

Title: Efficient and secure global container supply chains**Acronym:** CONTAINER-SC**Submitted by:**

Esbeth van Dyk (fevandyk@csir.co.za)

Tel: 021 8882614 Mobile: 083 6819598

Postal Address: Logistics & Quantitative Methods CSIR PO Box 320 Stellenbosch 7599

Theme: Transport (including aeronautics)**Focus Area:** Surface transport (rail, road and waterborne)**Type of project:** R&D project, including technology demonstration (large scale)

Summary: Aim: The aim of the project is to maximise the efficiency and security of global container supply chains. Background: Globally more than 250 million containers are shipped annually, carrying 90% of all cargo. These containers' flow is crucial to the world economy, but they are often subject to costly inefficiencies and are also vulnerable to terrorist activities, smuggling and fraud. Currently only a small percentage of containers' contents are verified through inspection or scanning (estimated at 2% in 2002). In a recent study it was found that one of the greatest impediments to supply chain security is the lack of uniformity across international security structures and initiatives. In addition, the efficiencies with which containers are handled in often congested and environmentally exposed ports should be improved for a more streamlined service.

Focus: This research will focus on the development and demonstration of technologies for:

- Processes in ports and terminals to ensure efficient container handling and flows. This includes electronic documentation;
- Ensuring the safety and security of containers. This includes verifying the contents of containers, monitoring the condition of cargo inside containers; and tracking and tracing cargo and containers throughout the global supply chain;
- Information and communication systems to facilitate the flow of electronic documents and other information linked to the flow of the containers. Expected outcomes will include: streamlined procedures for container handling throughout the supply chain and shared information system(s) containing electronic documents, information about the condition of goods inside containers and real-time locations of containers, accessible to the relevant role-players in the global supply chain. Furthermore, a relationship will be developed for the loading and offloading efficiency of container ships as a function of environmental conditions (especially wind and waves).

Expertise offered: In-depth knowledge of cold supply chain management for container transport of fresh fruit from SA to Netherlands, acquired during Fruitful project, done in collaboration with TNO, Delft and A&F (then ATO), Wageningen. Pilots and outcomes included: door-to-door time-temperature records,

- Standardisation of codes for EDI,
- Electronic booking of containers on vessels,
- Electronic exchange of phytosanitary certificate (hampered by EU regulations),
- Electronic Bills of Lading and outturn reports and;
- Optimised collection of goods from discharge terminal.

In-depth understanding of maritime and port security including the ISPS code, C-TPAT and CSI. Experience in the monitoring of ship motions in ports and the monitoring of environmental conditions. ITS laboratory, offering expertise on CCTV, RFID and other technologies for tracking goods and vehicles and securing the supply chain, e.g. a maritime video monitoring and warning system to monitor ship movements at the quayside and warn crane operators of movements that might affect their loading operations.

Previous FP involvement: Yes

Details of previous FP involvement: BESTUFS & Participated in submission of SSA for Scientific Support to Policies in FP6, coordinated by TNO. Topic: Connecting Overseas Networks for an Extended Trans-Tools model (CONNECT-T). Submission unsuccessful.

Consortium status: TNO will probably lead the consortium. They have lead previous PF consortia and are well connected with other EU partners.

Expertise sought: Ports, container lines (e.g. Maersk), container terminal operators, intermodal facility operators, Customs & Excise, providers of tracking & tracing technology and sensors to monitor goods inside containers e.g. Global Track, iPico, information system developers, research and consulting institutes, e.g. Institute of Shipping Economics and Logistics (ISL), Germany and Delft University of Technology, Netherlands. The latter has completed a number of projects on container handling and logistics for the Port of Rotterdam.

