The Bicentennial High Speed Railway Project

proposed to the Institution of Engineers, Australia, as a National Engineering Project for the Australian Bicentennial, 1788-1988

by the
National Committee on Railway Engineering

Revised December 1981

W.L. ABBOTT
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THE BICENTENNIAL HIGH-SPEED RAILWAY PROJECT

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INTRODUCTION

The Australian intercapital rail passenger system is in poor fettle. Trains are slow and the lot of chair-coach passengers, particularly those on overnight trains, is not a happy one.

Heavy freight-type locomotives and obsolete bogies limit train speeds, extend journey times, deter passengers and reduce productivity. Unlike the steady improvement to our highway system, there have been no significant realignments on the intercapital railways in Eastern and Southern mainland Australia since World War II. And for all practical purposes, Canberra is off the intercapital railway map.

To rectify this, the National Committee on Railway Engineering proposes inauguration of a Bicentennial High-Speed Railway Project to link all five capitals in Eastern and Southern mainland Australia.

In October 1981 a Technical Paper was prepared in support of the National Committee's proposal, using a variety of sources. It has since been reviewed and substantially revised to reflect an expanded national scope and additional inputs from civil engineering and planning experts.

The authors of the Technical Paper are two members of the Institution, Ian Macfarlane and Ross Carlton. Don Gould provided major inputs and there was active help from many colleagues in the railway, transport and engineering communities who are dedicated to the cause of better railway passenger service.

The project is commended as having the visibility, sense of excitement, opportunity for community participation and usefulness, and total community acceptance that should be sought for Bicentennial projects. It makes use of and improves established infrastructure and facilities. It should receive the enthusiastic support of all Australians.

EXECUTIVE SUMMARY

ES.1 This Paper proposes, as a major National Engineering Project for the 1988 Australian Bicentennial, the inauguration of the first stage of a Bicentennial High-Speed Railway Service in Eastern Australia.

ES.2 The Project would achieve, in several stages, a modern high-speed daylight express rail network connecting Sydney, Melbourne and Canberra, with similar trains running at accelerated schedules between Brisbane - Sydney and Adelaide-Melbourne. It would provide an integrated rail passenger network that would be viable and indeed a preferable alternative to air and road travel for many users.

ES.3 The total Project, shown in Fig. 1 would result in travel times:

Sydney - Canberra	3 hours
Melbourne - Canberra	6½ hours
Sydney - Melbourne	9 hours
Brisbane - Sydney	under 12 hours
Adelaide - Melbourne	8 hours

ES.4 Specific Bicentennial proposals comprise Stage 1 of this scheme, as shown in Fig. 2. They embody:

1. The construction of a new section of 160 km/h double track railway (the T-line) to link Yass, Cullerin (near Goulburn) and Canberra, thereby -

   - bypassing one of the worst sections of the existing Hume Railway;
   - making possible a direct Melbourne - Canberra service (which is not practicable today); and
   - substantially cutting the Sydney-Melbourne and Sydney-Canberra journey times.

FIG. 1 BICENTENNIAL HIGH - SPEED RAILWAY PROJECT

- THE FINAL PROJECT

(Further Progressive Expenditure)

