

Information Collection Request Supporting Statements: Part A
Occupant Anthropometry and Seating
OMB Control No. 2127-XXXX
(NHTSA-2024-0056)

Abstract:

The National Highway Traffic Safety Administration (NHTSA) is seeking approval for this new information collection request (ICR) to collect detailed information on current body size and shape, posture, and motion of vehicle occupants. This research will support NHTSA in the development of tools used for occupant protection during crashes, will add to the body of knowledge, and will inform future agency activities; however, it is not associated with immediate regulatory activities.

The designs of anthropomorphic test devices (ATDs, commonly known as crash test dummies) are based on measurements of volunteers sitting in vehicle and laboratory seats. The current generation of ATDs is based on data gathered at University of Michigan Transportation Research Institute (UMTRI) in the 1980s. Since that time, the U.S. population has change substantially, most notably due to the large increase in body mass.¹ Measurement technologies have also improved dramatically with the development of fast three-dimensional surface measurement systems. Seating configurations have also expanded from the traditional seat posture collected in the 1980s with increased recline angles in modern vehicles. This combination of a population size shift and more variable seat configurations presents a clear need for updated seated anthropometry to be collected with new advanced anthropometry measurement capabilities.

The individual data collections, approved by the Institutional Review Board at the University of Michigan, will each be performed once. Study participants will be male and female licensed adult drivers from the general public, and participation will be voluntary with compensation. For an in-lab study, information collections include (1) an online screening questionnaire; (2) an eligibility phone call to confirm eligibility, interest, and to schedule a time in the lab; and (3) informed consent for the in-lab study and anthropometric measurement. A subset of the in-lab participants will be asked to participate in an in-vehicle study to include (1) a pre-drive questionnaire for the in-vehicle study; (2) informed consent for the in-vehicle study and anthropometric measurements; and (3) a post-drive questionnaire for the in-vehicle study.

This research study will gather a new database of information on adult body size, shape, posture, and motion to support advancement in these safety applications. This study will add to the body of the knowledge on motor vehicle anthropometry and will support crash safety and occupant protection through the development of human body models (HBMs) and anthropomorphic test devices (ATDs). A technical report on the project and outcomes will be prepared and published.

¹ Flegal, Katherine M., et al. "Trends in obesity among adults in the United States, 2005 to 2014." *Jama* 315.21 (2016): 2284-2291

The annual burden hours for the new collection are estimated to be 341 with an estimated \$11,329 in opportunity costs.

A. Justification

- 1. Explain the circumstances that make the collection of information necessary. Identify any legal and administrative requirements that necessitate the collection. Attach a copy of the appropriate section of each statute and regulation mandating or authorizing the collection of information.**

A. Circumstances making the data collection necessary.

Early anthropomorphic test devices (ATDs), including the Hybrid-III family that was initially designed in the 1970s, were constructed using manually gathered anthropometric data, such as segment lengths and circumferences. Minimal 3D information was available, and seated postures were approximated. In 1980, NHTSA funded a large-scale study at UMTRI to develop anthropometric specifications for a new generation of ATDs. The Anthropometry of Motor Vehicle Occupants (AMVO) study gathered data and developed detailed 3D body shapes for small female, midsize male, and large male occupants using 5th percentile female, 50th percentile male, and 95th percentile male stature and body weight as the target reference values.² Drawing packages were developed detailing landmark and joint locations, and physical 3D surface shells were constructed using landmark data and minimal 3D contour information. These data have formed the anthropometric basis for most adult ATDs developed since that time.

AMVO had some limitations, however. Due to the limits of the technology available at the time, a small number of participants were measured (25 per size bin were used to create the final specifications), and no 3D surface information was collected. Moreover, the analysis was based on simple averaging per size bins, so no information was provided for other occupant sizes. Additionally, the midsize female was dropped for cost reasons, so the only female data were gathered from very small individuals.

Over the past 20 years, human body models (HBMs) have become an important addition to the biomechanics toolkit. Using the same logic that was applied to selecting body sizes for ATDs, the HBMs have typically been targeted to the same stature and body weight reference values as those used in AMVO. However, unlike the averaging process used in AMVO, most HBMs have been developed using data primarily or entirely from a single individual. A consequence of this approach is that HBM development has not provided meaningful additions to the anthropometric data available to characterize vehicle occupants.

² Schneider, L. R., DH; Pflug, MA; Snyder, RG. (1983). *Development of Anthropometrically Based Design Specifications for an Advanced Adult Anthropomorphic Dummy Family*. Final report DOT-HS-806-715. U.S. Department of Transportation, National Highway Traffic Safety Administration, Washington, DC.

In the decades since AMVO, UMTRI has conducted a large number of studies of occupant posture and body shape and has developed advancements in both measurement and analysis methodology. Of particular importance, rather than averaging data to create a representation of a single body size, UMTRI has developed continuous statistical models that can generate accurate specifications for a wide range of sizes and shapes (for examples, see <http://HumanShape.org>). Simultaneously analyzing both landmark locations and 3D body shapes has enabled the development of parametric human body modeling, in which HBMs are morphed to represent people with widely varying size and shape.

