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ATLANTIC The Canadian Network

A Thematic Long-term Approach to Networking for the
Telematics and ITS Community

WG 3.2 Human Machine Interface &
User Friendly ITS
(Human Factors and ITS)

Prepared by

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October 20, 2003

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1. EXECUTIVE SUMMARY

To be Completed after the Oct. 24 Workshop

2. WORK GROUP OVERVIEW WITHIN THE SCOPE OF ATLANTIC

2.1 WORK GROUP TITLE

Work Group 3.2: Human Machine Interface & User Friendly ITS (*Human Factors and ITS*)

The name of this work group reflects the European perspective. A preferred terminology for Canada is “cognitive ergonomics”, hence the sub-title in the parenthesis.

WG 3.2 is one of the 8 work groups within the Canadian Atlan-TIC network.

The 8 work group themes are as follows:

- Integrated Transport (3 Working Groups):
 - Telematics-based Traffic and Travel Information Services
 - Network Monitoring and Traffic Management and Control
 - Intermodal Collective Transport Information
- Technologies and Services (3 Working Groups):
 - Intermodal Freight Info, Pre-clearance & Logistics (logistic chains)
 - Intelligent Vehicles and Intelligent Vehicle Highway Systems
 - Electronic Road User Charging & Integration with Other Payment Systems
- Assessment and Evaluation of ITS (2 Working Groups):
 - ITS User Acceptance & Impact Assessment
 - Human Machine Interface/User Friendly ITS

2.2 SCOPE

The focus of the WG 3.2 is on the “driver”. The scope can be described as follows:

- Human Machine Interface (HMI) measuring techniques and criteria
- Behavioural & safety impacts of driver support
- Application of universal design to ITS
- Product development and evaluation
- Implicit and strategic driver adaptation of technology
- HMI standards and guidelines
- Driver workload and distraction
- Shaping of driver behaviour by assistance systems

As can be seen, the scope is rather extensive. The challenge is to prioritize our effort in this area within the resources and time constraints. Among these, driver distraction of ITS devices is a major issue. Another issue is the user’s response to ITS information, within the context of driver-vehicle and driver-infrastructure interface.

2.3 WORK GROUP COMPOSITION

WG 3.2 consists of a leader, a rapporteur and a team of invited experts recruited from both the public and private sectors. The leader of WG 3.2 is an academician from the University of Calgary, supported by a rapporteur drawn from the private sector consultancy

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Experts have been identified and invited to participate from the following groups:

- i. Research agents (i.e. universities or research institutes)
- ii. Public agencies (i.e. government departments or carriers)
- iii. Private firms (i.e. service and product providers)
- iv. Consumers and travelers, including seniors and persons with disabilities

The list of experts identified and solicited for WG .3.2 survey is at Appendix 7.1.

The Work Group is the focal point for the preparation of discussion papers and the collaboration among experts. Through discussion and interaction will identify, validate and prioritize a list of specific topics for the theme area that are:

- (a) Relevant to Canada,
- (b) Present an opportunity for international benchmarking,
- (c) Offer an opportunity to increase the knowledge base for decision making by ITS professionals in government and industry, and
- (d) Lead to follow-up proposals for cooperative R&D submissions to funding agencies.

Based on the inputs of Canadian experts on the highest priority issues, the present discussion paper has been developed by WG 3.2. More ambitious activities that cannot be undertaken because of budget or time constraints can be noted as issues for future study. Discussion results from the Work Group will be incorporated into the summary report of ITS research and development in Canada.

3. WG 3.2 SUBTOPICS AND THEMES SUMMARY

3.1 Conduct Literature Search

WG 3.2 Leader and Rapporteur have organized and managed the research work to develop the background material, collect data and conduct analyses with the assistance of students and others for this discussion paper. Papers relevant to the WG 3.2 discussion threads have been extracted from the literature as in **Section 6**. This will be placed on the Canadian ATLANTIC site as part of this discussion paper. These references could be used as stimulants for further discussion, may suggest fruitful new areas or may be a useful resource.

