



Planning and Running a Field Operational Test: FOT Implementation Plan

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List of Abbreviations

FESTA	Field opErational teSt supportT Action
FOT	Field Operational Test
FOTIP	Field Operational Test Implementation Plan
WBS	Work Breakdown Structure

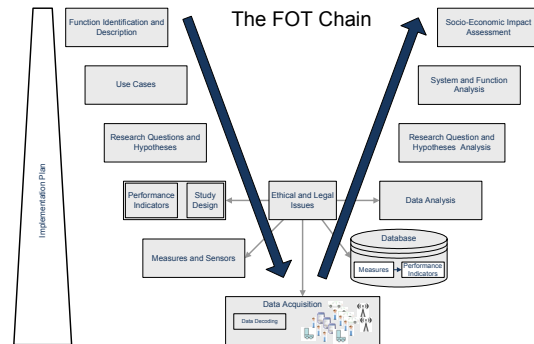
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1 Planning and Running a Field Operational Test

1.1 Introduction

For a Field Operation Test (FOT) to proceed smoothly, a plan of action must be developed which documents the scientific, technical, administrative and procedural activities and tasks that are needed to successfully complete it. Given that the lifecycle of a FOT typically evolves through many phases, there are many issues to consider. In this report, the critical activities and tasks which are necessary to run a successful FOT are documented — in the form of a “FOT Implementation Plan” (FOTIP) — drawing on lessons learned from previous FOTs conducted in Europe, the United States, Japan, Australia and elsewhere. As can be seen from the figure above, the FOTIP describes activities and tasks which span the entire FOT Chain (see the separate FESTA Handbook for a description of the FOT Chain).



The FOTIP is contained in Annex A of this report. In the following sections, the FOTIP is introduced, described, explained and discussed.

1.2 The FOT Implementation Plan

1.2.1 Purpose

The FOTIP is intended to serve primarily as a checklist for planning and running FOTs:

- to highlight the main Activities and Tasks that would normally be undertaken in successfully completing a FOT;
- to ensure that, in running a FOT, researchers and support teams are aware of critical issues that influence the success of the FOT;
- by drawing on the experiences of previous FOTs, to highlight the “dos” and “don’ts” of running a FOT; and
- to provide a consistent framework for planning, running and decommissioning FOTs.

The FOTIP in Annex A is not intended to be prescriptive, but rather to serve as a generic guide in conducting FOTs. By their very nature FOTs are major projects – extensive and expensive. Significant previous FOTs that have not delivered their anticipated outcomes have not done so primarily because of failures to anticipate problems that compromised their successful execution. The FOTIP attempts to map out all known critical issues that need to be taken into account in planning and undertaking a FOT.

The history of FOTs suggests that no two will be the same, and that there often are many unforeseen Tasks and Sub-Tasks that arise during its lifecycle. The list of Tasks and Sub-Tasks contained in the FOTIP in Annex A is not, therefore, exhaustive. It is based on the collective wisdom of those that have been involved in planning and running previous FOTs. There may

be specific requirements for future FOTs conducted in Europe that will need to be decided on a case-by-case basis.

The FOTIP describes *what* needs to be done, and approximately *when*, in running a successful FOT. Relevant chapters in the FESTA Handbook describe in detail *why* these activities are necessary and *how* they are to be accomplished.

1.2.2 Description of the FOT Implementation Plan

The FOTIP at Annex A resembles a traditional Work Breakdown Structure (WBS), but without timelines. It is specifically designed in this way so that timelines can be inserted at a later date by those responsible for the overall planning and running of the FOT.

The FOTIP is divided into 5 columns:

- **Column 1 — Activities.** An Activity is a high level task e. g. “Convene FOT research and support teams” that is usually needed to run a FOT.
- **Column 2 — Tasks and Sub-Tasks.** A Task directly supports an Activity e. g. “Appoint FOT project manager”. A Sub-Task directly supports a Task. Essentially, this column contains a series of action statements – “do this”; “do that”; etc. There are very few sub-tasks listed in this column, to contain the size of the document. The document is cross-referenced to relevant chapters of the separate FESTA Handbook, which identify the relevant Sub-Tasks that support these Tasks.
- **Column 3 — Person/Organisation Responsible for Activity.** This column identifies the person, team, organisation or combination thereof that would usually be responsible for completion of a Task. The FOT project manager is ultimately accountable for successful completion of all Tasks, and is therefore included for every Task. Column 3 contains a list of numbers, each of which denotes a particular person, team or organisation. The table in Annex A (immediately preceding the FOTIP) provides a legend for these numbers.
- **Column 4 – Critical Considerations (the “dos” and “don’ts”).** This column contains critical advice for ensuring that an Activity or Task is successfully completed. e. g. “Be sure that the vehicle systems are designed so they do not drain the battery when the vehicle engine is not running.” e. g. “Do not underestimate the amount of time required to recruit company drivers for the FOT.”
- **Column 5 – General Advice.** This column provides general advice on how to maximise the likelihood of running a successful FOT e. g. “The FOT lifecycle is long. Hence, it is advisable to write separate reports on each critical stage of the FOT...” This column also contains explanatory notes, reference to other relevant documents (e. g., FOT reports) and cross-referencing to relevant chapters in the FESTA Handbook.

The Activities and Tasks identified in the FOTIP are consistent with those identified in the higher level “FOT Chain” described in the FESTA Handbook, although the chronological order in which the Activities and Tasks are shown varies slightly between the two. For example, in

the FOT Chain, it is assumed that the first step when planning an FOT is the identification of systems and functions to be analysed. In the FOTIP, on the other hand, this task is identified later in the sequence of planning activities (within Activity 2), as there are other planning activities and tasks that necessarily precede the identification of systems and functions to be analyzed. The FOTIP identifies the scientific, technical, administrative and procedural activities for planning and running an FOT; the FOT Chain summarizes the key, high level, scientific and technical steps undertaken when performing an FOT, and the sequential links between them.

1.2.3 Development of FOT Implementation Plan

The content of the FOT Implementation Plan derives from several research activities undertaken in Work Package 2.5 of the FESTA project:

- a comprehensive review of the literature on previous FOTs undertaken in different parts of the world: the United States and Canada; the Asia-Pacific region (including Australia and Japan); Europe; and Scandinavia. This included reference to FOT project plans, internal reports, meeting minutes and related documents, where possible. A special literature review of FOTs of nomadic devices was also undertaken, which encompassed all of these regions. References for the publicly available literature reviewed are listed later in this document.
- a one-day workshop with FOT experts who had previously conducted FOTs, in Europe and the United States. This activity, along with the outputs of the literature reviews, identified critical Activities, Tasks and Sub-Tasks for successfully conducting FOTs, as well as the practical “dos” and “don’ts” of carrying out FOTs;
- an international teleconference with experts with experience in conducting FOTs and naturalistic driving studies. This augmented the information derived from the workshop;
- written feedback from FOT experts, who commented on an earlier draft of the FOT Implementation Plan; and
- internal consultation with other FESTA Work package leaders, to identify critical scientific, technical and administrative activities arising from other FESTA research activities undertaken in developing other chapters of the FESTA Handbook.

1.2.4 Assumptions underlying the FOT Implementation Plan

There is no one way of conducting a successful FOT. The review of the literature on FOTs revealed that many different approaches have been taken in planning, running, analysing and decommissioning FOTs. The FOTIP in Annexe A draws together procedural activities that are most common to the known FOTs that have been conducted, and the collective wisdom of those who conducted them.

The FOT Implementation Plan is relevant to FOTs in which the ADAS and IVIS systems to be evaluated already exist as production systems in vehicles, or to studies in which the systems

to be evaluated must be chosen by the FOT project team, purchased or developed, and installed (e. g., as in Regan et al., 2006).

The FOT Implementation Plan provides only a general guide to the sequence in which Activities, Tasks and Sub-Tasks should be performed. Some need to happen early in the project and others at the end. Some need to immediately precede others. Other tasks need to proceed concurrently with others. Decisions about the scheduling of Activities, Tasks and Sub-Tasks are the responsibility of the FOT Project Manager. Table 1 lists the 22 Activities identified in the FOTIP, and highlights the main dependencies that exist between them. Within Activities, it is up to the FOT Project manager to further decide which Tasks and Sub-Tasks should proceed sequentially and in parallel.

Some of the major Tasks listed in the FOTIP (e. g. “recruit participants”, within the Activity “Run FOT”) are given only a one-line description and, as such, may appear to be down played in the plan. A judgement had to be made about how much detail to include in the FOTIP. Where such one-liners exist, this is because either the Task in question is one that most researchers would normally be familiar with (e. g., recruiting study participants) or because the Sub-Tasks involved are described in detail in relevant Chapters of the FESTA Handbook. Where appropriate, any known difficulties and concerns associated with major Tasks for which only a one-line description is given are emphasised.

Table 1: A generic guide to scheduling the 22 Activities described in the FOTIP in Annexe A.