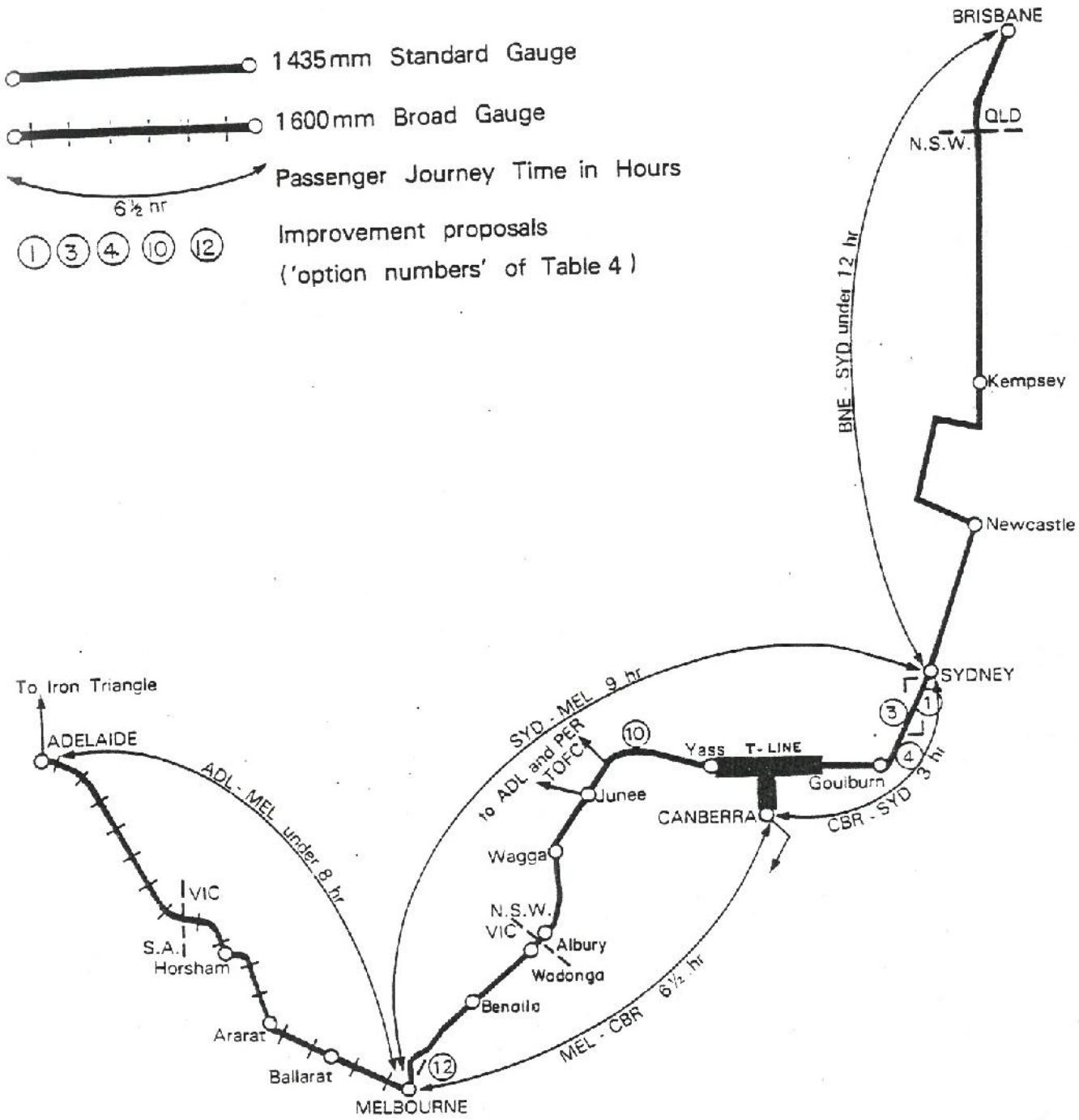
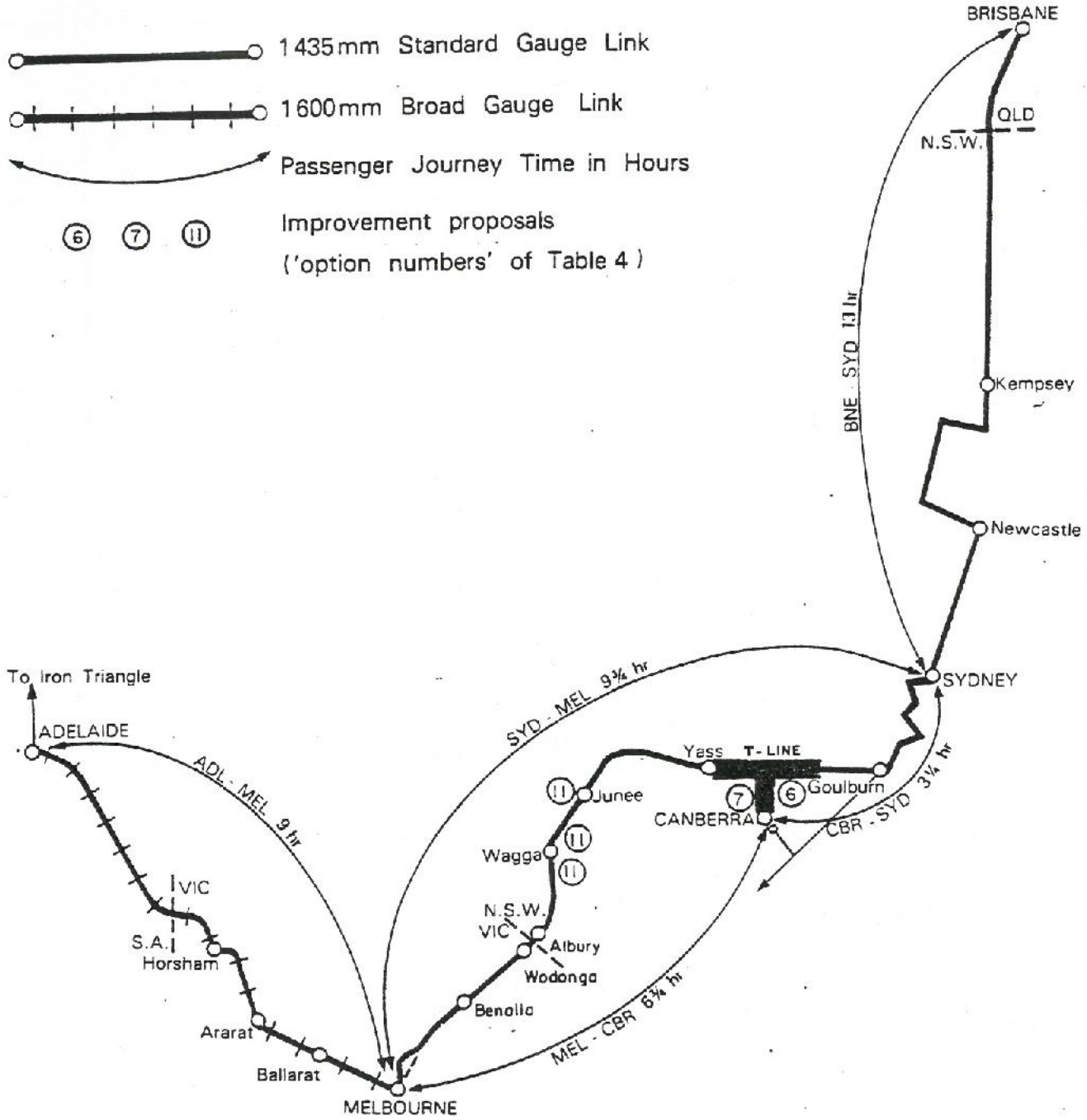


FIG. 2 BICENTENNIAL HIGH - SPEED RAILWAY PROJECT

- STAGE 1 FOR 1988 BICENTENNIAL

(Under $200m, including trains)



This new construction comprises the critical central section needed to tie the whole Bicentennial network together (see Figs 1 and 2).

