Collaborative Automotive R&D

2009 – 2010

EUCAR

EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

The European Council for Automotive Research and Development (EUCAR) consists of the twelve major European automobile manufacturers and pursues the main objective of strengthening the competitiveness of the European Automobile industry through strategic collaborative R&D. Following this, the primary task of EUCAR is the identification and definition of future automotive research needs while serving as an important interface between the European Commission and the European automobile manufacturers.

EUCAR's initiated R&D projects are aimed to fulfill the future objectives of the European Commission and to research and develop highly attractive, safe, environmentally friendly and affordable vehicles and automotive solutions for market launch by 2020 and market penetration by 2030.

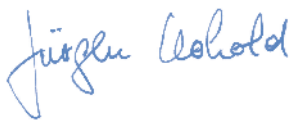
Currently, the European automobile industry is facing a wide range of challenges that require innovative solutions, e.g. research on alternative powertrains and fuels, ICT-based safety systems or innovative materials and manufacturing processes. We cannot forget the very demanding challenges posed by the present financial situation which requires the optimization of any internal and external processes regarding their efficiency, using all synergies and focusing on the technologies with the greatest potential for a successful future market introduction.

Nevertheless, the European automobile industry intends to pursue all evolving opportunities and to continue research activities in order to offer innovative solutions to its customers in the next few years. In the longer-term, this is indispensable for ensuring the competitiveness of the European automobile industry.

To be best prepared for the future, the EUCAR member companies bring a vast range of expert knowledge in the daily work of the various Working Groups that are researching the following four main R&D areas:

- Fuels and Powertrain
- Integrated Safety
- Materials, Processes and Manufacturing
- Mobility and Transport.

I acknowledge and thank all experts involved in the EUCAR Working Groups for their expertise and fruitful contributions to our R&D projects. Stepping forward in this way, the European automobile industry strives to be quite simply the most innovative in the world.



Prof. Dr. Jürgen Leohold

EUCAR Chairman 2009

Executive Director Group Research
Volkswagen AG

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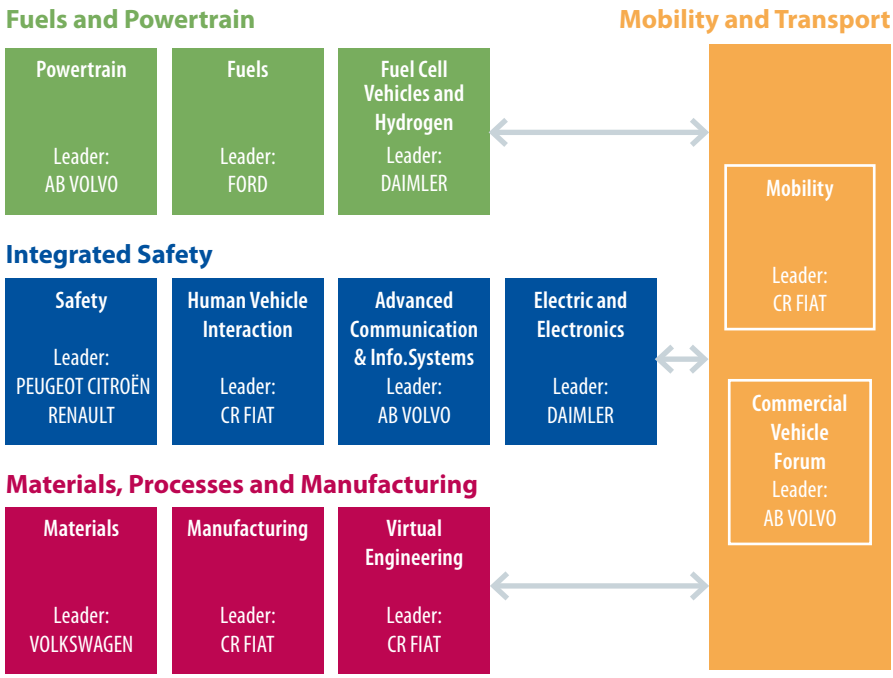
EUCAR
EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

Mission and Working Groups

"Strengthen the Competitiveness of the European Automotive Manufacturers through Strategic Collaborative R&D"

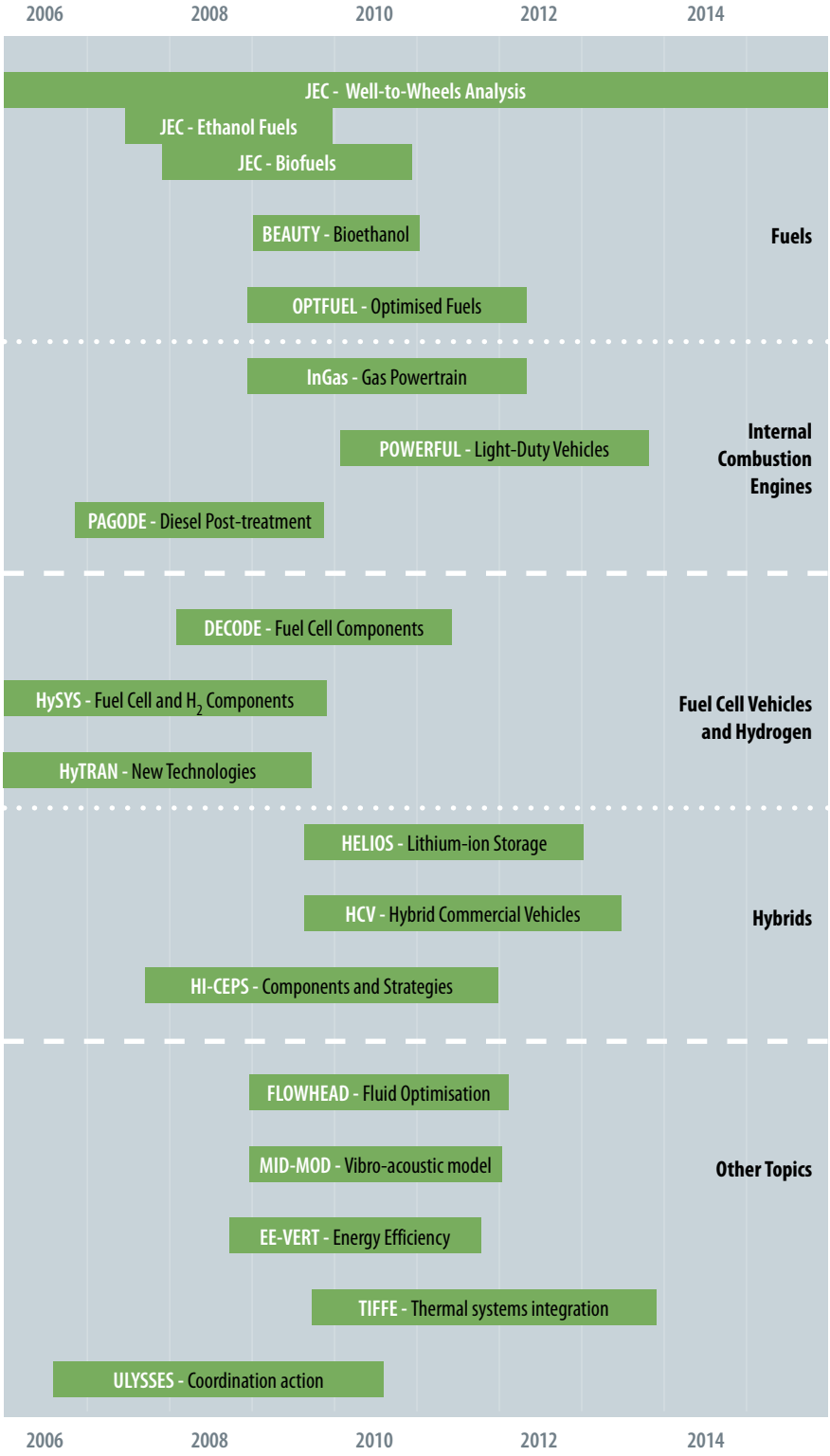
Our main activities are:

- Identifying, formulating and prioritising the common R&D needs.
- Interacting with the European Commission, national bodies and other key stakeholders in order to represent, promote and communicate these common R&D needs.
- Initiating, supporting and monitoring impact studies, R&D projects and programmes.



Fuels and Powertrain

Mapping of R&D projects



JEC WTW

Well-to-Wheels analysis of future automotive fuels and powertrains in the European context – an update

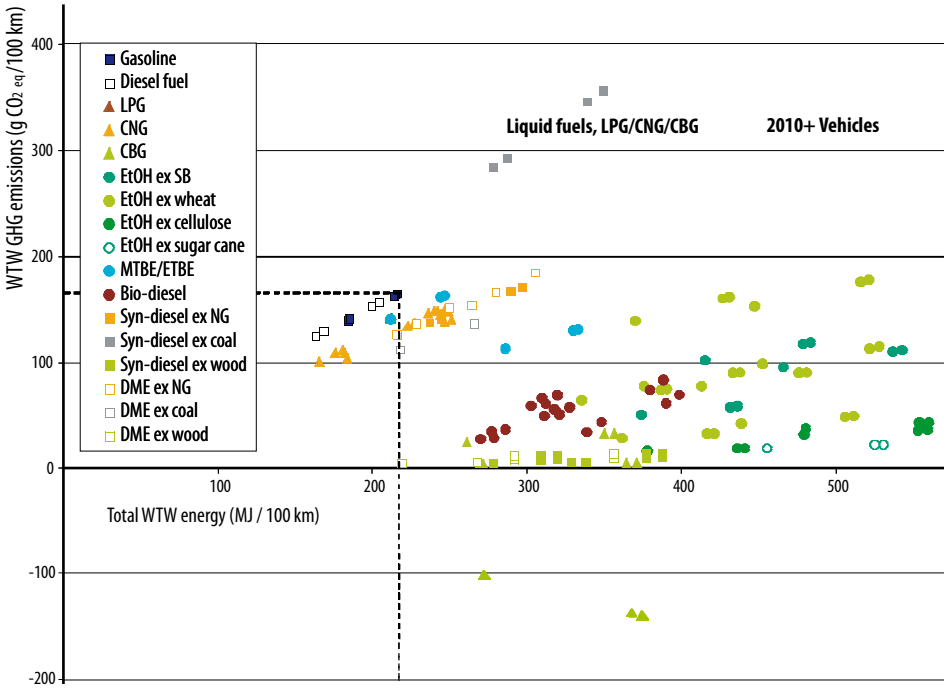
Objectives

EUCAR, CONCAWE and JRC (the Joint Research Centre of the EU Commission) have performed a joint evaluation of the well-to-wheels energy use and greenhouse gas (GHG) emissions for a wide range of potential future fuel and powertrain options. The objectives of the study were to:

- Establish, in a transparent and objective manner, a consensual Well-to-Wheels (WtW) total / fossil energy and GHG emissions assessment of a wide range of automotive fuels and powertrains relevant to Europe in 2010 and beyond.
- Consider the viability of each fuel pathway and estimate the associated macro-economic costs for energy/CO_2 abatement strategies.
- Have the outcome accepted as a reference by all relevant stakeholders.

Project Deliverables

The figure conveniently summarises the results for total energy use and GHG emissions of fuel/powertrain combinations for liquid fuels, LPG, CNG and Biogas (CBG)



Status / Achievements

2004 – 2006: Phase 2

- Up-date of the WtW-Report is available from: http://ies.jrc.cec.eu.int/WTW

2007 – 2008: Phase 3 revision

- Revision of fuels & vehicle data
- Several new fuel pathways

2009 - 2010: Phase 4 revision

Organisational Information

Budget	Self funded / Funding		
Duration	4th Phase: 2009-2010	Start	2001
Coordinator	Heinz Hass, FORD	Contact	hhass@ford.com
OEM Partners	All EUCAR members RENAULT – coordinates the TtW up-date		

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EUROPEAN COMMISSION DIRECTORATE-GENERAL Joint Research Centre

JEC Test Programme on Ethanol Fuels

Ethanol blends for Gasoline engines

Motivation and Objectives

Fuels containing Ethanol are substantially different from those fuels based on Hydro-carbons only, e.g.Octane, volatility, oxygen content, lower calorific value, heat of vaporisation, density, polarity, etc

The quantitative impact of ethanol on fuel consumption and emissions is an important assumption for e.g. WTW evaluations of ethanol-containing fuels. A literature review of recent engine and vehicle tests on E5-E20 fuels has not provide a definitive assessment of the ethanol impact.

Hence, EUCAR, CONCAWE and JRC have started to perform a joint evaluation of various ethanol blended gasoline fuels with the objective:

- Measure the impact of ethanol fuels on fuel consumption and exhaust emissions from modern vehicles

Project Plan, Milestones and Deliverables

Project Plan:

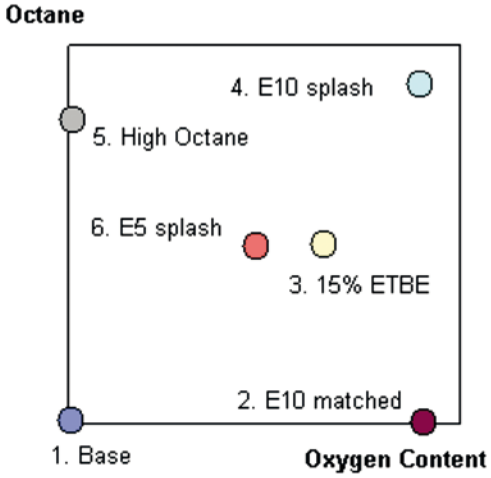
- CONCAWE to blend the fuel matrix and deliver the fuels to JRC
- EUCAR to support the project with modern vehicles
- JRC to perform all vehicle testing

Deliverables:

- Analysis and interpretation of emissions- and fuel consumption data

Technical Approach

- Formulate fuel matrix using DoE principles
- Blend fuels
- Develop testing methodology with regard to fuel consumption and emissions: NEDC, steady state, US cycle
- Test vehicles according to methodology



Achievements

- Fuel matrix has been blended, vehicle testing is finished
- Analysis of data is proceeding

Organisational Information

Budget	self-funded by partners		
Duration	30 months	Start	2007
DG		Priority Area	Renewable energies
Coordinator	Heinz Hass, FORD	Contact	hhass@ford.com
Partners	all EUCAR members, CONCAWE members & JRC		
Website	www.eucar.be / www.concawe.be		

JEC Biofuels Programme

Biofuels: the next decade in European Road Transport

Motivation and Objectives

The EU Renewable Energy Directive (RED, Dir 2009/28/EC) was published in early 2009. It sets a target of 10% renewable energy in transport by 2020. The target maybe achieved by several strategies, but in all of these biofuels are key. Implementation of this directive needs to acknowledge that

- The EU vehicle fleet may not be compatible with some biofuel blends options.
- Fuel manufacturers are required to blend biofuel components to levels needed.
- There is considerable debate around what are achievable and sustainable biofuel levels.

All stakeholders have an interest in generating relevant and scientifically sound data on these issues. Hence, EUCAR, CONCAWE and JRC have started to perform a joint evaluation with the objective:

- Clarify the opportunities and barriers to achieve 10% biofuels (energy basis) in road fuels by 2020
- Ensure that the introduction of biofuel blends to meet the 2020 target is seamless
- Ensure no detrimental impact on vehicle performance and emissions
- Avoid fragmented solutions across Europe

Project Plan, Milestones and Deliverables

Project Plan:
Small workings groups of JEC technical experts assigned to

- Develop a consensual supply picture of biofuel types and availability
- Model the EU LD & HD fleet development towards the 2020+ time

Deliverables:

- Better tools for evaluating future vehicle and fuel scenarios
- Potential for bio-components to impact fuel supply
- Fleet & Fuels scenarios to meet RED targets

Technical Approach

- Biofuel availability: literature review, JRC modelling
- EU Fleet & Fuel: construction of a modelling tool to evaluate scenarios towards 2020+

Status / Achievements

Programme Planning Workshop held February 2008

- Kick-off with technical experts from EC Directorates, Bio-industries and JRC/EUCAR/CONCAWE

1st Technical Workshop held November 2008

- Review status of transport fuel market, demand and supply picture for biofuel types and availability

2nd Technical Workshop held March 2009

- Fleet & Fuel model: model development started to project demand for 2010 – 2020+

3rd Technical Workshop held July 2009

- Modelling status, biofuel availability

Organisational Information

Budget	self-funded by partners		
Duration	36 months	Start	2008
DG		Priority Area	Renewable energies
Coordinator	Heinz Hass, FORD	Contact	hhass@ford.com
Partners	all EUCAR members, CONCAWE members & JRC		
Website	www.eucar.be / www.concawe.be		

BEAUTY

Bio-ethanol engine for advanced urban transport by light commercial & heavy-duty captive fleets

Motivation and Objectives

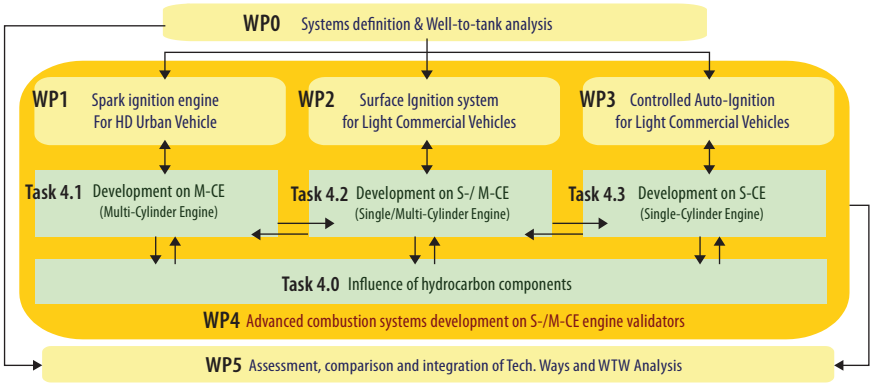
Motivation: to promote the use of Biofuels by the development of dedicated solutions (engines, combustion technologies and fuels) based on the use of bioethanol for local fleets in urban context.

Objective of the project is to define, in a crash programme of 2 years, engine solutions based on the three different technology ways able to meet ambitious targets in terms of:

- Future emission limits (Euro 6)
- Fuel conversion efficiency (at least 10% higher than a today SI engine running on eq. bioethanol blends);
- Cold startability down to -15°C of ambient temperature

The solutions will start from existing powertrains by adapting and optimising powertrains, systems (including aftertreatment), components and materials according to the given technology way

Project Plan, Milestones and Deliverables



Technical Approach

The development of engine technologies will cover a wide panel of combustion approaches:
1 - Stoichiometric S.I. engine for HD applications
2 - Surface ignition Diesel engine for LD applications
6 - Controlled Auto-Ignition (CAI) S.I. engine for LD applications
Due to specific combustion approaches, different fuel compositions have to be used not only in terms of gross bioethanol content, but also in terms of hydrocarbon composition, volatility, octane number, …
Experimental activities will be coupled to life cycle analysis that will consider the entire impact of both 1st and 2nd generation bioethanol chains. This analysis will provide a global comparative picture of the environmental performance of different chain options.

