

INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES REPORT OF WORKING GROUP ON INTELLIGENT TRANSPORT SYSTEMS (ITS)

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ABSTRACT

The International Harmonized Research Activities Working Group on Intelligent Transport Systems was established to coordinate government research aimed at developing harmonized procedures for the evaluation of safety of in-vehicle information, control and communication systems with respect to human performance and behaviour. It deals with human-machine interactions in the broadest sense of that phrase. However, it is acknowledged that even in its broadest sense human-machine interactions is only a part of ITS safety. This report describes the activities completed in the past five years, including the formulation of an overall framework for ITS safety assurance indicating the role of the ITS WG within this framework, a series of workshops on the safety test and evaluation of ITS, and definition of priority research problem statements. Recommendations are provided to address the formidable challenges facing the WG. It is anticipated that increased public and government concerns about ITS safety in the future will stimulate increased interest, expectation and funding of harmonized research.

BACKGROUND

The International Harmonized Research Activities Working Group on Intelligent Transport Systems was established to develop procedures (including methods and criteria) for the evaluation of safety of in-vehicle information, control and communication systems with respect to human performance and behaviour.

The impetus behind this WG reflects the need for governments to understand and minimize the potentially adverse consequences of ITS technologies. Harmonized research in ITS is of special importance for three reasons, 1) it represents a significant opportunity to influence active safety (also known as primary safety or crash avoidance) through effective collision avoidance intervention, 2) it addresses a global need to more clearly define the role of government with respect to ITS safety, 3) it represents an area essentially unregulated at the present time; consequently, there is a greater

likelihood of achieving harmonized safety policies than might otherwise be the case.

The WG was formed in 1996, following the establishment of the IHRA program at the ESV conference in Melbourne. It was given an initial mandate of 5 years. This report summarizes the activities during this period, provides critical comment concerning the functioning and value of the ITS WG, and offers recommendations for continued cooperation in this area.

INTRODUCTION

The International Harmonized Research Activities is an inter-governmental initiative which aims to facilitate greater harmony of vehicle safety policies through multi-national collaboration in research. IHRA is organized under the auspices of Enhanced Safety of Vehicles (ESV) representing the U.S., UK, Canada, the Netherlands, Germany, Australia, Sweden, Japan, France, Italy, Hungary, and Poland. In addition, the European Commission (EC) and the European Enhanced Vehicle-safety Committee (EEVC) are represented. The Working Group on ITS is one of five working groups addressing high-priority research needs.

The advent of ITS is revolutionizing motor vehicle transportation. Not only is the nature of driving changing radically, but it will likely to be in a continuing state of flux, at least in the foreseeable future, as technologies continue to evolve. Advances in sensor and communication technologies, for example, will provide new capabilities and opportunities to improve safety. Certain intelligent technologies are being developed with the express purpose of assisting drivers to avoid collisions (e.g., so-called collision avoidance systems include forward obstacle collision warning system, lane departure warning systems and fatigue warning systems as well as electronic stability program and electronic steering); whereas other systems are being developed to enhance driver convenience (e.g., navigation, adaptive cruise control). Governments throughout the world are actively promoting the deployment of ITS

technologies to achieve greater safety and mobility benefits.

It is extremely important, however, to ensure that new systems and technologies are guided by human factors principles and data so that they do not lead to driver behaviours and responses which are not intended by systems designers. In aviation, for example, increased pilot assistance and automation has unwittingly reduced situational awareness and produced out-of-the-loop performance problems (i.e., increased errors and response latency). The risks associated with increased automation (e.g., driver distraction, behavioural adaptation, loss of skill, and negative transfer) are not well understood and cannot be reliably predicted at present.

