It has been a great privilege for me to represent all 14 EUCAR members active in the field of European automotive research over the past year. Coming from a company based in the Netherlands, the fact that the Dutch held the EU Presidency during the first half of this year made my mandate even more interesting. At the European Truck Platooning Challenge in Rotterdam in April, all European commercial vehicle manufacturers jointly demonstrated the latest generation of truck technologies. A week later, a number of passenger cars did the same in the sidelines of the informal meeting of European transport ministers in Amsterdam.

One of the key priorities of the Dutch government during its six-month Presidency of the Council of the EU was to promote the development and deployment of automated vehicles; an area for which collaborative research between Europe's automotive manufacturers is crucial. EUCAR made a significant contribution to this, and will continue to do so in the future through its strategic pillar focusing on safe and integrated mobility, as you will read in the pages of this Project Book.

Further reducing CO2 emissions from road transport will remain one the most important societal challenges for the years to come. EUCAR projects in the sustainable propulsion domain are numerous, focusing on engines, aerodynamics, electrification and alternative fuels. Collaborative research is crucial to creating the right basis for feasible and competitive solutions which will make it to the market. Sustainable propulsion remained high on our agenda throughout 2016, with numerous high-quality EUCAR projects.

However, bringing down CO2 is not only a matter of engine and vehicle technology. Digitalisation and connectivity present great opportunities for a more integrated approach to decarbonisation, involving a broad range of stakeholders involved in mobility and transport. That is why collaborative research in this field is so important to securing a sustainable and competitive future for our industry on the European continent.

Yours sincerely,

As this year’s EUCAR Chairman I am proud to present the EUCAR Project Book 2016. This book contains an overview of all the current EUCAR projects in our priority fields of ‘Safe and integrated mobility’, ‘Sustainable propulsion’, ‘Affordability and competitiveness’ and ‘Commercial vehicles’.

Loek van Seeters
EUCAR CHAIRMAN 2016
DIRECTOR PRODUCT AND SERVICES PLANNING DAF TRUCKS
THE EUCAR MISSION

To strengthen the competitiveness of the European automotive manufacturers through strategic collaborative research and innovation by:

- Driving strategy and assessment of collaborative automotive research & innovation,
- Establishing common work with the European Commission, Member States and other key stakeholders,
- Facilitating the creation of high-quality projects with industrially relevant results.

THE MEMBERS
THE EUCAR STRATEGIC PILLARS OF RESEARCH & INNOVATION

COMMERCIAL VEHICLES

SAFE & INTEGRATED MOBILITY

SUSTAINABLE PROPULSION

AFFORDABILITY & COMPETITIVENESS
Safe & Integrated Mobility
Smart and safe vehicles for all purposes, integrated into a secure and intelligent transport system, progressing towards seamless mobility for all, maximum efficiency and ever-fewer accidents.

Sustainable Propulsion
Collaborative automotive R&I towards propulsion systems which are clean and energy-efficient over the full life cycle, with cost-effective technologies while maintaining customer priorities.

Affordability & Competitiveness
New sustainable approach for developing and producing affordable and competitive vehicles in Europe.

Commercial Vehicles
An integrated approach for reliable, clean, safe and efficient freight transport and passenger mobility, through dedicated vehicle concepts and effective logistics.
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SAFE & INTEGRATED MOBILITY

THE EUCA R STRATEGIC VISION

Smart and safe vehicles for all purposes, integrated into a secure and intelligent transport system, progressing towards seamless mobility for all, maximum efficiency and ever-fewer accidents.

SAFETY
Vehicles that protect their passengers, avoid accidents and dialogue safely with their drivers. Communications that enable cooperative safety for all road users. Safe application of increasing vehicle automation.

TRANSPORT / TRAVEL SYSTEM
An integrated system that provides comprehensive real-time actionable data, facilitates modal transitions and manages traffic for maximum mobility, efficiency and optimum use of infrastructure.

TRAFFIC EFFICIENCY
Substantially increased efficiency of passenger and goods traffic measured by time available for other purposes, consumption of individual vehicles and whole system efficiency.

VALUE ADDED CUSTOMER SERVICES
Highly valuable services, available to drivers and customers, that enhance the driving and mobility performance and experience, and provide additional business opportunities.

ICT & TELEMATICS
Vehicles that are integrated with the electronic information cloud, enabling a complete system approach for smart vehicles and intelligent transport.
SAFE & INTEGRATED MOBILITY
EUCAR PROJECT BOOK 2017

AutoNet2030
Co-operative Systems in Support of Networked Automated Driving by 2030

MOTIVATION AND OBJECTIVES
Triggered by the sofar limited convergence between sensor-based automation and cooperative V2X communications, the project seeks to research and validate procedures & algorithms for 802.11p-based interaction control among co-operative vehicles focusing on a) decentralised control system to realise fully-automated vehicles & drive the advised manoeuvring of manually-driven vehicles; b) multi-source data fusion and V2X-message-based communications to enable reliable positioning and automated manoeuvre planning.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
AutoNet2030 carries out cutting edge research across multiple fronts; the latter include cooperative manoeuvring control algorithms, specification and standardization of required enhancements to existing cooperative communication protocol standards, development of perception processing modules and HMI specifications and implementation for advised manoeuvring. Various software components are first evaluated through simulation while the integrated AutoNet2030 system is put under realistic test-track validation.

ACHIEVEMENTS
The AutoNet2030 achievements amount to the demonstration of inherently-safe cooperative manoeuvring control algorithms as well as the advanced perception and HMI systems that cope with driving scenarios of commercial and societal value. In parallel, significant contributions to the (standardized) use of 5.9 GHz V2X communications allow to enhance networked automated-driving protocols and showcase a TRL7 prototype. Thus, the project paves the way to cost-optimised and widely-deployable automated driving technology.
AdaptIVe develops, tests and evaluates automated driving applications for passenger cars and trucks in daily traffic. Guidelines for the implementation of shared control involving both the driver and the automation will be provided. To enhance the performance of automated systems the project improves the communication capabilities of the system. It defines and validates new specific evaluation methodologies and examines existing legal conditions with regards to barriers to implementation.

**TECHNICAL APPROACH**
- Derive functional and operational requirements.
- Define technical specifications, considering cooperative technologies.
- Integrate functionalities in demonstrator vehicles.
- Provide guidelines on legal aspects.
- Evaluate automated driving applications in realistic driving manoeuvres.

**ACHIEVEMENTS**
- Classification of automated systems from a legal perspective and examination of legal conditions.
- Enhancement of continuous driver support applications towards automated functions with strategies for system-driver interaction.
- Eight advanced demonstrator vehicles: seven passenger cars and one truck.
- Evaluation methods and tools and improved understanding of the impacts of automated driving on road safety, traffic and the environment.
RobustSENSE

Robust and Reliable Environment Sensing and Situation Prediction

MOTIVATION AND OBJECTIVES
RobustSENSE develops a robust and reliable sensor platform for automated and assisted driving capable of adapting to harsh conditions like snow, rain or sun-flare, and single sensor failures. Today’s systems decide in a binary manner on function availability. In case of a disturbance the system fails. RobustSENSE will improve sensor technologies and advance methods for sensor signal processing and sensor data fusion. Based on an integrated system approach RobustSENSE will add redundancy on sensor and processing level.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
RobustSENSE focuses on prototyping a system platform that will be capable of self-monitoring and information fusion. Each component should be able to continuously monitor its own performance and deliver this information to the other modules. Based on the current reliability of the sensors, the overall performance of the driving assistance system will be adapted and might – e.g. in case of bad weather – be reduced consequently to the safe range. Thus ensuring continued system functioning – albeit with reduced performance.

