DEPARTMENT OF TRANSPORTATION

1INFORMATION COLLECTION
SUPPORTING STATEMENT

Title: Recruitment and Debriefing of Human Subjects for Field Test of Vehicle Occupant Protection Technologies

Part B

NHTSA is seeking approval to conduct a Field Operation Test (FOT) to gather both objective and subjective data regarding how participants interact with and feel about seat belt assurance technologies when driving on the real roads.

In the FOT, a total of 48 participants will be recruited to participate in this study and provide feedback regarding the technologies. Participants will be recruited from southeastern Michigan. Recruitment flyers and post cards will be circulated on public sites in Washtenaw County, Michigan, such as commuter college campuses, coffee shops, restaurants/fast food establishments, and sports venues. Potential participants who are interested in participating in this study are asked to call the research team for participation. Researchers will ask each potential participant a set of eleven pre-screening questions which are designed to obtain information regarding participants' age, gender, and their seat belt use habit. These information will be used to identify if they are qualified to participate in this study. The pre-screening phone questionnaire is attached in the research plan document. Qualified participants will be called back from the research team and asked to: 1) travel to the University of Michigan Transportation Research Institute (UMTRI) to pick up the research vehicle, receive a brief overview of the vehicle's basic features and operations, and complete a short one-page questionnaire to collect data on their demographic background and personal owned vehicle; 2) use the research vehicle as a personal vehicle for seven days, driving as one normally would; 3) travel to UMTRI a second time to meet with researchers after the seven-day driving period and get an introduction of characteristics of the seat belt assurance system and operations; 4) return the research vehicle to UMTRI and complete surveys about their driving behavior. Each participant will be asked to fill out two paper-based questionnaires, one with 15 brief background items such as information regarding their personal owned vehicle, and one post-test evaluation questionnaire with 32 rating questions and 13 open-end questions, which are designed to collect participants' opinions towards the seat belt assurance systems and the other in-vehicle safety system. Both questionnaires are attached in the research plan document.

Data Analysis Plan

The answers to all the questions from all the 48 participants will be tabulated for analysis purposes. During data analysis, both qualitative and quantitative analyses will be conducted. Descriptive analysis will include belt use rate under different interlock conditions for each seat belt user group. The primary focus of the statistical analysis will be to compare belt use and user acceptance with regard to the different interlock systems. The analyses will be performed with linear regression models. Predictors include belt user group (non-user and part-time), seat belt assurance systems (speed limiter and transition locker), age [younger

(18-24 years old) and middle-aged (43-49 years old)], and sex (male or female). Dependent variables include participants' belt use rate and participants' acceptance towards the seat belt assurance systems.

Table 1. Proposed data analysis methods

Research Issues	**Data Required**	**Data Source**	**Analysis Approach**
Evaluate the effectiveness of each candidate seat belt assurance system.	Seat-belt use rate (video data will be used for verification); Vehicle operation data (e.g., speed, location)	FOT	Linear regression models
Identify methods and degree of difficulty to defeat each candidate seat belt system.	Behavior observation from video	FOT	Descriptive analysis
Identify technologies and associated financial costs to protect against defeating a seat belt assurance system.	Discussions with OEM partners	OEM input	Descriptive analysis
Identify circumstances where practicability may be an issue.	Driving environment (road type, duration of the trip etc.)	FOT and OEM input	Descriptive analysis
Find the percentage of users inclined to defeat the system.	Number of defeat events	FOT	Descriptive analysis
Measure the level of acceptance and satisfaction among users of the systems.	The scale of acceptance and satisfaction	Questionnaire	Mixed models
Collect and describe any suggestions for participant interface design.	Open questions	Questionnaire	Descriptive analysis
Determine if there are any unintended consequences associated with each candidate seat belt assurance system.	Unexpected events, using GPS data such as speed, location to identify road conditions, and time.	FOT	Descriptive analysis
Identify potential performance specifications for seat belt assurance systems and their	Discussions with OEM partners	OEM input, FOT, and	Descriptive analysis

advantages/disadvantages.		questionnaire	
Describe potential methods to eliminate opportunities for participants to circumvent the system and to reduce unintended consequences.	Discussions with OEM partners	OEM input	Descriptive analysis

B1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection methods to be used.

The goal of the study is to better understand potential seat belt assurance technologies, user acceptance, and safety related issues. The specific aims of the study are to: 1) determine the potential seat belt assurance technologies and logic approaches; 2) characterize the action of each candidate system when a belt is unbuckled during a drive; 3) identify methods and degree of difficulty to defeat each candidate seat belt system; 4) identify technologies and associated costs to protect against defeating a seat belt assurance system; 5) identify circumstances where practicability may be an issue; 6) determine the effectiveness of each system for the different kinds of belt users; 7) measure the level of acceptance and satisfaction among users of the systems; 8) determine if there are any unintended consequences associated with each candidate seat belt assurance system; 9) identify potential performance specifications for seat belt assurance systems and their advantages/disadvantages; and 10) describe possible methods to eliminate opportunities for participants to circumvent the system and to reduce unintended consequences.