For vehicles that are not fully automated, the impact of technological change on safety will depend on its implementation and, in particular, on the extent to which the system supports drivers' needs and is compatible with human capabilities and limitations. Not all on-board information, control and communication systems will have the same degree of impact on human-machine interactions. Those that have a critical impact will require more careful human factors analysis. It should be mentioned that the term "human-machine interactions" refers to the broad range of behaviours associated with the driving task, including strategic, tactical and operational control of the vehicle and its sub-systems. The primary human factors issues concern central human processes such as driver attention, situation awareness and cognition. Secondary issues concern peripheral processes (e.g., legibility) that are affected by the physical design of the human-machine interface.

Within the broad area of ITS safety, the WG has identified human-machine interaction as the principal focus of interest. The WG is concerned with developing methods for summative evaluations; that is, final test and evaluation of systems prior to their introduction into the market. It is recognized that during their development, systems undergo design iterations that involve the collection and analysis of relevant human performance and other data. These formative evaluations are conducted at various stages of system development to check system performance against corporate objectives and specifications. They are primarily within the control and serve the interests of industry and, as such, are beyond the scope of this WG. While formative evaluations are important and can contribute to overall system safety, safety assurance relies on evaluations of systems that are ready for implementation in the real world.

Participation

The following countries have participated in the ITS WG: Australia, Canada, France, Germany, The Netherlands, Japan, Poland, Sweden, U.K., and the U.S. While most WG members represent national governments some members come from the automotive industry. In certain cases, notably France, Germany and Japan, the national representatives come from industry or government research organizations and participate on behalf of the relevant government agencies.

Member list

A list of current WG members is provided in Appendix A.

List of Meetings

The WG meets normally semi-annually. As at time of writing, seven meetings of the WG have been held as follows:

1. April 8-9, 1997, Rotterdam, The Netherlands
2. October 25, 1997, Berlin, Germany
3. April 7-8, 1998, London, England
4. June 3, 1998, Windsor, Canada
5. April 16, 1999, Washington, DC
6. October 19, 1999, Stockholm, Sweden
7. April 12-13, 2000, Lyon, France
8. October 3-4, 2000, Ottawa, Canada

A set of minutes of these meetings is in the process of being posted to the IHRA web site (www-ihra.nhtsa.dot.gov).

SUMMARY OF ACTIVITIES

A number of initiatives were completed, including the formulation of an overall framework for ITS safety assurance and the role of the ITS WG within this framework, a series of workshops on the safety test and evaluation of ITS, and definition of priority research problem statements. These initiatives are briefly described below.

Overall Framework

The WG developed an overall framework for ITS safety assurance with the aim of delineating its role in relation to other groups involved with international standards and research. The framework, shown in

figure 1, posits that safety is optimized by (1) adherence to accepted safety principles, (2) conformity with existing human-machine interface (HMI) standards, (3) conformity with minimum criteria for collision avoidance systems (CAS), if applicable, and (4) implementation of a safety assessment program. These are shown in the model as four separate blocks and are briefly described below in order to elaborate the model. While all of these elements are important for safety, the work of the IHRA-ITS WG is focused on developing a framework for final test and evaluation of system safety. This element is indicated in the figure by the shaded block.

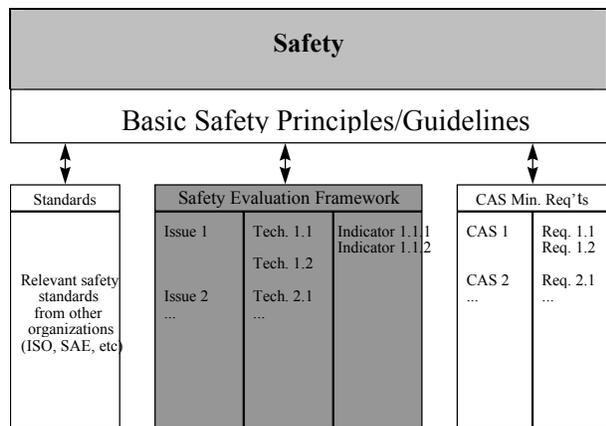


Figure 1: Principal elements of ITS safety assurance.