3.2 Identify Main Discussion Threads

From literature research and discussion with experts, WG 3.2 Leader and Rapporteur have developed a list of discussion paper topics and to select the highest priority topic for the project discussion, as follows:

3.1.1 Human factor analysis on ITS application to highway-railway grade crossings

The development, test and evaluation of highway-railway grade crossing ITS is ongoing in Canada, Europe, U.S. and Asia. The effectiveness of various systems to reduce violations, injuries, crashes and fatalities is largely unknown. From the literature, not much has happened in this domain except 1 or 2 reports from the Volpe Centre since the University of Calgary report for Direction 2006. (*Caird, J.K., Creaser, J.I., Edwards, C.J., & Dewar, R.E. (2002). A human factors analysis of highway-railway grade crossing accidents in Canada (Rep. No. TP 13938E). Montreal, Canada: Transport Development Centre, Transport Canada.*)

3.1.2 Application of universal design principles in ITS

Universal design is a set of principles that have the potential to benefit all users of transportation. Application of well-designed assistive technologies within transportation has the potential to benefit people with functional limitations and everyday users. Determining how newer technologies such as adaptive cruise control can benefit the widest range of people is central to the universal design of ITS.

It does appear that the UD (universal design) movement is catching on in Europe and Japan, but is still a novel concept in the ITS domain in North America.

3.1.3 Evaluation of in-vehicle telematics for distraction

The potential for driver distraction is not unique to cellular telephones. The frequency with which new technologies will be introduced into the vehicle is accelerating. Samples of these new applications include: navigation, night vision, collision warning, and intelligent cruise control systems. A similar set of issues surround the proliferation of ITS in-vehicle technologies as those associated with cellular phones. In addition, new issues such as which ITS application of many requires attention first are also emerging.

The WG 3.2 Leader's team in University of Calgary is conducting a significant driving distraction project for Transport Canada as part of the HASTE (Human Machine Interface And the Safety of Traffic in Europe) initiative that is funded by the EC's 5th Framework. Eight universities and corporations are involved including U. of Leeds, Delft, VTI, Volvo, VTT, Transport Canada (i.e., U. of Calgary) and U. of MN (Portugal). One of the first documents produced by the U. of Leeds is a review of measures and methods for driver distraction that can be used to assign a pass/fail criterion to any in-vehicle information system (IVIS). The University of Calgary team has been implementing the experimental protocol and running large-scale study over the summer.

Based on information from the University of Leeds and Transport Canada, it is assumed that European funding went the direction of doing something about the issues. The two top researchers in the world on driver distraction are Paul Green at UMTRI and Lois Tijerena at Ford.

Due to the extensive research work underway in North America and in Europe, our WG 3.2 survey questionnaire was developed to focus on in-vehicle telematics distraction issues.

3.1.4 Usability and utility of navigation systems

Navigation or route guidance systems provide drivers with directions to desired destinations. After the driver inputs a destination, the system guides the driver with voiced and/or displayed turn-by-turn instructions. Navigation systems have the potential to optimize routes, ease trip planning, avoid congestion, and solve or avoid getting lost. Route optimization can be requested and alternative routes can be suggested if congestion or traffic accidents impede a path. Manufacturers as options in higher priced vehicle models offer many different navigation systems. Not all systems are designed so that all users are accommodated. The University of Calgary team has been funded as a network of AUTO21. One of its collaborators, the University of Guelph, is going to address this topic in depth.

3.1.5 Feasibility of haptic and auditory systems for collision warnings

A promising alternative to visual and auditory warning modalities for collision warnings is the use of haptic or kinesthetic warning displays. Haptic warning devices can be constructed in the form of seat shakers, accelerator or brake pulsing (or push back) methods, and torque enhanced steering wheels. Each of these techniques offers both advantages and disadvantages in warning a driver of a potential critical situation. The University of Calgary's team has completed a

literature review for the Transportation Development Centre in Montreal on these topics as an interim report.

