Increased Mass, Height and Length Limits

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INCREASING ROAD TRANSPORT PRODUCTIVITY FOR QUEENSLAND

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HIGH PRODUCTIVITY VEHICLES

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1. INTRODUCTION

Road transport is one of the fastest growing segments of the Australian economy, growing an average 6 percent per year in recent years (1). It has enormous economic and social impact, generates substantial employment and contributes significantly to National Gross Domestic Product. Queensland is a large State, with widely distributed centres of population. Transport is vital to commerce and the quality of life for residents both in urban and remote areas.

The aim of government is to increase vehicle productivity of heavy vehicles while improving vehicle safety for all road users. Additional issues include the appropriate mode of transport for a certain task, best use of infrastructure, while protecting the road asset, and environment protection.

In recent years, the transport industry has sought to improve efficiency by introducing newer classes of transport vehicles or increase dimensions or mass capacity. Queensland Transport believes that dimensions creep has reached the limit of the road network, particularly in city environments. The concept of working smarter within existing limits is the future direction, by developing innovative vehicles to maximise productivity and safety.

A number of new heavy vehicle configurations have been developed by operators, in conjunction with Government, that will promote both safety and productivity in road transport throughout Queensland. Initiatives include new vehicle combinations, increased loading on common truck and trailer combinations, relaxation of some dimension limitations, and a review of possible mass increases for road friendly suspensions.

Freight efficient and innovative vehicle configurations such as B-Triples, AB-Triples and 2B3s play an important role in the economic development of Queensland and would provide significant productivity and safety benefits to the industry and the community.

This paper addresses the issues effecting the future of road transport, discusses some new developments in transport vehicles and operating conditions, identifies the directions of Government and industry and evaluates some results of the B-Triple trial. It will not directly address the technical aspects used to assess the dynamic performance of the B-Triples as they have been covered in other papers listed in the bibliography. A typical B-Triple combination operated in Queensland is shown in Fig 1.

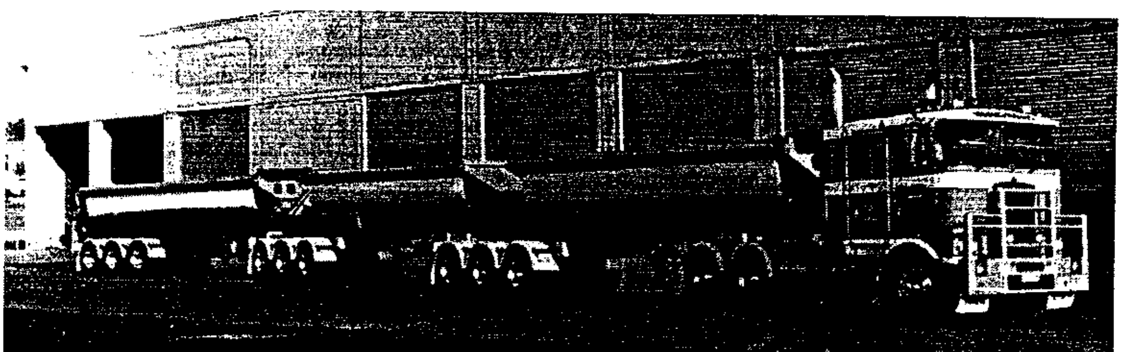


Fig 1. A B-Triple Combination

2. BALANCING PRODUCTIVITY, SAFETY AND INFRASTRUCTURE

The application of new technology to allow vehicle regulation to be set by dynamic performance rather than just dimensions is a substantially promising development over the last couple of years. The scope for change in this area will only be limited by the willingness of all participants, be they industry, government, or general community, to allow these better performing vehicles to be developed and operate. The achievable aims include:

- better integrated planning;
- better use of the transport systems and infrastructure;
- better freight logistics;
- better opportunities for remote communities; and
- better transport safety.

The critical issues are road safety, improvement in transport and network efficiency, and best return on monies invested in road infrastructure. To analyse the level and conditions of access for a combination vehicle the correct balance between safety, infrastructure protection and productivity must be achieved. The following criteria are issues for consideration:

Safety

The safety of the operation of the combination will depend on the performance of the vehicle and the operational environment:

- Dynamic performance characteristics of the combination,
- Road characteristics where the combination will operate,
- Impact on other traffic (traffic factors), and
- Environmental impact (mainly on adjacent land use and pollution).