Element 1: Basic Safety Principles/Guidelines

The basic safety principles/guidelines provide general, widely-accepted design and operational information to promote system compatibility with known driver characteristics. The European Code of Practice on Human Machine Interface for In-Vehicle Information and Communication Systems and the Draft British Standards Institute Guide to In-Vehicle Information Systems are examples of basic design guidelines. The guidelines in this category, however, are very general. For example, they may state that functions or display modes that overload the driver or intrude on the driving task should be disabled while driving, but they do not specify the functions or modes or indicate what constitutes overload or intrusion. In addition, widely-accepted human factors engineering principles (e.g., stimulus-response compatibility) are available from standard references.

Element 2: Standards

Another important element in the model concerns automotive human-machine interface (HMI) standards such as the design of visual and auditory displays. HMI is defined broadly and includes design aspects such as system functionality, message prioritization in addition to the physical characteristics of the interface. Several standards bodies (e.g., ISO, SAE,) are working to develop industry standards for HMI with a view towards providing an ergonomically sound interface that is compatible with driver needs, capacities and limitations. Standardization of HMI elements facilitates drivers’ understanding of system function and ensure consistency of operation.

Element 3: Collision Avoidance Systems Minimum Requirements

Collision avoidance systems (CAS) are systems that detect hazardous conditions and either warn the driver or trigger an automatic avoidance manoeuvre such as braking. The distinction between collision avoidance systems and other types of ITS is often not clear. For example, an adaptive cruise control is normally described as a convenience feature, especially if deceleration is limited to that available from engine power. If the same system also warns the driver of a forward obstacle it may be referred to as a forward obstacle warning system and if that system is capable of initiative braking it is a collision avoidance system.

Collision avoidance systems present a formidable challenge to designers because of the necessity to provide the driver a clear message in a short period of time in such a way as to be non-startling and without risk of causing inappropriate response. Because collision avoidance systems intervene in situations where the risk of collision is moderate or high, it is important to establish minimum functional requirements. Several groups are working to develop minimum requirements for specific CAS. However, no standard or guideline presently exists to help designers select appropriate functional characteristics to maximize safety benefits.

Element 4: Safety Evaluation Framework

The use of existing guidelines, HMI standards, and minimum functional requirements for CAS (i.e., the other elements of the model), is necessary but not sufficient to ensure that an ITS product is safe or that it reflects the current state-of-knowledge or practice

within the industry. The present element augments the others by specifying that ITS products should be evaluated in terms of their effect on driver performance and behaviour prior to their introduction into the market. There will likely be an increasing need for prospective techniques for evaluating the safety of on-board systems in the development and certification of ITS, especially since the underlying technologies and functionality are constantly

changing. Questions about what issues need to be addressed in these evaluations, how to investigate them and what criteria define acceptable performance constitute the subject matter for collaborative research envisioned for the WG.

The development of a framework for the evaluation of ITS can be regarded as the primary interest of the IHRA-ITS WG. An initial shell for the framework is presented in Figure 2. The framework is based on consideration of the main behavioural mechanisms by which on-board information, control or communication system can influence safety. Four main categories of safety mechanisms are identified in the framework; direct safety effects, behavioural adaptation, workload, and usability.

Mechanism	Conditions		Technique	Indicators/ Benchmarks
	Driver	Driving		
Direct Safety Effects (e.g., conflicts, incidences)				
Behavioural Adaptation				
Attention and Workload (e.g., visual demand, distraction)				
Usability (e.g., errors, time)				

Figure 2: ITS evaluation framework.

Direct Safety Effects (e.g., conflicts, incidences) - measured outcomes in terms of safety, including collision or incident frequency, conflicts and safety-critical errors

Behavioural Adaptation - the complex change in driver behaviour that occurs in response to a particular change in the road-vehicle system. Adaptation may be influenced by factors such as individual differences and the nature and salience of the system change. It may manifest itself in a variety of ways that are not well understood at the present time.