Concurrent with the development of parametric HBMs, crash injury data analyses have highlighted the potential benefits of these new tools. In particular, the field data indicate that female occupants experience higher risks of some injuries in certain types of crashes. Notably, lower-extremity injury risks are markedly higher for female drivers than for male drivers in frontal impacts.³ Detailed anthropometric and posture data for female drivers could help to elucidate the causes of this difference. Crash injury data also show that individuals with high body mass are at higher risks of some injuries, possibly due to differences in the interaction with the restraint systems. Minimal data are available to describe the seated postures and body shapes of this cohort, which is increasingly important in the U.S.

B. Statute authorizing the collection of information.

NHTSA was established by the Highway Safety Act of 1970 (Pub. L. No. 91-605, §202(a), 84 Stat. 1713, 1739-40). Its mission is to reduce the number of deaths, injuries, and economic losses resulting from motor vehicle crashes on our nation's highways. To further this mission, NHTSA conducts research as a foundation for the development of traffic safety programs. Specifically, NHTSA is authorized at 49 U.S.C. 30182 to (1) conduct motor vehicle safety research, development, and testing programs and activities, including activities related to new and emerging technologies that impact or may impact motor vehicle safety and (2) collect and analyze all types of motor vehicle and highway safety data and related information to determine the relationship between motor vehicle or motor vehicle equipment performance and accidents involving motor vehicles and deaths or personal injuries resulting from those accidents. In carrying out these activities, NHTSA is authorized to undertake collaborative research and development projects with non-Federal entities. This information collection supports the department's strategic goal of safety.

2. Indicate how, by whom, and for what purpose the information is to be used. Except for a new collection, indicate the actual use the agency has made of the information received from the current collection.

³ Forman, J., Poplin, G. S., Shaw, C. G., McMurry, T. L., Schmidt, K., Ash, J., & Sunnevang, C. (2019). Automobile injury trends in the contemporary fleet: Belted occupants in frontal collisions. *Traffic Inj Prev*, 20(6), 607-612. <https://doi.org/10.1080/15389588.2019.1630825>

UMTRI will conduct this new data collection effort with NHTSA. This information collection will support the effort to collect updated seated occupant anthropometry. The U.S. driving population size and shape, as well as vehicle seating configuration, have changed in the 40 years since the last collection of seated anthropometry. These updated anthropometric measurements are required for advancement of ATDs and HBMs in crash safety. This project will deliver a software tool to NHTSA providing statistically modeled seated anthropometry from men and women of 5th to 95th percentile size for public use. The project will also capture occupant in-vehicle posture particularly of the foot and ankle. This information will also be incorporated into ATD and HBM development and positioning in effort to improve female ankle injury outcomes. Study participation will be voluntary. Data collection and analysis will be performed by the research team at UMTRI.

This research will be conducted over two studies and involves six information collection components, including a screening questionnaire, an eligibility phone call, an informed consent for in-lab data collection, a pre-drive and a post-drive in-vehicle questionnaire, and an informed consent for the in-vehicle data collection.

Screening Questionnaire (NHTSA Form 1824)

PURPOSE: For determining individuals' willingness to participate in the study and individuals' suitability for study participation based on driving experience and demographics [age, sex, body mass index (BMI)]. The same criteria apply for both in-lab and in-vehicle studies.

HOW: The screening questionnaire is provided as a Google Form through the University of Michigan's Health Research portal and is completed online by prospective participants. We estimate that a total of 2,000 screening questionnaires will be filled out to obtain the needed number of subjects. The form has 23 questions, including name, address, and time slots available.

Eligibility Phone call (NHTSA Form 1825)

PURPOSE: To confirm an individuals' responses to the screening questionnaire, their continued interest in study participation, and to schedule a time to come into the lab for in-lab informed consent and data collection.

HOW: The investigators identify individuals who may be eligible based on their responses on the screening questionnaire and follows up with a phone call. No new information is obtained during this call. We estimate that a maximum of 600 individuals total will need to be contacted to obtain the needed number of 300 total subjects for the lab study. This considers that some people's schedules may not match up with lab openings, or they may not show up for their scheduled appointment.

In-Lab Informed Consent and Anthropometric Measurements (NHTSA Form 1826)

PURPOSE: Ensures individuals have an informed choice about whether to participate in the in-lab portion of the study.

HOW: At the study visit, the 300 total participants will be escorted to a private room upon arrival at UMTRI for the consent process. Each version of the consent is set up electronically. Participants

will undergo the consent process with a member of the research team using a desktop computer or tablet. After electronically signing the consent document, the participant will be able to download or be emailed a copy of the signed form.

In-Lab Data Collection (NHTSA Form 2110)

PURPOSE: To gather participant in-lab anthropometry.

