



# **Field Operational Tests**

**Final Report on the FP7 Consultation  
Workshop, 5 April 2006, Brussels**

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## Scope of the Report

Field Operational Tests (FOTs) have been proposed for inclusion within the research agenda of the ICT research programme for FP7, as part of *ICT for meeting societal challenges*, as suggested in the Communication on the Intelligent Car Initiative<sup>1</sup>. The focus of latter is on ICT for smarter, safer, and cleaner vehicles.

FOTs are large-scale test programmes, using ordinary citizens as drivers, covering a wide range of driving conditions, undertaken over an extended period of time. They enable the collection of data that cannot be produced by conventional test and demonstration methods associated with RTD activities. The data collected from FOTs can then be used for socio-economic and technical evaluations, leading to concrete information concerning the costs and benefits of advanced ICT-based systems in vehicles, and their impacts on driver behaviour, traffic safety, the environment, and transport efficiency. FOTs can be undertaken, in principle, with any type of road vehicle fitted with relevant ICT-based systems: cars, trucks, buses, coaches.

Over many years there has been research and development into advanced ICT-based systems for vehicles, focusing on improving safety, as well as other impacts such as traffic efficiency. Most recently, in FP6, there has been research on active safety systems, the integration of these systems in vehicles, and research into cooperative systems involving on-board systems, traffic control centres and road infrastructure-components. However, the large-scale deployment of safety systems in vehicles has been very slow, extending in some cases over many decades from the time when the initial development work was first initiated. Often penetration of these systems is very low, with applications being limited, for various reasons, to premium brands and top-of-the-range vehicles.

One significant element hindering wider uptake is lack of awareness, throughout society, of the potential benefits of these systems. Consequently, FOTs are seen as a way of radically transforming the present circumstances, by providing real and convincing data of the costs and benefits of advanced ICT-based safety systems in vehicles. The expectation is that once wide awareness is achieved, other barriers, such as legal liability frameworks, will be addressed, leading to a transformation whereby these advanced ICT-based safety systems will become normal features of all road vehicles. This is the strategic imperative lying behind the proposal to undertake FOTs within the ICT research programme of FP7.

In this context, a workshop was held in Brussels on 5 April 2006, to consult with relevant stakeholders, to discuss potential issues, challenges, and benefits arising from FOTs, and to define the agenda for implementing FOTs within FP7.

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<sup>1</sup> COM (2006) 59 final: “On the Intelligent Car Initiative: Raising the Awareness of ICT for Smarter, Safer and Cleaner Vehicles”

## **Themes Discussed**

The workshop participants presented prepared position papers and made presentations reflecting the perspectives of the various stakeholders present. A wide range of issues and challenges were exposed and discussed, including experiences from FOTs undertaken in the United States and The Netherlands.

### ***Common Views***

Several issues were raised by a number of stakeholders, suggesting some commonly held views. In particular, FOTs should involve representatives of all stakeholder groups and should be based upon using ordinary citizens as drivers. It is also desirable to develop a common harmonised assessment method within Europe. Also the development of common guidelines and recommendations should be addressed for designing strategies for introducing new systems, enhancing usability, creating awareness of performance, developing demand, etc.

FOTs should, when feasible, be based on more than just on-board eSafety systems; highway infrastructure, telematics, entertainment, and traffic control centre systems should also be included. Practical implementation issues, for example interoperability, installation of systems in vehicles, robustness of measuring devices and data loggers, maintenance of systems and data measurement devices, driver training, etc. needs to be addressed. Preparation for FOTs will probably require the use of simulation and test track facilities before embarking on actual road testing.

The assessment of test data should be based on socio-technical-economic evaluation leading to cost-benefit information on the systems tested. Adequate kilometres travelled need to be ensured so that enough events are captured and statistical relevance is attained, enabling conclusions to be reached. It is also necessary to study driving scenarios with and without the ICT-based safety systems, to enable comparisons.

### ***Commercial Perspectives***

It could be useful if commercial suppliers and OEMs could develop a common view of deployable functions, applications, business models and plans. However, it will be crucially important for commercial companies to identify and address competitive and confidentiality issues and concerns at the very beginning of the FOT work. Given the particular nature of FOTs, there may be a need to involve other, non-research departments such as marketing, strategy, finance, etc. It may also be the case that if only research departments are involved then it may be difficult to provide the large fleets of vehicles required for FOTs.

The purpose of FOTs should be to test functionality and not competing systems. It is important to avoid raising expectations, and the most appropriate way of exploiting FOTs for awareness is to use FOT results not the FOTs themselves.

The automotive industry expressed concern about the timing of FOTs in relation to the different stages of systems development. Their perspective is that FOTs are most

relevant to the R&D phase, and that by the time the pre-market phase is reached there is very little flexibility to make changes.

Commercial companies are also concerned about testing active safety systems on public roads and think that it may only be realistic to undertake limited scale testing for specific active safety systems in more controlled conditions.

OEMs expressed a wish to be involved in all steps of FOTs. OEMs are also concerned about being pushed into taking premature decisions about products and markets.

