

Information Collection Request for  
“Anthropometric Information on Law Enforcement Officers”

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**Part A: Justification**

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## **List of Attachments**

**Attachment A – Applicable Laws and Regulations**

**Attachment B – 60 Day Federal Register Notice**

**Attachment C – HSRB Approval Letter**

**Attachment D- Email Confirmation of Participation**

**Attachment E- Biographical Information**

**Attachment F- Informed Consent**

**Attachment G- Data sheet**

**Attachment H1- Assessment of Challenges in Vehicle and with Body Armor (Word)**

**Attachment H2 – Assessment of Challenges in Vehicle and with Body Armor (example screen shots)**

**Attachment I- Two-dimensional Hand Scan and Three-dimensional Body Scans**

### **Goal of the information collection:**

The objective of this project is to establish an up-to-date reference database of anthropometric information about law enforcement officers (LEOs) in the United States.

### **Intended use of the resulting data:**

The information will be used to redesign LEO cruiser cabs and personal protective gear (such as body armors). More specifically, the data will be used in defining the adjustment range of seats and restraint systems and other safety features of the cab as well as in specifying improved sizing systems for protective gear.

### **Methods to be used to collect:**

Data collection will occur in 4 U.S. geographic areas using both traditional anthropometric techniques and 2- and 3-dimensional (2D and 3D) scanning techniques for body measurements. An anthropometer, a beam caliper (rearranged pieces of the anthropometer), tape measures, and an electronic scale will be used to collect the traditional anthropometry data in the study. A hand scanner, head scanner, foot scanner, and whole body scanner, housed in a mobile trailer, are used for 2D and 3D body shape measurements.

### **Subpopulation of interest:**

The study population will be current law enforcement officers employed by police departments, sheriff's departments or similar governmental organizations throughout the continental United States. NIOSH intends to recruit 1,005 participants in order to obtain complete measurements on 1,000 participants. We estimate that 5 LEOs may not complete the study due to emergency assignments; they will be replaced using substitutes. The sampling plan consists of 233 subjects from the Pacific West region, 232 subjects from the North Central region, 235 subjects from the East region, and 300 subjects from the South region. The sampling plan also calls for 714 White, 117 Black, and 169 Hispanic and other by racial and ethnic group and 700 men and 300 women by gender.

### **How data will be analyzed:**

All traditional anthropometric measurements taken in the study will be summarized in descriptive statistics. In addition, the anthropometric data will be analyzed using a multivariate accommodation method to identify multivariate anthropometric body models (representative body models of LEOs). The corresponding 3-dimensional images of these representative body models will then be used to evaluate the space and driver-cab interface in computerized and simulated automotive driver workstations for improved vehicle cab design. In addition, a mathematic approach will be used to quantify LEO torso sizes and shapes for body armor design and sizing applications.

## A. Justification

### 1. Circumstances Making the Collection of Information Necessary

This is a new information collection request (ICR) from the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). The request is for three years to complete data collection. This data collection is authorized by the Occupational Safety and Health Act of 1970 and the Federal Mine Safety and Health Act of 1977 (Attachment A).

NIOSH's mission is to develop new knowledge in the field of occupational safety and health and transfer that knowledge into practice. Toward this end, NIOSH conducts research to reduce worker illness and injury, and to advance worker well-being. The proposed study is an example of targeted research consistent with NIOSH's mission and goals. Information will be collected to establish an up-to-date reference database of anthropometric information about law enforcement officers (LEOs) in the United States. The information is critically needed to improve effective design of cruiser cabs and personal protective gear (such as body armors) used by LEOs.

In 1975, the National Bureau of Standards (NBS) released its landmark anthropometric data of law enforcement officers (LEOs) (Martin et al., 1975). The data have largely become outdated due to demographic changes in the LEO workforce (e.g., gender and race/ethnicity) that have occurred in the past 43 years. While motor vehicle industries have taken steps to integrate available anthropometric data about citizens into the design of passenger vehicles, the data are inadequate for the design of LEO vehicles and personal protective equipment (PPE). Data from a regional survey of 400 LEOs in Buffalo, NY showed that on average LEOs are 27 pounds heavier than average civilians for males and 25 pounds heavier for females (Violanti et al., 2013).