HOW: After consent, participants will undergo a series of anthropometric measurements to include (1) standard manual anthropometric measurements; (2) seated measurements in a hardseat with a portable coordinate measuring machine (FARO Arm); (3) additional landmark measurements in seating mockups using the FARO Arm; (4) a 3D surface scan in the seating mockup using a 3D scanner; and (5) whole body scanning in the VITUS XXL whole body laser scanner.

In-Vehicle Pre-Drive Questionnaire (NHTSA Form 1827)

PURPOSE: For determining individuals' demographics, typical commute and driving practices, previous experiences with a range of vehicle technologies, and their typical footwear preferences when driving.

HOW: A subset of the in-lab respondents will be selected for the in-vehicle study. Selection will be based on filling the BMI and stature bins detailed in section 8. These 100 total participants will be asked to complete an electronic questionnaire to capture additional information about footwear.

In-Vehicle Informed Consent and Anthropometric Measurements (NHTSA Form 1828)

PURPOSE: Ensures individuals have an informed choice about whether to participate in the in-vehicle portion of the study and to gather participant in-vehicle anthropometry, belt fit, and foot placement.

HOW: The 100 total participants from the in-lab study will participate in the in-vehicle study. Upon arrival for the in-vehicle study, participants will undergo the consent process with a member of the research team. After consent, participants will be trained on the instrumented vehicle provided by UMTRI and its vehicle-specific safety and advanced driver assistance systems (ADAS) features. The training will include video and presentations of the vehicle technologies obtained from the manufacturer, relevant excerpts from the owner's manual, and materials developed by the research team that demonstrate the performance of the vehicle functions. Once seated in the vehicle, participants will be prompted to select a comfortable seat position and posture. A prescribed adjustment procedure with prompting for each component will be used to ensure that the subject adjusts everything and doesn't just accept what they were provided. Posture, belt fit, and position of selected vehicle components will be recorded using a FARO Arm coordinate measurement system and the vehicle data acquisition system (DAS).

In-Vehicle Data Collection (NHTSA Form 2111)

PURPOSE: To collect naturalistic driving data from the participant in-vehicle.

HOW: Naturalistic driving data collection will occur over an approximate 90-minute planned route. Participants will be asked to drive as they normally would in their everyday driving. After the data collection period, participant posture and belt fit will be recorded again using a FARO Arm before they exit the vehicle.

In-Vehicle Post-Drive Questionnaire (NHTSA Form 1848)

PURPOSE: To determine study experience and vehicle comfort and fit.

HOW: During the vehicle drop-off appointment participants will be asked debriefing items to obtain feedback about their experience in the study. We will also ask participants to rate the vehicle comfort and fit.

- 3. Describe whether, and to what extent, the collection of information involves the use of automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g., permitting electronic submission of responses, and the basis for the decision for adopting this means of collection. Also, describe any consideration of using information technology to reduce burden.**

All information collections are done electronically aside from the eligibility phone call. Anthropometric data are gathered using state-of-the-art human measurement methods, including 3D surface scanners and coordinate measurement equipment. The use of this equipment minimizes the amount of time the participants spend in the laboratory while ensuring high-quality data.

- 4. Describe efforts to identify duplication. Show specifically why any similar information already available cannot be used or modified for use for the purposes described in Item 2 above.**

NHTSA has not conducted or sponsored a similar study of occupant anthropometry in the last 45 years. UMTRI performed the data collection for AMVO 45 years ago and are considered experts in the field of occupant anthropometry. We are not aware of any research of this nature having been conducted with respect to recent population anthropometry and vehicle seats.

As part of the preparation for this study, a thorough literature review was conducted to identify existing sources of relevant data. The literature review identified specific gaps for which new data collection was needed. New data are particularly needed on (1) female driver posture and body shape; (2) posture and body shape for male and female occupants with high body mass; and (3) posture and motion of the lower extremities during normal driving for both male and female drivers.

- 5. If the collection of information impacts small businesses or other small entities, describe any methods used to minimize burden.**

The collection of information does not involve small businesses. Respondents are individuals who meet certain criteria and who volunteer for the study.

6. Describe the consequence to Federal program or policy activities if the collection is not conducted or is conducted less frequently, as well as any technical or legal obstacles to reducing burden.

The information collection covered herein will be collected once only. As the agency responsible for prescribing and maintaining the standards for vehicle safety in the United States,⁴ NHTSA is constantly seeking objective data for use in basing decisions about how to best protect the road-traveling public and minimize deaths and injuries associated with car crashes.⁵ In several reviews of real-world injuries from motor vehicle accidents, females have been found to have higher odds of injuries in certain injury severities and body regions between males and females.^{6,7} This is particularly true in regard to ankle injuries. High BMI is also understood to influence belt fit and play a role in occupant injury,⁸ and today, the average person adult body mass is ten kilograms higher than at the time of the last NHTSA-funded data collection.^{9,10} Failure to collect this data will leave gaps in the knowledge required for safety advancements to improve occupant protection to account for differences in sex and vulnerable occupants.

