



# **INTELLIGENT MOBILITY TRANSPORT IN CHANGING TIMES**

Research, Technology, Innovation

Austrian Federal Ministry  
of Transport, Innovation and Technology



## IMPRESSUM

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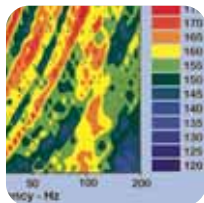
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## PREFACE

Social, economic and technological evolutions are imposing more and more complex demands on the transport system and its capacity. New technologies and innovations can provide an important contribution to the design of an intelligent mobility which meets future requirements, and afford new economic opportunities to the transport technology sector. This sector is one of the most successful ones in Austria. The economy benefits not only from an efficient transport system, but also from new products and services and thus improves national competitiveness as a whole.

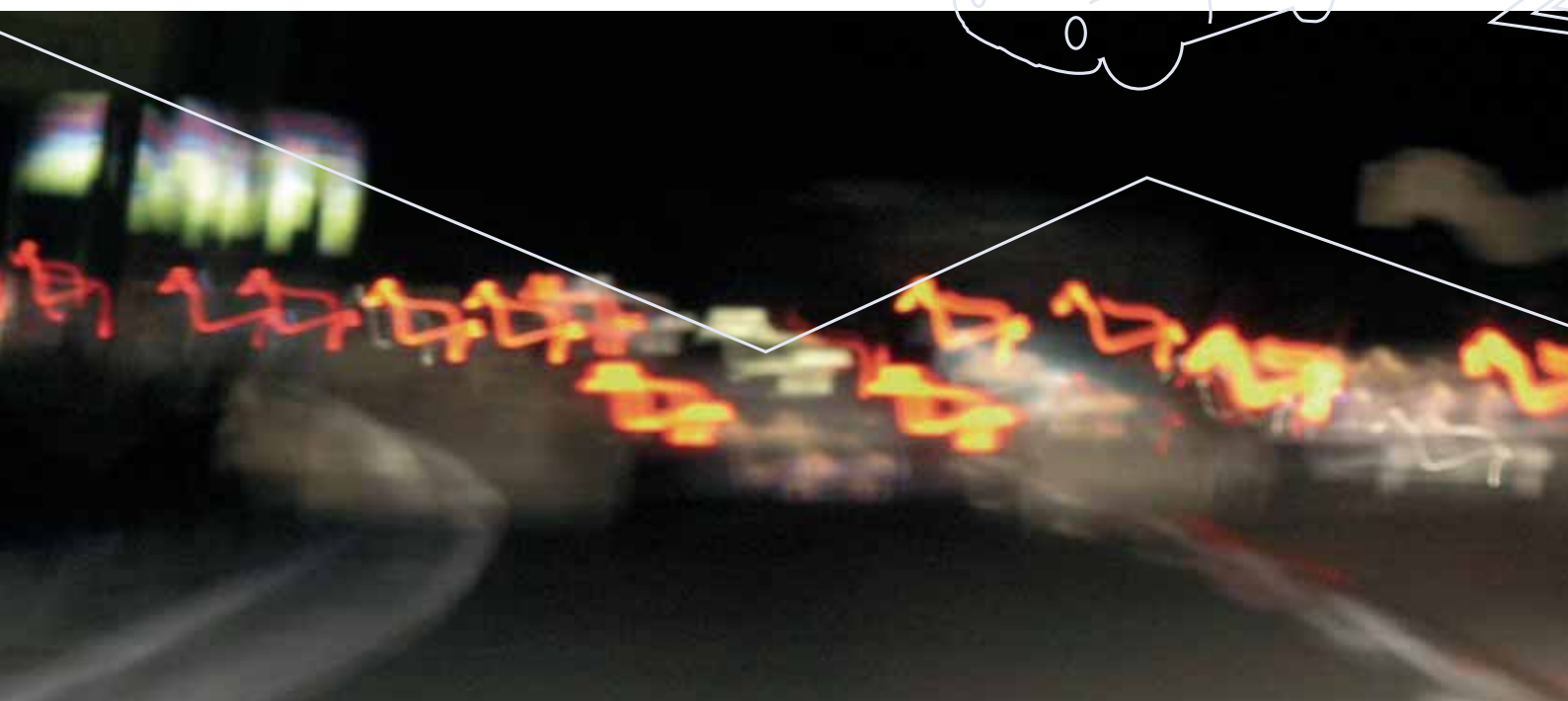
Austria has a long tradition of employing new technologies, e.g. for solving transport-related environmental problems, which owes its success to these twin competence areas of transport and infrastructure as well as technology and innovation being united within the same Ministry, allowing useful synergies as from an early stage. This cross-political approach has formed the foundation of thematic R&D research programmes in the last 10 years, such as Move (Mobility and Transport Technology), "IV2S" (Intelligent Transport Systems and Services) and TAKE OFF. The research topics addressed provide an essential contribution to attaining a "double dividend" in the economic and ecological sense.

With this approach, we consider ourselves aligned with the aims of the European Research and Technology Policy and the Transport Policy – as future needs can only be resolved through a common European endeavour.

**Evelinde Grassegger**

Head of Unit

Mobility and Transport Technologies



# AUSTRIA AS LOCATION FOR TECHNOLOGICAL VENTURES

## TARGETED R&D PROMOTION ENSURES CENTRAL COMPETENCE AREAS

As a highly developed industrial country, Austria achieved 3.2% of economic growth in 2006. According to a classification of the OECD (Organisation for Economic Cooperation and Development), Austria thus ranks sixth among the richest countries of the world. The most important foundation for this economic success is an innovative economy strong in exports.

The transport sector is one of the most significant national industrial branches. The automotive industry and rail vehicle construction are key branches, but other sectors of the transport technology industry, e.g. aeronautics, transport telematics or niche segments like cable-railways and overhead railways, construction of special vehicles or loading mechanisms have grown enormously in recent years and have achieved significant innovation track records.

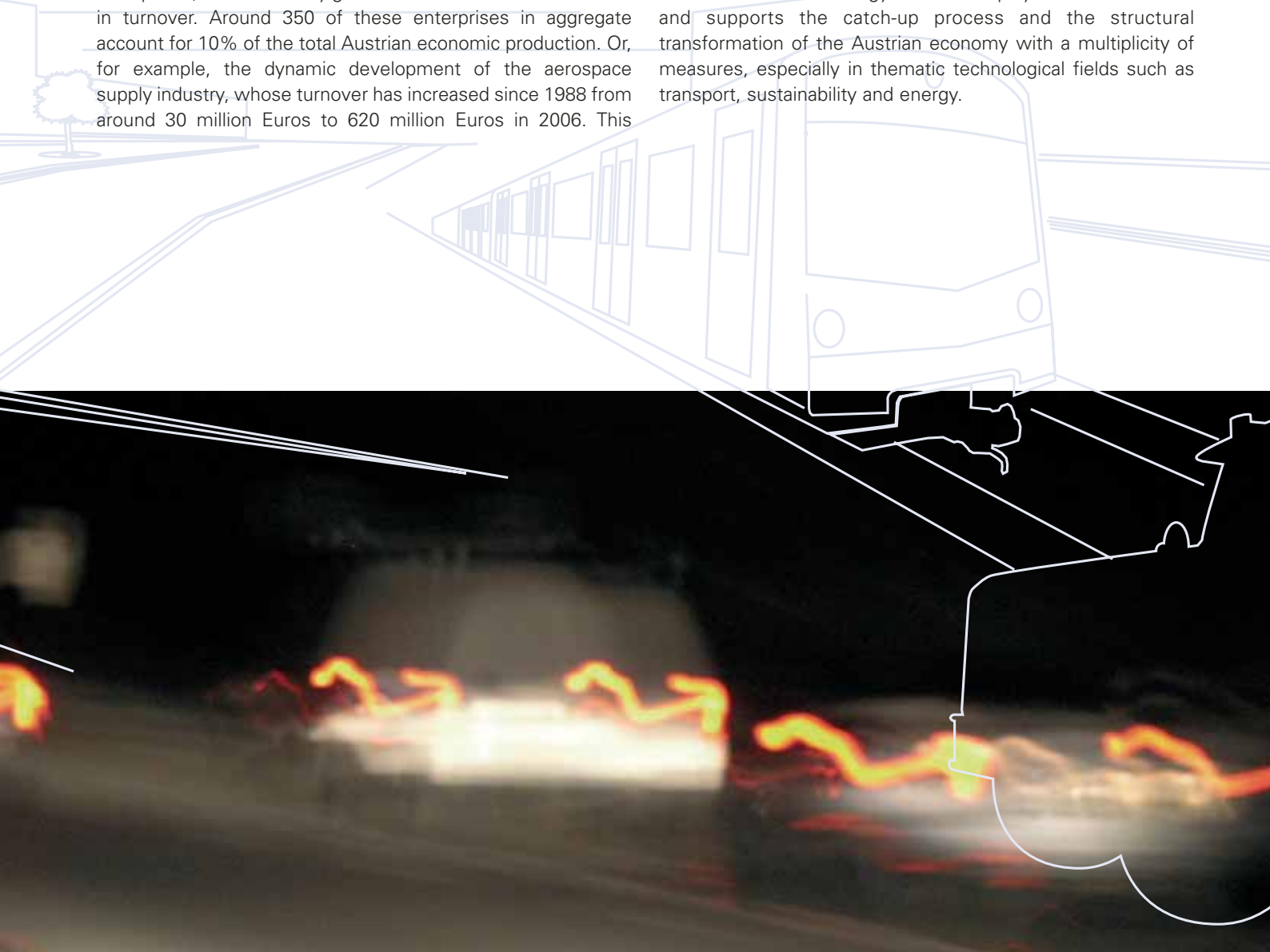
Thus, the automobile industry employs 175,000 workers in 700 enterprises, which annually generate more than 35 billion Euros in turnover. Around 350 of these enterprises in aggregate account for 10% of the total Austrian economic production. Or, for example, the dynamic development of the aerospace supply industry, whose turnover has increased since 1988 from around 30 million Euros to 620 million Euros in 2006. This

corresponds to an annual increase rate of 10%. With a research quota of 12.35%, the aeronautic industry, along with the automotive sector research quota of around 12%, is one of the most innovative branches.

### Top Research at EU Level

Following a successful technological catch-up process, Austria achieved peak values in most technological and innovation indicators in 2006 with a research quota of 2.43% and finally attained position 19 in the ranking of 49 countries for Global Innovation Performance in the "European Innovation Scoreboard".

