



EUROPEAN  
COMMISSION

European  
Research Area

# Transport and FP7: Shifting up a Gear



## Interested in European research?

**Research\*eu** is our monthly magazine keeping you in touch with main developments (results, programmes, events, etc.). It is available in English, French, German and Spanish. A free sample copy or free subscription can be obtained from:

European Commission  
Directorate-General for Research  
Communication Unit  
B-1049 Brussels  
Fax (32-2) 29-58220  
E-mail: [research-eu@ec.europa.eu](mailto:research-eu@ec.europa.eu)  
Internet: <http://ec.europa.eu/research/research-eu>

## EUROPEAN COMMISSION

Directorate-General for Research  
Directorate H - Transport  
Unit H.1 - Horizontal Aspects and Coordination

European Commission  
Office CDMA 4/173

B-1049 Brussels

Tel. (32-2) 29-87 522

Fax (32-2) 29-64 299

E-mail: [nora.allavoine@ec.europa.eu](mailto:nora.allavoine@ec.europa.eu)

# Transport and FP7: Shifting up a Gear



***EUROPE DIRECT is a service to help you find answers  
to your questions about the European Union***

Freephone number(\*):  
00 800 6 7 8 9 10 11

(\* Certain mobile telephone operators do not allow access to 00 800 numbers  
or these calls may be billed

## **LEGAL NOTICE**

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information.

A great deal of additional information on the European Union is available on the Internet.  
It can be accessed through the Europa server (<http://europa.eu>).

Cataloguing data can be found at the end of this publication.

Luxembourg: Office for Official Publications of the European Communities, 2009

ISBN 978-92-79-09743-0

doi 10.2777/99703

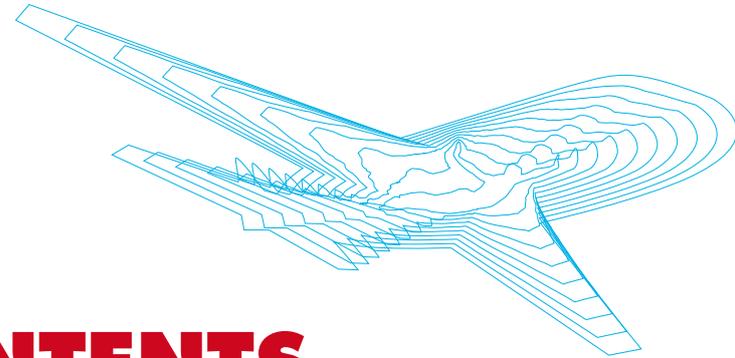
© European Communities, 2009

Reproduction is authorised provided the source is acknowledged.

*Printed in Belgium*

PRINTED ON WHITE CHLORINE-FREE PAPER

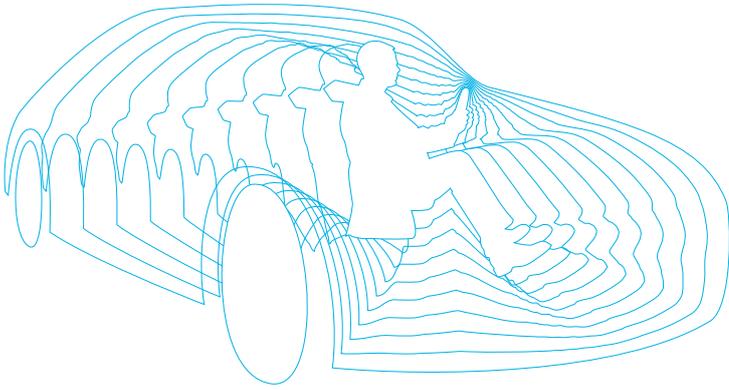
Pictures © Shutterstock, 2009, unless stated otherwise



# TABLE OF CONTENTS

<b>FOREWORD</b>	<b>6</b>
<b>CROSS-CUTTING ISSUES - HORIZONTAL ACTIVITIES</b>	
GREENING TRANSPORT  <b>GREEN FUTURE FOR SUSTAINABLE TRANSPORT</b>	<b>8</b>
COMPETITIVENESS OF THE EUROPEAN TRANSPORT INDUSTRY  <b>KEEPING EUROPE IN THE DRIVING SEAT</b>	<b>10</b>
SUPPORTING BREAKTHROUGH/PIONEERING TECHNOLOGIES  <b>BACK TO THE FUTURE</b>	<b>12</b>
SAFETY  <b>MAKING JOURNEYS SAFER</b>	<b>14</b>
<b>SURFACE TRANSPORT</b>	
URBAN MOBILITY  <b>PUBLIC TRANSPORT MOVES INTO THE FAST TRACK</b>	<b>16</b>
CO-MODALITY  <b>FULLY EXPLOITING EUROPE'S TRANSPORT NETWORK</b>	<b>18</b>
MARITIME TRANSPORT  <b>NEW WATERS FOR MARITIME TRANSPORT</b>	<b>20</b>
GREEN CARS INITIATIVE  <b>RECOVERY THROUGH INNOVATION IN THE AUTOMOTIVE SECTOR</b>	<b>22</b>
<b>AERONAUTICS</b>	
PROTECTING AIRCRAFT AND PASSENGERS  <b>SECURING THE SKIES</b>	<b>24</b>
CONSUMER SATISFACTION  <b>STRESS-FREE AIR TRAVEL</b>	<b>26</b>
INCREASING TIME EFFICIENCY  <b>TIME EFFICIENT FLYING</b>	<b>28</b>
JTI - CLEAN SKY  <b>CLEAN SKY - A GREENER FUTURE FOR FLYING</b>	<b>30</b>
<b>REFERENCES &amp; FURTHER READING</b>	<b>32</b>





# FOREWORD

The transport industry is key to Europe's prosperity. The EU is the world's largest producer of motor vehicles, producing almost a third of the world's passenger cars. It is a huge employer of skilled workforce, directly employing 2.2 million people but responsible for some 12 million jobs. It is a key driver of knowledge and innovation, investing more than €20 billion a year in R&D, making it Europe's largest private investor in R&D. With an annual turnover of €780 billion and a value added of over €140 billion, it makes a major contribution to the EU's GDP. The sector plays a central part in tackling many of the key economic, social and environmental challenges faced by Europe today, such as sustainable mobility and safety.

## WHY FUND TRANSPORT RESEARCH?

Transport research has been supported at European level for more than 15 years. This is particularly true in our current Community Framework Programme for research, which runs from 2007-2013 and in which over €4 billion have been allocated to transport research, a 30% increase on a yearly basis compared to the previous research framework programme.

Why this important increase? Because we see the serious challenges to sustainability that transport growth can create. Before the current crisis, demand for transport had been growing at an exponential rate; the price of oil it depends on showed how expensive this could become. The transport modes we use are too polluting, the oil it depends on can become too expensive, and our infrastructures and environment can no longer cope. We, policy-makers in the EU, look at these transport challenges in our own countries, and we know that they require innovative solutions to correct the fact that, today, 25% of the EU's CO<sub>2</sub> emissions come from transport, and that transport requires 71% of all oil consumption in the EU, while we know that sources of oil are finite and supply is insecure.

The current economic crisis does not change these data in a significant way, and research can still provide the solutions we need, by developing alternative ways of powering the cars on our roads, the ships on our seas and rivers, and the trains on our rail networks. A strong response to the crisis that hit the automotive industry can only come from research and innovation, and this is why

the European Commission has decided to launch the Green Cars Initiative. This public-private partnership focuses on supporting the industry in preparing the technologies of the future, in particular the electrification of road transport, at a moment when R&D investments might otherwise be at risk due to the financial squeeze. Research is also providing solutions for a better use of the transport systems we already have, by finding ways to improve the links between road, rail and waterways, which can, for example, help take freight off clogged motorways. Research can finally help change the habits and behaviours of people using individual and community transport.

## YOU TOO CAN APPLY FOR FUNDING

We invite participation from all universities, research organisations, and private enterprises big or small, who feel they have the ideas and the talent to further innovations in the field of transport, and would like EU funding to enable them to do so as a member of an international research consortium. Regular calls for proposals are held in the field of transport research, in which we invite consortia to bid for funding, presenting us with their unique and innovative research proposals. If you want to give it a try, and learn more about the opportunities FP7 presents for you and how to apply for funding, you can find out more by visiting [http://cordis.europa.eu/fp7/cooperation/transport\\_en.html](http://cordis.europa.eu/fp7/cooperation/transport_en.html)

*András Siegler  
Director, Transport Research  
European Commission  
Directorate-General  
for Research  
and Technological Development*



Funding opportunities are not limited to organisations from the 27 EU Member States. Many countries of the wider Europe are associated to FP7, and their universities, research organisations and private enterprises are able to participate in joint research projects funded by the EU. Other countries from any part of the world can also join in. Indeed, the challenges of developing the best transport solutions while responding to economic and environmental imperatives are not limited to the EU: the challenges we face are global, and so our response too must be global.

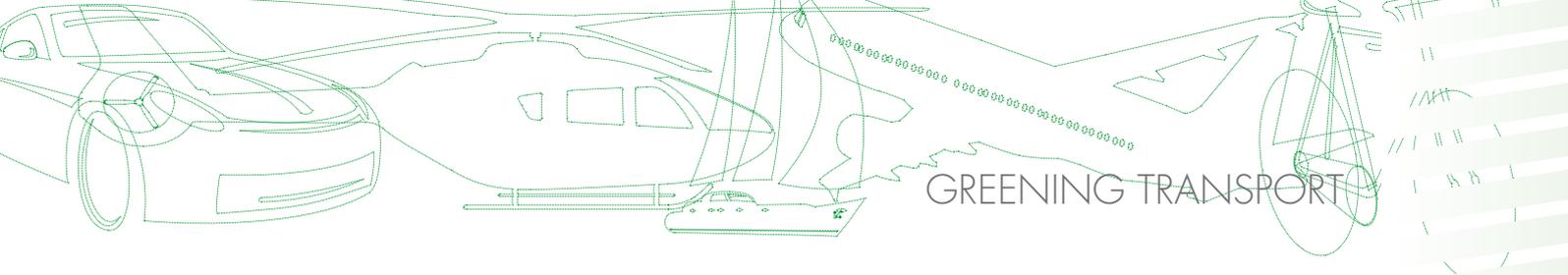
Through the funding of research projects, we are translating major EU policies into something very practical. Throughout this booklet, you will find examples of projects that have led to very real technological advances, and whose results are already finding their way into the day-to-day lives of our citizens. The European Commission, as you will see, has funded many successful projects that have brought together these needs, such as:

- personal 'travel pods' with no waiting time, to take travellers quickly and safely around airports; or
- jet engine aircraft that create less noise and environmental pollution

Such cooperation between the public and private sector are, to my mind, essential for bringing to market the vital technologies needed for the low-carbon economy.

This is how we can reach our targets for a more efficient, more sustainable, more competitive European transport industry and services: through dedicated research and innovations across the broad spectrum that is the European transport system. Furthermore, it is through such actions – and many others across all research sectors beyond transport – that large-scale EU priorities, such as the European Research Area for borderless research in Europe, or the Lisbon Agenda for growth and jobs, are able to come to life.





# GREEN FUTURE FOR SUSTAINABLE TRANSPORT

The transport sector is fundamental to the quality of life and economic prosperity of Europeans, and as a result it is a major priority for policy makers. Now more than ever, the EU is combining this priority with environmental concerns. Europe has already made great strides in reducing air pollution in the transport sector. But greater benefits are just around the corner, and the European Commission is ensuring that eco-friendly transport becomes a reality.

The sheer size of the European Union calls for an extensive transportation network. While transport is essential to economic growth and for the day-to-day lives of Europeans, both for work and pleasure, current transport patterns and growth rates are unsustainable. As a result, a great effort is being made to create a sustainable transport system.

Forecasts already predict that transport will be a major cause of increased energy consumption, particularly oil. With increased oil consumption comes increased pollution. The transport sector, principally road vehicles, is responsible for about 25% of all emissions of CO<sub>2</sub> in the EU. As a result, a large proportion of Europe's city inhabitants are exposed

to air pollution levels that exceed EU targets. Major inroads have been made, however, in reducing vehicle emissions, and further eco-innovations will ensure that Europe continues on its path towards achieving sustainability in transport. The EU's focus on transport has shifted from managing transport demand to addressing negative side effects.

## TOWARDS A SUSTAINABLE TRANSPORT SYSTEM

The aim of a sustainable transport system for Europe is threefold. Primarily, it means continuing access to basic modes of transport while preserving the health of people and ecosystems.