- 7. Explain any special circumstances that would cause an information collection to be conducted in a manner:**
- a. requiring respondents to report information to the agency more often than quarterly;**
 - b. requiring respondents to prepare a written response to a collection of information in fewer than 30 days after receipt of it;**
 - c. requiring respondents to submit more than an original and two copies of any document;**
 - d. requiring respondents to retain records, other than health, medical, government contract, grant-in-aid, or tax records, for more than three years;**

⁴ 49 U.S.C. 30101(1).

⁵ 49 U.S.C. 30101(2).

⁶ Forman, J., Poplin, G. S., Shaw, C. G., McMurry, T. L., Schmidt, K., Ash, J., & Sunnevang, C. (2019). Automobile injury trends in the contemporary fleet: Belted occupants in frontal collisions. *Traffic Inj Prev*, 20(6), 607-612. <https://doi.org/10.1080/15389588.2019.1630825>.

⁷ Brumbelow, M. L., & Jermakian, J. S. (2021). Injury risks and crashworthiness benefits for females and males: Which differences are physiological? *Traffic Injury Prevention*, 23(1), 11-16. <https://doi.org/10.1080/15389588.2021.2004312>.

⁸ Reed, M. P., Ebert-Hamilton, S. M., & Rupp, J. D. (2012). Effects of Obesity on Seat Belt Fit. *Traffic Injury Prevention*, 13(4), 364-372. <https://doi.org/10.1080/15389588.2012.659363>.

⁹ Schneider, L. R., DH; Pflug, MA; Snyder, RG. (1983). *Development of Anthropometrically Based Design Specifications for an Advanced Adult Anthropomorphic Dummy Family*. Final report DOT-HS-806-715. U.S. Department of Transportation, National Highway Traffic Safety Administration, Washington, DC.

¹⁰ Fryar CD, Carroll MD, Gu Q, Afful J, Ogden CL. (2021). Anthropometric Reference Data for Children and Adults: United States, 2015-2018. *Vital Health Stat 3*. 2021 Jan;(36):1-44. PMID: 33541517.

- e. **in connection with a statistical survey, that is not designed to produce valid and reliable results that can be generalized to the universe of study;**
- f. **requiring the use of a statistical data classification that has not been reviewed and approved by OMB;**
- g. **that includes a pledge of confidentiality that is not supported by authority established in statute or regulation, that is not supported by disclosure and data security policies that are consistent with the pledge, or which unnecessarily impedes sharing of data with other agencies for compatible confidential use; or**
- h. **requiring respondents to submit proprietary trade secrets, or other confidential information unless the agency can demonstrate that it has instituted procedures to protect the information's confidentiality to the extent permitted by law.**

NHTSA is requesting an exemption to the requirement at 5 CFR 1320.5(d)(2)(vi) to allow NHTSA to use a statistical data classification that has not been reviewed and approved by OMB. Specifically, NHTSA seeks to use the seven minimum categories for race and ethnicity in lieu of collecting more detailed information as specified in Statistical Policy Directive No. 15: Standards for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity (SPD 15). We anticipate that much of the detailed race/ethnicity data would need to be suppressed in the final de-identified dataset in order to protect respondents' privacy. Therefore, we are requesting to use the seven minimum categories for race/ethnicity.

Other than the request for exemption regarding SPD 15, there are no special circumstances that require this collection to be conducted in a manner inconsistent with 5 CFR 1320.5(d)(2).

- 8. If applicable, provide a copy and identify the date and page number of publication in the Federal Register of the agency's notice, required by 5 CFR 1320.8(d), soliciting comments on the information collection prior to submission to OMB. Summarize public comments received in response to that notice and describe actions taken by the agency in response to the comments. Specifically address comments received on cost and hour burden. Describe efforts to consult with persons outside the agency to obtain their views on the availability of data, frequency of collection, the clarity of instructions and recordkeeping, disclosure, or reporting format, and on the data elements to be recorded, disclosed, or reported.**

NHTSA published a 60-day notice on December 30, 2024, requesting comment on NHTSA's intention to submit this ICR to OMB for approval (89 FR 106741). NHTSA received one comment from the Partnership for Dummy Technology and Biomechanics (PDB).

NHTSA appreciates PDB's thoughtful and constructive engagement. PDB "highly appreciates the intension [sic] of NHTSA to update fundamental anthropometric data" and provided detailed comments regarding 1) the study design, 2) the in-lab study, and 3) the in-vehicle study. NHTSA values the depth and thoroughness of PDB's input and has carefully considered their recommendations.