CONTINUOUS WORK OF THE ROBUSTSENSE SENSOR PLATFORM

ACHIEVEMENTS
• Defined general system architecture, interfaces between components and to sensor fusion modules, validation criteria for sensors
• Developed component descriptions, general metrics format, overall performance and reliability monitoring module, system architecture of environmental model, architecture for system performance assessment module
• Achieved first pre-processing of reference lane detection system

BUDGET
€10.5 million

FUNDING
€3.3 million

START
June 2015

DURATION
36 months

CALL
H2020-ECSEL-2014-1

CONTRACT N°
661933

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www.robustsense.eu
MOTIVATION AND OBJECTIVES
Reliable detection of vehicles’ surroundings is absolutely necessary for higher automation levels. Currently used sensors in the automotive domain show significant performance decreases under adverse weather conditions. DENSE overall objective is to design, develop, and validate an all-weather sensor suite for driver assistance and automated driving to enable operation especially in adverse weather like rain, snow, and fog.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
The new sensor suite is based on a smart integration of three different technologies: Radio radar (MIMO Radar), gated short wave infrared camera (SWIR) with pulsed laser illumination and short-wave infrared LiDAR (SWIR LiDAR). The sensor suite has to consist of a combination of these sensors due to redundancy requirements. Neither one of the sensors alone manages variable visibility conditions especially under high safety requirements for autonomous driving.

DENSE SENSOR CONCEPT

ACHIEVEMENTS
DENSE is currently designing the system. Technical achievements will be:
• Defined requirements for miniaturized sensor suite operating in all weather
• Specifications and system architecture for automotive implementation
• Radar concept for operating in 77-81 GHz automotive band
• Short Wave Infrared (SWIR) gated camera sensor with pulsed laser illumination and Short Wave Infrared LiDAR as part of adverse weather imaging system
ecoDriver
Supporting the driver in conserving energy and reducing emissions

MOTIVATION AND OBJECTIVES
The project addresses the human element in promoting “green” driving, as driver behaviour is a critical element in energy efficiency. It focused on driver interaction with the vehicle and optimised feedback strategies (including HMI – Human-Machine Interface) to help ensure user acceptance and compliance. Technical aspects in the vehicle-environment-driver loop, as well as cost-benefit analysis and scaling up of effects, were addressed across a range of vehicles and powertrains in order to reduce energy use and CO2 emissions.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH

Different ecoDriver applications were developed: systems integrated into the vehicle and a nomadic system based on a Smartphone app. The systems contain an Energy Threshold Interpreter (which determines the best energy efficiency that could be achieved at a given moment) and a Driver Feedback Interface (HMI). The difference between the optimal energy consumption and the real energy consumption is fed back to the driver through the HMI. The concepts were tested with 170 drivers in on-road trails in seven countries.

FULL ECO DRIVER SYSTEM USING A SMARTPHONE HMI

ACHIEVEMENTS

The extensive ecoDriver trials, testing nine different eco-driving support systems in controlled and naturalistic environments, found that across all the systems, average reductions in fuel consumption and CO2 of 4.2% were achieved. The highest saving was on rural roads with an average saving of 5.8%. Systems integrated into the vehicle were more effective than nomadic (Smartphone app) systems with fuel savings up to 6%. Important safety benefits were also gained by encouraging drivers to reduce their speed.

www.ecodriver-project.eu
ADAS&ME

Adaptive ADAS to support incapacitated drivers & Mitigate Effectively risks through tailor made HMI under automation

MOTIVATION AND OBJECTIVES
ADAS&ME will develop Advanced Driver Assistance Systems (ADAS) that incorporate driver/rider state, situational/environmental context and adaptive interaction, to automatically transfer control between vehicle and driver/rider and thus ensure safer and more efficient road usage for all vehicle types (conventional and electric car, truck, bus, motorcycle).

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
Development of robust personalized detection/prediction algorithms for driver/rider state monitoring of fatigue/drowsiness, stress, inattention/distraction and impairing emotions, employing existing and novel sensing and speech technologies. Technologies, supportive technologies (automation, V2X) and HMI algorithms/components will be used for driver/rider state monitoring systems and HMI developments toward safe transitions.

AUTOMATICALLY TRANSFER CONTROL BETWEEN VEHICLE AND DRIVER

ACHIEVEMENTS
To achieve the goal of ADAS&ME a holistic approach is taken, that considers automated driving in conjunction with information on driver state. The work is based around 7 provisionally identified use Cases, aiming to cover a large number of critical driving scenarios. Experimental research will be carried out on driver state monitoring as well as on HMI and automation transitions and the ADAS developed for the use Cases will be tested and verified with real drivers in simulator and on road.
DESERVE
Development platform for Safe and Efficient dRiVE

**MOTIVATION AND OBJECTIVES**
DESERVE aimed at developing a Tool Platform for embedded Advanced Driver Assistance Systems (ADAS) to exploit the benefits of cross-domain software, standardized interfaces, and easy and safety-compliant integration of heterogeneous modules. The project built an innovation ecosystem for European leadership in ADAS embedded systems, based on the automotive R&D actors, with possible applications in other industrial domains.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

**TECHNICAL APPROACH**
- Apply holistic approach, which foresees the easy integration of different software and hardware solutions
- Allow the design, implementation and integration of brand-new components and embedded modules
- Provide methods and tools to implement dynamic adaptation of sensor fusion modules and HMI systems
- Design of the automotive system validation framework

**AUTONOMOUS BRAKING FUNCTION USING DESERVE PLATFORM**

**ACHIEVEMENTS**
- Modular system development platform to reuse existing components
- Implementation of the common software/hardware platform for the selected embedded automotive modules
- Speed up the automotive system and component development by 20%
- 4 patent applications, 30 inventions and 35 publications
- The verification of functionalities in 6 passenger cars and 2 heavy good vehicles

**BUDGET**
€25 million

**FUNDING**
EU: €4.2 million
National: €7.2 million

**START**
September 2012

**DURATION**
42 months

**CALL**
FP7-ARTEMIS-2011-1

**CONTRACT N°**
295364

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www.deserve-project.eu
**UDRIVE**

eUropean naturalistic Driving and Riding for Infrastructure & Vehicle safety and Environment

**MOTIVATION AND OBJECTIVES**
Naturalistic Driving is a research approach that provides insight into driver behaviour during everyday trips by recording details on the driver, the vehicle and the surroundings through unobtrusive data gathering equipment and without experimental control. The objective is to gain understanding of where, when and why drivers fail to perform the driving task safely. Based on the new insights, UDRIVE aims to provide recommendations for safety and sustainability measures, driver behaviour models and risk functions for traffic simulations.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**
Data collection is ongoing in France, Germany, Poland, The Netherlands, Spain, United Kingdom and will continue until April 2017. Analyses start in August 2016 and focus on crash causation, distraction, vulnerable road users and eco-driving. Preliminary results will be presented in Spring 2017. Final results and recommendations will be presented at UDRIVE final event on 7-9 June 2017. After project end, UDRIVE will offer access (within the bounds of legal and ethical restrictions) to the collected data.

**TECHNICAL APPROACH**
For up to 21 months, 120 cars, 32 trucks and 40 scooters are collecting vehicle data, GPS and speed data. Also collected is video data from a high number of views (5 for PTWs, 7 for cars and 8 for trucks) including the driver's face, hands and feet, and covering both inside and outside the vehicle. The idea is to monitor aspects including acceleration, lane position, speed, eye movement, traffic density and road condition.