While a choice of transport should be available, it should also be afford-

## SILENCE

### Bringing peace and quiet back to city life

*As the old adage goes, silence is golden. Unfortunately for many living in Europe's urban centres, noise pollution is a major concern. Despite the increased strictness on noise limits in recent years, a corresponding decrease in noise levels has not been significantly observed. In order to combat this, the European Commission is funding the SILENCE project. Its aim is to bring under control the level of urban noise through the integrated application of modern technologies, systems and methodologies.*

*In achieving these aims, the project will take into account the overall targets of city authorities with respect to noise from individual road traffic and mass transport, both rail and road. The broad scope of the project also means that they are working in close cooperation with other complementary research initiatives across the EU.*

*SILENCE's Scientific and Technical Director Pierre-Etienne Gautier says, 'We believe that the availability of better and more cost-effective solutions for reducing railway noise in urban areas will help cities to create more realistic and effective noise-abatement action plans, and this will ultimately benefit all EU citizens living in urban areas.' The project partners have also noted that advanced noise reduction technologies and methodologies will also help to ensure the global competitiveness of European rail transport industry.*



able, efficient and supportive of a vibrant economy. Research conducted by Member States, has developed models, evaluation methodologies and indicator frameworks, which provide useful input to the policy making process. The search for alternative and cleaner fuels is also well underway in Europe. Vehicle electrification is a clear trend, but internal combustion engines and fossil fuels will continue to dominate the market in the near future, albeit with cleaner and more efficient engines. Research into biofuel alternatives is proceeding cautiously, taking due notice of the possible negative impacts of biofuels.

sector. Military and civil aircraft are adopting more and more electric actuators instead of hydraulic ones, rail transport is already electrified in many countries, and hybridisation of the current diesel locomotives is under development. Ships too are considering electric power to increase their efficiency and reduce their emissions.

The EC-funded POSEIDON project, which has recently been launched, is looking into the potential advantages of combining electric motors and generators with superconducting materials in order to increase their efficiency; this in

## TRANSPORT ON THE SEA AND IN THE CLOUDS

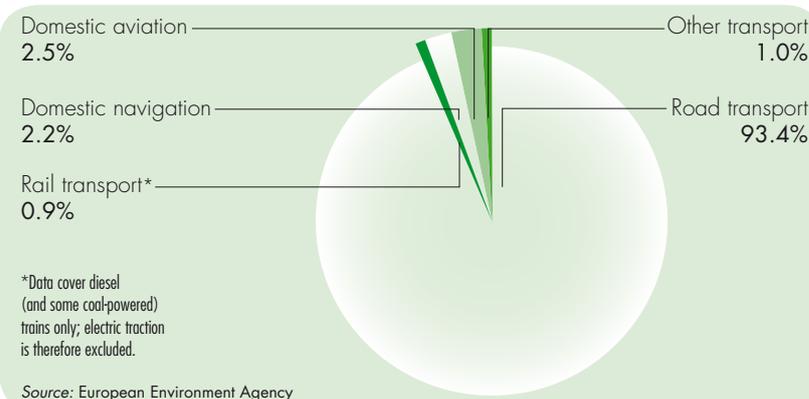
Nearly one in three ships sailing the high seas flies the flag of an EU Member State, and even more are owned by European companies. As a result, transport policy is not only dedicating itself to land and air, but to water travel as well.

### DID YOU KNOW?

**Emissions from domestic transport increased by approximately 26% from 1990 to 2004.**

Source: EEA/Eurostat

▼ Greenhouse gas emissions from transport by transport mode, EU-25, 2004 (in %)



Other alternatives being researched include the increased use of compressed natural gas (CNG). Fuel cell technology is also furthering the practical use of hydrogen as a viable alternative. Hydrogen or electric vehicles, if powered renewably, could contribute the most towards achieving energy security, as well as significantly helping to reduce emissions from greenhouse gasses.

What is more, electrification is a trend which is not limited to the automotive

turn would allow all the on-board systems to be electrified. For the time that the ship spends in port (thus contributing to the local pollution of the city) a system to allow on board systems to be powered from ground sources is also being developed. To solve the same problem the MC-WAP project is developing a large fuel cell to explore the possibility to use it in coastal areas, while KITVES aims at achieving a significant on board electricity production in the cleanest possible way: with the wind.

Ships are becoming a big source of air pollution in the EU and R&D activities are being conducted which will address ways to optimise the hydrodynamic performance of new ship propulsion systems. Innovative ideas such as integrated hull forms and complex configurations all aim to maximise the power from the engine that is converted to thrust through water.

The introduction of advanced concepts and technologies in the area of aeronautics promises a greener future for air transport as well. These include radically new aerodynamics design and drag reduction, advanced lightweight materials, and increased engine efficiency. This and similar research, will also have positive spillover benefits as new job and research opportunities open up, which in turn will encourage a more vibrant and competitive economy.



# KEEPING EUROPE IN THE DRIVING SEAT

The EU is now considered by many to be the largest economy in the world. In part, this major achievement was made thanks to the ability to move people and goods quickly and efficiently. One of the primary objectives of EU transport research is to ensure that transportation in Europe remains efficient and economical for European businesses and citizens. If companies are to work properly, transport must function properly, allowing money to be made and enabling people to live in prosperity. Competitiveness in transport also means exporting European transport-related products and services to foreign and global markets.

## TRANSPORT AND EUROPE'S ECONOMY

Transport, whether by land, sea or air, provides indispensable mobility for people and transport of goods, playing a vital role in the European economy and society. It involves a wide range of industries and services, from manufacturers and suppliers to infrastructure providers, communication, energy and research organisations, public authorities and many others. EU car makers, shipbuilders, aircraft and rail manufacturers represent multi-billion-

euro turnovers for Europe's economy and millions of jobs for European citizens. Therefore, using research to maintain the EU's competitive edge in the transport market is of major importance.

Research being carried out under the Seventh Framework Programme (FP7) will ensure sustainable, efficient and affordable transport services and create new skills and job opportunities. New technologies are being developed for design, manufacturing, assembly, construction and maintenance. The intention is to reduce life cycle costs, development lead times and environmental impacts. Fostering a

## VIVACE

### Injecting new life into air transport

*The air transport industry is perhaps one of the most competitive sectors in the EU. Air carriers around the world operate on thin profit margins, on top of which they are also trying to respond to consumer demands to become more 'green'. EU funding, however, is promising huge savings for one of Europe's largest employers by sector.*

*The EU-funded project VIVACE – Value Improvement through a Virtual Aeronautical Collaborative Enterprise – is promising to provide the aeronautical industry with vast reductions in cost thanks to advances in computer technology. Launched in 2004, the EU is funding well over half of the €75 million cost of the project which involves 63 of Europe's leading aeronautical companies and institutions. This also includes eight SMEs.*

*Through the successful application of computer modelling and simulations in the latest engineering laboratories, reductions in the development cost for the latest turbines could be as high as 50%. Another 5% cost reduction is also expected in aircraft development. All work conducted as part of the VIVACE project is based on real industrial simulations, either on an aircraft part or engine, or of a development process.*

*The tenet that customer needs are held paramount is central to the success of the project.*



competitive supply chain that can halve the time-to-market and reduce product development and operational costs can result in more affordable transport for all citizens. This can be achieved by improving the whole business process, from conceptual design to product development and manufacturing and in-service operations, including the integration of the supply chain. Particular attention should be given to the start-up and emergence of new high-tech SMEs, particularly in advanced transport technologies and 'services-related' activities.

The construction of new infrastructure and the renovation of existing infrastructure are to be studied. The aim is for a high quality level of service that delivers cost effectiveness, energy efficiency, low consumption of resources and long service life. This should take into account performance through the entire life cycle, durability and impact on traffic, especially safety and mobility. Special

attention is to be given to monitoring processes that reduce congestion. This includes monitoring traffic speed on both surface and structural conditions.

### MEETING CUSTOMER NEEDS

It is intended that new niche markets that take full advantage of eco-innovations be created. These should improve the quality and competitiveness of surface transport services and take into consideration various features. These include price attractiveness, environmental friendliness, punctuality, frequency, real time information and the opportunity for leisure and work during travel time. The aim is to sustain economic development in Europe and create skills and job opportunities by placing a special focus on green technologies. Proposals must ensure at least a neutral impact on climate change. The development of innovative vehicles, vessels and infrastructure also strengthen the competitiveness

of European industry by meeting the requirements of customers, changing markets and environmental challenges. The objective is for researchers to develop products and systems which emit less CO<sub>2</sub> and drastically reduce maintenance and inspection costs.

### DID YOU KNOW?

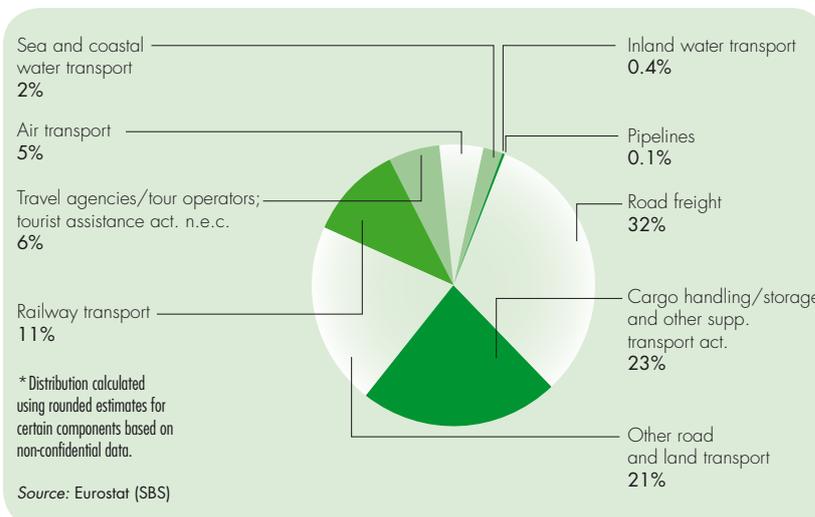
Road transport related industries contribute 11% to EU GNP.

Source: European Road Transport Research Advisory Council

### HOLISTIC STRATEGIES

Innovative methodologies and technologies for more competitive transport operations are intended to provide a reliable, environmentally friendly and economic service to customers. These activities address holistic strategies for minimising operating, environmental, maintenance and inspection costs. Navigation and control systems for optimised planning and routing across the entire transport chain also take into account real time traffic data and weather and sea state conditions. The aim is for simplified and low cost maintenance and renovation of transport infrastructure. This in turn provides reliable and high quality services with less equipment, lower life cycle costs and fewer environmental impacts. Furthermore, transport operators, end-users and passengers can benefit from improved real time information systems.

▼ Share of persons employed in transport services, by transport service, EU-25\*, 2004 (in %)



# BACK TO THE FUTURE

Transport has had a profound impact on societies all over the world, opening them up to trade and cultural exchange and in turn to greater well-being. This has been the case since humankind first set sail to foreign shores or explored new lands on horseback. These beginnings were then strengthened with new innovations and technologies such as railways, steam ships and aeroplanes. Now this trend is set to continue as transport is fast becoming a high-technology industry. Driven by the need to find safer, swifter and more environmentally friendly transport systems for citizens, European research is focused on developing intelligent transport systems involving communication, navigation and automation, and clean engine technologies providing increased fuel efficiency and promoting the use of alternative fuels. Developing technologies in support of the Galileo global satellite navigation system and its applications will also provide crucial opportunities to scientists and small and medium-sized enterprises (SMEs) at the cutting edge of innovation.

## INTELLIGENT TRANSPORT SYSTEM DEFINED

The term Intelligent transport system (ITS) refers to the integration of information and communications technology (ICT) into transport infrastructures and vehicles. There has been growing interest in these systems since they hold the promise of solving many of Europe's major transport problems in terms of congestion, safety and environmental impact.

Road transport, for example, accounts for more than one quarter of the EU's total energy consumption, and the number of accidents and fatalities on EU roads remain unacceptably high. These

intelligent systems based on information and communications technologies can help drivers to prevent, avoid or mitigate accidents, such as by calling the emergency services automatically in the event of a crash, for example. They can also provide drivers with real time information about the road network, so they can avoid being stuck in traffic for hours. They can also be used in electronic traffic management systems or the optimising of engine performance, thus improving energy efficiency and reducing pollution. These initiatives and more are currently under way and receiving funding under the EU's Seventh Framework Programme (FP7). The 'Intelligent Car Initiative', for example, aims to foster cooperative research in intelligent vehicle systems and facilitate the take up of research results by consumers and decision makers alike.