		Set Up/Design	Preparation	Data Collection	Completion
1	Convene teams and people	█			
2	Define aims, objectives, research questions & hypotheses		█		
3	Develop project management Plan		█		
4	Implement procedures for stakeholders communication		█		
5	Design the study		█		
6	Identify and resolve legal and ethical issues		█	█	
7	Select and obtain Vehicles		█	█	
8	Select and obtain systems and functions to be evaluated	█	█		
9	Select and obtain data collection and transfer systems		█		
10	Select and obtain support systems		█		
11	Equip vehicles with technologies		█		
12	Implement driver feedback and reporting systems		█	█	
13	Select / implement relational database for storing data	█	█	█	
14	Test all systems to be used according to specifications		█		
15	Develop recruitment strategy and materials	█	█		
16	Develop driver training and briefing materials		█		
17	Pilot Test equipment, methods and procedures		█		
18	Run the FOT			█	█
19	Analyse the data			█	█
20	Write minutes and reports	█	█	█	█
21	Disseminate the findings			█	█
22	Decommission the study				█

1.2.5 Using the FOT Implementation Plan

It is suggested that the FOTIP be used as follows:

- read through the FOTIP before starting to plan a FOT;
- use the FOTIP as a checklist for guiding the planning, design and running of the FOT — and as a quality control mechanism for ensuring during the study that nothing critical has been forgotten;
- read the FOTIP in conjunction with other chapters in the separate FESTA Handbook, and refer to other chapters and other FOT reports for detail; and

- if desired, use the FOTIP as the basis for the development of GANTT charts and other project management tools.

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Annex A FOT Implementation Plan (FOTIP)

FOT Teams and People

1. Research Institute contracted to run FOT
2. Project Manager
3. Research Team
4. Technical Support Team
5. Administrative Support Team
6. Project Steering Committee
7. Project Management Team
8. Accounting/Auditing Advisor
9. Legal and Ethical Advisors
10. Sub-Contractors
11. Public Relations and Communications advisor
12. Project Sponsor(s)

**Legend for FOT teams and people
identified in column 3 of the FOTIP**

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity <i>(See above for Legend to teams and people)</i>	Critical Considerations (the “dos” and “don’ts”) <i>(Italics denote most critical issues)</i>	General Advice <i>(Italics denote most critical issues)</i>
<p>1. Convene FOT teams and people</p>	<ul style="list-style-type: none"> • Appoint FOT project manager • Appoint research team • Appoint technical support team • Appoint administrative support team • Appoint team leaders in each of the research, technical and administrative teams • Appoint project steering committee • Appoint project management team (for –day-to-day management) • Appoint accounting/auditing advisor • Appoint a legal and ethics advisor • Appoint sub-contractors • Appoint a public relations/communications advisor • Sign off on agreed research and support structure. 	<ul style="list-style-type: none"> • 1 • 2 • 2, 6 • 2 • 2 • 2, 6, 7, 11, 12 • 2 • 2, 7 • 2, 7 • 2, 7 • 2, 7 • 2, 7, 5, 8, 12 	<p>While the project manager must have knowledge of all activities, ensure that critical knowledge is not vested in just one person. Personnel, including the project manager, may leave the project. <i>Ensure that there is a “standby” for all key research and management roles within the FOT.</i></p> <p>Appoint early someone to deal with human participants/ethics committee issues.</p> <p>Include in the research team someone who is a “gizmo” expert – who has up to date knowledge about current ICT/ITS developments and capabilities. Civil engineering and geographical information system (GIS) expertise is also critical.</p> <p>Ensure the project management team meets regularly (about once a month) to resolve research issues, monitor timelines and budgets, and resolve administrative, technical and other issues.</p> <p><i>Choose contractors that can guarantee in writing that, if a staff member leaves or is ill, there is sufficient expertise and capacity to maintain project continuity.</i></p> <p>Maintain good relations with other partners involved in the FOT.</p> <p><i>Ensure that the FOT evaluation process will be, and be recognised as, independent.</i></p> <p>It is not necessary to appoint all teams/people at the same time – appointments should coincide with project needs.</p>	<p>Although this Activity precedes Activity 2, the choice of teams and people will be determined to some extent by the aims and objectives of the FOT.</p> <p>Appoint a project manager with excellent research, project management and communication skills. (Note. In some FOTs, the FOT project manager is responsible for both the administrative and scientific management of the FOT. In other FOTs, a senior researcher may be responsible for the scientific, but not the administrative, management of the FOT. This requirement will depend on the scale of the FOT.)</p> <p>The research team should be multi-disciplinary and would typically include psychologists, civil, mechanical, electrical and electronics engineers, statisticians, human factors experts, traffic safety experts,</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
			<p>Identify a final internal arbiter, acceptable to all parties, who can resolve scientific, administrative, legal and other disputes.</p> <p>Decide early in the project the frequency and timing of project Steering Committee meetings</p>	<p>and socio-economic modelling experts.</p> <p>The technical support team would normally include computer software engineers, communications engineers, mechanical, traffic, civil and electronic engineers, and GIS experts.</p> <p>The project Steering Committee sets the strategic direction of the project and keeps it aligned with the project aims and objectives. Normally it would include the FOT project manager, selected members of the research and project management teams (e.g. the team leaders), along with key stakeholders and the sponsor(s). Members should have authority to commit their organizations to the aims, objectives and implementation of the FOT. For smaller FOT projects, the stakeholder committee may not be necessary.</p> <p>The project management team is led by the FOT project manager and includes selected members of the</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
				<p>research (e. g, the team leaders), technical and administrative teams.</p> <p>A legal advisor should support the FOT over the full duration of the project (a lawyer’s office providing advice whenever needed is sufficient). Legal knowledge must be available on the legal situation in the country, or countries, in which the FOT is conducted.</p>
<p>2. Define aims, objectives, research questions and hypotheses</p>	<ul style="list-style-type: none"> • Define aims and objectives of FOT, in conjunction with relevant stakeholders • Identify systems and functions to be tested • Identify use cases/ situations in which systems and functions are to be tested • Define research questions and prioritise them • Formulate hypotheses to be tested, deriving from research questions • Determine and resolve constraints which may prevent the aims and objectives from being met • Define final aims and objectives of the FOT, and seek agreement from relevant stakeholders. 	<ul style="list-style-type: none"> • 2, 3, 4, 6 • 2, 3, 4, 6 • 2, 3, 4, 6 • 2, 3, 4, 6 • 2, 3, 4, 6 • 2, 3, 4, 6, 7 • 2, 3, 4, 6 	<p>Be prepared for the potential for FOT aims and objectives to change when new administrations come in.</p> <p>Be prepared for the potential for conflict in objectives by different stakeholders. e.g. a car manufacturer wants a deep understanding of product use and driver behaviour and acceptance versus a public authority more interested in determining the impact of system use on traffic and on the transport system.</p>	<p>See Chapters 4, 5 and 6 of the FESTA Handbook for further advice on defining the aims, objectives, research questions and hypotheses for a FOT.</p> <p>Constraints which may prevent the aims and objectives from being met might include cost, lack of supporting infrastructure, time, willingness and commitment of key stakeholders to cooperate in providing supporting infrastructure, their likely support in promoting the aims and objectives of the FOT, the availability of appropriate data, etc</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<ul style="list-style-type: none"> Sign off on aims and objectives of FOT 	<ul style="list-style-type: none"> 2, 3, 4, 6, 7, 11, 12 		<p>Commonly cited aims are:</p> <ul style="list-style-type: none"> - evaluate system(s) effectiveness in changing behaviour and performance - evaluate driver acceptance of system(s), including willingness to purchase - evaluate system technical operation - stimulate societal demand for new technologies - evaluate safety impacts - evaluate environmental impacts - evaluate impacts on traffic (e.g. congestion, mobility) - evaluate socio-economic cost-benefits - evaluate commercial impacts (e.g. productivity, return on investment, direct cost savings, incremental revenues by getting more customers, customer loyalty, etc.) <p><i>Defining the research questions and prioritizing them at an early stage will ensure they stay at the focus of the FOT and help protect from subsequent “mission</i></p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
				<i>creep”</i>
<p>3. Develop FOT project management plan</p>	<ul style="list-style-type: none"> • Define project activities, tasks and sub-tasks • Decide who is accountable for completion of activities, tasks and sub-tasks • Determine timelines for completion of activities, tasks and sub-tasks • Determine budget for project activities, tasks and timelines • Develop a project GANTT chart to guide project management • Implement procedures for monitoring project activities, timelines, budgets and resources (e.g. project management team meetings) • Undertake a risk assessment for the FOT and plan contingencies as required. • Determine sign off procedures (meetings and documents) to ensure that there is sign off on all critical decisions and stages in the FOT by all relevant parties • Agree on project issues which are confidential and implement mechanisms for safeguarding their confidentiality. • Develop a manual for conducting the FOT that documents critical 	<ul style="list-style-type: none"> • 2, 7 • 2, 7 • 2, 7 • 2, 7 • 2, 7 • 2, 7 • 2, 7 and risk management consultant • 2, 7 • 2, 7, 12 • 2, 3, 4 	<p><i>Include in the total budget some “contingency” that can be used to pay for unforeseen activities and tasks (especially meetings) that cannot be anticipated. 5 -10 percent of the total project cost is recommended. Different elements of the project may require different proportions of this contingency. It should be held and allocated by the project manager, not sub-activity leaders or partners.</i></p> <p><i>Identify and document in the GANTT chart the dependencies that exist between different activities, tasks and sub-tasks.</i></p> <p><i>Anticipate the need and budget for specialist consultants with skills and expertise that does not exist within the project team (e.g. training experts, software developers, lawyers etc)</i></p> <p><i>Anticipate changes to 3rd party vehicle fleets (e.g. vehicle upgrades and changes in operating routes) during the course of the FOT.</i></p> <p><i>Be aware that technical efforts are most likely to incur risk in terms of time and budget (especially the hardening up/refinement of systems, where these are developed within the FOT)</i></p> <p><i>Don’t under-estimate the time required and the cost of designing, running, analysing and de-commissioning the FOT. It will be greater than you think.</i></p> <p><i>Assume that some further modifications to, and fine tuning of, the project management plan will be required. It is impossible to foresee everything that is required in running a FOT.</i></p> <p><i>Develop procedural manuals for those conducting the</i></p>	<p><i>Documentation of all project meetings is critical to record critical decisions, document the lessons learnt and justify possible blowouts in budgets and timelines.</i></p> <p><i>A budgeting structure that accommodates the uncertainties associated with running FOTs is desirable – for example, a series of prospective budgets for each critical stage of the FOT.</i></p> <p><i>Be aware that in some jurisdictions project papers from publicly funded projects are public documents and copies can be requested by members of the public.</i></p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<p>procedural knowledge.</p> <ul style="list-style-type: none"> • Sign off on project management plan. 	<ul style="list-style-type: none"> • 2, 7, 12 	<p>FOT to ensure that, if project staff leave, all procedural knowledge does not leave with them. These should be developed for each activity.</p>	
<p>4. Implement procedures and protocols for communicating with stakeholders</p>	<ul style="list-style-type: none"> • Commission communications advisor to design communications plan • Develop and implement communications plan • Appoint media spokespeople • Sign off on agreed communication protocols. 	<ul style="list-style-type: none"> • 2, 7 • 2, 7, 11 • 2, 7, 6 • 2, 7, 11, 12 	<p><i>The media can be an important ally in supporting and promoting the value and outcomes of FOTs. Assume, however, that you will be mis-represented at times by the media. Try and limit media attention until data collection is complete, and at least after participant recruitment is complete.</i></p> <p><i>Agree in the contract with the sponsor who is responsible for press releases and dissemination of information and results.</i></p> <p><i>FOTs attract a lot of unsolicited media attention. Provide adequate time and budget for unsolicited communication with stakeholders, especially with the media.</i></p> <p>Ensure that the project steering committee has input to the communications plan.</p> <p><i>Ensure that there is appropriate control of communication with the media, through the appointed media spokesperson. For EU projects, involving multiple partners, it may be necessary to appoint more than one media spokesperson.</i></p> <p>Everyone involved in the project must know who the media spokespeople are.</p> <p><i>The media spokesperson should consult with the project management group before speaking to the media, especially on sensitive issues.</i></p> <p>Provide media training for appointed spokespeople.</p> <p><i>Build political support for the FOT early in the project,</i></p>	<p><i>Open communication with key stakeholders is important at an early stage of the FOT to ensure that the aims and objectives of the FOT are clear, that stakeholders are committed to the project, and that the aims and objectives of the FOT are not misquoted, misrepresented or misunderstood.</i></p> <p>There should be an agreed minimum level of transparency and result sharing in the FOT — avoid “confidential FOTs”.</p> <p>It may be beneficial to engage a professional press office to handle external communications, particularly with the media.</p> <p>FOT drivers and FOT researchers are usually of most interest to the media.</p> <p>Decide in advance with stakeholders a minimum time for approval for statements</p>