2. The purchase of high-speed diesel-electric trains of the XPT type or equivalent, needed to operate the fast daylight services on each sector, viz.:

. Brisbane - Sydney	2 trains
. Sydney - Melbourne)	
. Sydney - Canberra)	6 trains
. Melbourne - Canberra)	
. Melbourne - Adelaide	2 trains

These would inaugurate the full network service between all five capitals (Stage 1) and progressively exploit subsequent line improvements (Stage 2).

3. The bypassing of three short, critical, steep grades that severely restrict interstate freight train operations in Southern N.S.W.

ES.5 The first stage costs would be $199m, viz.

	1981 $m
Major Hume Line Relocation	90 (net)
Canberra Connection	37
Three Minor Relocations (para 51)	8
Rolling Stock (Appendix C)	64
TOTAL	$199m

The second stage would comprise further line relocations and progressive upgrading of tracks and signalling. The ultimate phase would be electrification (separate decision) of the busiest sector of the routes.

ES.6 Analysis strongly indicates that:

. the interest charges on the net $90m Hume Railway component of the new T-line would be approximately covered by operating cost savings (Appendix A);

- the passenger trains should cover their direct operating costs (paragraphs 13, 14).

It is not expected that the extra capital needed to provide the high speed trains (about $64m) and to link Canberra into the National System via the 'leg' of the T-line (about $37m) would be recovered from revenue or savings. Intangible benefits justify inclusion of these components in the Bicentennial Project.

ES.7 The benefits of the project would at today's patronage levels, affect some 900,000 people each year (Appendix B). Ultimately, up to 2 million passengers p.a. would use the services. Journey times in hours would be:

	Today	Bicentennial (Stage 1)	Ultimate
Sydney-Melbourne	12¼	9 3/4	9
Sydney-Canberra	4 3/4	3¼	3
Melbourne-Canberra	No Service[(a)]	6 3/4	6½
Brisbane-Sydney	15 3/4	13	Under 12
Adelaide-Melbourne *	13½[(b)]	About 9	Under 8

* This Section not yet modelled on the computer

(a) 9¼h via bus link from Yass Junction

(b) Average of 13.20 and 13.40

ES.8 Considerable additional passenger revenue and freight-train operating economies would result for the railways concerned. The High Speed Passenger network would clear its operating costs at marketable fares.

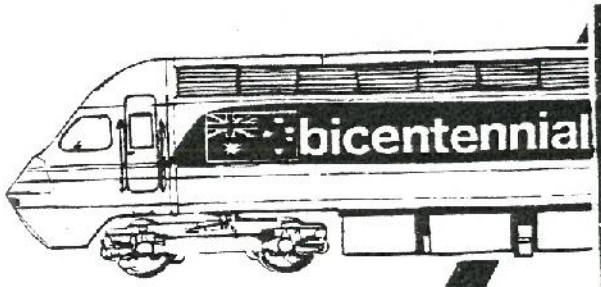
ES.9 The ultimate concept envisages a substantially electrified railway with provision for trailer-on-flat car (TOFC, piggyback) service to optimise the environmental and energy benefits of diverting road traffic to rail.

ES.10 All Australians take pride in our superb national capital. Now let's connect it to Australia!

SYDNEY

PLATFORM 3
Departs 14:00

Melbourne Train No 67
Afternoon Daylight
9hr XPT Service



WAGGA
ALBURY
BENALLA
MELBOURNE

SORRY-NO SPACE LEFT

MELBOURNE

THE BICENTENNIAL HIGH - SPEED RAILWAY PROJECT

PURPOSE

The purpose of this report is to document, as a practical preliminary proposal, the case for a Bicentennial High-Speed Railway Project to link Sydney, Melbourne, Brisbane and Adelaide with each other and Canberra, in time for the national Bicentennial Celebrations in January 1988.

GOALS

2. The goals of the proposed project are:

1. Creation of a high-speed passenger train service - the 'Bicentennial Network' - from Brisbane to Adelaide (possibly, to the Iron Triangle).

2. A high-speed daylight passenger rail service linking Sydney, Melbourne and Canberra with the substantially faster journey times made possible by the sections of new railway.

3. New and significantly faster daylight passenger rail service on the existing railway between:

   . Adelaide - Melbourne (on the broad gauge)

   . Brisbane - Sydney

4. A more efficient, economical, and marginally faster freight rail service between Sydney, Melbourne and Canberra.

5. Ultimately, an ability to rail semitrailers on flatcars (TOFC service) between southern Sydney (Campbelltown) or the Wollongong - Port Kembla industrial complex and -

   . the NSW Riverina;

   . NE Victoria;

   . northern Melbourne (Broadmeadows);

   . Adelaide, the Iron Triangle, Perth and Darwin (via Roto and Broken Hill).

This is a major new freight market capability for the Railways of Australia and its significance should not be underestimated. Existing TOFC service across the Nullarbor is a major growth traffic for rail - despite sealing of the Eyre Highway.

6. Ultimately, a similar TOFC capability between Melbourne and Adelaide (it already exists from Adelaide to the North and the West).