Around 6.3 billion Euros have been invested in research and development in 2006, 36% of this being from the public purse as part of the Federal Government innovation and research offensive. The Austrian Federal Ministry of Transport, Innovation and Technology is a central player in this offensive and supports the catch-up process and the structural transformation of the Austrian economy with a multiplicity of measures, especially in thematic technological fields such as transport, sustainability and energy.





# MISSION STATEMENT



## INTELLIGENT MOBILITY

In a modern industrial country, mobility and transport technologies are central areas of a proactive research and technology policy, since in a work-sharing internationally cross-linked information and scientific society, a high-performing and efficient transport system remains a prerequisite for an attractive business location. Furthermore, an environmentally compatible and user-friendly transport system ensures the standard of living and competitiveness of a country.

Social, economic and technological developments are imposing more and more complex demands on the transport system and its performance. New technologies and innovations can add an important contribution to the design of intelligent mobility which meets future requirements. The efficiency, attractiveness and safety of the transport system can be increased, negative environmental effects minimised, and the high costs of expanding and maintaining the transport infrastructure can be reduced.

The Austrian Federal Ministry of Transport, Innovation and Technology uses the opportunities provided by its overall responsibility for transport and technology and has for years focused on supporting research and technological development to create an efficient, environmentally compatible and safe mobility. This simultaneously increases the scientific competence, innovational strength and competitiveness of an Austrian key industry.



## USE FUTURE OPPORTUNITIES EFFICIENTLY!

### Helping Innovations Succeed

Research, technology and innovation are crucial for ensuring and increasing prosperity, economic growth and employment. Public investments in research, technology and infrastructure increase the quality of innovations through high-risk research projects and clear advances in innovations and technology.

### Developing Intelligent Transport Solutions with and for People

As a partner of economy and science, the Austrian Federal Ministry of Transport, Innovation and Technology understands research and technology policy to be an essential contribution to solving social questions of infrastructure and environmental and transport policy, and thus ensures Austria's standard of living and competitiveness.

### Supporting International Networking

The Austrian technology policy supports the development of Europe-wide transport solutions and enforces the integration of Austrian companies into international research cooperation and value added chains. The strategic alignment of the Austrian Federal Ministry of Transport, Innovation and Technology R&D policy thus allows for global competition.

### Developing and Implementing Mutually Intelligent Mobility

The creation of networks and communication platforms allows information exchange and cooperation between science, economy, policy and consumers in ensuring an intelligent mobility which satisfies future requirements.





# INNOVATION IMPULSE FOR KEY SECTORS



## TRENDS AND STRATEGIC EMPHASES

### New Concepts Reinforce Austria's Industrial Position

The options for a more sustainable mobility are currently unfolding in rapid stages. Besides fossil fuels, future road vehicles will increasingly use renewable or at least more environmentally friendly resources. Simultaneously, new engine designs must satisfy more demanding exhaust gas values in coming years, until comprehensive alternatives to the combustion engine are available. Core themes of innovative transport systems are new energy and propulsion technologies, new organisational structures, transport management, the application of transport telematics and improvement of transport vehicle designs.





## MASTERING THE MOBILITY REQUIREMENTS OF THE FUTURE OPENS UP NEW MARKETS

Future transport must be cleaner, more barrier-free, safer, more efficient, quieter, more flexible and intelligent in order to fully master future mobility requirements. The impulses which national and European aims and targets set offer considerable innovatory opportunities to the Austrian transport sector but also involve the challenge to further develop its competitiveness in the long run. Continual investments in research and development are therefore essential for the Austrian transport sector.

Key questions for a new mobility are:

- ensuring Austrian participation in the worksharing economy of the European Common Market through qualitatively high-grade transport infrastructures and services,
- relief of congestion centres and high-grade transport corridors
- preserving the quality of the Austrian business location while allowing for the standard of living of its population
- resource efficiency especially in regard to energy efficiency and the use of alternative energy sources to reduce the crude oil dependency of the transport sector
- reduction of greenhouse gas emissions by the year 2012 in compliance with the Kyoto Agreement to a value 13% below the 1990 level.

In its research and technology policy, Austria identifies with the future transport aims formulated by the European Union. In concrete terms, the White Paper and Midterm Evaluation of the European Transport Policy states, for example:

- Replacement of 20% of the total transport fuel consumption by alternative propellants by 2010
- Halving the number of transport deaths within ten years
- Optimisation of each individual form of transport in both individual (single-mode) and multi-mode application: "Co-Modality"
- Increase in energy efficiency of drive systems and vehicle designs for all transport types and in all forms of transport
- Increase in intermodal goods transport and logistical solutions (seamless cargo services)
- Improvement of multi-modal road networks in passenger-transport (seamless passenger services).



# ESTABLISHING STRATEGIC PRIORITIES IN THE TRANSPORT SECTOR

Against the background of these European and national challenges, the Austrian Federal Ministry of Transport, Innovation and Technology is developing pioneering concepts and suitable implementation tools. For many years research and technological programmes with an integrated approach have thus been implemented to solve social, political and economic challenges.

## **The Strategy Programme IV2S – Intelligent Transport Systems and Services 2002-2006**

The Strategy Programme IV2S – Intelligent Transport Systems and Services – selected certain strategic core themes and technologies in the transport sector taking into account the strengths in the Austrian industrial, research and innovation landscape. A double dividend was envisaged by exploiting both

the social and economic aspects of IV2S. First, research and technological development would increase competence in a key sector, and raise competitiveness through opening up new innovative potentials, and secondly, innovative solutions would contribute to a modern transport and environmental policy.

The following aspects were supported

- achieving technological break-throughs
- pooling of university, extra-university and industrial research
- international networking
- demonstrating and implementing new technological solutions

The project selection followed a public call for proposals and an evaluation procedure by a panel of international experts.

### Strategy Programme 2002 – 2006 **IV2S** Intelligent Transport Systems and Services

Impulse Programme  
**A3**  
Austrian Advanced  
Automotive  
Technology

Impulse Programme  
**I2**  
Intelligent  
Infrastructure  
Transport Telematics

Impulse Programme  
**ISB**  
Innovative  
Rail System

[www.iv2s.at](http://www.iv2s.at)

Overall coordination: Evelinde Grassegger



# TAILOR-MADE FOR AUSTRIA'S AUTOMOBILE SECTOR

## THE A3 IMPULSE PROGRAMME – AUSTRIAN ADVANCED AUTOMOTIVE TECHNOLOGY

The A3 Impulse Programme is strategically targeted towards reinforcing and further developing Austria's internationally renowned competence in the automotive sector. Complementary to research activities within the framework of European networks, A3 especially promotes projects which are aiming at supporting technological advances and innovative approaches in the Austrian automobile supplier industry.

### Core Areas

The A3 Impulse Programme concentrates on three subject areas whose development is critical for future mobility concepts:

- Alternative propulsion systems and fuels such as hybrid drive systems, fuel cells, hydrogen engines and storage technologies, super-capacitors or electric engines, fuels from biomasses and their respective engine designs, and power trains and the development of future supply infrastructures.
- Alternative materials and production processes, including innovative concepts for hydrogen storage, which are also used in space technology.
- Vehicle electronics and concepts for structural integration of new propulsion technologies in future vehicles.

Since the start of the Impulse Programme, 4 calls for proposals have been launched, in which a total of 78 projects with 319 partners were selected for promotion. In addition, two further calls in 2005 and 2006 permitted the promotion of totally 8 lighthouse projects. Lighthouse projects are large demonstration and implementation projects involving not only developers and producers, but also users of alternative drive systems and fuels and their respective infrastructure to further optimise them in real operation and prepare clients for technological transitions in transport technology.

**Dr. Philipp Dietrich**

**Technology Transfer Coordinator**

**Paul Scherrer Institute, Switzerland**

The A3 Programme is a well-established initiative, which permits Austria to expand its acknowledged research competence in the sector of vehicle technology and of development of alternative drive systems. Cooperative development projects enable networking of research centres with industry. This ensures that the topics being monitored have a realistic opportunity of becoming market innovations.

	Projects Promoted	Promotion Volume	Total Project Volume
Calls	78	20.4 million Euros	39.6 million Euros
Lighthouse Projects	8	3.3 million Euros	7.4 million Euros

Contact:  
Andreas Dorda  
andreas.dorda@bmvit.gv.at



# NEW TECHNOLOGIES BROUGHT ON TRACK

## THE ISB IMPULSE PROGRAMME – INNOVATIVE RAIL SYSTEM

With a volume of almost 100 billion Euros and annual growth rates of 2-3%, the world market for rail technology is one of the most interesting technological areas in the transport sector. Besides an internationally successful rail vehicle industry with strong export achievements, Austria has excellent know-how in the rail technology supply industry and is a world leader in rail and turnout manufacture.

The ISB Impulse Programme supports research and development of innovative technologies and systems for rail transport.

### High Tech for Rail

ISB concentrates on 5 topic areas whose development is crucial for the rail system:

- Information and communication technology for operation and control systems
- Modern vehicle and drive technology to increase energy efficiency and optimise performance
- Decrease in noise emissions
- Safety in operation, increase in reliability
- Interoperability with longterm aim of an internationally standardised rail transport system

2 calls for tender were issued in the framework of ISB, and in addition, 1.5 million Euros were provided both in 2005 and 2006 for increased demands in cooperative bottom-up projects, as well as for calls for fundamental and feasibility studies.

**Prof. Karsten Lemmer,**

**German Aerospace Center (DLR)**

**Institute of Transportation Systems**

With the ISB Impulse Programme, Austria is investing in the construction of an enduring mobility. The promotion supports projects with short-, medium- and longterm effect and thus guarantees continuity: Starting with the development of concrete technologies back to industrial and fundamental research, Austria is surely progressing on the path to the future. ISB networks research with industry and rail operators and thus strengthens Austria as a location for economic and scientific success.

	Projects Promoted	Promotion Volume	Total Project Volume
Calls	40	8.2 million Euros	18.2 million Euros
Accompanying Measures	8	0.6 million Euros	0.6 million Euros
TKE and WGF*)	20	0.7 million Euros	1.6 million Euros

\*) TKE Technology and Component Development. WGF industrial basic research

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# INTELLIGENT SYSTEMS FOR FLEXIBLE TRANSPORT MANAGEMENT

## IMPULSE PROGRAMME I2 – INTELLIGENT INFRASTRUCTURE FOR TRANSPORT TELEMATICS AND INTELLIGENT TRANSPORT SYSTEMS

Efficient future transport systems require a high-grade automation and control of the complex operating routines based on realtime information. The programme I2 – Intelligent Infrastructure was created to motivate Austrian companies to take innovatory steps and generate a critical mass to ensure competitiveness in existing and new markets. Concrete topics are:

- comprehensive and up-to-date traveller information systems to prevent congestion and peak loads
- innovative mobility and transport concepts with modern approaches in regard to intermodality
- new developments in sensors and measurement methods to detect transport procedures
- substantial contributions to intelligent transport management and control
- telematic applications on rail for efficient goods and passenger transport
- designing of an attractive and efficient public transport system

Since the start of the programme, 3 calls have been launched. A total of 204 projects with around 650 partners were submitted. Of these, 95 projects with around 310 partners were recommended for funding. In addition, lighthouse projects were carried out in the topic areas “use of telematics in inland waterway navigation” and in “crosstransport management” (MOBILE project).