Up-to-date information on U.S. LEO body shapes and sizes is urgently needed in order to engineer enhancements of LEO body armors, cruiser cabs, seats, seatbelts, and the cruiser central console computer system interface. These items are essential for protecting LEOs from fatalities associated with traffic-related crash incidents and violent acts.

Data collected will be used by other researchers, standard setting bodies, manufacturers, police departments and police professional associations to improve safety for LEOs in vehicles and PPE.

### 2. Purpose and Use of Information Collection

There are approximately 817,000 law enforcement officers (LEOs) serving in the U.S. (U.S. Census Bureau, 2012). They were among the five occupations with a non-fatal injury incidence rate greater than 300 cases per 10,000 full-time workers in 2012 (Bureau of Labor Statistics, 2013). Of their injury occurrences, 20% were related to transportation incidents and 27% were associated with violent acts. In addition, there were 968 LEO line-of-duty deaths during 2003-2009; 48% of the fatalities were associated with traffic-related crash incidents, and 44% were connected to violent acts (Tiesman et al., 2013).

Literature has pointed to some critical aspects for improvement to reduce LEO vehicle crashes and increase incident survivability, including patrol vehicle cab and equipment configurations (Batiste, 2011; Kun et al., 2004), seat arrangement (Donnelly et al., 2009; Ludwig, 1970), seatbelt design and use (Stafford et al., 2004; Oron-Gilad et al., 2005; NHTSA, 2011), seatbelt-body armor interface (Wenäll and

Andersson, 2005; Granberg, 2001), and overall patrol car design (Dorn & Brown, 2003; Ludwig, 1970). Front seat area configurations (i.e., seat, center console and computer, and overhead console design) and interface among body armor, seatbelt, and the firearm/equipment belt continue to be issues for safe operation and crash survivability. These concerns point to the need for up-to-date LEO anthropometric data for “human factors engineering” enhancements of vehicle and apparatus design.

Study results will be used to enhance design guidelines for LEO vehicle configuration and personal protective equipment (PPE). Law enforcement officer anthropometry has an important role in the design of ergonomically efficient LEO cruisers and personal protective systems. The improved vehicle configurations will help enhance safe operation (due to improved driver visibility and control operation) and increase post-crash survivability (due to enhanced seats and restraint system configurations). Body armor, helmet, gloves, and boots are important elements of an integrated LEO personal protective system, especially for handling violent acts. Poor equipment fit may compromise protective capabilities of personal protective equipment (PPE) and may result in LEOs not wearing the PPE because of discomfort. By establishing an anthropometric database for LEOs, the designers and manufacturers of these types of equipment will be able to produce products that are more effective and reduce the problems associated with sizing and stocking these items.

### **3. Use of Improved Information Technology and Burden Reduction**

The data collection involves the use of 2-dimensional and 3-dimensional scanning technologies to reduce data collection time and thus decrease the burden to the respondents. The data collection also uses anthropometers and calipers equipped with digital reading functions for 50% of the time. The process is necessary for a comparison of selected compatible body dimensions between the available NBS study done in 1975 and the current study. The entire study requires taking physical measurements as it is not feasible to collect this information any other way than in person.

### **4. Efforts to Identify Duplication and Use of Similar Information**

We conducted an extensive literature search in 2013, a peer review of the study protocol in 2014, and a partner meeting in 2016 to identify any possible duplication and use of similar information. The background information in Section 1 has reported that the best available anthropometric data for LEOs was published in 1975. The data have largely become outdated due to demographic (e.g., gender and race/ethnicity) and body-size changes that have occurred in the past 43 years. No other existing data or publications are available to address the goal described in Section 2.