7. Ultimately, a substantially electric railway, independent of petroleum fuels.

8. The major economic, social, energy, and environmental benefits that would result from diversion of people from road and air, and goods from road, to a railway and ultimately to a pollution-free electric railway.

3. Only the Stage 1 developments are proposed for completion by the 1988 Bicentennial; they would cost $199m.

4. The ultimate involves the progressive improvement of the routes by work such as straightening and deviations, plus track upgrading and resignalling to make possible the ultimate services and journey times of Table 1, and finally, for electrification of the more densely trafficked sections where this is economic.

PASSENGERS

5. Table 1 sets out the journey times involved. It is important to realise that today there are daylight services only on the sectors from Sydney to Melbourne and Canberra; elsewhere night trains convey sleeping-car and chair-coach patrons, the latter under relatively uncomfortable and sleepless travelling conditions. Moreover, XPT - quality interstate services are not proposed by the individual State Railways because the States do not have the capital funds concerned. Nor is there a compelling political incentive for States to create a national passenger network of this quality.

Table 1 TRAIN SERVICES PROPOSED FOR THE BICENTENNIAL HIGH-SPEED RAILWAY NETWORK

Between	Approx journey time, hrs			Services per day (each way)	
	Today	Bicent. (Stage 1)	Ultimate Stage 2	Bicent. (Stage 1)	Ultimate Stage 2
Sydney-Melbourne	12¼	9 3/4	9	2	3
Melbourne-Canberra	*	6 3/4	6½	1	2
Sydney-Canberra	4 3/4	3¼	3	3	3
Brisbane-Sydney	15 3/4	13	Under 12	1	1 or 2
Adelaide-Melbourne	13½	About 9	Under 8	1	2

* 9¼ hours using bus link to Yass Junction

FREIGHT

6. On the freight side, it is likewise important to stress the need initially to build the new T-line (Stage 1) with high vertical clearances, and ultimately to open up the rest of the key links outside the suburban areas to accommodate TOFC traffic. Australian railways are primarily freight railways; shippers to-day prefer door-to-door service by road. Clearances for TOFC would permit the substantial diversion of interstate semi-trailer traffic from road to rail, with considerable national benefits from environmental improvements and reduced accidents and road pavement damage. The option is not possible in Eastern Australia today because of restricted Edwardian-era rail clearances. Unfortunately, extensive suburban electrification, tunnels and through-truss bridges virtually rule TOFC out on the Campbelltown (NSW) - Sydney - Brisbane sector, save at a very great cost. However, TOFC clearances are valid and are necessary on the other routes.

STAGING

7. The project envisages three stages.

Stage 1 - for the 1988 Bicentennial

	$m
. Construction of the 'T-line', a new high speed link between Cullerin (near Goulburn), Yass, and Canberra. See Appendix A.	127
. Relocation works to ease grades facing freight trains at three key locations in Southern NSW.	8
. Purchase of high-speed diesel-electric passenger trains of the XPT quality See Appendix C .	64
TOTAL	$199m

. An ongoing commitment by the five Governments concerned to progressively upgrade the railway to the full standard envisaged for Stage 2.

Stage 1 would provide, in time for the Bicentennial, a much faster passenger service over the network with modern diesel-electric trains, and offer considerable economies in freight train operation between our two most populous capitals. It would also provide the needed technical impetus and national political drive to get this improvement project moving. Such drive is very important for our fragmented railway systems.

8. Stage 2 - by 1995

. Sydney - Melbourne

. Follow-up works listed in paragraphs 54 - 92 that would assure the ultimate express service, and the existence of an integrated road-trailer-on flatcar rail network effectively serving all major Australian industrial complexes south and west of Sydney.

. These comprise deviations, curve-straightening, track and signalling improvements; many are scheduled to occur in any event.

. Brisbane - Sydney and Adelaide - Melbourne similar upgrading to the above.

9. Final Stage - Electrification (separate issue and decision)

. From Sydney to Goulburn by 1990.

. To Junee and Canberra by 1992.

. To Albury, from both Melbourne and Junee, by 1995-1996.

. Adelaide and Brisbane links after 1995 (probably).

These are entirely practical dates, based on two recently published studies. Full inter-capital electrification would displace the diesel-electric power vans for use elsewhere, and require electric power vans. Alternatively, they could be re-equipped as electric power vans; their diesel-electric power plants would be life-expired after 15-20 years but the rest of the equipment would still be useable.

MARKET RELEVANCE

Passengers

10. The passenger market is analysed in some depth in Appendix B. It shows that this railway project is highly relevant in terms of existing and future potential inter-capital passenger travel in Eastern and Southern mainland Australia.

11. The National Travel Survey estimated existing travel patterns and market shares (Table 2). Railway seat - occupancy counts, however, have revealed a far different picture and when related to the capacity of the proposed services, have confirmed that the inter-capital passenger trains are carrying far more people than is generally believed. Speeded-up they would have the ability to carry many more.

12. Appendix B develops the market prospects in depth. Appendix C indicates the services that would meet these market needs. In essence, analysis shows that the potential market is already there, and that very real gains in patronage would result. It is important to note that the basis of the analysis is conservative ; it ignores newly-generated travel. Factors confirming this view of relevance include:

1. Relatively small existing rail penetration of the market and thus

2. the relatively small shifts needed to fill the new trains.

