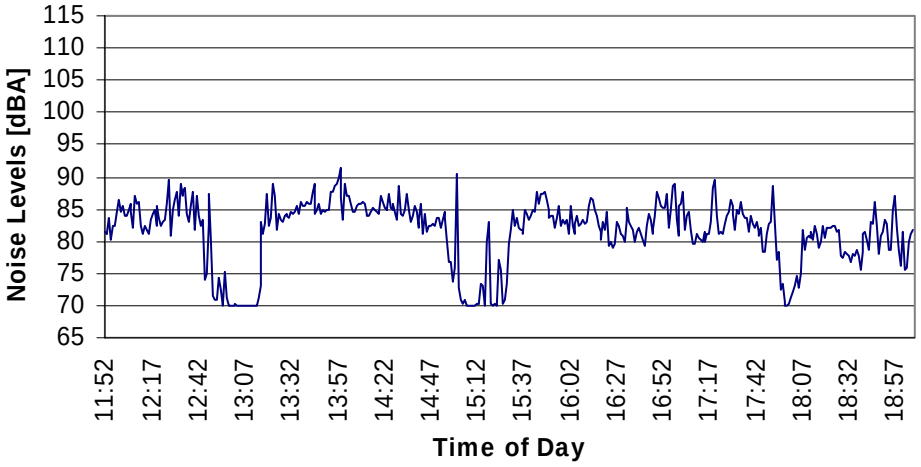

Figure 1. Average noise levels for Transportation Security Administration screener #1 working in the B-Bags checked baggage screening area on March 9, 2006.

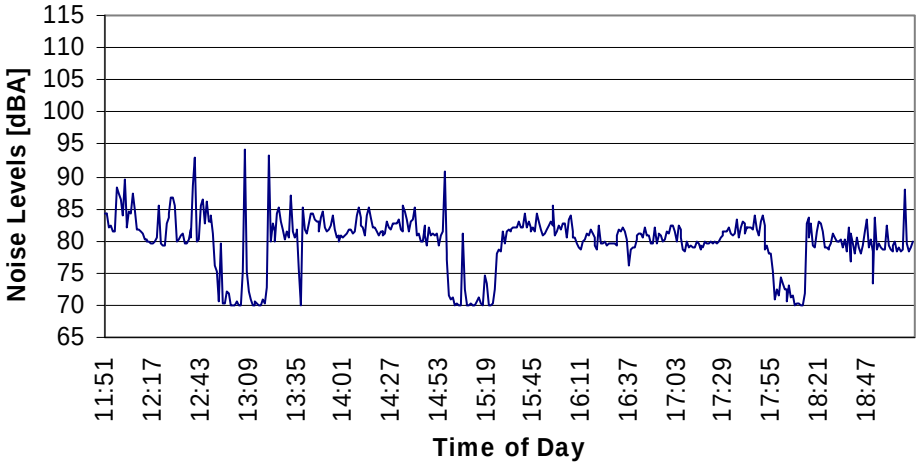

Figure 2. Average noise levels for Transportation Security Administration screener #2 working in the B-Bags checked baggage screening area on March 9, 2006.

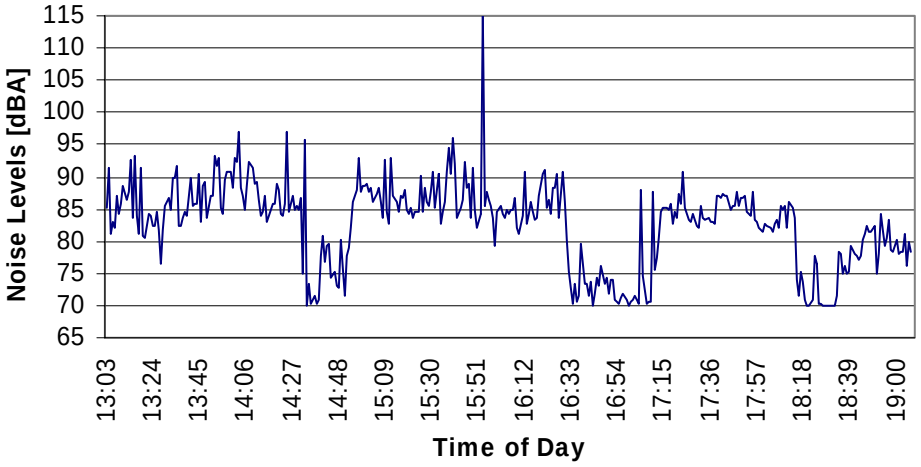

Figure 3. Average noise levels for Transportation Security Administration screener #3 working in the B-Bags checked baggage screening area on March 9, 2006.