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			<p><i>and maintain it during and after the FOT.</i></p> <p><i>Be aware that there may be some key stakeholders who believe that FOTs are an impediment to system rollout. These people, in particular, must be made aware of the rationale for FOTs.</i></p> <p>Plan to have some results available at early stages of the project. If desirable, they should be released to an informed audience (e.g. at a conference) but not to the media as they could contaminate subsequent data collection.</p> <p>Plan for annual public meetings, and a project website, to disseminate information and findings.</p> <p><i>Don’t undermine the scientific integrity of the research program by mis-timing communications with the media and other stakeholders.</i></p> <p><i>Have a response prepared in case of serious incidents – such as a crash involving a test vehicle. Anticipate media contact between the media and participant drivers.</i></p> <p>Be aware that fleet/truck drivers may be more inclined to disclose opinions to the media if asked.</p>	<p>released to the media.</p> <p>Be prepared for the possibility that politicians may at times want to veto communications between the FOT project team, the media and other stakeholders.</p> <p>Building support outside the project for the FOT aims can help provide protection against strong partners/sponsors who may wish to change its direction in a way that could compromise it.</p> <p><i>Early negative media attention may have a significant impact on participant recruitment and/or colour participant expectations of system performance. Try to prevent any media awareness until after the recruitment phase is complete.</i></p>
<p>5. Design the Study</p>	<ul style="list-style-type: none"> • Become familiar with the methods, measures and procedures of previous FOTs: <ul style="list-style-type: none"> ○ Read the FESTA handbook ○ Attend FOTNET seminars and similar events and networking activities 	<ul style="list-style-type: none"> • 2, 3, 4 	<p><i>Ensure that necessary historic data (e.g. data on vehicle speeds on certain roads) is available for baseline comparisons or Cost Benefit Analysis.</i></p> <p>Allow sufficient time between vehicle allocations for system maintenance and verification, servicing and repairs to be undertaken.</p> <p>Accept that it is impossible to design a perfect FOT.</p>	<p>See Chapter 6 of the FESTA Handbook for detailed advice on designing the research study.</p> <p>See the FESTA Handbook reference list for published reports on previous FOTs.</p>