Infrastructure Protection

The impact of the combination on road wear and bridge loadings and how to reduce these impacts per tonne of freight carried.

Productivity

Many elements affect the cost per tonne of freight carried such as:

- Increased payload/deck space,
- Increased fleet flexibility,
- Decreased maintenance costs,
- Lower running cost per tonne of freight.

Queensland Transport is striving to assist in increasing the productivity of road freight vehicles. Main Roads is assessing strategic freight routes and improving the network to meet the community transport needs and expectations. Both these issues are balanced against the safety and capacity of the road network. Any productivity improvements are predicated on improvements to vehicle safety.

3. HEAVY VEHICLE CLASSES

Large heavy vehicles can be either single rigid trucks (fitted with single axles or axle groups), articulated vehicles, truck-trailers or multicombination vehicles such as B-Doubles, B-Triples and Road Trains. Vehicles commonly used by the road transport industry, the maximum length limits and permitted Gross Combination Mass (GCM) are shown in Table 1.

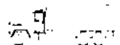
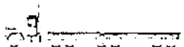
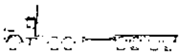
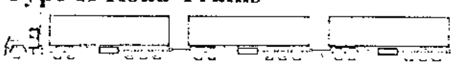
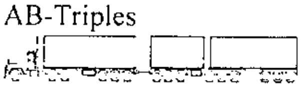
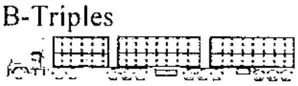
VEHICLE TYPE	MAXIMUM LENGTH (m)	MAXIMUM GCM (Tonnes)
General Access Vehicles		
Rigid Trucks 	12.5 m	22.5 t
Truck-trailers 	19 m	42.5 t
Prime-mover semi-trailers 	19 m	42.5 t
19m B-Doubles 	19 m	50.0 t
Truck and 4 axle dog 	19 m	50.0 t
B-Doubles 	25 m	62.5 t
Type I Road Trains 	36.5 m	79 t
Type II Road Trains 	53.5 m	115.5 t
Innovative configurations		
AB-Triples 	36.5 m	102.5 t
B-Triples 	36.5 m	82.5 t

Table 1. Typical Heavy Vehicle Configurations in Queensland

4. THE ROAD NETWORK

The road network in Queensland is extensive and improvements are costly and are gradually made over a number of years. The improvements in transport vehicles and increases in operator expectations are much more rapid. The result is that the vehicle combinations permitted must be suited to the existing road network, allowing for slow network improvements into the future.

Network limitations include geometry, bridge loadings, road widths, gradients, seal widths and overtaking opportunities. Traffic densities and mix of traffic, and weather conditions are also important considerations. These must be addressed in opening up the network for newer vehicle classes.

Queensland currently has 4 sets of route networks for operation of combination vehicles based on overall length:

- Entire network – maximum combination length 19 m,
- B-Double network – maximum combination length 25 m,
- Type 1 Road Train routes – maximum combination length 36.5 m,
- Type 2 Road Trains routes – maximum combination length 53.5 m.

The initial standards are prescriptive, setting dimension standards for example. Current processes are turning to performance measurement and outcomes to meet the network capacity.

This introduces the concept of a hierarchy of road access standards, defining different levels of access. Combinations able to perform to the set standards have access to that network level. Defining procedures for enforcing the performance on-road has been the difficulty to date, given that vehicles are often intermixed in a combination and there is no guarantee that vehicles in general transport are operating in an approved combination.

An important principle in assessing and approving routes for a particular class of vehicle is to be able to approve as wide an area of the network as possible. If a particular road is approved, requests to use other roads will certainly follow, as in the continuous requests for B-Double operations. Where possible, areas or road networks should be approved, as in the road train system, with appropriate maps published. The issues of equity and availability to all appropriate users are important.

5. STRATEGY FOR ASSESSING HIGH PRODUCTIVITY VEHICLES

To achieve the balance between safety, infrastructure protection and productivity for high productivity vehicles there needs to be a basic starting point. For consideration of new vehicle combinations for operation on the Queensland road network the following general principles are used:

- The combination should be within the overall combination length for the set of routes under consideration.