**Prof. Fritz Busch**

**Holder of Professorial Chair for Transport Technology  
Munich Technical University,  
Germany**

“The Impulse Programme I2 – Intelligent Infrastructure focuses on clear objectives and core research areas. It has succeeded in involving the entire research scene and promoting market- and implementation-oriented demonstration projects in cooperative schemes clearly related to a telematic framework. The Ministry incorporated important aspects/themes into the lighthouse projects, to provide signals in research promotion. A strict organisation and efficient management has achieved much in recent years.”

	Projects Promoted	Promotion Volume	Total Project Volume
Calls	95	16.1 million Euros	32.3 million Euros
Lighthouse Projects	13	2.9 million Euros	6.6 million Euros

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# NETWORKS WITH FUTURE

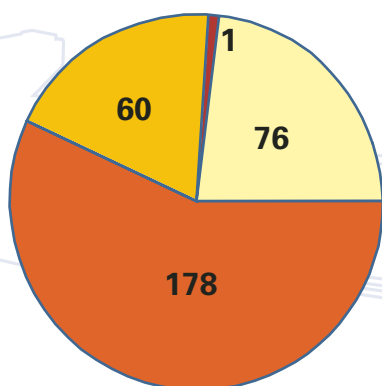
## IV2S PROJECTS STRENGTHEN COOPERATION AND PROVIDE DIRECTLY APPLICABLE RESULTS

IV2S – Intelligent Transport Systems and Services initiated strategically important impulses for technological advances and successful innovations in the transport sector. This was shown in the first interim evaluation carried out in autumn 2006.

The aspired aims of network building, strengthening of cooperation between companies and science, improvement of innovation level and competitiveness in international competition were achieved to a high extent and in part exceeded. The project results have already been partly exploited on the markets or are about to be. This has been shown in a questionnaire among the programme participants.

### New Cooperation

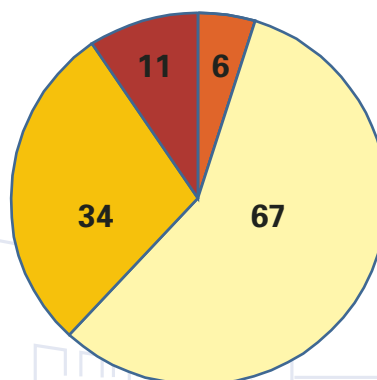
56% of the 315 programme participants questioned stated they had involved a new project partner in the consortium. 19% of participants have entered into entirely new consortia. This really resulted in new cooperation.



- No, we had already collaborated with all partners previously.
- Partly, at least one project partner in the consortium was a new partner for us.
- Yes, before the project we had collaborated with none of the partners.
- We are carrying out our project without any collaboration partners.

### Successful Results

57% of the 118 polled stated they had found a fundamental solution. 29% of participants could already corroborate such a solution through a demonstration. 9% of the tested solutions have already furnished improvements at an everyday level.

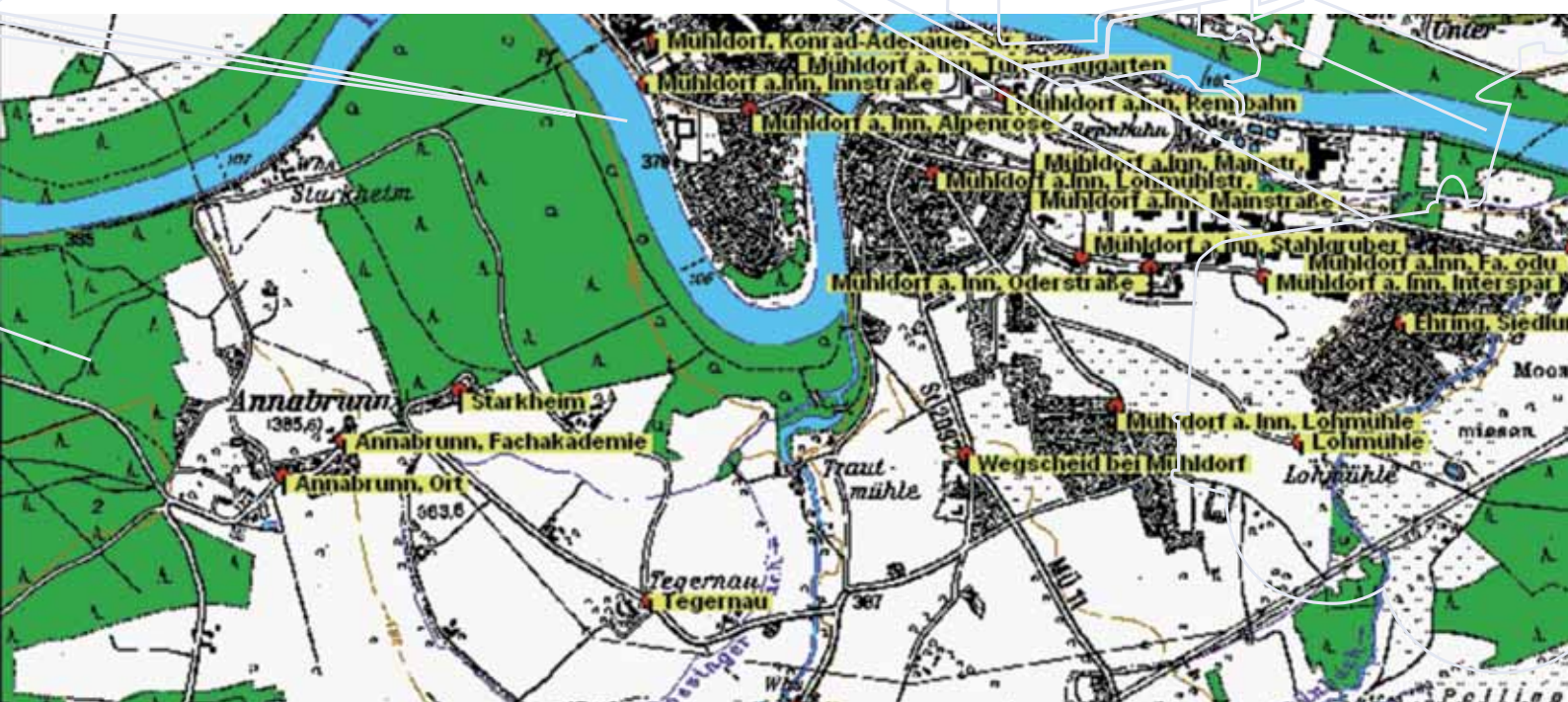
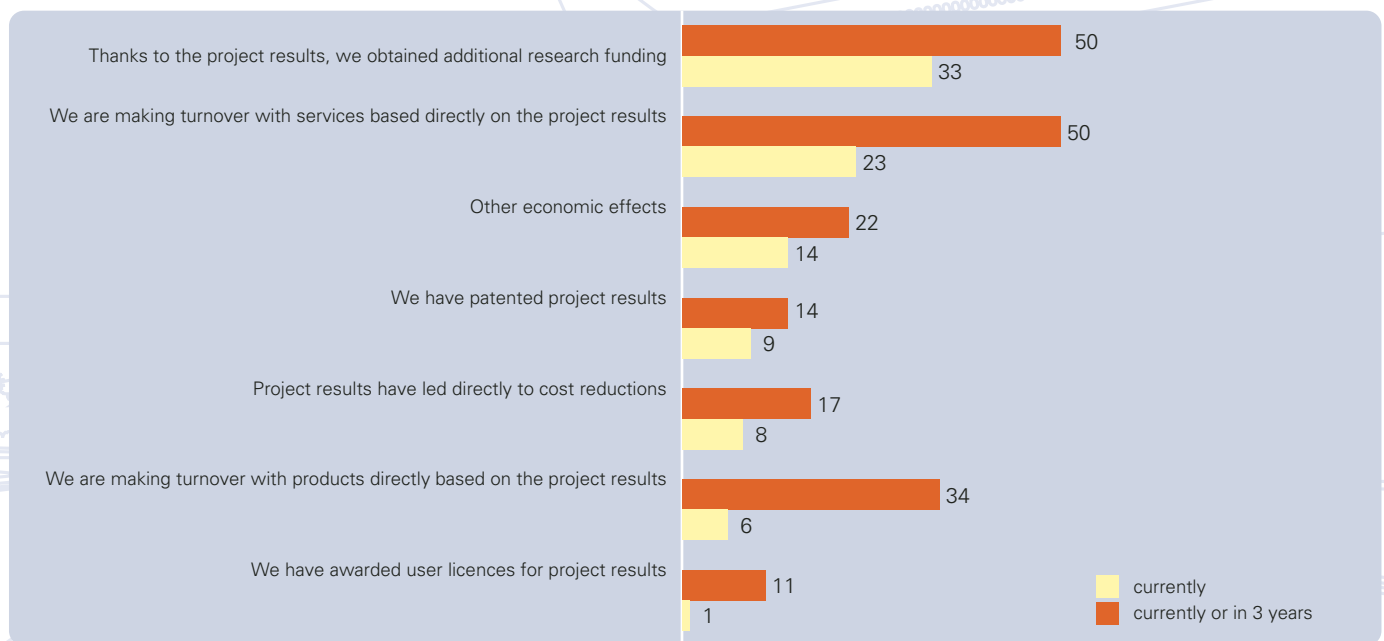
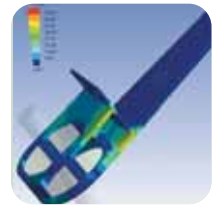


- The project provided no directly exploitable results.
- The project demonstrated the basic feasibility of a new or improved solution in the transport sector.
- The project led to the use of a new or improved solution in the transport sector under demonstration conditions.
- The project led to the use of a new or improved solution in the transport sector in everyday application.



## Economic Effects – Contribution to Competitivity

First indications as to how far the programme has contributed to ensuring the competitiveness of the Austrian research and transport industry are provided in the results of the (anticipated) economic exploitation of the project results.