Status / Achievements

WP0: Development of a dedicated SW tool for Carbon footprint calculation.
WP1: S.I. engine system definition based on simulation tool
Study of the injection system and procurement of the specific parts
WP2: Adaptation of the engine cylinder head and optimization of glow plug characteristics and design for surface ignition approach
WP3: SW tool for CFD calculation and design of the cylinder head for the CAI single cylinder engine
Procurement and instrumentation of the multi-cylinder engine
Production, blending and lab characterization of the different fuel blends
WP4: Instrumentation and engine set up at the test bench for preliminary activities with reference fuel

Organisational Information

Budget	6.15 M€	Funding	2.97 M€
Duration	24 months	Start	January 2009
DG	Research	Priority Area	Sustainable Surface Transport Coordinator
Coordinator	Andrea Gerini, CR FIAT	Contact	andrea.gerini@fptpowertrain.crf.it
Partners	CR FIAT, DAIMLER, FEV, AVL, CNR-IM, RWTH, WUT, E4TECH, EXXON (US)		

OPTFUEL

Optimised fuels for sustainable transport in Europe

Objectives

OPTFUEL undertakes a first large scale demonstration of the Biomass to Liquid (BtL) production chain from biomass via gasification and fuel synthesis to the final fuel in the consumer car. All production chain components from biomass provision up to market introduction of final consumer fuels containing BtL will be optimized and demonstrated.

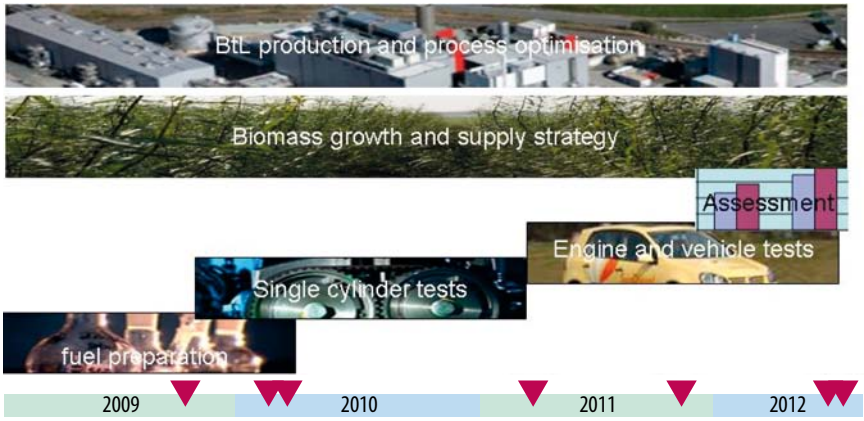
The motivation of the project is:

- demonstration of BtL-Fischer Tropsch fuels is urgent necessary, being the step before full commercialisation
- clarification whether BtL-splash blend or -designed blend has more benefits to the engine performance

The objectives of the project are:

- demonstrate the production of BtL in industrial size
- develop the basis for large scale production including biomass supply strategies
- develop proposal for BtL-blend specification
- supply up-to-date Well to Wheel data in terms of fuel costs and CO_2-emission.

Project Plan, Milestones and Deliverables



Technical Approach

- demonstration the feasibility of BtL by production in a 45 MW plant environment producing 15000 t BtL/a
- modelling the BtL process including a model validation and conduct dynamic calculations for a large scale BtL plant
- utilisation of BtL fuels as blend component for diesel and HCCI combustion
- derive most suitable fuel blend formulation to maximise emission benefits
- demonstrate the fuel benefits in show cars

Achievements

WP1: successful plantation and growing of first 100 ha of energy crops (willow, poplar)

Organisational Information

Budget	13.6 M€	Funding	7.8 M€
Duration	42 months	Start	January 2009
DG	TREN	Priority Area	Renewable energies
Coordinator	Eckart Heinl, VW	Contact	Eckart.Heinl@volkswagen.de
OEM Partners	10 partners among them FORD, RENAULT, CONCAWE, CHOREN		
Website	www.optfuel.eu		

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SEVENTH FRAMEWORK PROGRAMME

INGAS

Integrated Gas Powertrain –Low emissions, CO_2 optimised and efficient CNG engines for passenger cars (PC) and light duty vehicles (LDV)

Motivation and objectives

Natural gas (NG) vehicles were introduced on the market more than 10 years ago. Nevertheless, today's market share of compressed natural gas (CNG) vehicles is relatively small but rapidly increasing:

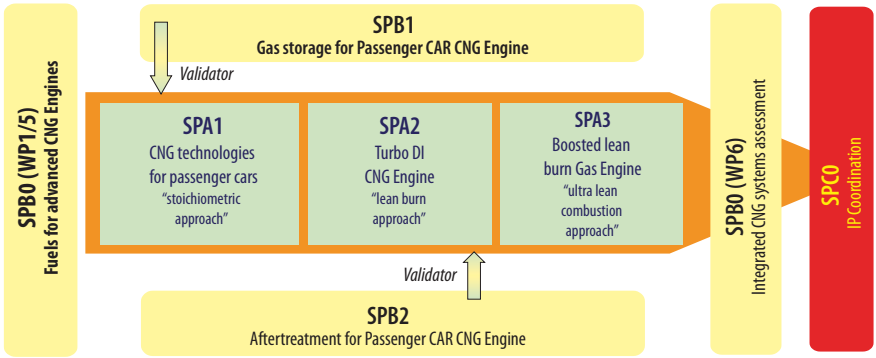
- Security of energy supply (@ relatively low costs)
- Clean fuel with reduced greenhouse impact and high octane number

Today's gas engines have the heavy drawback of being developed as multi-fuel engines out of conventional gasoline fuelled combustion engines.

Main objectives of "Integrated gas powertrain" Collaborative Project is to deploy a custom designed engine integrated with a specific aftertreatment systems applied to a light duty vehicle, able to achieve a 10% higher fuel conversion efficiency than that of corresponding 2006 diesel vehicle and complying with an emission level lower than Euro 6. Additional features:

- Advanced storage system (vehicle range) and vehicle architectures
- Multi-grade fuel tolerance and fuel flexibility.

Project Plan, Milestones and Deliverables



Technical Approach

To achieve the InGas targets, three main combustion technologies will be developed and compared:

SP A1 "CNG technologies for passenger cars" with stoichiometric approach;
SP A2 "Turbo DI CNG engine" with a lean burn approach;
SP A3 " Boosted lean burn gas engine" with an ultra-lean combustion approach.

Achievements

The main results achieved in the first six month are:

- The three engine platforms have defined as base engine and vehicle specifications
- Specifications of new components (injectors, nozzles, pressure regulator,. . .) and new ECU layouts
- Survey on natural gas composition in Europe is on-going to define new fuel specs
- A new vessel design, in terms of storage density, innovative material, cost target, certification, has been carried out and a first prototype of hybrid vessels have been manufactured and testing is on-going.
- The advanced CNG storage vehicle platform has been designed
- Preliminary tests on new powders and honeycomb catalyst have been performed

Organisational Information

Budget	21.64 M€	Funding	12.28 M€
Duration	36 months	Start	October 2008
DG	Research	Priority Area	Sustainable Surface Transport
Coordinator	Massimo Ferrera, CR FIAT	Contact	stefania.zandiri@fptpowertrain.crf.it
Partners	CR FIAT, AVL, FEV, EON-RHUR, DAIMLER, General Motors Powertrain Sweden AB, General Motors Powertrain Germany GmbH, GDF SUEZ, IFP, CNR-IM, TU-GRAZ, ECOCAT, Continental Automotive GmbH, SIEMENS, PoliTo, CHALMERS, Haldor Topsøe A/S, RWTH, MEMS, CVUT-JBRC, XPERION, VENTREX, BAM, WRUT, DELPHI, USTUTT, POLIMI, ICSC-PAS, KATCON		
Website	www.ingas-eu.org		

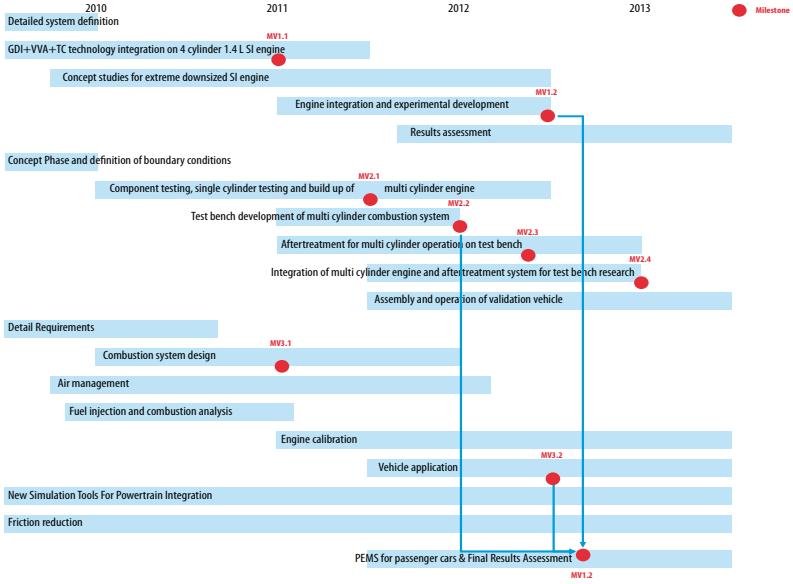
Powerful

Powertrain of future light-duty vehicles

Motivation and Objectives

A. To meet 40% lower CO_2 emissions with respect to the 2005 figures for spark ignited (SI) engines powered vehicles and 20% lower CO_2 than the 2005 level for compression ignition (CI) engine powered vehicles with comparable fun-to-drive figures of the 2005 vehicles.
B. To meet CO, HC, NO_X and PM figures, as engineering targets, at least 10% less than the Euro 6 emissions limits shown in Table 1.1.
C. To maintain the CO_2 and pollutant emissions levels during the useful engine life and keeping into account real world emissions, i.e. in accordance not only with the standard NEDC (new European driving cycle) but also with the Artemis duty cycle (Fig. 1.1). Furthermore the PEMS procedure will be applied to vehicles independently on any cycle.
D. By fulfilling the above targets, the realization of the LEEV (Light-duty Environmentally Enhanced Vehicle) concept, defined as a vehicle that both meets the next stage of pollutant emission limit values and stays below the above mentioned level of CO_2 emissions.

Project Plan, Milestones and Deliverables (begins 01/01/10)



Technical Approach

POWERFUL will address research, development, validation and demonstration of future light-duty vehicle engines for road transport and based on three vertical sub-projects:

V1. An advanced four-stroke SI engine concept characterized by low-cost / low emissions;
V2. An advanced four-stroke CI engine concept able to run also on new tailored fuels and integrating the LTC (low temperature combustion) mode in the CI combustion system;
V3. An advanced two-stroke CI engine concept running on diesel fuel and integrating the LTHC (Low Thermal Homogeneous Combustion) mode in the CI system.

These advanced engine concepts will be accompanied by a transversal sub-project T1 taking care of the development of new simulation tools describing the strong interactions between combustion systems and engine architecture, means for reducing engine frictions and performing an intelligent energy management, PEMS (portable emissions measurement system) approach.

Organisational Information

Budget	24.35 M€	Funding	13.5 M€
Duration	48 months	Start	January 2010
DG	Research	Priority Area	Fuel & Powertrain
Coordinator	Pascal Tribotte, RENAULT	Contact	pascal.tribotte@renault.com
Main Partners:	18 partners among them CR FIAT, VW, RENAULT, AVL, FEV, Delphi, IFP,...		

PAGODE

Post-treatment for the next generation of Diesel engines

Motivation and Objectives

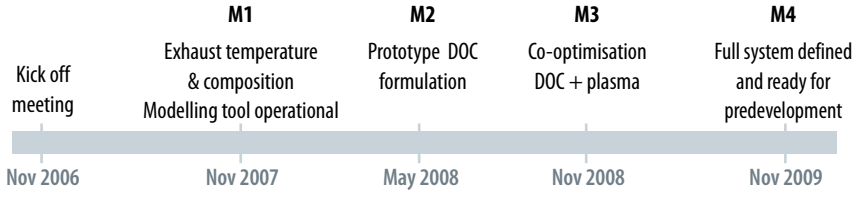
Motivation:

- With strengthened regulations conventional Diesel engines will become more expensive, less efficient and will encounter difficulties in reaching future emission standards
- There will be consequences on the possibility for Europe to fulfil its CO_2 objectives

Objectives:

- High performance catalytic formulation (especially for HC and CO from HCCI combustion mode) assisted by non-thermal plasma
- Modelling tool for design and simulation

Project Plan, Milestones and Deliverables



Technical Approach and Achievements

- **Formulate, develop, test and optimise advanced new catalyst formulation** for CO/HC low temperature oxidation.
- **Design, develop and test emerging flexible low temperature oxidation** technologies based **on plasma concepts**.
- Perform a **powertrain system synthesis** and evaluate, for next generation power trains, the needed requirements and boundary conditions to best implement the advanced aftertreatment processes in diesel engines.

Achievements:

WP1 Characterisation of emissions level typical of low temperature combustion mode. Assessment of the developed simulation tool for the modelling of novel catalyst devices with inversed kinetic (i. e. capable of treating very high CO and HC levels) by direct comparison with novel catalysts and plasma device performances measured at the engine bench level.

WP2 Selection of the most promising catalyst formulations for full scale realisation.

WP3 Vision and orientation on the potential of plasma discharges to fulfil the next generation of Diesel engine emissions.

WP4 Vision and orientation on the potential of emergent catalyst and plasma technologies to meet the next 2020 emissions objectives. Cost evaluation and vision of the most promising technology to reach a future market introduction.

Plasma reactor on IFP test bench.

Organisational Information

Budget	2.95 M€	Funding	1.59 M€
Duration	36 months	Start	November 1st 2006
DG	Research	Priority Area	Sustainable Surface Transport
Coordinator	Xavier GLIPA, PSA PEUGEOT CITROËN	Contact	xavier.glipa@mpsa.com
Partners	PSA PEUGEOT CITROËN, CR FIAT, Johnson Matthey (JM), IFP, Chalmers University (Chalmers), Aerosol & Particle Technology Laboratory CERTH / CPERI (APTL), Ecole Supérieure d'Electricité (SUPELEC)		

DECODE

Understanding of degradation mechanisms to improve components and design of PEFC

Motivation and Objectives

Present problems of PEFC technology related to the commercialization are the costs, durability, reliability, performance, and public acceptance. The DECODE project is focusing on improving durability taking the water management, especially liquid water, into account. Water management of PEFC is one of the crucial issues for the performance and the life-time.

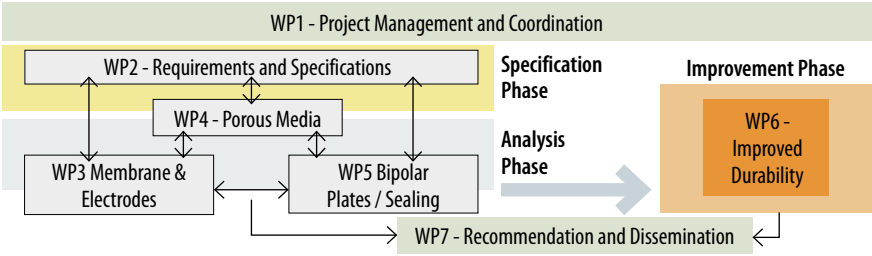
The main objective is to increase the life-time of fuel cells for automotive applications focusing on liquid water interactions. For this, different work tasks have to be performed as described above in order to achieve the objectives which are listed in the following:

- To understand the influence of the degradation processes on the fuel cell performance and on the fuel cell behaviour especially on the water management/water balance in the fuel cell
- To describe the degradation of fuel cells as a cumulative effect based on the individual degradation processes
- To derive operating strategies for higher durability, reliability, and stability

Project Structure

The project plan is split into three phases:

1. The specification and definition phase for materials, components as well as testing and operating conditions
2. The analysis phase for the investigation of the individualism of degradation processes of the components (WP3: membrane and electrodes; WP4: porous media; WP5: bipolar plates) and their interactions
3. In the improvement phase for the generation of the technological progress including development of novel fuel cell operating strategies to mitigate degradation phenomena and to improve components and single cell design



Technical Approach

- Experimental studies of the degradation mechanisms and processes of single components, single cells, and short stacks. All investigations are performed to understand the influence of operating conditions.
- Modelling of transport processes and porous media.
- Improvement of operating strategies and materials based on the knowledge of degradation processes

Achievements

WP2: Materials and test components are defined.

WP3: Experimental investigations of CCM degradation started. First model to describe interferences of different electrode degradation mechanisms.

WP4: Experimental investigations of GDL degradation started. Modelling tools for simulation of transport processes of porous media developed. Ex situ spectroscopy applied to indicate PTFE ageing.

WP5: Experimental investigations of bipolar plates started. 1000 h test with short stacks were performed.

WP6: Start in October 2009.

WP7: The project was presented at different conferences and workshops. The workshop "International Workshop on Accelerated Testing in Fuel Cells" was organised in cooperation with other partners.

Survey studies for WP3 – WP5 are written by the partners.

Organisational Information

Budget	5.5 M€	Funding	3.70 M€
Duration	39 months	Start	January 2008
DG	Research	Priority Area	Fuel cells
Coordinator	Andreas Friedrich, DLR	Contact	andreas.friedrich@dlr.de
Partners	11 partners among them VOLVO and OPEL		
Website	www.decode-project.eu		

HySYS

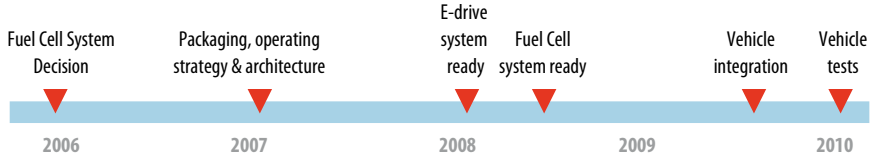
Fuel cell hybrid system component development

Motivation and Objectives

- Improvement of fuel cell system technology for market readiness (functionality, reliability, cost, customer acceptance)
- Development of low cost mass market FC- & Drive Train components.
- Validation of component and system performance on two FC Vehicles (DC and PSA)
- Identification of common architecture and modular design
- Focus is on FC systems, considering also components that can be used in ICE Hybrids
- Identify synergies with ICE-Hybrids
- Involve suppliers in FC- and ICE Hybrid component development by cooperation in a European project
- Close cooperation of car industry with suppliers is needed for a successful market introduction of FC-vehicles

Project Plan, Milestones and Deliverables

The figure summarises the main milestones to build up the validator vehicles and conduct the component tests on board of the vehicles under road conditions.



Technical Approach

- Develop specifications for fuel cell hybrid vehicles, fuel cell- and electric drive system and all components.
- Select base fuel cell system from available systems (purchase part)
- Design, develop and test selected fuel cell system- and electric drive components.
- Integrate FC-system components in base FC system and E-drive components to E-drive system
- Interate FC-system and E-drive system in validator vehicles
- Test and evaluate validator vehicles to verify achievements

Achievements

SP2000: Implementation of HC and CO low temperature oxidation mechanism modeling, validated at laboratory scale for the relevant conditions of temperature, Co levels and representative HC speciation.