3.1.6 Complacency and intelligent cruise control (ICC)

The purpose of intelligent cruise control (ICC) is to increase driver comfort by adapting conventional cruise control, through sensor feedback loops and/or algorithmic tailoring to forward vehicle's changes in velocity. The driver is allowed to relax somewhat because they do not have to continuously adjust headway. At a predetermined limit, the system will disengage, change gears, and/or apply limited braking for the driver. ICC systems do not necessarily provide a warning after the headway closure has reached the limit nor is evasive action taken by the system. Drivers who assume that an ICC system will solve particular circumstances may be complacent or have a misunderstanding of the functionality of a system.

3.1.7 Interaction and prioritization of multiple telematics interfaces

The interaction with multiple in-vehicle interfaces produced by different manufacturers presents a difficult design challenge. How should information from multiple interfaces be presented to the driver such that the most important information is given first? This is a difficult problem to tackle. There is little current work to show because of the complexity of experimental designs.

3.1.8 Standards and guidelines for infrastructure and in-vehicle information display

Human factors guidelines typically specify ways that designs should consider the user. Guidelines serve a number of functions including a means to summarize human engineering data, to make general recommendations about design, and to specify design principles. Not all manufacturers of ITS devices adhere to design guidelines. Standards, in contrast to guidelines, are much harder design constraints, that is, manufacturers tend to follow them closely. SAE and ISO are extremely active for standards.

4. DATA COLLECTION

A questionnaire was developed to elicit our "experts" prioritization of candidate issues and studies based on key criteria (Kantowitz, B.H., Lee, J.D., & Kantowitz, S.C. (1997). *Development of human factors for advanced traveler information systems and commercial vehicle operations: Definition and prioritization of research studies* (Rep. No. FHWA-RD-96-177). McLean, VA: Federal Highway Administration). Appendix 7.2 was distributed to the experts on September 22, 2003 with an expected response date of October 7 2003. Thus far about **7 replies** have been received. ***The results will be presented at the October 25 Workshop.***

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5. SUMMARY AND CONCLUSIONS

To be Completed after the Oct. 24 Workshop

6. SELECTED REFERENCES BY DISCUSSION THREADS

6.1 Human factors analysis on ITS applications to highway-railway grade crossings

Carroll, A., Passera, A., & Tingos, I. (2001). *Vehicle proximity alert system for highway-railway grade crossing prototype research* (Rep. No. DOT/FRA/ORD-01/01) Cambridge, MA: Volpe National Transportation Systems Center.

Caird, J.K., Creaser, J.I., Edwards, C.J., & Dewar, R.E. (2002). *A human factors analysis of highway-railway grade crossing accidents in Canada* (Rep. No. TP 13938E). Montreal, Canada: Transport Development Centre, Transport Canada.

Chugh, J. S. & Caird, J. K. (1999). In-vehicle train warnings (ITW): The effect of reliability and failure type on driver perception response time and trust. *Proceedings of the 43rd Annual Meeting of the human Factors and Ergonomic Society Meetign* (p.p. 1012-1016) Santa Monica.CA.: Human Factors and Ergonomics Society.

Richards, H.A., & Bartoskewitz, R.T. (1995). The intelligent highway-rail intersection integrating ITS and ATCS for improved grade crossing operation and safety. In *Safety of Highway-Railroad Grade Crossings: Research Needs Workshop, Volume II – Appendices*. (DOT/FRA/ORD-95/14.2). Washington, D.C.: Department of Transportation, Federal Railroad Administration.

Tardiff, L., Parviainen, J., & Ede, W. J. M. (1996). *Application of intelligent transportation systems (ITS)/advanced train control systems (ATCS) technologies at highway-rail level crossings* (Res. Rep.). Ottawa, ON: Transport Association of Canada.

6.2 Application of universal design principles in ITS

Cambell, J.L. (1999). Commentary on “Elderly and disabled travelers: Intelligent Transport Systems for the 3rd Millennium.” *Transportation Human Factors*, 1(2), 135–139.