Related projects: International bilateral cooperation

Title: Feasibility analysis of sky liberalisation process and surviving the transition

Acronym: FALSEPAST

Submitted by:

Mathetha Mokonyama (mmokonyama@csir.co.za)

Tel: 012 841 4732 Mobile: 083 457 5648

Postal Address: P O Box 395 Pretoria 0001

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Liberalisation is the act of relaxing the laws governing an industry to become less strict or severe, which entails government's removal of control to allow for a free efficient market place that would encourage competition. Liberalisation has been seen as advantageous in improving the quality and competitiveness but in order to encourage member states to open up their skies, various aspects of the industry need to be taken into account. The feasibility of the creation of a single sky would involve: passenger demand modelling for airlines that will compete for the market share, streamlining the consolidation process of the traffic movements and operations, optimum hub network design modelling to lower the costs. So far, the biggest impediment to liberalisation, more obvious in Africa than Europe is the mistrust of member countries, unclear economic benefits of the transition into the open skies policy, unspecific alignment procedures and the fear of the unfair competition by dominant airlines. This means that studies need to be undertaken to analyse: the economic analysis of the quantifiable benefits of liberalisation, possible financing mechanisms to enable smaller airlines to compete and the alignment of safety and security guidelines for all member countries and airlines. This extensive research will enable regional organs like the EU and AU which want to benefit from the current trends of liberalisation and globalisation, through the creation of a single sky, to have an in-depth analysis on all the aspects of aviation that will be merged through the creation of a single sky. The fast tracking of the open skies policy both in Europe and Africa, will be enabled through the highlighting the advantages enjoyed by member states and airlines. Regional organs and executing agencies will be the platforms used to set up procedures to streamline the process of liberalisation without excluding the mandatory requirements of institutional organs like ICAO and IATA.

Expertise offered: - Transport operations research - African aviation research - Transport legislation - Transport modelling

Previous FP involvement: No

Consortium status: None existing.

Expertise sought: Aviation research, Open skies, Network modelling

Related projects: South African national R&D programmes

Title: Demand responsive public transport system as a solution for special events and low development densities in both urban and rural areas

Acronym: DRESSDIVA

Submitted by:

Mathetha Mokonyama (mmokonyama@csir.co.za)

Tel: 012 841 4732 Mobile: 083 457 5648

Postal Address: P O Box 395 Pretoria 0001

Theme: Transport (including aeronautics)

Focus Area: Surface transport (rail, road and waterborne)

Type of project: R&D project, including technology demonstration (large scale)

Summary: South Africa will be hosting the FIFA football world cup in 2010. A total of 10 venues have been selected from 9 host cities. Sporting events at some of the selected venues continuously prove to be problematic in terms of transport operations, for example, delays caused by both periodic and non-periodic roadway congestion. Public transport services in the current form would also be insufficient to curb the congestion both in terms of spatial capacity and vehicle capacity even if made more attractive as an alternative mode. Research

into demand responsive public transport systems, e.g. University of Newcastle upon Tyne in the UK, has demonstrated the technical feasibility of these systems in the UK for regular transport services. Nevertheless, it appears that regulatory issues and not technical issues are more critical to the success of the system. It is proposed in this research to conduct a feasibility study for the application of demand responsive public transport system in South Africa with specific short term application on special events leading towards the 2010 FIFA football world cup. In the longer term the feasibility of extending the concept as a public transport solution for low development density, a characteristic of South African cities and also rural areas, would be investigated. The project further provides an opportunity to incorporate Intelligent Transport System technologies in a manner that emanates from the EU FP6 SIMBA project. Moreover, with the introduction of the Gautrain Rapid Rail Link, a high speed rail line connecting Johannesburg, Pretoria and the Johannesburg International Airport, a demand responsive system could potentially become a feeder and distribution system in the aforementioned low development density environment. The project would strategically contribute to the current research work in the CSIR on passenger transport service design science.

Expertise offered: - Public transport operations research - Transportation modelling - Traffic engineering - Land use planning - Transport legislation

Previous FP involvement: No

Consortium status: Does not exist.