# SUCCESSFUL DEVELOPMENTS FROM IV2S

## A3 – AUSTRIAN ADVANCED AUTOMOTIVE TECHNOLOGY

### PEM BZ-HYBRID VEHICLE

#### Development of an Electric Vehicle with Combined Fuel Cell-Battery Propulsion

A hydrogen powered hybrid vehicle can recover brake energy through transformation into electric energy and store it temporarily in the battery, which improves the overall efficiency by approximately 8% and reduces fuel consumption especially in city areas. In addition, the battery/fuel cell combination provides a power increase during acceleration and compensates for peak loads, thus providing advantages in terms of costs, durability and efficiency. The fuel cell unit can also be reduced in size.

Contact:  
AVL List GmbH

### LH2 INTERNAL TANK SUSPENSION

#### Combination of Pipelines and Internal Tank Suspension of LH2 Tank Systems

The heat entry into the tank system is reduced as much as possible through the innovative combination of the pipeline, valve and suspension components in the vacuum chamber of a liquid hydrogen tank for automobiles. Due to the reduction of heat bridges, the pressure buildup in the internal cryo-tank (ca. 20°K) and hydrogen losses through safety-related boiling-off are decreased. Further advantages are obtained through reduction of the system complexity and tank weight, to which compound materials are contributing as well.

Contact:  
MAGNA STEYR Fahrzeugtechnik AG & Co KG

### LASER-HCCI

#### Laser Ignition Concept for "HCCI High Efficiency Zero Emission Engines"

An extremely lean homogeneous fuel-air mixture is brought to a controlled ignition in the cylinder of an autoengine by a laser impulse. Due to the high cylinder pressures, the engine must consequently withstand extremely high loads when under full load. The "Homogeneous Charge Compressed Ignition" combustion concept combines the Otto with the Diesel process and thus attains excellent degrees of efficiency with particlefree combustion and lowest NOx emissions (< 5ppm).

Contact:  
GE Jenbacher GmbH & Co OHG





## ISB – INNOVATIVE RAIL SYSTEM

### CHECKPOINT

#### **Safety System for Automatic Train Monitoring Mechanisms**

Checkpoints are locally established points in the rail network at which trains are monitored to check their satisfactory condition. This check is performed by sensory components, which are passed by both passenger and goods trains at the locally permissible speed. The information obtained during the measurement is connected logically, compared with tolerance limits and preset messages are transmitted in the case of discrepancy.

Contact:  
Alcatel Austria AG

### SIMCONT

#### **Container Terminal Functions Simulator**

As part of the SimConT project, a Container Terminals Functions Simulator (SimConT) is being created for efficient resource application planning and capacity analysis for hinterland container terminals, based on modern simulation technologies.

Contact:  
University of Natural Resources and Applied Life Sciences –  
Institute of Production and Logistics

### **Active vibration reduction by elastic vehicle structure regulation**

Vibrations in the lightweight bodywork of modern rail vehicles, especially underground, are detected by sensors and reduced by appropriately regulated actuators. This measure results into a clear improvement in travelling comfort.

Contact:  
Vienna University of Technology – Institute of Mechanics and  
Mechatronics



# SUCCESSFUL DEVELOPMENTS FROM IV2S

## I2 – INTELLIGENT INFRASTRUCTURE

### AKUT

#### Acoustic Tunnel Monitoring

The sensory analysis in tunnels additionally monitors noises. Anomalies such as impacts, tyre squealing or sudden silence are identified and assigned to certain alarm classes. The tunnel manager can react even faster and more selectively to disturbances.

Contact:

Joanneum Research Forschungsgesellschaft mbH

### DYGES

#### Dynamic Weight Determination

Vehicle speed and vehicle weight are determined in real time by dynamic bridge reaction. The process core was the development of algorithms and their conversion to software level. Statistics regarding traffic composition and observations of bridge conditions can be performed over longer time periods. Overloaded vehicles can be identified by supplementing the process with video enforcement units.

Contact:

VCE Holding GmbH

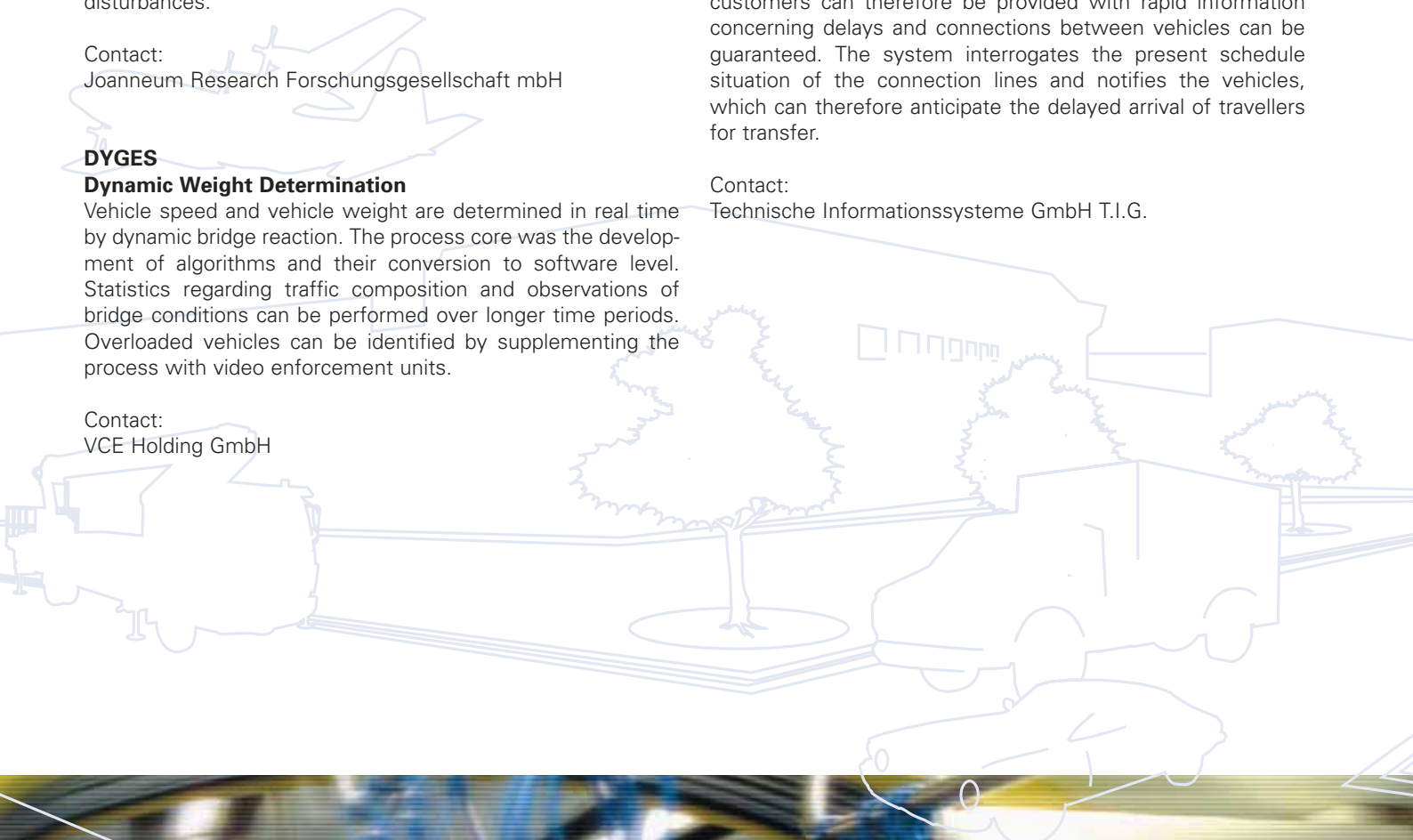
### CON.TAKT

#### Secure Bus-Bus-Rail Connections with Autonomous Vehicle operation

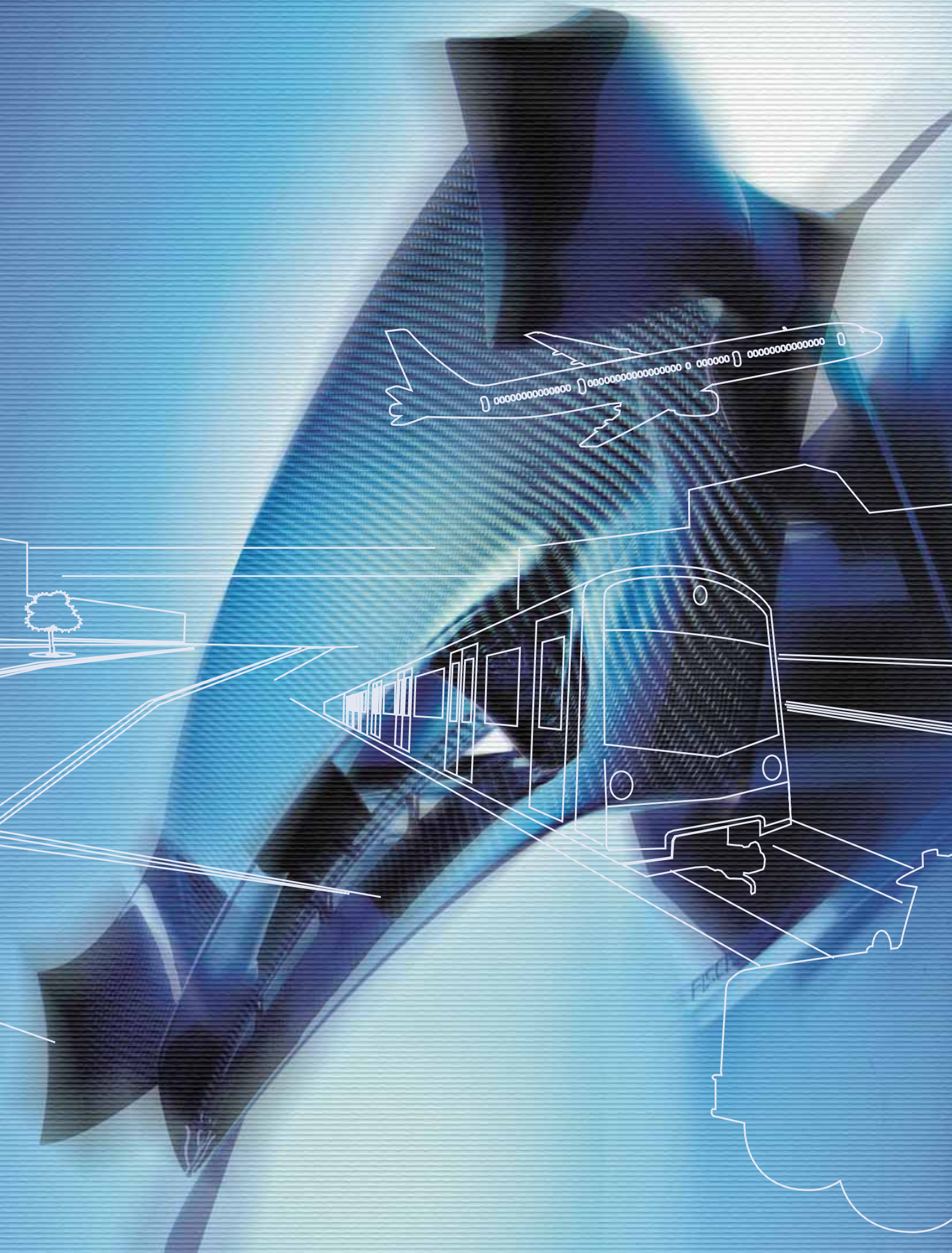
Guarantee of automatic secure connections with autonomous vehicle operation between buses and rail. In regions without computer-assisted operations control centres, public transport customers can therefore be provided with rapid information concerning delays and connections between vehicles can be guaranteed. The system interrogates the present schedule situation of the connection lines and notifies the vehicles, which can therefore anticipate the delayed arrival of travellers for transfer.