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[also see, <http://hermes.civil.auth.gr/telscan/telsc.html>]

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Vanderheiden, G.C. (1997). Design for people with functional limitations resulting from disability, aging, or circumstance. In G. Salvendy (Ed.), *Handbook of human factors and ergonomics* (pp. 2010–2052). Toronto: John Wiley.

6.3 Evaluation of in-vehicle telematics for distraction

Bhise, V., Dowd, J.D., Smid, E. (2003). *Driver behavior while operating in-vehicle devices paradigm* [CD-ROM]. Transportation Research Board Annual Meeting.

Burgett, A. L. (1994). *Methodologies for evaluating the impact of safety of intelligent vehicle highway systems*. Proceedings of the Association of Automotive Medicine (pp. 499– 512).

Green, P. (1995a). *Measures and methods used to assess the safety and usability of driver information systems* (Pub. No. FHWA-RD-94-088). McLean, VA: Federal Highway Administration.

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Green, P. (1999). Estimating compliance with the 15-second rule for driver interface usability and safety. *Proceedings of the Human Factors and Ergonomics Society 43rd Annual Meeting* (pp. 987-991). Santa Monica, CA: Human Factors and Ergonomics Society.

Greenburg, J., Tijerina, L., Curry, R., Artz, B., Cathey L., Grant, P., Kochhar, D., Kozak, K., & Bloomer, M. (2003). *Evaluation of driver distraction using an event detection paradigm* [CD-ROM]. Transportation Research Board Annual Meeting.

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6.4 Usability and utility of navigation systems

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6.5 Feasibility of haptic and auditory systems for collision warnings

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6.6 Complacency and intelligent cruise control (ICC)

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6.7 Interaction and prioritization of multiple telematics interfaces

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6.8 Standards and guidelines for infrastructure and in-vehicle information display

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7. APPENDICES

7.1 Appendix 7.1 List of Experts Identified for Survey of WG 3.2

7.2 Appendix 7.2 Survey Questionnaire of WG 3.2

Appendix 7.1 List of Experts Identified for Survey of WG 3.2

Fname	Lname	Address	Other contact information
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ii. Public agencies (i.e. government department or carriers)

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Allen	Rao, Ph. D.	Operations Research Analyst US Dot John A Volpe Center 55 Broadway Cambridge, MA 02142 U.S.A.	Tel.: 617-494-3911 Fax: 617-494-2318 E-mail: rao@volpe.dot.gov
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iii. Private firms (i.e. service and product providers)

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iv. Consumers and travelers, including seniors and persons with disabilities

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Appendix 7.2 Survey Questionnaire of WG 3.2

A Thematic Long-term Approach to Networking for the Telematics and ITS Community (ATLANTIC):

The Canadian Network

To Invited ITS Experts

Date: September 22, 2003

Dear Colleague,

Invitation to Join the Canadian ATLANTIC Network as an “Expert” Member

ATLANTIC is an international network of professionals, researchers and decision-makers from Europe, the USA and Canada working together to solve key problems in Intelligent Transportation Systems (ITS) in a coordinated and structured way, and to communicate results to stakeholders. Initial support for the ATLANTIC thematic network came primarily from the European Commission (EC) with additional funding from the Federal Highways Administration (FHWA) in the USA, and Transport Canada.

www.atlan-tic.net

In April 2003, sponsored by Transport Canada, the provincial Ministries of Transportation for Quebec and Ontario, the Canadian ATLANTIC Network Project was officially launched as a partnership of ITS stakeholders in Canada under the joint lead role of the University of Toronto and the Université de Montréal. ATLANTIC is open to participants from all universities in Canada with an interest in the issues and problems associated with the application of Intelligent Transportation Systems (ITS) and the research and development opportunities that flow from them. It is also open to participants from the public and private sectors with similar interests.