## NICHES

### Developing new niches in transport

*NICHES is one of the latest EU projects to be funded under FP7. Its goal: to develop new and innovative forms of urban transport. Once developed, the project will then actively seek measures to promote these concepts amongst the general public, encouraging them to use these new forms of transport.*

*The project will investigate 12 innovative methods which have been broadly split into 4 themes. Innovative concepts to enhance accessibility will address the needs of people with different physical abilities. For example, some cities are already bringing in low-floor trains and buses to help people who find traditional public transport difficult to negotiate. Concepts for efficient planning and use of infrastructures investigate how intermodal and more sustainable modes of transport can be integrated with more traditional types.*

*Ways of adapting intelligent transport systems (ITS) will also be looked into as part of the urban traffic management centres theme. ITS refers to the latest in communication technology which can be harnessed to ensure a more smoothly flowing traffic system as well as managing vehicles, loads, travel times and safety. Finally, space efficient transport systems will build upon the efforts of CITY-MOBIL, an FP6-funded project. The role of NICHES will be to promote already proven enhancements to urban transport to all stakeholders. These include the use of high-tech buses to incorporating shuttle services with parking centres.*



### PLANE SAILING

As the growth in air transport has been steady over the past decades with a forecasted annual increase in flights of up to 3.4% per annum through to the year 2025, it has become clear that a harmonised European air traffic management network is needed. Enter the Single European Skies ATM Research (SESAR) programme, which aims to introduce the most modern technologies to air traffic management (ATM) within the European single sky. In seeking to reduce the fragmentation of the diverse nationally-driven ATM systems, the SESAR programme will aim to minimise the impact of air traffic on the environment and increase safety, contribute to employment and open export markets for European air traffic technology.

### CROSS-BORDER RAILWAYS

The European Rail Traffic Management System (ERTMS) will bring similar advantages to the rail sector. This EU-backed initiative will aim to enhance cross-border interoperability between national networks and signalling procurement by creating a single Europe-wide standard for railway signalling. The two main components of the system are the European Train Control System (ETCS), a standard for on-board train control, and GSM-R, the GSM mobile communications standard for railway usage.

### WATER THE WAY TO GO

As for the river information services (RIS) system, it is already being deployed on the main European corridors. As a modern traffic management system, it enhances the swift electronic transfer of data between water and the shore. In Austria,

for example, the Donau River Information Services (DoRIS) project — embedded in the European RIS development work — successfully developed and implemented a telematic system that can automatically generate traffic information by means of transponders. In this way the system improves both the safety and efficiency of the Danube waterway.

### PARTNERING

As it invests considerable public funds in these systems and accompanies their roll-out with the necessary regulatory framework, the EU also exploits the opportunities of establishing public-private partnerships in support of research and development of new technologies. The Clean Sky Joint Technology Initiative (JTI) for example has as its primary goal improving the environmental performance and competitiveness of Europe's aeronautics industry by developing cleaner and more competitive engine technologies. The public-private partnership between industry, the research community and the European Commission will seek to invest in research and innovation with the goal of reducing carbon dioxide (CO<sub>2</sub>) emissions by 40%, nitrous oxide (NO<sub>x</sub>) emissions by 40% and noise emissions by the order of 20 decibels. It is hoped that these advances will be made in time for the next generation of aircraft to enter into service from 2015.

The next innovation is in the greening of surface transport through a Hydrogen and Fuel Cells JTI. It aims to accelerate the development and deployment of these technologies in Europe, by structuring technical research on these technologies, which are considered to be a clean alternative to fossil fuels, and stimulating increased public and private investment

in R&D. It will also help to develop awareness of fuel cell and hydrogen market opportunities and energy scenarios and foster future cooperation.

### GALILEO

The Galileo satellite navigation system will be operational by 2013 and provide a highly accurate, guaranteed global positioning service under civilian control. It will be inter-operable with GPS and GLONASS, the two other global satellite navigation systems.

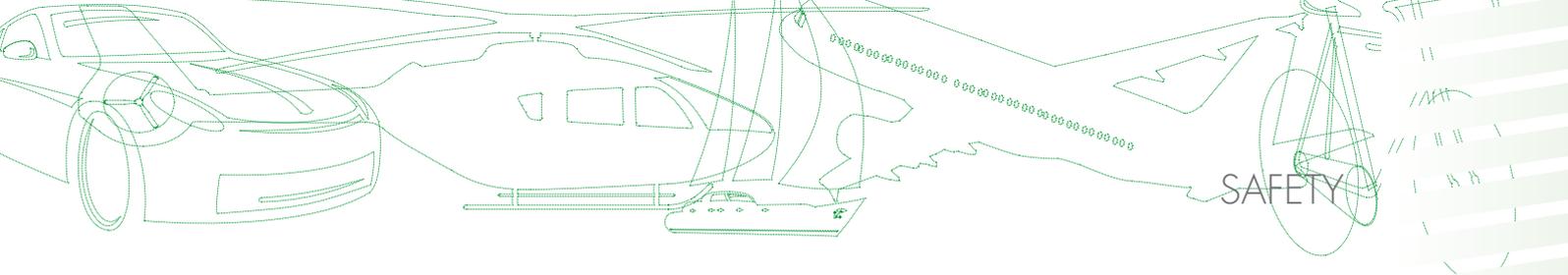
### DID YOU KNOW?

**The EU is a leading provider of transport services, equipment and technology. European companies control 30% of worldwide air transport and 40% of maritime fleet. Transport equipment accounts for 16% of EU exports.**

*Source: The Statistical Office of the European Communities; Eurostat*

A user will be able to take a position with the same receiver from any of the satellites in any combination. By offering dual frequencies as standard, Galileo will aim to deliver real-time positioning accuracy down to the metre range. It will also guarantee availability of the service under all but the most extreme circumstances and will inform users within seconds of a failure of any satellite. This will make it suitable for applications where safety is crucial, such as running trains, guiding vehicles and landing aircraft.





# MAKING JOURNEYS SAFER

Every year nearly 40 000 people are killed on the roads in the EU – the equivalent of a small town. And the number of injured as a result of road accidents exceeds 1.2 million per year. These unacceptable statistics call for action by the European Commission, and with the backing of all Member States, a number of actions will be put into place which will hopefully reach the Commission's target of saving 20 000 lives a year on European roads.

While transport is regarded as an entitlement and an essential part of economic growth and prosperity, it is increasingly being perceived as a potential hazard. Every hour of every day, life threatening accidents are affecting the general public. Statistically speaking, various measures implemented by the EU and Member States have ensured that while the volume of traffic has tripled over the last 30 years, the overall number of road deaths has fallen by half. This, however, is no cause for celebration and the European Commission is seeking to reduce this number even more.

## ROAD DEATHS UNACCEPTABLE

As a result, the objective of further halving the number of road accident victims in the EU by 2010 has been set, and a new Road Safety Action Programme is being developed to achieve this ambitious but elusive target. The actions required to achieve this goal are simple enough, but require a strong cooperation between Member States. The first and most important requirement is to foster a basic understanding among road users that it is their responsibility to improve their behaviour. The main cause of serious accidents is a result of drivers failing to comply with the most basic of road safety legislation. Fighting speeding, drink driving and the lack of seat belt and child safety restraint use is fundamental, and the EU is also promoting technological developments

## SAFECRAFTS

### Safe crafts for all

*Majestic cruise liners are once again gaining popularity, with some of the largest and most luxurious being built in European shipyards. The largest ever, which was built in Europe, displaces over 154 407 gross register tonnes, can carry 4 370 passengers and has a crew of 1 360 people. If something were to happen, it could be a major catastrophe. That's why passenger safety is paramount in the minds of ship designers, and that's why projects such as SAFECRAFTS are so vitally important.*

*SAFECRAFTS is researching evacuation methodology to ensure the safety of everybody aboard a ship. Until now, little research has been conducted on life saving appliances (LSA). This is partly because even test conditions are considered too dangerous to subject test passengers to. To combat this trend, non-conventional measures will be employed and analysing the rescue process as a whole will give the researchers new insight into safety protocols.*

*New developments in technology and advancements in our understanding of what actually happens during an emergency means that vast improvements in shipboard safety can be made. For example, tests have shown that under stressful conditions such as fire, passengers are more willing to open doors that have windows than those that do not. Therefore the simple application of this and similar knowledge during the construction phase can lead to the increased safety of everyone on board.*



(e.g. advanced driver assistance, emergency braking systems, smart restraint systems, etc.) which have an enormous potential to save lives on the road by preventing and mitigating road accidents.

Currently the EU is at the forefront of car safety. On one side the so-called passive safety has been constantly improved. Exclusive competences were developed in the past to satisfy whole vehicle type approval regulations, and then further refined under the pressure of the more and more stringent, EU-supported EURO-NCAP tests. At the same time, a series of research projects has also enabled design technology to confer high energy absorption capability to vehicle structures to provide protection against injury. Other technologies (the so called active safety devices) have been developed to avoid accidents altogether. This is also being extended to commercial vehicles and their trailers, as well as coaches and buses. Also of equal

importance is improving the infrastructure of road networks. Improvements to road infrastructure and the introduction of procedures can make a significant contribution towards reducing the frequency and seriousness of road traffic accidents. Designers can influence road user behaviour. The development and implementation of sophisticated side barriers and roadside verges mean that human error does not necessarily end in death or serious injury and overall make for safer roads

### SAFETY ON THE SEAS

The EU can boast some of the cleanest waters and beaches in the world, and in order to maintain this it is following a proactive strategy in the area of maritime safety in an effort to avoid the mistakes of the early 1990s. As a result, the EU and its Member States are at the forefront of improving maritime safety legislation and promoting high-quality standards.

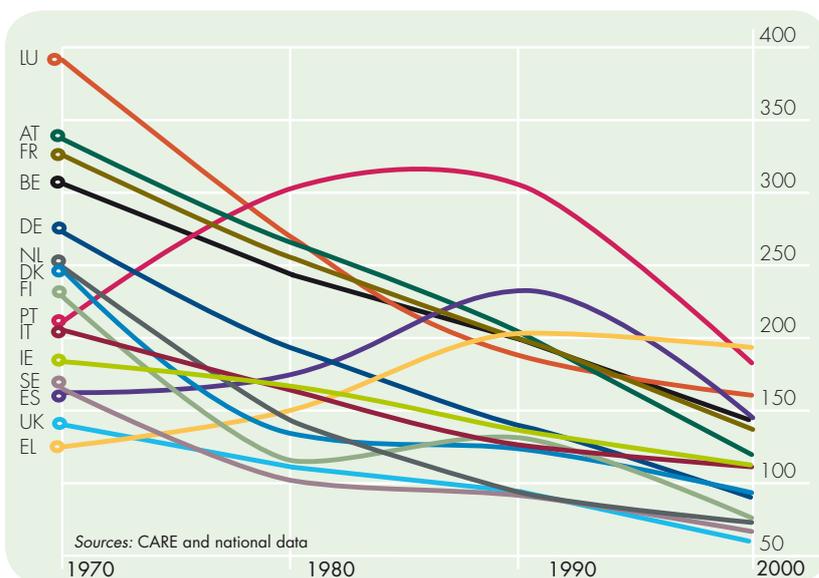
As part of this commitment to raise safety standards for ships and seafarers, the European Commission is working within international forums to improve the situation regarding the checks made by countries on ships flying their country's flag. Currently the onus is on the flag state to ensure owners and operators are meeting their obligations regarding safety. Despite this, however, many ships fail to meet these standards, which is why the Commission is working through these multinational forums to affect change.

### DID YOU KNOW?

**The direct and indirect social costs of fatalities on roads has been estimated at €160 billion, i.e. 2% of EU GNP.**

Source: EU Transport Research

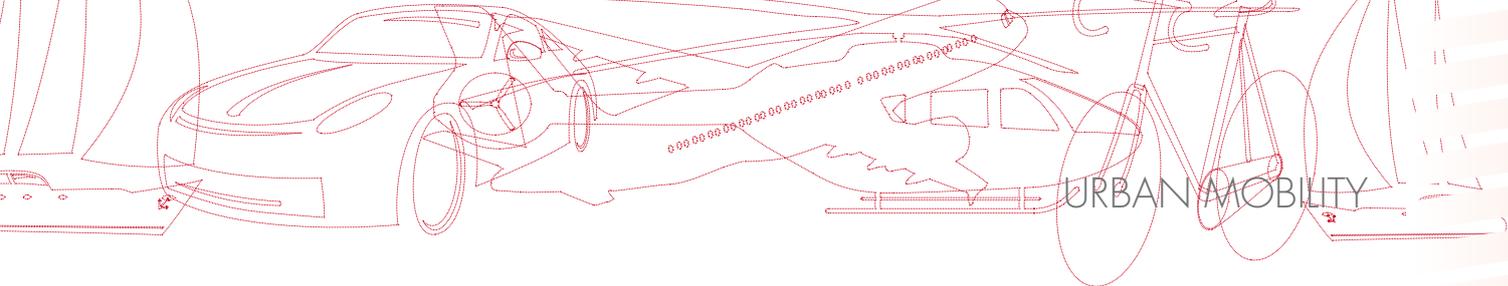
▼ Road accidents, number of deaths per million inhabitants per year in EU-15, 1970–2000



The European Commission also set up the European Maritime Safety Agency (EMSA) whose main role is to provide the Commission and Member States with scientific and technical support relating to legislation for maritime safety, maritime security, pollution prevention and response. EMSA's operational duties include looking after the EU's SafeSeaNet project, essential for the monitoring of maritime traffic around Europe, and assisting Member States with additional operational means to respond to pollution caused by ships.