**IMPRESSION OF UDRIVE DATA COLLECTION SYSTEM**

**ACHIEVEMENTS**
- Development of research questions and analysis plan
- Specification of Data Acquisition System and study design
- Development of Data Acquisition System
- Participants recruitment and instrumentation of vehicles
- Data collection and pre-processing for analysis
- Development of data analysis and annotation tool
- Video annotation started

---

**BUDGET**
€10.5 million

**FUNDING**
€8 million

**START**
October 2012

**DURATION**
57 months

**CALL**
FP7-SST-2012-1

**CONTRACT N°**
314050

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www.udrive.eu
TEAM
Tomorrow’s Elastic, Adaptive Mobility

MOTIVATION AND OBJECTIVES
TEAM turns static into elastic mobility by joining drivers, travellers and infrastructure operators together into one collaborative network balancing individual and network needs to create better transport solutions. Goals:
- Collaborative decision making and optimisation algorithms
- Technology building blocks for the automotive cloud
- Real-time management of individual driving and travelling needs
- Quantification of the technical performance and impacts

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
Extending the concept of converging connected vehicle systems, TEAM converts raw data streams into coaching information for travellers and drivers. Distributed algorithms address the needs of both travellers and infrastructure operators to foster system optimized mobility without centralized data collection. TEAM applications include short-term advice on driving and lane merging as well as collaborative navigation advice for safer and more efficient mobility for citizens and visitors.

DRIVERS, TRAVELLERS AND INFRASTRUCTURE BECOME A TEAM

ACHIEVEMENTS
11 applications for collaborative mobility | Novel distributed sensing and best-effort balancing algorithms, anticipating traveller needs and actions | Advanced local dynamic map services (LDM++) and converged communication technologies | Off-board automotive cloud and smart phone integration | Coaching mechanisms for safe and green driving and traveling | Demonstration of TEAM systems during the Euro-EcoChallenge | Development of business models for effective deployment of elastic mobility systems.

www.collaborative-team.eu
ENABLE-S3

European Initiative to Enable Validation for Highly Automated Safe and Secure Systems

MOTIVATION AND OBJECTIVES
ENABLE-S3 is industry-driven and aspires to substitute today’s cost-intensive validation and verification efforts by more advanced and efficient methods to pave the way for the commercialization of highly automated systems. The main objective is to significantly raise the level of dependability of automated systems and to minimize the risk of design or implementation faults by the provision of a modular comprehensive verification and validation platform. The developed bricks should be applicable across 6 industrial domains (Automotive, Aerospace, Rail, Maritime, Health, Farming).

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
The ENABLE-S3 project will develop novel V&V technologies for assuring that the complex behaviour of highly automated systems is correct, reliable and in line with safety and domain-specific regulations. The technical approach covers: Extraction of test scenarios (e.g. from vehicle road data, etc.); Scenario-based V&V in virtual, semi-virtual, and real testing environments; Environment and sensor models as well as sensor stimuli for MiL/SiL, HiL, ViL; Integrated safety and security analysis approaches; Reduction of required tests for highly varying environmental conditions.

ENABLE-S3 MODULAR VALIDATION FRAMEWORK (SEE BELOW)

ACHIEVEMENTS
Technologically the development of automated systems is satisfactorily understood. However demonstrating the reliability, safety, and robustness of the technology in all conceivable situations is still a key challenge and is today the main roadblock for product homologation and certification and thus commercialization. ENABLE-S3 will considerably contribute to new approaches needed to reduce the effort required by today’s state-of-the-art practices by orders of magnitude in order to become economically acceptable.
PIPER

Position and Personalize Advanced Human Body Models for Injury Prediction

MOTIVATION AND OBJECTIVES

In passive safety, advanced Human Body Models (HBM) have the potential to represent the population variability and improve injury predictions. However, they are underutilized in R&D. Reasons include difficulties to position them in vehicles and availability limited to a few sizes. The main objective is to develop “user friendly” tools to position these HBMs and to facilitate the generation of population specific HBMs. This will enable new applications in industrial R&D for the design of restraint systems as well as new research applications.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH

The approach is centred on a novel, modular, HBM neutral Open Source framework. Combining proven approaches and innovative solutions transferred from computer graphics, statistical shape and ergonomics modelling, it integrates predictors of posture and shape (WP2) to help drive the new personalization and positioning tools (WP3). Specified with future industrial and academic users, it is evaluated with adult and improved child models (WP1). An extensive dissemination is driven by the industrial partners (WP4).

HBM IN THE PIPER SW INTERFACE AND UPDATED CHILD MODEL

ACHIEVEMENTS

• A software framework including modules for positioning (e.g. real time simulation based), personalizing (with different interpolation techniques) and smoothing. Able to import/export leading HBM in different codes with user defined metadata. Continuously updated.
• First modules to predict anthropometric dimensions and spinal curvature to drive the HBM transformations. Their integration in the framework is ongoing.
• An updated child model for safety including cartilage descriptions.

BUDGET

€3.9 million

FUNDING

€2.9 million

START

November 2013

DURATION

42 months

CALL

FP7-SST-2013-3

CONTRACT N°

605544

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www.piper-project.eu
PROSPECT

PROactive Safety for PEdestrians and CyclisTs

MOTIVATION AND OBJECTIVES
Accidents involving pedestrians and cyclists still remain a pending issue for road safety. The first Autonomous Emergency Braking (AEB) systems that avoid and mitigate Vulnerable Road Users (VRU) accidents have been recently introduced in the market. The PROSPECT project aims to improve the effectiveness of active VRU safety systems compared to current systems by expanding the scope of accident scenarios addressed and improving the overall system performance.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
PROSPECT will pursue this approach: better understanding of relevant VRU scenarios by means of statistical accident studies and naturalistic observations; improved VRU sensing using enlarged VRU sensor coverage as well as improved situational analysis; advanced control strategies such as combined steering and/or braking; project demonstrators that integrate the previous concepts; validation in realistic traffic scenarios, user acceptance tests and test methodologies that will be proposed to Euro NCAP for standardization.

AEB SYSTEM: ROAD SCENE ANALYSIS AND RECOGNITION OF VRU

ACHIEVEMENTS
The expected achievements of the project are the following:

- New sensor concepts and operation modes for AEB VRU systems
- New generation of AEB VRU systems fitted into passenger cars
- Test and assessment methods for Euro NCAP AEB VRU systems
- Test tools for AEB VRU development and testing

www.prospect-project.eu

BUDGET
€6.9 million

FUNDING
€6.9 million

START
May 2015

DURATION
42 months

CALL
H2020-MG3-4-2014

CONTRACT N°
634149

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FUNDING
€6.9 million

DURATION
42 months

CALL
H2020-MG3-4-2014

CONTRACT N°
634149

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SAFE & INTEGRATED MOBILITY
EUCAR PROJECT BOOK 2017

SENIORS
Safety ENhanced Innovations for Older Road userS

MOTIVATION AND OBJECTIVES
A reduction of around 48% of all road fatalities was achieved in Europe in the past years including a reduced number of elderly fatalities. However, among all the road fatalities, the proportion of elderly is steadily increasing. In an ageing society, SENIORS aims to improve the safe mobility of the elderly (and persons with overweight). Thus, this project primarily investigates and assesses the injury reduction that can be achieved through innovative and suitable tools as well as passive vehicle safety systems targeting the protection of the elderly.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
SENIORS consists of four technical Work Packages (WP1 – WP4) which interact and provide substantial knowledge throughout the project focusing on car occupants, pedestrians and cyclists. These WPs consider "Accidentology and behaviour of elderly in road traffic", "Biomechanics", "Test tool development" and the "Current protection and impact of new safety systems". The transfer of knowledge and results is guaranteed through cooperation with regulatory, industry, consumer and insurance entities by workshops and publications.