Expertise sought: Transport operations research and ITS

Related projects: FP6

Title: Natural Fibre Reinforced Composites for Aerospace Industries

Acronym: Aero comp

Submitted by:

Rajesh Anandjiwala (ranandi@csir.co.za)

Tel: +27 (0)41 508 3273

Postal Address: CSIR, MSM Fibre & Textile P.O. Box 1124 Port Elizabeth 6000

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Recent resurgence of South Africa in global automotive market and interest shown by leading players in the aerospace industries, such as Boeing and Airbus for sourcing natural fibre reinforced composite products and technology from South Africa necessitate appropriate responsive R&D intervention from South African Science Councils and Tertiary Education Institutes. Besides, the Government recently launched the Accelerated Shared Growth Implementation of South Africa (ASGISA) and (JIPSA) initiatives to facilitate the sustainable growth of the industry through identified interventions. This is in addition to the DTI published Integrated Manufacturing Strategy (IMS) and Advanced Manufacturing Technology Strategy (AMTS) championed by the Department of Science and Technology for improving the competitiveness of the industry through identified R&D intervention and pursue national human capital development. To address the R&D need and resolve some of the outstanding research problems in the field of natural fibre reinforced composites for automotive and aerospace applications and meeting with Airworthiness Standards, obviously well directed multi-disciplinary interventions with adequate financial, human capital and infra-structure are required. To support this aim, multiple funding agencies, such as EU-FP7, DST, the DTI, DST and Science Councils need to pull their resources to develop a globally competitive technology platform. The EU - FP7 is a multi-billion Euros initiative which will provide funding to competent R&D project for seven years from January 2007. To access this fund, South Africa has ESASTAP initiative through the DST in the partnership with the EU. The proposed project strategically fits well with the EU - FP7 themes on new research and application developments for transport sectors which include aeronautics.

Expertise offered: The Fibres and Textiles Competence Area (F&T CA) of Materials Sciences and Manufacturing (MSM) of the CSIR has invested in the state of the art no woven technology platform, a precursor technology, for preparing fibrous reinforcement in polymeric composites. The AMTS supported project will provide additional impetus to the efforts of conducting basic R&D and address problems encountered in natural fibre reinforced composite materials. Materials Sciences and Manufacturing Unit has necessary infrastructure and

characterisation facility, which in co-operation with national and international tertiary higher education systems will be able to provide a base R&D programme in the field. Currently F&T CA is already involved in two projects, funded by NRF through international bilateral, and on natural fibre reinforced composite development besides current funding allocations from the AMTS programme. Besides, Airbus Industries has shown an interest in Natural Fibre Composites, both from polymeric and bio polymeric materials. This effort will provide a new platform to the South African researchers to interact with their European counterparts.

Previous FP involvement: No

Consortium status: The current status of the consortium is as follows: (1) CSIR MSM (both Fibres and Textiles and Polymer, Ceramics and Composites Competency Areas), Poland, Hungary, France, Belgium, and Airbus Industries.

Expertise sought: The collective expertise of the consortium members will be complimentary to conduct basic R&D project and then lead it to an effective technology transfer activities that a leading aerospace industries, such as Airbus requires. We will also strengthen the network eventually once this SIP is approved, with a particular emphasis with the Belgian, French and Italian partners in the consortium.

Related projects: International bilateral cooperation South African national R&D programmes

Title: Controllable suspension

Acronym: 4S4

Submitted by:

Petro Uys (petro.uys@up.ac.za)

Tel: +27 012 4202254

Postal Address: Department Manganese Ingenieurswese, Universiteit van Pretoria, Pretoria. 0002

Theme: Transport (including aeronautics)

Focus Area: Surface transport (rail, road and waterborne)

Type of project: R&D project, including technology demonstration (large scale)