Regarding the study design, PDB emphasized that participant body sizes should represent the overall population and recommended ensuring a sufficient number of participants at characteristic percentiles (5th, 50th, and 95th) for males and females. They also recommended considering age alongside anthropometry because age influences seating position. NHTSA agrees with these points and the sample design will reflect selection criteria intended to ensure population representation and inclusion of specific characteristics. In a currently funded effort, UMTRI is reanalyzing data from over 400 seated subjects across varied anthropometries, sexes, and ages. Identified gaps and low sample sizes from these data were used to develop a participant recruitment matrix within a task implementation plan for this ICR. Participants will be 18 years of age and older, with ages distributed across three bins (20–39, 40–59, and 60–80 years). This collection aims to obtain about half the participants in the middle bin to address relatively small numbers of subjects in that age range in earlier studies. Stature will span from below the 5th percentile to above the 95th percentile for adult women and men in the U.S. population (1498 to 1875 mm). Recruitment will use three stature bins with approximately 2 times oversampling in the tails to ensure robust statistical power for regression modeling. BMI will be sampled in three bins, with 50% of participants having BMI > 30 kg/m² (roughly 40% of U.S. adults have a BMI > 30) and about one-sixth with BMI > 40. Age, stature, and BMI will be approximately independent, though exact equivalence of age distributions within bins may be constrained by sampling challenges.

PDB recommended including second-row seat position measurements alongside driver and front passenger positions. NHTSA concurs that second-row positioning data are important. Although second-row seats are not included among the six mockup seats selected for in-lab data collection in the task implementation plan, the test conditions will incorporate fixed seat back angles typical of second- and third-row seats, including highly reclined conditions. NHTSA believes these test conditions address PDB's intent and satisfies their suggestion.

PDB also suggested the in-vehicle study be conducted at a consistent time of day, preferably in the morning, to reduce spine relaxation effects from daily activities. NHTSA appreciates and understands the rationale behind this recommendation; however, due to time constraints and the large sample size required, the study cannot restrict data collection to a specific time of day. NHTSA does not expect this variation to have a significant impact on the data, but time of day can be considered as a covariate in analyses to clearly shed light on effects, if any.

In discussion of the laboratory study, PDB highlighted the importance of manual data collection in addition to 3D scans and recommended collecting the same locations measured in the first AMVO study. NHTSA thanks PDB for this practical and helpful guidance and agrees with both recommendations. The study will incorporate comprehensive manual data collection of all locations from the first AMVO study alongside 3D scans. A complete list of measurement requirements is outlined in the task implementation plan with UMTRI and provided in Tables 1 and 2. These tables specify measurements to be gathered from each participant using standard manual anthropometry. Many additional dimensions can be extracted from the 3D scans beyond

those listed. NHTSA intends to compare all new measurements from this study to prior AMVO measurements and will use both manual measures and 3D scans to obtain comparable data.

Table 2 lists the surface landmarks used to define posture and estimate internal joint center locations. All landmarks are measured in the laboratory hardseat, which provides access to both anterior and posterior landmarks; these data are used to create a subject-specific skeletal linkage that informs interpretation of vehicle seating conditions, where posterior landmarks below C7 are generally not accessible. Landmark locations, including points used to quantify belt fit, will be measured in the mockup conditions using the FARO Arm in a comparable manner. NHTSA is confident that the study design and measurement plan will fulfill PDB’s request for thorough manual data collection.

PDB provided a list of landmarks desired for Human Body Model (HBM) positioning. NHTSA appreciates these recommendations and will ensure the data collected under this ICR to provide sufficient landmark data for positioning and orienting both HBMs and ATDs. Body landmark data from the mockups will be analyzed using methods similar to those in prior UMTRI publications (e.g., Park et al., 2016). First, hardseat data will be used to estimate internal joint center locations and construct a skeletal linkage for each subject. Next, the skeletal linkage and surface landmarks will be used to estimate joint center locations in each mockup condition. Regression analysis will predict landmark locations as functions of subject characteristics (stature, BMI, etc.) and test condition variables (seat height, seat back angle, etc.). The VITUS laser scanner 3D data will be processed following established methods (e.g., Park et al., 2022): props (seats, handholds, etc.) are manually removed from the scan, an automatic surfacing process fills holes to obtain a watertight mesh, and texture data are used to manually digitize landmark locations in Meshlab. A standardized template is fitted to the mesh using UMTRI-developed methods. NHTSA is confident this collection will capture the landmark data discussed by PDB.

Table 1

*Manual Anthropometry Measures**

1	Weight	12	Maximum Hip Breadth
2	Stature (without shoes)	13	Buttock Knee Length
2.5	Stature (with shoes)	14	Buttock-Popliteal Length
3	Erect Sitting Height	15	Biacromial Breadth
4	Eye Height (Sitting)	16	Shoulder Breadth
5	Acromial Height (Sitting)	17	Chest Depth (on scapula)
6	Knee Height	18	Chest Depth (on spine)
7	Tragion to Top of Head	19	Bispinous (BiASIS) Breadth
8	Head Length	20	Chest Circumference at Axilla
9	Head Breadth	21	Waist Circumference
10	Shoulder Elbow Length	22	Hip Circumference at Buttocks
11	Elbow-Hand Length	23	Upper Thigh Circumference

* See Hotzman et al. (2012) for definitions and measurement methods.