- Each unit in the combination meets all dimension standards including width, length, height, rear overhang, tow coupling overhang, etc.

- The innovative combination meets the performance standards for the middle range of the combination normally used on that route network.

- The combination meets the axle mass requirements, including internal axle spacing, as required by the gross mass formulae for that route network.

These guidelines are not the only issues to be considered but are intended to form the basis of any assessment as a "place to start".

The idea is to have improvements in safety with new combinations through improved dynamic performance with the target values based on the mid point of the combinations currently used on that part of the network. However, this is not always practicable and construction of the vehicle and the type of goods carried need to be taken into account. For example, a livestock B-Triple may not reach the mid point for existing Type 1 Road Trains, but it has superior dynamic performance compared with existing Type 1 livestock road trains and introduction of B-Triples carrying livestock will have a safety benefit.

6. CURRENT HIGH PRODUCTIVITY VEHICLES

Over the last few years Queensland Transport has used this approach when assessing proposals for high productivity vehicles. There have been a number of proposals ranging from alternatives for general use road trains through to combinations for special applications.

- **AB-Triple**: a six axle prime mover semi-trailer combination towing a set of 8 or 9 axle B-Double trailers, with a GCM up to 102.5 tonnes and a maximum overall length of 36.5 m. AB-Triples currently are permitted to operate on all road train routes.

- **B-Triple**: a prime mover hauling three semi-trailers, with a GCM up to 82.5 tonnes and a maximum overall length of 36.5 m. B-Triples are also permitted to operate on all road train routes.

- **19 metre B-Double**: a B-Double with an overall length of only 19 metres. This combination has access to the entire network when operating at 50 tonnes but can operate on B-Double routes at up to 55.5 tonnes.

- **4-axle dog trailers**: a 3 axle rigid truck towing a 4 axle dog trailer with an overall length of up to 19 metres and a GCM of up to 50 tonnes. This combination can operate on the entire network under gazettal conditions, which has detailed axle spacings. A similar gazettal system is under consideration for operation of rigid trucks and 3 axle dog trailers up to 45 tonnes.

- **ICON (2B3), Cannington Mine Vehicle**: a tri-drive prime mover, towing three semi-trailers (B-Triple) hauling another set of B-Triple trailers, with a GCM up to 166 tonnes and a maximum overall length of 53.5 m.

- **Road trains** with **tri-drive prime movers** and **tri-axle dollies**; there have been numerous enquiries for consideration of both Type 1 and Type 2 Road Trains with tri-drive prime movers and/or tri-axle dollies, and trial vehicle combinations are already in operation.

- **Stinger Car Carriers**; a rigid truck towing a semi-trailer coupled at the rear of the truck. Combinations to 23 and 25 metres operate on B-Double routes and the latest versions of 25 metre stingers carry 12 cars.

- **Long semi-trailers**; semi-trailers up to 14.6 metres long (current standard is 13.7 metres). The semi-trailer and prime mover must still be within the overall length of 19 metres.

- **High vehicles**; apart from stock crates and car carriers the maximum height for vehicles is 4.3 metres. Following stability tests in Victoria and NSW, a gazettal system has been implemented that allows semi-trailers to operate up to 4.6 metres in height. Conditions have been developed to ensure roll stability is not degraded through requiring at least 50% of the trailers deck space must be less than 1.2 metres high, and Gross Combination Mass (GCM) is reduced to 90% of equivalent 6-axle vehicles.

There are two distinct processes in order to manage the introduction of new vehicle combinations on the network.

- Evaluation of the vehicle performance dynamics, and

- Assessing the network capacity or extent that is appropriate to be used.

This paper will address in more detail the assessments used for three different high productivity vehicles, AB-Triple, B-Triple and the Cannington Mine Vehicle.

7. VEHICLE PERFORMANCE ASSESSMENT

Although each of these combinations have been assessed and introduced to the road system on the basis of improved dynamic performance, based on improved design and innovation but using a slightly different process for each combination. These new vehicle configurations have been proposed by both government and industry. The process has evolved over time as we have learnt by reviewing each project and inputting the results of the review back into the next project.