3. Trends towards increasing airline costs (especially fuel costs) and fares.

4. Increased perceived costs of motoring (petrol price).

5. The superior travel - time peformance of high speed rail over private cars, and the psychological impact of motorists travelling at 80 - 110 km/h being overtaken by a 160 km/h train.

6. A confirmed return to daylight passenger rail where it has been most actively promoted - in N.S.W. - and this despite the limitations posed on the State Rail Authority's marketing by classic 115 km/h locomotives and antique coaching stock.

Table 2 MODAL SHARES (FROM NATIONAL TRAVEL SURVEY)

Sector	Total 1-Way Journeys P.A.	PERCENTAGE MARKET SHARES			
		Air	Road		Rail
			Bus	Car	
SYD-MEL	1.93 million	51	0.6	44	5
SYD-CBR	1.25 million	14	5.5	79	2
CBR-MEL	0.35 million	31	1.7	67	Nil
BNE-SYD	1.12 million	60	1	37	3
ADL-MEL	0.82 million	30	4	59	6

BTE Occasional Paper 42, December 1980 (p. 309)

Table 3 RAIL JOURNEYS AND MARKET SHARES BASED ON TICKET COUNTS

Sector	Existing Total 1-Way Rail Trips P.A.	ESTIMATED RAIL SHARES OF TOTAL MARKET (a)	
		Existing Rail	Target for High-Speed Rail Service
SYD-MEL	333 300	17%	13%
SYD-CBR	68 000	5%	30%
CBR-MEL	16 000	4%	36%
BNE-SYD	190 000	17%	7%
ADL-MEL	180 000	22%	8%

Notes

(a) The total market (100%) is the NTS figure in Table 2 above, the existing shares are seat occupancy counts, and the target high speed shares assume 60% load factor on the projected services for 340 days per annum.

Operating Costs

13. It is well known that most Australian passenger trains lose money. The trains that come the closest to breaking even are those that:

1. Generate the greatest seat-km payload (i.e. occupied seats) per vehicle that has to be maintained. Daylight chair-car trains have an almost 3:1 capacity:cost advantage over overnight sleeping car trains. They also make the most effective use of hotel services staff and maximise catering revenue.

2. Make the most productive use of railway staff. This means high daily kilometrage, and there is only one way to achieve it: higher speeds to permit shorter journey times, and more trips through more intensive diagramming.

3. Offer the railways real prospects for charging a higher fare for a truly superior quality of service (speed and comfort - especially riding quality).

4. Do not occupy valuable night-time track capacity on single-lines, at the expense of profitable overnight express freight-train services. Daylight services achieve this.

5. Are filled throughout their journeys. Intercapital service offers this possibility, c.f. the "tapering-off" of load on an outbound country or suburban train.

6. Are of identical type, giving the operator the maximum flexibility to deploy standard stock from one route to another and to hold the minimum number of spare vehicles.

Note: Daylight stock, especially one class chair cars offers the railways the ultimate in flexibility.

14. Studies by the N.S.W. State Rail Authority have shown that XPT - type trains can definitely clear their direct operating costs, at fares which the market will stand*, SRA intends to run these rains without loss on intrastate country services with tapering load factors. The Bicentennial High Speed Passenger Network is essentially a 'bridge' system and has the potential of higher load factors throughout longer journeys.

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* Such fares cannot, however easily cover daily ownership costs of over $11 per seat as well. ($8m train, 310 seats, 10% p.a., 300 -day year, 30 years depreciation life)

The Bicentennial Network would not, repeat not, involve the railways in direct operating losses.

Choice of Train Type

15. Before they chose the 'power van plus plain coaches' (XPT) solution for country services, detailed studies were run by the (then) Public Transport Commission of N.S.W. covering loco-hauled and underfloor engined diesel railcar options. The conclusion was that the train that came closest to breaking even and that could sometimes run at a profit was a high-speed train comprising power vans and plain coaches. Victoria also chose the hauled-coach option but in view of shorter distances, opted for haulage by refurbished conventional locomotives. This report does not advocate XPT as a particular make of train - there are other relevant options e.g. the Canadian LRC, the Spanish Talgo, possibly a diesel-electric variant of the French TGV. Again, one Australian organisation is known to be developing a new high-speed coach and a European organisation is known to have offered to demonstrate another such train. What this report does claim is that an XPT type high-speed train is a credible, minimum-operating-cost solution for providing marketable passenger services on the Bicentennial network. It is the only such solution currently running in Australia and because it is about to enter service over N.S.W. routes critical to the Bicentennial concept, it is used as a known quantity that others would have to beat.

Market Relevance - Freight

16. Road dominates the non-bulk freight market along the Hume corridor. The truck density on this route is the highest in the country. The rail share of the interstate non-bulk market has been estimated at around 35 per cent of northbound and around 30 per cent of southbound traffic. The major reasons for this relatively low share are:

1. Customer insistence on reliability;
2. Customer preference for door-to-door service and accountability;
3. The relative shortness of the haul as an inland container-freight route.

Rail is hard-pressed to compete with the road haulier using its present vehicles (vans, containers) and delivery techniques.

17. The rail freight share on the Melbourne-Adelaide route is around 40 per cent and this, too, is a situation deserving considerable improvement.

18. The proposal therefore embodies TOFC clearances to give rail a completely new capability to line-haul semi-trailers. This is already highly successful in the western part of Australia and is the major growth area in non-bulk rail freight in North America. As an indication of the final overall cost involved, the Sydney-Melbourne Electrification Study reckoned on add-on cost of $33m to $36m for TOFC clearances.