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	<ul style="list-style-type: none"> ○ Talk to experts who have conducted FOTs previously. ○ Review the relevant literature • Identify the performance indicators necessary to test the hypotheses derived in Activity 1 • Select measures (objective and subjective) that allow performance indicators to be derived to test the hypotheses • Identify the sensors and sensor requirements for obtaining the required measures • Design the experimental methods, tools and procedures for testing the hypotheses • Define the experimental environment in which to conduct the FOT • Define methods, tools, requirements and procedures for acquiring, storing, transferring, decoding, reducing/transcribing, filtering, backing up and verifying the data. • Define methods, tools and procedures for analyzing the data. 	<ul style="list-style-type: none"> • 2, 3, 4 • 2, 3, 4 • 2, 3, 4 • 2, 3, 4 • 2, 3, 4 • 2, 3, 4 • 2, 3, 4 	<p>Many practical issues – including time and money — will constrain the final experimental design.</p> <p>Remember that an FOT is not an experiment – control is limited, and counterbalancing may not be possible.</p> <p><i>Design into the FOT a contingency plan, in case there is an unexpected requirement to reduce or increase the scope of the study (e. g, to save money or time).</i></p> <p>Employ a multidisciplinary team in developing hypotheses. This should include researchers and people with expert knowledge about the systems to be tested.</p> <p><i>Design the study in a way that allows for direct comparisons to be made between objective data (logged by the vehicle) and subjective data (collected through questionnaires, focus groups etc).</i></p> <p>Keep to an acceptable minimum the number and size of questionnaires that must be completed by participants at different points of the study, to maximise the likelihood of them being completed. A sub 2-hour completion duration is a useful target, as longer sessions may tend to remind participants that they are part of a scientific study.</p> <p><i>Don’t be tempted to reduce the sample size in order to save money – conducting a study with too few participants leads to a lack of statistical power to detect effects, and may ultimately be a waste of time and money.</i></p> <p>Make sure that everyone understands the FOT study design, so that they appreciate the timing issues and the consequences of wanting to make changes to it e.g. if wanting to reduce the scope of the study.</p> <p>Delays in one area of the program cannot necessarily be made up by making sacrifices to other areas.</p>	<p>Where it is not possible, for ethical, practical or safety reasons, to investigate an issue in a FOT, consider safe alternative means for doing the research (e.g. simulators, test tracks).</p> <p><i>The level of driver familiarity with the test vehicle may influence driver performance during the early stages of the FOT.</i></p> <p>Ethical incentives that can be given to discourage driver attrition from the study should be agreed on early in the project.</p> <p>The models for estimating safety and other benefits may need to be updated in response to recent literature when making the estimation.</p> <p><i>For the business sector, the commercial impact of the technologies deployed (e.g. in terms of productivity, return on investment, cost savings, incremental revenues by getting more customers, customer loyalty, etc) will be important to evaluate.</i></p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<ul style="list-style-type: none"> • Determine sample characteristics and optimal size (conduct power analyses) to ensure sufficient statistical power. • Select models for estimating the potential safety, environmental and other benefits of the technologies tested. • Sign off on study design, methods and tools, questionnaires and associated procedures. 	<ul style="list-style-type: none"> • 2, 3 • 2, 3 • 2, 7, 6, 9, 12 	<p><i>Don’t assume that FOT drivers are the only ones who will drive the FOT vehicles.</i></p> <p>Don’t be pressured into changing the design of the study if, in doing so, it compromises the scientific integrity of the study.</p> <p>Ensure that all terms and phrases making up the research questions and hypotheses are clearly defined and unambiguous. This will facilitate interpretation of the FOT outcomes and comparisons with previous and future FOTS.</p> <p><i>When performing the sample size calculations, allow for participant attrition, e.g. if using fleet drivers, some may leave the company during the FOT period.</i></p> <p>Where hypotheses are not supported, consider conducting a process evaluation. This can help determine whether the system did not work, or whether any implementation issues may have impacted on the results.</p>	
<p>6. Identify and resolve FOT legal and ethical issues</p>	<ul style="list-style-type: none"> • Seek specialist advice to identify relevant legal and ethical issues • Resolve all legal and ethical issues that can be identified in advance • Create contracts and confidentiality agreements with all relevant parties (e.g. car leasing organisations, suppliers, consultants, fleet managers, researchers etc) for all relevant issues (e.g. data collection, provision and usage, theft, insurance, privacy, duty of care, property, disposal of vehicles after 	<ul style="list-style-type: none"> • 2, 8, 9 • 2, 7, 8, 9 • 2, 7, 8, 9 	<p><i>There must be mutual agreement on the relative risks to all parties before contracts are signed.</i></p> <p><i>Double check that the final design and conduct of the FOT accords with ethical and legal requirements in all jurisdictions in which the FOT will physically occur.</i></p> <p>Ensure that all intellectual property issues are identified and resolved “up front”.</p> <p>Ensure permission to drive (and necessary insurance cover) restrictions are understood by all parties, particularly participants.</p> <p>Identify the conditions under which a participant will be expelled from the study, and ensure these are made known to participants before the FOT commences.</p>	<p>See Deliverable D6.3, Annex A, and Chapter 3 of the FESTA Handbook, for detailed advice on legal and ethical issues.</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<p>the study, etc)</p> <ul style="list-style-type: none"> • Seek ethics approval to conduct study (where required) from relevant ethics committee • Seek expert advice regarding liability issues and to ensure insurance provision is adequate for all foreseeable eventualities • Ensure that vehicle’s licensing requirements are adhered to in spite of the modifications (implementation of data logging equipment and possibly systems to be evaluated, etc.) • Obtain informed consent of participants before they are allowed to participate in the FOT • Sign off on all aspects of the FOT design and procedures pertaining to legal and ethical matters. 	<ul style="list-style-type: none"> • 2, 3, 4, 9 • 2, 8, 9 • 2, 7,8, 9 • 2, 3, 9 • 2, 7, 8, 9, 12 	<p>Ensure that all participating drivers are fully licensed to drive the test vehicles.</p> <p><i>Don’t forget about the need to adhere to contractual obligations and confidentiality agreements. FOTs often extend over long periods, making it easy to lose sight of obligations and agreements.</i></p> <p>Clarify participant responsibilities and the study’s obligations to the participants. Participant responsibilities should include routine vehicle maintenance activities e.g. checking fluid levels.</p> <p><i>Ensure all relevant health and safety requirements of participants and the study team are met.</i></p> <p>Clarify data use with participants in order to allow for anonymised data to be passed to 3rd parties. (NB with GPS and video data it may be very difficult to guarantee anonymity). All project staff must understand who has access to project data, especially video data.</p> <p><i>All study team members must understand the agreed response should a major event, such as an accident, occur. Media comment should only be made by the appointed spokesperson.</i></p> <p>Don’t underestimate the complexity and the time commitment involved in identifying and resolving the legal and ethical issues associated with the conduct of a FOT.</p> <p><i>Ensure that all methods, tools, procedures and materials used in the study that require legal and ethics approval are approved by the ethics committee at appropriate points in the study.</i></p>	

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
<p>7. Select and obtain FOT Vehicles</p>	<ul style="list-style-type: none"> • Specify functional requirements, performance specifications and user requirements for the test vehicles needed for the study. • Specify functional requirements and performance specifications for the <i>integration</i> into vehicles of all technologies needed for the FOT (FOT technologies, support technologies and data collection technologies), if these are not already in the vehicles. • Select test vehicles (makes and models) that meet above requirements. • Purchase, lease, hire or borrow (where the driver owns the vehicle) the test vehicles. • Sign off on selection and obtaining of test vehicles. 	<ul style="list-style-type: none"> • 2, 3, 4 • 2, 3, 4 • 2, 4 • 2, 8 • 2, 4, 7, 12 	<p>The choice of vehicles may well impinge on the selection of participants which, in itself, will impact on the research questions. Choice of vehicles must be undertaken at an early stage in the project’s planning.</p> <p>Be aware of the large costs associated with leasing vehicles that are used in FOTs.</p> <p><i>Consider obtaining one or two extra vehicles. These can be used as spare vehicles in case of vehicle/system failure and as “showcasing” vehicles. The latter can be driven at appropriate times by politicians and other high ranking officials in positions of authority to promote and deploy the systems on a wider scale.</i></p> <p>Be aware that vehicle choice may affect participant response if the test vehicle is significantly better/worse than the vehicle they are used to driving. Choose a conservative model.</p> <p><i>Do consider vehicle maintenance requirements and the dealer network that is available in the FOT area. If the FOT will take place in a limited area, consider advising the local dealer(s) of the study. This may be important if a participant takes a test car to a dealer to fix a problem.</i></p>	<p>See also Chapter 7 of the FESTA Handbook for information relevant to this Activity.</p> <p>The test vehicle will vary, depending on the nature of the FOT. In some FOTs, the test vehicles will already contain mature OEM systems. In others, the systems will need to be developed (fully or partly) and integrated into the vehicles. In some FOTs, the systems will be integrated into drivers’ own vehicles; in others, they will be integrated into company fleet vehicles.</p> <p>The vehicles must be capable of hosting the technologies to be evaluated (OEM, aftermarket and nomadic) and the data logging and support systems.</p> <p>In some FOTs, where pre-production systems are being tested, one or two additional vehicles have been obtained, which serve as pilot platforms for ironing out bugs prior to deployment of the test vehicles.</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
<p>8. Select and obtain systems and functions to be evaluated during FOT (if they are not already implemented in the vehicles)</p>	<ul style="list-style-type: none"> • Develop selection criteria for choosing systems and functions (OEM, aftermarket and nomadic) to be tested (if the technologies to be tested have not already been selected by the sponsor; see General Advice column). • Use above selection criteria to select and obtain systems to be tested • If commercial systems do not exist, that meet the above criteria, develop functional requirements and performance specifications for systems that do, (including for HMI and security issues). • Develop functional requirements and performance specifications for the infrastructure needed to support the deployment of the technologies to be tested (e.g. digital maps, roadside beacons). • Source infrastructure that meets the above functional requirements and specifications. • Where infrastructure is not commercially available, develop supporting infrastructure that meets the above functional requirements and performance specifications. • If appropriate, issue Expressions of Interest/Requests for Tenders for provision of systems and supporting 	<ul style="list-style-type: none"> • 2, 3, 4, 6 • 2, 3, 4 • 2, 3, 4 and (if appropriate) consultant • 2, 3, 4, 6, and (if appropriate) consultant • 2, 4 and (if appropriate) consultant • 2, 3, 4 and (if appropriate) consultant • 2, 7, 8, 9 	<p><i>Ensure that criteria for the selection of candidate technologies (where this is required) to be evaluated are developed in consultation with relevant stakeholders, to ensure the systems to be tested meet the needs of all relevant stakeholders and are suitable for in-car use (this includes good interface design).</i></p> <p>Selection of technologies must be undertaken with consideration of the data-logging system. If not, problems of interfacing may result.</p> <p>Beware of hidden costs of hardware and software development if these technologies are not originally designed for research purposes.</p> <p><i>Do not underestimate the amount of time it will take to obtain services if public service organisations are called on to provide infrastructure to support the FOT, especially for cooperative systems eg digital maps. It may take months or even years.</i></p>	<p>See also Chapter 7 of the FESTA Handbook for information relevant to this Activity.</p> <p>Criteria for selection of candidate technologies in the FOT (if they have not been pre-selected by the sponsor) could include: likely safety or environmental benefit, likely benefit in increasing commercial productivity and efficiency, availability, compatibility with host vehicles, technical performance, cost, reliability, maintainability, likely acceptability to drivers, usability, compliance with relevant human factors/ergonomic guidelines, compliance with local legal requirements, compliance with relevant standards, crashworthiness etc.</p> <p>If prototype systems are tested, then estimates of durability, reliability, maintenance costs etc of production systems will be difficult, and full Cost Benefit Analyses may not be possible.</p>