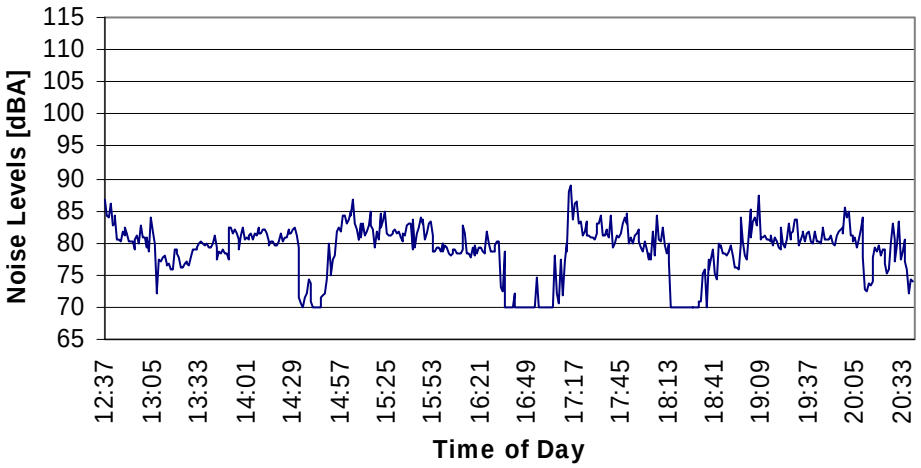

Figure 4. Average noise levels for Transportation Security Administration screener #4 working in the B-Bags checked baggage screening area on March 9, 2006.

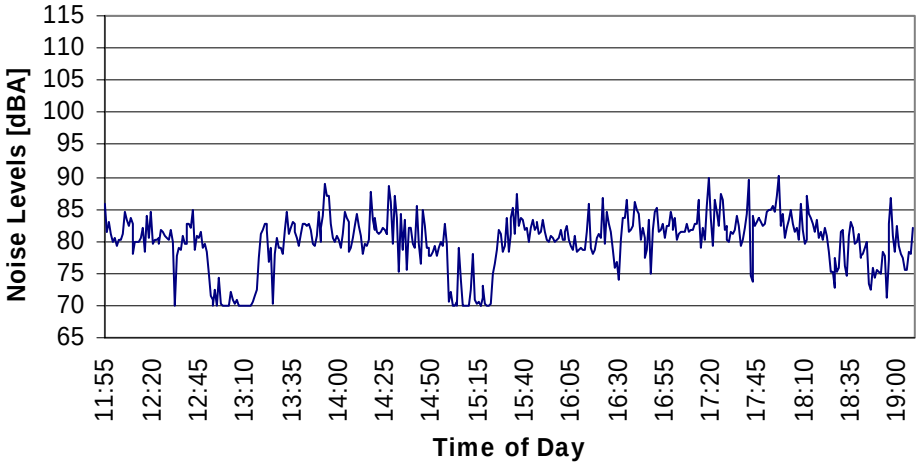

Figure 5. Average noise levels for Transportation Security Administration screener #5 working in the B-Bags checked baggage screening area on March 9, 2006.

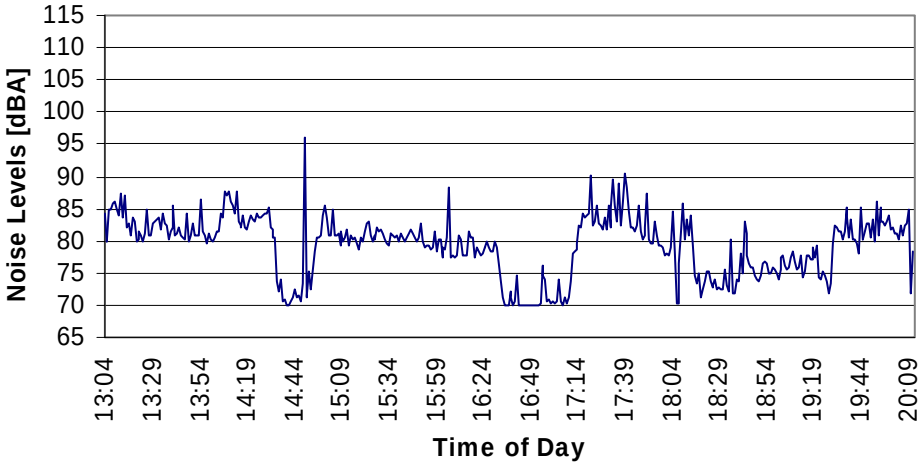

Figure 6. Average noise levels for Transportation Security Administration screener #6 working in the B-Bags checked baggage screening area on March 9, 2006.