EXPERIMENTAL AND VIRTUAL TESTING

ACHIEVEMENTS
• View on anthropometric particularities of the elderly and their injury mechanisms compared with younger persons
• Development and optimization of test tools, procedures and assessment methods in the area of passive vehicle safety regarding the needs of the elderly
• Identifying differences in the dynamics of different age groups in the pre-crash and crash phase
• Customised R-scripts package for the calculation of injury risk curves
SUSTAINABLE PROPULSION

ICE BASED POWERTRAIN
Highly efficient and affordable powertrains with an internal combustion engine as the major propulsion unit, based on most advanced components, system architecture and operation strategies.

XEV* BASED POWERTRAIN
Highly efficient and affordable electrified powertrains, based on most advanced components and system architecture.

FUELS & INFRASTRUCTURE
Advanced fuels, including electricity, produced sustainably and under efficient processes including required infrastructure.

VEHICLE THERMAL & ELECTRIC ENERGY MANAGEMENT
Efficient management of thermal and electric energy flows in the vehicle.

* xEV includes BEV, FCEV, REEV, PHEV

THE EUCAR STRATEGIC VISION
Collaborative automotive R&I towards propulsion systems which are clean and energy-efficient over the full life cycle, with cost-effective technologies while maintaining customer priorities.
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<tr>
<th>Project</th>
<th>Year</th>
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<tbody>
<tr>
<td>Li-S batteries</td>
<td>2011</td>
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<td>Li-ion batteries</td>
<td>2012</td>
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<tr>
<td>On-road charging</td>
<td>2013</td>
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<tr>
<td>Hybrid powertrains</td>
<td>2014</td>
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<td>Network for electromobility</td>
<td>2015</td>
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<td>Hybrid powertrains</td>
<td>2016</td>
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<tr>
<td>Mild hybrid</td>
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<td>Gas-only engines</td>
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<td>Mono- and dual-fuel gas engines</td>
<td>2019</td>
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<td>Optimized diesel engines</td>
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<td>HD-powertrain optimization</td>
<td>2021</td>
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<td>Optimized gasoline engines</td>
<td>2022</td>
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<td>Particulate free gasoline engines</td>
<td>2023</td>
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<tr>
<td>Well-to-Wheel analysis</td>
<td>2024</td>
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<tr>
<td>Biocatalytic solar fuels</td>
<td>2025</td>
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</table>
EUROLIS

Advanced European Lithium Sulphur Cells for Automotive Application

MOTIVATION AND OBJECTIVES
EUROLIS is a project which includes basic research on various levels with a focus on the understanding of Li-S battery behavior.
The objectives of project are:
• 18650 Li-S cell prototype cells.
• High cycle efficiency in the entire life cycle in a wide temperature range.
• Durability reflected by a life time required in automotive industry.
• Low cost with sustainable and environmentally friendly approach.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
The project includes basic research on various levels: the development of new carbon host materials from the sustainable raw components, of new electrolyte solutions, additives and ion selective separators. All the research and development steps are monitored with 6 analytical tools developed at the beginning of the project. The applied part of the research is focused on the optimization and integration of the materials into 18650 cells and cell testing for their appropriateness in the automotive applications (Figure below).

DYNAMIC STRESS CYCLING OF 18650 prototype cells

ACHIEVEMENTS
The European chain of battery production line has been established with involvement of all partners into the development and integration of the cell components into prototypes. Three different generations of the Li-S cells have been produced and their electrochemical characteristics were improved from the generation to the generation. The cells were tested in different climate environments using different cycling regimes. We have demonstrated that the cells can be cycled under realistic EV profile (Dynamic Stress Cycling).

BUDGET
€3.77 million

FUNDING
€2.88 million

START
October 2012

DURATION
48 months

CALL
FP7-NMP-2012-1

CONTRACT N°
314515

COORDINATOR
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PARTNERS
Renault Group, Volvo Group, SAFT, Solvionic, NIC, CNRS, MPG, Chalmers, Elettra, Fraunhofer

www.eurolis.eu
eCAIMAN

Electrolyte, Cathode and Anode Improvements for Market-near Next-generation Lithium Ion Batteries

**MOTIVATION AND OBJECTIVES**
The objective of eCAIMAN is to bring European expertise together to develop a battery cell that can be produced in Europe and meet the following demands:

- Energy density of Lithium-ion batteries (LIB) of ~270 Wh/kg.
- Cost 200 €/kWh.

The project will also:

- Investigate the integration in light, passenger, and heavy duty vehicles.
- Validate safety and reliability of the cells.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

<table>
<thead>
<tr>
<th>TECHNICAL APPROACH</th>
</tr>
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<tbody>
<tr>
<td>• Industrialising a 5V high-voltage spinel cathode material.</td>
</tr>
<tr>
<td>• Industrialising a high-capacity composite anode material.</td>
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<tr>
<td>• Industrialising a stable high-voltage electrolyte.</td>
</tr>
<tr>
<td>• Producing Technical Readiness Level 6 (TRL) large-scale automotive cells applying above materials and technology</td>
</tr>
</tbody>
</table>

**eCAIMAN SYNERGISTIC APPROACH**

<table>
<thead>
<tr>
<th>ACHIEVEMENTS</th>
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<tbody>
<tr>
<td>• Reduced battery system cost by applying a scalable modular concept for use in light, passenger, and heavy duty vehicles and buses</td>
</tr>
<tr>
<td>• Slurry engineering: general and efficient method to maximise electrochemical performance for a given active material and minimise side effects</td>
</tr>
<tr>
<td>• Reduction of electrode preparation processing cost via aqueous processing</td>
</tr>
<tr>
<td>• New test procedure for future high voltage cells as well as demands from light/passenger/heavy duty vehicle concepts --&gt; update of current test procedures</td>
</tr>
</tbody>
</table>
Feasibility analysis and development of on-road charging solutions for future electric vehicles

**MOTIVATION AND OBJECTIVES**
FABRIC assesses the technological feasibility, economic viability and socio-environmental impact of dynamic charging of electric vehicles (EVs). The basic project objectives can be summarised as follows:

- Development and testing of advanced dynamic, wireless charging solutions;
- Specifications for sustainable integration with road and grid infrastructures;
- Long-term socioeconomic impact & feasibility studies for large-scale deployment of dynamic EV charging.

**FABRIC TECHNICAL APPROACH**

In order to assess the technological feasibility and long term viability of dynamic wireless EV charging solutions and their large-scale deployment potential, novel wireless power transfer solutions will be developed and adaptations of EVs, road and grid infrastructures will be implemented and tested in three test sites in Italy, France and Sweden. Testing results will feed to thorough feasibility analyses and impact assessment with respect to the users, the society and environment.