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	<p>infrastructure.</p> <ul style="list-style-type: none"> • If appropriate select preferred tenderers, negotiate contracts and award contracts. • Decide what will be done with the test vehicles, and the equipment in them, once the FOT has been completed. • Sign off on selection and obtaining of technologies to be evaluated during the FOT 	<ul style="list-style-type: none"> • 2, 7, 8 • 2, 3, 4, 5, 6, 9, 12 • 2, 4, 7, 12 		
<p>9. Select and obtain data collection and transfer systems for FOT vehicles</p>	<ul style="list-style-type: none"> • Specify data to be logged (measures and sampling rate) • Specify functional requirements and performance specifications for systems for collecting and transferring the data to be logged. • Source, purchase and/or develop systems for logging and transferring the data that meet the above functional requirements and performance specifications. • Sign off on selection and obtaining of data collection and transfer system for test vehicles. 	<ul style="list-style-type: none"> • 2, 3, 4 • 2, 3, 4 • 2, 4 and (if appropriate) sub-contractors. • 2, 7, 9, 12 	<p>Implement re-calibration procedures that will ensure accuracy of measurements/sensors over time and help prevent data drift issues.</p> <p>Plan for software upgrade and revision during the FOT and try to ensure that all software systems are updated together. Ideally, this should be possible remotely.</p> <p><i>In-vehicle data logging systems need to be unobtrusive, safe and secure — but they also need to be accessible to enable routine repairs.</i></p> <p><i>Provide a local location for vehicle support and a vehicle tracking capability.</i></p> <p>Minimise driver involvement in data download from test vehicles.</p> <p><i>Ensure boot-up time for test systems and data logging systems is sufficiently fast to prevent data loss at the beginning of each trip.</i></p> <p><i>Ensure that a common time stamp is used for all recorded data sources.</i></p>	<p>See also Chapters 7 and 8 of the FESTA Handbook for information relevant to this Activity.</p> <p>The technologies fitted to the test vehicles may also include supplementary technologies (such as sensor technologies; e.g. forward looking radars, GPS) that are needed to, for example, measure inter-vehicle following distances in order to determine whether speeds are free or constrained (e.g. see Regan et al, 2006, Volume 1).</p> <p>See Deliverable D6.3, Annexe A and Chapter 3 on legal issues of data privacy to be aware of, possible dangers,</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
			<p>Verify the definition of signals provided by 3rd parties (e.g. CAN message definitions by car manufacturers)</p> <p>Do not allow data collection to proceed automatically without active confirmation of data capture and validity. This may include the generation of warning messages (SMS?) when out of tolerance data is recorded.</p> <p>Recognise that some data is much more important than others and should be given a relatively higher priority.</p> <p><i>Do keep a stock of spares for critical items and anticipate that some components (e.g. PC cards) may become unobtainable during the study.</i></p> <p>Consider the opportunities for ad-hoc and post-hoc interrogation of raw data files to answer additional questions. This may not be possible if data collection is triggered.</p>	<p>and legal provisions.</p>
<p>10. Select and obtain support systems for FOT vehicles</p>	<ul style="list-style-type: none"> • Define the support systems needed (see General Advice Column) • Develop functional requirements and performance specifications for systems needed to support the study • Where appropriate, develop functional requirements and performance specifications for the HMI, to ensure that the HMI for support systems is safe and user-friendly • Source, purchase and/or develop support systems that meet above functional requirements and performance specifications 	<ul style="list-style-type: none"> • 2, 3, 4 and (if appropriate) consultant • 2, 3, 4 and (if appropriate) consultant • 2, 3, 4 and (if appropriate) consultant • 2, 4 and (if appropriate) sub-contractors. 	<p>Ensure that the data logging system is capable of logging whether the test vehicle is driving forward and in reverse.</p> <p>If possible, support systems should be capable of remote operation to allow, for example, remote system re-boot.</p> <p>In the case of very large naturalistic studies it may not be practicable to provide operator support systems. In these cases attempt to automate as much as possible.</p> <p>Anticipate data analysis requirements before specifying data to be logged (e.g. rates and resolution).</p> <p>Ensure that missing data are clearly indicated – e.g. if the data collection system malfunctions, missing data should NOT be indicated with a zero, where zero is a valid measure (e.g. speed).</p> <p>If in doubt about the final list of measures to be logged, log more parameters if performance of the data logging</p>	<p>See also Chapter 7 of the FESTA Handbook for information relevant to this Activity.</p> <p>Support systems have multiple purposes: e.g. to display information to drivers; to automatically turn systems on and off where multiple systems are being tested and exposure to each is kept constant across drivers; for manually disabling systems in the event of malfunctions (i.e. “panic buttons”); for preventing use of systems by non-participants; for</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<ul style="list-style-type: none"> Sign off on selection and obtaining of support systems for test vehicles. 	<ul style="list-style-type: none"> 2, 7, 12 	<p>system or storage capacity are not affected.</p>	<p>diagnosing system status and faults; etc.</p>
<p>11. Equip FOT vehicles with all technologies</p>	<ul style="list-style-type: none"> Prepare a system installation/integration specification. Equip test vehicles with the FOT technologies to be evaluated (if not already in vehicles) Equip test vehicles with data collection and transfer systems Equip vehicles with FOT support systems (e.g. panic button, for turning systems on and off etc) Sign off on system integration activities, ensuring that all systems have been installed in accordance with the system installation/integration specification. 	<ul style="list-style-type: none"> 2, 4 and (if appropriate) sub-contractors. 2, 4 and (if appropriate) sub-contractors. 2, 4 and (if appropriate) sub-contractors. 2, 4 and (if appropriate) sub-contractors. 2, 7, 12 	<p>Ensure that the in-car computer driving all systems (FOT, data collection and support) has sufficient computing power to avoid processing delays.</p> <p><i>Ensure that all systems (FOT, data collection and support) operate identically across test vehicles.</i></p> <p><i>Allow all new vehicles a “burn-in” period (around 1000km) so that vehicle faults, that could disrupt the FOT, can be detected.</i></p> <p>Be aware that ‘identical’ vehicles, fresh off the production line, may perform differently due to variation in components and manufacturing variability. Check for differences that may be critical for the FOT.</p> <p>Try and make all adaptations to test vehicles (e.g. fitment of novel display systems) invisible to reduce the likelihood of theft or behaviour modification by other drivers.</p> <p><i>Create protocols that standardise the procedure for installing all in-vehicle equipment.</i></p>	<p>See also Chapter 7 of the FESTA Handbook for information relevant to this Activity.</p>
<p>12. Design and implement driver feedback and reporting systems</p>	<ul style="list-style-type: none"> Design, develop and implement systems and procedures to allow drivers to report technical problems in a timely manner. Design, develop and implement systems and procedures to 	<ul style="list-style-type: none"> 2, 3, 4 2, 3, 4 	<p>Possibly implement ‘driver diaries’ to allow confirmation of driver identity and trip details (if this process cannot be automated using a smart card, i-button or other technology). This may, however, encourage the drivers to behave less naturally.</p> <p>Implement a timetable for the timely collection of qualitative data so that participants don’t have to rely on</p>	<p>See also Chapters 6 and 7 of the FESTA Handbook for information relevant to this Activity.</p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<p>allow drivers to provide feedback to researchers, in real time or retrospectively (e.g. usability problems, opinions of systems, confirmation that systems are operating as required etc)</p> <ul style="list-style-type: none"> • Design, develop and implement systems and procedures that allow researchers to monitor participant progress (e.g. to ensure they are adhering to study requirements). • Sign off on implementation of driver feedback and reporting systems and procedures 	<ul style="list-style-type: none"> • 2, 3, 4 • 2, 3, 4, 7, 12 	<p>their memories.</p> <p><i>Anticipate that drivers may not complete diaries accurately or consistently and may fail to attend for debriefing interviews. Appoint driver liaison staff as a single point of contact.</i></p> <p><i>Ensure that the project team can respond to emergencies and incidents on a 24/7 basis.</i></p> <p>Ask participants to announce when they are going on holiday or not driving for an extended period.</p> <p>Keep a record of all reported problems, and document these in relevant reports.</p> <p>Ensure that all feedback and reporting procedures are documented in a manual for quick reference by the research and technical support team as required.</p> <p>Consider whether you need to design, develop and implement a system to allow for the collection of fuel consumption information.</p> <p>Where fuel consumption is calculated manually, anticipate that drivers will not always use fuel cards, return fuel docketts or fill in the fuel logbook.</p>	
<p>13. Select, obtain and implement standard relational database for storing FOT data</p>	<ul style="list-style-type: none"> • Design, develop and implement a database for storing data logged from the test vehicles • Design, develop and implement a database for storing the subjective data collected from participants (e.g. from questionnaires, from focus groups, from feedback lines etc) • Develop data navigation and visualization tools 	<ul style="list-style-type: none"> • 2, 3, 4 • 2, 3, 4 • 2, 3, 4 	<p>Before an FOT is launched, the database architecture should be reviewed by a system evaluator to ensure that all requirements are fulfilled.</p> <p><i>Ensure copies are made of raw data, reduced raw data and all processed data files and store these securely, separate from the primary data store.</i></p> <p>Use an industry standard relational database to store the data.</p> <p><i>Ensure that unauthorised access to the database is not possible. Preferably, do not give the database host an IP number.</i></p>	<p>See Chapter 8 of the FESTA handbook for more detailed advice relating to this activity.</p> <p>Basic legal advice on this issue is also provided in FESTA handbook Chapter 3, and Deliverable D6.3, Annexe A.</p>