Attention and Workload (e.g., visual demand, distraction) - the portion of the driver's maximum mental resource capacity expended in the performance of the driving task

Usability (e.g., errors, time) - the extent to which a system or device is effective, efficient, satisfying, easy to learn and control, and is compatible with task goals in the driving environment.

Safety evaluations should address each of these broad areas to ensure that system design and integration is safe and compatible with the driving task. For each

safety mechanism, techniques need to be identified that can be used to assess the adequacy of system safety performance. Safety indicators, or measures believed to be relevant to safety will be specified for each technique indicated. Since it is unlikely that absolute safety performance criteria can be established in the foreseeable future, the techniques may take the form of comparative evaluations in which the subject system is compared against a benchmark. Benchmarks are reference levels of performance that are considered to be acceptable from a safety perspective. They might, for example, indicate baseline levels of performance (e.g., without the ITS). The driver and driving conditions to be represented in the evaluations are the same for all safety mechanisms.

Workshops

Three workshops were held as part of the work activity of the WG. A brief synopsis of each is provided below.

IHRA-ITS: Workshop on ITS Safety Test & Evaluation (October 24, 1997, Berlin)

This workshop was held in conjunction with the Third ITS World Congress in Berlin, October, 1997. There were many good presentations covering a broad range of evaluation techniques - too many, in fact, to permit in-depth discussion and exploration of the relevant issues. Some of the techniques presented were summarized in a previous report. Many important aspects of evaluation were raised that are not immediately apparent. For example, the need to consider the impact on non-equipped vehicles and the influence of driving style on test results are important considerations in the evaluation of safety.

Several of the papers described early European projects that attempted to address this subject, with limited success due to lack of continued funding. Specifically, Drive II projects (HOPES, HARDIE, EMMIS, and GEM) attempted to prepare frameworks, guidelines, and methodologies for safety assessment of in-vehicle systems. They collected a lot of data and developed, manuals, databases, and tools such as Skill Acquisition Network (SANE) and Dialogue Design and Evaluation Method (DIADEM). However, the results of these efforts have not addressed safety specifically, they lack full scale context and employ too many measurements. Continuation of these types of studies may be

supported by current European Commission (EC) Fifth Framework Program.

IHRA-ITS Workshop on ITS Safety Test & Evaluation (Washington, DC, April 14-15, 1999).

The IHRA-ITS Working Group convened a Workshop on ITS Safety Test & Evaluation in Washington, DC, April 14-15, 1999. The goals of the workshop were to consider research needs and opportunities and formulate priority projects that can advance ITS safety test and evaluation methodology through collaborative international research. Nearly 50 researchers from research organizations and universities worldwide participated in the workshop. The workshop was structured along the four domain areas defined above, namely direct safety, behavioural adaptation, workload and usability. Four keynote presentations provided an overview of each topic, after which the delegates were divided into four breakout groups. The Nominal Group Technique was used by each group to formulate research problem statements.

The workshop generated 16 projects. These were considered in detail by the WG at its meeting immediately following the workshop. The WG selected 8 of these projects as representing priority areas for research. Project leaders were identified to coordinate activities within each project domain. The 8 priority projects are outlined under project summaries below.

IHRA-ITS Workshop on Safety Checklist, Stockholm, Sweden, October 20-21, 1999

SNRA sponsored this workshop as part of the Swedish "ITS SafeTE project". The intent was to have experts evaluate the utility of the DETR/TRL's Safety Checklist for the Assessment of In-Vehicle Information Systems (Stevens, De Lancey, Allen & Quimby, 1999). About 30 experts drove five Audi A6's equipped with Travel Pilot using Teletlas Intelligent Maps. A special route was developed for these trials. Participants had the opportunity to drive a vehicle and complete the TRL checklist. The second day was devoted to discussion of navigation system performance issues and checklist utility.

The workshop clearly indicated the value and validity of using checklists as instruments to identify safety concerns that require more detailed evaluation. It has also become very apparent that practical testing and evaluation raises a plethora of questions and issues

that need to be addressed and resolved. Recommendation for checklist improvements were made, many of which were subsequently incorporated in the final version of the TRL checklist.