RELEVANCE AS A NATIONAL ENGINEERING PROJECT

19. A quarter-century ago, the Snowy Mountains Project symbolised the Menzies-era contemporary philosophy of unbounded development and expansion. It provided a boost to national morale, a stimulus to migration and technical education, and a major fillip to all the leading engineering disciplines. In one way or another, all Australians benefited.

20. It is fitting that Australia should have another major-advance, morale-boosting national engineering project for the 1788-1988 Bicentennial. Such a project should, however, be in step with changed economic times, changed public attitudes, and changed social expectations. Specifically, it should:

1. Be sensibly-priced and politically saleable, and thus likely to happen.

2. Like the Snowy, be a high-profile project, reasonably accessible to all Australians and visitors to Australia.

3. Be of direct benefit to a large number of ordinary Australians, and widely spread through our society.

4. Be national in character, rather than a single-State or a regional project, and yet -

5. In geographical terms, relate to the major centres of population.

6. As a technology and a strategy, be capable of wider application elsewhere in the country and perhaps even exportable.

7. Be catalytic and positive in its overall economic impact, even though at least initially, the project may not itself withstand the rigid application of classic economic analysis (as the Snowy, for example, did not).

8. Be not negative or neutral, but quite positive and favourable in its environmental impacts.

9. Be likewise positive in respect of energy.

10. Be attuned to positive and desirable trends in the society.

11. Involve all major engineering disciplines: civil, mechanical and electrical.

12. Be a showpiece of Australian technology, yet one that lay people can comprehend and identify with.

13. Be capable of implementation - at least in part, and with ongoing potential - in time for the 1988 Bicentennial.

21. The National Committee on Railway Engineering proppsal for a Bicentennial High-Speed Railway would meet the essential criteria for relevance, in the following respects:

1. Cost and Political Saleability - The Stage 1 cost of the Bicentennial High-Speed Project is $199m spread over (mostly) 1985 - 1988. This is a sensible order of cost for a National Engineering Project. Stage 2 expenditure can be incremental. Electrification can likewise be implemented in stages and as necessary. The theme of the project is itself apolitical. The goal confers the sorts of positive benefit that political leaders like to help bring about.

2. Visibility - The benefits of the Project are, in terms of public visibility and accessibility, second only to a major freeway in their impact.

3. Benefits widely spread - The project does this primarily through the lower cost of rail travel. The three hour Sydney Canberra service in particular is also likely to be used by many businessmen in preference to driving or flying.

4. National in Character - The project links Australia's four largest state capitals with each other and the National Capital. The Stage 1 inauguration can be tied into national Bicentennial celebrations, including the opening of the new National Parliament House.

5. Geographical Relevance - The project links the most densely-populated centres and (in Australian rural terms) the most populous rural centres in the country. Over 60 per cent of Australia's population is directly served by the Bicentennial High-Speed railway concept.

6. Wide Application - There is already a general trend in NSW back to intercity rail. The N.S.W. Express Passenger Train is expected to stimulate it. The principles of selective line upgrading for higher passenger train speeds are widely applicable. The total project management skill and the technology of a fast 'rough-track' train are very exportable (to the U.S. for example).

7. Positive Economic Impacts - Improved passenger access always brings positive economic impacts.

8. Positive Environmental Impacts - Overall, any project which moves people off road (reducing automobile pollution, accident, traffic noise, and land use impacts) onto rail has a positive net environmental effect. The project is also designed to give the potential to move Hume Highway semi-trailer truck traffic between Melbourne, Albury-Wodonga, the Riverina and Sydney, and other transcontinental truck traffic between Sydney, Adelaide, the north and the west,

off road and onto rail as piggyback loading. A similar benefit would ultimately apply to Melbourne-Adelaide.

9. Positive Impacts in Terms of Energy - High-speed diesel rail (the Stage 1 situation) is significantly more energy-efficient despite its superior speed and comfort, than private automobile travel. High-speed diesel rail is much more energy-efficient than air. High-speed diesel rail is marginally less energy-efficient than a long-distance road coach, but because of the train's superior speed and comfort, is likely to attract from road and air far more patronage than the bus, and thus to have a more favourable impact. The ultimate, electric rail, is the ideal solution to conserving petroleum energy.

10. Attuned to Social Trends - The major social trend and expectation of increased mobility is unlikely to change, even though the cost of energy is likely to continue to increase. Consequently the ability of socially disadvantaged people, the unemployed and pensioners to pay for mobility by motor car is unlikely to rise in step with their expectations for mobility. These factors are helping to stimulate the current 4 per cent annual increase in intercity passenger rail patronage in N.S.W. Ground public transport and the railways in particular are likely to be increasingly called upon to meet this expectation of mobility. The project will facilitate and indeed stimulate it, in a more environmentally desirable form.

11. Involve all Engineering Disciplines - The Bicentennial High-Speed Rail Project will involve the civil, mechanical and electrical disciplines. The civil discipline will be involved in planning, survey, design, soil mechanics, hydraulics, concrete, structural steel, tracklaying and track maintenance applications.

Mechanical engineers will be involved in wheel/rail dynamics, rolling stock, diesel traction, air conditioning and car fabrication and maintenance; electrical/electronic engineers will apply their knowledge to traction electrical, power and control electronics, illumination, auxiliary supply, signalling and telecommunications. At the final electrification stage a wide variety of disciplines associated with all forms of electric power engineering will be applied by Australian Engineers.

