DEVELOPMENTS IN TRUCK RESEARCH IN AUSTRALIA

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INTRODUCTION

Rapid developments are occurring in both vehicle technology and the regulatory environment in which trucks operate. This includes the way in which safety and road infrastructure impacts are viewed and controlled. It also includes the important question of cost recovery for trucks' use of the road system. We are also seeing a great willingness on the part of some fleet operators to depart from the traditional vehicle configurations.

As a researcher involved with projects for both government and industry I will give you my view of the major current issues in Australia, provide an update on recent research and consider areas where industry could hope to improve productivity.

MAJOR ISSUES

Interviews with key players in the Australian road transport scene have revealed the following major current issues as expressed by experts in both industry and government.

INDUSTRY

Urban Road Access

Road funding and priorities for urban arterials, the cost/benefit of various urban arterial projects, access to ports and links between ports and major interstate routes are of major concern.

Driver Training and Communication

Development of drivers has not kept pace with development of vehicles. Drivers are not adequately informed of the effects of their behaviour on the productivity and safety of operations. It is difficult to keep drivers abreast of legislative changes, and drivers are generally unaware of the rules. Total driver training is needed.

Enforcement

Behaviour of some drivers and operators in grossly exceeding speed limits and intimidating other road users is giving the entire industry a bad image. Enforcement needs to have a consistently higher profile and to have sufficient credibility as not to be perceived to be revenue-raising.

Statistical Information

Fatal crashes involving trucks in NSW appear to be increasing. Governments may react with measures such as reduced truck speed limits. A balanced picture is needed to prevent knee-jerk legislative reactions which may adversely affect the industry.

B-Doubles

The ADR for B-doubles needs to be completed. Issues to be resolved include anti-lock brake requirements and gradeability requirements. There is strong interest in promoting the wider acceptance of B-doubles and in developing interstate routes. There is also concern to allow flexibility in the B-double configuration and not to lock in on the 8-axle/23m concept.

Productivity/Option D

Option C, allowing a gross weight of 42.5t is now available, with an increased road user charge, in the Eastern states. There is a desire to pursue a further increase to Option D (44t) to improve productivity. There is a need for industry to explore the government attitude to Option D and to address concerns with road wear and safety, particularly for hazardous materials in low-tare-weight vehicle designs, and with regard to limitations in tanker standards.

Cost Recovery

There is wide interest in the extent to which trucks pay their way, and this covers all sectors, including motorists' organizations. There is concern that current calculations of trucks' cost responsibility with respect to road wear are not sufficiently accurate.

GOVERNMENT

Data

Freight-related data are required to provide information on what is on the road for the purposes of road user charging and checking (where self-enforcement is involved) Data are also needed to monitor safety (speeds, numbers and types of vehicles) and to assist with asset management (numbers of vehicles and standard axle loads). there is also a need to know which parts of the network to preserve and which parts to wind back.

Optimum Weight Option

There is a need to consider the next step with gross weight limits: Option D (44t) and Option E (46t). Options should be considered in terms of the user pays principle, the relative loads permitted on tandem and triaxle groups and alternative vehicle configurations such as a 4x2 prime mover with triaxle trailer, or quad axles on trailers.

Enforcement Regimes

There is a need to improve the enforcement of speeds, licenses, hours of driving, axle weights and vehicle defects. Strategies are needed to introduce new technology, to promote industry self-regulation with checking, to combine operations and to evaluate enforcement effectiveness.

On-Board Technology

On-board computers offer the potential for self-regulation in the areas of speeds, loads and user charges. There is a need to review the technologies available for compatibility and the need for further development, and to investigate on-board weighing.

Intermodal Issues

There is a need to reduce road-rail tension, obtain realistic relative cost figures for operating the two modes, improve compatibility between all modes and reduce delays.

Urban Road Benefits

Studies of truck operators' use of new road projects, such as the South Eastern Arterial Extension in Melbourne, indicates driver attitudes in route choice

and are a step towards costing the benefits to truck operators.

B-Double Design

Potential problems in the design of B-doubles are in coupling design, dolly design, evaluation of units departing from the 8-axle/23m format and gradeability requirements. There is also a need for design standards and broad-based acceptance criteria.

Driver Training and Communication

Driver communication is needed to increase their professionalism, perhaps through the use of route choice information and on-board computers.

Driver Fatigue

Industry practices as they impose pressures on drivers, influence driving habits and produce driver fatigue are of concern.

Anti-Lock Brakes

Anti-lock brakes need review for intermixing problems when different brands are involved in a combination vehicle, and for specifying which axles need to be active. Standards are needed for B-doubles as well as general freight vehicles.

Cost Recovery

Road costs are being allocated between various road users. Road wear costs need to be allocated rationally and in a way that can be explained to operators. The remainder, and majority, of road costs need to be allocated and causal relationships are required.

SUMMARY OF CURRENT ISSUES

The above issues cover the broad road freight transport system and show a considerable overlap in interests of industry and government. There is clear common interest in targetting roads spending in areas of need to improve truck access and in rational cost recovery. There is also common interest in driver training and communication, enforcement, B-double issues and general freight vehicle productivity and fluid weight limits (including Option D). It is also interesting to note government interest in the use of new vehicle technology, including ABS.

RESEARCH TO IMPROVE PRODUCTIVITY

We see an environment where governments recognize the infrastructure needs of the industry, provided it is prepared to pay, but are increasingly concerned with the on-road behaviour of the entire industry, with enforcement and surveillance, and with the prospect of a deteriorating truck safety situation.