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	<ul style="list-style-type: none"> • Sign off on database for storing FOT data. 	<ul style="list-style-type: none"> • 2, 3, 4, 7, 9, 12 	<p>Careful database design can reduce the need for post-collection manipulation if the database is designed to feed directly into a statistical package for data cleaning and analysis.</p> <p><i>Decide early in the project how to manage post-project data. Issues to consider are: What happens to data when the project ends? Who will have data usage rights? Who can access it? Who pays for possible storage? In projects with large amounts of stored data (several terabytes), the cost to store and manage data is not insignificant, and all project partners might not have the means to handle it afterwards. Where data is taken off-line, determine what meta data should be kept, and how.</i></p>	
<p>14. Test all technologies against functional requirements and performance specifications</p>	<ul style="list-style-type: none"> • Develop “acceptance testing” protocols (see comment column). • Test the technologies for acceptance, using the acceptance testing protocol. • Develop a usability test plan for the purpose of assessing the systems for usability. • Conduct usability testing, using the usability testing plan, to ensure systems are user-friendly and that the systems meet all usability assessment criteria. • Obtain or develop a valid and reliable ergonomic checklist. 	<ul style="list-style-type: none"> • 2, 3, 4 • 2, 3, 4 • 2, 3 with consultant (if appropriate) • 2, 3, with consultant (if appropriate) • 2, 3 	<p><i>Do not sign off on the outputs of any of the previous activities until all technologies have been tested and, where appropriate, refined.</i></p> <p>Be sure that all systems are designed so they do not drain the battery when the engine is not running.</p> <p><i>Be sure that retrofitted systems are properly secured and meet all relevant crashworthiness requirements.</i></p> <p>If sub-contractors are appointed to install or maintain test equipment, implement a quality assurance programme.</p> <p><i>Be aware that system clocks can drift significantly if left to run independently – although, GPS time can be used to correct system clock error.</i></p> <p><i>Implement procedures to ensure that alignment and calibration of sensors is maintained and tested in all potential weather conditions.</i></p> <p>Various guidelines, standards and checklists exist for</p>	<p>This activity is <i>not</i> about pilot testing — it is about testing the performance, security and reliability of systems – to ensure that all technologies to be deployed perform in accordance with the functional requirements and performance specifications developed for them in previous activities.</p> <p>An Acceptance testing Protocol is a test protocol for testing that all systems to be used in the study (FOT systems, data collection systems and support systems) meet the functional</p>

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	<ul style="list-style-type: none"> • Assess systems, using the ergonomic checklist, to ensure that they meet all relevant criteria. • Assess vehicles against relevant certification procedures to ensure that vehicles are safe, roadworthy and comply with all relevant National, State and Territory laws, treaties and other protocols. • Ensure that all vehicle modifications that affect primary safety are signed off by a competent engineer or appropriate testing authority. • Rectify all technical, usability, ergonomic and certification issues where deficiencies are noted. • Sign off on completion of all systems tests. 	<ul style="list-style-type: none"> • 2, 3 • 2, 4 with consultant (if appropriate) • 2, 4 with consultant (if appropriate) • 2, 3, 4 with consultant (if appropriate) • 2, 3, 4, 7, 12 	<p>assessing the ergonomic quality of the human-machine interface for ICT systems (see Chapter 25 of Regan, Lee and Young, 2008, for a summary). Also see: AIDE (EU-Project) Deliverable 4.3.1: “Report on the review of available guidelines and standards” – publicly available over the internet.</p> <p><i>Be aware that some system components may become corrupted over time with continuous use (e.g. flash memory cards).</i></p> <p>Create an installation manual for all vehicle modification procedures.</p> <p>Consider the need to obtain waivers/special licences from regulatory authorities for equipment that is non-compliant (e.g. radars that operate outside legal bandwidths).</p> <p>Standard testing of vehicle modifications by a competent authority may be necessary with respect to safety features (e.g. proper deployment of airbags following modification to vehicle interiors).</p> <p><i>Be aware that some systems (e.g. displays) that are not OEM-installed may fail in automotive environments.</i></p> <p><i>Where appropriate, test for radio frequency (RF) interference effects (e.g. from overhead tram wires), which may adversely affect system operation. Also ensure that normal vehicle systems (e.g. FM radio and remote locking) are not affected by installed equipment.</i></p> <p>Ensure that the in-car computer powering the data collection system and support systems is powerful enough to ensure that the data sampling rate is consistent and at the rate specified.</p> <p>Don’t assume that OEM systems that are already installed in test vehicles have been ergonomically</p>	<p>requirements and performance specifications developed for them by the FOT project team, under all foreseeable operating conditions.</p> <p>The term “usability” can mean different things to different people. The test plan should use a standard definition of usability (e.g. ISO 9241).</p> <p>Be aware that the frequency used by some radar-based systems may interfere with the operation of other systems used by Police, emergency services or other operators (or vice versa) when used in other countries or jurisdictions. This must be investigated where the FOT is conducted across State and international boundaries.</p>

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			<p>assessed against appropriate standards and guidelines. Ergonomic assessment of systems prior to system deployment can be useful in identifying ergonomic problems that may explain or confound treatment effects.</p> <p>Provide a written statement for the participants to keep (in the vehicle) which confirms their participation in the FOT and the nature of vehicle modifications – in case they are challenged by Police or other authorities.</p> <p><i>Resolving any technical, usability, ergonomic, and certification issues may require several iterations. Do not underestimate the time required for this process.</i></p>	
<p>15. Develop FOT recruitment strategy and materials</p>	<ul style="list-style-type: none"> • Develop recruitment strategy, including driver entry and exit requirements and procedures. • Develop recruitment materials and procedures • Sign off on recruitment strategy, materials and procedures. 	<ul style="list-style-type: none"> • 2, 3, 9 • 2, 3, 11 • 2, 3, 7 	<p>Where possible, ensure drivers are representative of the relevant driving population to ensure results can be generalised.</p> <p>Assume that there will be an attrition rate of about 10 to 15 % when using company drivers, who come and go, and retire.</p> <p>Be aware that, when company drivers change jobs within their companies, this may have a dramatic effect on their annual mileage rates.</p> <p>If fleet drivers are recruited via a fleet owner or manager it is also necessary to get buy-in from individual drivers.</p> <p><i>Assume that it is much harder to recruit women than men when using company drivers.</i></p> <p>With respect to safety, select drivers who do not pose a risk to themselves, others or the project, but without biasing the participant sample.</p> <p><i>It is harder to recruit company drivers than lay people.</i></p> <p>Do not underestimate the complexities involved in recruiting company drivers (see Regan et al., 2006, Vols</p>	<p>See Chapter 6 of the FESTA Handbook for further advice relevant to this Activity.</p> <p><i>The Ethical requirements for recruitment of drivers may be difficult to adhere to when recruiting company drivers. In any case: ensure voluntary participation.</i></p> <p>Ideal companies to approach to recruit fleet vehicle drivers have the following characteristics: many vehicles; drivers have high mileage rates; drivers drive primarily in the geographical areas of interest in the FOT; and management has a commitment to the aims and objectives of the FOT.</p>