www.civ.utoronto.ca/sect/traeng/its/atlantic.htm

We have identified you as an expert in the area of ITS and are inviting you to become an expert member of the Canadian ATLANTIC network and, specifically, as a member of Work Group 3.2, Human Machine Interface and User Friendly ITS (i.e., Human Factors and ITS). Experts are the key members of the Canadian ATLANTIC network as they bring the knowledge and expertise needed to successfully research and develop the ITS discussion topics. The Canadian ATLANTIC network project is comprised of eight working groups, as follows:

WG 1.1 Telematics-based Traffic and Travel Information Services

WG 1.2 Network Monitoring, Traffic Management and Control

WG 1.3 Intermodal Collective Transport Information

WG 2.1 Intermodal Freight Information, Pre-clearance and Logistics (transport chains)

WG 2.2 Intelligent Vehicles and Intelligent Vehicle - Highway Systems

WG 2.3 Electronic Road User Charging and Integration with other payment systems

WG 3.1 ITS User Acceptance and Impact Assessment

WG 3.2 Human Machine Interface / User friendly ITS

We are specifically inviting you to participate in Work Group 3.2 and you will find an outline paper for this Work Group in an attached Word file for your information and consideration. Work Group 3.2 will be devoting its efforts to the Human Machine Interface (HMI) for ITS systems with emphasis on the HMI measuring techniques and criteria, behavioural & safety impacts of driver support, and universal design for ITS. The end product will be a discussion paper reporting on this topic.

However, as a member of the Canadian ATLANTIC network, you are entitled to participate in any of the 8 Work Groups. To explore this option further, you will find the outlines of the proposed papers for all 8 Work Groups in the ZIP file that accompanies this letter and also posted at the following websites for easy reference.

(www.civ.utoronto.ca/sect/traeng/its/atlantic.htm) (English versions)

(www.umontreal.ca/) (French versions)

Each Canadian ATLANTIC Work Group consists of a leader, a rapporteur and a team of experts as members. Briefly, the role of experts is as follows:

- To contribute knowledge of ITS-related activities in Canada and elsewhere that will enable the Canadian ATLANTIC network to become the leading source of information on ITS research and development in Canada; contributions can be forwarded via e-mail or telephone exchanges;
- To participate actively in one or more Work Groups (representing ITS thematic areas) to contribute advice and expertise to the preparation of the discussion papers and to review and comment on draft versions and other outputs; participation may be via electronic exchanges, teleconferences or, occasionally, Work Group meetings; and
- To participate in international ATLANTIC electronic forum discussions, e-mail exchanges and other networking opportunities and make contributions to the debates and discussions (register at www.atlan-tic.net).

Experts are invited to join or may apply to join the Canadian ATLANTIC network. Membership is voluntary but the rewards are tangible - recognition as a member of the leading ITS research and development thematic network in Canada, and, opportunity to contribute to setting priorities and to fostering the overall success of future ITS research and development in Canada and internationally.

Those experts who wish to be more active in their participation can consider pursuing one or more of the following optional roles and tasks:

- Planning of proposals for follow up ITS research and development submissions to funding agencies, for example, planning for an ITS network of centres of excellence;

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- Participation in the Canadian ATLANTIC workshop in October 2003 to contribute to finalizing the project outputs and to share new information and insight among network participants;
- Participation in selected international discussion forums, workshops and “orange book” focus groups with U.S. and European partners to make presentations and to contribute knowledge.

Participation in the ATLANTIC network offers an opportunity to make your views known and to share your experiences with the ITS community in Canada, North America, Europe and the world. The results of our discussions will be summarised and presented to key policy-makers in Canada. Our ultimate aim is to enable decision-makers to develop funded research programs in critical areas of concern for ITS development.

If you agree to join the Canadian ATLANTIC network as an expert member, kindly let us know by return e-mail with your complete coordinates and information about your activities related to Work Group 3.2 and other Work Groups of your choice. Alternatively, you can complete and return the questionnaire in **Attachment 1**. If you have any questions, please contact either of the undersigned or one of the Core Team members listed on the next page.

