



ACRI Rail Knowledge Bank update

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GROUP

New to the ACRI Rail Knowledge Bank

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The World Congress in Railway Research (WCRR) is a biennial international conference which focusses on railway research, development and innovation. The most recent event took place on 29 May 2016 in Milan, Italy.

SPARK hosts the [research papers](#) from 2016. These join all papers from [past congresses](#) already held on SPARK.

Bridges

[The rail-bridge interaction: recent advances with ERS fastening system for steel bridges](#)

The purpose of this paper is to analyse and describe the response of ERS system under different vertical and horizontal load, based on a small scale laboratory test. The results from the test are discussed in the paper, together with the FEM model of the sample. Second part of the paper describes the numerical analysis of the application of the ERS system on the Starý most in Bratislava, where the test results were directly used and enabled the new and unusual solution for the multiple-rail track, fully embedded in the bridge deck.

[Railway bridge weigh-in-motion system](#)

The paper provides an overview of the development of a railway bridge weigh-in-motion (B-WIM) system, one of the first of its kind for weighing trains in motion. A steel truss bridge in Poland was used for testing the system. The development of the railway B-WIM has been a success and has demonstrated that calculations of train weights using instrumented bridges can be efficiently performed.

Competition

[Comparison of three models for introducing competition in rail freight transport](#)

Though European rail policies are aiming to introduce intra-modal competition in the railway sector, there are different ways to introduce intra-modal competition in the rail freight transport. This study compares three models for introducing competition in rail freight transport in the three countries; the UK, India, and Japan. The three cases show that there are different types of intra-modal competition in the freight rail transport and briefly explains the models adopted by each of the three countries for introducing competition in the rail freight sector and investigates the advantages and disadvantages of each.

[Innovative track access charges](#)

A detailed and serious cost calculation is a precondition for a competitive offer of railway traffic services in future. The principle, to charge the “cost that is directly incurred as a result of operating the train service”, leads to numerous different interpretations throughout Europe. It is essential to base the charge on three levels. The first level is the network-section or line. The second step has to be seen from the view of the competitiveness of railway freight transport. Lastly the quality of rolling stock is an essential part of the generated infrastructure costs.

Design

[Application of the D3H2 methodology for the cost-effective design of dependable systems](#)

The use of dedicated components as a means of achieving desirable levels of fault tolerance in a system may result in high costs. A cost effective way of restoring failed functions is to use heterogeneous redundancies: components that, besides performing their primary intended design function, can also restore compatible functions of other components. In this paper, we apply a novel design methodology called D3H2 (aDaptive Dependable Design for systems with Homogeneous and Heterogeneous redundancies) to assist in the systematic

identification of heterogeneous redundancies, the design of hardware/software architectures including fault detection and reconfiguration, and the systematic dependability and cost assessments of the system.

Ergonomics and visibility in tramway driving cab

The guidebook aims to set minimums for designers of rolling stock to assure an appropriate visibility to drivers and to gather the needs of the tramway operators. These specifications concern in particular: 1. Visibility: close and far-off outside fields of vision, inside field of vision, area swept by windscreen wipers, etc; 2. Location and type of controls; 3. Windscreen and side windows. The two driving positions are studied (centred and off-centre) and a specific part of the guide deals with tram trains regarding the compatibility with conventional railway standards.

Flying ballast resistance for composite materials in railway vehicle carbody shells

This paper describes a simplified practical approach to the impact damage assessment of flying ballast or debris in composite materials, which could potentially be used for passenger rail vehicles. With the development of high-speed lines in order to guarantee the safety of primarily the driver and passengers, the vehicle body shell must be strong enough to resist the penetration of these types of objects into the vehicle

Emissions

The potential mitigation of CO2 emissions via modal substitution of high-speed rail for short-haul air travel from a life cycle perspective – an Australian case study

The objective of this study is to provide a strategic evaluation of the mitigation of CO2 emissions via modal substitution of high-speed rail for short-haul air travel on the Sydney–Melbourne, Australia city-pair from a life cycle perspective. It has been demonstrated that when considering CO2 emissions from vehicle operations, the modal shift from air to high-speed rail on this city-pair has the potential to provide a means of CO2 mitigation. The scenario comparison indicated that the substitution of high-speed rail for short-haul air travel on the city pair resulted in CO2 emissions avoidance throughout the longitudinal period.