The approval process has been one of industry submission, based on consultants' reports and computer simulations. These theoretical approaches have been backed up by on-road trials of the combinations where appropriate. Knowledge of dynamic performance has increased rapidly over recent years, and the important characteristics to be addressed include:

- Low speed offtracking (swept path),
- High-speed offtracking,
- Steady state rollover,
- Load transfer ratio,
- Speed, acceleration performance,
- Braking,
- Trailing fidelity,
- Rearward amplification.

As discussed, performance measures for these parameters are reasonable for the middle point of the current fleet. This demands on-going steady improvement of vehicle performance. Some flexibility for acceptance of marginal performance is still possible where the nature of the operation minimises improvement opportunities (stock transport).

8. COMPUTER SIMULATION AND CONSULTANCY

Computer simulation has been used extensively to predict vehicle performance. Given the inherent variability of actual road conditions, the on-road performance demonstrated during trials has been reasonably comparable with the computer predictions.

Queensland Transport has access to some computer simulation packages, and uses its resources to evaluate consultants' proposals. Queensland Transport however is not able to fully analyse all proposals submitted by industry. Operators are directed to private enterprise to supply a full report of predicted dynamic performance for government evaluation of the request. The information provided is confidential to the client, however once a vehicle is approved for use on a portion of the network, the vehicle class is made available to other transport operators. The AB-Triple combination is an example of this flow on.

While the area of dynamic performance and computer assessment for vehicles is relatively new, consultants including ARRB and RoadUser Research are available to industry. Commercial opportunities should see an increase in numbers.

Queensland Transport resources are limited to undertake wide spread performance assessment. The suggested role for Queensland Transport is to request industry to use external consultants to produce quality reports, and for Queensland Transport to evaluate. Consultants have played an important role in assisting industry to develop and promote these new, innovative combinations.

9. ROUTE ASSESSMENT

Route management and assessment are critical auditing roles for Queensland Transport, Main Roads, the Police Service and Local Authorities. Management is required for vehicle dimensions, masses and performance of vehicles. While most vehicles use the road network as-of-right and travelling without restrictions, larger vehicles need to be controlled.

Using existing draft standards for route assessment, new guidelines are being developed for use by various authorities to assess road suitability for road trains and B-Doubles, and new innovative combinations. These Guidelines will be broad enough to assist all levels of government determine appropriate route access equitably. Some of the issues addressed in the development are:

- Dimensional capacity – lane and shoulder widths, swept path, curves;
- Geometry – traffic islands, roundabouts, grades, overtaking lanes;
- Road safety – overtaking opportunities, traffic density, sight distance;
- Structural capacity – road design, bridge capacities, pavement condition;

- Railway issues – level crossing standards and limitations;
- Traffic conditions – volumes, speed limits;
- Community concerns – time restrictions, intersections, noise, residential areas, high pedestrian areas, bicycle routes, pedestrian crossings;
- Operational issues – access issues, existing operations, type of commodities, dangerous goods, servicing, parking, loading/unloading facilities.

Critical areas of operation, similar to the Pilot escort areas now being determined, are necessary to minimise repetitive route assessment.

10. AB-TRIPLE

An AB-Triple is a vehicle combination consisting of a prime mover and semi-trailer, towing a set of B-Double trailers, connected by a draw bar and a converter dolly. The AB-Triple can operate with an overall length of up to 36.5 m and a GCM of up to 106 tonnes as shown in Fig 2.