### **5. Impact on Small Businesses or Other Small Entities**

No small business will be involved in this data collection.

### **6. Consequences of Collecting the Information Less Frequently**

This is a one-time data collection.

## 7. Special Circumstances Relating to the Guidelines of 5 CFR 1320.5

This request fully complies with the regulation 5 CFR 1320.5.

## 8. Comments in Response to the Federal Register Notice and Efforts to Consult Outside the Agency

A. A 60-day Federal Register notice was published in the Federal Register on March 16, 2017; Vol. 82, No. 50, pp. 14000-14002 (Attachment B). No comments were received in response to this notice.

B. In 2015 and 2016, the NIOSH research team consulted with other government agencies, academia, local police departments and professional police associations in the concept and design of this study. There was general agreement that the data collection is needed based on the data currently used being in excess of 40 years old. During these discussions there was fine tuning made to the study. Changes included narrowing the scope of the data collection to LEOs who are patrolmen as opposed to the entire LEO population. The number of data elements was also refined in an attempt to reduce time to participants and costs to the government, while still focusing on the data needed to achieve the intended goals of making LEO cruisers and PPE safer to the users.

Those consulted and their corresponding titles, email addresses (if available), phone numbers (if available) and agencies are listed below.

- Brian Montgomery, Officer Safety and Protective Technologies Program Manager, [Brian.Montgomery@usdoj.gov](mailto:Brian.Montgomery@usdoj.gov) (202) 353-9786 (National Institute of Justice (NIJ)),
- Cathy Sanz, President, [WIFLE@Comcast.net](mailto:WIFLE@Comcast.net) (Women in Federal Law Enforcement (WIFLE)),
- Ed Hutchison, Director of Traffic Safety & Triad Programs, [ehutchison@sheriffs.org](mailto:ehutchison@sheriffs.org) (703) 838-5326 (National Sheriffs' Association (NSA)),
- Art Mindlin, [amindlin@fleoa.org](mailto:amindlin@fleoa.org) (973) 597-8225 (Federal Law Enforcement Officers Association (FLEOA)),
- Bruce Bradtmiller, President, [bruce@anthrotech.net](mailto:bruce@anthrotech.net) (937) 767-7226 (Anthrotech),
- Steve Paquette, Anthropology Team Leader, [steven.p.paquette.civ@mail.mil](mailto:steven.p.paquette.civ@mail.mil) (U.S. Army, Natick Soldier Research, Development and Engineering Center (USA NSR)),
- Bob Bona, General Manager, [Robert.Bona@human-solutions.com](mailto:Robert.Bona@human-solutions.com) (919) 741-6130 ext. 102 (Human Solutions),
- Wil Price, Highway Safety Specialist, [wil.price@dot.gov](mailto:wil.price@dot.gov) (National Highway Traffic Safety Administration, United States Department of Transportation (NHTSA)),
- Dwayne Crawford, Executive Director, [dcrawford@noblenatl.org](mailto:dcrawford@noblenatl.org) (703) 658-1529 (National Organization of Black Law Enforcement Executives (NOBLE)),
- Dave Weisz, Executive Director, [dave.weisz@comcast.net](mailto:dave.weisz@comcast.net) (847) 404-8189 (National Association of Women Law Enforcement Executives (NAWLEE)),
- Marcie Wacker, [iawpregionseven@gmail.com](mailto:iawpregionseven@gmail.com) (651) 398-5834 (International Association of Women Police (IAWP)),
- Flo McDavid, Director of Business Development, [flo.mcdavid@bodylabs.com](mailto:flo.mcdavid@bodylabs.com) and Evan Lee, [evan.lee@bodylabs.com](mailto:evan.lee@bodylabs.com) (914) 450.8511 (Body Labs Inc.),
- Ed Preston, Chief, [epreston@cityofmorgantown.org](mailto:epreston@cityofmorgantown.org) and Matt Solomon, Lieutenant, [msolomon@morgantownwv.gov](mailto:msolomon@morgantownwv.gov) (304) 284-7496 (Morgantown (WV) Police Department (MPD)),
- Dr. John Violanti, Principal Investigator, [violanti@buffalo.edu](mailto:violanti@buffalo.edu) (716) 829-5367 (State University of New York at Buffalo (SUNY-Buffalo)),