Table 2

Surface Landmarks

Glabella	L4Surface
Ectocanthus (corner eye)	L5Surface
Center Eye (orbit under pupil)	Acromion
Tragion	HumeralEpiCon_Lat
Vertex	Wrist_Lat
Back of Head	FemoralEpiCon_Lat
Suprasternale	Suprapatella
Substernale	Infrapatella
C7Surface	Malleolus_Lat
T4Surface	ASIS_L
T8Surface	ASIS_R
T12Surface	PSIS_L
L1Surface	PSIS_R
L2Surface	Toe Tip
L3Surface	Heel

PDB recommended measuring belt routing in mockup configurations. NHTSA will incorporate belt routing into the study design and appreciates PDB's emphasis on this point. In the task implementation plan, drivers will be measured in a core set of conditions (middle steering wheel position at three seat heights). A subset of participants will be assigned to a belt matrix in which

belt fit is measured across a variety of belt anchorage locations, and another subset will be measured in the remaining package conditions.

PDB also recommended collecting reclined postures with seat back angles up to around 45–50 degrees. NHTSA appreciates this recommendation and have included reclined postures up to 45 degrees in the task implementation plan. Posture will be measured using the FARO Arm at three seat back angles in each seat (20, 25, and 30 degrees) and at 35, 40, and 45 degrees for each participant in one randomly assigned seat (so highly reclined postures will be captured for approximately 1/6 of participants in each seat). For postures reclined >30 degrees, NHTSA will use methods from Reed et al. (2019) to identify each participant's preferred supported head location. While PDB suggested angles up to about 50 degrees, NHTSA believes capturing up to 45 degrees provides sufficient coverage for the intended analyses.

PDB suggested that landmarks measured during the in-vehicle portion match in-lab landmarks whenever possible. NHTSA agrees and incorporated landmark matching efforts into the implementation plan. Because the ICR will recruit subjects from the in-lab study for the in-vehicle study, UMTRI will have comprehensive anthropometry and an accurate three-dimensional, articulated avatar for each driver participant, enabling fitting to vehicle 3D data and accurate whole-body posture estimation. Seated posture, belt fit, and the position of selected vehicle components will be recorded using a FARO Arm coordinate measurement system and the vehicle DAS once participants are comfortably seated. PDB also recommended using the FMVSS 208 procedure to establish a consistent coordinate system. FMVSS 208 specifies the vehicle centerline at the rear bumper as the coordinate system origin; in this study, driver data will be defined in a package coordinate system anchored to the pedals and steering wheel so results are generalizable across vehicles. Seat back kinematics, including seat back angle change, will also be measured. These methods align with SAE and FMVSS practices. The collected seat H-point and vehicle interior dimensions will be sufficient to reproduce the package configuration in simulation or other physical mockups.

Finally, PDB asked NHTSA to consider pressure distribution on the seat pan during static in-vehicle measurements. NHTSA appreciates the technical rationale for this suggestion but has determined that adding pressure distribution data collection would increase data collection efforts substantially and would be difficult to generalize because pressure maps depend heavily on seat design. Therefore, NHTSA will not add pressure distribution to this ICR.

NHTSA published a 60-day notice on December 30, 2024, that stated NHTSA's intention to submit this ICR to OMB for approval (89 FR 106741).

9. Explain any decision to provide any payment or gift to respondents, other than remuneration of contractors or grantees.

For the Screening Questionnaire and Eligibility Phone Call, no compensation will be provided to respondents. For the remaining collections and procedures, NHTSA plans to provide monetary

compensation at a rate of \$40 per hour for both in-lab and in-vehicle study participation. Each part of the study (in-lab and in-vehicle) requires two hours of time, so an anticipated \$80 will be provided to participants for each study. Such compensation is consistent with normal experimental practice to compensate participants for their time and encourage participation in research studies. The mean hourly wage rate across all occupations in the Ann Arbor region is roughly \$33.43 (https://www.bls.gov/oes/current/oes_11460.htm). We determined that \$40 per hour is appropriate to capture opportunity costs. Recruitment of non-college aged individuals should be competitive with hourly rates found in a college town without payment being coercive while also high enough to draw in professionals that make more than the average wage. The amount of compensation offered covers typical costs incurred such as travel. Our facility does not charge for parking and the nearest bus is free fare.

The compensation rate was reviewed and approved by an independent Institutional Review Board.

10. Describe any assurance of confidentiality provided to respondents and the basis for the assurance in statute, regulation, or agency policy. If the collection requires a systems of records notice (SORN) or privacy impact assessment (PIA), those should be cited and described here.

Participants will be given a consent form to sign during orientation that notifies them of the confidentiality of their information as participants in this study. The data gathered in this experiment is confidential. Participant name and all other personal information will appear only on the consent form. Participant data will be identified only by a code number that is not linked to participant identity in any way. UMTRI will blur or obscure the participant face in any photos or other images that are displayed publicly, for example, in research publications.