Summary: The classic compromise between ride comfort and handling in the design of wheeled vehicle suspension systems is well known. With a normal passive suspension system, the characteristics of the springs and dampers are fixed at the design stage and cannot be changed afterwards. This compromise is especially problematic for vehicles used under both on- and off-road conditions. By using controllable springs and dampers, these characteristics can be changed while the vehicle is moving. It therefore becomes possible to have soft settings for good ride comfort whilst travelling in a straight line on a good road, while the suspension can be changed to a hard setting moments later to give good handling when the vehicle has to change direction as required for lane changing or even accident avoidance. Controllable suspension systems offer the possibility to change the spring and damper characteristics while the vehicle is moving, thereby adapting to different terrains and speeds. These suspension systems can thus reduce or even eliminate the ride comfort vs. handling compromise. Hydro pneumatic suspension systems have the additional property that the vehicle height can be varied. By lowering the height of the centre of gravity of the vehicle, rollover propensity is reduced and the stability and safety of passenger and vehicle improved. The purpose of the research proposed in this submission is to develop a controllable suspension system for improved ride, handling and safety of off-road vehicles. Current systems remain an expensive option and are therefore applied mainly in luxury vehicles. The system proposed in the current study is novel and will improve the cost / performance ratio of controllable suspension systems. The research aims to design, develop, manufacture and test a two-stage, semi-active, hydro-pneumatic spring, combined with a two stage semi-active damper. The resulting suspension hardware will be tested and characterized to obtain all the parameters required for mathematical modelling. The system will be fitted to a test vehicle, together with the necessary sensors and control system. Vehicle tests will be performed to validate mathematical models and to quantify improvements in ride comfort, handling and rollover propensity.

Expertise offered: Expertise exists with respect to mathematical modelling, vehicle dynamics, model verification, field testing and hardware development. The University of Pretoria has extensive laboratory facilities with Schenck Hydropuls test equipment that will be utilized for suspension component testing and characterization. Data acquisition equipment is also available for both laboratory and field-testing. Computer hardware and software (ADAMS) for vehicle dynamics analysis exist and are maintained at the latest releases. Other software used for mathematical simulation (Matlab/Simulink) is also available) A dedicated test rig for testing the suspension units have been developed and manufactured. This test rig is now available for all future testing of the suspension unit. Hardware-in-the-loop (HiL) technology has been developed and verified. This will now be used during testing of the prototypes and for control system development

and testing. The Gerotek vehicle test facility (30 minute's drive from the campus) is used by the University of Pretoria for field-testing of vehicles. This facility has all the equipment and infrastructure needed to perform a complete vehicle evaluation including suspension tracks, skid pans, a high speed track as well as several off-road test tracks, specially developed to test off-road vehicles. A test vehicle is available for mounting and testing of hardware.

Previous FP involvement: No

Consortium status: Unknown

Expertise sought: Controllable springs, controllable dampers, off-road vehicles, semi-active suspension, and military applications of semi-active suspensions, ride comfort and handling of off-road vehicles, roll over propensity, handling criteria, and ride versus handling decision

Related projects: None

Title: Sense-and-avoid technologies

Acronym: N/A

Submitted by:

John Wesley (jwesley@csir.co.za)

Tel: 012 841 2068 Mobile: 072 2465430

Postal Address: PO Box 395 Pretoria 001

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Research in autonomous or automatic sense-and-avoid technologies and doctrines is required to assist the entry of Uninhabited Aerial Vehicles into commercial (and military) airspace. The project addresses airport operations and traffic management, and the improvement of all safety aspects of air transport. The project includes investigation into sensor requirements and avoidance algorithms, to avoid aircraft and their wakes.

Expertise offered: Sensor technologies (radar and electro-optics) with more than 30 years experience; UAV development, test and evaluation experience, leading to UAVs in service; links with South African Civil Aviation Authority and Air Traffic and Navigation Services; test and evaluation facilities including wind tunnels; modelling and simulation and computational facilities.

Previous FP involvement: No

Consortium status: At present, University of Stellenbosch and Denel Aerospace Systems

Expertise sought: EU sense-and-avoid consortia; universities, research institutes and industrial partners

Related projects: South African national R&D programmes

Title: Advanced aircraft concept design and optimisation

Acronym: N/A

Submitted by:

John Wesley (jwesley@csir.co.za)

Tel: 012 841 2068 Mobile: 072 2465430

Postal Address: PO Box 395 Pretoria 001

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Conceptualisation, evaluation and optimisation of novel airframe concepts to achieve improved airframe efficiencies (drag, lift, and payload). This would address both a wider choice of aircraft ranging from wide body to smaller size vehicles suitable for different applications and alternative fuel and propulsion concepts.