To achieve the study objectives, NHTSA is conducting a FOT to collect both subjective and objective data on how participants interact and feel about seat belt assurance technologies when driving on the real roads. Participants will be asked to fill up the two questionnaires: one during their first visit and the other after they complete their use of the vehicles installed with the seat assurance systems. Issues of non-response may not occur due to the design of this study.

In the FOT, all participants will be given one type of research vehicle for a total of three weeks, one baseline week (i.e., the seat belt assurance system is not turned on), and two treatment weeks (i.e., the seat belt assurance system is activated). Seat belt use will be recorded and compared between two belt user groups, part-time belt and non-users. A power analysis was performed to determine that the proposed sample size would be adequate to detect the hypothesized effects of the seat belt assurance technologies on seat belt use. Based on the NHTSA NOPUS report (Pickrell & Ye, 2013), in 2010 and 2011, young occupants (between 16 and 24 years old) had the lowest seat belt use rate at 79% and middle-aged (25-49 years old) occupants had a seat belt use rate of 85%, which are lower than older occupants' seat belt use rate of 88%. Therefore, this study will focus on the high-risk groups (i.e., younger and middle-aged participants).

Table 2. Target participant population

	Part-Time Belt User		**Non-Belt User**	
	Female	Male	Female	Male
Younger **(18 – 24 years old)**	n=6	n=6	n=6	n=6
Middle-aged **(43 – 49 years old)**	n=6	n=6	n=6	n=6

The sample will be equally divided into two age groups—24 younger (18-24 years) participants and 24 middle-aged (43-49 years) participants. Because young participants between the ages of 16 and 18 years are generally novice participants their driving behavior and our previous studies showed that these drivers have a much higher compliance rate of seat belt use when compared to other age groups. Therefore, they will not be included in this study. The sample will also be counterbalanced with respect to gender (see).

Estimated Incidence

Based on our previous experiences with studies that require participant to return on twice during the study, to UMTRI to turn on the seat belt assurance system function or to return the research vehicle), a high drop-out rate is expected (i.e., approximately 20% attrition rate). Therefore, an additional 12 participants will be recruited to replace any participants who drop out of the study. Therefore, it is estimated that about data from 60 participants will be recorded.

B2. Describe the procedures for the collection of information.

The procedure for the collection of information for the Human Factors research on seat belt assurance technologies research is as follows:

- Survey/study population is defined.
- Qualified participants will be asked to come to the test conducting place, UMTRI.
- The background questionnaire will take approximately 5 minutes to complete.
- The post-test evaluation questionnaire will take approximately 30 minutes to complete.
- A total sample size of up to 50 will be surveyed for the post-test evaluation questionnaire with data from 48 participants who complete the whole test will be used for the final data analysis.
- The survey will only be conducted in English.

- Data tables, including important cross-tabulations, will be prepared along with a final report of the key findings.

B3. Describe methods to maximize response rates and to deal with issues of non-response.

Issues of non-response may not occur due to the design of this study and our previous experiences.

To maximize response rate, different recruitment methods will be used, such as posting recruitment advertisement online and local newspaper. Recruitment flyers and post cards will also be circulated on public sites in Washtenaw County, Michigan, such as commuter college campuses, coffee shops, restaurants/fast food establishments, and sports venues. Potential subjects may also be selected from the subject pool obtained in a previous UMTRI's naturalistic driving studies.

B4. Describe any tests of procedures or methods to be undertaken.

Data Collection and Analysis

Responses will be initially collected on paper. Data processing will consist of tabulation of quantitative and coded open-ended responses. Data analysis will be conducted by NHTSA's contractors, UMTRI. Since individual differences are randomly distributed across conditions, UMTRI plans to use standard statistical techniques to test observed effects between different systems. Summary statistics will be analyzed to determine whether or not significant differences exist between the rating evaluations of different systems based on reported acceptance, satisfaction, usefulness and willingness to purchase. Open-ended responses will also be analyzed to add context to the evaluations participants have provided and can help in assessing the seat belt assurance system features and make a purchase decision.

B5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

In preparation of sending this package to OMB for approval, NHTSA provided contacts at various agencies the opportunity to comment on the approach for this plan. The following individuals have reviewed technical aspects of Human Factors research on seat belt assurance technologies research plan:

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The institute selected as a contractor for this study is University of Michigan Transportation Research Institute (UMTRI). UMTRI is a well-known research organization. This team has extensive experience in both qualitative and quantitative human factors research practices. More information can be found at their website (http://www.umtri.umich.edu/). The contact information for this team is as follows:

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