Participant identifying information, such as name, contact information, photographs, videos, or the surface scan of the head and face, will not be made available to the study sponsor or anyone other than the study team. UMTRI will keep the information collected from the participant indefinitely. They will not keep the name or other information that can identify a participant directly, except that they will retain photographs, 3D scans, and videos in which the participant's face is visible. Identifiable information about the participant, including photographs or 3D scans, will not be distributed or made available outside of the research team. All research team members received mandatory training on human subject research, including privacy and confidentiality, called PEERS.

NHTSA has an adjudicated PTA for this study.

11. Provide additional justification for any questions of a sensitive nature, such as sexual behavior and attitudes, religious beliefs, and other matters that are commonly considered private. This justification should include the reasons why the agency considers the questions necessary, the specific uses to be made of the information, the explanation to be

given to persons from whom the information is requested, and any steps to be taken to obtain their consent.

The study requests information about musculoskeletal ailments and abnormalities that may impact a participant's ability to walk or sit comfortably, have scoliosis, or amputations that would change subject anthropometry. The responses to these questions are not recorded or reported on in the final dataset but are used as exclusion criteria. As individuals with such musculoskeletal ailments or abnormalities are inherently unique, the research team is unable to collect data that would be generalized on a larger scale.

12. Provide estimates of the hour burden of the collection of information on the respondents and estimates of the annualized labor cost to respondents associated with that hour burden.

The annual estimated time burden to complete the collection of information is 341 hours and an annual opportunity cost of \$11,329 over the study period. Note that these figures are slightly less than those posted in the 60-day notice for this information collection. The 60-day notice over-estimated the total time per response for the entirety of the in-vehicle study, which is corrected herein. Further, the 60-day notice included a private industry workers' wage adjustment, which has since been deemed unnecessary for this information collection's burden estimates, as participants are engaging on their own time as volunteers for all aspects of this study. Therefore, this monetary adjustment to the opportunity cost per hour has been omitted.

Using the University of Michigan's Health Research portal, the research team expects to have 2,000 participants respond to the screening questionnaire in total. Across the three years of the study collection, NHTSA estimates 667 respondents for the screening questionnaire. A complete questionnaire is estimated at 5 minutes. Of the screened individuals, we anticipate that up to 600 total (200 annually) will need to be contacted for an eligibility phone call to obtain the needed number of 300 total participants (100 annually) scheduled for the in-lab study. Scheduled participants who do not show up will be replaced from the remaining pool of screened participants to ensure a total of 300 individuals (100 annually) arrive for in-lab measurements. After completion of the 2-hour process for informed consented and in-lab data collection, some participants will be asked if they are interested in the in-vehicle study. From the 300 total in-lab participants, a total of 100 (34 annually) will be scheduled to return to the lab for the in-vehicle study. The in-vehicle pre-drive and post-drive questionnaires will each take 5 minutes, the informed consent and anthropometric measurements will take 10 minutes, and the vehicle drive itself will take 100 minutes, totaling 2 hours for the entirety of the in-vehicle study.

To calculate the opportunity cost associated with the forms and other relevant activities necessary for this collection of new information, NHTSA looked at average hourly earnings for employees across all occupations in the Ann Arbor, MI area. The Bureau of Labor Statistics

(BLS) estimates that the average hourly wage for this group is \$33.43, thus serving as the opportunity cost per hour.¹¹ NHTSA estimates the total opportunity cost associated with the 1017 burden hours to be \$33,989. Annual burden cost is estimated to be \$11,329, and annual burden hours is estimated to be 341. There may be a slight variation in the comparison of total to annual burden over the three years due to rounding. The annual burden figures will be those represented in ROCIS.

Table 3

Burden Estimates

NHSTA Form No.	Information Collection	Number of Respondents Total/ Annual	Time per response (min)	Cost per Response	Frequency of Response	Burden Hours Total/ Annual	Burden Cost (dollars) Total/ Annual
1824	Online Screening questionnaire	2000/ 667	5	\$2.79	1	167/ 56	\$5,583/ \$1,861
1825	Eligibility Phone Call	600/ 200	5	\$2.79	1	50/ 17	\$1,674/ \$558
1826	Informed Consent, In-Lab	300/ 100	10	\$5.57	1	50/ 17	\$1,672/ \$557
2110	In-Lab Data Collection	300/ 100	110	\$61.29	1	550/ 183	\$18,387/ \$6,129
1827	In-Vehicle Pre-Drive Questionnaire	100/ 34	5	\$2.79	1	8/ 3	\$285/ \$95
1828	Informed Consent, In-Vehicle	100/ 	10	\$5.57	1	17/ 	

¹¹ [Ann Arbor, MI - May 2023 OEWS Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates](#), (accessed November 7, 2024).