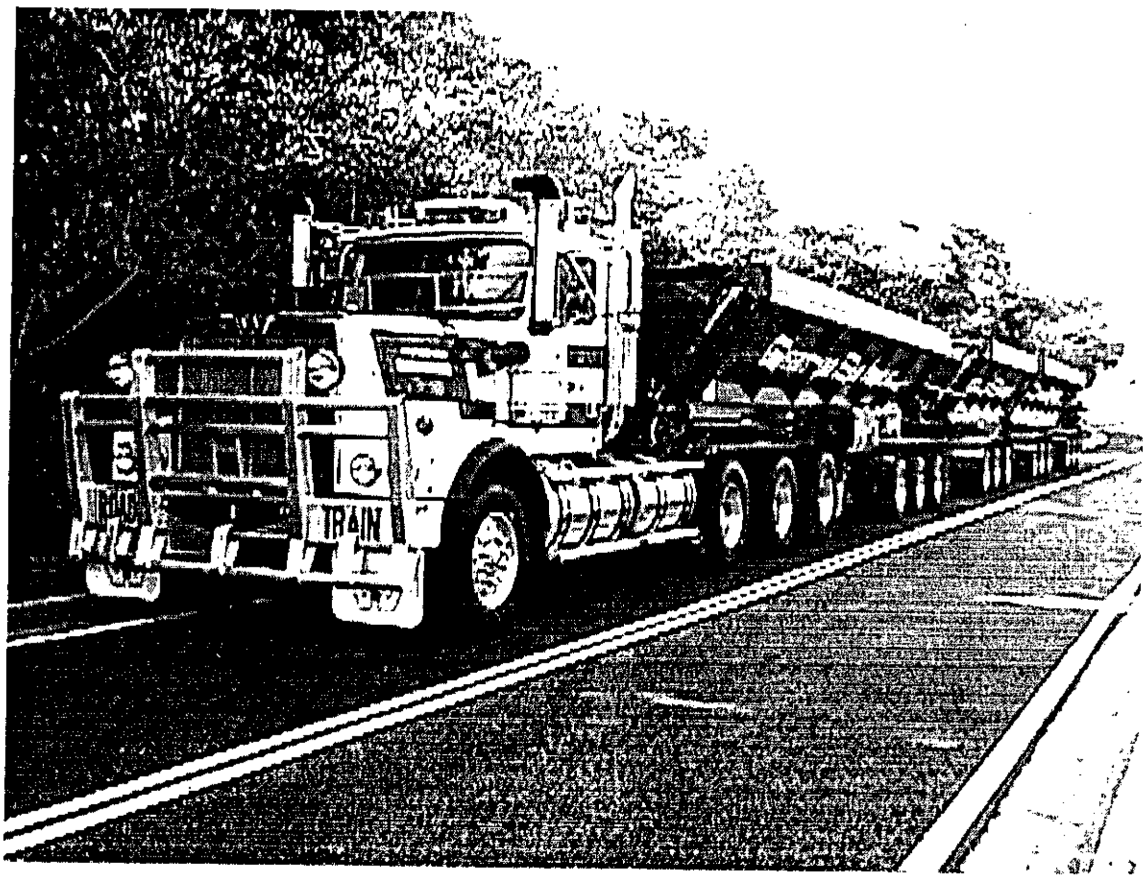


Fig 2. The AB-Triple

In 1992, the combination was assessed for dynamic stability by consulting engineers using computer simulations programs. In particular, the tracking ability of the trailers was closely examined. Trial runs of a typical combination were conducted in the Roma area and following consultations with all regions, the vehicle combination was approved for use. Additional trials from Townsville to Mt Isa have been undertaken, which have verified the good dynamic performance of the combination.

The results of this assessment proved that the AB-Triple had:

- Superior dynamic performance to existing Type I Road Trains, which translates to improved road safety,
- Improvements in road wear through a lower ESA per tonne of freight carried and meets the axle mass spacing formulae, and
- Increased productivity for operators through increased payload and greater utilisation of equipment.

Consequently AB-Triples have been approved for use on all road train routes. They have been included in the performance guidelines for road train operations and no longer require additional permits. The AB-Triple is a good example of a high productivity vehicle that produces benefits for all stakeholders involved in road transport.

11. THE B-TRIPLE

11.1 Background

The B-Triple is a prime mover hauling three semi-trailers. In the simplest terms this combination is similar to the common B-Double with an additional lead trailer in the combination. The B-Triple can be up to 36.5 m overall length and up to 82.5 tonnes GCM as illustrated in Fig 3.