Expertise offered: Test and evaluation facilities (wind tunnels, flight test facilities); computational fluid dynamics; analytical and design expertise; optimisation expertise.

Previous FP involvement: No

Consortium status: To be formed. Past interactions with University of Pisa.

Expertise sought: Universities, research institutes and industrial partners

Related projects: South African national R&D programmes

Title: Vortex Generation, Propagation and Persistence

Acronym: N/A

Submitted by:

John Wesley (jwesley@csir.co.za)

Tel: 012 841 2068 Mobile: 072 2465430

Postal Address: PO Box 395 Pretoria 001

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Experimental, computational and analytical investigation into the generation, propagation, persistence and interaction of vortices in the subsonic, transonic and supersonic regimes. The project looks at persistent effects of air disturbance behind fixed and rotary wing aircraft through all phases of flight for safety and efficiency.

Expertise offered: Aerodynamic test and evaluation facilities including wind tunnels and flight test facilities; computational fluid dynamics; analytical and design expertise.

Previous FP involvement: No

Consortium status: To be formed: Current work with Universities of Witwatersrand, Glasgow, Pisa and Uppsala and FOI Sweden

Expertise sought: Universities, research institutes and industry partners.

Related projects: South African national R&D programmes

Title: Environmentally friendly gas turbine engines

Acronym: N/A

Submitted by:

John Wesley (jwesley@csir.co.za)

Tel: 012 841 2068 Mobile: 072 2465430

Postal Address: PO Box 395 Pretoria 001

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Effect of unsteady flows on the design and optimisation of 3 dimensional design of turbine blading

Expertise offered: 1.5 Stage Turbine test rig, cascade test facilities. Expertise in hot wire, aerodynamic probe and heat transfer measurement. Design, optimisation and analysis (CFD)

Previous FP involvement: Yes

Details of previous FP involvement: VITAL TTC

Consortium status: Currently cooperating with Durham University and Stuttgart University

Expertise sought: Universities and engine manufacturers

Related projects: FP6 South African national R&D programmes

Title: Smart vibration monitoring

Acronym: SMARTMON

Submitted by:

Stephan Heyns (stephan.heyns@up.ac.za)

Postal Address: Department of Mechanical and Aeronautical Engineering University of Pretoria South Africa

Theme: Transport (including aeronautics)

Focus Area: Surface transport (rail, road and waterborne)

Type of project: Networking between organisations in same area

Summary: Noise, vibration and harshness of surface vehicles are still growing rapidly in their importance as competitive factors in design, development and marketing. Smarter interpretation of measured vibration signals, using artificial intelligence and sophisticated analysis algorithms, can significantly contribute to the improvement of the NVH behaviour of such vehicles. The development of novel techniques for this purpose is proposed. These will include techniques for power-train and overall vehicle vibration analysis and diagnostics as well as residual life estimation on critical subsystems such as transmissions. This programme should improve the competitive NVH performance of the vehicles under consideration, as well as improve the reliability of the vehicles.

Expertise offered: Extensive experimental and analysis capability in the areas of structural dynamics and vibration. This includes multi-axis servo-hydraulic actuators and controllers for structural fatigue testing, scanning laser vibrometry, finite element analysis capability, modal analysis capability, and experience with neural networks in specialized monitoring applications.

Previous FP involvement: No

Consortium status: Established links with other universities active in related fields.

Expertise sought: Links are needed with OEMs that might be interested to improve the NVH behaviour of their vehicles and who are especially interested to embark on smart monitoring programmes.