These and other actions aim to eliminate substandard shipping, increase the protection of crews and passengers, and reduce the risk of environmental pollution. This is good news for business, passengers and the environment.





# PUBLIC TRANSPORT MOVES INTO THE FAST TRACK

The European transport industry is facing many serious challenges that must be addressed in the coming years. Our cities are dealing with a constant increase in population, passengers and freight. Congestion and pollution are having a detrimental effect on our way of life and our health, and many hours of our lives are wasted in traffic jams or trying to find a parking space. This is in addition to the fact that congestion of freight vehicles is causing an estimated loss of 1% of the EU's GDP per year. People continue to add to city congestion and pollution by using private cars when buses, trains and trams are easily available because they feel public transport is not safe enough, cheap enough, reliable enough or flexible enough.

## VERVE AND VISION FOR THE FUTURE

According to a recent opinion poll, 90% of Europeans think that the traffic situation in their area should be improved. The challenge for the EU over the next few years is to create a smarter and more dynamic transport system that people want to use. Encouraging people out of their cars and on to public transport is not an easy task, but a good starting point is to develop transport systems that are cheaper, safer, more flexible and more comfortable than cars.

Under the EU's Seventh Framework Programme for Research (FP7) many research topics are now being undertaken to improve the quality of European urban transport and inject new dynamism into city transport systems. More attention is being given to transport alternatives in cities, such as cycle routes and park and ride systems. The latter particularly are being encouraged in as many city centres as possible as a positive way of reducing congestion and improving

transport connections in and out of cities. There is a need for more out of town parking areas and more graded pricing systems to encourage people to park outside cities. At the moment the potential to build new infrastructure for transport systems, such as car parks, is being hampered by lack of space in city centres. Research topics include how to better integrate transport systems by making vehicles more efficient and cost-effective, how to link different transport modes, and how to make them more welcoming to vulnerable passengers.

Other important issues are the better use of existing infrastructure in city centres through upgrading older transport stock and providing improved access to transport for all passengers – including elderly people and the disabled.

## DISCREET DELIVERIES

Research is being carried out on how movement of freight vehicles and goods can be improved to minimise the impact they make on residents, such as using hybrid electric technology for city buses. Focus is also being put on reducing energy consumption, emissions and

## CityMobil

### Testing personal electric travel pods

*CityMobil has EU funding of €40 million. Twenty-eight partners from 10 EU countries are researching ways to make better and smoother transport connections, such as the Heathrow Airport 'travel pods' – officially known as the ULTra Personal Rapid Transit system (PRT). This exciting new innovation offers personal transport with practically no waiting time to take passengers quickly and smoothly to their chosen destination. The driverless pods will carry up to four people and their luggage safely around the airport and can be called from a central control point in the airport. This will revolutionise the way passengers travel around airports, making it quick, convenient and with no long distances to walk!*



One of CityMobil's personal transport 'travel pods'

© ATS

noise. Better freight delivery systems are essential to keeping the European economy ahead of the global market. New technologies aim to produce efficient, safe and quiet transport vehicles to make night-time transport and distribution of goods easy and discreet.

### KEEPING CITIZENS SAFE

Safety and security are two top priorities of FP7 transport research. The most vulnerable members of society need special attention from transport providers. The elderly and disabled should be able to take full benefit of transport systems in EU countries and must feel safe using public transport. FP7 safety and security issues must be all-encompassing including passengers, pedestrians, motorcyclists, bicyclists, the elderly and the disabled. There are still too many road accidents in EU countries, mostly involving pedestrians

and cyclists. It is imperative therefore that new technologies are developed for safety and security including the design of vehicles that have built-in safety and security characteristics. New design constructions, such as updated traffic-speed monitoring equipment, are a top priority in EU transport research. These will provide a high standard of service to the public and will help to increase the level of passenger safety and confidence in transport systems.

Research is also being carried out into flexible safety measures for the transport of hazardous goods.

### STAYING AHEAD OF THE GAME

In terms of economics, above all else the European transport industry must be competitive. The strengthening of the global competitiveness of the European

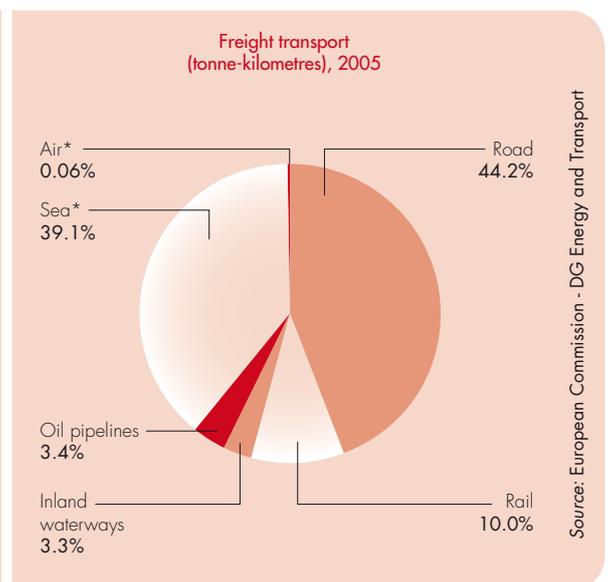
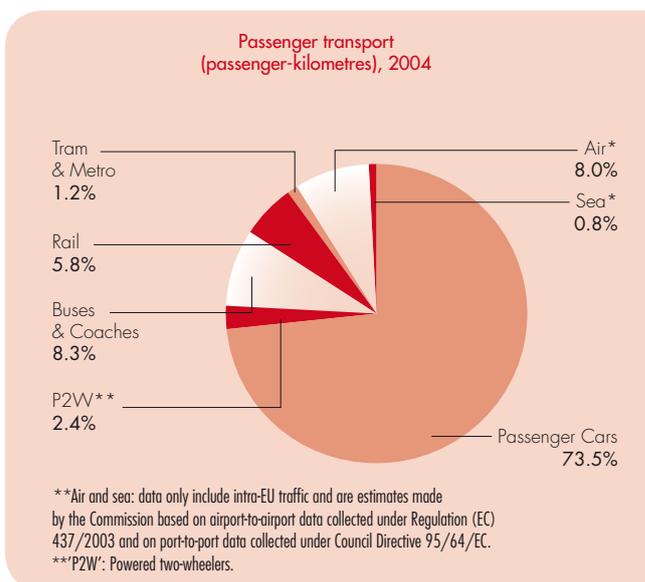
transport industry will result in the creation of new skills and job opportunities through research and development such as decreasing life cycle costs of different transport modes and advanced industrial processes including design, manufacturing, construction and maintenance. Research into innovative processes such as new production organisations and supply chains is also imperative. The role of SMEs in the innovation process and in the supply of systems and equipment is crucial, and will lead to an expansion of their role and an increase in job creation.

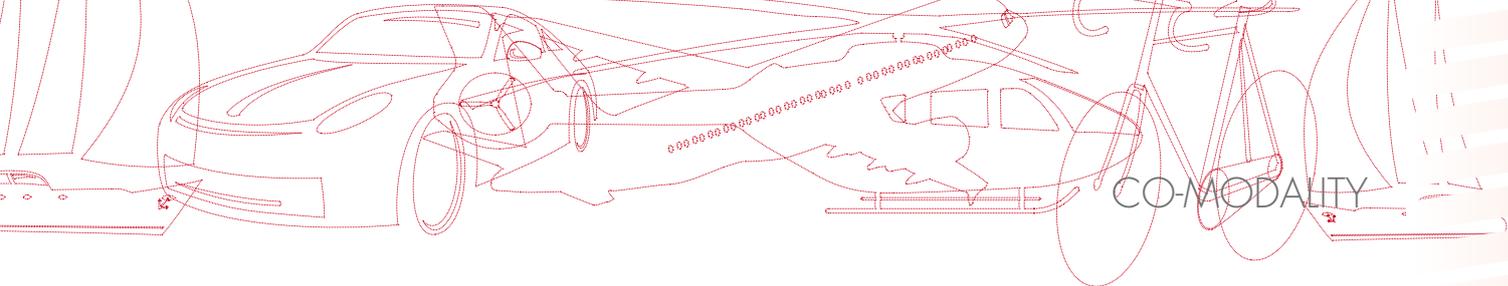
### DID YOU KNOW?

According to the latest statistics there is nearly **one car to every two inhabitants in the EU-25.**

Source: Eurostat

▼ Comparative modal shares of passenger and freight transport





# FULLY EXPLOITING EUROPE'S TRANSPORT NETWORK

When travelling across Europe, one is immediately struck by the different landscapes that exist. Europe incorporates some of the highest mountain ranges in the world, some of the most beautiful beaches, vast green valleys and intricate canals. And when it comes to movement and transport across the European continent, EU policy embraces these geographical idiosyncrasies.

Instead of promoting one method of transport, or pitting one mode against the other, EU transport policy seeks to integrate various modes of transport. In doing so, individuals and businesses can benefit from various methods of transport to and from each region. Co-modality – the use of different modes of transport on their own and in combination – will therefore achieve a more sustainable and optimal use of resources.

## SHIFTING GEARS

According to estimates, freight transport has grown by over 30% in the past 10 years and it is expected that similar levels of growth will take place over the next decade. At the moment, the majority of goods are carried on Europe's roads. However, such an increase in volume is providing a major challenge to the road transport industry and the European transport system as a whole. Rising oil prices, congestion levels and stringent environmental standards aimed at tackling climate

change and air and noise pollution are making it imperative for Europe's transport system to shift gears.

## THE FUTURE IS MULTI-MODAL

A modal shift towards more sustainable transport modes such as rail, short sea shipping and inland waterway transport, has been identified as a potential solution. Enter the concept of 'co-modality' in transport. For example, the goal of the EU is to improve traditional freight transport by supporting the efficient door-to-door movement of goods using two or more modes of transport, in an integrated transport

## CREATING

### Developing the world's cleanest ship

*Reducing Europe's environmental footprint is a major target for EU transport policy. One way of achieving this is by shifting transport away from those modes which are high in pollution and congestion to cleaner alternatives. The CREATING project is doing just that.*

*CREATING aims to stimulate water transport and encourage the use of the existing network of canals and waterways that stretch from the Atlantic to the North Sea and from the Danube to the Black Sea. The CREATING team incorporates 27 partners across 9 countries. Together they will encourage research and development that will improve the integration of different modes of transport as well as improvements in ship and terminal designs.*

*New designs in vessels, such as barges, could lead to reductions in cost and improve lead times in the logistics chain. Improvements can be made to a ship's hydrodynamics (similar to a car's aerodynamics, but with regard to the ship's hull and its movement through water), improving the engine's efficiency and the ship's safety. Already the project has successfully demonstrated that huge reductions in pollution can be made with their model ship 'Victoria' (see photo).*

*Once changes such as these and others in the area of the logistics chain are made, a true paradigm shift in co-modality will begin to occur and a wider audience will become more aware of the possibilities of co-modality and the consequent improvements that it can bring to the areas of environment, safety and economics.*



chain. Each mode of transport has its own advantages in terms of capacity, safety, flexibility, energy consumption and environmental impact. Therefore, co-modality in transport allows each mode to play its role in building integrated transport chains which overall are more efficient, cost effective and sustainable.