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			<p>1 and 2). Be aware that some commercial operations may have driver turn-over rates approaching 100 % per annum.</p>	<p>It may not be possible in some countries (e.g. Germany), to obtain personal information about drivers that can be used to screen them for inclusion in the study (e.g. has a drunk driving record). It may not be possible in some countries to obtain directly from car dealers the names of drivers of particular makes and models of vehicles. In some countries (e.g. France), potential participants must be screened by a registered doctor. <i>The recruitment materials and procedures will need to have been incorporated and approved as part of the FOT ethics and legal approval processes.</i></p>
<p>16. Develop FOT driver training and briefing materials</p>	<ul style="list-style-type: none"> • Conduct training needs analysis (TNA) to identify training requirements (if appropriate) • Design and develop driver briefing and training materials, based on outputs of the TNA. • Design and develop briefing materials for participating car/truck fleet managers (if 	<ul style="list-style-type: none"> • 2, 3 with consultant (if appropriate) • 2, 3 with consultant (if appropriate) • 2, 3, 9 	<p><i>Ensure that training programs and briefing materials are designed in a way that does not confound experimental treatment effects.</i></p> <p>Ensure all drivers understand existing in-vehicle systems as well as test systems, especially if use of them is required as part of a baseline comparison.</p> <p>Don’t underestimate the time required for the development of briefing and training materials — it is a time consuming activity.</p> <p>Anticipate that some car manufacturers will not wish the</p>	<p>See Chapters 3 and 6 of the FESTA handbook for further advice relevant to this Activity</p> <p>See Regan et al, 2006 (Volume 2) for examples of training and briefing materials used in a previous FOT.</p> <p><i>Refresher training may be required if FOT systems are not activated for several</i></p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<p>appropriate)</p> <ul style="list-style-type: none"> • Design and develop FOT system(s) user manual (if appropriate) • Design and document the procedures for the delivery of the briefing and training to the FOT participants • Sign off on driver training and driver (and company) briefing materials and delivery processes. 	<ul style="list-style-type: none"> • 2, 3, 9 • 2, 3 • 2, 3, 7 	<p>participating drivers to receive any training about implemented systems. In such cases, “structured familiarisation” may be more acceptable.</p> <p>Provide drivers with a mini-operating manual to keep in the vehicle and prepare written materials (brochures, DVDs & CDs) that can be taken away after briefing sessions as memory joggers for important information.</p>	<p><i>weeks or months into the FOT.</i></p> <p>The training and briefing materials and procedures will need to have been incorporated and approved as part of the FOT ethics and legal approval processes.</p>
<p>17. Pilot test FOT equipment, methods and procedures</p>	<ul style="list-style-type: none"> • Develop protocol for pilot testing FOT equipment, methods, procedures and materials (including training, briefing materials and data collection, downloading and analysis procedures) • Recruit, brief and train pilot participants • Deploy a small sample of FOT vehicles under a representative range of driving conditions that will be experienced in the FOT, as per the pilot testing protocol. • Fine tune FOT vehicles and technologies, systems, procedures and protocols, as required, on the basis of the 	<ul style="list-style-type: none"> • 2, 3, 4, 9 • 2, 3 • 2, 3, 4 • 2, 3, 4, 7 	<p><i>Do not truncate your pilot test plan, and do not underestimate the time required for comprehensive pilot testing. The importance of pilot testing cannot be overstated.</i></p> <p>Undertake a ‘full dress rehearsal’ of the FOT on a scale that is smaller than the FOT but big enough to properly test all systems, procedures, and equipment.</p> <p>Use pilot testing also as a means of estimating the amount of time required to complete activities, as this will enable more accurate budgeting during the remainder of the project.</p> <p>Pre-test all data analysis procedures to ensure appropriate data is collected – particularly data related to event recording triggers.</p> <p>Ensure that the routes used in pilot studies maximise the likelihood of critical situations of relevance to the FOT.</p> <p>Add independent monitoring systems to pilot vehicles to ensure the validity of data derived from sensors.</p>	<p>See also Chapters 6, 8 and 9 of the FESTA handbook for further advice relevant to this Activity.</p> <p>For data collection systems, ensure that data is being recorded, determine the accuracy of data recorded, test downloading procedures and equipment, test reader software and analyse samples of pilot data.</p>

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	<ul style="list-style-type: none"> • pilot data yielded. • Sign off on pilot testing. 	<ul style="list-style-type: none"> • 2, 3, 4, 7 	<p><i>In the pilot phase listen to the drivers as well as the owners of the vehicle fleet – their ideas are likely to be different.</i></p>	
<p>18. Run the FOT</p>	<ul style="list-style-type: none"> • Ensure that all sign offs have occurred for previous activities. • Manage the FOT: <ul style="list-style-type: none"> • monitor project activities, timelines, budgets and resources • prepare regular progress and financial reports for sponsor • convene and attend regular meetings with research and support teams • maintain communication with sponsor and key stakeholders • Recruit participants • Organise training session times/materials • Brief and train participants • Brief fleet managers (if appropriate) • Deploy FOT vehicles • Regularly monitor participant progress, including kilometres travelled • Administer questionnaires and 	<ul style="list-style-type: none"> • 2, 7 • 2, 3, 4, 5, 7 • 2, 3 • 2, 3 • 2, 3 • 2, 3 • 2, 3, 4 • 2, 3 • 2, 3 	<p>Anticipate, and plan for, driver ‘dropout’ throughout the FOT — over-sample. It is rarely possible to replace drivers who drop out after more than a few days without affecting the timing plan.</p> <p><i>Develop protocols for responding to drivers with technical and other problems (e.g. provide drivers with a dedicated cell phone to report problems; ensure at least two people have pagers to receive problem calls; etc) Timely responses will keep drivers happy.</i></p> <p>Anticipate problems that may increase the drop out rate (e.g. higher fuel consumption in the FOT vehicle than in the drivers’ own vehicle) and take steps to prevent or mitigate these problems.</p> <p>Monitor closely system usage for drivers who you suspect may be tempted to ‘demonstrate’ novel systems to friends and neighbours.</p> <p>Adhere to quality control mechanisms to ensure that data is being properly recorded and downloaded.</p> <p>Adhere to calibration procedures to ensure accuracy of measurements/sensors over time and help prevent data drift issues.</p> <p>Find a suitable location for training drivers where you can also assess transfer of training to the test vehicles in a safe environment</p> <p><i>If the number of kilometres driven by drivers is being controlled for, conduct regular calibration checks of cumulative distance travelled.</i></p> <p>Assume that it will take you 50 % longer than you think</p>	<p>More detailed advice relevant to this Activity can be found in other chapters of the FESTA Handbook: Chapter 6 for participant recruitment; Chapters 3 and 6 for organising training sessions; Chapters 6 and 7 for implementing data collection methods at pre-determined intervals and for collecting and storing subjective data; Chapter 9 for preliminary data analysis; Chapters 3, 7 and 8 for vehicle maintenance and compliance with laws; and Chapters 3 and 6 for reporting of dangerous driving, where appropriate.</p> <p><i>Ongoing communication with key stakeholders is important during the FOT to ensure that the aims and objectives of the FOT are clear, that stakeholders stay committed to the project, and that the aims and objectives of the FOT are not misquoted, misrepresented or misunderstood.</i></p>

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	<p>implement other data collection methods at pre-determined intervals</p> <ul style="list-style-type: none"> • Collect, enter into database (unless automated) and store subjective data • Record, download and store objective (i.e., logged) data • Collect special data (e.g. fuel docket) needed to analyse surrogate performance indicators • Monitor for, collect and document data on technical problems and user feedback • Commence preliminary evaluation of data, to identify instances of dangerous driving and any other findings of interest/relevance to FOT outcomes • Repair and re-deploy vehicles (as required) • Routinely ensure vehicles and vehicle systems are properly maintained and legal in other ways (e.g. registered, licensed, tyres properly inflated) • Report dangerous driving behaviours (if legally required) 	<ul style="list-style-type: none"> • 2, 3 • 2, 3, 4 • 2, 3 • 2, 3, 4 • 2, 3, 4 • 2, 4 • 2, 3, 4 • 2, 3, 4 	<p>to recruit participants if recruiting company drivers. Check logged data as soon as you receive it to verify accuracy and completeness of data and verify kilometres travelled.</p> <p><i>Monitor and record critical factors that could have an impact on the measured outcomes/dependent variables (e.g. changes in Police enforcement strategies, unseasonal weather conditions). If these are not controlled for in the experimental design, or accounted for in the analyses, they could confound the measured effects of the systems being tested.</i></p> <p>Where company fleet vehicles are involved in the study, advise fleet managers not to “demonstrate” their vehicles, as this may compromise the aims of the study. <i>Give sponsors early warning of potential problems that could compromise the integrity of the study, or increase the budget.</i></p> <p>Encourage participants to report technical problems as soon as possible.</p> <p><i>Don’t assume that all systems in the test vehicles are functioning as required. Develop systems to check, at appropriate times, that they are operating properly.</i></p> <p>Don’t assume that drivers will do what you ask them to do (e.g. to fill out questionnaires; maintain vehicles). They need regular reminding and follow-up.</p> <p>Where data downloading is manual, don’t forget to replace flash memory cards, or other storage devices, with new (empty) ones on a regular basis.</p> <p>Do not always assume that drivers will clock up their kilometres evenly over the trial. Contact them on a regular basis to check cumulative distance logged.</p>	