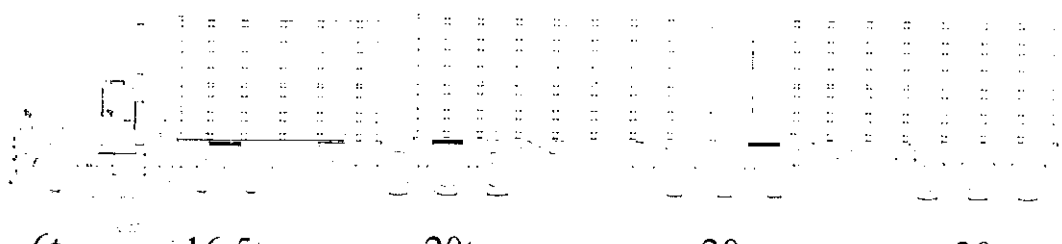


Fig 3. The B-Triple

While the introduction of the AB-Triple (an AB-Triple combination consists of a 6-axle prime-mover-semi-trailer towing an 8 or 9-axle B-double as shown in Table 1.) developed from an industry proposal the introduction of the B-Triple via the B-Triple trial was a Queensland Transport initiative (2). The transport industry continually seeks increased productivity through increased load carrying space, increased mass or increased access. The B-Triple was seen as a viable alternative to existing Type 1 Road Trains due to improvements in safety, productivity and infrastructure protection.

11.2 B-Triple Combinations

Initially there were 4 operators selected for participation in the trial; Wagners Transport of Toowoomba, NQX, Oakey Haulage and Porters of Kingaroy. In addition to the initial four combinations, other B-Triple combinations were approved to participate in the trial extending the scope of the trial. Table 2 summarises the overall lengths, Gross Combination Masses (GCM) and the type of operation of the approved B-Triples.

COMPANY	LENGTH (m)	GCM (t)	TYPE OF OPERATION
Wagners Transport	32.1	82.5	Tipping
NQX	36.02	82.5	General Freight
Oakey Haulage	35.51	82.5 (*90t)	Livestock
Porters	33.8	82.5 (*90t)	Livestock
McIver Transport	28.8	86.0	Tipping
Frasers Livestock	35.6	82.5 (*90t)	Livestock

(* Operated under the Livestock Loading Scheme)

Table 2. B-Triple Combinations running in Queensland

The B-Triples were allowed access to all road train routes in Queensland, with some extensions. There were numerous applications for participation in the B-Triple trial and Queensland Transport evaluated these, along with requested routes, in consultation with Main Roads and Queensland Police. Many of the proposals could not proceed as operators wished to operate a B-Triple outside road train areas.

The B-Triple also has superior dynamic performance compared with an AB-Triple, which relates to improved safety performance, but has a lower payload. One of the main aims of the B-Triple trial was to establish some definitive criteria and procedures for consideration of high productivity vehicles. The entire trial was intended to be as transparent as possible with wide involvement of industry, local community and Main Roads through establishment of a Monitoring Group.

As the use of new combinations on the road must not expose other road users to unacceptable risk, Queensland Transport has developed a test program for the assessment of the dynamic and operating performance of the B-Triple combinations. The program included on-road brake tests, overtaking tests, rearward amplification tests (3) and evaluation the operational characteristics of the B-Triple combination such as intersection clearance times, gradeability and travelling speed. The program was designed to assist both industry and government objectives by:

- Gathering information on real-life brake performance of B-Triples,
- Improving heavy vehicle safety on the road,
- Supporting vehicle innovation and new technological changes to enhance safety and productivity.

11.3 Comments B-Triple Operations

Since the introduction of B-Triples in November 1996 more than 300 trips were undertaken with various B-Triple combinations. Destinations have included Toowoomba, Townsville, Warwick and a wide range of road train routes in South-East Queensland. Queensland Transport has collected information on loadings, maintenance cost, fuel efficiency and driver's comments on the B-Triple performance plus reports on other factors. Queensland Transport has also undertaken extensive consultation with police, local government and interested road user groups about the B-Triple operations.

In general, the motoring public has not noticed this new combination on the roads and it is unlikely that there could be any serious reservation about operating B-Triples in the areas tested.

11.4 Results of the B-Triple Trial

The tests and the computer simulations have shown that the B-Triple is clearly a much better performing and safer combination than existing Road Trains. This has been highlighted by the combinations involved in the B-Triple trial, have safely travelled approximately 350,000 km (4).

As a part of the B-Triple trial, the operating cost of different combinations has been monitored. The calculations include fuel, labour, tyres, capital cost of equipment, repair and maintenance cost. The structure of the running cost of a B-Triple configuration is shown in Fig 4.

A detailed economic analysis of the operations has also shown that the cost per tonne of freight moved in a B-Triple configuration is generally lower than that for other configurations.

An obvious alternative to encourage the use of B-triples is to allow B-Triples access to more highly populated areas. However, there are community perception issues that will need to be resolved before any additional access to B-Triples is granted.