Surveys

The WG conducted a survey of relevant research either on-going or that has been completed within the last 5 years. The definition of relevant work includes any study or demonstration that contained test and evaluation elements, or work that specifically set out to develop or validate protocols, procedures or techniques for the evaluation of safety. Some 50 projects were identified and entered into a Microsoft Access database. It was noted that there are relevant research not currently captured in the database, some representing collaborative projects among European countries. WG members will continue to provide input on an on-going basis to ensure that the database is as comprehensive as possible.

Project summaries

The IHRA-ITS Workshop on ITS Safety Test & Evaluation, Washington, DC, 1999 generated 16 projects that can advance ITS safety test and evaluation methodology through collaborative international research. The WG selected 8 of these projects as representing priority areas for research. Project leaders were identified to coordinate activities within each project domain. The 8 priority projects are outlined below.

1: Development Of A Harmonized Safety Evaluation Methodology Framework (Worldwide)

The objective of this project is to develop a Harmonized Safety Evaluation Methodology Framework for in-vehicle information, control, and communication systems with respect to human performance and behaviour. An inventory of possible methodologies for road safety evaluation of in-vehicle systems, including a variety of experimental and observational approaches, has been developed and is currently being evaluated for relevance, validity and suitability.

2: Driver Understanding And Expectation Of ITS Systems: Identification And Measurement Of The Effects Of False Expectation Of Driver Performance

The purpose of this project is to identify factors that affect a driver's understanding of ITS system functional characteristics and determine how they develop performance expectations for these systems. In particular, the main objective is to assess the safety consequences of mismatches between driver expectation and system performance.

Drivers may have a variety of ITS applications available to them, each having different operating characteristics. The picture is further complicated by the fact that for a particular type of ITS, such as ACC, system performance characteristics may vary from one vehicle/system to another. How well the driver understands the ITS application and the expectation he or she has for its performance can directly impact the safety of its use.

The project sub-group met to discuss various forms of collaboration related to ITS and driver expectation, including joint projects, information exchange, personnel exchange, etc. It is evident that there are a variety of relevant projects underway in different countries. However, the group was unable to commit to joint research because the sponsors of existing projects are outside the IHRA umbrella. Nevertheless, there appears to be some prospects for limited bilateral collaboration, which will be explored further by interested members.

3 Human Factors Principles Checklist For In-Vehicle Systems

The purpose of this project is to develop a checklist based on human factors principles to be used in the safety evaluation of in-vehicle systems.

Bilateral co-operations for the development of evaluation methods are in progress. A further catalyst has been the European Commission's recommendations on HMI and the need to address issues of testing, evaluation and compliance with these HMI principles. It is hoped that further co-operation will be possible. In order to complement the checklist, an objective measure of mental workload, in a joint project between Sweden and Germany will be started using a peripheral detection task.

4: Normative Data On Naturalistic Driving Behavior

The purpose of this project is to characterize driving behaviour in realistic situations by developing a driving performance database which comprises data on normal driving behaviour, in-vehicle ITS system usage, safety critical events, and crash data.

Naturalistic driving means unsupervised driving on public roads. The vehicle used can be the driver's personal vehicle or it can be one provided by the project team. In most cases, the vehicle will include instrumentation which is used to collect data on driver and vehicle performance. Similarly, *normative driving* is taken to mean driving that is done without the assistance of any experimental device. Normative data is often gathered for the purpose of eventual comparison with similar data when the driver does have assistance from some type of experimental in-vehicle equipment. Hence, the data that is collected may be focused on specific situations and conditions that are related to the purpose and performance of experimental equipment.

While there is high interest in this area, the opportunities for cooperation are few. This is partly due to the magnitude of the studies which would fall in this category.