SP3000: The electrical turbocharger, and the hydrogen line are developed, tested and integrated in the fuel cell system. Humidification system components are developed and tested. The hydrogen sensors are developed and currently being improved.

SP4000: Battery systems, power electronics and elctrical motors are developed, tested and ready for vehicle integration

SP5000: Packaging, operating strategy and architecture of the vehicles are ready. Vehicles are prepared for the intregration of the fuel cell systems and electric drive system

Organisational Information

Budget	22.7 M€	Funding	11.2 M€
Duration	60 months	Start	December 2005
DG	Research	Priority Area	Sustainable Energy Systems
Coordinator	Dr. Jörg Wind, DAIMLER	E-Mail	joerg.wind@daimler.com
Partners	28 partners among them DAIMLER, CR FIAT, PSA PEUGEOT CITROËN, RENAULT, VOLVO, VW, Bosch, ContiTemic,Saft, AVL, NuCellSys		
Website	www.hysys.eu		

HyTRAN

Hydrogen and fuel cell technologies for road transport

Objectives

Hydrogen and fuel cell technologies are seen as promising alternatives for road transport. However, components and sub-systems are still a major bottleneck to the development of fuel cell systems for transport. The objective of the project HyTRAN is to advance the fuel cell technology towards solutions that are commercially viable, by developing the required components and subsystems and by demonstrating them in two fuel cell systems.

Technical approach and achievements

Technology Platform 1: Direct-hydrogen fuel cell based propulsion system

First 3 years:

- Fuel cell stack design. Component characterisation. Air supply. Water and thermal management studies. Definition of specifications for subsystems and components.

Last 18 months:

- Manufacturing and delivery of the fuel cell stack and of the twin-screw compressor with water injector and silencers. Design and manufacturing of cooling system, hydrogen feeding line and other auxiliary components.
- Layout and virtual installation of FC power system (Figure 1), control strategies, HAZOP, Fault Tree Analysis and global system model in MatLab/Simulink completed.
- Integration of the fuel cell system and auxiliary components in the Panda HyTRAN is in progress.

Technology Platform 2: 5kW diesel reformate PEM fuel cell-based Auxiliary Power Unit

First 3 years:

- System design and development of key components.

Last 18 months:

- Definition of the final design of the laboratory APU system (Figure 2).
- Manufacturing, testing and delivery of sub-systems such as the fuel cell stack and the air supply system.
- Virtual system study for a future product has been completed.
- Laboratory APU system has been manufactured and is currently being tested (Figure 3).

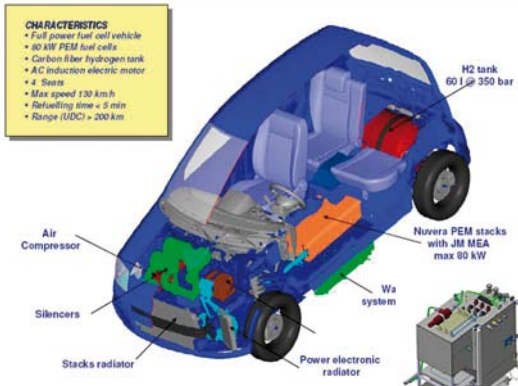


Figure 1: Technology Platform 1: Panda HyTRAN fuel cell vehicle –main components and characteristics

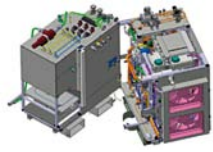


Figure 2: Technology Platform 2: Fuel cell APU – representation of modular build-up and interface between hot and cold areas in the laboratory system.

Figure 3: Technology Platform 2: Fuel cell APU laboratory prototype during assembly.

Organisational information

Budget	16.8 M€	Start/End	January 2004 - October 2009
DG	DG Research	Priority Area	Sustainable Surface Transport
Coordinator	Per Ekdunge, VOLVO	Contact	per.ekdunge@volvo.com
Core Team	VOLVO, CR FIAT, DAF, VW, Nuvera Fuel Cells, Johnson Matthey Fuel Cells, Opcon Autorotor, Tenneco, Weidmann Plastics, ADROP, RWTH Aachen, ECN, Politecnico di Torino, Paul Scherrer Institut, Institut für Mikrotechnik Mainz, Imperial College London, Environment		

HELIOS

High Energy Li-ion Storage Solutions

Motivation and Objectives

A large consortium including six car manufacturers, several laboratories and test institutes, one recycler and a battery manufacturer will combine their efforts to understand the causes behind the battery cells aging and safety behavior. The study is performed on large High Energy cells for Electric Vehicles, high e-range PHEV and Hybrid Heavy Duty trucks applications.

The objectives of the HELIOS project are to:

Propose updated specifications and test procedures for high energy battery cells used in European context.

Perform the study on representative large cell formats (close to 40Ah cells) with identical design, using four different positive electrodes.

Have the new and aged cells samples analysed "post-mortem" after ageing to identify for each technology the aging and safety mechanisms.

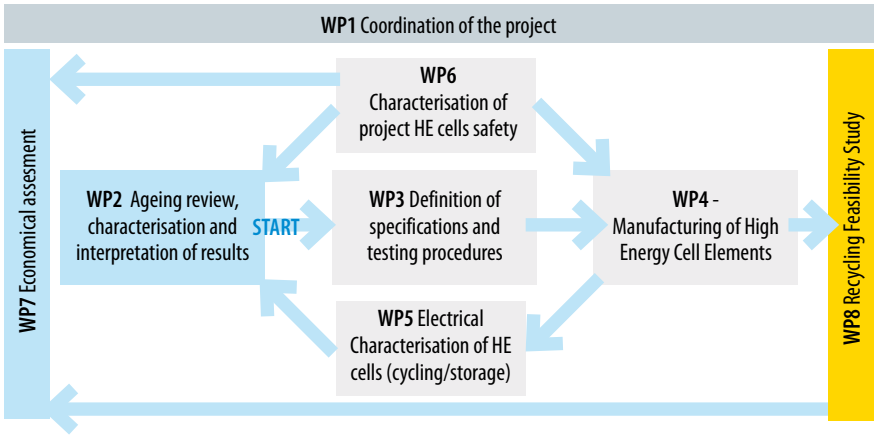
Assess the impact of such results on the battery system/pack level: estimation of extra recycling needs and of the consequence of safety tests results on the battery pack concept. Consequent cost evaluation.

Project Planning & Deliverables

The project will start in November 2009. The main milestones are reported below.

Technical Approach & Expected Achievements

The figure conveniently summarizes the different steps divided into W, including their interaction.



Organisational Information

Budget	4.3 M€	Funding	2.80 M€
Duration	36 months	Start	November 2009
DG	Research	Priority Area	Renewable energies
Coordinator	Anna Teyssot, RENAULT	Contact	anna.teyssot@renault.com
Partners	18 partners including OPEL, FORD Aachen, PSA PEUGEOT CITROËN, CR FIAT, VOLVO, Saft, Johnson-Control, Umicore, EDF, ZSW, Ineris, LRCS, Uppsala University, ENEA, AIT, CEA, RWTH.		

HCV

Hybrid Commercial Vehicle

Motivation and Objectives

Develop urban buses and delivery vehicles with advanced second generation of energy efficient hybrid electric powertrains. Demonstrate early second generation buses and distribution trucks in practical real-life conditions in different cities in the enlarged Europe in order to ensure good acceptance by public transport, delivery operators, drivers and passengers.

- Develop high-efficient hybrid systems and components enabling mass market introduction.
- Cost reduction of 40%
- Fuel consumption reduction of 30%

Project Plan, Milestones and Deliverables

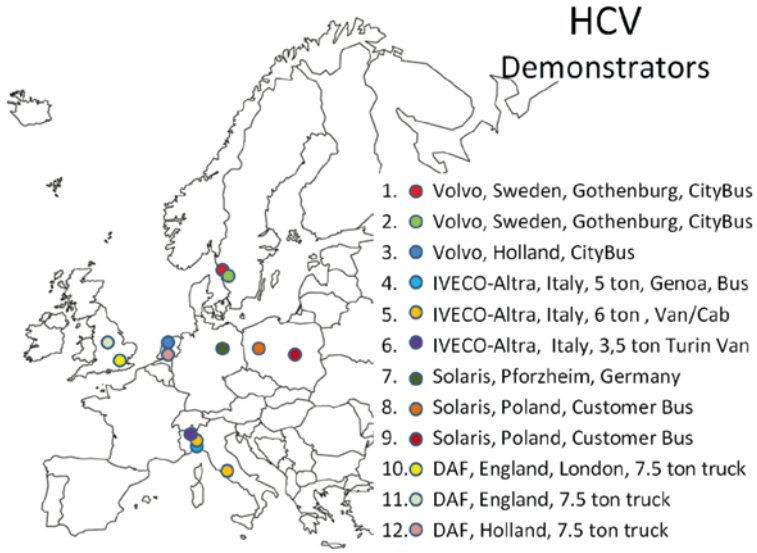
Advanced second generation vehicles which are cost effective and fuel efficient hybrid vehicles.



Technical Approach

- Field experiences from early second generation vehicles.
- Development of common components, functions and communications standards.
- Develop urban buses and delivery vehicles with advanced second generation of energy efficient hybrid electric powertrains
- The final result will be the demonstration of a passenger bus and a distribution truck with this advanced technology.

Demonstration



Organisational Information

Budget	20 M€	Funding	10 M€
Duration	48 months	Start	2009
DG	Research	Priority Area	Sustainable Surface Transport
Coordinator	Lennart Cider, VOLVO	Contact	lennart.cider@volvo.com
Partners	VOLVO, IVECO, DAF, Alfdex, Altra, Arsenal, Avl, Bosch, Certh, CR FIAT, Danaher, Dimac, Enea, Magna, Pisa, Idmec, SKF, Solaris, TNO, Veolia		

HI-CEPS

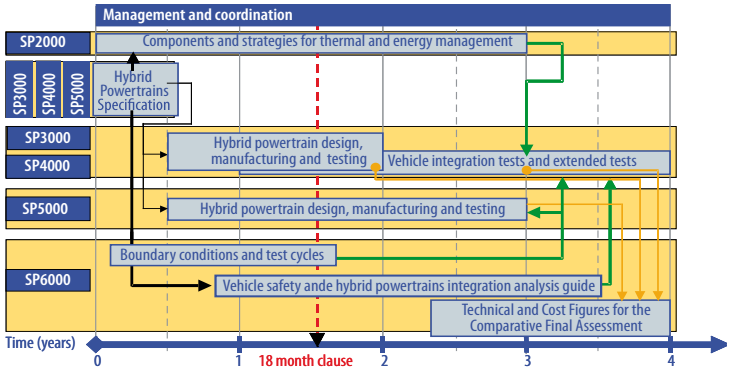
Highly integrated combustion electric propulsion system

Motivation and Objectives

Develop 3 different novel series-parallel hybrid e-powertrains adopting standardised common powertrain **e-devices**, vehicle **auxiliaries** and dedicated **gasoline, diesel and NG ICEs** with aftertreatment systems for hybrids, adjustable for future fuels.

Conjugate at vehicle level the **environmental friendly issues** (fuel consumption, CO_2 and noxious emission reduction) with **fun to drive characteristics** (enhanced performance, driveability & comfort) at **acceptable purchasing/operation costs** (perceived value).

Project Plan, Milestones and Deliverables

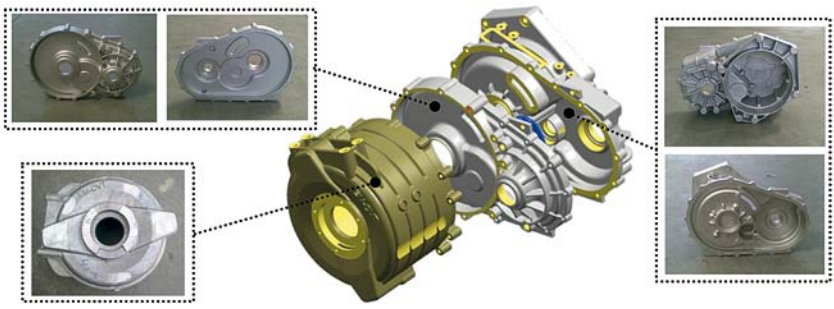


Technical Approach

- Identification of the right complex hybrid thermal-electric powertrain and auxiliaries architecture for each investigated application (small, mid size and light delivery cars)
- Extended usage of common standardised electric devices for all the different hybrid powertrains
- On bench and vehicle validation including optimised electric and thermal management strategies
- Comparative technical and extra costs evaluation considering different ICEs typologies (gasoline, diesel and natural gas) and including their after-treatment systems

Achievements

Main results reached up to now: hybrid powertrain architectures definition and system&devices specs; auxiliaries usage profile and test procedures identification; hybrid powertrains design&prototype realisations, on bench test (in progress) and vehicle integration (started); cost analysis tool development (near completed)



Outcomes examples: SP3000 Hybrid EM-CVT electric active transmission

Organisational Information

Budget	20 M€	Funding	10 M€
Duration	48 effective months	Start	September 2006
DG	Research	Priority Area	Renewable energies
Coordinator	Vittorio Ravello, CR FIAT	Contact	hiceps@crf.it
Partners	22 partners among them CR FIAT, PSA PEUGEOT CITROËN, FORD, AVL, Ricardo, FEV, Magna Steyr, Eldor		
Website	www.hi-ceps.eu		

FLOWHEAD

Fluid optimisation workflows for highly effective automotive development processes

Motivation and Objectives

- FlowHead aims to develop fast gradient-based optimisation methods using adjoint sensitivity analysis for automotive design. The key steps are
- developing and enhancing a range of adjoint solvers, including commercially licensed solvers, open source solvers and research codes
- developing automated shape parametrisation methods to deliver sensitivities for the complete design chain
- develop topology optimisation methods for industrial applications
- to integrate the optimisation tools into the design workbench and the product development process.

Project Plan, Milestones and Deliverables

The project runs for 3 years from Feb. 2009 to Jan 2012. Key milestones are:

M6: Partners receive first versions of adjoint sensitivity codes

M12: Concepts completed for CAD and DMU data-based design space definition and Manufacturing constraints

M24: Integration of the optimisation workflows into the PDP completed

M30: Software implementation and integration completed

M36: Evaluation and benchmarking completed

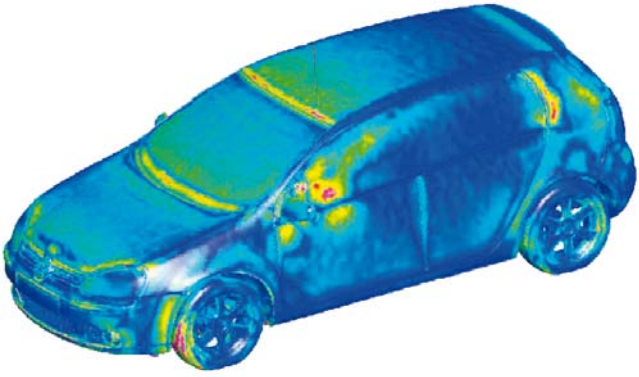
Technical Approach

- Development of adjoint flow solvers for fast gradient-based optimisation
- Large scale shape optimisation using adjoint sensitivities
- Industrial application of topology optimisation
- Integration of fast gradient-based optimisation tools into an industry standard workbench environment
- Linking of the optimisation workbench into the Product Development and Management (PDM) environment.

Achievements

The Project has recently had its 6M meeting, key deliverables met so far are:

- delivery of adjoint codes to partners for integration in their design chains
- definition of interfaces between workflow and PDP/DMU
- definition of workflow conception and modular interfaces



Organisational Information

Budget	3.2 M€	Funding	3.2 M€
Duration	36 months	Start	February 2009
DG	Research	Priority Area	Transport
Coordinator	Jens-Dominik Müller, QMUL	Contact	j.mueller@qmul.ac.uk
Partners	11 partners among them RENAULT, VW, ESI, CD-Adapco, FE-Design		
Website	flowhead.sems.qmul.ac.uk		

EUCAR
EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

SEVENTH FRAMEWORK PROGRAMME

MID-MOD

Mid-frequency vibro-acoustic modelling tools
Innovative CAE methodologies to strengthen European competitiveness

Motivation and Objectives

Noise and vibration have a very large impact on the competitiveness of transportation vehicles, not only driven by the increasing customer demand for vibro-acoustic comfort, but also by the tightening legal regulations regarding noise and vibration emissions and immissions. Since noise and vibration as functional performance attributes often conflict with other attributes, such as weight and CO_2 emission, concurrent design and analysis procedures are required. Such processes involve multi-attribute optimisation and are facilitated by the use of Computer Aided Engineering (CAE) tools. Also, there is an increasing trend towards virtual prototyping to reduce costs and development times. As a result, good CAE tools are essential in modern vehicle design

Project Plan, Milestones and Deliverables

MID-MOD research activities involve studies towards what is needed to lift these technologies out of their academic environment and to apply them for real-life engineering problems in the transportation industry. Problems, for which currently industrial CAE tools are lacking.

- A first objective of the proposed project is the development of innovative solutions for the modelling and simulation of vibro-acoustic transport problems in the mid-frequency range
- Milestone 1 involves a profound comparative study between five deterministic technologies (Wave Based Method, Fast Multipole Method, Domain Decomposition Method, Stabilized Method and Higher order Wave Based Integration Schemes) which are currently most promising.
- Milestone 2 involves a similar comparative study, but instead of approaching the mid-frequency range from below using deterministic approaches, this time five high-frequency probabilistic methodologies are studied (Stochastic Boundary Elements,

Technical Approach

The goals of the proposed project are depicted briefly as "triple digit performance improvements". Such improvements will become apparent in the following quantifiable targets:

- the reduction of solution times: pursuing "over-night" calculation times, i.e. starting the simulation at office closing time and having the results the morning after;
- the enlargement of the applicable frequency range: bridging the mid-frequency gap for interior transportation applications (i.e. the 200Hz – 1 kHz gap) and increasing the upper frequency limit of exterior calculations (i.e. going from the 500Hz octave band to the 4kHz octave band);
- increasing the prediction accuracy in the low-, mid- and high-frequency range: pursuing a 3dB absolute accuracy;
- the reduction of computational loads, i.e. both CPU times as well as memory and disk space requirements such that (networks of) conventional office desktop pc's may be applied for numerical;
- tools for NVH evaluation to become available not only for the expert analyst, but also for the design engineer to support early-design stage decisions based on a multi-attribute optimisation including NVH.