We would like to take this opportunity to thank you in advance for your participation and your anticipated contributions.

Yours sincerely,

WG. 3.2 LEADER

WG. 3.2 RAPPORTEUR

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Attachment 1: Expert Questionnaire

Attachment 1

<p style="text-align: center;">A Thematic Long-term Approach to Networking for the Telematics and ITS Community (ATLANTIC):</p>
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The Canadian Network

Expert Members' Questionnaire

All responses will be treated confidentially.

Part 1: About You

Name: _____

Company / Organisation:

Your position in Company / Organisation:

Company Address:

Telephone No:

Fax. No. _____

Email address:

If you have any files or reports summarizing experiences or results that are relevant to the ITS Work Group 3.2 Human Machine Interface, please list them (use extra pages if required):

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A number of important issues have emerged from attempts to evaluate the impact of in-vehicle ITS or telematics on safety and system performance. The purpose of this questionnaire is to sample human factors experts to determine if any consensus has been reached within the community of researchers in North America and Europe about the measurement and interpretation of safety and system performance. Your responses will be synthesised and made available to others as a paper through the ATLANTIC network.

A hypothetical evaluation context is briefly described followed by a series of open-ended items. The open questions, into which you can type a response, ask you to: list the dependent variables you would use to evaluate the context as specified; what the variable results would mean in terms of safety and system performance; and if you made or used any assumptions, definitions, or literature sources in your answers.

The questions are not necessarily easy to answer so it will take some time to think each one through. If you feel that current data does is insufficient, indicate so and mention whether research in the area is a low, medium or high priority. If an evaluation context does not fall into your domain of expertise, please say so.

Once you have completed the questionnaire, please send it to: jkcaird@ucalgary.ca by **October 7th, 2003**. If you have questions or suggestions, you can use the same email. We would like to thank you for taking the time to answer all the questions.

1) To determine the visual demands associated with driving and interacting with an in-vehicle ITS device.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

2) To examine the cognitive distraction potential of a system.

What variables would you measure to determine performance with a system and safety using it?

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

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What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

3) To determine the effects of fatigue on driving performance and strategic use of in-vehicle ITS device.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

4) To examine the comprehension, reliance and potential confusion between existing road signs and in-vehicle signing information.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

5) To identify the impact of new and novel uses of a device by younger drivers.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

6) To determine the cognitive and physical impacts of a system on older driver safety and mobility.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

7) To increase driver underload or decrease driver overload while using a system.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

8) To determine the loss of reliability of a system on driver performance.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

9) To determine potential physical or cognitive conflicts between new ITS controls and existing conventional in-vehicle controls (e.g., HVAC, radio, etc.).

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

10) To determine the tradeoffs among visual, auditory and/or haptic modalities of ITS presentation.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

11) To determine the degree to which an ITS application is accessible and useful to range of users with functional limitations.

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What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

12) To determine, from a set of functions or the overall product, whether or not a product will be accepted by users.

What variables would you measure to determine performance with a system and safety using it?

What mean and/or range of the dependant variable(s) do you consider to be safe and usable?

What mean and/or range of the dependent variable(s) do you consider unsafe or not usable?

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Did you make any assumptions, use any explicit definitions, or rely on published or unpublished literature in your answers? If so, what?

Part 2: About Others

Please suggest other people for us to contact whom have the expertise to fill out this questionnaire:

Name _____
Email _____
Institution _____
Tel. _____
Fax. _____

Name _____
Email _____
Institution _____
Tel _____
Fax. _____

Name _____
Email _____
Institution _____
Tel _____
Fax. _____

If we contact any of the individuals listed above, may we mention your name?

Yes

No

Thank you for taking the time to reply to this questionnaire.

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Once you have completed the questionnaire, please send it to: jkcaird@ucalgary.ca by **October 7th, 2003**. If you have questions or suggestions, you can use the same email.

We would like to thank you for taking the time to answer all the questions.