Save for imported diesel engines and some electrical and signalling equipment - perhaps some 20 percent of Stage 1 cost - all the Project funds will be spent in Australia. The Government, non-Government and Consulting sectors will be involved at the individual, small-group and large-organisational level.

12. Showpiece of Technology - The ability to mount a 160 km/h service over what is (relative to Europe) a lightly-trafficked intercity main line would be a showpiece of Australian engineering technology. Australia leads the world in heavy-haul railway track-vehicle dynamics, and much of this work is directly transferrable to high-speed passenger railway engineering.

13. Capable of Implementation - The key requirements to acquire land, and construct the T-line and the three freight (gradient) deviations in N.S.W. can easily be achieved by 1988, provided a firm political decision is taken by the end of 1982. Construction of the trains in 2 to 3 years is entirely practical.

22. All that is needed to implement the Stage 1 project for the 1988 Bicentennial (January 1988) is the technical and political will to win.

ANALYSIS

23. While essentially preliminary, this proposal has been analysed in sufficient detail to define engineering and operating practicalities and to seek out any fatal flaws. A number of very eminent experts have been consulted and made suggestions that resulted in modifications to an early (October 1981) set of proposals. The analysis takes due account of local and overseas practice, known plans and trends, and the findings of a number of previous relevant projects, studies and other documents (not all published). These studies include:

- the N.S.W. Express Passenger Train Project;
- the Australian Main-Line Railway Upgrading Program;
- the Sydney-Melbourne Railway Electrification Study;
- Sydney Area Coal Transport Studies;
- the Lonie Report recommendations;
- understandings reached between the Department of the Capital Territory and N.S.W. for improvement of passenger rail services between Sydney and Canberra;
- the Major Airport Needs of Sydney Study;
- preliminary engineering examinations by the Department of the Capital Territory for new railways to Canberra;
- various proposals and internal studies within the State Rail Authority of N.S.W. and VicRail;
- correspondence with manufacturers.

The proposal also uses other basic data including:

- maps;
- gradient, curve and track layout charts;
- working timetables;
- computer performance analyses for the standard N.S.W. 'XPT' train (two power cars, five coaches) on lines from Brisbane to Melbourne and Canberra;
- the results of limited field inspection and local knowledge.

COSTS

24. Preliminary cost estimates (in 1981 $A) have been made for the suggested Stage 1 of the project, proposed for completion in 1988. They are judged sufficiently accurate for appropriate submissions to the Prime Minister and to Cabinet and, with further analysis and refinement, for annual cash flow estimates.

25. Costs are listed in paragraph 8 and developed in detail in Appendices A (construction of the T-line) and C (provision of rolling stock). Cost offsets are identified and the net cost brought forward to paragraph 8. The basis of costing is conservative and initial estimates made in October 1981 have been reviewed and adjusted (upwards) as a result of later consultations. The rolling stock costs are based on firm quotations. Given careful contract management there is a good chance of achieving some savings on both major components of total project cost.

26. Only the proposals needed to achieve Stage 1 in parallel with other existing upgrading work have been costed and charged. Subsequent improvements, particularly line straightening and deviation will need very detailed examination and option analysis. Those on the key backbone section Sydney/Melbourne have been identified but not costed. Deadlines and limited resources have prevented a similar review of the Brisbane/Sydney and Adelaide/Melbourne lines and accordingly, no detailed indication of further time savings beyond Stage 1 (provision of high-speed rolling stock for these routes) has been possible. As such services are feeders to the central sector of the network any errors or extensions of journey time would not constitute fatal flaws in the network's success.

ENGINEERING PHILOSOPHY

27. The Bicentennial High-Speed Railway concept is oriented primarily at passenger traffic potential, in which role the existing links are quite inadequate or in the case of Melbourne-Canberra, in effect non-existent. The concept must nonetheless recognise the reality that the potential of perhaps six high-speed train services conveying thirty to forty carloads of people each way daily, would in no way justify construction of special high-speed routes. The new French TGV railway, for instance, will carry over twenty times the through traffic density of the Goulburn-Sydney section.

28. Even given the construction of an alignment appropriate for higher speeds, the same considerations apply in respect of the track maintenance standards. Even with rolling stock that imposes acceptable static and dynamic loads on the track, the frequency of maintenance needed to hold the 'line', 'top' and 'cross' of the rails increases rapidly with speed increases above 100 km/h,and very rapidly thereafter. The consequent extra costs are directly attributable to a decision to run the relatively few high-speed trains, even though most of the deterioration that has to be corrected will be caused by the relatively frequent slow-speed freight trains. This, too, imposes a 'sensible' maximum speed appropriate to the traffic density and mix.

29. While several European systems have set their standard 'high-speed' operation at 200 km/h, a value of 160 km/h is proposed for the Sydney-Melbourne-Canberra sections. This 160 km/h maximum is:

1. More consonant with the realities of track maintenance cost.

2. Equal to the maximum design speed of the N.S.W. XPT train, on tangent tracks maintained to existing N.S.W. main south line standards (as measured).

3. The maximum chosen by Sweden for certain main lines whose traffic densities and mixes more closely relate to the Tri-Capital route. The Brisbane and Adelaide links assume 115/130 km/h maxima.