Contact:

Technische Informationssysteme GmbH T.I.G.







# GROWTH SECTOR HIGH-TECHNOLOGY

## THE TAKE OFF R&D PROGRAMME FURTHER EXPANDS AUSTRIA'S POSITION IN THE AERONAUTICS INDUSTRY

Europe's air transport sector is one of its most successful and dynamic industrial areas. Net product in overall European air transport is 220 billion Euros and therefore has a 2.6% share of European national product. The aerospace supply industry provides almost half a million people in Europe with highly skilled and thus secure jobs. More than half of the production has gone into exports, so the EU-wide sector has shown a positive trade balance of 29 billion Euros. With this heavy growth, the Austrian aerospace industry has also increased its turnover from 30 million Euros to more than 620 million Euros over the last two decades and has successfully asserted its position in specialised niches.

### Specially Designed Austrian R&D Programme

In recent years, the Federal Ministry of Transport, Innovation and Technology has already taken a series of steps to improve Austrian networking with the European aeronautics research scene and, with TAKE OFF 2002, developed a specially adapted Austrian aeronautical Impulse Programme.

TAKE OFF supports Austrian research bodies and companies in creating strategic European and international partnerships and as well domestic firms in opening up new markets. Its aims are to improve competitiveness through high levels of skill in research, technology and cooperation, and networking and know-how building in the industrial and university areas. The returns to the Austrian aerospace sector are thus to be increased in the long term and high-tech productions to be guaranteed in Austria, in turn generating safe and highly skilled jobs.

### Core areas

**Research** oriented towards strategic technological fields such as materials, components and systems for air transport propulsion systems, structures and interior design, information and communications technology based solutions for air transport and general aviation.

In 3 calls, 31 projects were promoted with around 13.2 million Euros.

**Educational Training** by higher training of workers and the development of computer based training tools; to date, 13 training measures have been promoted.

**Certification Campaign** by supporting companies in the Austrian aerospace supply chain and teaching bodies in compliance with the guidelines of the European Aviation Safety Agency. Within this initiative, Austro Control provided consultation services for around 25 companies. Industrial standard EN 9100 is presently a leading future core area.

**Risk Sharing** along with the AWS, the federal promotional bank of Austria, and its credit lines and guarantees for better support of aerospace suppliers in so-called risk sharing partnerships.





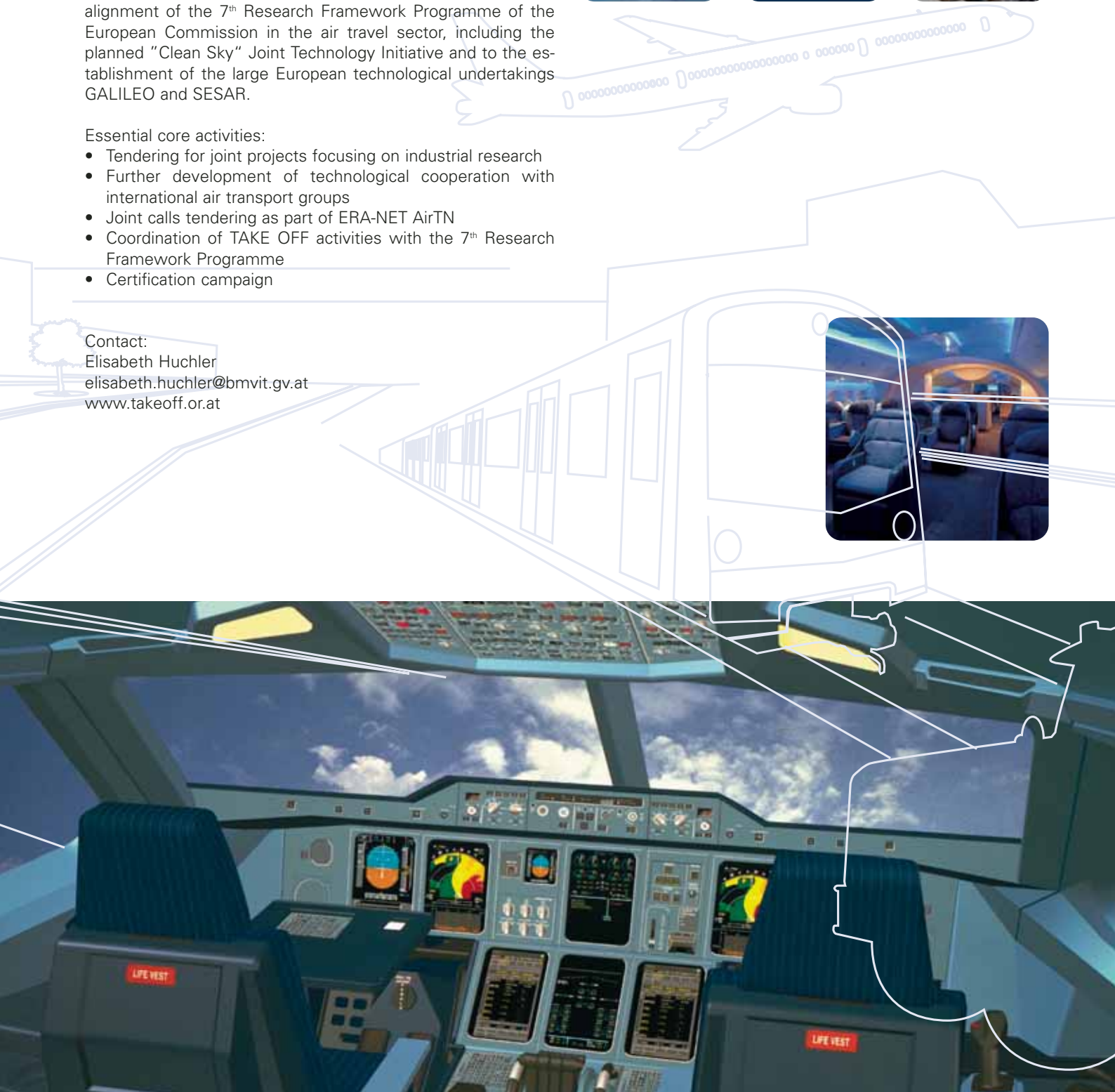
## THE FUTURE OF TAKE OFF

The Austrian Federal Ministry of Transport, Innovation and Technology continues to shape the TAKE OFF Programme along with the set-up of a strategy for research, technology, and innovation for the Austrian Air Transport System. This strategy has been finalised in the early summer of 2007 and is particularly oriented towards the new developments of the Strategic Research Agenda formulated by ACARE, to the new alignment of the 7<sup>th</sup> Research Framework Programme of the European Commission in the air travel sector, including the planned "Clean Sky" Joint Technology Initiative and to the establishment of the large European technological undertakings GALILEO and SESAR.

Essential core activities:

- Tendering for joint projects focusing on industrial research
- Further development of technological cooperation with international air transport groups
- Joint calls tendering as part of ERA-NET AirTN
- Coordination of TAKE OFF activities with the 7<sup>th</sup> Research Framework Programme
- Certification campaign

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[www.takeoff.or.at](http://www.takeoff.or.at)





## STRATEGY PROGRAMME IV2Splus

### INTELLIGENT TRANSPORT SYSTEMS AND SERVICES PLUS (2007-2012)



# LEADING RESEARCH WITH NEW CORE AREAS

## STRATEGY PROGRAMME IV2Splus – INTELLIGENT TRANSPORT SYSTEMS AND SERVICES PLUS 2007-2012

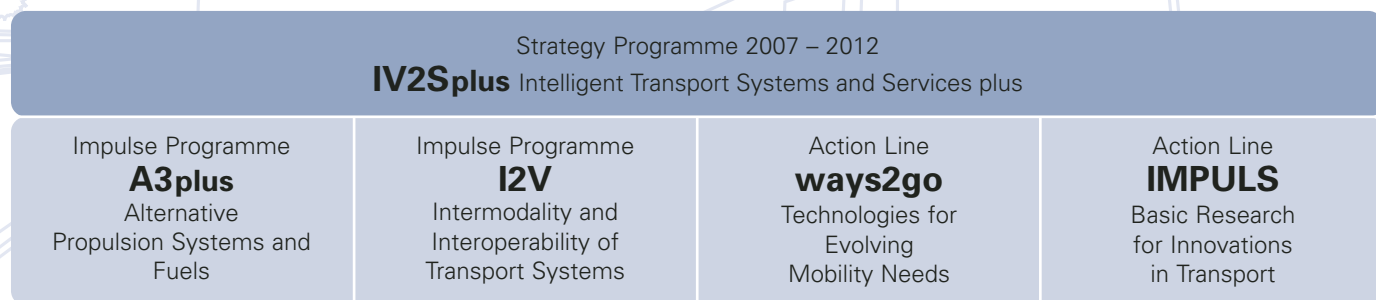
IV2Splus Intelligent Transport Systems and Services plus operates in continuity to the successful forerunner programme IV2S, but goes beyond IV2S in significant aspects and establishes new emphases and core areas of content, which cover

- Creation of excellence through greater international incorporation of the successfully established national R&D skills with the aim of a reinforced integration into international industrial value creation chains. Austria should thereby make an influential contribution to the development of future mobility solutions at European level.
- Promoting cooperation between science and economy with a special focus on SMEs to use their innovatory potential and create skills compatible with future requirements.
- Targeted impulses in areas which are of central social concerns: Reduction of energy consumption in transport organisation, use of alternative energy sources, decrease in environmental loads, especially in CO<sub>2</sub> emissions through transport, and increase in efficiency and safety of the overall system
- Attention to future social and economic needs in the development of new transport systems and mobility requirements

- Rapid opening up of new socio-technological options and problem-solving approaches for the transport application area
- Creation of skills and resources to meet future demands, such as human resource development and special attention to gender aspects.