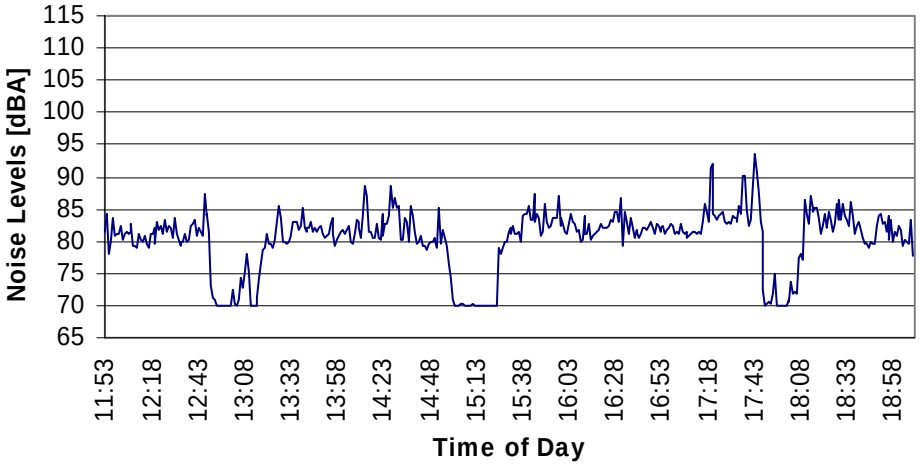

Figure 7. Average noise levels for Transportation Security Administration screener #7 working in the B-Bags checked baggage screening area on March 9, 2006.

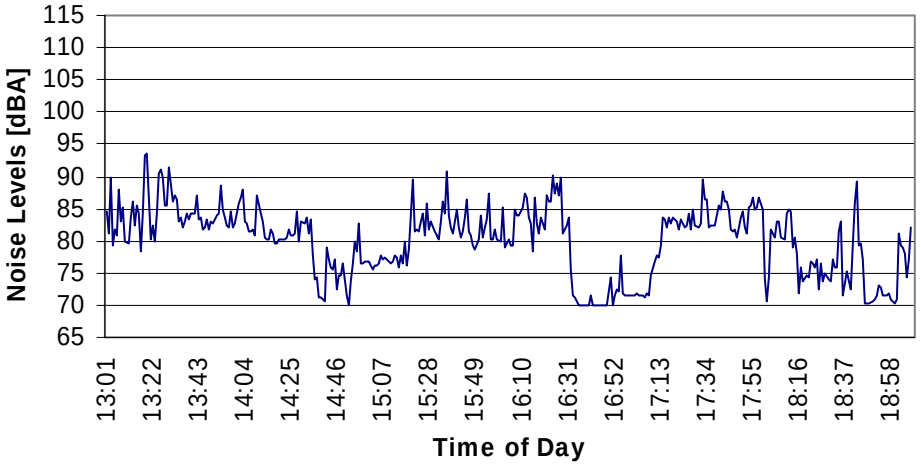

Figure 8. Average noise levels for Transportation Security Administration screener #8 working in the B-Bags checked baggage screening area on March 9, 2006.

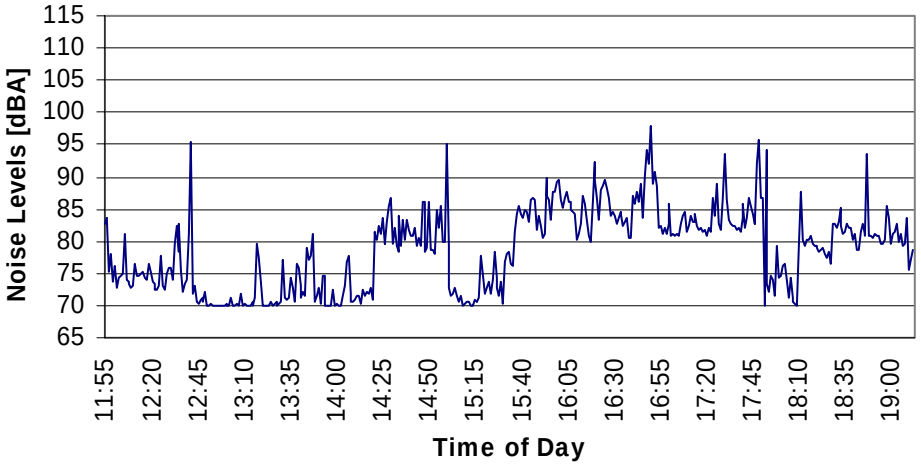

Figure 9. Average noise levels for Transportation Security Administration screener #9 working in the B-Bags checked baggage screening area on March 9, 2006.