		34				6	\$567/ \$189
2111	In-Vehicle Data Collection	100/ 34	100	\$55.72	1	167/ 57	\$5,682/ \$1,894
1848	In-Vehicle Post-Drive Questionnaire	100/ 34	5	\$2.79	1	8/ 3	\$285/ \$95
	Total Burden/ Annual Burden					1017/ 341	\$33,989/ \$11,329

13. Provide an estimate of the total annual cost burden to respondents or record keepers resulting from the collection of information. Do not include the cost of any hour burden already reflected in the response provided in question 12.

There are no burden costs associated with this collection. Travel costs are minimal and will be offset by the monetary compensation that will be provided to all research participants who enroll.

14. Provide estimates of annualized costs to the Federal government. Provide a description of the method used to estimate cost, which should include quantification of hours, operational expenses (such as equipment, overhead, printing, and support staff), and any other expense that would not have been incurred without this collection of information.

The total estimated cost to the Government for this one-time information collection is \$1,248,824.84. The annualized cost across a three-year approval period is \$416,274.95. Roughly 50% of the cost will cover data collection up through the in-lab study and the remaining 50% will cover the cost of the in-vehicle study. The estimated cost in terms of government time is approximately 150 hours for the Contracting Officer's Representative (COR). Using the hourly wage of \$71.25 for a GS-14, Step 3, in Washington, DC, the estimated cost of wages for the COR is \$10,687.50 (150 × \$71.25). The total wages are \$10,687.50. To estimate total compensation costs, NHTSA used the Bureau of Labor Statistics estimate that wages and salary only represent 61.6% of total employee compensation cost for State and local employees.¹² Therefore, the estimated annual total compensation cost is \$17,349.84.

¹² See Table 1. Employer Costs for Employee Compensation by ownership (June 2024), available at <https://www.bls.gov/news.release/ecec.t01.htm> (accessed November 7, 2024).

- 15. Explain the reasons for any program changes or adjustments reported on the burden worksheet. If this is a new collection, the program change will be the number of burden hours reported in response to question 12 and the entire burden cost reported in response to question 13. If this is a renewal or reinstatement, the change is the difference between the new burden estimates and the burden estimates from the last OMB approval.**

The collection of this information is associated with a new project. As such, it requires a program change to add the estimated annual 341 burden hours for the new collection. There are no burden costs associated with this collection.

- 16. For collections of information whose results will be published, outline plans for tabulation and publication. Address any complex analytical techniques that will be used. Provide the time schedule for the entire project, including beginning and ending dates of the collection of information, completion of report, publication dates, and other actions as applicable.**

Data collection will begin three months following OMB approval and continue for six months. Data gathered in the study will be de-identified, subjected to quality control procedures, and submitted to NHTSA in aggregated form. A technical report on the project and outcomes will be prepared and published. The technical report will be submitted to NHTSA nine months after PRA approval.

- 17. If seeking approval to not display the expiration date for OMB approval of the information collection, explain the reasons that display would be inappropriate.**

NHTSA is not seeking such approval. NHTSA will display the expiration date for OMB approval.

- 18. Explain each exception to the topics of the certification statement identified in "Certification for Paperwork Reduction Act Submissions." The required certifications can be found at 5 CFR 1320.9.¹³**

¹³ Specifically explain how the agency display the OMB control number and expiration date and will inform potential respondents of the information required under 5 CFR 1320.8(b)(3): the reasons the information is planned to be and/or has been collected; the way such information is planned to be and/or has been used to further the proper performance of the functions of the agency; an estimate, to the extent practicable, of the average burden of the collection (together with a request that the public direct to the agency any comments concerning the accuracy of this burden estimate and any suggestions for reducing this burden); whether responses to the collection of information and/or has been collected; the way such information is planned to be and/or has been used to further the proper performance of the functions of the agency; an estimate, to the extent practicable, of the average burden of the collection (together with a request that the public direct to the agency any comments concerning the accuracy of this burden estimate and any suggestions for reducing this burden); whether responses to the collection of information are voluntary, required to obtain or retain a benefit (citing authority), or mandatory (citing authority); the nature and extent of confidentiality to be provided, if any (citing authority); and the fact that an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

There are no exceptions to the certifications statement. In accordance with the requirement at 5 CFR 1320.9(g), the following statement will be provided to participants:

On the screening questionnaire:

Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. The OMB Control Number for this information collection is 2127-XXXX. The information collected on this form is necessary to determine if you are eligible to participate in a research study on vehicle occupant body size, shape, posture, and motion. We estimate that it will take approximately 5 minutes to complete the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, National Highway Traffic Safety Administration, 1200 New Jersey Ave, S.E., Room W45-205, Washington, DC, 20590.

On the consent form for the in-lab and in-vehicle studies:

Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. The OMB Control Number for this information collection is 2127-XXXX. The information collected in this study will be used to create a database of vehicle occupant body size, shape, and posture. The data will be used to improve vehicle safety. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, National Highway Traffic Safety Administration, 1200 New Jersey Ave, S.E., Room W45-205, Washington, DC, 20590.