**DYNAMIC STRESS CYCLING OF 18650 PROTOTYPE CELLS**

Within its first 2.5 years, FABRIC analysed the state-of-the-art in electromobility and dynamic charging, including systems, components and ICT. The specifications of the three charging solutions and the system architecture have been defined. Currently the charging prototypes have been delivered, the test sites’ grids have been adapted and a new >100m e-road has been constructed in French test site. Several studies on potential impacts have already been conducted which may serve as guidelines to stakeholders and policy makers.
ECOCHAMPS

European COmpetitiveness in Commercial Hybrid and AutoMotive PowertrainS

MOTIVATION AND OBJECTIVES
Hybrid vehicles are already available on the market, but their sales numbers are still relatively low and limited to certain vehicle classes. To increase interest in hybrid vehicles, ECOCHAMPS will extend their functionality and improve their fuel economy whilst at the same time minimising their cost premium. ECOCHAMPS targets to improve fuel efficiency by up to 20%, reduce powertrain weight and volume by up to 20% and significantly reduce hybrid vehicles costs, targeting a 10% maximum cost premium.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
ECOCHAMPS’s technical approach is based on the following logical steps:
• Target setting
• Modularisation, standardisation and development of hybrid components
• Design and build up of the hybrid drivelines and demonstration vehicles
• Evaluation of the demonstration vehicles, underlying hybrid powertrains, components and technologies

CONCEPT

ACHIEVEMENTS
• Target setting: requirements, reference vehicles, use cases and test scenarios have been defined
• First draft of the Modular System and Standardisation Framework for Commercial Vehicles (MSF) has been finalised
• Development of hybrid electric components, according to the MSF and LV123 (light duty) is on track, using synergies between light and heavy duty vehicles
• Development of optimised and integrated powertrains is in progress

www.ecochamps.eu
NEMO

Hyper-Network for electroMobility

MOTIVATION AND OBJECTIVES
NeMo aims to make electromobility more attractive and facilitate its mass adoption, acting in a catalytic way across the entire energy management cycle of electromobility, including battery and smart grid recharging management. The project aims to facilitate increased service availability and the better planning and more secure electric grid operation, by making backend data and services accessible to the right actors and bringing down digital and physical barriers.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
NeMo will develop a distributed environment with open architecture based on standardised interfaces, in which all electromobility actors, physical (i.e. Charge Points, Power Grid, Electric Vehicles) or digital (i.e. Charge Point Operators, Distribution System Operators, Electromobility Service Providers, EV owners, etc.), will be able to connect and interact seamlessly, in order to exchange data and to provide improved electromobility ICT services in a fully integrated and interoperable way via an open virtual Cloud Marketplace.

ACHIEVEMENTS
The main outcome of NeMo will be a Hyper-Network of tools, models and services to provide seamless interoperability of electromobility services among all relevant actors.
ORCA

Optimised Real-world Cost-Competitive Modular Hybrid Architecture for Heavy Duty Vehicles

MOTIVATION AND OBJECTIVES
The overall objectives of the ORCA project are to reduce the TCO to the same as diesel vehicle TCO level, targeting over 10% system cost premium reduction; to improve the hybrid powertrain efficiency up to 5% through optimized RES selection & sizing and by improving the energy and ICE management; to reduce the fuel consumption by 40%; to downsise the ICE by at least 50%; to improve the electric range from 10km to 30km by adding the PHEV capabilities and optimising the RES capacity; and case study for CNG heavy-duty engines.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
NeMo ORCA will be conducted by an 11-member consortium from 7 different European Members States representing all requested competencies in the field of powertrain optimization for Heavy Duty vehicles. The consortium comprises OEMs with IVECO-ALTRA, CRF and VOLVO (also members of EUCAR), suppliers VALEO, BOSCH, JOHNSON MATTHEY and JSR MICRO (CLEPA), leading RTD organizations and Universities with TNO, FRAUNHOFER, and VUB (EARPA). The majority are also members of ERTRAC and EGVIA.

FOCUS TOWARDS SUB-SYSTEM AND SYSTEM OPTIMISATION

ACHIEVEMENTS
Achieving these key innovations at affordable cost will significantly strengthen the European technical and technological leadership in the value chain of heavy-duty vehicles, enabling a leading position in this crucial field of hybridised vehicles and increasing the competitiveness of European heavy-duty road vehicle manufacturers and suppliers. The Optimised Real-world Cost-Competitive Modular Hybrid Architecture will be ready for its first market introduction between 2021 and 2022.
THOMSON

Mild Hybrid cost effective solutions for a fast market penetration

MOTIVATION AND OBJECTIVES
The project aims to the development of cost effective solutions, based on 48V architectures, answering the need in reducing the environmental impact of the transportation sector through a clever combination of advanced engines technologies, electrification and wider use of alternative/renewable fuels.

The project addresses very precise and consistent objectives to support a quick transition towards high efficient, cleaner and affordable electrified powertrains focusing on the 48V architectures, intended as key element to increase fuel economy and reduce environmental impact and to support a quick penetration on the market of the hybrid powertrains.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
Approaches developed in the THOMSON project will demonstrate how the right combination of advanced engine downsizing/turbocharging technologies, coupled with a 48V motor-generator system, can provide the most cost effective solution for a rapid electrification through conventional vehicles. The project will provide an exhaustive evaluation of this concept through the development of two different 48V architectures (one integrating the e-machine on the front engine belt drive, the other between the engine and the transmission) on two different engine families: on one side a mid-size 1.6 litre Diesel engine and, on the other one, a small downsized Spark Ignited CNG engine equipped with a Direct Injection system.

PROJECT STRUCTURE
GASON
Gas-Only Internal Combustion Engines

MOTIVATION AND OBJECTIVES
In order to realize sustainable mobility in Europe, future vehicles for road transport have to be significantly more efficient by 2020: GasOn project aims to develop advanced CNG only, mono-fuel engines able to comply with post-2020 CO2 emission targets, claiming the 20% CO2 emission reduction compared to the current best in class CNG vehicle segment by segment, to fulfill the new homologation cycle and to guarantee a low fuel consumption even in real driving conditions.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
GasOn is based on 3 parallel technology ways leading full development of demonstrator vehicles, all based on the integration of the gaseous direct injection system developed in the project matched with advanced variable valve actuation or advanced boosting system with variable compression ratio or lean burn / charge dilution combustion. The project is focusing also on innovative combustion approaches (like pre-chamber), advanced aftertreatments and fuel quality sensors.

OPTICAL ENGINE EQUIPPED WITH DIRECT CNG INJECTION

ACHEEIVEMENTS
• CNG engine prototype with direct injection, fully flexible variable valve actuation and high compression ratio
• CNG engine prototype with twin stage turbocharger and variable compression ratio device
• CNG direct injection included control and feeding system
• Advanced exhaust aftertreatment system for lean burn gas engine
• Diesel pilot gas engine prototype
HDGAS

Heavy Duty Gas Engines integrated into Vehicles

**MOTIVATION AND OBJECTIVES**
The overall objective of the HDGAS project is to develop, demonstrate and optimize advanced powertrain concepts for dual-fuel and for pure natural gas operation engines, perform integration thereof into heavy duty vehicles and confirm achievement of Euro VI emissions standards, in-use compliance under real-world driving conditions and CO2 or greenhouse gas targets currently under definition.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

**TECHNICAL APPROACH**
HDGAS will develop all key technologies (LNG fuel system including High Pressure tank design, compact and insulation in tank, cryogenic pump, aftertreatment systems), and three engines as well as new fuel systems will be integrated into three demonstration vehicles. HDGAS will also prepare a plan for a credible path to deliver the innovations to the market. The exploitation plan will be proportionate to the scale of the project and contains measures to be implemented both during and after the project.