Related projects: International bilateral cooperation South African national R&D programmes

Title: Imbedded fibre optical sensors in composite materials

Acronym: IFOS

Submitted by:

Japie van Wyk (ajvw@ing.rau.ac.za)

Tel: 011 489 2424 Mobile: 082 557 3058

Postal Address: University of Johannesburg Mech. Eng. Sc. PO Box524 Auckland Park 2006 Johannesburg

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: a) Imbedded fibre optical sensors is aimed at establishing quality control of the manufacture of composite structural aerospace components, the certification of structural components and the structural health monitoring of the components in operation. To be conducted in close collaboration with partners in the Aeronautical Industry. The bonding of sensors and their influence on the structures as

well as the types of parameters that needs to be sensed are the main aspects which will be concentrated on during the execution of the project. B) Application of bonded fibre optical sensors to wind tunnel balances is being researched presently. c) Fibre optical sensors have been bonded to torque sensor applications and the system patented. Collaborative development is sought for use of this in a variable pitch propeller aircraft propulsion system

Expertise offered: At UJ a substantial infrastructure for optical fibre sensors (in human capital and R13m equipment capital) exists which was established over a number of years under learnership of Prof Swart.

Previous FP involvement: No

Consortium status: Current projects with CSIR, ATE and Aerosud are being initiated under the AMTS Programme

Expertise sought: A partner ship with the Universities of Gent in Belgium and Messina in Italy (Sicily) is being sought as they are presently engaged in similar work in collaboration with Aeropean Aerospace Industries.

Related projects: None

Title: The Development of Aeronautical Systems and Design Algorithms for Industrial Applications

Acronym: ASDA

Submitted by:

Christiaan Redelinghuys (chrisr@ebe.uct.ac.za)

Postal Address: Department of Mechanical Engineering University of Cape Town Private Bag X3 Rondebosch 7701 South Africa

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Specific details of the project are still to be formulated. The project will most likely focus on novel industrial applications of parafoil technology. It will include the development of physical prototypes. Design and flight test data analysis software will be developed and validated.

Expertise offered: South Africa possesses extensive aerospace development facilities such as test ranges and wind tunnels. In addition, substantial human resources skilled in aerospace are available. These skills include the design, development and testing of a range of aerospace products such as satellites, unmanned air vehicles, airframes and avionics.

Previous FP involvement: No

Consortium status: Four institutions have entered the planning phase: DLR, AeroLabs, UCT and DAS

Expertise sought: To be determined

Related projects: None

Title: THz Photonics for Passenger Screening

Acronym: TerraScreen

Submitted by:

Christoph Bollig (cbollig@csir.co.za)

Tel: +27128412707 Mobile: +27724026006

Postal Address: CSIR-NLC PO Box 395 Pretoria 0001 South Africa

Theme: Transport (including aeronautics)

Focus Area: Aeronautics and air transport

Type of project: R&D project, including technology demonstration (large scale)

Summary: Terra-Hertz (THz) radiation is in the electromagnetic spectrum between the far-infrared optical region and the RF microwave region. Many common materials are transparent in this region, e.g. fabrics, paper, plastics. In addition, many substances of interest have a unique spectral signature in this region, e.g. explosives and drugs. Potentially, THz systems can be used to automatically scan passengers for these substances. In contrast to x-ray scanning, it can be automated and does not rely on human supervision. This could lead to an increase in reliability and at the same time increase efficiency and reduce delays during peak traffic. Initially, the main application will be in passenger screening at airports, but in the long term, the technology might even be suitable for passenger screening in ground transportation. At this time, the main obstacle is the lack of compact and efficient high-power THz sources. In addition, there is still work required in THz optics (delivery and shaping of the radiation), detection and analysis algorithms. In addition to the security field, there are potential applications for THz systems in the medical and biological field. The aim of this project would be research in the following areas: - Novel compact and efficient high-power THz sources - THz optics (including delivery, shaping and scanning) - THz detection and imaging - Detection systems for explosives of various types - Detection and imaging systems for other threats (e.g. ceramic weapons, powders, drugs) - Systems and algorithms for automatic detection of threats.

Expertise offered: - Efficient high-power mid-IR laser sources as pump lasers for THz generation - Short-pulse operation of lasers - Electronic control of lasers

Previous FP involvement: No

Consortium status: We are currently discussing the project with the Nonlinear Optics Group of the Physics department, University of St. Andrews, UK.

Expertise sought: Non-linear materials for THz generation (e.g. GaAs); THz optics; THz detection and imaging; Experts in the security industry who would potentially utilise this technology; Experts in computer algorithms for automatic detection

Related projects: None