- Erin Vermilye, Manager, [vermilye@theiacp.org](mailto:vermilye@theiacp.org) (703) 647-7390 (International Association of the Chiefs of Police (IACP)),
- Harvey Heddon, Executive Director, [hheddon@wi.rr.com](mailto:hheddon@wi.rr.com) (262) 767-1406, (International Law Enforcement Educators and Trainers Association (ILEETA)),
- Samuel Cabral, International President, (941) 487-2560 (International Union of Police Associations AFL-CIO (IUPA))

## **9. Explanation of Any Payment or Gift to Respondents**

If respondents participate in the study during their working hours, as part of their duty, they will not receive an incentive for their study visit. Respondents who schedule their exam outside of working hours will receive \$50 as a token of appreciation at the end of the study visit. The use of an incentive is necessary for two main reasons. First, data collection will occur in 4 U.S. geographic areas and the anthropometric measurements can only be conducted by professionally trained scientists in person. The study population will be current law enforcement officers employed by police departments, sheriff's departments or similar governmental organizations throughout the continental United States. Participants are to travel to the data collection sites to participate in the study. Second, NIOSH intends to recruit 1,000 participants (with 5 additional substitutes in case that individuals cannot complete the entire study due to emergency calls). The sampling plan consists of 233 subjects from the Pacific West region, 232 subjects from the North Central region, 235 subjects from the East region, and 300 subjects from the South region. The sampling plan also calls for 714 White, 117 Black, and 169 Hispanic and other by racial and ethnic group and 700 men and 300 women by gender. The stratified sampling plan is to assure the best representation of participants to the national LEO population and statistical power for meaningful comparisons among subgroups. LEOs are considered a hard-to-reach study population for their work schedule and assignment, and maintaining the stratified sampling plan is critical to the scientific validity of the study. Use of incentives in this study is warranted.

## **10. Assurance of Confidentiality Provided to Respondents**

The CDC/ATSDR Privacy Act Officer has reviewed this submission and determined that the Privacy Act does apply. This activity is covered under the Privacy Act System of Records Notice (SORN) Records of Subjects in Certification, Testing, Studies of Personal Protective Devices, and Accident Investigations, Privacy Act System Notice 09-20-0159.

Potential participants will be informed that their participation is voluntary and they may withdraw their consent and participation in this study at any time. Participants who decide to participate in the data collection for the study will be required to sign an Informed Consent Form. Participants do not need to reveal their names, except for signing the consent form. Two parts of personal information will be collected for the study. The first part is biographical information (sex, ethnicity, race, birth day, occupation, year of service at the current occupation, exam location, exam date, self-reported body height, and self-reported body weight; see Attachment E: Biographical Information). The information is collected to determine the eligibility of individuals for the study, and to assure that the participants by racial/ethnic group, sex, regions, and age match the proposed sampling plan; see SSB: Collection of Information Employing Statistical Methods). The second part of information is anthropometric information (various body measurements - see Attachment G: Data Sheet; fit of current vehicle and protective gear – see Attachment H: Assessment of Challenges in Vehicle and with Body Armor; and scans of participants – see Attachment I: 2-dimensional hand scan and 3-dimensional body scans). The information is collected

to enhance design guidelines for LEO vehicle configuration and personal protective equipment (PPE) for reducing LEO work-related fatalities and injuries.

