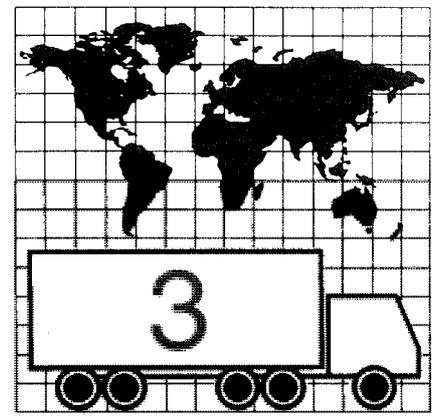


HEAVY VEHICLES AND ROADS

TECHNOLOGY, SAFETY AND POLICY

EDITED BY D. CEBON
AND C. G. B. MITCHELL



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Heavy vehicles and roads

technology, safety and policy

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Proceedings of the third international symposium on heavy vehicle weights and dimensions organised by the University of Cambridge and held at Queens' College, Cambridge, UK, on 28 June – 2 July 1992

Edited by D. Cebon and C. G. B. Mitchell



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Preface

The Third International Symposium on Heavy Vehicle Weights and Dimensions was held at Queens' College, Cambridge, UK, on 28 June to 2 July 1992.

The Technical Committee comprised Dr C. G. B. Mitchell (Chairman, UK), J. Berry (EC), Dr R. Cantieni (Switzerland), Dr D. Cebon (UK), M. Dalglish (UK), Dr M. Huhtala (Finland), M. Jocteur Monrozier (France), D. J. Lyness (UK), J. Morris (USA), J. Pearson (Canada), R. Rider (UK), Dr P. Sweatman (Australia), Dr P. J. von Becker (Germany), K. Walker (Canada), P. F. Willmer (UK) and C. B. Winkler (USA).

Seventy-nine papers were presented, including six keynote addresses and two endnote addresses. There were contributions from 19 countries, as follows: 22 from the UK; 13 from Canada; 12 from the USA; 5 from Australia; 4 each from France and Czechoslovakia; 3 each from New Zealand and Germany; 2 each from Finland and the European Commission; and 1 each from Belgium, Chile, Hungary, Japan, Latvia, South Africa, Sweden, Switzerland and The Netherlands. A total of 102 delegates participated in the symposium, representing researchers, regulators and operators.

The main themes of the Third International Symposium on Heavy Vehicle Weights and Dimensions were the effects of heavy vehicle design and size/weight limits on pavements, bridges, safety and transportation policy. The technical papers investigated these issues from the perspectives of researchers, policy makers, regulators, road agencies and the freight transport industry. The technical sessions included the following topics: vehicle dimensions, pavements, dynamic loads, vehicle-bridge interaction, high-speed road monitoring, effects of tyres on road damage, vehicle testing technologies, vehicle weights, vehicle safety and weigh-in-motion. The workshops discussed economic and operational issues, highway safety, enforcement technologies, suspension design and assessment and vehicle-pavement interaction.

The symposium was opened by the Permanent Secretary of the UK Department of Transport. The first plenary session reviewed highway goods transportation issues, with presentations by a distinguished panel of international experts. During the following three days a mixture of concurrent and consecutive technical sessions and workshops took

place. There was also an exhibition of vehicle technology and traffic instrumentation. The meeting concluded with a general discussion of the main issues arising from the conference, outstanding research needs and the way forward in heavy vehicle weights and dimensions regulations and enforcement.

During the symposium a new organisation, tentatively named the 'International Forum for Heavy Vehicle Weights and Dimensions', was formed. The purpose of the organisation is to formalise and support the running of regular international symposia on heavy vehicle weights and dimensions and to facilitate information exchange between researchers, policy makers, regulators, road agencies and the transport industry.

There are many people and organisations to whom we owe a debt of gratitude for making the conference such a success. In addition to the Technical Committee, the following deserve special recognition:

- The sponsor: Golden River Traffic Ltd
- The supporting organisations: Transport Research Laboratory (TRL), Federal Highway Administration (FHWA), The University of Cambridge, Marshall of Cambridge (Engineering) Ltd, Automotive Development Centre Ltd and International Association for Vehicle System Dynamics (IAVSD)
- The session chairmen: Professor David Newland, Paul Fancher, Rod Addis, Dr Peter Sweatman, Dr John Billing, Chris Winkler, Professor Alan Clayton, Professor Wolf Hahn, Mike Dalglish, John Woodroffe, Dr Reto Cantieni, David Lyness, Peter Willmer, John Berry, John Aurell, Ron Rider and Dr Matti Huhtala.
- Pam Lewis and Jacqueline James for assistance during the symposium.
- All the hard-working members of the local organising committee: Julia Warnes, Dr David Cole, Dr Mike Hardy, Andrew Collop, Raymond Cheung, Ren Lin and Theo Potter.

*David Cebon
Cambridge University Engineering Department*

*Kit Mitchell
Transport Research Laboratory*

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Opening address

A. P. BROWN, Permanent Secretary, Department of Transport, UK

It is a great pleasure to have been invited to open the Third International Symposium on Heavy Vehicle Weights and Dimensions. The first and second Symposia were organised by the Roads and Transportation Association of Canada and were held at Kelowna in British Columbia. Staff from Cambridge University and from the British Department of Transport contributed to both of those Symposia, along with engineers, operators, vehicle manufacturers and legislators from many countries. The first two Symposia were very successful, and we in Britain greatly appreciate the honour of being asked to organise the Third Symposium as the first to be held in Europe.