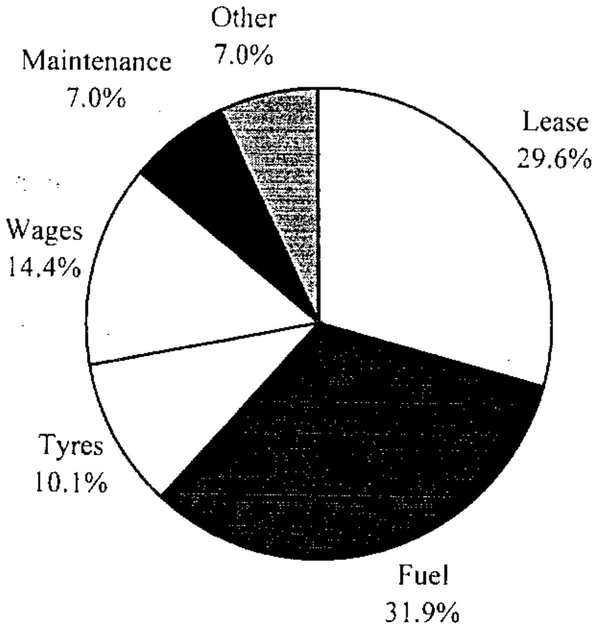


Fig 4. Actual running cost of B-Triple Combinations

Based on the results of the B-Triple trial, Performance Guidelines now have been prepared to cover the B-Triple operations in Queensland. As the B-Triple is not presently covered under the road train gazettal guidelines, a permit will be issued by for approved operations.

Following the B-Triple trial in Queensland other states have investigated allowing B-Triples to operate within their state. South Australia has introduced B-Triples as well as Victoria, which has 2 B-Triple combinations running from Geelong to Melbourne.

Additionally, a group of companies have joined together to fund a project, Freight Corridors 2000, with the long term aim of B-Triple having access to major interstate freight corridors. The project has the support of a number of state road authorities that are building on the work started by Queensland Transport.

12. CANNINGTON MINE VEHICLE

An innovative high productivity vehicle has been introduced into service as part of the Cannington mine project. The vehicle, which has been christened the ICON, (Innovative Combination Of the North) consists of a tri-drive prime mover towing two sets of B-Triple trailers (six trailers in total), which are connected with a tri-axle dolly. The ICON as shown in Fig 5, which has an overall length of 53.5 metres, a GCM of 166 tonnes and a payload of 115 tonnes, will carry lead and zinc concentrate from the mine to a railhead at Yurbi.

The ICON was also an industry initiative as a result of an extensive study by the mine owners, BHP. Throughout the entire process BHP have consulted extensively with the local residents of McKinley, local police, regional and head office Divisions of Queensland Transport and Main Roads.

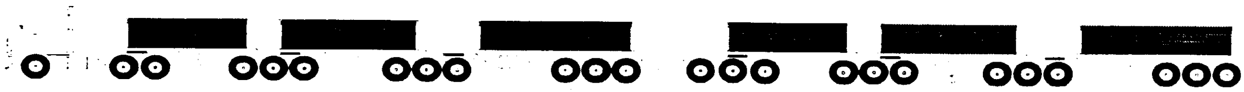


Fig 5. The ICON (2B3)

The initial proposals from BHP meet all of the criteria described above, i.e.

The combination was within the overall combination length for the set of routes under consideration, ie Type 2 road trains.

Each unit in the combination met all dimension standards including width, length, height, rear overhang, tow coupling overhang, etc.

The combination meets the performance standards for the mid range of the combination used on that route network. Actually, the initial computer simulations showed that the ICON would have improvements over some Type 2 road trains currently using part of the proposed route.

The combination meets the axle mass requirements, including internal axle spacing, as required by the gross mass formulae for that route network. The initial proposal asked for consideration for increased axle masses, up to 22.5 tonnes per tri group, but this was not granted and will not be considered until finalisation of the mass limits review.

While an approval in principle was given for operation of the ICON further consultation was needed before a final approval will be granted to BHP for operation. To achieve this it was agreed that a pilot operation would be conducted for a period of 6 months during which time BHP, and the transport operator, would need to undertake a series of test activities. These were detailed in a Pilot Operation Brief (5) that was jointly prepared by BHP, Main Roads and Queensland Transport.