The Strategy Programme is embedded into the international cooperation and programmes at European level to which it has abundant contacts and link-up points. The Austrian Federal Ministry of Transport, Innovation and technology thus acknowledges the importance of a sustainable transport policy oriented towards the Lisbon objectives of the European Union.

The IV2Splus is aligned along two Impulse Programmes and two Action Lines which are regarded as the logical consequence of the successful Impulse Programmes of former years and are in line with the 7<sup>th</sup> Research Framework Programme of the European Commission.



Overall Coordination:  
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# NEW OPPORTUNITIES FOR ENVIRONMENT AND ECONOMY

## IMPULSE PROGRAMME A3plus – ALTERNATIVE PROPULSION SYSTEMS AND FUELS

The transport of the future must be not only more environmentally friendly, but significantly more energy efficient as well. It is anticipated that within just a few years the exhaust gas values for diesel vehicles will have to be reduced to a fraction of present day emissions. Bio fuels and natural gas as alternatives to petrol and diesel require completely new engine designs, which will have previously unattained consumption and emission values.

Alternative combustion concepts and fuels will gradually replace the current combinations of Otto or Diesel engines with conventional petrol and diesel fuels. In the longer term, combustionless propulsion systems such as the fuel cell will achieve reductions in noise, contaminant emissions and energy consumption which combustion engines cannot attain due to the limitations of Carnot cycle. The requisite conversion of the entire power chain to electric components is facilitated by the economic successes already being achieved with the hybrid vehicle, enabled by clear advances in battery technology.

Natural gas and biofuels will achieve increasing market shares in both gaseous, fluid and liquefied form. Sustainable hydrogen will be obtained in these scenarios pursued by the automobile industry either with electricity generated from renewable sources from water through electrolysis, or be produced from biomethane resulting from biomass recycling.

Until things reach this point, however, a series of development stages and technological hurdles need still to be overcome.

The Impulse Programme A3plus – Alternative Propulsion Systems and Fuels consequently focuses on 6 core areas:

- Highly efficient engines and power chains and their components – either highly specialised monovalent or highly flexible multivalent engines, hydrogen engines, hybrid drives, fuel cells, electric engines, electric brakes, energy recuperation
- Alternative liquid and gaseous fuels and fuel combinations (hydrogen, natural gas, biogas, ethanol, methanol, synthetic propellants, bio fuels)
- Innovative storage concepts – highpressure tanks for hydrogen, biogas or natural gas, cryotanks for liquid hydrogen, nonpressurized hydrogen storage in metal hybrids or ionic fluids, highly efficient accumulators, heavyduty condensers for shortterm storage of recovered brake energy
- Designs to incorporate new alternative drives into the overall vehicle design
- Development and promotion of necessary infrastructures for innovative drive designs in lighthouse projects.
- Studies concerning the use of alternative drives for all modes of transport

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# SEAMLESS TRANSPORT CHAINS INSTEAD OF CONGESTION

## IMPULSE PROGRAMME I2V – INTERMODALITY AND INTEROPERABILITY OF TRANSPORT SYSTEMS

Road goods transport in the European Union will probably increase by up to 50% by 2020 and cross-border transport is expected to double by 2020 if no decisive measures are taken.

In a transport system of the future, different modes of transport should mesh seamlessly and it should be possible to combine transport facilities according to situation and purpose of a particular transport task. To successfully employ intermodal resources, road transport, rail and inland waterway transport need to be integrated into the logistical chains. Thus, existing infrastructures can be simultaneously used more effectively and transport configured in a more environmentally-friendly manner.

The Impulse Programme Intermodality and Interoperability of Transport Systems aims at investigating and implementing new transport solutions which are suited to the requirements of integrated future transport. Using technologies, cooperative safety, navigation and management systems can be developed which employ integrated vehicle electronics and driver assistance systems. The use of "real time" data and location based services forms the foundation of the said systems.

Medium- and long-term systems should thus be developed which enable efficient transfer between the modes of transport, and support systems which ensure connections and flexible schedule management. Intermodal transport should thus be designed more efficiently and attractively overall.

### Core Areas

Building on previous programmes, the core areas of the programme focus on the intersections between infrastructures and projects aiming at surmounting system limits:

- Automation and acceleration of goods transshipment
- Rolling stock to be flexible and harmonised
- Intermodal transshipment terminals and logistical centres
- Efficient firstmile and lastmile concepts
- Crosscarrier goods transport chains
- Technologies to increase safety during transport of valuable and dangerous goods
- Innovative intermodal transport concepts for business, leisure and supply routes
- Transport concepts and system solutions for mass rallies

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# SUSTAINABLE MOBILITY AS AIM

## ACTION LINE WAYS2GO – TECHNOLOGIES AND PROBLEM SOLUTIONS FOR EVOLVING MOBILITY REQUIREMENTS

The number of trips which Austrians cover daily has constantly increased in the past decades. A rapidly increasing mobility need and mobilisation of entire population groups can be observed particularly in the leisure transport sector. As such, more than 50% of all trips covered on a working day are journeys undertaken by cars or other motorised vehicles. More than 5.6 million automobiles are currently licensed in Austria (one vehicle per 1.5 adult inhabitant). However, more flexible lifestyles and changed settlement development structures have caused an explosion in distances covered. Work journeys of more than 50 kilometres are completely accepted nowadays.

The sociodemographic transformations and changed socio-economic frames of reference in our society will impose further great demands on transport systems in coming decades. To cover the daily mobility requirement, innovative technologies and integrating problem solution will have to be promoted, aimed at reducing personal vehicle dependency, improving the accessibility and usability of traffic systems and infrastructures – and their safety – and can clearly contribute to a reduction in environmental and health stresses. However, mobility must not redevelop into a privilege of certain population groups. The claims of older people and people with restricted mobility must be given more consideration than formerly in the design of a viable future transport system.

Technologies and problem solutions for evolving mobility requirements are therefore among the most important research aims in the transport sector. The action line is aimed at expanding the scientific basis of future mobility and transport requirements and developing viable future transport systems and mobility solutions.

### Core Areas

The primary aim of the action line is to investigate and develop strategies and concepts for intelligent and viable future transport systems and mobility solutions which satisfy these requirements

- Innovative mobility and transport concepts (mass-transport)
- Technologies to improve access and safety (ambient technologies)
- Concepts to improve accessibility and availability
- Integrated mobility management to increase reliability, efficiency and attractiveness
- Social strategies to raise awareness regarding transport safety and transport use
- Concepts to achieve sustainable mobility means and to change mobility culture
- Traveller information systems for a sustainable form of transport and route selection (creative content)

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# MAKING BETTER USE OF FINDINGS FROM BASIC RESEARCH

## IMPULS – AN ACTION LINE FOR RAPID UTILISATION OF KNOWLEDGE FOR THE TRANSPORT SECTOR

### BIONICS – NATURE AS MODEL

To master future tasks, promising new methods must be adopted. As one of these new methods, bionics deals with the investigation of stimulants to biological evolution and examination of their applicability to principles in the technical and organisational areas, with the aim of applying new concepts and products in the transport sector.

### HIGH-TECH FROM NATURE

Aircraft whose outer skin is similar to the skin of sharks could reduce their flow resistance by 20 percent, surfaces with the microstructure of certain plants would be resistant to pollution, bridges built according to the model of human bones could bear a multiple of presently conceivable loads while employing significantly less material. Natural organisational forms and their principles can also serve as models for human projects – for example through similar use of success principles such as closed material life cycles, energy efficiency, diversity, selfrestriction and viable life systems.

### Core Areas

A preliminary stage of this action line focuses on the potentialities of bionics in the transport sector.

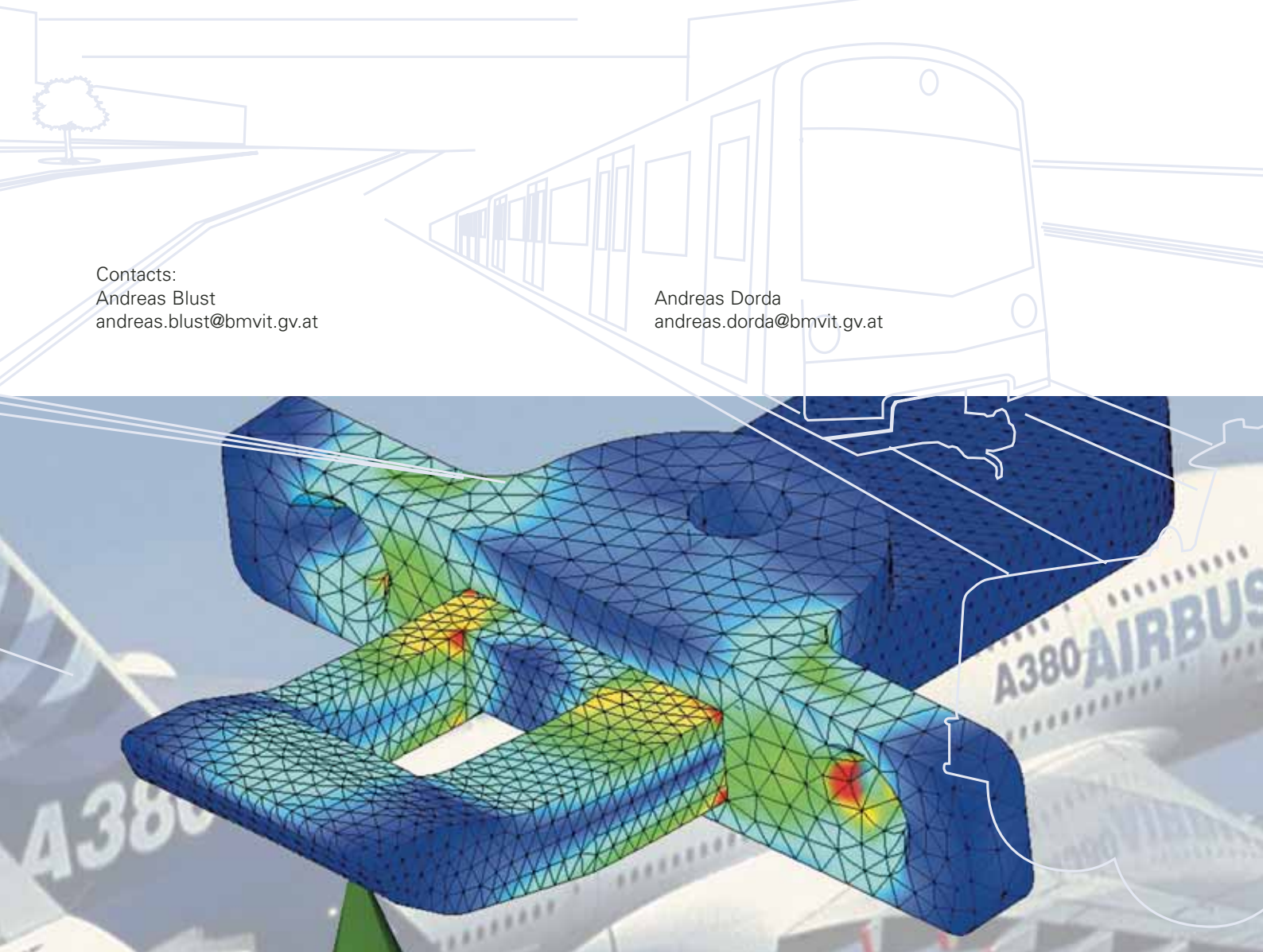
- Strategies and concepts for the application of bionics in the transport system
- Interdisciplinary networking of existing skills and creation of a "critical mass" in Austria
- Linking to international developments and research cooperations
- Information regarding new solution potentialities for industrial application
- Presentation of the potential of the basic research to public perception
- Development of promotion funding schemes

With IMPULSE, in addition to bionics, other new scientific and technological knowledge and problem solving approaches should rapidly be opened up for the transport sector in accordance with the aims of IV2Splus.