The U.S. program includes several projects that are providing naturalistic driving data. These include field operational tests of an Intelligent Cruise Control system on passenger vehicles and also on heavy trucks, a Rear-end Collision Warning system on passenger vehicles and also on heavy trucks, a Rollover Stability Advisory system on heavy trucks, and baseline driving of personal vehicles with added instrumentation and data collection capability.

5: Simulator Reference Test Scenarios

LEAD: C. Patten

The goal of this project is to develop a catalogue of driving scenarios for use in driving simulator research. The set of scenarios should encompass the breadth of driving possibilities from uneventful everyday situations to safety critical situations.

Simulator reference test scenario 'tiles' are to be defined. The idea being that most nations have their own highway idiosyncrasies. However, with predefined test scenarios in the form of tiles or templates, the appropriate reference test scenario tile

for the respective simulator and local highway characteristics can be adopted. Therefore, with these tiles, one can more readily compare the results from different simulators with a higher degree of comparative validity. There are many benefits from the usage of internationally agreed upon simulator reference test scenario-tiles.

6: Improved Secondary Task Methodology For Evaluating Safety Effects Of Driver Workload

The goal of this project is to develop a useful secondary task methodology to calibrate workload effects of combining in-vehicle and out-of-vehicle information.

Based on the questionnaire responses for research development, we have proposed the objective of Project 6, the candidate methodologies of workload measurement, the further steps for progress, and the time frame for development. In the last meeting of IHRA-ITS WG, all have agreed that workload measurement is important for evaluating ITS systems, and Project 6 is also associated with other projects such as Project 1 (Development of a Harmonized Safety Evaluation Methodology Framework) and Project 7 (Harmonization and Validation of Surrogate Measures). We have had only a few responses for the proposal, so that as the next step we will continue the task to get opinions from relevant researchers as well as the project members.

7: Harmonization And Validation Of Surrogate Safety Measures

The goal of this project is the harmonization and validation of surrogate safety measures.

Surrogate safety measures are measures that can be used to estimate numbers of crashes and resulting injuries and deaths. Many projects, probably most, do not have access to large data bases of events that provide a basis for directly estimating the number of crashes and the impact of vehicle-based systems on the likelihood of crashes. Thus, surrogate measures are measures that can help estimate numbers of crashes and resulting injuries and deaths. Surrogate measures are usually related to specific types of problem (for example, surrogate measures for rear-end crashes are probably different than surrogate measures for road departure crashes).

There was only one response to the letter of solicitation to members of the working group. This

topic is problem specific; and countermeasure specific. The prospect for collaborative research is not high, but this remains an important area that will be a key concept for future work.

The U.S. program has developed surrogate measures for some types of situation and crash. Others are currently being developed.

Dormant 8: Driver Learning, Retention, & Acceptance Of New Its Systems: What We Can Learn And Problems To Avoid

The objective of this project is to make use of available data from past introductions of ITS vehicle systems to indicate where potential problems might arise with the introduction of new systems. This knowledge would be used in an effort to avoid problems that were encountered in the past. Some data are available (e.g., ABS) on the subject; however, the WG decided to make this project dormant for the time being as it has lower priority.

CRITICAL ISSUES

Nature of Harmonized Research

Research in the general area of ITS safety is on-going in different parts of the world, but without much influence from IHRA. Some of the research is performed by industry and is, to a large extent, proprietary. Other research is performed within the framework of national or regional programs, for which there is, at present, limited opportunities for external collaboration. To date, the ability of the ITS WG to embark on a comprehensive program of harmonized ITS safety research has been limited for the following reasons:

- The primary objective of current research is not focused on harmonizing safety policy. Specifically, there is currently no regulatory activity in this area.
- Research sponsored by government agencies on ITS safety policy at present is not amenable to collaboration on a global level, though bilateral collaboration has begun.
- IHRA-WG involvement in early stages of national research planning has not been possible during the first five years due to long government

planning cycles. However, closer collaboration may be possible in the future

Although there is interest on the part of several research organizations around the world in collaborating within the framework of IHRA, the main impediments are lack of resources, competition and protection of intellectual property. For example, whereas IHRA is advocating cooperative research on a global level much of the current research is undertaken within a regional, competitive environment. As a result, the main thrust of the IHRA-ITS WG has been to monitor relevant research with the aim of extracting useful knowledge and identifying research priorities and opportunities. The WG acknowledges that there is no prospect for it to be involved in regional, competitive research. It must work towards the role of coordinating government-sponsored research.