**TITLE**

**ACHIEVEMENTS**
- Advanced LNG vehicle fuel and aftertreatment systems/emission control
- Development of Natural Gas engines, Dual Fuel engines and controls
- System integration into Demonstration vehicles
- Evaluation and independent testing
- Market introduction at selected fleet owners and markets
- Further optimisation of components and systems
- Ramp up production of vehicles

**BUDGET**
€27.83 million

**FUNDING**
€9.89 million

**START**
May 2015

**DURATION**
36 months

**CALL**
H2020-GV7-2014

**CONTRACT N°**
653391

**COORDINATOR**
Theodor Sams
AVL List GmbH

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**PARTNERS**
19 partners incl. Daimler, IVECO, Volvo Group, MAN, Ricardo, FPT Powertrain Technology

www.hdgas.eu
REWARD
REal World Advanced Technologies foR Diesel Engines

MOTIVATION AND OBJECTIVES
It is the aim of the REWARD project to reduce the pollutant emissions of diesel powered class B, C, D and E passenger cars below the Euro 6 emissions limits under Real Driving conditions (EU6 RDE) and, additionally, to improve their fuel efficiency. REWARD develops and will demonstrate advanced 4-stroke Diesel combustion concepts, exhaust gas after-treatment systems, control strategies and new approaches for friction & wear reduction. Furthermore, REWARD will develop an innovative 2-stroke Diesel engine architecture.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
REWARD's holistic approach addresses the 3 major energy conversion items for Diesel engines: Smooth cylinder charging & gas exchange; Efficient and complete combustion; Consistent exhaust aftertreatment.

New control strategies focus on an improved model-based control of the cylinder charge and on new concepts for the compensation of emission drifts.

Friction and wear reduction is accomplished by new coatings in combination with new lubricants.

CONCEPT & IMPACT

ACHIEVEMENTS
New Diesel combustion concepts for the demonstrator vehicles Renault Kadjar and Volvo XC90 have been specified.
New catalyst formulations and their integration in complete aftertreatment systems have been investigated.
Architecture of the Diesel 2-Stroke engine has been chosen in order to provide the best fuel consumption and scavenging.
Cost assessment for new technologies is in progress.

www.project-reward.eu
The overall objective of the PaREGEn project is to demonstrate at up to TRL 7 a new generation of gasoline direct injection engine vehicles achieving a 15% reduction in CO2 emissions through the optimal combination of advanced engine and robust aftertreatment technologies. Modelling and simulation software will be verified and used to improve the design and the capability of the engines. The vehicles will comply with upcoming Euro 6 RDE limits with particle number emissions measured to a 10 nm dia. size threshold.

The overall concept and technical approach comprises three major elements: Research for improved understanding (orange box); Innovation and demonstration of new technologies combinations (light blue boxes), where the developed know-how, software and control strategies are implemented in two novel optimised gasoline engine vehicles; Independent assessment of their impact element (green box) to track the progress of the project towards reaching the targets.

The PaREGEn project started on the 1st of October, 2016, with its kick-off meeting in the last week of the month. The first achievements are the set-up of: the Project Website, Initial Dissemination Plan and the dissemination tools.

The first technical milestones are to be the concept engine designs for the two demonstrator vehicles and the baseline version of the gasoline combustion kinetics models, including the PAH, RANS 3-D CFD soot model and the O-D SI-SRM tool, for the activities in the advanced combustion work package.

BUDGET
€12.1 million
FUNDING
€9.95 million
START
October 2016
DURATION
36 months
CALL
H2020-GV2-2016
CONTRACT N°
723954
COORDINATOR
Simon Edwards
Ricardo
CONTACT
secretary@uniresearch.com
PARTNERS
Ricardo, Daimler, Jaguar Land Rover, BOSCH, FEV, Honeywell, Johnson Matthey, JRC, Uniresearch, IDIADA, SIEMENS, LOGE, ETH, UDE, RWTH, UFI Filters

www.paregen.eu
UPGRADE

High efficient particulate free gasoline engines

MOTIVATION AND OBJECTIVES
The Upgrade project aims to support the transition to a high efficient, cleaner and affordable powertrain technology systems, based on Spark Ignited GDI (Gasoline Direct Injection) approach, suitable for future Light Duty applications. The project also includes a deep analysis of the phenomenon of the formation of the nanoparticles in relationship to the engine design and its operating conditions and, with regard to the after-treatment solutions, the study and development of new Gasoline Particulate Filter (GPF) technologies.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
To increase the engine efficiency under Real Driving conditions, the following steps will be carried out:
- address stoichiometric combustion approach on a “small” size engine and lean-burn combustion approach on a “medium” size one
- study and develop the best combinations of technologies, including advanced VVA/VVT capabilities, advanced boosting system (including e-booster operations), EGR (Exhaust Gas Recirculation) and thermal management

PROJECT STRUCTURE
Photofuel

Biocatalytic solar fuels for sustainable mobility in Europe

**MOTIVATION AND OBJECTIVES**

The motivation is to advance the development of high quality, low impact transportation fuels. The challenge is to advance the base technology of microalgae cultivation in closed bioreactors by enabling phototrophic algae or cyanobacterial microorganisms to produce alkanes and alcohols, which are excreted to the culture broth for direct separation without cell harvesting. This turns the microbial cells into self-reproducing biocatalysts allowing the process to directly convert solar energy, water and CO2 into engine-ready fuel.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

**TECHNICAL APPROACH**

Biocatalyst development on base of two cyanobacterial strains and one microalgae, targeted fuel compounds are butanol, medium chain alcohols and alkanes, sesquiterpenes. The best performing strain(s) are selected by the Photofuel consortium and jointly improved in the last 18 month of the project.

Further activities concentrate on upscaling cultivation volumes and assessing the biocatalysts. The final volume is 5m³ for outdoor production of fuel compounds. A control strategy and fuel separation process is developed.

**SOLAR ENERGY, WATER AND CO2 INTO ENGINE-READY FUELS**

**ACHIEVEMENTS**

- Biocatalysts produce butanol and bisabolene
- Continuous production separation shown on lab scale
- Layout of LCA agreed

Outlook:

Workshop on biocatalyst development for direct fuel production. CeBiTec Industrial Biotechnology, Bielefeld September 24-27, 2017
MOTIVATION AND OBJECTIVES
Fuel economy is a key aspect to reduce operating costs and improve efficiency of freight traffic, thus increasing truck competitiveness. The main objective of the IMPERIUM project is to achieve fuel consumption reduction by 20% (diesel and urea) whilst keeping the vehicle within the legal limits for pollutant emissions. The IMPERIUM consortium consist of major European actors and is able to provide a 100% European value chain for the development of future powertrain control strategies for trucks.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
The approach relies on the three following stages:
• Direct optimisation of the control of the main powertrain components (e.g., engine, transmission) to maximize their performances.
• Global powertrain energy manager to coordinate the different energy sources and optimize their use depending on the current driving situation.
• Provide a more comprehensive understanding of the mission (e.g., eHorizon, mission-based learning) to enable long-term optimization strategies.