Organisational Information

Budget	3.8 M€	Funding	2.6 M€
Duration	36 months	Start	January 2009
DG	Research	Priority Area	Competetiveness
Coordinator	Carl Fredrik, VOLVO Tec.	Contact	carl.fredrik.hartung@volvo.com
Partners	12 partners among them VW, CR FIAT, VOLVO		
Website	www.mid-mod.eu		

EE-VERT

Energy efficient vehicles for road transport

EE-VERT Energy Efficient Vehicles for Road Transport

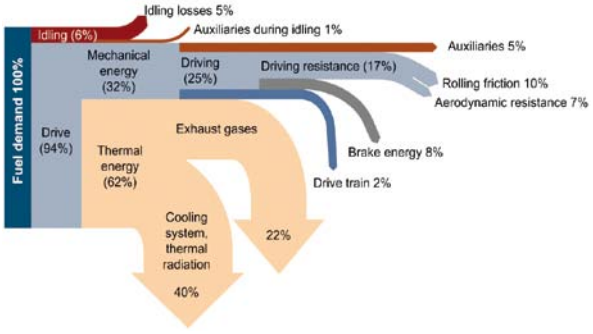
Motivation and Objectives

Present day vehicles have a certain number of features and constraints that make it difficult to optimise the use of electrical energy. Some examples:

- A single electrical power bus (the power net) with the generator, the battery and all consumers connected continuously to this bus
- Electrical power generated and consumed continuously irrespective of operating conditions
- Many other auxiliaries consume power continuously
- Some "islands" of technology already deployed that change this model e.g. regenerative alternator, EPAS, electrified auxiliaries (especially in hybrid electric vehicles)
- New functions e.g. stop-start exceeding the capabilities of the present architecture

The objectives of the project are the following:

- Reduction of 10% in CO_2 on NEDC through co-ordinated energy generation and consumption
- Technologies and processes developed in the project are applicable to vehicles with conventional powertrain as well as hybrid electric vehicles
- Life cycle assessment methods are used to evaluate the environmental impact of the new technologies compared to existing vehicles



Project Plan, Milestones and Deliverables

Project plan

WP1: Requirements for energy management

WP2: Components

WP3: System

WP4: Demonstrators

WP5: Dissemination and exploitation

Milestones plan

Month 12: concept selection

Month 24: critical technology review

Month 36: technologies incorporated into vehicle demonstrator

Technical Approach

- Electrical power used for energy transfer between systems
- Electrical power generation scheduled according to when it can be generated with low energy losses
- Energy recovered from other sources (e.g. regenerative braking, waste heat, solar cells) and placed in short-term or long-term storage depending on present and predicted demand
- Requires changes in electrical architecture to permit integration of multiple generation, actuation and storage devices with different optimal operating voltages and usage profiles

Achievements

- WP1: State-of-the-art, mission profile, and requirements specification reports delivered
- WP2: Power generation concepts outlined and first simulation models created
- WP3: Agreement on tools and processes

Organisational Information

Budget	6.7 M€	Funding	3.62 M€
Duration	36 months	Start	January 2009
DG	Research	Priority Area	Sustainable Surface Transport
Coordinator	Dr David Ward, MIRA Ltd	Contact	david.ward@mira.co.uk
Partners	MIRA, VOLVO Tec. Corporation, CR FIAT, Robert Bosch GmbH, Lear Corporation, Engineering Center Steyr, FH Joanneum, Universitatea Politehnica din Timisoara, Beespeed Automatizari		
Website	www.ee-vert.net		

TIFFE

Thermal systems integration for fuel economy

Motivation and Objectives

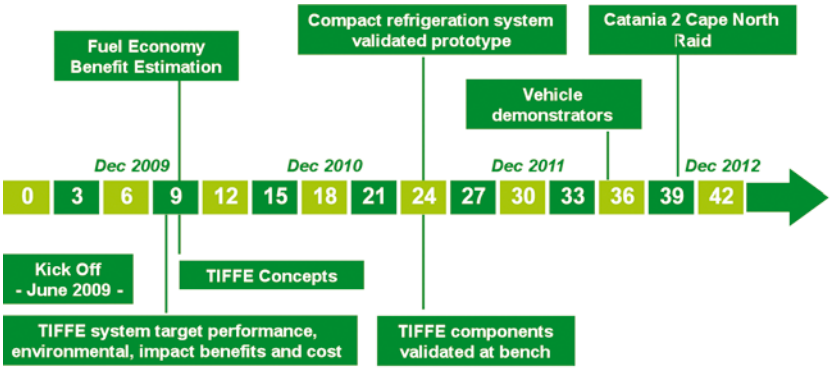
Reduction of vehicle fuel consumption of about the 15% in real use and lay out simplification developing a new Integrated Thermal System able to enhance the heat rejection and management (passenger cars and LCVs)

The concept is based on the integration of engine cooling, air conditioning, battery cooling (in case of hybrid) and on the development of a new generation of coolant fluid (nanofluids) and heat exchangers

The technologies will be demonstrated on an hybrid LCVs and on a small passenger car with Stop&Start and fully tested and validated following the standard procedures and with a road test from Catania (I) toCape North (N)

Project Plan, Milestones and Deliverables

The figure conveniently summarizes the major project milestones and outcomes.



Technical Approach

Development of a vehicle rejection system
Design, develop and realization of a compact refrigeration unit able to act also as heat pump
Development of nanofluids to enhance the heat transfer
Development and realization of planar heat exchangers as body panels to enhance the heat rejection
Implementation of the systems, test and validation on a Hybrid Light Commercial Vehicle & Passenger car with S&S

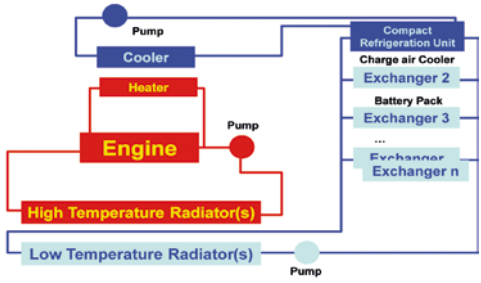
Achievements

The major expected final results are:

- a new vehicle thermal system improving the heat rejection and fuel economy both for LCVs and passenger cars
- a compact refrigeration unit (water cooled condenser, chiller, internal heat exchanger, expansion device, compressor)

The developed system will be the basis of future:

- power train cooling (water cooled, charge air cooler, ...)
- auxiliary systems cooling (battery, generator, electronics...)
- air conditioning system: semi hermetic compact system
- new coolant fluids with enhanced heat transfer properties



Organisational Information

Budget	3.6 M€	Funding	2 M€
Duration	36 months	Start	June 2009
DG	Research	Priority Area	Priority Area Fuel & Engines
Coordinator	Carloandrea Malvicino, CR FIAT	Contact	carloandrea.malvicino@crf.it
Partners	CR FIAT, Maflow, SINTEF, Braunschweig Un., FORD, DENSO TS		
Website	http://www.tiffe.eu		

ULYSSES

The future propulsion as ONE system

Motivation and Objectives

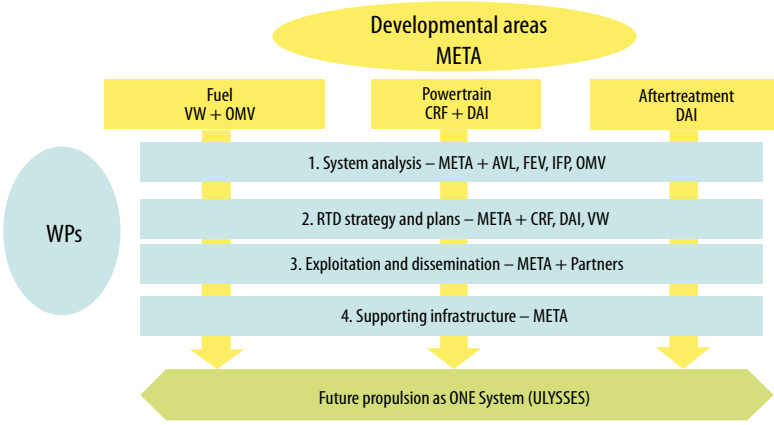
The Project is a Coordination Action (CA) aiming to establish a platform for exchanging of information and strategic planning of EC funded research projects dealing with the new propulsion technologies / concepts based on IC engines by:

- Identification of linkages among the involved projects
- Integration of projects, thus improving synergy & facilitating technology transfer
- Acceleration of dissemination and analysis of projects outcomes.

Major objectives are:

- System analysis of the propulsion system versus the future fuel scenarios
- Assessment of the state of the art, identification of gaps and needs in the RTD activities, definition/updating of the joint RTD strategy and plans
- Definition of coordinated cross-fertilization plans in order to improve the dissemination of project outcomes

Project Plan, Milestones and Deliverables



Technical Approach and Achievements

The mission of ULYSSES is to identify the areas of technological improvement covered by the powertrain projects. At the end of its life, ULYSSES has to indicate how the CA projects meet the strategic targets (CO_2 and pollutant emissions reduction, energy security & biofuels, etc.). This exercise allows to determine the areas covered by the research funded by the EC, the areas not yet covered, the research duplicates or the useless research topics because already funded in the past or of no interest, and, above all, the technology gaps where to address the future research.

Some projects are finished: ECO-ENGINES, GREEN, NICE and RENEW; other projects are running: BEAUTY , CLEANENGINE, HI-CEPS, INGAS, IPSY , PAGODE and TOP-EXPERT, while two new FP7 projects are expected to join ULYSSES in 2009: LESSCCV (Large-Eddy Simulation and system simulation to predict Cyclic Combustion Variability in spark ignition engines) and POWERFUL (POWERtrain of Future Light-duty vehicles.

Planned activities for the fourth year:

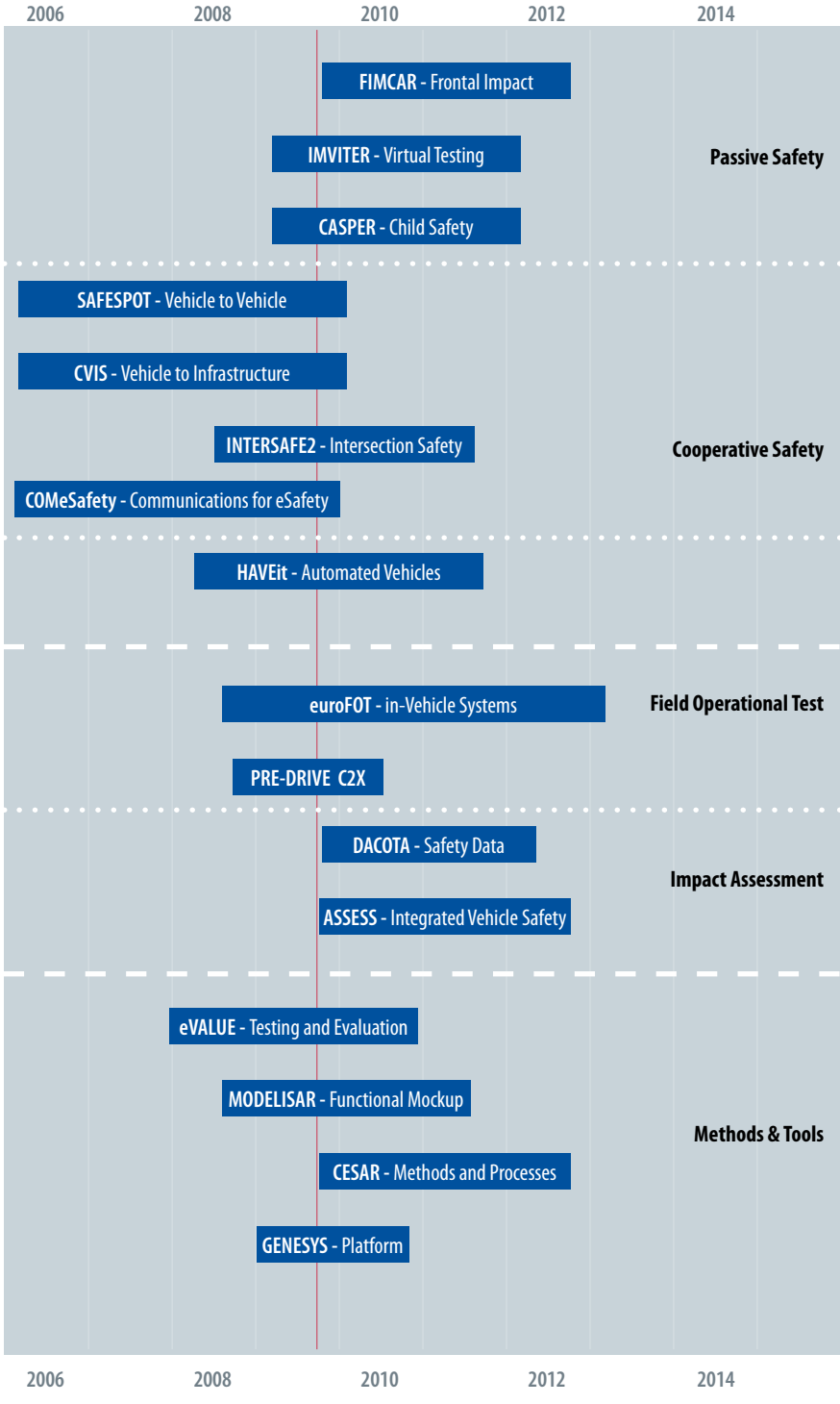
- Finalize the outcome of the Cracow workshop on Modelling and Simulation.
- Proceed with final release of the system analysis (WP1).
- Complete the RTD strategy and plans of WP2.
- Organize the annual review of the CA projects in the spring of 2010 (WP3 and WP4).

Organisational information

Budget	1.2 M€	Funding	1.2 M€
Duration	48 months	Start	June 2006
DG	Research	Priority Area	Sustainable Surface Transport Coordinator
Coordinator	Eugenio Faggioli, CR FIAT	Contact	stefania.zandiri@fptpowertrain.crf.it
Partners	CR FIAT, DAIMLER, VW, META, AVL, FEV, IFP, OMV		
Website	www.ca-ulysses.eu		

Integrated Safety

Mapping of R&D projects



FIMCAR

Frontal Impact and Compatibility Assessment Research

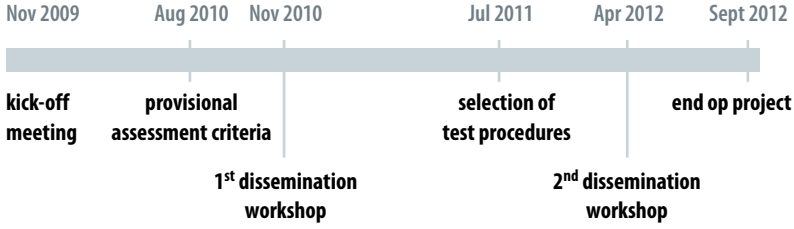
Motivation and Objectives

For the real life assessment of vehicle safety in frontal collisions the compatibility (described by the self protection level and the structural interaction) between the opponents is crucial. Although compatibility has been analysed worldwide for years, no final assessment approach was defined. EEVC WG15 and the FP5 VC-COMPAT project activities developed two test approaches which are important candidates for the assessment of compatibility. Both are composed of an off-set and a full overlap test procedure. However, no final decision was taken. In addition another approach (tests with a moving deformable barrier) is getting more and more in the focus of today's research programmes.

Within the FIMCAR project different off-set, full overlap and MDB test procedures will be assessed for their suitability in a compatibility assessment approach. The objective of this research project is to deliver the missing research results needed to fully develop a commonly accepted approach to assess crash compatibility. To achieve this goal, a project team consisting of all significant car manufacturers and research organisations has been assembled.

Project Plan, Milestones and Deliverables

The figure conveniently summarizes the most important milestones and deliverables within the course of the project. In total 23 Milestones and 30 deliverables are planned.



Technical Approach

- Analysis of accident data as input data for the further research and especially for the cost benefit analysis.
- Definition of the evaluation criteria for the assessment of the different compatibility assessment procedures.
- Analysis of the different candidate test procedure according to the evaluation criteria developed before.
- Fleet modelling with different approaches to support the investigation of different test procedures and to analyse the possibilities of numerical compatibility assessment:
  - MBS
  - simplified FE models
  - generic full detail models
- Evaluation and comparison of test procedures
- Definition of final test approach

Achievements

Project did not start yet.

Organisational Information

Budget	6 M€	Funding	3.8 M€
Duration	36 months	Start	October 2009 (scheduled)
DG	Research	Priority Area	Safety and Security by Design
Coordinator	Heiko Johannsen, TU Berlin	Contact	heiko.johannsen@tu-berlin.de
Partners	DAIMLER, FIAT, OPEL, PSA PEUGEOT CITROËN, RENAULT, VOLVO, VW, BASt, IDIADA, TNO, TRL, UTAC, Chalmers, CR FIAT		

IMVITER

Implementation of virtual testing in safety regulations

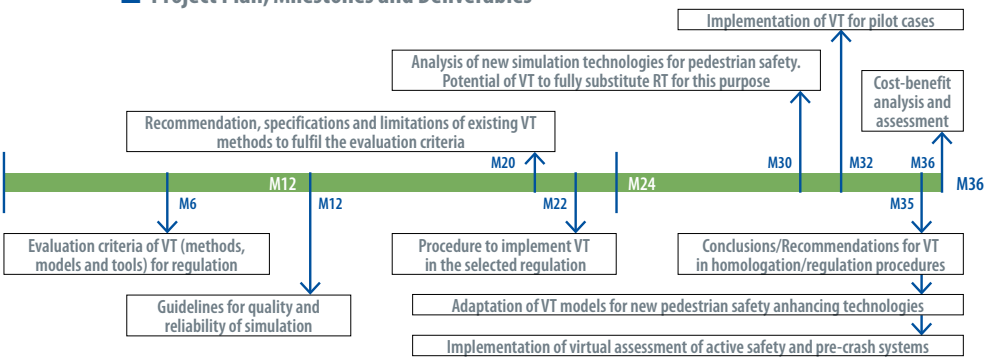
imviter

Motivation and Objectives

To increase car industry competitiveness by reducing the burden of the currently type approval test system, nowadays almost completely based on physical tests, and to improve road safety by raising the quality level of protection measures taking advance of the introduction of virtual tests (numerical simulation). The objectives of the project are:

- Implementation of virtual (VT) procedures in existing safety standards by consolidation of advanced VT technologies
- Development of showcase procedures of implementation of VT, substituting Real Testing in particular homologation/regulation cases
- Investigate the possibility to transfer the process of VT in order to assess new advanced safety systems (active and pre-crash safety systems)

Project Plan, Milestones and Deliverables



Technical Approach

- To work out recommendations for the implementation of VT procedures in existing homologation procedures and consolidation of advanced VT technologies for this purpose, analyzing the ensuing costs and benefits
- Development of evaluation criteria independent of software platform or performing organization
- Put in practice procedures of implementation of VT in order to substitute RT in the selected pilot cases
- Investigate the possibility to transfer the process of VT to assess new advanced safety systems (active and pre-crash safety systems)

Achievements

WP1: Definition of criteria for the evaluation and selection of candidate homologation/regulation pilot cases. Detailed definition of the project tasks for the implementation of VT in the selected RT.