Energy Consumption

Model predictive control for energy and climate management of a subway station thermo-electrical microgrid

Electricity consumption in urban railway stations accounts for almost one third of the total energy consumption of a subway network of a city like Paris. The overall system's efficiency can be optimized by taking advantage of available sources of energy such as regenerative braking of trains or local renewable energy resources. This can be achieved by handling the intermittent nature of the various sources and consumption points and by redesigning the station energy grid in a global approach.

Light Rail

Initiation of the light rail project

In 2012 the ACT Government made a policy decision to implement a light rail between Gungahlin and Civic. Between 2012 and late 2014, the Capital Metro Agency undertook work

to plan for the delivery of the Capital Metro light rail, including: 1. designing the light rail, i.e. determining its design features and how the light rail should operate; 2. estimating the costs associated with the light rail and the value of the benefits expected to be derived from the light rail; and 3. identifying the most appropriate way to proceed with the delivery of the light rail, including whether it should be delivered through a public private partnership. This audit considers the activities of the Capital Metro Agency in initiating the Capital Metro Light Rail Project, following the ACT Government's 2012 policy decision, including project management, governance and administrative arrangements associated with the Capital Metro Light Rail Project and activities to design the light rail, estimate the costs and benefits associated with the light rail and identify the most appropriate way to proceed with the delivery of the light rail.

Modal Choice

[Preference heterogeneity in mode choice based on a nationwide survey with a focus on urban rail](#)

The provision of efficient and effective urban public transport and transport policy requires a deep understanding of the factors influencing urban travellers' choice of travel mode. The majority of existing literature reports on the results from single cities. This study presents the results of a nationwide travel survey implemented to examine multiple modes of urban passenger transport across five mainland state capitals in Australia, with a focus of urban rail.

Passenger Rail

[Developing multi-state institutions to implement intercity passenger rail programs](#)

This TRB report presents practical models of multi-state institutional arrangements for planning, developing, and operating intercity passenger rail networks and services and offers eight models of possible institutional relationships and a practitioners' guide to help determine which model is more appropriate given the particular issues faced by those interested in establishing an intercity passenger rail service.

[Guidebook for intercity passenger rail service](#)

The TRB Guidebook presents the resources, strategies, analytical tools, and techniques to support all phases of planning and decision making in the development of intercity passenger rail service at state, regional, or multistate levels. It addresses three major phases required to build and operate passenger rail: planning, design and construction, and operations.

[Intercity passenger rail in the context of dynamic travel markets](#)

This TRB report develops an analytical framework or structural plan to improve understanding of how current or potential intercity travelers make the choice to travel by rail. This framework provides guidance for use by practitioners and decision makers considering alternative planning, operating, financing, service, and capital investment strategies for intercity passenger rail service in existing and potential travel markets; and it allows users to evaluate how mode choice is affected by a variety of changing and evolving parameters.

[Public transportation: passenger rail and terminals, volume 2](#)

This issue contains 14 papers on the passenger rail and terminal aspects of public transportation. Topics addressed, (but not limited to), include: platform-train interface safety

(Platform edge detection and protection effects on platform–train interface safety); train service costs (Determinants of train service costs in Metro operations; moving-block signaling (Impacts of Moving-Block signaling on technical efficiency: application of propensity score matching on urban Metro rail systems) and unattended train operations (Impacts of unattended train operations on productivity and efficiency in metropolitan railways).