IMPERIUM - TECHNICAL APPROACH

ACHIEVEMENTS
IMPERIUM's objectives, main innovations and targeted key results are:
• Obj. 1: Development of a methodology and simulation environment for assessing the performance of HD trucks in real-driving conditions
• Obj. 2: Development of Dynamic eHorizon system for Heavy Duty trucks
• Obj. 3: Three advanced fuel efficient Heavy Duty Demonstrators
• Obj. 4: Analysis and validation of the project outcomes by means of in-vehicle measurements integrated into the proposed simulation environment
JEC WTW Analysis

Well-to-Wheels (WTW) analysis of future automotive fuels and powertrains in the European context

**MOTIVATION AND OBJECTIVES**

EUCAR, CONCAWE and JRC (JEC) continue to perform joint evaluations of the WTW energy use and greenhouse gas (GHG) emissions for a wide range of existing and future fuel and powertrain options. The objectives of the study are: Establish a consensual WTW total/fossil energy demand and GHG emission assessment of automotive energy carriers and powertrains relevant to Europe. Consider the viability of each fuel pathway. Attempt to have the approach and results accepted as a reference by all relevant stakeholders.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**


**TECHNICAL APPROACH**

Well to Tank (WTT) evaluates the energy expended and the associated GHG emitted to deliver the final fuel to a vehicle. The Tank to Wheels (TTW) evaluation does the same for the fuel application in the vehicle. Hence the WTW integration enables an assessment of the combined fuel and vehicle pathways. The WTW study takes into account changes generated by fuel and/or powertrain substitution. This is particularly important for fuels where careful consideration of co-products is essential to a good understanding.

**PROJECT STRUCTURE**

**ACHIEVEMENTS**

Results of this work are used by the European Commission (EU Renewable Energy Directive default value methodology; EU Fuel Quality Directive calculation of Fossil Fuel Comparator) and provides input to new initiatives, like the Clean Power for Transport program. Furthermore, it is considered by Technology Platforms like the European Biofuels technology Platform as well as ERTRAC and recognized by EU member states.
AFFORDABILITY & COMPETITIVENESS

THE EUCAR STRATEGIC VISION

New sustainable approach for developing and producing affordable and competitive vehicles in Europe.

APPLICATION OF SUITABLE MATERIALS FOR FUTURE VEHICLES
Materials suitable for enhanced affordable and competitive design and manufacturing of functionally optimised and lightweight vehicles.

VIRTUAL ENGINEERING PRODUCT PROCESS INTEGRATED APPROACH
Innovative engineering solutions to guarantee and ensure the European automotive competitiveness for future vehicle generations.

SUSTAINABLE AND FLEXIBLE MANUFACTURING
Efficient and effective manufacturing systems capable of producing affordable and competitive vehicles in Europe.
MAPPING

MATERIALS, MANUFACTURING AND VIRTUAL ENGINEERING

ALIVE P.80
Lightweight electric vehicles

ENLIGHT P.82
Lightweight electric vehicles

CRYSTAL P.84
Embedded systems engineering

ALLIANCE P.86
Affordable lightweight vehicles


EUCAR PROJECT BOOK 2017
ALIVE

Advanced high volume affordable lightweighting for future electric vehicles

MOTIVATION AND OBJECTIVES
The ALIVE project concept aims to advance both lightweight design and lightweight manufacturing & joining capabilities for high volume affordability, reliability and safety. ALIVE advances computer-based as well as experimental validation approaches to enable fast and reliable design & optimization loops to be run on component, subassembly, assembly and full vehicle-body-in-white level. A full-scale demonstrator is build-up to validate NVH and crash performance.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
Body in white design and optimization, design and optimization of chassis, hang-on parts, closures and front seats. Virtual performance assessment and validation of vehicle design options. Characterize and adapt selected material classes, develop manufacturing, joining and bonding technologies and assembly strategies. Testing by characterization test coupons, sub-systems, full vehicle testing and validation. Demonstrator assembly. Life cycle analysis.

ALIVE VEHICLE BODY STRUCTURE AND PHASE OF BUILD-UP

ACHIEVEMENTS
• Design for electric vehicle concept completed
• Bill of materials and joining techniques defined
• New joining simulation models generated
• Simulated proof of NVH- and crash-performance
• LCA prepared for components
• Built up of body-in-white demonstrators (biw) started in July 2016, 1st biw available by August 2016 for testing
MOTIVATION AND OBJECTIVES
Electric cars of the future require lightweight solutions that not only enable specific design requirements to be respected but are also cost effective and sustainable throughout their lifecycle.

Thus, ENLIGHT aims to accelerate the technological development of a portfolio of innovative thermoset, thermoplastic, bio-based and hybrid materials which together offer a strong potential to reduce weight and overall carbon footprint to enable their viable application to medium-high volume EVs in 2020-25.

PROJECT PLAN, MILESTONES AND DELIVERABLES
Seven technical work packages addressing design & simulation, material development, manufacturing technologies, testing & validation and LCA.

Baseline is the vehicle architecture developed in ALIVE from which the following five modules have been selected for demonstration: front module, control arm, cross-car beam, door and lower floor module.

TECHNICAL APPROACH
• Development of highly innovative lightweight/low embedded CO2 materials for their application in medium-volume automotive production (50,000 units/year)
• Design capabilities for affordable medium-volume lightweight EVs
• Manufacturing and joining capabilities for affordable medium-volume lightweight EVs
• LCA and economic analysis to ensure the highest probability of application

ENLIGHT COMPOSITE LOWER FLOOR MODULE

ACHIEVEMENTS
• All considered modules achieve at least 20% further weight reduction compared to ALIVE
• The performance is similar or better compared to ALIVE
• Cost-efficient manufacturing of CFRP dominated designs is feasible
• Bio-based thermoplastic materials and hybrids has been qualified for automotive production
MOTIVATION AND OBJECTIVES

The project goal of CRYSTAL is to foster Europe’s leading edge position in embedded systems engineering, regarding quality and cost effectiveness of safety-critical embedded systems and architecture platforms. CRYSTAL connects major tool providers and OEMs in the areas of aerospace, automotive, rail, and healthcare to establish and push forward an Interoperability Specification (IOS) as an open European standard for the development of safety-critical embedded systems.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH

The CRYSTAL technical innovation is based on 4 pillars:
- Apply engineering methods on industrially relevant use cases.
- Provide technical innovations (“technology bricks”) with high maturity to fill gaps identified in the use cases.
- Push the Interoperability Specification towards Standardization.
- Support SME integration into the embedded systems engineering ecosystem.

CRYSTAL TECHNOLOGY GROUPS AND APPLICATION DOMAINS

ACHIEVEMENTS

CRYSTAL has significant economical and societal impacts:
- OEMs benefit from better supplier collaboration and reduced system design costs.
- The CRYSTAL IOS increases the flexibility for all stakeholders and has the potential to deeply impact the market on a global level.
- OEMs can easily combine tools from different vendors, and tool vendors are able to find new market opportunities in an open and extensible environment.
ALLIANCE
Affordable Lightweight Automobiles AlliaNce

MOTIVATION AND OBJECTIVES
Six of the European carmakers (Daimler, Volkswagen Group, Toyota Motor Europe, CRF, Volvo Group, Opel Group), under the coordination of EUCAR, have joined forces to commonly address the high cost issue of innovations in vehicle lightweighting, having identified it as the major bottleneck towards their implementation in vehicle series and mass production. ALLIANCE has the ambition to develop novel advanced materials (steel, aluminium, hybrid) and production technologies, aiming at an average 25% weight reduction over 100k units/year, at costs of <3 €/kg.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
ALLIANCE will develop a mass-optimizer software tool and a multi-parameter design optimisation methodology and process, aiming at an accelerated pre-assessment of technologies over existing designs in a holistic framework. ALLIANCE will work on eight different demonstrators of real vehicle models; six will be physically tested, aiming at market application by OEMs within six years from project end. A transferability and scalability methodology will also be developed for results replication across other vehicle components and models.

TRANSFERABILITY AND SCALABILITY METHODOLOGIES

ACHIEVEMENTS
ALLIANCE aims at becoming a central hub for innovation in lightweight design in Europe. To do so, it will establish an open inclusive framework towards external centres and clusters in this field, involving them in ALLIANCE development through an open lightweight design contest and dedicated workshops.
COMMERCIAL VEHICLES

THE EUCAR STRATEGIC VISION

An integrated approach for reliable, clean, safe and efficient freight transport and passenger mobility, through dedicated vehicle concepts and effective logistics.