WP2: Development of technical evaluation criteria for the quality assessment of simulation models. Improvement of numerical methods

WP3: Definition of methods and approaches on accreditation procedures for homologation/regulation scenarios based on VT

WP4: Application of the full process of homologation trough VT under existing regulations (previously selected in WP1) in order to investigate the feasibility of the procedures. Validation of regulatory test tools and simulation models

WP5: Cost-benefit analysis. Evaluation of benefits for industry and society

WP6: Investigate the future potential of Virtual Testing, evaluate advanced safety systems (pre-crash) and new test procedures and various impactors (e.g. Flex-Pli)

Organisational Information

Budget	4.8 M€	Funding	3.2 M€
Duration	36 months	Start	April 2009
DG	Research	Priority Area	Transport
Coordinator	Cordero, Roberto	Contact	robcor@cidaut.es
Partners	15 partners among them AUDI, DAIMLER, OPEL, RENAULT		
Website	www.imviter.com		

CASPER

Child advanced safety project for European roads

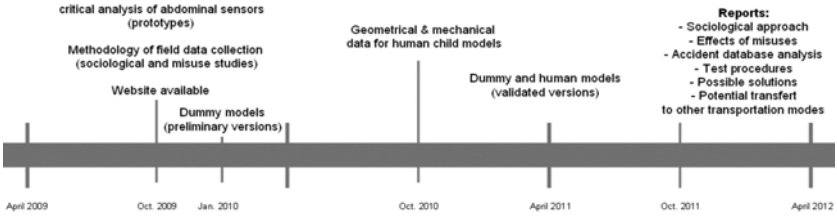
Motivation and Objectives

CASPER fits into the continuing objective of further reducing the number of fatalities on the EU roads, but will not address legal and enhancement aspects. The activities are mainly supported by research addressing many fields such as in depth road accidents data collection and analysis regarding children, the influence of the impact of societal behavior of adults in transport situations and technological based solutions to improve the safety of children.

The aim is to develop new technologies and systems to protect children, to develop risk analysis methodologies for the design of better child protection. Emphasis is made on an integrative approach such as child human modeling, passive and when possible active safety, including sociological aspects.

Project Plan, Milestones and Deliverables

The main deliverables will be the improvement of behaviour of dummies, associated to new sensors, as well as dummies and child human numerical models and improved test procedures, allowing solving the issues of children protection. Reports on the conditions of use of CRS (Child Restraint Systems) and consequences in accidents, including campaigns of information, will be made in order to solve the problem of children involved in traffic accidents.



Technical Approach

CASPER will address two main aspects:

- on one hand, the improvement of the efficiency of child protection through the development of innovative tools, such as sensors, dummies models and child human models, completed by test procedures in frontal and lateral impacts, with associated injury criteria, in order to provide to CRS (Child Restraint Systems) manufacturers the possibility to develop and test their products at a lower cost, with new methods, and at a same guarantee of efficiency.
- on another hand, the analysis of the reasons and consequences of misuse of CRS's and of the influence of the conditions of transportation of children, as compared to the certification test procedures.

Achievements

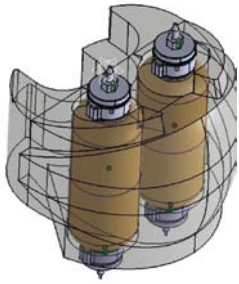
WP1 : tools for dummy approach for child safety: dummies development and modelling, experimental testing and simulation and determination of child injury tolerance.

WP2 : child human body modelling: geometrical and mechanical properties, development of human segments/whole body models, numerical accident simulations and numerical criteria.

WP3 : diagnosis of child safety: understanding of real child safety environment, road experience and other injury sources for children.

WP4 : demands and applications : test procedures experimental and virtual, solutions for CRS in terms of use, solutions for car safety devices and demonstration of feasibility.

WP5 : dissemination and knowledge exchange, web site and data storage, cooperation with other groups on child safety.



Abdominal sensor

Organisational Information

Budget	5.8 M€	Funding	3.8 M€
Duration	36 months	Start	April 2009
DG	Research	Priority Area	Renewable energies
Coordinator	Françoise Cassan, LAB PSA RENAULT	Contact	francoise.cassan@lab-france.com
Partners	15 partners (7 countries), among them RENAULT, PSA PEUGEOT CITROËN, CR FIAT		
Website	www.casper-project.eu		

SAFESPOT

Cooperative systems for road safety "Smart vehicles on smart roads"

Motivation and Objectives

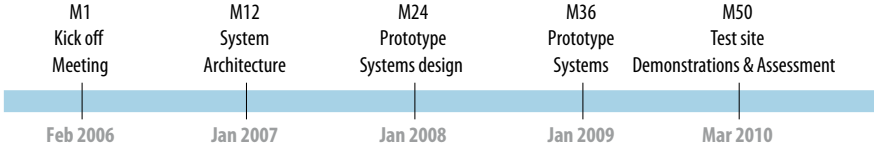
The number of road accidents is still unacceptably high, few years ago a number of EUCAR Working Groups cooperated to evaluate the opportunity that new wireless communication technologies where offering to the development of cooperative systems.

The SAFESPOT Integrated Project designs cooperative systems based on vehicle to vehicle and vehicle to infrastructure communication to improve road safety. The core aim is the development of the technological building blocks and of the related enabling technologies to enable the future implementation of cooperative systems for road safety.

SAFESPOT will prevent road accidents with its Safety Margin Assistant that detects in advance potentially dangerous situations. SAFESPOT is testing its applications in six European countries involving vehicles and road infrastructures.

Project plan, Milestones and Deliverables

The figure conveniently summarises the SAFESPOT results.



Technical Approach and Achievements

SAFESPOT applications are based on vehicle to V2V and V2I communication to:

- improve the range, quality and reliability of the safety-related information available to vehicles
- provide drivers an "extended co-operative awareness" via a real time reconstruction of the driving context and environment
- give more time and space to drivers and on-board systems to react safely and appropriately to risky situations

SAFESPOT developed the core technologies to enable the exchange of geo-referenced safety messages and to update in real time navigation maps with relevant attributes for a safe and efficient driving.

Achievements

SP1: modular in vehicle sensing platforms to detect potentially dangerous driving situations
SP2: road infrastructure sensing platforms to be installed in "black sports" road sections
SP3: core technologies: vehicle ad hoc network, local dynamic maps, vehicles' relative positioning
SP4: cooperative systems applications based on vehicle to vehicle communications
SP5: cooperative systems applications based on vehicle to infrastructure communications
SP6: deployment strategies to plan future perspectives of cooperative systems
SP7: key role to design the Common European Architecture for Cooperative Systems

Organisational Information

Budget	38 M€	EC Funding	20.5 M€
Duration	48 months	Start	February 2006
DG	Information Society and Media	Priority Area	ICT for Transport
Coordinator	Roberto Brignolo, CR FIAT	Contact	roberto.brignolo@crf.it
Partners	52 partners among them DAIMLER, RENAULT, VOLVO, Piaggio, Magneti Marelli, Bosch, Continental, TNO, MIZAR, COFIROUTE, ANAS,...		
Website	www.safespot-eu.org		

CVIS

Cooperative vehicle-infrastructure systems

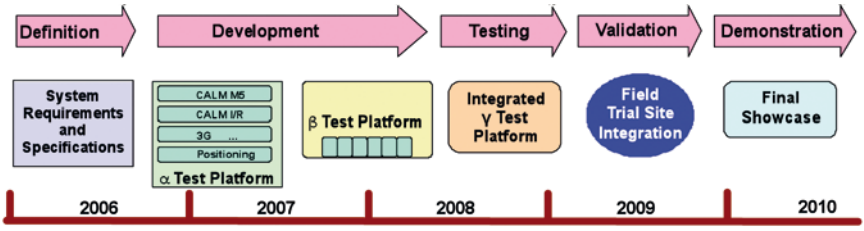
Motivation and Objectives

The goal of the CVIS project is to create and validate a universal technical platform to enable a future world where vehicles and infrastructure can freely communicate, interact and cooperate, bringing benefits of greater safety and efficiency, improved mobility and reduced energy consumption and environmental impact. The project has developed and is testing:

- a standards-based open architecture and a prototype universal reference platform
- a wireless network amongst vehicles & infrastructure
- an open framework for application development & management
- enhanced positioning and mapping solutions
- cooperative data management and sharing
- innovative cooperative applications.

Project Plan, Milestones and Deliverables

The figure below shows the CVIS development process and key milestones.



Achievements

The CVIS technologies have been integrated into a stable, universal platform suitable for the CVIS field trials and for use by third parties. Already over 10 other projects and companies have begun assessing the CVIS platform for their own activities. Extensive demonstrations were organised during the ITS World Congress in Stockholm in September 2009, showing the CVIS platform's performance and how CVIS applications could improve the safety and efficiency of mobility of people and goods. The winners of an Application Innovation Contest were announced at Stockholm, showing just how open and easy it can be to develop creative new cooperative mobility applications using the CVIS developers' kit and run-time environment.

Key achievements include:-

- highly flexible development and test platform available, suitable for cooperative mobility applications & services;
- nearly 1000 Congress delegates experienced eight different applications & services during demonstration rides;
- "demo theatre" production using real actors illustrated how cooperative systems can work to give real benefits for improved safety, efficiency, driver comfort and mobility.

Organisational Information

Budget	41 M€	EC Funding	21 M€
Duration	53 months	Start	February 2006
DG	Information Society & Media	Priority Area	ICT for Transport
Coordinator	P. Kompfner, ERTICO – ITS Europe	Contact	p.kompfner@mail.ertico.com
Partners	62 partners among them VOLVO, CR FIAT, DAIMLER, RENAULT, Logica, Q-Free, NAVTEQ		

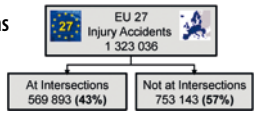
INTERSAFE-2

Cooperative intersection safety

INTER SAFE 2

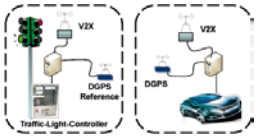
Objectives

- **Cooperative Intersection Safety System to improve traffic safety at intersections**
- Bidirectional V2X communication and cooperative data fusion
- Cooperative warning and interventions



Technologies

- Road user perception using on-board sensors
- Intersection reconstruction and relative localisation
- Intersection monitoring using infrastructure sensors
- Data fusion of on-board sensors and cooperative information

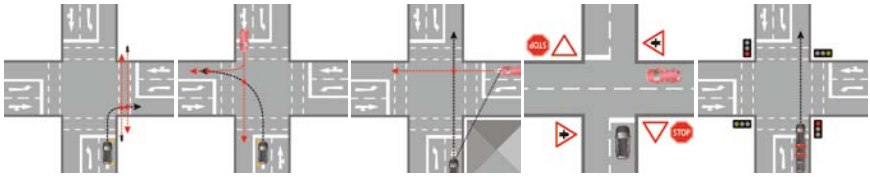


BMW demonstrator vehicle

Volkswagen demonstrator vehicle

VOLVO Tec. demonstrator truck

Addressed Intersection Scenarios



Right turning | Left turning | Crossing | Right-of-way | Traffic light

Organisational information

Budget	6.5 M€	Funding	3.9 M€
Duration	36 months	Start	June 2008
DG	Information Society and Media	Priority Area	ICT
Coordinator	Kay Fuerstenberg IBEO Automobile Sensor GmbH	Contact	Kay.Fuerstenberg@ibeo-as.com
Partners	BMW, VOLVO, VW, VTT, TRW, Ika, NEC, INRIA, Signalbau Huber, Uni Cluj-Napoca, Ibeo		

Integrated Safety

COMeSafety

Communications for eSafety

Motivation and Objectives

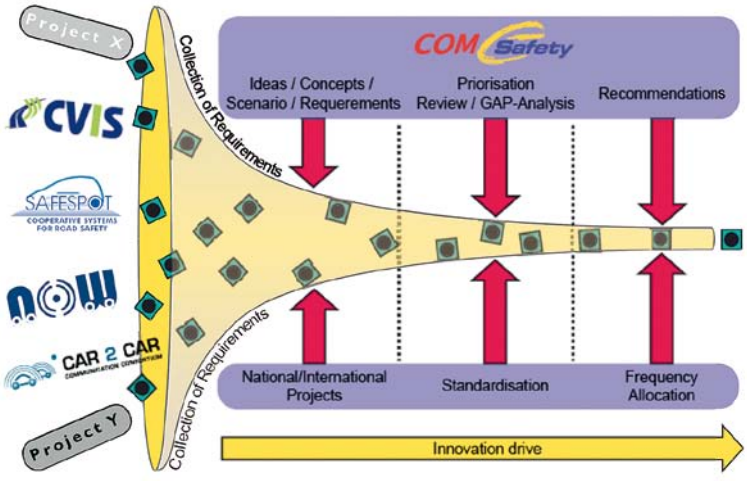
The overall goal of the COMeSafety proposal is to support realization and possible deployment of cooperative, communication based active safety systems. The project provides information to the EC about relevant technical and organizational matters. It is dedicated to foster wide agreement mainly on technical issues, but also on deployment strategies.

Objectives of the COMeSafety Project are:

- Co-ordination and consolidation of research results and their implementation.
- Support of the eSafety Forum, especially the Working Group Communications.
- Worldwide harmonisation.
- Frequency allocation: Support of spectrum allocation for ITS applications in the field of Car-2-Car and Car-2-X Applicatoins.
- Dissemination of system properties towards all stakeholders.

Consolidation Process

When COMeSafety started in 2006, many European projects and activities were planned or already on their way dealing with different aspects of Car-2-X communication and cooperative systems. A European wide process was missing to consolidate the results und to support the projects to introduce these results into the European and world wide standardisation process. Therefore a new consolidation process shown in the figure below is one of the main guiding principles of COMeSafety. The basic idea was to collect the requirements of the projects under consideration. These requirements needed to be consolidated. The results of the consolidation would provide a basis for the European and world-wide standardisation and the frequency allocation process.



Achievements

- European allocation of 30MHz of spectrum at 5,9GHz for V2V and V2I safety and efficiency applications.
- Definition and specification of the European ITS Communications Architecture.
- Support to ETSI in establishing the Technical Committee ITS.
- Contributions to eSafety Forum, especially WG Communications as documented in their final report.
- Organisation of the yearly vehicle communications workshop series.
- Publication of bi-yearly newsletters.
- Support of international harmonisation by information provision and recommendations.

Organisational Information

Budget	1.5 M€	Funding	1.1 M€
Duration	48 months	Start	January 2006
DG	Information Society and Media	Priority Area	eSafety ITS
Coordinator	Timo Kosch, BMW Forschung und Technik	Contact	timo.kosch@bmw.de
Partners	BMW, AUDI, DAIMLER, CR FIAT, RENAULT, VW, GZVB		
Website	www.comesafety.org		

HAVE-IT

Highly automated vehicles for intelligent transport

Motivation and Objectives

In the beginning of 2008 the European Commission started the co-funded HAVEit Integrated Project with 18 partners (OEMs, suppliers and research bodies). HAVEit aims at the development of highly automated vehicle applications built on the dynamic task repartition between driver and co-system as well as on the safe vehicle architecture. HAVEit covers vertical and horizontal issues:

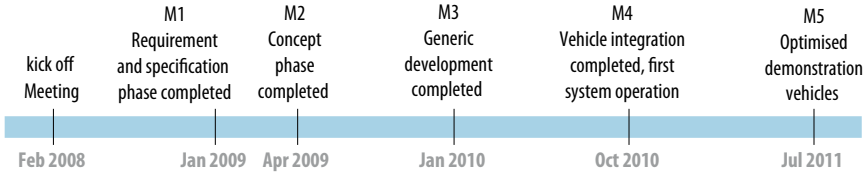
Vertical objectives (vehicle applications will be demonstrated in passenger cars, trucks and a bus):

- Highly automated applications: Automated Assistance in Roadworks and Congestion, Automated Queue Assistance, Temporary Auto-Pilot, Active Green Driving
- Safety architecture applications: Joint System Interaction, Brake-by-Wire Truck, Architecture Migration Demonstrator

Horizontal objectives (enabling technologies):

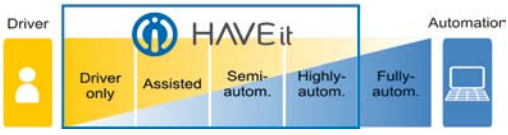
- The task repartition will be designed depending on driver load, environmental situation and other related factors.
- The suitable vehicle architecture will take into consideration the different safety demands, up to the fail-safe requirements caused by drive-by-wire platforms.

Project Plan, Milestones and Deliverables



Technical Approach

- On basis of driver state, driver wish and situation interpretation the most suitable automation level will be determined.
- One key challenge is the organisation of transitions between the automation levels. A further challenge consists in the definition of a minimum risk manoeuvre in case the driver is not able to properly react to a take-over request.
- Direct and indirect driver monitoring is applied for the detection of drowsiness and distraction.
- The environment will be monitored by a multi-sensor network. Advanced data fusion techniques will be used to achieve robust and reliable perception.



Achievements

M1: Function definition, requirements, specifications completed. Architecture developments ongoing according to plan.

M2: Realisation concepts available for joint system, dynamic task repartition and all highly automated vehicle applications available.

M3: Generic developments proceeding according to plan. Several joint system integration weeks for the joint system successfully completed. First joint system interaction validation by means of simulation.

M4: Demonstration vehicles and most components are available. Vehicle installation is ongoing.

Organisational information

Budget	28 M€	Funding	17 M€
Duration	42 months	Start	February 2008
DG	Information Society and Media	Priority Area	ICT for Intelligent Vehicles
Coordinator	Reiner Hoeger, Continental Automotive GmbH	Contact	reiner.hoeger@continental-corporation.com
Partners	18 partners among them VW, VOLVO Tec., Continental, Haldex, DLR, INRIA, LCPC, WIVW		
Website	www.haveit-eu.org		

SEVENTH FRAMEWORK PROGRAMME

euroFOT

European large-scale field operational tests on in-vehicle Systems

Bringing intelligent vehicles to the road

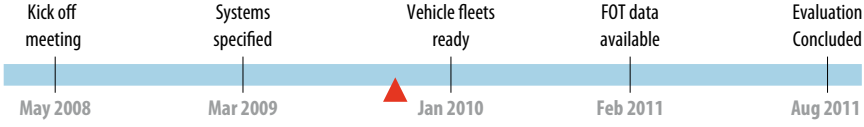
Motivation & Objectives

The European project euroFOT is developing a large-scale assessment program for advanced active safety systems (ADAS) in cars and trucks, based on Field Operational Tests with normal drivers in ordinary traffic. Road safety, energy efficiency and traffic congestion are major challenges faced by our transport system. New in-vehicle technologies can significantly improve these issues. However, their implementation represents a risk to manufacturers in terms of different markets, user acceptance, and real-world driving conditions. Field Operational Tests are a powerful tool for making correct business and political decisions, as well as for understanding directions for further deployment and areas with major potential benefits.