### TARGETED RESEARCH

Encouraging and increasing modal shift and decongesting transport corridors are major priorities for transport research under the Seventh Framework Programme (FP7). The EU's overarching research goal is to develop integrated, greener, smarter and safer European transport systems that respect the environment, with the aim of maintaining Europe's leadership position in the field and further developing its competitiveness. In the case of rail transport, in order to achieve these goals, two basic areas of research have been identified. The first is an intelligent and interoperable

infrastructure on a continental scale. A truly integrated European railway area is in the process of being created through the standardisation of different national railway systems with the ultimate goal of allowing seamless movement through international rail networks. The second is to improve the customer experience through better performances, products and services. In time, this will expand the cost effectiveness of rail in the freight and passenger transport area.

### MOTORWAYS OF THE SEA

Although waterborne transport is the most sustainable transport mode from the economic and environmental points of view, current research in this transport sector aims to keep its environmental footprint within acceptable limits, whilst ensuring it meets its targeted increase in market share. The answer lies in research and developing low emission technologies, which could eventually lead to a new generation of 'zero emission' vessels.

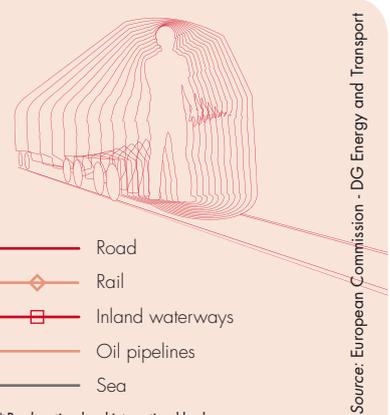
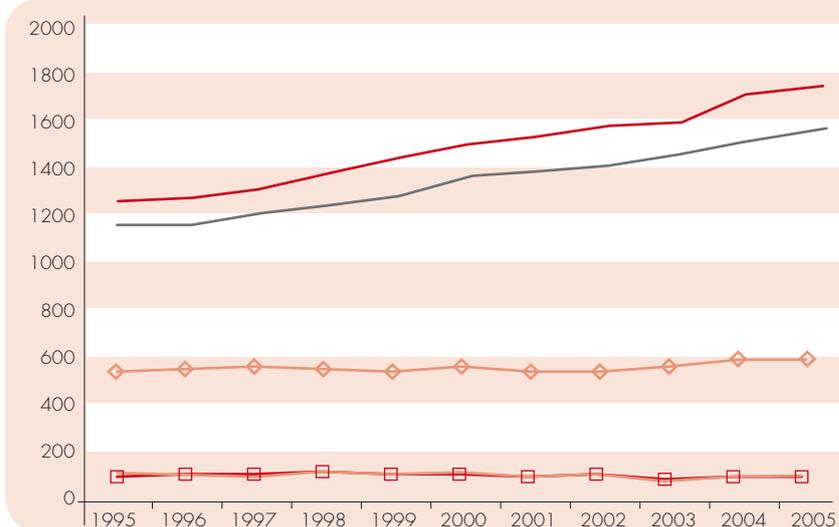
### INFORMATION TECHNOLOGIES

Finally, getting the maximum benefit from information and communication technologies (ICT) is key to the efficiency of all freight transport modes in the co-modal approach. Research here is primarily concerned with developing integrated ICT concepts within and across modes in line with the principles of co-modality.

**DID YOU KNOW?**  
**Transport is responsible for a quarter of all the EU emissions of CO<sub>2</sub>.**

Source: European Commission

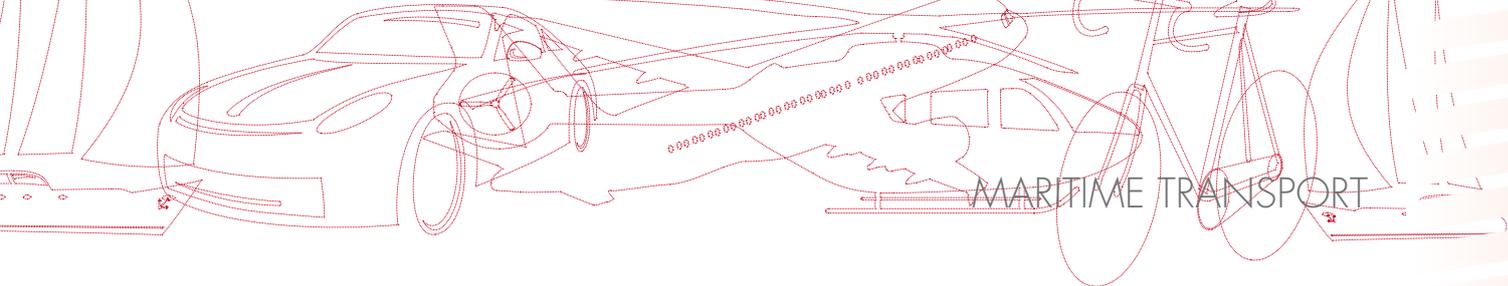
▼ Freight transport performance\*, by transport mode, EU-25, 1995-2005 (in billion tonne-kilometres)



\* Road: national and international haulage by vehicles registered in the EU-25. Sea: data for tkm and pkm only include intra-EU traffic and are estimates by the Commission services based on port-to-port data collected under Council Directive 95/64/EC.

Source: European Commission - DG Energy and Transport





# NEW WATERS FOR MARITIME TRANSPORT

Maritime transport is of strategic importance to the world economy. 90% of the EU's external trade is based on shipping. This reflects the cost and fuel efficiency of this transport mode. While the current economic crisis is strongly affecting shipyards, growth prospects for maritime transport remain high over the long term because shipping is irreplaceable for long distance trade. Furthermore, inter-modal transport of goods by a combination of road, rail, short sea trips and inland waterways will continue to be developed to help address the congestion of roads. Current projections are that EU shipping might double by 2015 compared to today's volumes. This raises considerable technical and environmental challenges, considering the present levels of congestion in ports and the need to reduce emissions and accidental pollution from shipping, in a context of increasing international competition. Maritime transport research seeks to tackle these challenges, while considering maritime transport in the framework of all maritime activities, in line with the EU's new maritime policy.

## MAKING THE MOST OF OUR SEAS

EU shipyards accounted for 14% of the total tonnage of ships produced in the world in 2007, but the value of their production is about 20% of the total. This was achieved by focusing on the high tech / high range value segment of the market. With the current economic crisis and the environmental challenges we are facing, the EU needs to further move in this direction by using the best technologies to enhance the environmental performance and the safety of new ships.

By doing this, while also updating maritime infrastructures, further improving logistics and efficiency in ports, and promoting inter-modality, the EU will be able to meet the growing demand for maritime transport, in an environmentally sustainable manner.

Consolidated EU-wide research programmes are necessary to achieve this objective. Consequently, 30% of the Seventh Research Framework Programme's transport budget for collaborative research in surface transport is going into maritime transport research.

## HERCULES

### Time to stop polluting

*Shipping is responsible for a low part of global CO<sub>2</sub> emissions, but the use of heavy fuels in maritime transport generates important emissions of atmospheric pollutants, such as nitrogen and sulphur oxides. In fact, in the EU this kind of pollution may soon be caused nearly as much by ships as by cars and lorries, and finding ways to reduce them is therefore imperative.*

*The HERCULES Integrated Project, which ran from 2004 to 2007, involved a consortium of engine makers, equipment manufacturers, shipping companies, universities and research organisations, developed new technologies to reduce NO<sub>x</sub> emission by 20% as well as particulate emissions from marine engines. The project also led to increased engine efficiency and reliability, thus reducing fuel consumption, CO<sub>2</sub> emissions and engine lifecycle costs.*

*It is with this type of projects that the EU can improve the competitive position of its maritime industries and tackle the global environmental challenges.*



### SHIP TO SHORE AND ONWARDS

Ports are the hubs of the shipping industry and they must work smoothly if there are to be no delays and hitches in the distribution of goods. But many EU ports are jammed and a significant percentage of goods are unloaded behind schedule, which means a loss to the whole economy. The EU is researching new ways of innovating in ports to speed up unloading and distribution, and it is also looking at “inter-modal” transport methods to create a smooth chain of arrival and delivery.

The idea of inter-modal transport is becoming more popular as congestion on EU roads worsens. Pollution from lorries, and the high cost of road tolls and fuel, are making it imperative for more imaginative transport solutions to be developed. Transporting goods by a combination of road, rail, long and short sea trips and inland waterways makes sense, as it will remove a lot of pressure from Europe’s roads. The possibility of creating “inland ports” to ease the pressure on maritime ports is also being investigated.

### AN INTEGRATED APPROACH

Shipbuilding and shipping are crucial to the EU’s economy. But, together with other maritime activities like tourism, fishing, aquaculture and energy production, shipping contributes to an ever increasing pressure on the marine environment. Emissions, accidental pollutions, sewage and waste release as well as transport of potentially invasive organisms in ballast waters are important issues that need to be addressed.

Research is already taking place in the EU to try to counteract much of the detrimental effect of human activity in the maritime environment. Research is for example being carried out to increase fuel efficiency and decrease emissions from ships (such as the HERCULES project; see boxed text).

Taking a wider perspective, the EU marine and maritime research strategy tackles inter-disciplinary issues which involve maritime transport and other sectors (such as, for example, the impact of human activities on marine ecosystems and risks and opportunities attached to development of activities in the Arctic).

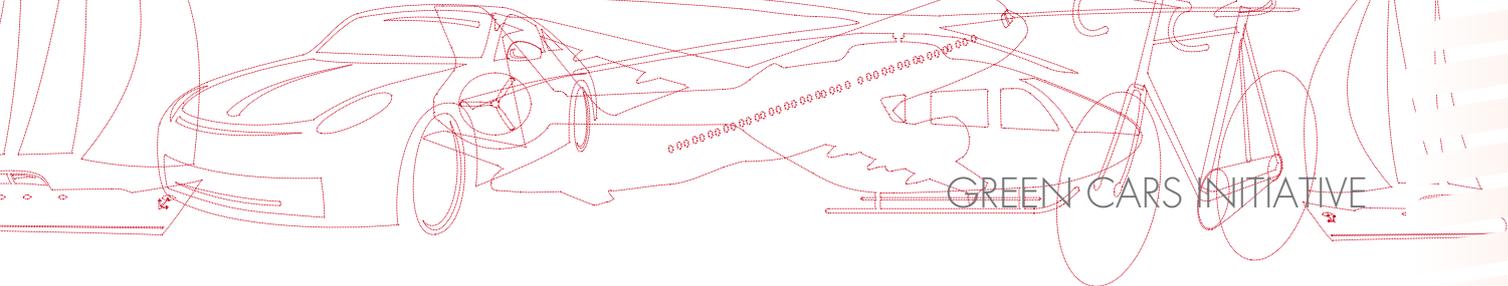
### THE WATERBORNE TECHNOLOGY PLATFORM

The EU maritime industries are facing increasing competition from emerging economies. Against that background, they must compete together on the basis of scientific and technological excellence. The Waterborne Technology Platform was created in 2005. It brings together all stakeholders in the maritime transport and offshore industries including thousands of SMEs on the basis of a shared vision and strategic research agenda for the 15 coming years. This research agenda, supported by the Research Framework Programme, seeks to improve the competitive position of the maritime industry while addressing major safety, security, and environmental concerns.

**DID YOU KNOW?**  
Nearly 398 million passengers passed through EU-25 ports in 2006

Source: Eurostat





# RECOVERY THROUGH INNOVATION IN THE AUTOMOTIVE SECTOR

The global economy is in crisis – a crisis which is already putting car sales in jeopardy. The car industry is a major employer, and any major disturbance to the industry risks affecting the economic and social fabric of Europe.

This is why the European Commission made the car industry a key focus of its economic recovery package, presented in November 2008. At the same time, today's environmental imperatives mean that we need to encourage all road transport stakeholders to move towards more sustainable transport. The

**European Green Cars Initiative** responds to both these needs. It provides financial support to research into the green technologies that will propel our cars, trucks and buses in the near future – spending on research today to correctly meet the demands of tomorrow.

Road transport is one of the major sectors of European industry, generating 11% of EU GDP and contributing €33 billion of external trade. The automotive industry, in particular, is responsible for over 14 million jobs. 'Greening' is necessary to achieve EU and world targets for missions reductions. Around 25% of CO<sub>2</sub> emissions in the EU are linked to the transport sector.

More than 90% of all EU transport emissions are due to road transport. And, while overall emissions declined, those from transport rose continuously between 1990 and 2005 due to high growth in both passenger (28%) and freight transport (62%). There is also the need to improve urban air quality in order to protect citizens from pollution.