Specifically, Australian governments are responsive to industry's productivity desires and have entered a period of fluid weight limits for General Freight Vehicles and of permits for larger, more innovative, vehicles such as B-doubles. The important corollaries of this fluidity are cost recovery and cost effective means of authorizing and checking. This relies on a practical means of technical assessment of different weight scenarios, vehicle configurations and vehicle technology. Governments are currently unable to exercise this technical assessment role in a fluid manner and research is needed.

I will first give some recent examples of such research and then consider some future opportunities.

RECENT RESEARCH

6x2 Prime Movers

Mobil Australia decided to introduce low tare weight 6x2 prime movers in 1987. In addition to approximately 1t less tare weight, the 6x2 offered other productivity advantages, including reduced transmission losses. The Queensland authorities became concerned about allowing the 6x2 the further productivity gain of Option A limits (41t): the safety performance aspects of vehicle stability and tractive ability were called into question. Under industry sponsorship, Australian Road Research Board carried out research into 6x2 traction and stability (Tso 1988).

Full-scale testing was carried out to (i) determine the traction limit of the 6x2 and to (ii) compare stability of the 6x2 with that of an otherwise identical 6x4. Results for traction were as follows:

WEIGHT	WET TRACTION LIMIT
38t	13.7%
41	13.7
42.5	13.7+
44	13.7+

The stability tests showed no significant difference between the 6x2 and 6x4 concepts with regard to rollover stability limit or vehicle behaviour near the stability limit. The 6x2 was, in general, easier to control.

These results were surprising to some in both government and industry. The 6x2 was accepted on an equal footing with the 6x4 under Queensland regulations.

The 6x2 issue was a good example of a productivity initiative in danger of foundering on lack of fluid technical assessment.

B-Doubles and Road Trains

ARRB research (Sweatman and Tso 1988) quantified the dynamic stability benefits of the B-double configuration and specifically investigated the design of the rear trailer in tanker applications.

ARRB has also applied a combination of vehicle dynamics and traffic engineering skills to the assessment of the suitability of road trains, and particular configurations of road trains, on particular routes. The interaction of the dynamics performance of the road train (including rearward amplification and trailing fidelity) with road factors (including seal width and roughness) and traffic factors (including traffic volume).

Although there is a need for further development of simulation models to assess the dynamic performance of various combinations, a good indication of the dynamic stability of a multi-articulated combination may be obtained from the Roll Coupled Length (RCL) (Sweatman 1988). Analysis of Roads and Transportation Association of Canada data (Ervin and Guy 1986) showed that dynamic stability correlates well with the total wheelbase of that part of the vehicle coupled in roll (i.e. units coupled using B or C dollies).

Weigh-In Motion (WIM)

As part of the effort to make on-road enforcement more cost effective and to obtain better data on freight vehicle operations, the use of Culway WIM equipment is increasing in Australia. 60 units are now in use by road and traffic authorities and data is used for pavement design, vehicle classification and freight movement analysis. Culways have proven to be cost effective both as portable installations (as in Queensland) and as permanent installations (as in Victoria). For low-speed enforcement weighing, EMU is now accepted in Victoria and South Australia.

Wide Single Tyres

Research into both the pavement wear effects and the vehicle stability effects of wide single tyres was carried out. (Sharp, Sweatman and Potter 1986). Even though wide singles were found to have a greater effect on pavements, for a given load, than duals, the benefits for stability were sufficient to justify wide singles' being allowed to operate at the same load limit as duals when fitted to triaxle groups. Otherwise, they are limited to 3.33t per tyre.

CURRENT RESEARCH

Swept Path

The National Association of Australian State Road Authorities (NAASRA) has commissioned ARRB and Road User Research Pty Ltd to carry out a study of heavy vehicle swept path requirements. This will include data collection on critical manoeuvres actually carried out in the road network, the development of appropriate swept path criteria and consideration of a performance-based regulation of swept path, to allow industry greater scope for innovation in vehicle design.

Suspensions

There is now considerable world-wide interest and activity in truck suspension research and the Organization for Economic Cooperation and Development (OECD) Group IR/2 has been established to review and coordinate research into dynamic road loading and to involve vehicle manufacturers in a process aimed at developing performance standards for road protection, consistent with the maintenance of safe and effective operational characteristics. Australia is the lead country for this project.

Braking

ARRB is continuing research into drivers' behaviour in truck braking and its relation to the compatibility between prime mover and trailer brakes.

Cost Recovery

Research is continuing into road costs attributable to truck traffic through monitoring of road costs and condition measures in a number of States, and including the determination of vehicle operating costs in relation to road condition. This research is being used to contribute to national working parties and an Interstate Commission inquiry into appropriate cost recovery and user charges, including the options of fixed annual and fuel-based charges.

CONCLUSIONS

As demands for greater road freight productivity have increased, demands on researchers for new technology in the areas of safety, road wear, traffic impact and enforcement have increased. While researchers must accept the challenge to provide such technology in a practical, implementable manner, industry and government must move towards performance-based standards which are technically-based. Such standards need to be based on sound research and developed co-operatively.

In Australia, size and weight limits have entered a more fluid and complex phase where issues of cost recovery and performance standards have become increasingly important. Research is continuing in the areas of heavy vehicle swept path standards, suspension standards, braking standards, cost recovery and user charges.

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