The objectives of the study are:

- Perform coordinated tests of several Intelligent Vehicle Systems with ordinary drivers in real traffic
- Investigate performance, driver behaviour, and user acceptance
- Assess the impacts on safety, efficiency, and the environment using data in a variety of scenarios

Project Plan, Milestones and Deliverables

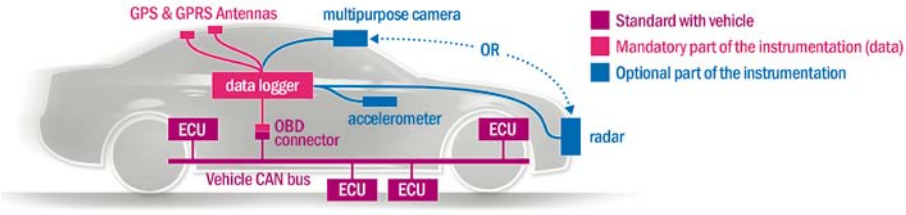


Technical Approach

- Use state-of-the-art ADAS applications in vehicles, operated by ordinary drivers and without supervision
- Define research questions & hypotheses
- Specify a common set of scenarios and performance indicators
- Implement reliable data acquisition and communication systems on board
- Collect data during 12 months, with an exposure of approximately 18 million km
- Include a pilot phase for tuning the experiments and a set of baseline conditions for proper analysis
- Develop and apply a common framework for data analysis, including OEM-specific investigations

Achievements

SP2: definition of research hypotheses for all stand-alone functions and their combinations
SP3: specification and selection of Data Acquisition Systems for CAN data, CAN+video and for extra sensors
SP4: design of the experiments, including a description of events, situational variables and metrics for the measurements
SP5: operational procedures for the Vehicle Management Centers (daily operation, driver selection and assistance, documentation, etc.)
SP6: definition of the framework for Data Analysis
Establishment of an international network addressing FOT and related issues



Organisational Information

Budget	22 M€	Funding	14 M€
Duration	40 months	Start	May 2008
DG	Information Society and Media	Priority Area	ICT for Mobility
Coordinator	Aria Etemad, FORD	Contact	aetemad1@ford.com
Partners	28 partners among them BMW, CR FIAT, DAIMLER, FORD, MAN, VOLVO Cars, VOLVO Tec., VW		
Website	www.eurofot-ip.eu		

EUCAR
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SEVENTH FRAMEWORK PROGRAMME

PRE-DRIVE C2X

Preparation for driving implementation and evaluation of C2X communication technology

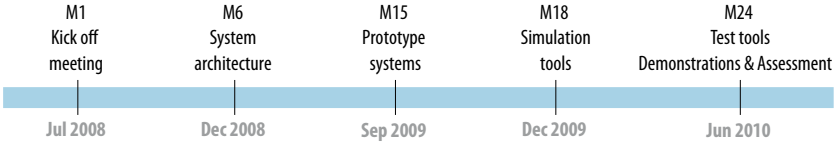
Motivation and Objectives

PRE-DRIVE C2X prepares a large scale field trial with vehicular communication technology. Based on the common European architecture for a vehicle to x communication system, defined by the task force on cooperative systems led by COMeSafety, PRE-DRIVE C2X develops a detailed specification for such a system and a functionally verified prototype robust enough to be used in future field operational tests.

All tools and methods necessary for functional verification and testing of cooperative systems in laboratory environment and on real roads in the framework of a field operational test will be developed.

Project Plan, Milestones and Deliverables

The figure conveniently summarises the results for PRE-DRIVE C2X to pave the road towards a Europe-wide implementation of vehicle-to-x communication technology fro a safe and sustainable mobility.



Technical Approach

- Development of a consistent system architecture for European cooperative driving systems
- Commonly agreed use cases for V2X communication systems
- Development of an integrated simulation tool set to assess all aspects of V2X
- Robust hardware and software components suitable for use in field operational tests.
- Verified methods and tools for field operational test with V2X.
- Demonstration, functional verification and impact assessment of the Common European Architecture on V2X.

Achievements

WP1000: Consolidation of the harmonized European ITS communication architecture for cooperative systems: PRE-DRIVE C2X supports and leverages the benefits of the architectural concepts and provides important measures to validate the architectural concept that is considered by ETSI TC ITS for standardisation.

WP2000: PRE-DRIVE C2X provides an integrated tool set that allows a complete simulation and evaluation of the impacts of cooperative systems.

WP3000: PRE-DRIVE C2X identified and specified the components that are not yet available and selected the most promising among the existing ones to develop relevant use cases for safe, efficient and clean mobility.

WP4000: PRE-DRIVE C2X provides a comprehensive testing infrastructure to support all aspects of system's verification and validation.

WP6000: Towards future deployment of cooperative systems: two stakeholders' workshops have been successfully organised with the active participation of all relevant stakeholders.

Organisational Information

Budget	8.43 M€	Funding	5.02 M€
Duration	24 months	Start	July 2008
DG	Information Society and Media	Priority Area	ICT for Transport
Coordinator	Matthias Schulze, DAIMLER	Contact	matthias.m.schulze@daimler.com
Partners	24 partners among them AUDI, BMW F&T, CR FIAT, DAIMLER, OPEL, VW, VOLVO Tec., Delphi, Hitachi, NEC, Renesas, SAP, PTV, ...		
Website	www.pre-drive-c2x.eu		

ASSESS

Assessment of Integrated Vehicle Safety Systems for improved vehicle safety

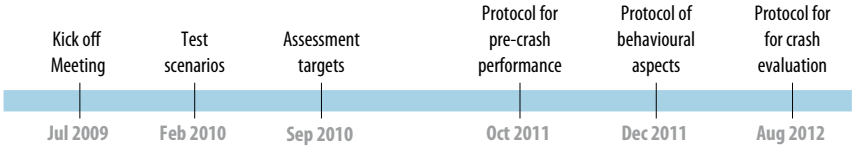
Motivation and Objectives

Pre crash sensing systems that use environment sensors to detect dangerous traffic situations have a high potential to improve vehicle safety due to their ability to influence crash conditions and/or adapt to these crash conditions. In order to enable wide spread introduction a project dedicated to the development of assessment procedures has been initiated involving members of EUCAR, CLEPA and EARPA.

The main objective of the study is to develop harmonised and standardised assessment procedures and related tools for frontal pre crash sensing systems. Procedures will be developed for driver behaviour evaluation, pre crash system performance evaluation, crash performance evaluation and socio economic assessment.

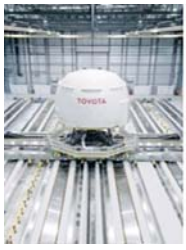
Project Plan, Milestones and Deliverables

The figure conveniently summarises the result timeline for the development of a protocol for crash evaluation involving pre-crash performance and behavioural aspects.



Technical Approach

- Define test scenarios and evaluation criteria based on field data and information from field operational tests
- Investigate the driver behaviour in relation and interaction to a pre crash sensing system by means of driving simulator test and track tests with volunteers. Tests will be done using commercially available pre crash systems .
- Develop test and assessment methods for the remote sensing systems and pre crash actions suitable for regulatory testing and consumer assessment by updating existing test track facilities.
- Develop methods to evaluate the benefits of pre-crash systems during the crash phase of an accident, based on experience in the passive safety field. Simulations, sled testing and full crash testing are considered here.
- Validation of repeatability and reproducibility of the developed assessment methods by extensive expert audits
- Develop methods for the socio-economic impact assessment based on results from previous EU FP projects like eIMPACT.
- Investigate liability aspects related to pre crash sensing systems for EU and the US



Organisational Information

Budget	5.4 M€	Funding	3.6 M€
Duration	42 months	Start	July 2009
DG	Research	Priority Area	SST
Coordinator	Paul Lemmen, FTSS Europe B.V.	Contact	plemmen@ftss.com
Partners	15 partners, FTSS, BAST, BOSCH, Chalmers, DAIMLER, IDIADA, PSA PEUGEOT CITROËN, TNO, Toyota, TRL, TRW, Uniresearch, TUG, CEESAR, UoC		
Website	www.assess-project.eu		

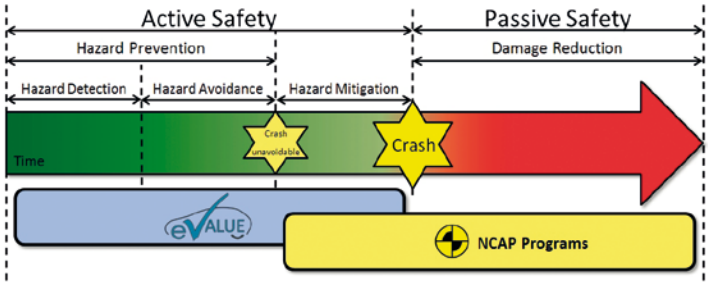
eVALUE

Testing & evaluation methods for ICT-based safety systems

Motivation and Objectives

eVALUE is a joint initiative led by members of EUCAR and EARPA which has the objective to define testing and evaluation methods for active vehicle safety. This will raise customer awareness and under-standing for the topic. In particular, the objectives are:

- Definition of objective evaluation and testing methods and performance criteria
- Regard active safety of vehicles as such (not on the system level)
- Physical testing, supported by simulation
- Communication with key stakeholders like OEMs, suppliers, national authorities, customer organizations, ISO working groups etc.
- Raise public awareness for the topic, e.g. by easy-to-understand benchmarks
- Support development at vehicle OEMs and suppliers with common testing methods
- No fail or pass criteria (thresholds) will be defined by the project



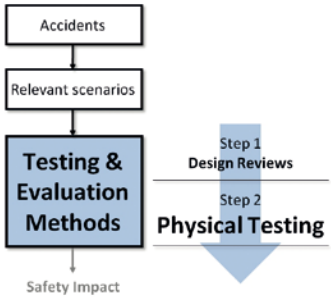
Project Plan, Milestones and Deliverables

The project plan has been adopted to meet the latest developments. The focus has been changed from a system-oriented to a full-vehicle-oriented approach. The next milestones and deliverables are:

- Second version test and assessment protocols: February 2010
- Completion of physical testing: June 2010
- Final event and project completion: December 2010

Technical Approach

The adjacent figure gives an overview of the top-down approach which has been chosen by the project partners.



- Practical analysis of available accident statistics and results of previous projects (TRACE, eIMPACT)
- Derivation of relevant traffic scenarios which represent critical driving situations
- Investigation of different testing & evaluation methods and decision for a two-step procedure:
- Step 1: Design Reviews of the subject vehicle and its equipment including HMI
- Step 2: Physical Testing in longitudinal, lateral and stability-related situations

Achievements

- Derivation of relevant traffic scenarios for active safety assessment
- Description of draft procedures for longitudinal, lateral and stability-related physical testing
- Definition of design reviews for: subject vehicle, environmental conditions, HMI, and functional safety
- Definition of draft safety indicators according to test procedures
- Investigation of driver behaviour started
- Active cooperation with different stakeholder groups

Organisational Information

Budget	3.8 M€	EC Funding	2.3 M€
Duration	36 months	Start	January 2008
DG	ICT	Priority Area	ICT for Transport
Coordinator	Micha Lesemann, (IKA)	Contact	info@evalue-project.eu
Partners	VOLVO Tec., CR FIAT, SP, VTI, IDIADA, Tecnalia Robotiker, IBEO, IKA		
Website	www.evalue-project.eu		

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SEVENTH FRAMEWORK PROGRAMME

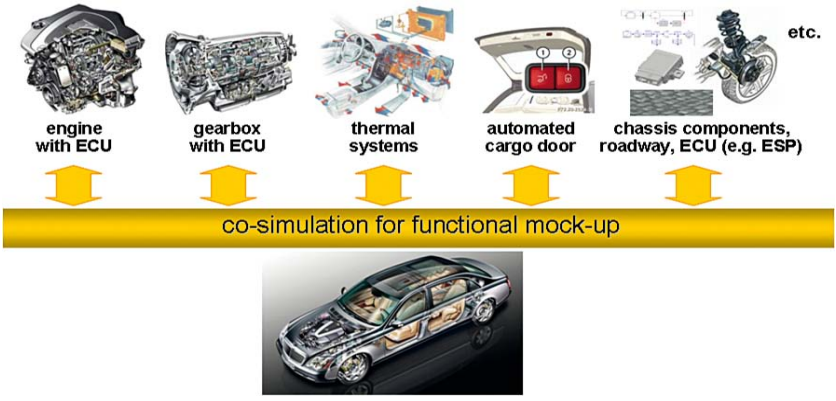
MODELISAR

Modelica – AUTOSAR integration to support vehicle Functional Mockup

Motivation and Objectives

Functional Mock-Up is the next generation of the Digital Mock-up to enable the simulation of the vehicle functional behaviour, leveraging Modelica for vehicle behaviour modelling & simulation, and AUTOSAR for embedded software generation.

MODELISAR objective is to boost collaboration and innovation across system and software disciplines thanks to integrated System & Software simulation (Functional Mock-up), and to enable early vehicle behaviour tests at a lesser cost in the virtual world



Project Plan, Milestones and Deliverables

The project will deliver a standard proposal through Functional Mockup Interface (FMI) specifications, and a series of proof of concept demonstrators for the following scenarios: Cabriolet Top, Electrical Drive, Electronics, Energy Mgt, Electrical Power, Interior HMI, Power Lift Gate, Engine Gearbox Shifting, Mechatronic Card Board, Chassis Control, Combustion Ignition, Climate Comfort.

Technical Approach

- Describe automotive use cases; describe code generation, HIL, calibration and test use cases.
- Provide them as expectations onto the FMI.
- Perform technology studies based on state of the art in simulation topics
- Use the above elements to specify the FMI
- Implement FMI prototypes, esp. for Modelica and AUTOSAR tools
- Demonstrate the FMI through use cases prototypes
- Finally demonstrate the tool chain integration and engineering workflow on the PLM infrastructure

Achievements

WP1 Project management: organization and means are installed

WP2 FMI development: specifications are iteratively delivered, technologies studies and tools prototypes are going on

WP3 Automotive Proof of Concept: use cases definition and demonstrators preparation are going on

WP4 Code generation, HIL, calibration and test: use cases definition and demonstrators preparation have started

WP5 Collaborative PLM for Modelica, AUTOSAR & FMI: at beginning, will reuse previous WP results

Organisational Information

Budget	30 M€	Funding	10 M€
Duration	36 months	Start	July 2008
DG	Information Society and Media	Priority Area	ITEA2 PROJECT
Coordinator	Francois Bichet, Dassault Systèmes	Contact	francois.bichet@3DS.com bernd.relovsky@daimler.com
Partners	29 OEMs, SME, research institutes - Dassault Systèmes, DAIMLER, VW, VOLVO, AVL, LMS/Imagine, INTEC, ITI, QTronic, Dynasim Geensys, Extessy, DLR, Arsenal, Fraunhofer, IFP, Trialog, ATB, Berata, TWT, Verhaert, …		

CESAR

Cost-efficient methods and processes for safety relevant embedded systems

Motivation and Objectives

The CESAR- domains need to develop ultra-reliable embedded systems meeting societal demands for increased mobility and ensuring safety in highly competitive global markets. Answering the ARTEMIS JTI Call 1, CESAR contributes to safe mobility in respect of environment, for which embedded systems are key enabling solutions.

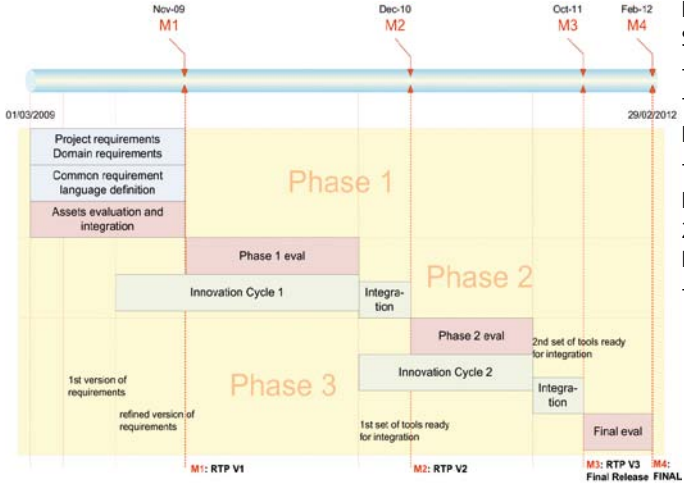
CESAR aims to boost cost efficiency of embedded systems development and safety and certification processes by bringing significant innovations in the two most improvable systems engineering disciplines:

- Requirements-Engineering
- Component-Based-Development

In addition, CESAR intends to provide a breakthrough in system development by deploying a Reference Technology Platform (RTP).

Project Plan, Milestones and Deliverables

CESAR follows a development process with two innovation cycles. The initial RTP is extended in each innovation cycle with new capabilities requested and evaluated by the application subprojects.



Phase 1:
Survey and providing RTP
- definition of requirements
- ends with 1st version of RTP

Phase 2: 1st innovation cycle
- ends with 2nd version of RTP

Phase 3:
2nd innovation cycle,
Final Evaluation
- ends with final RTP

Technical Approach

The Domain-Subprojects (SP5 Automotive, SP6 Aerospace and SP7 Rail& Automation) provide information about their gaps and needs in safety-critical development to the Innovation-Subprojects (SP1 Reference Technology Platform, SP2 Requirements Engineering and SP3 Component Based Development). The Innovation-Subprojects turn solutions over to the Domain-Subprojects who are evaluating them in applied pilot applications. The process described represents the innovation cycle that will be repeated 2 times in CESAR.

Achievements

- Innovation Subprojects: SP1 to build the CESAR Reference Technology Platform, preparing and enabling such customized integration by providing means for the automated construction of customized development platforms. SP2 (Requirements Engineering) and SP3 (Component Based Development) are jointly achieving the harmonized technical requirements.
- Domain Subprojects: SP5 (Automotive), SP6 (Aerospace) and SP7 (Rail & Automation) are focusing on the integration of technical innovations of the innovation subprojects in domain-specific processes and assessing the achievements of technical and business objectives by use case developments, in particular involving the initial scenarios.

Organisational Information

Budget	58.5 M€	Funding	28.3 M€
Duration	36 months	Start	March 2009
ARTEMIS JU	DG Infso	Priority Area	Embedded Systems
Coordinator	Josef Affenzeller, AVL List GmbH	Contact	info@cesarproject.eu
Partners	55 Partners among which CR FIAT, VOLVO Tec.	Website	www.cesarproject.eu

GENESYS

Generic embedded system platform

Motivation and Objectives

The world of embedded systems is broad and diverse, addressing a wide variety of application contexts. The present-day embedded systems technological situation is correspondingly fragmented. However, the following technology trends enforce a consolidation:

- Economies of scale of the semiconductor industry
- Interoperability of systems from different domains
- Pressing need to reduce the number of nodes and cabling through multi-criticality nodes
- Cross-domain challenges (e.g., security, robustness, and diagnosis)
- Education and limited human resources
- Investments in software and tools

It was the objective of the GENESYS project to develop a cross-domain reference architecture for embedded systems that meets the requirements and constraints documented in the ARTEMIS Strategic Research Agenda (e.g., composability, robustness, energy efficiency). The reference architecture is domain-independent and serves as a template that can be instantiated to concrete platforms for individual application domains (i.e., automotive, avionic, industrial control, mobile, consumer electronics).