All participant data and personal identifiers in the study will be managed in accordance with the Privacy Act and the NIOSH IRB informed consent procedures. All forms and computer data will be coded with a randomly assigned number to ensure privacy. The link between the identifiers (in the consent form) and the assigned random numbers will be kept in the NIOSH Anthropometry Lab (Room 1502; an access-controlled room) in a locked cabinet. The consent forms and the “key” of random number assignments will be destroyed 6 years after the study is completed. At the data collection sites, locked cabinets will be available for securing this information. Once the information is sent back to NIOSH, it will be kept in the NIOSH Anthropometry Lab (Room 1502), which will be locked and has key access only by the project officer, the anthropometry lab manager, Division of Safety Research (DSR) management, and NIOSH security personnel. The project officer and the anthropometry lab manager will be the only persons with access to the random subject number assignments that link to the consent form. They will be responsible for the secured transfer of custody of the data to a different project officer in the event of a change in job assignment.

At data collection sites, traditional anthropometry will be entered into a computer carried by the data collection team. The 2D and 3D scan data will be managed in a similar way. The data will be collected by a computer designated for whole-body scanning, and a computer for head and face scanning, hand scanning, and foot scanning. Once the data are sent to NIOSH, the data will be stored on a LAN computer in the Anthropometry Lab. Data on the LAN computer is saved daily. Three levels of physical security are maintained for the data libraries at all times: controlled building access, controlled lab access, and ID/password access to data storage devices.

The results of the study in a summary format will be disseminated to police vehicle manufacturers, manufacturers of law enforcement officer (LEO) safety equipment, and state police organizations. Additional dissemination of results will be reported in peer-reviewed journals and other transportation safety forums. All data shared will be de-identified prior to dissemination (i.e., randomly assigned number will not be released). The study results will be used to improve the design of the LEO vehicle cabs, safety apparatus, and personal protective gear.



## **11. Institutional Review Board (IRB) and Justification for Sensitive Questions**

### IRB Approval

The proposed data collection was reviewed and approved by the NIOSH Institutional Review Board (Attachment C).

### Sensitive Questions

The study does not contain sensitive questions. The personal information that is collected for the study is limited to name [for participation consent], birth date, height, weight, and scans of participants, and various related measurements. The data collected is assigned to a subject number for identification. Only the project officer and site manager will have the key to the random number assignments.

## **12. Estimates of Annualized Burden Hours and Costs**

The study population will be current law enforcement officers employed by police departments, sheriff's departments, and similar governmental organizations throughout the continental United States. One thousand LEO volunteers (with 5 additional substitutes in case that individuals cannot complete the entire study due to emergency calls) will participate in the study over three years. The information collection is based on the following instruments. The average burden per response is also itemized. 1. Biographic Information (3 minutes, see Attachment E); 2. Data Sheet (25 minutes, see Attachment G); 3. Assessment of Challenges in Vehicle and with Body Armor (5 minutes, see Attachment H1 for instrument content and Attachment H2 for example screen shots); 4. Two-dimensional Hand Scan and Three-dimensional Body Scans (30 minutes, see Attachment I). For each respondent, the data collection is expected to take no longer than 63 minutes (total) to complete. The total estimated annualized burden hours are 353. There are no costs to the respondents other than their time.

Estimated Annualized Burden Hours

Type of Respondents	Form Name	No. of Respondents	No. of Responses per Respondent	Avg. Burden per Response (in hrs.)	Total Burden (in hrs.)
Law Enforcement Officers	Biographical Information	335	1	3/60	17
Law Enforcement Officers	Data Sheet	335	1	25/60	140
Law Enforcement Officers	Assessment of Challenges in Vehicle and with Body Armor	335	1	5/60	28
Law Enforcement Officers	Two-dimensional Hand Scan and Three-dimensional Body Scans	335	1	30/60	168
Total					353