## HICEPS

### Building better hybrids

*The partners in the HICEPS project will look at the development of new hybrid architectures. The first of these will be coupled to a natural gas engine to further minimise CO<sub>2</sub> emissions. It aims at completely eliminating the gearbox through an innovative device that has an electric motor turning within another one. In this way the power can be transferred in all directions between the batteries, the engine and the wheel and with an infinite number of ratios. The expected benefit would be to decrease fuel consumption by a further 10% with respect to the best existing hybrids while offering a range of 10 km in pure hybrid mode. The second architecture, aimed at very small gasoline-powered vehicles, distributes the hybrid components between the front and rear wheels, thus allowing 4x4 traction and all the features of hybrid vehicles at the same time.*

*The third type of powertrain couples an optimised diesel engine to an advanced dual clutch transmission to achieve the best fuel economy for an urban delivery van.*

*As the experience of other manufacturers has shown, however, having a good hybrid powertrain is not enough. Today's cars have a number of power-hungry auxiliary systems which also need to be optimised and adapted to the peculiar workings of a hybrid vehicles. Customers expect to have air conditioning, power steering and other conveniences; under current technology these are often dependent on the internal combustion engine is stopped.*

*The four-year HICEPS project should enable the European automotive industry and their suppliers to compete with other hybrid models.*



The European Green Cars Initiative is a novel partnership between the European Community and industry, based upon long experience of cooperation through Technology Platforms. This public-private partnership is funded by the Community, the European Investment Bank, industry, and Member State contributions, with a combined envelope of at least €5 billion. It includes three parallel streams of action:

- Firstly, it includes a €4 billion financial envelope for loans made through the European Investment Bank to support the development of new, sustainable forms of road transport. Besides the loans provided by the existing Risk-Sharing Finance Facility (RSFF), the new European Clean Transport Facility (ECTF) has been created as a direct response to the effect of the downturn on the transport industry. The ECTF is aimed specifically at transport research, development and innovation, with the goal of lowering emissions and improving energy-efficiency and applies not only to road transport but also to other modes such as rail and inland and maritime navigation.
- It also includes grants to support research and development in targeted areas, made through the European Community's Seventh Framework Programme for Research.
- These financial support measures will be supplemented by demand-side measures, involving regulatory action by Member States and the EU, such as the reduction of car registration taxes on low CO<sub>2</sub> cars to stimulate car purchase by citizens.

### TARGETED TECHNOLOGIES

Despite its name, the Green Cars Initiative is not only for passenger cars. Under the Green Cars Initiative, the topics which will receive research grants from the European Commission's fund for research and development include research on internal combustion engines for trucks, bio-methane use, logistics, and of course electric and hybrid vehicles and infrastructure. The electrification of road transport will be a major focus of the Green Cars Initiative, notably through support for research into high-energy batteries, power electronics, electric components and motors, as well as interfaces between vehicles and smart electricity grids.

Car electrification is all the rage, lately, but it is in no way a novelty in EU funded research. The development of hybrid and electric vehicles and of the necessary electric components (batteries, motors, power electronics etc.) has been the subject of many projects, which have helped assemble the knowledge and industrial base on which the Green Car initiative will build upon. The latest of these projects, HICEPS (see boxed text), is currently underway, and it has the ambition of developing four different hybrid vehicle concepts adapted to the lower segments of the market, where difficulties in applying hybrid technology are the biggest, and to the light duty freight transport segment, where benefits on pollution and energy efficiency are likely to be large.

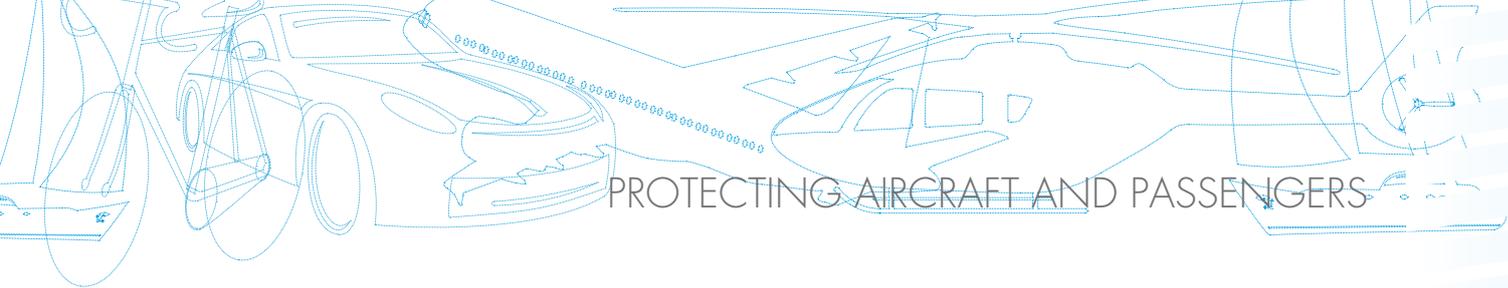
### DID YOU KNOW?

The automotive industry in Europe:

- directly employs 2.2 million people;
- indirectly supports 12 million jobs;
- accounts for 11% of total industrial exports.

Source: ACEA





# SECURING THE SKIES

Ensuring the security of air transport is a top priority for the EU. The events of 11 September 2001 and its subsequent developments have focused attention on the protection of passengers, crew and infrastructure. This includes preventing hostile action of any kind which could risk incurring injury, loss, damage or disruption to travellers or citizens due to the effects of aircraft misuse. Research is concentrating on improved security measures in cabin and cockpit design, automatic control and landing in the case of unauthorised use of aircraft, and protection against external attacks. The security aspects of airspace management and airport operations are also being studied. All these actions are set against a backdrop of unprecedented growth in demand for air travel.

## PROTECTING AIRCRAFT AND PASSENGERS

One important aspect of this cooperation is the aeronautics research that the EU funds to develop safer air transport for its citizens.

Security has always been a major concern in aviation and has traditionally been dealt with by individual Member States, rather than at Community level. This situation, however, changed following the events of September 11, 2001. After that tragic event, it became apparent that cooperation at the EU level

was needed to deal with the changing security climate that is facing the world. A whole new suite of security measures is being developed to ensure that EU citizens can fly the airways with the knowledge that every effort has been taken to ensure their complete safety.

This is why a completely holistic approach is being taken when it comes to safety. Research is focusing both on dealing with threats to security and developing new methods to protect against freak accidents and naturally occurring threats, be they lightning strikes or wind shear.

## SAFE

### Safer flights from take-off to landing

*The SAFE project (Security of Aircraft in the Future European Environment), was completed at the end of 2007 and received €19.5 million in funding from the EU. The project has developed technologies for improving security of commercial air travel, focusing on in-aircraft systems. The goal was a fully secure flight from departure to arrival destination, whatever the identified threats. In order to protect an aircraft, defensive layers are built around it. The first level involves security procedures on the ground to prevent dangerous individuals boarding the aircraft. If this fails, on-board systems will come into play. A number of scenarios are addressed by SAFE, such as September 11 style attacks, where the aircraft is seized and used as a weapon. Other scenarios involve electronic jamming and the hacking of computer systems used for controlling aircraft.*

*SAFE had five key activities. These included onboard threat detection, involving the application of advanced audio and video surveillance techniques and a threat assessment and response management system for determining appropriate courses of action. An Emergency Avoidance System and an automatic guidance system, can take control of the aircraft allowing it to be brought home safely. A data protection system was also developed for securing all data exchanges in and out of the aircraft. The final research area worked on cross-cutting issues, building an integrated and comprehensive system for on-board security.*



Mock-up of an aircraft cabin (external view), used for onboard threat detection (OTDS) evaluation

### FACING THE CHALLENGE THROUGH RESEARCH

The EU is now working on new research initiatives to answer the security challenges facing the aviation sector. The objective is to prevent hostile action and aircraft misuse. The issues being addressed include heightened security measures in cabin and cockpit designs and automatic control, as well as the security aspects of airspace management and airport operations. The work improves aerostructures through the use of advanced technologies. This includes the development of blast-resistant cabin structures and bomb-proof cargo containers. Research is also being carried out into explosive detection systems, secured wide-band communication systems and techniques for detecting and counteracting missile attacks on aircraft.

Researchers are not concentrating just on aircraft. A range of innovative solutions and technologies is being applied to security in airports and air

traffic management. The human factor is also being taken into account. This ranges from the modelling of human behaviour and the use of advanced techniques for crisis management, to the training of personnel to deal with security threats. However, new measures and procedures must increase security while, at the same time, maintaining the efficient movement of air travellers.

### INNOVATIONS IN SAFETY

As well as protecting aircraft and passengers from hostile acts, studies are also being carried out to improve the overall safety of air transport. The intention is to achieve a five-fold reduction in the rate of accidents by ensuring that aviation safety remains at current high standards or even improves regardless of air transport growth. This can be achieved through improving the safety of the aircraft itself and its systems. One example is the use of advanced methods and techniques to ensure the safety of ageing airframe and engine structures.

Research is being undertaken to protect against hazards such as wind shear, wake vortex, clear air turbulence, icing and electro-magnetic interference. Work is to be carried out that will allow aircraft to make a fully automatic approach and landing in all weather. This will use concepts developed in SESAR – the Single European Sky Air Traffic Management Research programme – which is intended to help improve the air traffic management structure of Europe. Other studies will help to avoid crashes both in mid-air and on the ground. Fire, heat and smoke protection is being improved and new procedures for evacuating aircraft are being developed.

### DID YOU KNOW?

**Air passenger numbers are growing by five percent every year.**

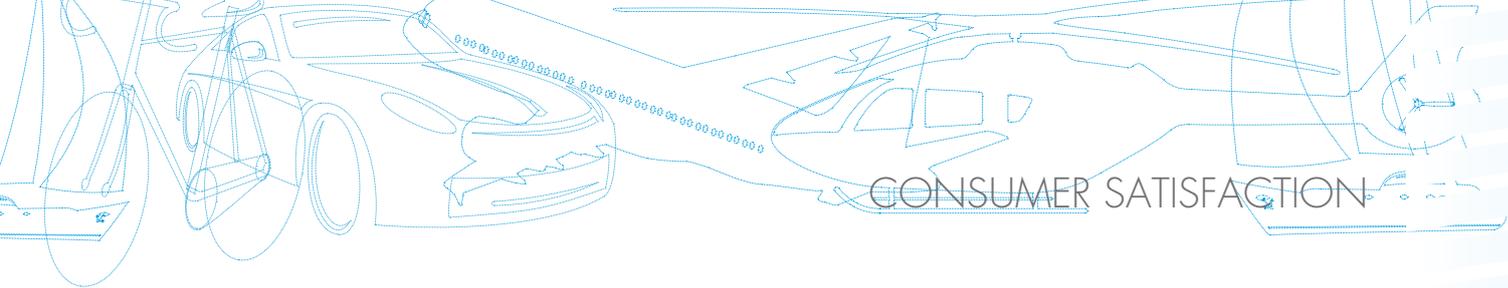
Source: BBC



Understanding of human-machine interaction and crew performance in the cockpit and improving the design of cockpit displays is also being enhanced. Studies are to be made into human behaviour and the transport system, especially with regard to the crew and maintenance personnel, with a particular focus on abnormal situations and crisis management.

NLR Flight/cockpit simulator (GRACE) for a threat assessment and response management system (TARMS)





# STRESS-FREE AIR TRAVEL

Manned flight has freed us from the bonds imposed by geography, terrain and water. Air routes are now the highways of the global economy, enabling people and goods to be transported over huge distances at great speed. Aviation has massively increased business and leisure opportunities, cultural exchanges and the development of international institutions. Few achievements have made such an outstanding contribution to the development of mankind over the last 100 years. Yet despite all of this, travelling by air is still considered by many to be uncomfortable and stressful. Therefore, the European Commission is helping fund research that will radically change our experience of air travel by the year 2020.

## INCREASED CHOICE

In order to strengthen the competitiveness of the European aviation sector, researchers are looking into new ways to give passengers greater choice regarding travel costs, time to destination, on-board services and comfort. New technologies currently being researched may enable a wider choice of aircraft and engine configurations, ranging from very large, wide-body airliners, medium-sized craft, business jets, and tilt-rotor aircraft to personal small-sized vehicles. These would be expected to employ the highest levels of safety. The intention is to adapt airports and air traffic so that they operate 24 hours round-the-clock at noise levels acceptable to neighbouring communities.

The target is for passengers to be offered more routes and more flights to and from destinations with a greater choice of flights from regional locations. The aim is to make flying itself a more customised experience, with on-board choices far beyond what a traveller now receives. The objective is for cabin facilities to cater for different customers, such as those who wish to work, play games, access video or audio libraries or simply spend their time reading and sleeping.