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## NETWORKING AT EUROPEAN LEVEL

AUSTRIA'S TRANSPORT RESEARCH SOLIDLY ANCHORED IN EU INITIATIVES.

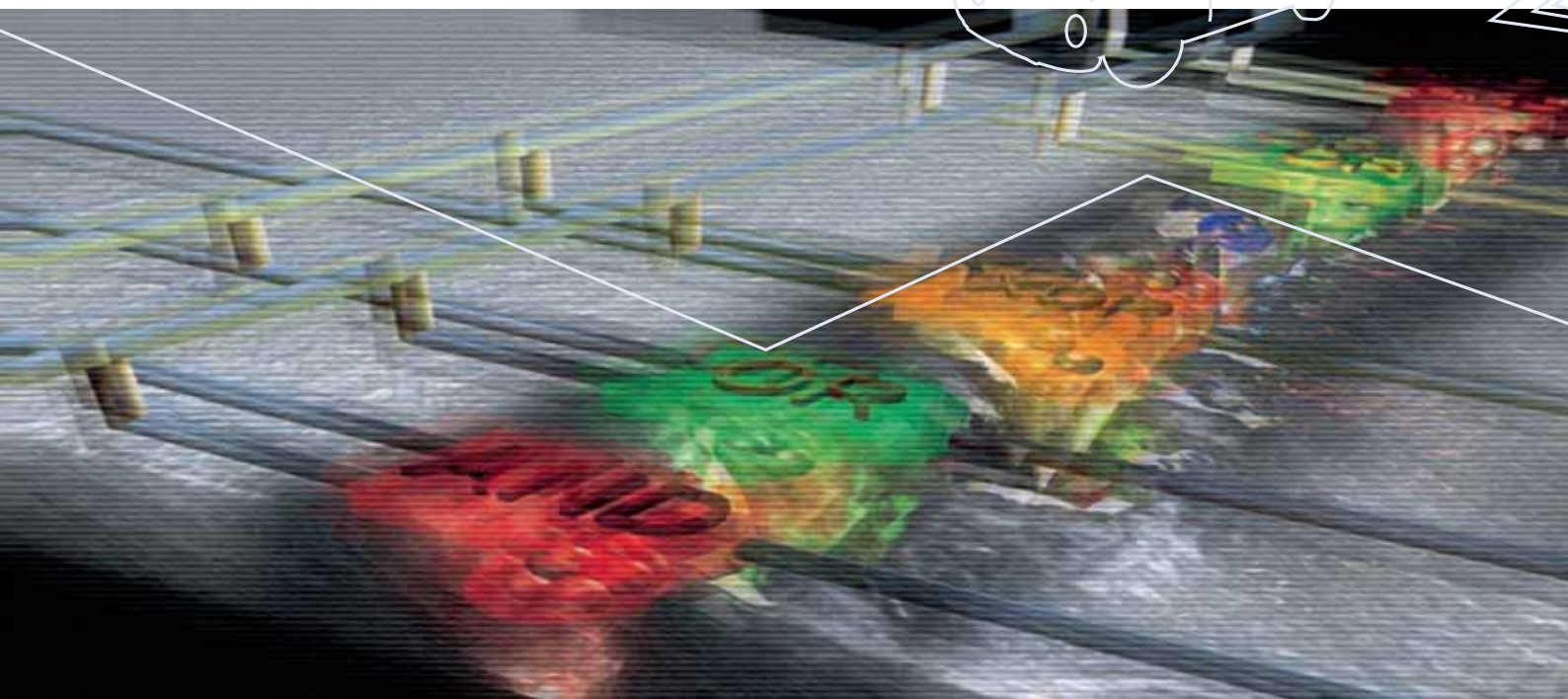
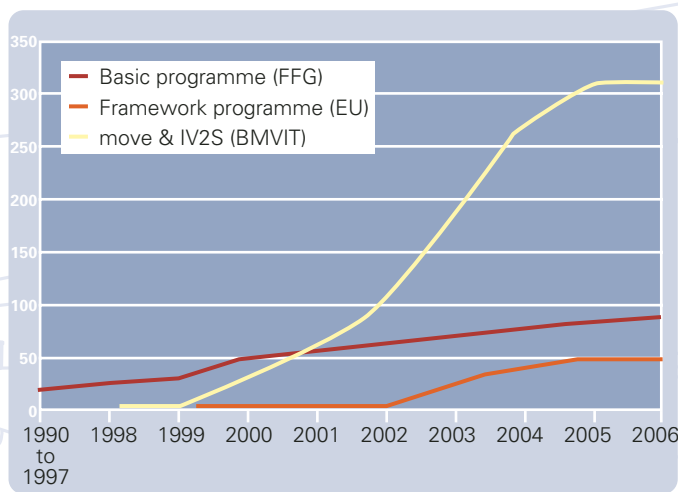
The Austrian track record of the 6<sup>th</sup> Research Framework Programme indicates that successful participation has also been fostered significantly by national programmes.

The effects of the IV2S Strategy Programme on the presence of Austrian companies at European level is clearly visible. By reinforcing national research-activities through move (1999-2003) and IV2S (2002-2006), the participation of Austrian companies in the 6<sup>th</sup> Research Framework Programme of the European Commission has clearly increased.

### DEMONSTRABLE AUSTRIAN TRACK RECORD IN THE 6<sup>TH</sup> RESEARCH FRAMEWORK PROGRAMME (PROVISO Data)

At 2.53%, the share of Austrian promotions in the overall payouts of the 6<sup>th</sup> Research Framework Programme exceeds the share of the Austrian gross contribution payments to the EU budget, which stands at 2.13% (position at end of 2005). Austria has thus benefited more than the average from the European research promotion. At 3.53%, the returns in the transport sector again clearly exceed the overall value. The transport sector is therefore the area of the domestic R&D scene which is most European-oriented. The Austrian participation in the transport sector is in the peak European area. Whereas the Austrian success quota in the 6<sup>th</sup> RFP was 18%, in the transport sector it was 30%.

Thus, the Austrian Transport Research can not only finance additional research facilities but also actively participate in European solutions.



## INCREASING COOPERATION LEVEL

### ERA-NET (EUROPEAN RESEARCH AREA NETWORK)

In the 6<sup>th</sup> Research Framework Programme, a further initiative to reinforce the European Research Area was started with the ERA-NETs for the EU member states. With the active participation of the Austrian Federal Ministry of Transport, Innovation and Technology in ERA-NET TRANSPORT and ERA-NET AIR-TN, cooperation networks were constructed in several transport-related domains such as telematics, inter-modal freight transport, alternative propulsion systems and fuels, logistics and dangerous goods transports, railway and air transport. Future thematic coordination between different national transport research programmes of European member countries was thus initiated at national level.

Initial resounding successes are already perceptible. In autumn 2006, for example, the first transnational invitation to tender was commenced together with Germany in the transport sector on the subject "Intelligent Logistics".

With the transnational activities resulting from this initiative, new opportunities are being opened up to the Austrian transport research scene to participate in cross-border research

promotion cooperations and the national research policy experiences can be shared among other countries.

As part of this cooperation initiative, the Austrian Federal Ministry of Transport, Innovation and Technology will in future assume as well important duties in scaling up transnational cooperation procedures, and is currently already preparing actively coordinated research promotion measures in different subject areas with the partner countries in ERA-NET TRANSPORT.

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### NEW DEVELOPMENTS IN THE 7<sup>TH</sup> EU RESEARCH FRAMEWORK PROGRAMME

For a period of 7 years, a total of 50.5 billion Euros (without EURATOM) have been made available, which represents an average annual increase of 60% in comparison to the 6<sup>th</sup> Research Framework Programme. In terms of budget allocation, aeronautics and surface transport are ranking third amongst all RFP7 Thematic Priorities. Its contents reflect the national research promotion core areas and anticipate a similarly high participation as in RFP6.

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## TECHNOLOGY PLATFORMS – STRATEGIC PARTNERSHIPS

As from 2000, thematic technology platforms have been initiated at European level with the aim of developing Europe-wide research strategies and achieving better networking and coordination of all European Research and Development capacities. With the involvement of different stakeholders from industry, science, consumers and the member states, authorities and the European Commission, research agendas were developed for the respective areas with aims targeted for up to the year 2020. These strategic developments are regarded as pioneering for the European, national and industrial R&D programmes. In the transport-related technology platforms, representatives from the Austrian Federal Ministry of Transport, Innovation and Technology, Unit of Mobility and Transport Technologies are actively involved in the strategic development and implementation of the research agendas. The Austrian Federal Ministry of Transport, Innovation and Technology thus functions as an information turntable and door opener for new cooperation for research and development partners at European level.

### IEA – GLOBAL ENERGY RESEARCH CO-OPERATIONS FOR SUSTAINABLE TRANSPORT

The International Energy Agency opens up valuable research cooperation options beyond the European area, which are actively used by the Austrian Federal Ministry of Transport, Innovation and Technology. One of the areas where the development of more energy-efficient transport technologies is being pursued, is the implementing agreement "Hybrid & Electric Vehicles", in which Austria is cooperating with 8 member states and is running the Annex "Fuel Cells for Vehicles".