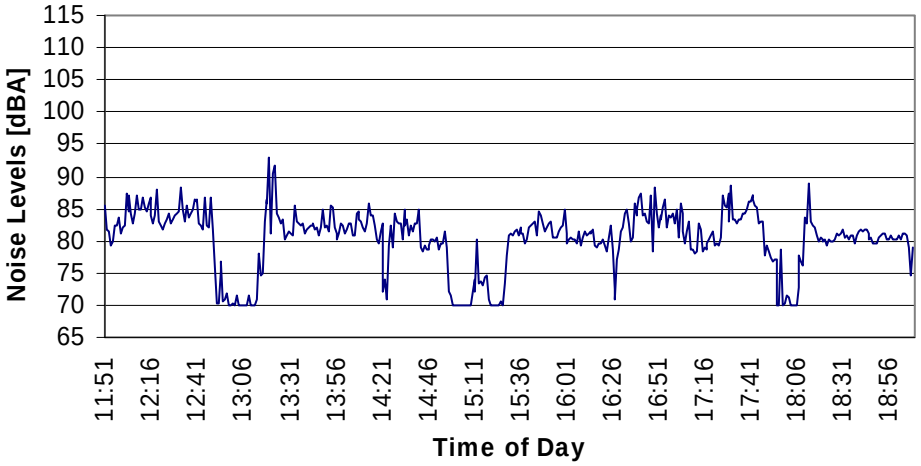

Figure 10. Average noise levels for Transportation Security Administration screener #10 working in the B-Bags checked baggage screening area on March 9, 2006.

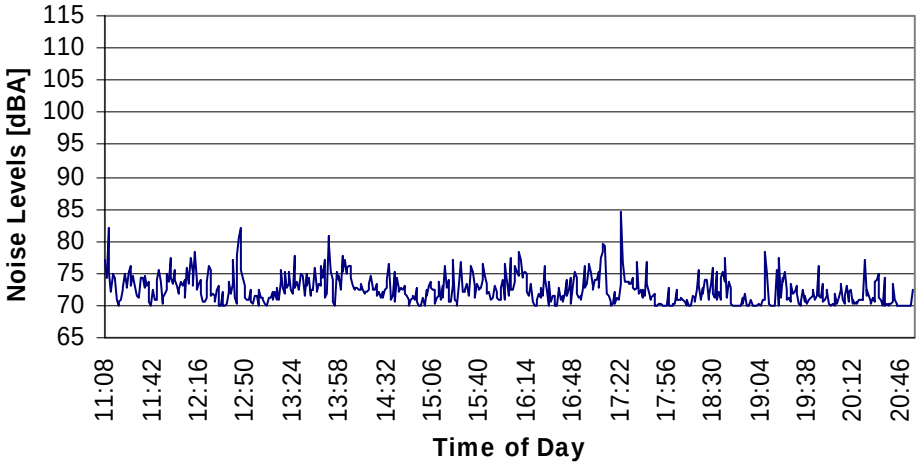

Figure 11. Average noise levels for Transportation Security Administration screener #11 working in the T-Drive checked baggage screening area March 9, 2006.

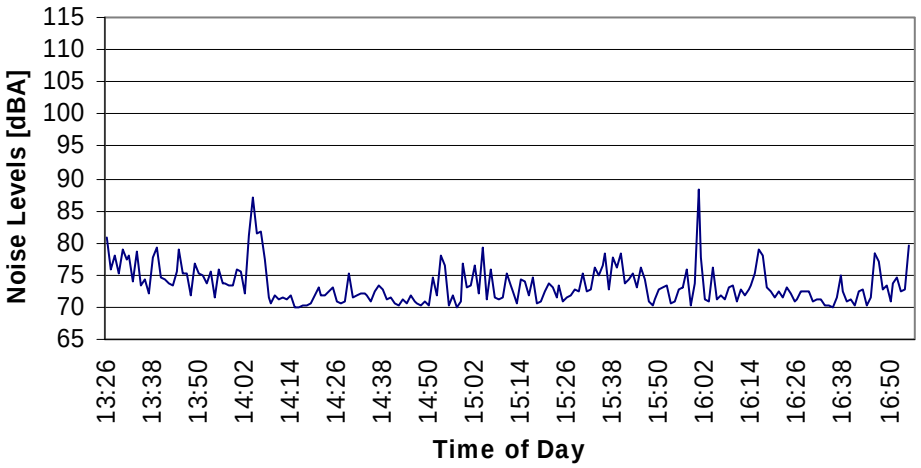

Figure 12. Average noise levels for Transportation Security Administration screener #12 working in the T-Drive checked baggage screening area on March 9, 2006.