Project Plan, Milestones and Deliverables

The figure summarizes the main results. The **architectural style** of GENESYS encompasses fundamental architectural principles that guide the designer in such a way that the ensuing system meets the ARTEMIS challenges. GENESYS is a platform architecture that provides a minimal set of core **architectural services** and a plurality of optional service that are predominantly implemented as self-contained system components. Choosing a suitable set of these system components that implement optional services, augmented by application specific components, can generate domain-specific instantiations of the architecture. A model-based **development methodology** supports this instantiation. Further important results include the **prototype implementations** of the architecture and the **assessment** by the industrial partners. A concise overview of the architecture is available in the **GENESYS book** (ISBN 978-3-8381-1040-0), which can be downloaded at http://www.genesys-platform.eu/genesys_book and will be commercially available through the publisher Südwestdeutscher Verlag für Hochschulschriften (SVH).

Main Achievements

Using the GENESYS architecture, significant improvements concerning time-to-market, cost, and robustness for a wide range of applications are possible. Through its architectural principles (e.g., strict component orientation) and the generic architectural services, GENESYS contributes towards a cross-domain solution for the ARTEMIS challenges. In particular, GENESYS provides solutions to the following three challenges:

Composability: GENESYS supports the straightforward composition of systems out of independently developed components. In addition, the GENESYS architecture facilitates the establishment of a component-market for multiple domains. For example, a given security or networking component might be deployed in automotive as well as avionic and industrial control applications. Thereby, the transition from separate sectoral, vertically structured markets to a horizontally structured market is supported.

Robustness: GENESYS supports the robustness of embedded systems by establishing a framework for fault containment and error containment, the selective restart of components that have failed after a transient fault, and the masking of transient and permanent errors.

Energy Efficiency: GENESYS provides for energy efficiency by integrated resource management that makes it possible to individually reduce the power-requirements of components or to turn off components completely that are not needed during a particular interval (power gating). In addition to the basic configuration services, advanced dynamic resource management services can be provided by dedicated resource management components.

Organisational information

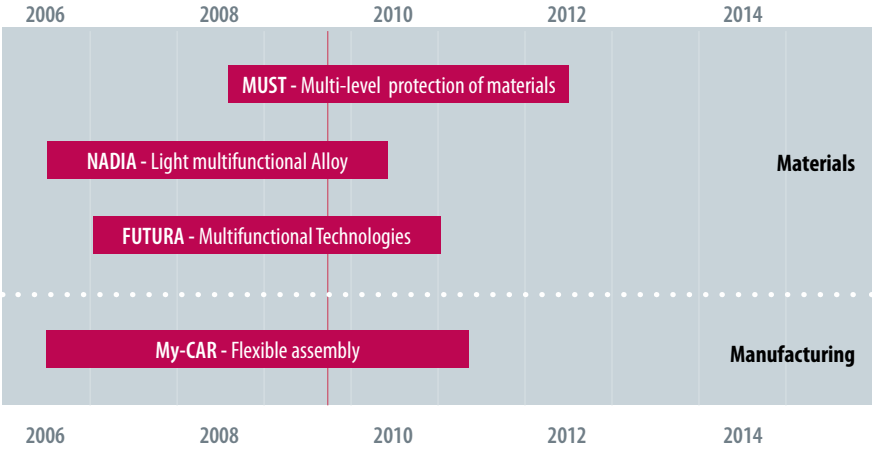
Budget	2.8 M€	Funding	1.8 M€
Duration	18 months	Start	January 2008
Coordinator	Roman Obermaisser, TU Vienna	Contact	roman.obermaisser@tuwien.ac.at
Partners	23 partners among which CR FIAT, VOLVO Tec.		
Website	www.genesys-platform.eu		

EUCAR
EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

SEVENTH FRAMEWORK PROGRAMME

Materials and Manufacturing

Mapping of R&D projects



MUST

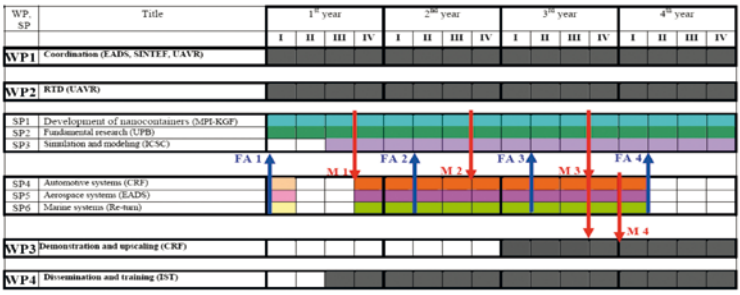
Multi-level protection of materials for vehicles by "smart" nanocontainers

Motivation and Objectives

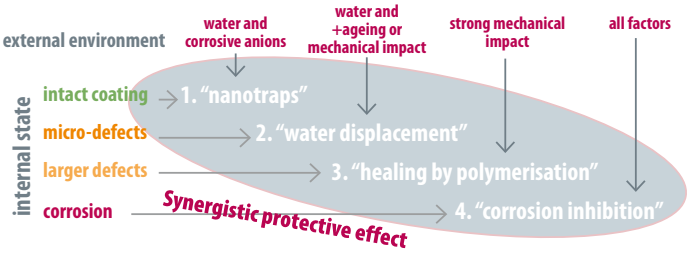
The destructive effect of environment and the corrosion induced degradation are the important problems which determine the service life of a vehicle or its components. The application of organic coatings is the most common and cost effective method of improving protection and durability of metallic and plastic structures. However the degradation processes develop faster after disruption of the protective barrier. Therefore an active protection based on "self-healing" of defects in coatings is necessary to provide long-term effect. Another indispensable issue for manufacturing of future vehicles is adhesive joining of structural components. The contact of adhesively joined structures with environment containing water and other aggressive species leads to the ageing and the degradation of adhesive joints as in the case of coatings.

The main vision of the project MUST is development of new active multi-level protective systems for future vehicle materials. Products like self-healing coatings, adhesives and other composite materials will be based on "smart" release nanocontainers incorporated into the polymer matrix of current commercial products. A multi-level self-healing approach will combine - within one system - several damage prevention and reparation mechanisms, which will be activated depending on type and intensity of the environmental impact

Project Plan, Milestones and Deliverables



Technical Approach



Achievements

WP1: Coordination and project management

WP2: lab-scale development of nanocontainers of corrosion inhibitors, compatibility evaluation of some nano-containers with coating formulation, development of model coating and adhesive systems.

WP3: The pre-industrial applicability of the technology developed in WP2 will be demonstrated in WP3. The activity will start on month 24

WP4: Training, dissemination and exploitation strategy. Presentation of preliminary results in 2 international congresses, first training course in the frame of the MUST and Multiprotect projects.

Organisational Information

Budget	10.53 M€	Funding	7.14 M€
Duration	48 months	Start	June 2008
DG	Research	Priority Area	Sustainable Surface Transport
Coordinator	EADS	Contact	Theo Hack
Partners	20 beneficiaries from 10 different European Countries among which CR FIAT, VOLVO Tec.		
Website	http://www.sintef.no/Projectweb/MUST/		

NADIA

New automotive components designed for and manufactured by intelligent processing of light alloys

Motivation and Objectives

NADIA is an IP-SMEs Project supported by EU inside the 6th FP, whose aim, through collaborative research and technological development, along a value chain with research groups, design, engineering and manufacturing companies is to allow the exploitation of the potential of light multifunctional alloys for car and truck components and systems through advances in nano & micro technologies. NADIA addresses multi-level S&T objectives:

- Engineering & Production:
  Proof-of-concept light alloys multifunctional components for the transport industry.
- Applied RTD:
  Multi-scale design & simultaneous engineering tools, Processing solutions, Procedure & standards for components.
- Basic Research: Models of nano-scale phenomena in alloys and nano/micro structure effects on properties, Alloying elements effects on components behaviour, Optimised nano-size powders for coatings.

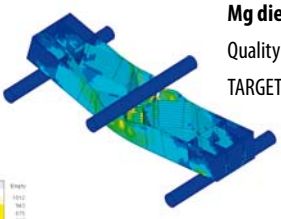
To fully exploit the potential of the EU SME's, the employed approach is the Intelligent Processing, combining Multi-scale simultaneous engineering tools, deeper knowledge about alloys and SME involvement to develop and produce high-tech components.

Project Plan and Deliverables

The alloys, the processes and the engineering methods and tools coming from NADIA will lead to an optimised and intelligent use of materials in components for the transport industry.

To witness NADIA's interest for application of simultaneous engineering approach, proof-of-concept Demonstrators will be manufactured: multifunctional powertrain components with safety, and, environmental functionality, combining high crash and fatigue behaviour, impact and wear resistance, and significantly contributing to the reduction of weight (and emissions) of future vehicles.

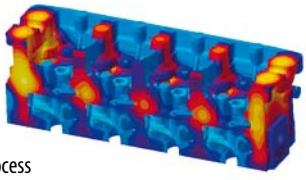
Key aspects of multi-scale design for the different demonstrator components



Mg die-casting process

Quality mapping

TARGET: Crash behaviour



Al cylinder head

Heat treatment process

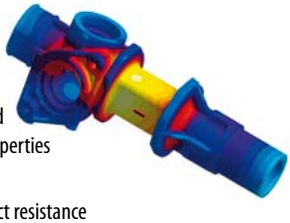
Local mechanical properties and residual stress

TARGET: Fatigue behaviour

Al Engine Block

Heat treatment process
Linear nano-coating

TARGET: Mechanical behaviour and wear resistance



Al die-casting

Quality mapping and local mechanical properties

TARGET: Mechanical behaviour and impact resistance

Organisational Information

Budget	13.2 M€	Funding	7.2 M€
Duration	48 months	Start	May 2006
DG	RTD/Unit G2 CDMA 0/35	Priority Area	Automotive Industry
Coordinator	Stefano Odorizzi, EnginSoft S.p.A.	Contact	s.odorizzi@enginsoft.it
Partners	Total of 26 from 7 European countries EnginSoft SpA, CR FIAT, DAIMLER, Hydro, Raffineria Metalli Capra, Teksid Aluminum, Toolcast, Abamotor Energía, MAGMA GmbH, Foundrysoft, University of Trondheim, Università di Padova, IPPT, Helsinki University of Technology, SINTEF, Fundación Tekniker, MBN, Matfem, Thermico, LPM, Imperia, Fundación CIE, FORD, Jönköping University, Rheinisch-Westfälische Technische Hochschule Aachen, INGUS		

FUTURA

Multi-functional materials & related production technologies integrated into future industries

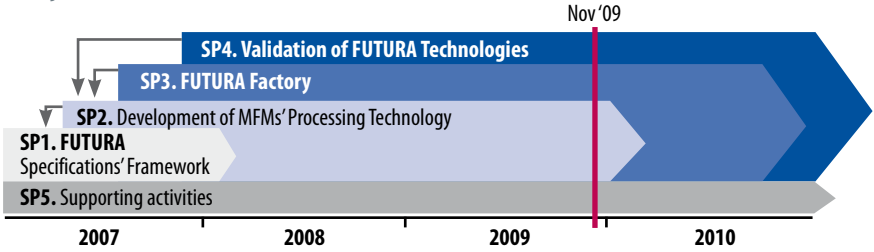
Motivation and Objectives

FUTURA Project motivation:

- to promote the development of innovative vehicles, with high-added customer value and environmental sustainability,
- to evolve from the traditional BiW structures to a new generation vehicles with advanced functionality,
- to develop a cost efficient light weight design of vehicles for minimizing CO_2 emissions and,
- to integrate innovative materials and processing methods into the BIW production

FUTURA Project aims to increase the competiveness of the European automotive industry by introducing new materials and processes, with the scope of reducing cost and development time and increase customization possibilities.

Project Plan, Milestones and Deliverables



Technical Approach and Achievements

SP1: Project Specifications:

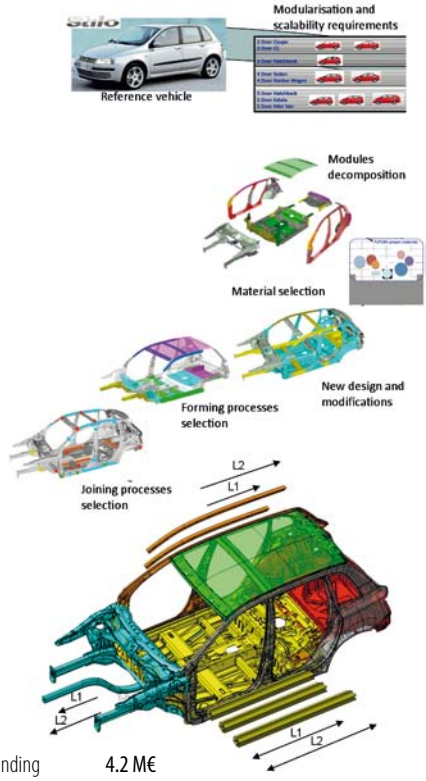
- Multi-functional materials assessment – database implementation
- Profile intensive BiW
- Development of FUTURA business case

SP2: Process development:

- Forming processes
  - Stamping of sandwich sheets
  - Roll-forming of MFMs
  - Stretch bending of complex profiles
  - Integration of APM foam
  - ILC/D-LFT & injection molding with nano-fillers
- Laser Welding
  - Laser welding
  - Adhesive bonding
  - Mechanical – Hybrid bonding
  - MIG/TIG, FSW and RSW

SP3: FUTURA Factory:

- Process monitoring issues
- Development of production setups
- Production planning and control issues



Organisational Information

Budget	7.1 M€	Funding	4.2 M€
Duration	48 months	Start	January 2007
DG	Research	Priority Area	NMP
Coordinator	Dr. Karl-Heinz Fueller, DAIMLER	Contact	karl-heinz.fueller@daimler.com
	Prof. G. Chryssolouris, LMS		gchrys@hol.gr
Partners	DAIMLER, PORSCHE, CR FIAT, VOLVO, RENAULT, Sika, Comau, Novelis, Bertrandt, LMS-UniPatras, UniSkoevde, BTU-Cottbus, Polyt. Slaska, Armines-CEMEF, Fraunhofer-IFAM, SLV Duisburg, CreaForm		
Website	www.futura-ip.eu		

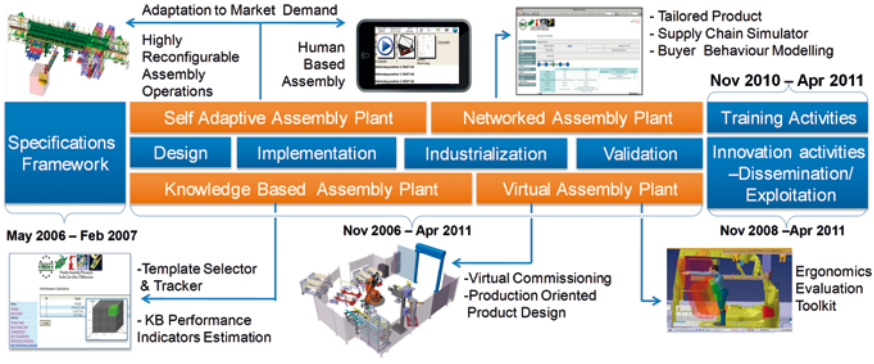
MyCar

Flexible assembly processes for the car of the third millennium

Objectives

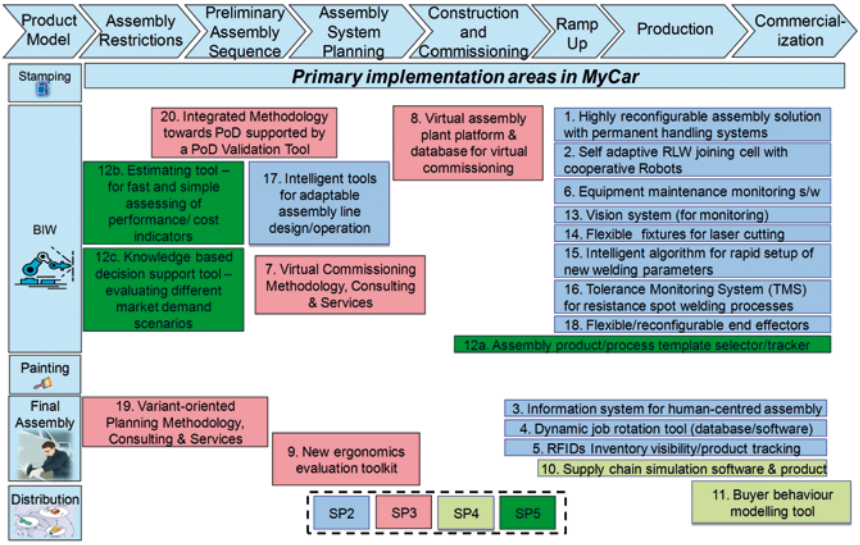
Long term sustainability of EU vehicle manufacturing considering the customer as the core element, offering personalisation to achieve market differentiation against non-EU competitors.