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	<ul style="list-style-type: none"> • Conduct exit interviews with drivers and fleet managers • Remove systems and equipment from private vehicles (if used) • Sign off on completion of this activity of the FOT. 	<ul style="list-style-type: none"> • 2, 3 • 2, 4 • 2, 3, 4, 5, 6, 7, 8, 10 	<p>If legally required, don’t forget to report to the appropriate authorities (e.g. company fleet managers) recorded instances of dangerous driving by test drivers.</p> <p><i>Don’t assume that drivers will drive the vehicles without trailers, bike racks and other accessories. These may affect the operation of some FOT systems (e.g. reverse collision warning devices).</i></p> <p>Minimise interference to commercial operations during FOTS, especially trucking operations. Problems that compromise commercial productivity may result in companies withdrawing vehicles from the FOT.</p> <p><i>Make sure fleet managers are, and remain, motivated. Their support is critical.</i></p> <p>Be careful about the feedback given to drivers. They may be concerned about the possibilities of ‘unintended consequences’ e.g. their managers learning how and when they take rest breaks etc.</p> <p>Participants are more likely to comply with what is asked of them if they engage with the project. Ongoing communication and even small incentives can enhance perceived engagement and improve compliance. However, the level of engagement must not compromise the outcomes of the study.</p> <p>Remember that long-term involvement in a research study can be onerous for a participant. At all times treat them as participants in the study process, not simply subjects of a study.</p> <p><i>Allow sufficient time for any data entry which has to be done manually (e.g. responses from pencil and paper questionnaires, focus groups). As far as is possible, manual data entry should be carried out routinely during the course of the data collection phase and not all left to</i></p>	

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			<p><i>the end.</i></p> <p>A system for basic inventory management is recommended for FOTs with more than a few vehicles in use. For such a system to be efficient, sensors, data acquisition system units, vehicles and all other equipment need to be included, as well as relevant supporting procedures developed.</p>	
<p>19. Analyse FOT data</p>	<ul style="list-style-type: none"> • Develop a data analysis plan • Analyse objective (i.e., logged and recorded data) • Analyse subjective data (i.e., data obtained from interviews, questionnaires, focus groups, hotlines, etc) • Draw conclusions with respect to the hypotheses generated for the FOT • Sign off on completion of all required analyses 	<ul style="list-style-type: none"> • 2, 3, 4 • 2, 3 • 2, 3 • 2, 3 • 2, 3, 7, 12 	<p>Plan for the fact that there will be constant demand for study findings, such as general trends in the data, early in the project, even though the data may not be statistically reliable enough to report with any confidence.</p> <p>In a well-powered study, null findings (i.e., where no effect is found) are potentially as interesting as when the hypotheses are supported.</p> <p><i>Anticipate the requirement to have to perform supplementary analyses for the funding organisation, which may be expensive and not originally budgeted for. This will require negotiation with the sponsor if these analyses are expected to be carried out within the original budget.</i></p> <p>Anticipate that, unless distance travelled is controlled for in the FOT, the distance travelled by different drivers will vary significantly. Take this into account in the analysis to ensure results are not skewed.</p> <p>Don’t forget to run “reality checks” on the data, to be sure that the data are “clean”. This is essential.</p> <p><i>If data is reduced/aggregated, always keep a copy of un-aggregated data.</i></p> <p>Ensure that all data analysts have used the test vehicles</p>	<p>See Chapters 7, 8 and 9 of the FESTA Handbook for detailed advice on data analysis tools and methods.</p> <p>There may be a requirement to conduct ongoing analysis, such as ongoing identification of dangerous drivers, determining whether adaptation to systems is occurring early enough to warrant a shorter FOT duration (e.g. to save money and time), and to identify early trends in the data. These checks should be built into the analysis plan at the start of the project.</p> <p>Some FOTs have developed novel ways of turning ADAS technologies on and off to control precisely the amount of exposure to the technologies that are being</p>

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			<p>and understand the circumstances in which data was/is collected.</p> <p>All team members who handle participant data should receive appropriate training in relation to data privacy issues.</p> <p>Work out how to best filter logged data and deal with missing data.</p>	<p>evaluated (see Regan et al, 2006, Vols 1 and 2).</p> <p>Sponsors need to be calibrated about the relative costs of running FOTs. For example, the cost of running simulation models at the end of the FOT to estimate safety and other benefits of ICT technologies is a fraction of the cost of preparing and deploying the FOT vehicles.</p>
<p>20. Write minutes and reports</p>	<ul style="list-style-type: none"> • Write minutes of regular project management team meetings • Write regular minutes of Project Steering Committee meetings • Write quarterly progress reports for the sponsor(s) • Write the draft FOT report • Send the draft FOT report to relevant stakeholders and peers for peer-review • Convene 1 or 2 meetings to discuss feedback with sponsor/peers • Incorporate feedback and write final report. 	<ul style="list-style-type: none"> • 2 • 2 • 2 • 2, 3, 4 • 2 • 2 • 2, 3, 4 	<p><i>Use regular progress reports to document problems, solutions and lessons learnt.</i></p> <p>Allow sufficient time for sponsor review of draft and final reports, but not so long that the review process drags out unduly. Six to 8 weeks is recommended.</p> <p>Consider peer review of major outputs; this will improve their quality, but delay their release.</p> <p><i>Document all lessons learnt in the final FOT report.</i></p> <p>Ensure that the final report contains practical recommendations for wider scale deployment of those systems found to be effective, and for fine-tuning of those with potential to be more effective.</p> <p><i>Develop, in consultation with the Project Steering Committee, a suggested plan for implementing the recommendations deriving from the FOT. Document the suggested implementation plan in the FOT final report.</i></p>	<p><i>The FOT lifecycle is long. Hence, it is advisable to write separate reports on each critical stage of the FOT, particularly the lessons learned, to ensure that nothing important that should be documented is forgotten.</i></p> <p>Formal meeting minutes are a critical resource for the project in confirming departures from the project plan.</p>

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	<ul style="list-style-type: none"> Deliver final report to sponsor(s) Sign off on completion of all required reports 	<ul style="list-style-type: none"> 2 2, 3, 4, 7, 12 		
<p>21. Disseminate the FOT findings</p>	<ul style="list-style-type: none"> Send regular project reports to the sponsor Disseminate preliminary and final findings at seminars, conferences and special events Prepare reports on preliminary findings for the sponsor Send sponsor draft and final FOT reports Provide other stakeholders with access to FOT final report (s) and, if allowed, raw or filtered data from the FOT Showcase the vehicles at relevant events during the FOT (e.g. Smart Demos, motor shows) to promote awareness and wider deployment of systems. Sign off on completion of all dissemination activities 	<ul style="list-style-type: none"> 2 2, 3, 4 2, 3, 4 2 2, 3, 4 2, 4, 6, 7, 12 2, 3, 7, 12 	<p>Disseminate the findings in accordance with the previously agreed communications plan, and other contractual obligations (e.g. as specified in EC-funded projects).</p> <p><i>Agree on what can and cannot be disseminated and said at different points in the study.</i></p> <p>Seek necessary permissions prior to divulging FOT findings to any third party.</p> <p>FOT reports are large and expensive to print. Allocate sufficient budget at the beginning of the project for printing, if required.</p> <p>FOT reports are large and hard to read. It is desirable to produce conference papers along the way that document the outputs of the study at different phases. Prepare a concise 1 or 2 page synopsis of the study outcomes that can be read and easily digested by politicians, chief executives and relevant others in positions of authority.</p> <p>Agree in advance who is empowered to release and comment on results.</p>	<p>Where private industry is a participant in the FOT, it may be necessary to seek permission from the manufacturer before divulging certain information deriving from the FOT. This must be established.</p> <p>Maintain at least one vehicle for demonstrations; preferably at a location that is convenient to politicians, officials and the press.</p> <p>A demonstration and briefing to an influential politician is likely to be far more effective than sending them a report.</p>
<p>22. Decommission the FOT</p>	<ul style="list-style-type: none"> Conduct de-briefing interviews with participants to elicit feedback on the FOT that can be used to improve future FOTs. 	<ul style="list-style-type: none"> 2, 3 	<p>Ensure that participants return relevant items at the end of the study (e.g. flash memory cards, i-buttons) and perform other required activities to decommission the FOT vehicles (e.g. disconnect power to support systems).</p> <p><i>Keep one vehicle until all data analyses are complete.</i></p>	<p><i>Consider keeping one or two vehicles as showcasing vehicles after the study, to allow stakeholders in positions of authority to</i></p>

Activities	Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Critical Considerations (the “dos” and “don’ts”)	General Advice
	<ul style="list-style-type: none"> • Dispose of test vehicles which are no longer needed (if vehicles are not privately owned). • Retrieve installed data logging equipment (if vehicles are privately owned) • Sign off on completion of all FOT activities 	<ul style="list-style-type: none"> • 2, 3, 4, 5, 7, 8, 12 • 2, 4, 5, 8 • 2, 3, 4, 5, 7, 8, 9 	<p>Consider providing public access to FOT databases, where ethically allowed, that enables others to use the data for other research purposes after the FOT has been de-commissioned (but remember to fully explore and address anonymity issues). The data collected and stored after the FOT is de-commissioned should be regarded as “living data”.</p> <p><i>Don’t lose momentum at the end of the FOT. Lobby stakeholders to ensure that there is commitment to implementing the recommendations of the FOT.</i></p>	<p><i>experience the look and feel of the vehicles.</i></p> <p>It may be necessary to consider legal issues when decommissioning the FOT as far as the de-installation of data logging equipment is concerned (in a contract with participants). See Deliverable 6.3 and Annexe A on legal issues.</p>