B. The estimated total cost for this information collection is \$10,612.\*

Estimated Annualized Burden Costs

Type of Respondent	Form Name	Number of Respondents	Average Burden per Response	Hourly Wage Rate	Total Respondent Costs
Law Enforcement Officers	Biographical Information	335	3/60	\$30.17	\$506
Law Enforcement Officers	Data Sheet	335	25/60	\$30.17	\$4,211
Law Enforcement Officers	Assessment of Challenges in Vehicle and with Body Armor	335	5/60	\$30.17	\$842
Law Enforcement Officers	Two-dimensional Hand Scan and Three-dimensional Body Scans	335	30/60	\$30.17	\$5,053
Total					\$10,612

\* The value assigned for the hourly wage rate is based on the average U.S. hourly wage rate for law enforcement officers available in the following information: Bureau of Labor Statistics, U.S. Department of Labor, <https://www.bls.gov/oes/current/oes333051.htm>

### 13. Estimates of Other Total Annual Cost Burden to Respondents or Record Keepers

No other cost burden to respondents or record keepers is anticipated.

### 14. Annualized Cost to the Government

A. Over the three-year data collection and validation period, a contractor will be used to supplement NIOSH personnel at data collection sites. The cost of this contract is \$804,257.96.

B. The cost for the NIOSH travel team to go to the regional data collection sites is \$142,560.

C. The cost for operation and maintenance (O&M) of the truck and trailer transporting the Mobile Anthropometry Lab between regional data collection sites is expected to be \$20,500.

D. The NIOSH project team consists of a Project manager at \$115.00/hour Personnel Salary and Benefits (PS&B), a Technician at \$44.90/hour PS&B and five investigators at an average \$58.76 PS&B.

Annual PS&B for this collection is in the following table.

	Rate Yr 1	Year 1 Hours	YR 1 PS&B	Rate Yr 2	Year 2 Hours	YR 2 PS&B	Rate Yr 2	Year 2 Hours	YR 3 PS&B
Project Manager	\$115.00	208	\$23,920.00	\$117.30	208	\$24,398.40	\$119.65	208	\$24,886.37
Technician	\$44.90	1248	\$56,035.20	\$45.80	520	\$23,816.00	\$46.71	0	\$0.00
Investigator 1	\$58.76	1560	\$91,665.60	\$59.94	1040	\$62,337.60	\$61.13	1040	\$63,575.20
Investigator 2	\$58.76	1560	\$91,665.60	\$59.94	1040	\$62,332.61	\$61.13	1040	\$63,575.20
Investigator 3	\$58.76	1040	\$61,110.40	\$59.94	520	\$31,168.80	\$61.13	0	\$0.00
Investigator 4	\$58.76	1040	\$61,110.40	\$59.94	520	\$31,168.80	\$61.13	0	\$0.00
Investigator 5	\$58.76	1040	\$61,110.40	\$59.94	520	\$31,168.80	\$61.13	0	\$0.00
	Annual totals		\$446,617.60	\$266,396.00		\$152,037.60			
	Grand Total		\$865,051.20						

**SUMMARY:**

A. Contract:	\$804,257.96
B. Travel:	\$142,560.00
C. Mobile Lab O&M	\$ 20,500.00
D. PS&B:	\$865,039.98
<b>TOTAL:</b>	<b>\$1,832,369.16</b>

The total cost to the government for this data collection is expected to be \$1,832,369.16. Annualized over the 3 year data collection is \$610,789.72.

### **15. Explanation for Program Changes or Adjustments**

This is a new data collection.

### **16. Plans for Tabulation and Publication and Project Time Schedule**

<b>Activity</b>	
Recruiting of respondents	1—9 months after OMB approval
Information/Data collection	3—30 months after OMB approval
Complete field work	30 months after OMB approval
Validation	15—30 months after OMB approval
Analyses	18—35 months after OMB approval
Publication	36 months after OMB approval

### **17. Reason(s) Display of OMB Expiration Date is Inappropriate**

Not applicable. The OMB expiration date will be displayed.

### **18. Exceptions to Certification for Paperwork Reduction Act Submissions**

There are no exceptions to the certification.