Project Plan, Milestones and Deliverables



Technical Approach and Achievements

- Enhancing production flexibility/ increasing number of models produced in a single line - flexible assembly equipment and human operators to easily adapt to market variations
- Shorter ramp up times - virtual validation of production using realistic model of actual production – Advanced human ergonomics simulation
- Supply chain flexibility - enhanced supply chain communication flows to enable real time decisions
- Closing the loop between production & design - shorten product/process implementation time

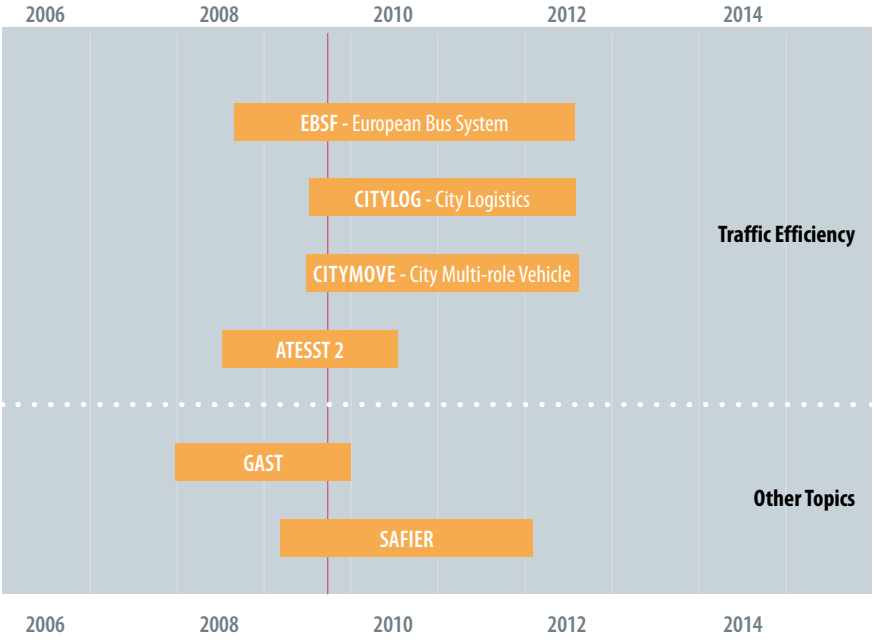


Organisational Information

Budget	9.6 M€	Funding	6 M€
Duration	60 months	Start	May 2006
DG	Research	Priority Area	NMP
Coordinator	Bert Hill, VOLVO Tec.	Contact	bert.hill@volvo.com
Project management	Prof. George Chryssolouris, LMS	Contact	gchrys@hol.gr
Partners	VOLVO, DAIMLER, FORD, CR FIAT, COMAU, PRIMA, HWH, CASP, LMS-UniPATRAS, Chalmers, UniSKOVDE, UNIKARL, UdS, Siemens A&D, EDAG, Tünkers, Emphasis, CENIT		
Website	www.mycar-project.eu		

Mobility and Transport

Mapping of R&D projects



EBSF

European bus system of the future

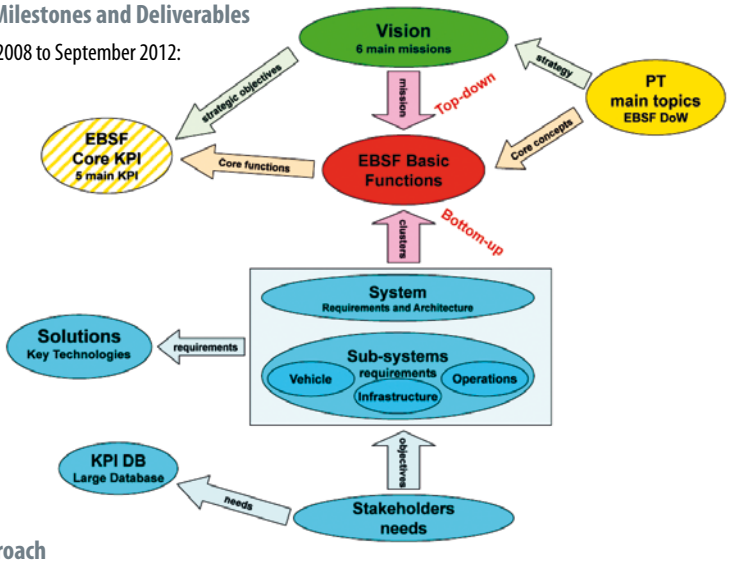
Motivation and Objectives

The EBSF project brings together the five leading European bus manufacturers and other 41 partners to:

- Conceive and develop an innovative high quality bus system adapted to European cities
- Make a breakthrough design of vehicles, infrastructures and operations
- Improve the competitive position of the European bus manufacturers and operators
- Provide guideline for the operational implementation of the new concept "European bus system"
- Set-up the frame for harmonisation and standardisation of the innovative solutions
- Create the backbone of a new Research Agenda for bus systems

Project Plan, Milestones and Deliverables

From September 2008 to September 2012:



Technical Approach

- Develop prototypes of the vehicles and the bus components
- Create four bus demonstrators
- Build simulation tools vehicle demonstrator, equipments and prototypes

Achievements

- Collection of the Needs from all the Bus System stakeholders: users, operators, authorities, industry…
- Identification of the large set of Key Performance Indicators to assess the whole EBSF system
- Identification of the EBSF System Requirements and the relative EBSF Basic Functions
- Definition of the EBSF System Architecture & Interface
- Identification of the Sub-Systems (Vehicle, Infrastructure and Operation) Requirements
- Overall description of generic IP vehicle communication architecture (state of art)
- Specification reports of Handling support system guidance
- Analysis of A/C requirements
- Publication of the EBSF Vision

Organisational information

Budget	26 M€	Funding	16 M€
Duration	48 months	Start	September 2008
DG	Research	Priority Area	Mobility and Transport
Coordinator	Umberto Guida (UITP)	Contact	umberto.guida@uitp.org
Partners	47 partners among them Evobus/ Mercedes, Irisbus IVECO, MAN, Scania		
Website	www.ebsf.eu		

CITY-LOG

Sustainability and efficiency of city logistics

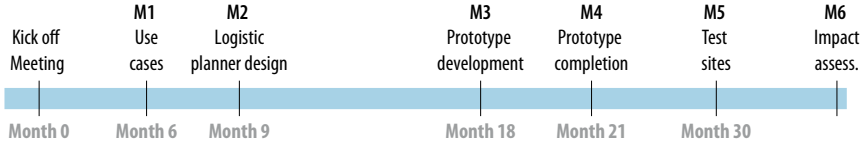
Motivation and Objectives

The CITYLOG project aims at increasing the sustainability and the efficiency of urban delivery of goods through an adaptive and integrated mission management and innovative vehicle solutions. Logistic oriented telematic services for optimised routing and mission management, vehicle technologies to enable operational flexibility and safety of lorries and vans, innovative load units are the elements of the CITYLOG logistic model. All these components will allow to:

- reduce of vehicles entering the urban areas;
- decrease of unsuccessful deliveries;
- make acceptable transhipment operations in terms of efficiency and costs;

Project Plan, Milestones and Deliverables

The figure conveniently summarises the main milestones for the project.



Technical Approach

- development of logistic-targeted telematic services for optimised planning and routing, including a service for the last-mile parcel tracking
- designing and prototyping new vehicle solutions both for medium-heavy and light commercial vehicles, with interoperability enabled by a new load unit
- use of simulation tools to estimate the impact of the CITYLOG solution on a large scale
- test case implementation and demonstration on three European cities (Berlin, Lyon and Torino areas)

Achievements

CITYLOG is in its negotiation phase, and expected project outcomes are:

WP1: collection of the functional requirements coming from the actors involved in the city logistics. Start from a general analysis of current trends in Europe and identification of use cases;
WP2: evaluation of functional requirements for the expected mission support systems (planning, rerouting etc.);
WP3: development of a telematic framework to support the logistic operators for a rationale and effective trip management and for successful missions.
WP4: vehicle and load units prototyping.
WP5: application of CITYLOG solutions to improve the local city logistics in the CITYLOG test sites.
WP6: analysis of results coming from the test sites and evaluation of the CITYLOG impact, also in terms of business aspects.

Organisational information

Budget	6 M€	Funding	3.6 M€
Duration	36 months	Start	Fall 2009
DG	Research	Priority Area	Urban mobility
Coordinator	Saverio Zuccotti, CR FIAT	Contact	saverio.zuccotti@crf.it
Partners	18 partners among them CR FIAT, IVECO, VOLVO, TNT		
Website	www.city-log.eu		

CITY-MOVE

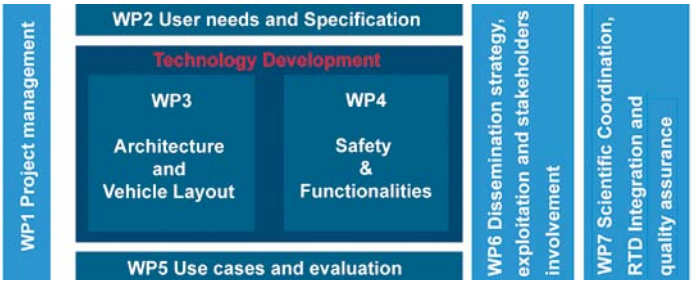
CITY multi-role optimized vehicle

Motivation and Objectives

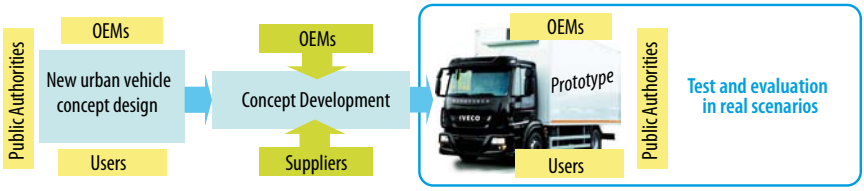
- CITY MOVE aims at developing an innovative integrated vehicle solution fitting with the integrated city transport solution approach for a secure, flexible, reliable, clean, energy efficient and safe road transportation of goods across European cities, having also a significant impact on reduction of CO_2 emissions and improvement in terms of safety and security.
- CITY MOVE aims at contributing to matching EC needs by integrating new technologies into a urban multi-role solution in a interoperable environment bringing to a significant breakthrough increasing in terms of efficiency and safety (in-vehicles) and reduction in CO_2 emissions

Project Plan, Milestones and Deliverables

The figure below shows the structure of the project. Main deliverables will be two demonstrator vehicles (IVECO, VOLVO)



Technical Approach



Achievements

CITYMOVE expected project outcomes are:

- User needs and system requirements.
- System and architecture specification.
- Vehicle, traffic and goods movement model.
- Specification, design and prototyping of specifically designed functions:
  - anti-rollover
  - vulnerable road user protection
  - collision avoidance
- Specification, design and development of solution to reduce emission
  - noise reduction
  - vehicle fuel consumption
  - energy management of auxiliaries
  - low CO_2 refrigerating systems
- Two prototype vehicles
- Results of test and impact assessment

Organisational information

Budget	5.4 M€	Funding	3.3 M€
Duration	36 months	Start	Fall 2009
DG	Research	Priority Area	Urban mobility
Coordinator	Gianfranco Burzio, CR FIAT	Contact	gianfranco.burzio@crf.it
Partners	13 partners among them CR FIAT, IVECO, VOLVO, Continental		
Website	www.citymoveproject.eu		

ATESST2

Advancing traffic efficiency and safety through software technology phase 2

Motivation and Objectives

Advanced automotive functions are increasingly dependent on software and electronics. These embedded systems are becoming increasingly complex and critical for the entire vehicle. Model based development is a means to manage this complexity and develop embedded systems in a way that increases safety and quality.

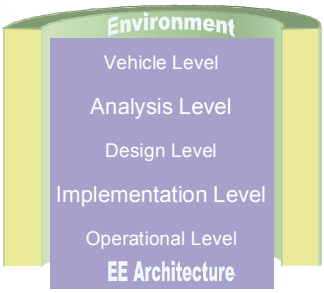
The ATESST2 project addresses this topic and provides means to integrate the engineering information from documents, spreadsheets and legacy tools into one systematic structure, an EAST-ADL2 System Model. The focus is on implementation-independent modeling of both needs (external requirements) and solution (system requirements and system solution) in the domain of automotive systems. A key element is separation of concerns. Abstract solution, design, and implementation details are found in different abstraction levels in the model. The implementation, i.e. the software architecture, is represented using the AUTOSAR standard.

Project Plan, Milestones and Deliverables

The project will deliver

- EAST-ADL2 Language definition (new release)
- EAST-ADL2 Methodology
- EAST-ADL2 UML2 Profile
- ATESST2 Workbench tool suite
- ATESST2 Demonstrators (Examples of EAST-ADL2)

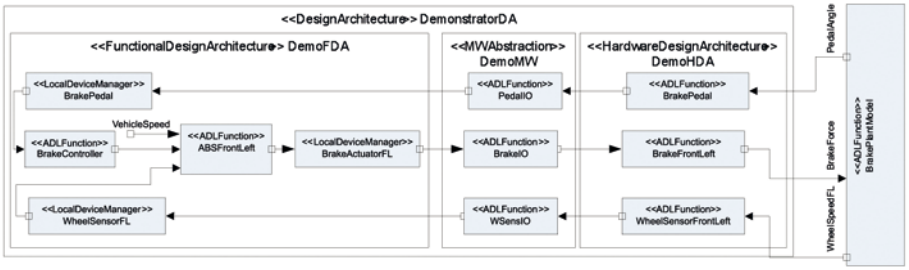
ATESST2 works iteratively: New releases of the language, tools and examples are delivered several times.



Technical Approach

Provision of means to manage the engineering information related to automotive EE systems

- System modeling is based on the EAST-ADL2 architecture description language
- AUTOSAR models are used for software architectures
- Special attention is devoted to the support for safety, requirements and variability
- Provision of a modeling tool based on UML2, to asses project results.



Achievements

- Reengineering of EAST-ADL2 to conform to AUTOSAR metamodel
- Revised support for the modelling of safety, timing, variability and requirements
- Proposal of Methodology explaining how the EAST-ADL2 can be deployed
- Definition of UML2 profile for EAST-ADL2 which is linked to the OMG MARTE standard
- Interaction with several related projects using or about to use EAST-ADL2

Organisational Information

Budget	4 M€	EC Funding	2 M€
Duration	24 months	Start	July 2008
DG	Information Society and Media	EC Research Program	ICT for cooperative systems
Coordinator	Henrik Lönn, VOLVO Tec.	Contact	henrik.lonn@volvo.com
Partners	CR FIAT, VOLVO Tec. Corp, VW/Carmeq, Delphi/Mecel, Continental, Mentor Graphics, CEA, Kungliga Tekniska Högskolan Stockholm, TU Berlin, University of Hull		
Website	www.atesst.org		

GAST

Green and safe road transportation

Motivation and Objectives

Vision 2030 for GAST

- Become a leading European actor addressing the needs of the European Community for a greener and safer mobility of persons and goods on the road.
- Continuously foster the diffusion of modern innovation and collaboration models/cultures
- Contribute to the development of new standards for the automotive sector.

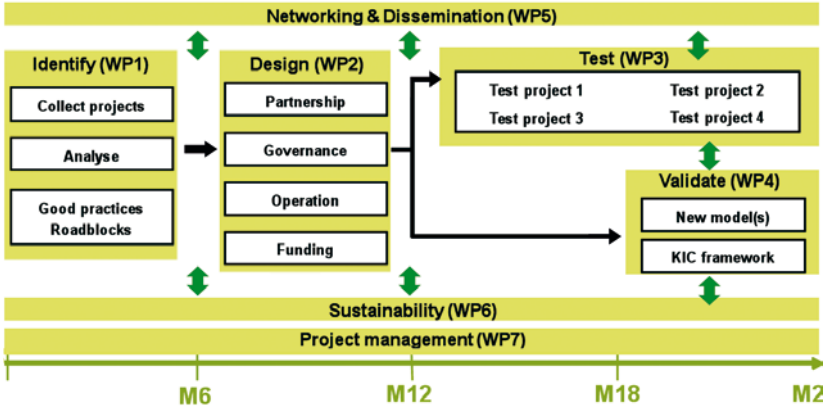
GAST shall bring therefore together key players from the knowledge triangle of education, research and innovation and integrate industrial players who are in a position to bring innovative solutions to the market.

Research and Innovation activities within GAST will focus on the development of the next generation of:

- Emission neutral vehicles,
- Intelligent and efficient transport systems.

Education plays a major role for the future of European automotive sector. GAST shall contribute to the development of an adequate education and training offer and increase the inflow of students needed by the automotive industry.

Project plan



Technical Approach

- Collect, analyse and assess collaboration practices;
- Design new collaboration models;.
- Test and validate some of the components of those new models;
- Disseminate the results of the projects to the wider innovation community;
- Ensure the conditions for the exploitation of the results beyond the lifetime of the project.

Achievements

- GAST kick-off on 10 and 11 January 2008 in Karlsruhe, Germany
- Collection, analysis of existing practices achieved – lessons learned
- Vision 2030 for the GAST consortium drafted
- 4 test cases performed:
  - European Automotive Master
  - Cluster of clusters
  - Project House
  - International Project Workshop
  - Final Conference on 26 and 27 November 2009 in Karlsruhe, Germany

Organisational Information

Budget	1.4 M€	Funding	1 M€
Duration	24 months	Start	December 2007
DG	Education and Culture	Priority Area	Innovation
Coordinator	inno Germany AG	Contact	l.schmerber@inno-group.com
Partners	AVL, Continental, CR FIAT, VW, VOLVO, Chalmers, IST, KIT, KTH, Politecnico di Torino, RWTH Aachen, TNO, TU/e		
Website	www.gast-online.eu		

SAFIER

Suppport action for the implementation of ERTRAC's road transport research priorities

Motivation and Objectives

SAFIER builds the strategies for implementing a step-change in the road transport sector - and more widely within the transport and energy sectors – by providing the objective, consensus-based plans for the European Technology Platform ERTRAC. SAFIER provides common agreement on the scenarios and research recommendations for the sectors urban mobility, long-distant transport, road transport safety, environment and energy as well as global competitiveness.

Project Plan and Deliverables

SAFIER is structured in three work packages:

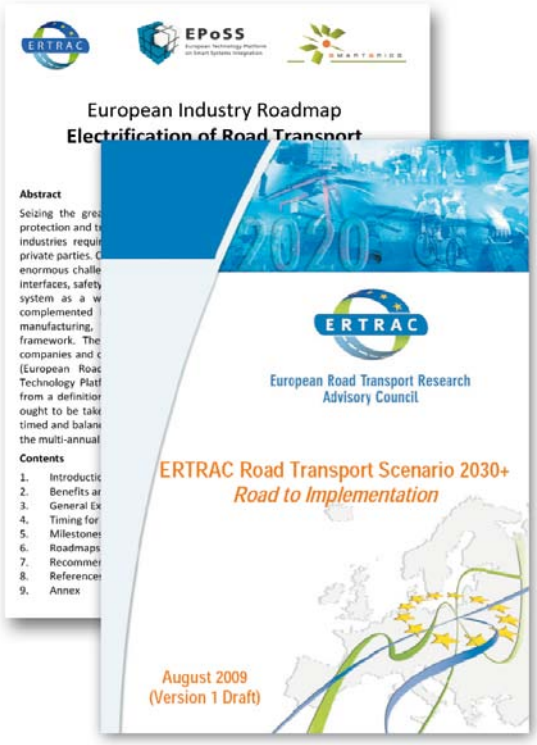
WP1:
Implementation of Strategic Road Transport Research Priorities
Task 1.1: Urban Mobility
Task 1.2: Energy, Resources and Climate Change
Task 1.3: Long Distance Transport
Task 1.4: Road Transport Safety
Task 1.5 Definition of Global Competitiveness Strategies on Road Transport Sector
Task 1.6: Enabling Technologies

WP2:
Research Cooperations, Education and Training
Task 2.1: Complementary and similar national and EC initiatives
Task 2.2: International orientation and co-operation strategies of European road transport research
Task 2.3: Education and Training

WP3:
Awareness Raising, Project Management and Administration
Task 3.1: Work Task and Workshop Organisation
Task 3.2: ERTRAC Dissemination and Promotion
Task 3.3: Project Administration and Management

Selected Deliverables:

- Scenarios and research recommendations
- Mapping of national road transport RTD programmes in Europe
- Assessment of European road transport research projects
- Education and training concepts



Achievements

- ERTRAC Road Transport Scenarios 2030+ (published for consultation in August 2009)
- European Industry Roadmap Electrification of Road Transport (joint publication ERTRAC-EPoSS-SmartGrids, August 2009).

Organisational Information

Budget	1.5 M€	EC Funding	1.5 M€
Duration	36 months	Start	February 2009
DG	Research	Priority Area	Road Transport
Coordinator	Josef Affenzeller, AVL List	Contact	josef.affenzeller@avl.com
Partners	CR FIAT, VOLVO Tec. Corp, VW/Carmeq, Delphi/Mecel, Valeo, UITP, Fehrl, IKA, Ertico, CONCAWE, AVL		
Website	www.ertrac.org		

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