## CREATURE COMFORTS

People come in all sorts of shapes and sizes and the choice of available seats and leg room will reflect this. Research is being undertaken to improve on-board communication, entertainment, information and catering services. An enhanced cabin environment would give greater passenger comfort with regard to temperature, pressure,

## SILENCER

### Jet engines without all the racket

*Europe's citizens will soon be able to enjoy more peaceful skies thanks to an EU-funded research project that is developing quieter aircraft engines. SILENCER, a €110 million, four-year project, involves some 50 European companies, universities and research institutes in a concerted effort to reduce jet engine noise while controlling equipment cost, weight and performance. The overall goal has been to reduce aircraft noise by as much as six decibels. A wide range of engine technologies have been tested, from low-noise fans to nozzle jet-noise suppressors, as well as modifications to parts of the aircraft itself such as wings and landing gear in order to reduce their noise 'signature'.*

*Airlines generally face two choices with regard to reducing engine noise. One is to re-tool, or retrofit, their existing aircraft engines with so-called 'hush kits' and other noise-reducing parts and systems. The other is to re-engine, or completely replace, an old engine with a new one. SILENCER offers both solutions — new retrofit technologies and newly designed engines. There are a lot of aircraft engines approaching the 20-year mark of their design, so a large retrofit market already exists.*



humidity and ventilation and would include personalised climate control. Research is being carried out to ensure that excessive noise, vibration and turbulence will be no worse than driving on a motorway in an executive car.

The target is for airline timetables to be adhered to much more rigorously by the end of the next decade, with airports no longer being a test of the traveller's strength and patience. Studies are now being made into passenger-friendly air transport operations. The aim is to ensure that air travellers will be less exposed to delays and travel inconveniences resulting from air transport operations by improving passenger related activities at the airport and ensuring timely maintenance operations. As a result of electronic check-in, automated luggage-handling and advanced people-moving systems, the flow of passengers through the terminal buildings at both ends of the journey will be steady and smooth.

### LESS WAITING AROUND

Up to 99% of flights should arrive and depart within 15 minutes of their scheduled departure time, in all weather conditions. Time spent by passengers in airports for purely transportation related procedures to be kept to less than 15 minutes for short-haul flights and to less than 30 minutes for long-haul. The EU also intends that a larger percentage (by value) of cargo will go by air as it will be more financially competitive than land and sea transport and will be fully integrated into a seamless intermodal freight transport system.

To this end methods are being developed for on-time maintenance and the elimination of unscheduled

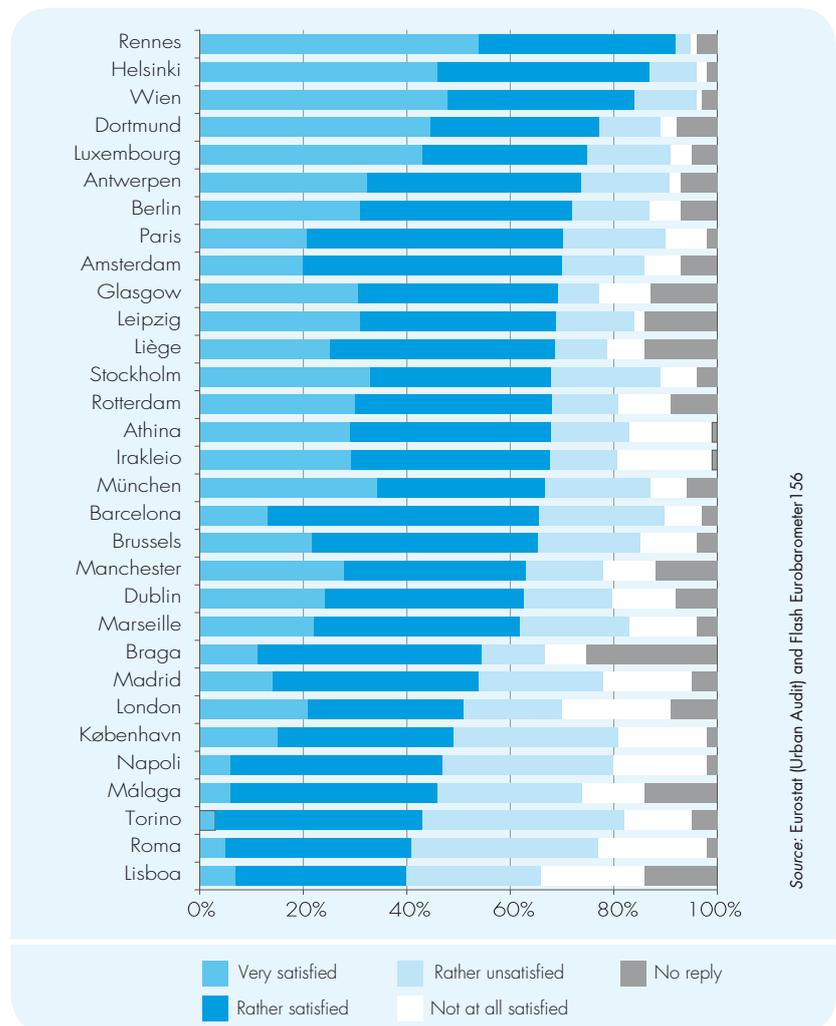
maintenance. Work is also being undertaken to ensure efficient passenger and luggage flow in the terminal area. This involves the intelligent tracking of luggage and passengers before debarking. Concepts developed for fleet management will be applied to ensure a rapid turnaround of aircraft at the apron area.

### DID YOU KNOW?

Within the EU there are 112 very large airports handling at least 1.5 million passengers a year each.

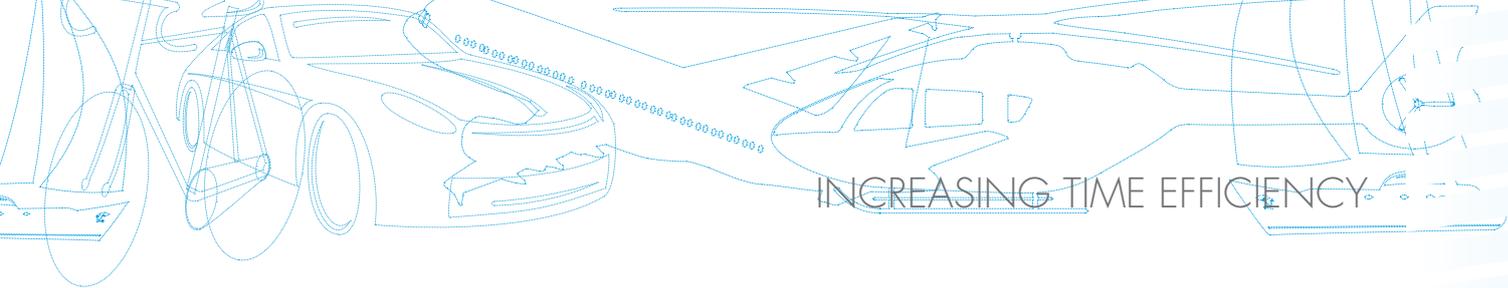
Source: Eurostat

▼ Europeans' satisfaction with public transport, 2004



Source: Eurostat (Urban Audit) and Flash Eurobarometer 156





# TIME EFFICIENT FLYING

Europe's skies are set to become even busier with a projected three-fold rise in aircraft movements by 2020. This dramatic increase needs to be dealt with in an extremely efficient way if major disruption to the air transport system is to be avoided. At the same time, the highest standards of safety must be maintained. In meeting this challenge, aviation will face major changes that will affect both airline and airport operations. Flight schedules can only be met if aircraft are able to land whatever the weather conditions, and if time within the airport terminal is significantly reduced.

## INTEGRATED AIR TRAFFIC MANAGEMENT

Researchers are currently developing an innovative Air Traffic Management System (ATM) within the context of the Single European Sky ATM Research (SESAR) initiative. This means designing aircraft systems that integrate with airlines, airports and air traffic management operations and procedures. New aircraft designs facilitate the handling of passengers and cargo. This will enable the efficiency of airspace management to be greatly improved. Novel solutions will enhance the way airports are used, and in connecting air transport to the overall transport system.

Improved aircraft systems and equipment for aircraft across the board reduce the amount of time lost in flight operations. This improvement is achieved by focusing on the responsiveness and reliability of the aircraft. Innovative techniques and technologies give improved time performance by minimising the time spent on maintenance and overhaul.

Advanced computer modelling techniques improve the prediction and detection of wind shear and wake vortex, which enables aircraft to land in all weather. Ideas developed through SESAR include advanced cockpit display technologies for all weather, 24-hour operations.

## HILAS

### Reducing human error in flight

*The project Human Integration into the Lifecycle of Aviation Systems (HILAS) is an EU-funded international research initiative with 40 partners from across the aviation industry and academia. Its intention is to reduce the possibility of human error, which is responsible for 70% of aircraft accidents on the flight deck. It also results in poor maintenance, which is estimated to be the cause of 12% of major accidents and 50% of engine-related flight delays. The project will help the aviation sector achieve its target of an 80% reduction in accidents by 2020.*

*An integrated system for flight operations, process improvement and performance management will lead to a standardised European model for flight operations performance monitoring. New and emerging technologies have been developed for use on the flight decks of aircraft. These include synthetic vision systems (SVS), head-mounted displays and multi-modal dialogue systems – a computer system intended to converse with a human being.*

*The monitoring and improvement of maintenance operations will be enhanced through the improved management of the human element across the maintenance lifecycle, from design to operations. The implementation of this management system, which takes into account the human factor, will produce a standardised assessment of safety and quality in maintenance systems and operations.*



### FASTER BOARDING AND DISEMBARKING

The continuous monitoring of aircraft structures and systems is being researched. Techniques for repairing and enhancing components are being developed, which will preserve or improve their mechanical, aerodynamic or thermal performances. Technologies for 'smart' maintenance systems include self-inspection and self-repair capabilities. Methods and techniques for on-time maintenance and the elimination of unscheduled maintenance are also being produced.

Improved air transport operations result in greater time-efficiency for airport and air traffic management. Research is being undertaken to optimise passenger- and flight-related airport activities through effective air traffic management. Studies are being made into passenger boarding patterns and the use of multi-door embarkation and disembarkation. Greater efficiency in processing the flow of passenger and luggage through the terminal area is also being investigated. Faster freight operations will use

advanced fleet management concepts to enable a quicker turnaround of aircraft on the apron area. Innovative modelling tools and techniques will support strategic decision making, resulting in greater flexibility and optimum use of airports within the context of the whole air transport system.

### A NEW APPROACH TO AIRCRAFT MAINTENANCE

The target is a greatly enhanced ability to ensure continuous aircraft availability during operations. This can be achieved through minimising operational disruptions and the associated costs, while increasing the level of safety. This involves further developing and validating aircraft and engine health monitoring and management technologies, as well as processes, to enable a global maintenance system. Aircraft and ground segments will achieve greater integration through their ability to exchange information. They include Maintenance, Repair and Overhaul (MRO) and manufacturer operations, as well as information systems and processes.

The most appropriate technologies and processes are to be identified according to value/cost benefit, demonstrating their ability to contribute to aircraft and engine diagnosis, decision making and global maintenance. A standardised maintenance system will be validated through an integrated aircraft health management test platform with appropriate connections to MROs and operators. Key health monitoring technologies will also be validated through test rigs and large scale aircraft and engine testing.

### DID YOU KNOW?

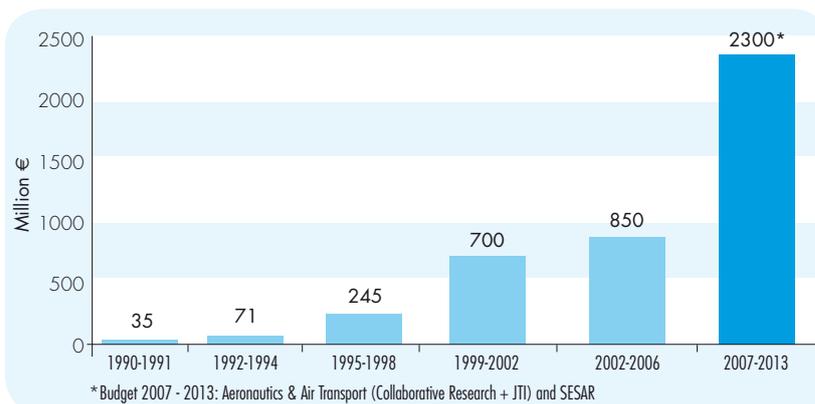
The air transport system in Europe can call upon a fleet of some 5 000 aircraft and moves one billion passengers every year.