### ***Lessons Learned from Field Operational Tests***

There have been a number of FOTs undertaken in the United States and a very small number at national level in Europe, for example in The Netherlands. The lessons learned from these are wide ranging.

A comprehensive step by step method needs to be used, and an independent party should undertake analysis of FOT data. Detailed advance planning is needed involving representatives from all stakeholders groups. Discussions and negotiations between stakeholders need to be undertaken before the start of actual field-testing, with agreement reached on such matters as test scenarios, definition of test measures, etc.

FOTs based on specific accident problems, for example collisions at junctions, tend to produce better results, than those just based on testing safety systems without clear specifications or targets.

FOTs should cover a large number of driver characteristics and driving conditions. FOTs should be undertaken over an extended testing period to cover the phases when the driver is still learning about the systems being tested, and the phase when the driver has acquired experience. Driver training may be needed in some circumstances. Realism of operating conditions is important and a pilot stage can be useful before full scale FOTs. On-going data collection, verification and analysis are needed. However it is necessary to be precise about the purpose of the test, otherwise too much data might be generated. In circumstances where FOTs involve testing system components that are part of the infrastructure, it is necessary to ensure that drivers use the parts of the infrastructure where the components are installed.

A naturalistic approach has been adopted in some FOTs, specifically the testing of close-to-market systems. This involves collecting data continuously from vehicle sensors and unobtrusive video cameras installed in the vehicles. No special instructions are given to drivers, and no experimenter is present in the vehicle.

It is important to be able to identify near-crashes and incidents and video is useful for this. However analysis of the videotapes is very time consuming and a way needs to be found to automate this process. However, such analysis reveals more near-crashes than had previously been realised; this sort of data has never been previously collected.

The design FOTs should enable the creation of comparable data sets so that data from different FOTs can be compared and also combined for further analysis. Importantly in the European context, cultural differences between nations driving habits need to be addressed and behavioural adaptations also need to be considered. Testing of individual systems and integrated systems to assess specific systems impact and overall impact are needed. Experience shows that cooperation between stakeholders is essential for success.

In the United States, Automotive OEMs were initially reluctant to be involved in FOTs, but having participated they are now convinced of the value of FOTs.

FOTs provide an opportunity for creating awareness and helping with acceptance and FOTs should help to identify areas where future R&D is needed. FOT data can also be used as an input to the design of new systems.

### ***Different Stakeholder Interests***

It is evident that the several stakeholder groups have different interests and priorities. These all need to be made clear up-front and addressed within the FOTs. Identifying potential conflicts is important. However ensuring that these different stakeholder interests are addressed will help to encourage participation.

Undertaking FOTs may lead to the creation of interdependencies between FOT results and stakeholder reactions to results. This aspect needs to be addressed in the FOTs. FOTs should also consider the implications of different financial risk scenarios for OEMs and for society, and deal with the issue of implementation strategies, especially possible mismatches between OEM interests and other stakeholder interests

### ***Selection of FOTs***

The EU's interests could play a role in determining selection of problems to address in FOTs. EU policy priorities, accident statistics, or both could drive selection. Given the goal of identifying instruments for an accelerated deployment of the most promising systems, the EU may want to collect FOT data on systems that are currently being used on the roads or that are very close to being on the market. However, it is important that any systems tested should already have been subjected to user and technological testing; they must be safe to use on public roads, in normal traffic conditions, by *ordinary* drivers. For this reason it will not be possible to test cooperative systems until the later stages of FP7. Likewise it may not be possible to test integrated on-board systems in the early years of FP7. In the case of cooperative systems, the scale of the tests needs to be considered, as some benefits may only be seen if a critical mass of vehicles and infrastructure is equipped.

### ***Incentives to Participate***

Previous funding models in FP6 for demonstration activities have been based upon a 30% community contribution, and this may be a limiting factor on participation in terms of time scale, and the amount of contribution different parties make in relation to the benefits that they will derive.

Identifying the right incentives, for all parties, is therefore crucial. Clearly FOTs must address all the stakeholder groups' interests, which are quite varied. Those who undertake the independent data analysis also need the right incentives. In the United States the FOT evaluators received high percentage compensation. Will a 50% community contribution be sufficient to ensure the participation of independent evaluators in European FOTs?

The incentive, financial and non-financial, of other stakeholder groups also needs to be considered, to ensure their participation. Creating the right conditions for participation is essential.

## **Long Term Challenges (2007-2013)**

The various issues involved in undertaking FOTs arise from different interests and concerns of the stakeholders. The main challenge in the period 2007-2013 will be to create experience of undertaking FOTs in Europe while dealing with these issues, learning where necessary from the experiences of FOTs already undertaken in the United States and at a national level in Europe.

It clear that a phased approach will be needed, starting with on-board systems that are in a ready state for testing, moving forward to the testing of cooperative systems, and integrated on-board systems, later in FP7. The main challenge will be to identify systems that are in a suitable state for testing, and undertaking work that may be necessary to bring other more advanced systems, for example, cooperative systems, to a state where they too can be subject to FOTs. This however can only be done once research and development projects started in FP6 have been successfully concluded.