The Directors-General of Queensland Transport and Main Roads and the Manager of the Cannington Project agreed to the Pilot Operation Brief, which is quite extensive. The document details who all the stakeholders are, their responsibilities and the criteria that must be met for continued operation of the combination.

The pilot operation is assessed on three aspects of the ICON and its operation, namely:

- Safety Management Plan
- Vehicle Performance (including dynamics and general operation)
- Perception Management.

Additionally, the results of the pilot operation will provide a basis for the identification of any road infrastructure improvements that may be required to safely sustain the operation of the ICON.

12.1 Safety Management Plan

The safety management plan demonstrated how the operator's operational management systems and procedures can effectively manage any risks caused by the operators freight tasks and not expose the drivers, other road users or the environment to unacceptable levels of risk.

The plan covered those aspects of the operation that are necessary to be assessed prior to registration of the vehicle and commencement of operations. This covers fatigue management, basic mechanical standards of the vehicle including axle mass limits, driver competency standards and methods of assuring continued compliance with this plan.

12.2 Vehicle Performance

The vehicle performance section of the Pilot Operation Brief covers both meeting the minimum necessary mechanical standards and actual on road dynamic performance of the combination.

The pilot operation showed that the vehicle meets the basic mechanical standards, as for any other road train, for brake response timing, braking performance, startability and component rating.

The ICON has been approved in principle for pilot operations based upon expected dynamic performance as indicated by computer simulations. Testing and evaluation of the vehicle is being conducted to establish if the prototype meets the expected dynamic performance, as predicted by computer simulations, especially in terms of the proposed route. This will be evaluated both objectively and subjectively against the expected performance of normal road trains.

Performance is demonstrated through testing to verify computer model predictions. The testing has included standard tests, measuring actual performance on the route, and also an assessment of interaction with other traffic.

12.3 Perception Management

The perception management plan is to demonstrate how BHP has, and will continue, to manage any adverse reaction from the community from introducing the ICON onto the route.

The plan also included a communication strategy to keep stakeholders advised of progress and a pro-active approach to advise other road users of possible interaction.

12.4 Current Status of the Project

There are currently three ICON combinations operating under permits supporting the Cannington Mine.

Queensland Transport has finalised the physical evaluation of the ICON which was undertaken in the vicinity of the Cannington Mine and Yurbi in late 1997. The process of evaluation involved the providing of ICON vehicle performance against the computer model, which formed the basis of the proposal to trial this vehicle.

Land Transport and Safety Division's evaluation thus far, both of the computer model and physical testing, has shown the ICON vehicle to exhibit generally better performance than a Type 2 road train, particularly in regard to trailing fidelity and roll stability.

In addition, Department of Main Roads in conjunction with Queensland Transport is close to finalising the road infrastructure impact report, which will address issues such as:

- Pavement performance analysis,
- The impact of large loads on a chip seal,
- Comparison of the impact of Tandem-drive versus Tri-drive prime movers
- Life of a chip seal pavement under Tri-drive conditions.

13. CONCLUSION

To improve productivity, industry will continue to present proposals for higher productivity vehicles and the challenge for Queensland Transport is to encourage industry to think of a new or better way of conducting their business.

The use of this approach will result in benefits in terms of safety improvements and improvements to infrastructure in addition to productivity improvements.

The introduction of new vehicles will raise the safety performance of the heavy transport fleet. These vehicles require experienced drivers, and Queensland Transport is addressing problems of fatigue and driver training, particularly in long distance travel.

Although protection of the road network by specifying and using fewer and better vehicles is the aim of Queensland Transport, the appropriate transport mode is also important. There is an increasing need for a transport partnership between road and other modes of transport, especially rail, as road transport not always provides the best solution. Road safety is always foremost in the planning.

Having a strategic approach to this issue, such as has been described in this paper, will ensure that all stakeholders know the ground rules and can progress forward in a reasonable and logical progression.

While Queensland Transport has a basic strategy for this issue the application of the strategy must be flexible enough to allow tailoring to the specific operation and have a feedback loop to allow continuous improvement in our approach.

14. REFERENCES

(1) Australian Census (1996) - ABS

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