CONNECTED COMMERCIAL VEHICLE
Commercial vehicles that are connected to the infrastructure, operators and drivers, supporting an efficient and resilient transport system and effective logistics.

SAFE COMMERCIAL VEHICLE
Commercial vehicles that protect all road users and avoid and mitigate accidents through advanced vehicle technology, cooperative systems and increasing levels of automation.

EFFICIENT COMMERCIAL VEHICLE
Commercial vehicles with optimum efficiency and performance, making use of advanced propulsion and energy systems and dedicated vehicle configurations.
### COMMERCIAL VEHICLES

#### MAPPING

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<tr>
<th>Year</th>
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#### MAPPING OF CROSS-CUTTING SUPPORT ACTIONS

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CONVENIENT

Complete Vehicle Energy-saving Technologies for Heavy-Trucks

**MOTIVATION AND OBJECTIVES**
Fuel efficiency is top priority for operators of long-haul trucks due to the major impact (about 30%) on the Total Operating Costs. The efficiency of heavy-duty vehicles can be improved in a relevant way by operating on both the tractor and the semi-trailer. The main objective of CONVENIENT project has been the development of a novel solution for long-distance heavy-trucks enabling a fuel saving of up to 30%.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

**TECHNICAL APPROACH**
The project aim is to develop three heavy-truck prototypes (by IVECO, VOLVO and DAF) featuring a range of technologies to enable a relevant reduction of fuel consumption and includes the development, integration and evaluation on validator vehicles of innovative energy-saving systems and energy harvesting devices, advanced active and passive aerodynamics devices on the truck and on the semitrailer, energy management system at vehicle level and driver support system to maximize the benefits of the devices and strategies.

**SUSTAINABLE FUEL-SAVING TECHNOLOGIES FOR HEAVY COMMERCIAL VEHICLES**

**ACHIEVEMENTS**
Three prototype trucks were developed to demonstrate up to a 30% improvement in fuel efficiency via hybrid powertrains, electrified auxiliaries such as pumps (power steering and water) and compressors (brake and HVAC), and other developments including: radiator shutters, dual-level cooling circuit with flat heat exchangers, active and passive aerodynamics, reduction of driveline friction, solar panels on tractor and trailer, predictive energy buffer control, holistic energy management and driver efficiency coaching.

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**BUDGET**
€16.6 million

**FUNDING**
€10 million

**START**
November 2012

**DURATION**
42 months

**CALL**
FP7-SST-2012-1

**CONTRACT N°**
312314

**COORDINATOR**
Roberto BRACCO
CRF

**CONTACT**
roberto.bracco@crf.it

**PARTNERS**
The Consortium comprises three major EU truck manufacturers (IVECO, Volvo Group, DAF Trucks), ten Tier 1 & 2 suppliers and a network of nine research centres and universities.

www.convenient-project.eu
TRANSFORMERS

Configurable and Adaptable Trucks and Trailers for Optimal Transport Efficiency

MOTIVATION AND OBJECTIVES
By combining reduced energy consumption with load optimisation for long haul transport, TRANSFORMERS is targeting a 25% energy consumption reduction per tonne.km of goods transported through innovations including:

- A semi-trailer mounted “Hybrid-on-Demand” (HoD) electric driveline
- Mission-based, transformable vehicle aerodynamics
- An internal trailer design offering optimised load capacity
- Mission adaptability to allow optimisation for each transport mission

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
One trailer optimises load capacity, along with a novel multi-segment lowerable roof to optimise aerodynamics. An electric driveline is integrated in the 2nd trailer including intelligent energy control to offer a modular, mission selectable approach to hybridisation. A pre-standardisation communication interface proposal facilitates future market penetration. Aerodynamic optimisation includes an innovative single segment lowerable roof. Practical and economic viability is evaluated. Effects on the road infrastructure are also investigated.

TRANSFORMERS ENERGY EFFICIENCY & LOAD OPTIMISATION TRAILERS

ACHIEVEMENTS
Innovative solutions to increase the efficiency of long haul goods transport have been developed from end user requirements. The first distributed, trailer mounted “Hybrid on demand” driveline designed to support the conventional tractor driveline has been developed and commissioned, with a pre-standardisation communication framework. Simulations optimised component choice. Aerodynamics have been optimised by development of alternative lowerable roof systems, and internal capacity increased within EU regulations.
European Bus System of the Future 2
EBSF_2

MOTIVATION AND OBJECTIVES
The European Bus Systems of the Future 2 capitalizes on the results of the previous EBSF project and aims to test and validate innovative technological solutions for urban and suburban bus systems through demonstrations in real service. The ultimate goal is to improve the efficiency of operations, mainly in terms of costs and energy consumption, while raising the image of the bus for the users.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
Solutions dealing with 6 research areas will be tested on-board vehicles operating in several European cities, namely:
• Energy Strategy and Auxiliaries;
• Green Driver Assistance Systems;
• IT Standards introduction in existing fleet;
• Vehicle Design (Capacity, Accessibility, Modularity);
• Intelligent Garage and Predictive Maintenance; and
• Interface between Bus and Urban infrastructure.

EBSF_2 DEMONSTRATIONS IN BARCELONA AND PARIS AREA

ACHIEVEMENTS
The so-far achievements can be summarised as follows:
• Finalisation of implementation plan for all demonstrations;
• Evaluation methodology and selection of performance indicators;
• Definition of test scenarios and performance targets;

The demonstrations are running a set of technological innovations and strategies that will lead to cost-effective and energy efficient bus systems.
FORSTER-ROAD

The support action for ERTRAC, the European Technology Platform for Road Transport Research

MOTIVATION AND OBJECTIVES

FORSTER-Road supports ERTRAC, the European Road Transport Research Advisory Council, to strengthen the research and innovation strategies of road transport industries and policies in Europe. It brings together experts from all relevant stakeholder groups to monitor projects, develop roadmaps and support their implementation.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH

The topics are covered by the ERTRAC working groups and dedicated task forces:

- Urban Mobility
- Long Distance Freight Transport
- Energy & Environment
- Road Transport Safety & Security
- Global Competitiveness
- Connectivity and Automated Driving
- Electrification

SELECTED PUBLICATIONS (AVAILABLE AT: WWW.ERTRAC.EU)

www.ertrac.eu
FUTURE-RADAR
Future Research, Advanced Development and Implementation Activities for Road Transport - the Support Action for ERTRAC and EGVI

**MOTIVATION AND OBJECTIVES**
FUTURE-RADAR supports the European Technology Platform ERTRAC and the European Green Vehicle Initiative to create and implement the needed research and innovation strategies for a sustainable and competitive European road transport system. Moreover, FUTURE-RADAR facilitates the exchange between cities in Europa, Asia and Latin America on urban electric mobility solutions.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

**TECHNICAL APPROACH**
Linking representatives of all stakeholder groups, the activities include project monitoring, strategic research agendas, international assessments and recommendations for innovation deployment as well as twinning of international projects and comprehensive dissemination and awareness activities.

**PROJECT STRUCTURE**

**ACHIEVEMENTS**
FUTURE-RADAR supports ERTRAC’s holistic approach for achieving a 50% more efficient road transport system until 2050. The dissemination of deliverables to the relevant stakeholders will strengthen the European Research Area for transport research and consequently support the development of innovations for a globally competitive European transport industry.