In the absence of specific targeted funds for harmonized research, the WG has attempted to leverage existing national efforts, with some success. For example, the Stockholm workshop has benefited from participation of the WG. Other similar efforts are underway to establish cooperation involving two or more members. These efforts are an important first step in establishing a harmonized research program in ITS.

Resources

Lack of resources continues to be a major impediment to establishing a truly collaborative research program. Financial and human resources are required to sustain a meaningful program of harmonized research, involving a comprehensive workplan and joint projects. At the present time, very few resources have been identified by governments for harmonized research in ITS safety.

The WG has discussed various approaches to securing resources for harmonized research and considers that the most practicable approach is for each country to fund its own participation. This approach has been implemented to a limited extent, with the initiation of unilateral or bilateral research. The WG is hoping to extend this approach to achieve a higher degree of collaboration. Ideally, each country would identify the priority projects of interest and work with other members to define the nature and plan the details of its research contribution.

Collaboration Mechanisms

There is a variety of mechanisms of collaboration that have not been fully explored during the past few years. They include:

- Holding a regular conference (perhaps, a more direct involvement in ESV) or workshop, perhaps in conjunction with an established annual conference
- Personnel exchange, (cross industry-government, etc.)

Such activities serve the overall objective of sharing knowledge and know-how and the WG is keen to encourage these.

CONCLUSIONS

Research in this area is relatively new in comparison with passive safety, the latter having had the benefit of considerable R&D investments over many years. The activities of the WG, including the development of a research framework and initiation of priority projects, surveys and workshops have proven to be of value. A further benefit is the informal sharing of information among WG members about activities in different countries. This is very important since it is currently the only forum with the express purpose of coordinating government research in this area. Moreover, interest in this WG seems to be growing, owing largely to a growing awareness of the need for ITS safety policy. Thus, the IHRA-ITS WG has the potential to play a major role in ITS safety.

WG members believe that inter-government collaboration in ITS safety research is an important activity - one that serves the interests of both government and industry in meeting the challenges of safety in a global economy. We believe the timeframe should be extended to reflect the anticipated long-term commitment needed in this area. ITS-equipped vehicles are only just being introduced into the market. As technologies evolve, there will be a constant need for governments to monitor the safety of these systems and to adapt policies to respond to public expectations.

The WG anticipates a need for increased involvement by participating countries, particularly at technical levels. For example, there is a need for technical reviews of national research projects in order to assess, on a global level, research findings and

implications, and to identify new research directions. This represents a turning point for the WG in that it implies a much greater involvement in detailed reviews and technical analyses than has been possible to date. The WG envisions the future formation of specific working groups in certain areas, but is not in a position to make specific recommendations at this time.

RECOMMENDATIONS FOR FUTURE WG ACTIVITIES

It is recommended that the mandate of the ITS WG be extended. However, for it to become more effective, it is recommended that;

- The IHRA Steering Committee consider how it might ensure appropriate representation and active participation on the WG.
- Participating countries/organizations should be prepared to commit resources earmarked for IHRA-ITS collaborative research.
- Participating countries/organizations should identify which priority project they are prepared to fund or support in other ways.
- The WG should continue to strengthen its relationship with relevant bodies such as WP29, the EC, etc.
- The research database should be maintained on an on-going basis.
- The ESV conference should become the premiere forum for the exchange of government-sponsored and relevant research on ITS safety evaluation

APPENDIX A: MEMBERS OF IHRA-ITS WORKING GROUP

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