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The following technology platforms are particularly relevant for the transport sector:

<b>ERRAC</b>	European Rail Research Advisory Council
<b>ACARE</b>	Advisory Council for Aeronautics Research in Europe
<b>ERTRAC</b>	European Road Transport Advisory Council
<b>EIRAC</b>	European Intermodal Research Advisory Council
<b>Waterborne</b>	European Technology Platform WATERBORNE
<b>BIOFRAC</b>	Biofuels Research Advisory Council
<b>HFP</b>	European Hydrogen and Fuel Cell Technology Platform
<b>ERTICO</b>	European Road Transport Telematics Implementation Coordination Organisation. With membership in ERTICO the Austrian Federal Ministry of Transport, Innovation and Technology is involved in an international network for supporting strategic partnerships.





## NATIONAL R&D PLATFORMS

In parallel with these initiatives at European level, national transport-related R&D platforms have been widely established with support from the Austrian Federal Ministry of Transport, Innovation and Technology with the aim of developing strategies based on national strengths and requirements to incorporate national interests and position them internationally. An active information and know-how exchange can thus be ensured among the partners, but also with the European technology platforms. The Austrian Federal Ministry of Transport, Innovation and Technology cooperates closely with these national platforms.

The most recent example is the **A3PS (Austrian Agency for Alternative Propulsion Systems)**: founded in 2006 as a strategic public-private partnership between industry, research and technology policy it supports the development of alternative propulsion systems through national and international networking ([www.a3ps.at](http://www.a3ps.at)).

The **ITS Austria** initiative was set up in 2004 and, since the foundation of AustriaTech, has operated under its roof. The task of ITS Austria is to offer a platform to the many parties interested in intelligent transport systems, on which information may be exchanged, projects developed and cooperation initiated. Intensive dialogue should also be enabled with and between the users. ITS Austria successfully presented itself for the first time at the ITS World in London in September 2006 with around 12 companies and research institutions. ([www.its-austria.info](http://www.its-austria.info))

The **RTCA** (Rail Technology Cluster Austria) was established in 2003 as a technology-oriented platform and is actively pursuing the progress of the technological edge of its around 50 members and the increase in service orientation of the railway system through new products and services ([www.rtca.at](http://www.rtca.at)).

The **"Research Forum Mobility for All"** was established in 2005 as a platform for the dissemination of European and national research results on the subject equality of opportunity in Transport. The core areas are determined annually and contain barrier-free social and environmentally oriented transport planning and structuring and support equal mobility opportunities for country and town dwellers, women, men and children, etc.

With the foundation of the **Austrian Aeronautic Industries Group** (AAIG) a platform was created in 1999 with 36 members from the aerospace supply industry. The aim of the association is to represent their interests both nationally and internationally (member of the AeroSpace and Defence Industries Assoc. of Europe – ASD).

In addition, there are still further important transport/technology related platforms in Austria such as the Automotive Clusters Vienna Region, AC Styria, AC Upper Austria and the **ATTC** (Austrian Transport Telematics Cluster).



## FROM THE INITIAL SPARK TO MARKET MATURITY

Further measures have been developed from the experiences of different transport-related R&D programmes, principally to close the gap between research and implementation. Through suitable instruments specially designed for the solution of socially relevant and transport policy-related questions, the research funds invested should quickly produce positive effects at industrial and macroeconomic level.

**Lighthouse Projects** – are set up to facilitate the market introduction of new technologies. The Austrian Federal Ministry of Transport, Innovation and Technology thus promotes the creation of “lighthouse projects” as large-scale pilot and demonstration projects with the participation of not only developers and producers but also users of these technologies. Thus, currently existing problems may be solved jointly and the improvement potential of these technologies demonstrated to the public. The Austrian Federal Ministry of Transport, Innovation and Technology directly supports the creation of the lighthouse projects in an interactive process in order to facilitate the involvement of potential technology users (public transport services, municipal authorities, tourism regions, fleet operators, etc.) to take into account the international experience of successful demonstration projects and to obtain the participation of political decisionmakers at the national and international level in such R&D projects.

Lighthouse projects are currently being carried out as part of Impulse Programmes A3 and I2.

### **AustriaTech – Core Area Telematics**

AustriaTech, the company of the Austrian State for Politico-technological Measures, was founded in 2005 by the Austrian Federal Ministry of Transport, Innovation and Technology and functions as a technology agency with development duties in the telematics area. In this context, the task of AustriaTech is to ensure the national and international interoperability of systems to open up optimum general public use of telematics in the transport system. Furthermore, the development of intelligent transport systems in new problem fields is to be stimulated. The aim is to have suitable technologies for the efficient transport of the future developed and implemented principally by Austrian companies, and to organise transport intermodally, along with the infrastructure operators.

[www.austriatech.org](http://www.austriatech.org)

### **A3PS – Service in the Innovation Sector**

As a strategic public-private-partnership between industry, research and technology policy, the Austrian Agency for Alternative Propulsion Systems founded in 2006 supports Austrian research and industry through the provision of basic innovation promoting, legal and financial conditions, information, research and cooperation management and national and international networking. The aim of A3PS is to offer a wide range of additional services such as technology foresight and assessment, support in the setting up of R&D or demonstration projects and in the marketing of Austrian technological skills, in the sense of a modern technology policy supplementing the existing financial promotion.

[www.a3ps.at](http://www.a3ps.at)

**RTA** – (Rail Tec Arsenal) is an internationally active, independent research and test institute for rail vehicles, road vehicles, new transport systems and all technical installations exposed to extreme climatic conditions. As a globally acknowledged know-how institute for climate tests, Rail Tec Arsenal operates two modern climate wind channels to optimise thermal comfort in mass transport units and to check and improve availability and safety of systems in sensitive technical areas.

[www.rta.co.at](http://www.rta.co.at)



# INNOVATIONS PROMOTE MULTIMODAL TRANSPORT

Combined road/rail/ship transport of goods represents an environment-friendly alternative to purely road transport. The disadvantages resulting from ignoring external costs in road transport and the increased handling expenditure and requirement for special equipment justifies the promotion of investments in this sector according to European competition legislation. The Programme is selectively used by the Austrian Federal Ministry of Transport, Innovation and Technology to rapidly provide innovations and new technologies from R&D programmes to the sector, thereby strengthening the competitiveness of the transport economy and its acceptance of innovation.



## Concrete core areas include particularly

- the application of innovative technologies and systems to improve the performance of bi-/ multimodal transport systems and
- logistics systems and special logistics services to create seamless transport chains

Around 20 projects with a promotional volume of around 3 million Euros are financed annually. Thanks to its widescale acceptance, especially in regard to the use of new technologies and logistical systems, the programme is being extended beyond the year 2008.

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# AUSTRIAN FEDERAL MINISTRY OF TRANSPORT, INNOVATION AND TECHNOLOGY STATE PRIZES

In 2005, a State prize was awarded for the first time by the Austrian Federal Ministry of Transport, Innovation and Technology for outstanding solutions and projects in the logistics sector. In 2006 projects on the topic "Telematics – Innovative Application in Transport" were distinguished by the State prize.

State prizes are the highest distinctions which the competent Austrian Federal Minister can award in his domain. With the Austrian Federal Ministry of Transport, Innovation and Technology State prize, a platform was created which rewards outstanding innovative transport projects and reinforces Austria as business location in the international field. The State prize award falls into 2 categories:

- design and development of prototypes/system solutions
- marketed products/system solutions

In addition, special prizes may be awarded. As, in particular, SMEs are to be motivated to present their solutions to a wide public, it is planned to dedicate this special prize to this company category from 2007.

All Austrian firms and institutions, both in the private economy and public corporations and companies in the public sector which are responsible for the submitted solutions, are eligible to make submissions.

Through the establishment of the State prize for innovation, a symbol was created for the significance of research and technology within an innovative transport policy. The positive synergic effects achieved through the dual responsibility for transport and technology in the Austrian Federal Ministry of Transport, Innovation and Technology can thus be simultaneously displayed.

The State prize concession is planned annually, alternating between the topics logistics and telematics.

## 2005 Prize-Winners

- SmartWarehouse, a concept from Messrs. Salomon (development)
- Ballon, a logistics system solution from the RHI industrial group jointly with Kühne & Nagel (product)
- WoodLogistics, a concept of Innofreight Consulting & Logistics (special prize)

## 2006 Prize-Winners

- Development of an acoustic tunnel monitoring system by Joanneum Research (development)
- Transport management and information system (VMIS) by ASFINAG (product)
- DoRIS, the Austrian inland waterway navigation information system of via donau (special prize)



## COOPERATION PARTNERS

### **Austrian Research Promotion Agency (FFG) – the Central Contact Point for Programme Management and Research Funding Administration**

Through the pooling of four different research promotion agencies in the FFG, a "one stop shop" was created in 2005 for Austrian companies and researchers. The FFG has a wide

promotion portfolio including bottom-up instruments and several top-down programmes and also provides support services within the European and international R&D programmes.

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### **AWS – Austria Wirtschaftsservice – Promoting – Supporting – Financing – Consulting**

As federal promotional bank of Austria, AWS supports company-related investments in terms of growth, innovation and employment. Thus, as a supplement to the FFG promotions, the implementation of innovative developments in companies and foundations of high technology companies are financially promoted. A further instrument are risk sharing initiatives for company set-ups or ambitious market entries, such as in the aeronautics sector.

[www.awsg.at](http://www.awsg.at)

### **Infrastructure Operators, Service Providers, Public Transport Companies**

The infrastructure companies ÖBB, ASFINAG, Austro Control and via donau and transport companies such as Vienna Public Transport Lines and Transport Union Vienna Region are important partners for the development and implementation of innovative schemes. They therefore improve the performance and innovative capacity of the Austrian transport system and ensure the attractiveness of Austria as business location.

### **Arsenal Research –**

#### **Leading Edge Research for Mobility and Energy**

Arsenal Research has established itself among the Austrian research centres as central contact point for applied research and development in the mobility and energy sectors, and was active in a total of 48 EU projects in 2006. Arsenal research combines its strategic research fields, in which experts from 18 nations are active, within five programme lines.

[www.arsenal.ac.at](http://www.arsenal.ac.at)

### **Austria's Researchers and Innovators!**

Almost 1000 companies and university and extra-university research institutions have participated in projects within IV2S. They jointly make an important contribution to reinforcing skill in a key sector of the Austrian economy.



**INNOVATION = IDEA + IMPLEMENTATION + SUCCESSFUL MARKETING**

The term "innovation" is frequently used as a synonym for "invention". However, an invention only becomes an innovation if it is superior to existing products or processes and is therefore accepted by the market: The better is the substitute of the good. Technological innovations are the result of complex processes:

- > It is the policy which gives the impetus to search for better solutions
- > It is the people who run research
- > It is the structures and the financial resources which enable application-oriented research and development within the European and national framework

The collaboration of all players and resources ensures success.