Safety

Best practice international solutions for mitigating human factor causes of signal passed at danger

This is a tool commissioned by the New Zealand Transport Agency that allows rail participants to explore their strengths and weaknesses for SPAD risk reduction. It is accompanied by a report describing the development and application of the tool.

Development of risk assessment specifications for analysing terrorist attacks vulnerability on metro and light rail systems

With terrorist security of critical assets becoming a vital aspect of railway systems, this paper reviews the existing international policy frameworks and also risk assessment methodologies. This information fed into development of a risk assessment methodology (RAMPART methodology) specifically addressing metro and light rail systems (mass transit).

Lessons learned from the collaborative European project RESTRAIL: REduction of suicides and trespasses on RAILway property

RESTRAIL was a three year EU FP7 research project which aimed to help reduce the occurrence of suicides and trespasses on railway property and the costly service disruption caused by these events. The project was coordinated by the International Union of Railways (IUC) and provided the rail industry and researchers worldwide with an analysis of the most cost-effective prevention and mitigation measures. The goal of this paper is to inform the railway and scientific community about the successful completion of the project and to present an overview of the main results and key innovations.

Review of the National Standard for Health Assessment of Rail Safety Workers: consultation report

This report explains the proposed changes to the Australian National Standard for Health Assessment of Rail Safety Workers as part of the periodic review of the medical criteria.

Safety and operation of tramways in interaction with public space

COST Action TU1103 aimed at contributing to tramway safety through improving the management of data collection and the design of their insertion into urban space. While there exists great diversity of tramway systems and safety management mechanisms, some conclusions have been reached about the nature of safety issues, the need for relevant information and the operator's essential role which has enabled some practical recommendations on accident data collection, indicators and their analysis.

Stations

[Assessing the usage and level-of-service of pedestrian facilities in train stations: a Swiss case study](#)

A framework for assessing the usage and level-of-service of rail access facilities is presented. A dynamic demand estimator allows to obtain time-dependent pedestrian origin–destination demand within walking facilities: using that demand, a traffic assignment model describes the propagation of pedestrians through the station, providing an estimate of prevalent traffic conditions in terms of flow, walking times, speed and density. The corresponding level-of-service of the facilities can be directly obtained. A six-step planning guideline is also presented that can be used to design and optimize rail access facilities for new or existing train stations. In the long term, the framework may also be used for crowd management, involving real-time monitoring and control of pedestrian flows.

[Human exit choice in crowded built environments: investigating underlying behavioural differences between normal egress and emergency evacuations](#)

Egress behaviour of pedestrians in crowded complex confined spaces is investigated in this study. Despite recent methodological progress in the development of simulation tools for predicting crowd egress and evacuation, little is known based on empirical data about the underlying rules that govern exit wayfinding of pedestrians in multi-exit places. Particularly, fundamental differences between behavioural features of emergency and non-emergency egress have not been fully explored by previous studies. Stated-choice data was collected in face-to-face interviews with passengers as they exited a major railway station in Melbourne. Participants were asked what exit decision they would have made given certain hypothetical scenarios at that same station. Econometric models (error-component mixed logit) were developed to quantify the way passengers evaluate and prioritise various contributing factors while accommodating the potential decision heterogeneity.

Train Control Systems

[Next Generation Train Control \(NGTC\): more effective railways through the convergence of main-line and urban train control systems](#)

The main scope of the Next Generation Train Control (NGTC) project is to analyse the commonality and differences of required functionality for mainline and urban lines and develop the convergence of both European Train Control System (ETCS) and Communication Based Train Control (CBTC) systems, determining the level of commonality of architecture, hardware platforms, and system design that can be achieved. The paper focuses on the analyses of the already produced NGTC Functional Requirements Specifications and is summarizing other project activities on various train control technology developments suitable for future train control systems.



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[National Interest Services supporting an informed land transport community](#)

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See the [Rail Knowledge Bank Charter](#) for more information on its objectives and resource coverage.



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