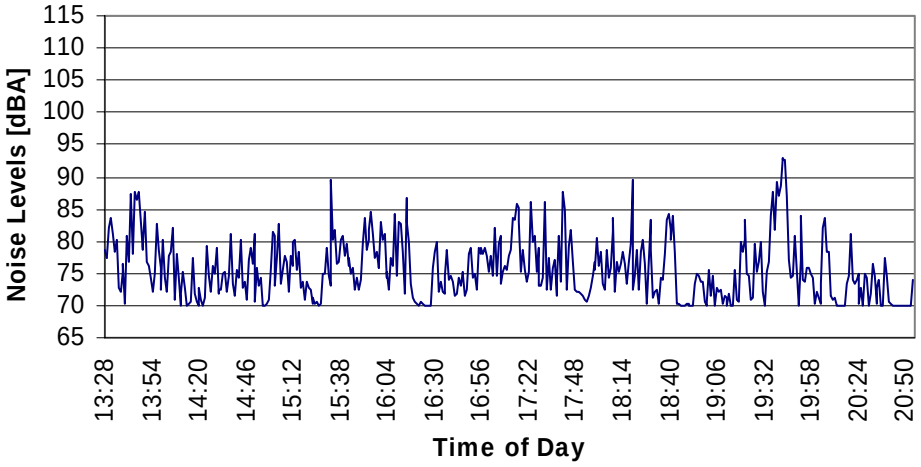

Figure 13. Average noise levels for Transportation Security Administration screener #13 working in the T-Drive checked baggage screening area on March 9, 2006.

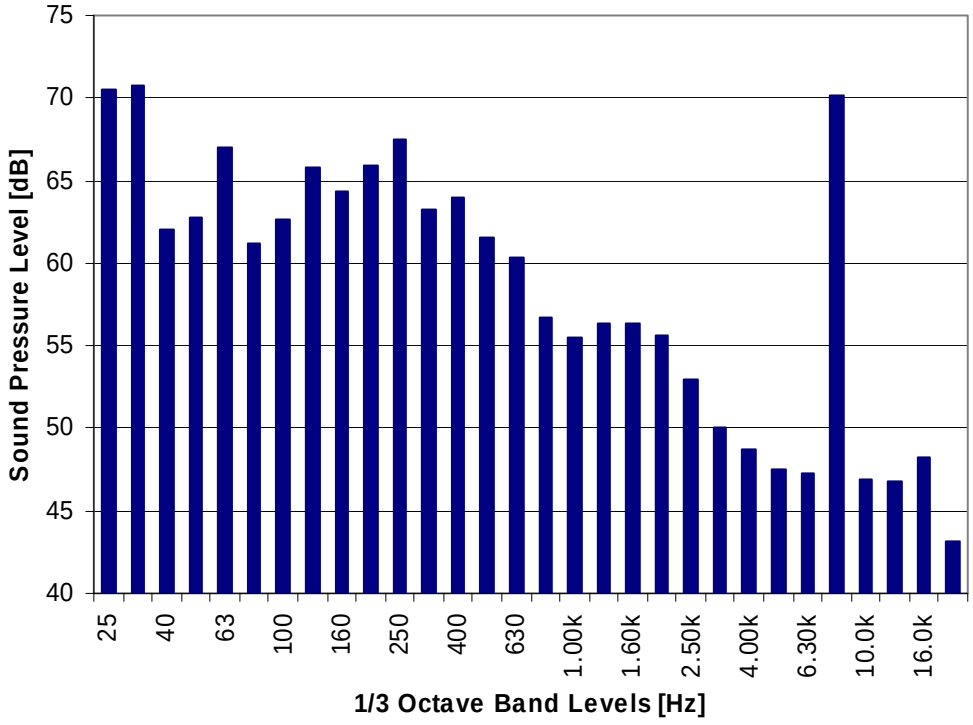

Figure 14. Third octave band noise levels in the T-Drive checked baggage screening area at the Cincinnati/Northern Kentucky International Airport on April 13, 2006.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226-1998

OFFICIAL BUSINESS
Penalty for private use $300

National Institute for Occupational Safety and Health
NIOSH

**Delivering on the Nation's promise:
Safety and Health at work for all people
through research and prevention**

To receive NIOSH documents or information about occupational safety and health topics contact NIOSH at:

1-800-35-NIOSH (356-4674)
Fax: 1-513-533-8573
E-mail: pubstaft@cdc.gov
or visit the NIOSH web site at:
http://www.cdc.gov/niosh

S A F E R • H E A L T H I E R • P E O P L E™