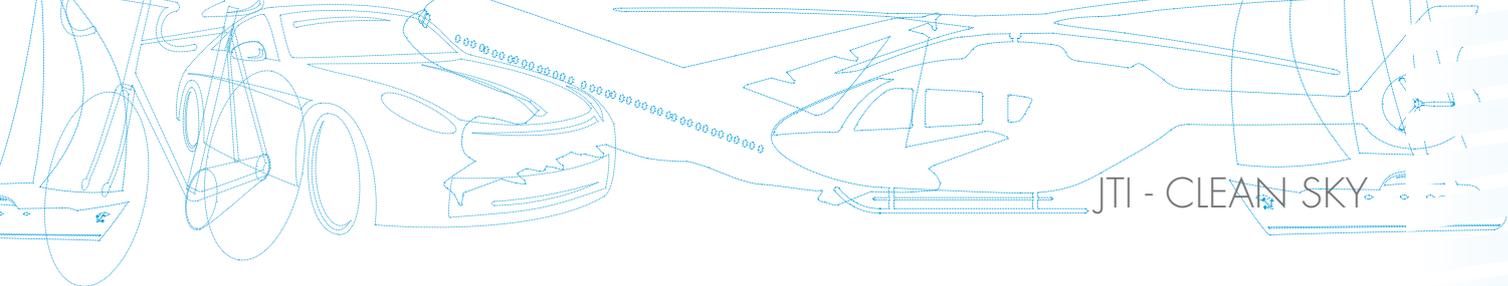
Source: EU Transport Research

Advanced avionics systems enable aircraft to operate under all types of conditions by tackling the challenges facing aircraft with regard to external perturbations. These technologies involve increased automation and improved crew interface design. The feasibility of future single pilot operations is also under consideration.

The all-conditions operations project focuses on developing the capability of the flight deck to enable greater autonomous aircraft operation and to anticipate and avoid possible perturbations in-flight or on the ground. This can be achieved through enhanced vision systems and 3D situational awareness, weather surveillance sensors, and new navigation capabilities. It is envisaged that this will be applied to all types of aircraft.

▼ R&TD Funding for Specific Aeronautics Research on EU Level (in million Euro)





# CLEAN SKY A GREENER FUTURE FOR FLYING

The challenges that face us today, such as boosting international competitiveness and tackling climate change, are common to all European countries and research is a major part of the answer. This can create an opportunity for European countries to make a real difference by working together. The Clean Sky initiative represents a new approach for delivery of innovative solutions in the area of air transport. Based on projected growth, over the next 20 years the sector could contribute an additional 1.8% of GDP to the European Union (equivalent to €200 billion per year).

In February 2008, research into more efficient and environmentally friendly aircraft took a major leap forward with the launching of the Clean Sky Joint Technology Initiative (JTI). This is the EU's largest research programme, with a budget of around €1.6 billion, equally shared between the Commission and industry, over the period 2008–2014.

Some of the biggest names in European industry are taking part in the initiative, including Airbus, Dassault, Saab and Rolls-Royce. Clean Sky also encourages the participation of SMEs, thereby

offering opportunities to the whole aeronautic supply chain from all Member States and Associated Countries.

## DRASTIC CUT IN EMISSIONS

The aeronautics and aerospace industries are extremely aware of their environmental responsibilities and over the last few decades have managed to dramatically reduce both emissions and noise resulting from aircraft. With major increases in air traffic envisaged over the coming years, Clean Sky is an excellent way of addressing the challenges faced in developing more sustainable aviation, helping to bring about a step-change in the air transport system. The programme provides an opportunity

## CLEAN SKY

### JTI – radical research solutions

*The Joint Technology Initiative (JTI) is a new instrument created by the European Commission for the Seventh Framework Programme (FP7). It allows large-scale and long-term private research partnerships to implement ambitious research on a scale that requires major public and private investment. Led by industry and backed by the private sector, the JTIs provide significant support for research, delivering innovative solutions. The JTI is a completely new approach and represents a long-term public-private partnership with the objective of carrying out large-scale technological R&D programmes in support of industrial research at the European level. It will speed up technological breakthrough developments, shortening the time to market for new solutions tested on full scale demonstrators.*

*Clean Sky is one of the first JTIs to get off the ground under FP7 and brings together EU-funded projects and major industrial stakeholders in the aeronautics and aerospace sectors. The JTI concept will break down barriers, bringing together industrial, academic, research and institutional partners. Clean Sky is a seven-year research programme for greening the next generation of European Air Transport. It will radically improve environmental impact, while strengthening and securing the competitiveness of Europe's aeronautics industry. Industry partners, SMEs, research establishments and academia are all contributing to the success of the Clean Sky JTI.*



to make a dramatic breakthrough in the technological capability of ATS environmentally friendly systems through the integration of advanced technologies and the development of full scale demonstrators.

The initiative will develop innovative technologies and solutions for the next generation of aircraft, resulting in a major reduction of fuel consumption, noxious emissions and noise.

This is expected to result in a 40% cut in carbon dioxide emissions, a 40% cut in nitrous oxide emissions and a 2-3 billion tonne cut in CO<sub>2</sub> emissions over the next 40 years. Such improvements will in part be due to more fuel-efficient engines as well as breakthroughs in wing technology.

Although aeronautics accounts for 3% of current emissions, the growth of air travel continues unabated, with passenger numbers increasing by 5% every year. Therefore, emission levels are set to rise substantially in the future unless decisive action is taken now.

### NEW TECHNOLOGIES TO KEEP EUROPE AHEAD

The aviation sector accounts for over three million jobs in Europe and over two billion passengers per year worldwide.

It is estimated that 14 000 new aeroplanes will be required by the year 2020. Technological developments through Clean Sky are not only necessary to help fight climate change, but also to boost Europe's global competitiveness.

Clean Sky will help consolidate European industry around a project of common European interest. The programme is divided into six priority areas for greener technologies. The SMART Fixed Wing Aircraft project is developing active wing technologies and new aircraft configurations. Green Regional Aircraft will deliver low weight, low noise aircraft using smart structures and low noise configurations and the integration of engine and energy management technologies. Under the Green Rotorcraft project, innovative rotor blades and new engine

technologies are being developed to reduce noise and lower airframe drag in helicopters.

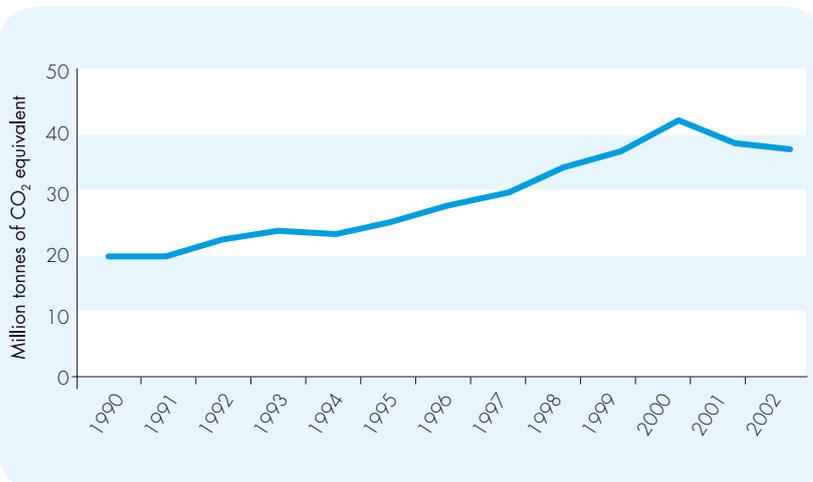
Advanced electrical systems will help to eliminate the use of noxious hydraulic fluids and reduce fuel consumption. The 'Sustainable and Green Engines' project is designing and building five engine demonstrators. These will integrate new technologies for reduced noise, greater efficiency and lower emissions. 'Systems for Green Operations', focuses on all-electrical aircraft equipment and systems, new approaches for 'trajectories' and mission and improved ground operations.

### DID YOU KNOW?

**There are over 30 000 small planes registered in the EU for private use.**

*Source: Eurostat*

The Eco-Design project concentrates on developing a green design, manufacturing and maintenance, and disposal product lifecycle. The environmental impact of the entire product lifecycle can be greatly improved through the withdrawal and recycling of aircraft and the best use of raw materials and energy.



◀ GHG emissions from air transport 1990-2002



# EAGER TO FIND OUT MORE?

- For more information on EU Transport Research, visit our website on [http://ec.europa.eu/research/transport/index\\_en.cfm](http://ec.europa.eu/research/transport/index_en.cfm)
- For more information on the research projects featured in this publication, you can visit their websites at the following addresses:

**SILENCE** <http://www.silence-ip.org/>

**VIVACE** <http://www.vivaceproject.com/>

**NICHES** <http://www.niches-transport.org/>

**SAFECRAFTS** <http://www.safecrafts.org/>

**CityMobil** <http://www.citymobil-project.eu/>

**CREATING** <http://www.creating.nu/>

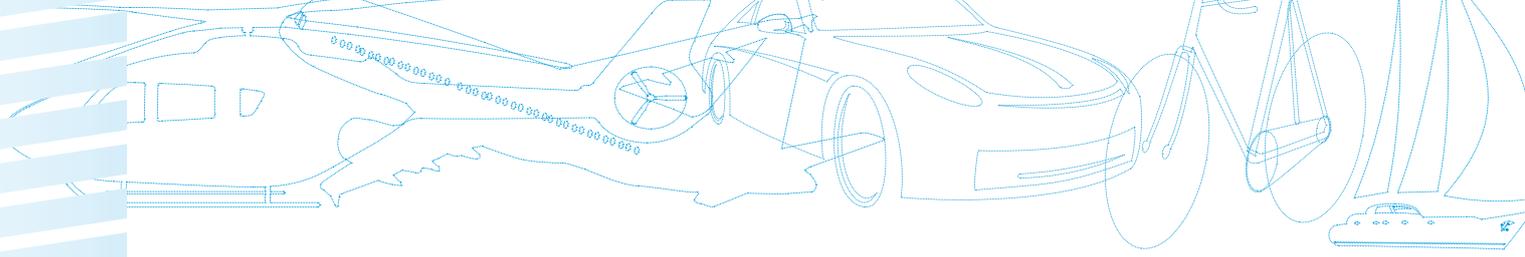
**HERCULES** <http://www.ip-hercules.com/>

**HICEPS** <http://www.hi-ceps.eu/>

**SAFE** <http://www.safee.reading.ac.uk/>

**HILAS** <http://www.hilas.info/>

**Clean Sky** <http://www.cleansky.eu>



- Other publications on the EU's Seventh Research Framework Programme include:



**GET INVOLVED!  
YOUR GUIDE  
TO EU-FUNDED  
TRANSPORT RESEARCH**

General Transport in FP7 - (2 pages)



**RESPONDING TO CALLS  
FOR PROPOSALS  
IN TRANSPORT RESEARCH:  
A BEGINNER'S GUIDE**

General Transport in FP7 - (2 pages)



**OUT OF THE BOX -  
IDEAS ABOUT FUTURE  
OF AIR TRANSPORT**

(92 pages)

You can download or order these – and more – online at  
[http://ec.europa.eu/research/transport/more\\_info/publications\\_en.cfm](http://ec.europa.eu/research/transport/more_info/publications_en.cfm)





European Commission

**Transport and FP7: Shifting up a Gear**

Luxembourg: Office for Official Publications of the European Communities

2009 — 36 pp. — 21.0 x 29.7 cm

ISBN 978-92-79-09743-0

doi 10.2777/99703

## How to obtain EU publications

**Publications for sale:**

- via EU Bookshop (<http://bookshop.europa.eu>);
- from your bookseller by quoting the title, publisher and/or ISBN number;
- by contacting one of our sales agents directly. You can obtain their contact details on the Internet (<http://bookshop.europa.eu>) or by sending a fax to +352 2929-42758.

**Free publications:**

- via EU Bookshop (<http://bookshop.europa.eu>);
- at the European Commission's representations or delegations. You can obtain their contact details on the Internet (<http://ec.europa.eu>) or by sending a fax to +352 2929-42758.



Transport is key to Europe's economy and society: it provides millions of jobs, enables goods to be shifted between buyer and seller, and allows citizens to travel for work and leisure. To ensure that the transport sector remains competitive, and sustainable, the European Commission brings together research organisations, private companies and universities across Europe and the world, and helps fund their research projects to produce greener, safer and smarter transport solutions for European citizens.

In this brochure, you will find out more about the areas where research work is being conducted under the EU's Seventh Framework Programme for research, and find out more about the results of past research projects.



Publications Office

ISBN 978-92-79-09743-0



9 789279 097430