A further challenge will be ensuring cooperation with relevant agencies in the Member States, to gain support for FOT deployment.

## **Priorities for 2007-2008**

The priorities for 2007-2008 are to undertake preparatory work for FOTs. There should then be a simple FOT, to gain experience, using on-board systems that are in a ready state for testing.

## **Conclusions**

The workshop concluded that FOTs will be essential for moving forward the deployment and the development of various ICT-based vehicle safety systems. FOTs have a transformational potential with respect to creating conditions for wider uptake and implementation of ICT-based safety systems. The results derived from FOTs should provide a basis for informed decisions about necessary changes to legal frameworks and should also provide an incentive for politicians to initiate these changes. FOTs, therefore, are strategically important and should be supported within the ICT programme of FP7.

The challenges involved in FOTs were identified during the workshop, and although there are many of these for all the stakeholder groups, the fact that FOTs have been successfully undertaken elsewhere demonstrates that none of the difficulties are insurmountable. It will be necessary to create experience of undertaking FOTs in Europe, learning where necessary from the experiences of FOTs already undertaken in the United States and at a national level in Europe.

Given that FOT is an activity that has not previously been addressed at EU level within the ICT research programme, and is also something that the various stakeholders have little direct experience of, an evolutionary approach is considered to be highly desirable. In addition, before any FOTs are undertaken it is essential that careful preparatory work be undertaken, both in terms of dealing with generic issues, and also in relation to specific FOTs.

FOTs therefore should be implemented within the ICT programme of FP7, on the following basis:

- ? The aim should be to evaluate the functionality of advanced ICT-based vehicle safety and other systems, with respect to impact on road safety, traffic efficiency, environment, and driver behaviour. There should be no evaluation of competing systems.
- ? Increasing the awareness throughout society should be based on the results of the FOT assessments and not the FOTs themselves. Avoiding creating unrealistic expectations is important.
- ? Commercial confidentiality must be respected and conflicts between commercial stakeholders avoided.
- ? The scope and objectives of each FOT should be clearly defined.
- ? Calls should be based on defined road safety problems, rather than specific types of ICT-based vehicle safety systems. These road safety problems can be specified based on EU policy priorities, or accident data, or both.
- ? An evolutionary phased approach should be adopted based upon what is feasible to include in FOTs.
- ? Statistical relevance of FOT data has to be attained, and this will probably involve combining data sets from several FOTs.
- ? Independent parties should undertake assessment and analysis of FOT data.
- ? The starting point for FOTs should be preparatory work, followed by a simple FOT, to gain experience, using on-board systems that are in a ready state.
- ? Cooperative systems, and integrated on-board systems, should also be included in FOTs later in FP7.
- ? Integrated Projects should be used for FOTs and not STREPS, and these Integrated Projects should involve representatives from all stakeholders.
- ? The appropriate funding structure should be a 50% community contribution.

## Appendix 1 – List of Participants

<b>Name</b>	<b>Company</b>
ANDREONE, Luisa	CRF
BOOTSMA, Gerben	NL ministry of Transport
EVENSEN, Knut	Q-Free
FEINDT, Uwe	Robert Bosch
KOSCH, Timo	BMW
MALONE, Kerry	TNO
NIELSEN, Michael	Ertico
PALMQVIST, Ulf	EUCAR
AYRAL, Louis Sylvain	CLEPA
PFLIEGL, Reinhard	Austriatech
RESENDES, Ray	US DoT
SCHULZ, Wolfgang	IfV Köln
ULMER, Berthold	Daimler Chrysler
VICTOR, Trent	Volvo Technology

**Rapporteur:**

KIDD, Paul

**EC Officials:**

VITS, André

MINARINI, Fabrizio

## Appendix 2 – Position Papers

Contributions were received from:

<b>Author</b>	<b>Organisation</b>	<b>Title</b>
Trent Victor	Volvo Technology	Field Operational Tests
Timo Kosch	BMW	Position paper with focus on esafety and telematics from a Car2x communication perspective
	PREVENT Integrated Project	PREVENT position towards FP7 Field Operational Tests
Wolfgang H. Schulz	University of Cologne	Contribution to Strategic Objective ICT for Transport for the FP7, First Work program (2007-2008), Field Operational Tests
Gerben Bootsma	Ministry of Transport Rijkswaterstaat; Transport Research Centre	Position Paper Intelligent Vehicles
Kerry Malone	TNO	Contribution to Strategic Objective ICT for Transport for the FP7, First Work program (2007-2008), Field Operational Tests
	Bosch	Position Paper on "Field Operation Tests (FOT)" for Information and Communication Technologies (ICT) for Transport" within the initiative "Intelligent Vehicle"
Ray Resendes	US DoT	Goals of Field Operational Test and Evaluation
Luisa Andreone	Centro Ricerche Fiat	Field Operational Tests
	CLEPA	Automotive Component & Systems for intelligent Vehicles: IC Technology Portfolio for the "Intelligent Car Initiative"