There are many reasons why it is appropriate for this Symposium to be held in Europe at the present time. With the recent agreement between the European Community and the EFTA Nations, Western Europe is now the largest trading area in the world. Trade with Eastern Europe is growing rapidly and has enormous potential. Most trade within Europe is carried by road. Community legislation on weights and dimensions of goods vehicles has a strong influence on the design of these vehicles, particularly those used in international traffic, throughout the whole of Europe. The Community is well placed to move forward with improved technical standards to heavy vehicles which will have an influence well beyond its present borders. It is most appropriate that Mr Werring from the Directorate General for Transport of the European Commission, is making a keynote presentation later today.

It is important that changes to technical standards are based on the most up to date and thorough understanding of the complicated interaction between vehicles and roads. There is much that Europe can learn from the experience of North America and Australasia, and there is much that Europe can contribute to the global expertise on these subjects. Just as Mr Werring will be speaking from the

viewpoint of the European Communities, Mr Pearson will be speaking from that of the Australian National Road Transport Commission. In many ways this is the body that, in the context of road transport, does for the Australian States what the Directorate General for Transport does for the Member States of the European Communities. It will be interesting to compare the approaches in the two continents.

I would like to mention my pleasure at the way that the Transport Research Laboratory has been cooperating for many years with the University of Cambridge in research on heavy goods vehicles. Both organisations have much to offer, and the contribution they can make in collaboration is greater than they can achieve individually. But research cooperation goes far beyond this. In the 1980s Dr Sweatman in Australia and Dr Hahn in Germany, both of whom are here today, led the way in demonstrating how different types of heavy vehicle suspension caused different amounts of road wear. There is now a group of experts round the world, in the USA and Canada, in Europe and the Australia and New Zealand, carrying out research, exchanging results and helping legislators reduce the unnecessary costs caused by the necessary transport of goods by road. Most of this group are in Cambridge this week.

It is also appropriate that the OECD is represented at the Symposium by Dr Sweatman, the Chairman of the OECD Expert Group on dynamic road loading. I am told that the report of this group, which is now in draft, is a major contribution to explaining the importance of the suspensions of heavy vehicles for road wear. It is hoped that the work of this group will lead on to a formal cooperative research programme to answer a number of questions the group identified. The whole topic of vehicle weights and dimensions, as well as the proposed OECD research programme, is a subject that involves the design of both roads and vehicles, and it is good that Dr Lord, an expert on

road pavements who will be involved in the OECD programme, is making a keynote address to the Symposium.

On 1st July, during the Symposium itself, the United Kingdom assumes the Presidency of the European Communities for the remainder of the year 1992. This is the year in which the internal market must be completed, that is to say all barriers to trade should be removed including the present restrictions on road transport operations. Agreement has already been reached on complete freedom for **international** road goods transport from the beginning of 1993, without quotas or the need for any permits. But a common market means that operators from one country should be able to move goods within the other countries, what are called "cabotage" operations. We have a limited temporary scheme of road goods cabotage put in place until the end of this year. Discussions are continuing on how quickly the EC will move to the complete abandonment of all restriction on road goods cabotage, and it will be one of our priorities to try to secure agreement on that during our Presidency.

Heavy vehicles are essential for the economic prosperity and trade throughout the Continent of Europe. But they are not popular with other road users and, according to British studies, heavy goods vehicles, buses and coaches together cause over 99 per cent of the structural wear to our highway system. Balancing the economic benefits against the environmental and civil engineering costs of heavy vehicle traffic is demanding ever more information. I am sure that Mr Turner, of the Freight Transport Association, will be discussing these issues later today, from the point of view of an operator, as will Mr Lyness, of the Department of Transport, from the point of view of a legislator.

It is clear from research in many countries, and in Britain at Cambridge University and the Department of Transport's own Transport Research Laboratory, that much can be done through the design of vehicles and through the specifications for highway design and maintenance, to reduce the environmental and maintenance costs of heavy vehicle traffic. This research has already led to national and European legislation. European directives allow higher gross weights on some classes of vehicles if their drive axles are fitted with air or equivalent suspensions to reduce road wear. The Community recognise the need to carry this approach of road friendly suspension further by adopting provisions for other vehicles and trailers. I have no doubt

that this subject will form the basis for plenty of discussion in the next few days.

In the case of Britain, we have used legislation of this sort to encourage the use of air suspensions on 3 axle semi-trailers. This has been very successful in increasing the use of air suspensions. The Transport Research Laboratory estimates that this legislation alone will soon be reducing the cost of road maintenance in Britain by between £10m and £20m a year. If we can get all heavy goods vehicles fitted with suspensions that are typical of good modern design practice, the savings to road maintenance would be much greater.

In the wider context of the environmental impact of heavy vehicles, research in many countries has provided the justification for reducing the allowable noise emissions so that 10 goods vehicles today make no more noise than one did little more than 10 years ago. Much work is in progress to reduce the spray caused by heavy vehicles. Britain was the first European country to require heavy goods vehicles to be fitted with spray suppression equipment and effective sideguards. I believe our experience has been helpful in the development of European standards for this type of equipment.

Much has been achieved, but there is still more to be done. To be effective, legislation needs to be based on a good understanding of the technical and economic issues involved. Its development requires inputs from researchers, operators, manufacturers and legislators. This Symposium has brought together the experts on heavy vehicle weights and dimensions from all over the world. It is a unique opportunity in Europe to discover the current situation on technical and economic issues that influence legislation and operating practice in this field.

I am delighted that Cambridge have taken the initiative in organisation the Symposium, that the Department of Transport's Transport Research Laboratory has helped with this organisation, and that the Symposium has attracted this quality and quantity of delegates and papers that it has.

It is a great pleasure to welcome you to this Symposium, to wish you a successful meeting, and declare open the Third International Symposium on Heavy Vehicle Weights and Dimensions.