30. The engineering philosophy must further recognise that the Railways concerned are primarily freight links. The Hume Railway's role is both interstate (mainly non-bulk) with some 60 per cent of the net tonne-km, and intrastate (mainly bulk) for the remaining 40 per cent. Some sections pass up to 4m net tonnes p.a. (northbound). Any developments proposed must, if they are to make financial sense, relate to improving the freight service or to cutting freight train operating cost. Improved service will be attained from improved clearances that will enable the railways to offer container capacities more competitive with the latest high-cube volume vans on road, and trailer on flat-car (TOFC, piggyback) service. Reduced freight train costs can be attained from easing the restricted-speed curves that waste diesel fuel, but particularly from grade-easing works at key locations and ultimately, from electrification of at least the Sydney-Junee sector.

31. The addition of a high-speed service to this particular freight railway is possible because:

1. The most difficult sections of the Hume Railway are double track.

2. The high-speed services will operate mostly by day, while the through freights run mostly overnight.

Nonetheless the concept of mixed operation will ultimately call for more generous provision of refuge facilities, some reversible 2-track operation and full centralised traffic regulation so that fast trains can overtake and pass the slow ones.

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32. A further factor needs to be borne in mind on mixed freight and passenger railways: the need for a compromise in respect of cant (superelevation) on curves. If freight trains are powered routinely to traverse a given curve at (say) 80 km/h but high-speed trains could traverse it at (say) 120 km/h, the cant selected must be a compromise, and a penalty paid in terms of low-side rail wear by the dominant freight trains and some passenger discomfort in the few high-speed trains. The limits are 50 mm cant excess for the freight trains and 110 mm cant deficiency for high-speed traffic. This is a potential problem in South Australia, which is less canted than N.S.W. (about 75 mm maximum).

km/h

POTENTIAL NEW CONSTRUCTION

33. In the case of the Hume Railway corridor, a number of major realignments, as distinct from local relocations have been examined, and engineering judgements made of their relative worth: see Table 4. Time prevented similar detailed analysis of the Brisbane and Adelaide lines.

34. In making judgements about these it was recognised that while it is always cheaper to build new in green fields than to work under or beside existing traffic, it is also very hard to justify completely new construction, priced at anything up to $2 million per route kilometre (double track) solely for 160 km/h operation, if the existing parallel track is adequately graded for economic freight operation at 80 - 100 km/h.

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TABLE 4 MAJOR NEW CONSTRUCTION CONSIDERED FOR CENTRAL ROUTES (SYD-MEL-CBR)

Option	Existing Section	Option Considered	Engineering Judgement			
			Stage 1	Stage 2	Worth Detailed Study	Ruled Out
1.	Sydney-Glenfield	New exit via Illawarra line and new Direct Southern Link, East Hills to Glenfield		X		
2.	Campbelltown-Marulan	New high-speed track beside, or in median strip of, the Hume Freeway				X(a)
3.	Picton-Mittagong	Upgrade the original Loop Line (steep grades but straight) as a high-speed route			X	
4.	Campbelltown-Goulburn	Selective straightening and regrading		X		
5.	Goulburn-Yass-Junee-Culcairn	By-pass with a new direct link Goulburn-Canberra-(area of) Tumut-Holbrook involving trans-montaine tunnel. Alternative to Option 9				X(b)
6.	Cullerin (near Goulburn)-Yass	By-pass with new railway via Yass River Valley (part of T-line)	X			
7.	Yass River Valley - North Canberra	Single track spur (part of T-line)	X			
8.	Yass-Albury	New high-speed track beside, or in median strip of, proposed Hume Freeway				X(a)

TABLE 4 (Continued)

Option	Existing Section	Option Considered	Engineering Judgement			
			Stage 1	Stage 2	Worth Detailed Study	Ruled Out
9.	Yass-Junee	Replace by new high-speed railway via Gundagai (alternative to Option 5)				X(c)
10.	Yass-Junee	Selective straightening and regrading		X		
11.	Junee-Albury	Selective regrading at three points (for freight trains)	X			
12.	Somerton - North Melbourne	New direct standard gauge link, to replace one track of Upfield-Coburg-North Melbourne broad gauge suburban electric railway, which was recently reprieved from closure. Problem of many level crossings.			X	

Notes:

(a) Rejected because of grades, which make it unsuitable for the major traffic and hence reduce the economics.

(b) Rejected because of cost. A similar relocation of the more heavily-trafficked Hume Highway has already been ruled out on these grounds.

(c) Rejected because no better basic route (as distinct from a series of relocations) could be found.

SPEED VERSUS RELOCATION COST

35. To put each proposal for building a completely new railway or sections thereof into proper perspective, it is worth noting how long it takes a train to cover 100 km of line at various average speeds (Table 5).

TABLE 5 TIMES AND TIME PENALTIES TO RUN 100 KM

At average speed of (km/h)	run time, minutes	Time penalty relative to 160 km/h, minutes
160	38	NIL
130	46	8
120	50	12
110	55	17
100	60	22
80	76	38

36. This table can be used as a guide for pragmatic assessment of the worth of new construction, relocations and track upgrading. Using it, and bearing in mind that XPT is a high-performance train, a number of observations can be made.

1. Whenever a basically favourable alignment makes it practical there is a real time payoff from raising the existing 115 km/h straight tracks to the full XPT potential of 160 km/h.

2. At the opposite extreme, it is essential that the worst curves - and on the Hume Railway there are many 90, 80 and even 70 km/h curves - be eliminated to raise the potential of existing 80 km/h sections through the mountains to 100 km/h.*

* the Brisbane - Sydney line is even worse over almost its entire length.

3. There is relatively less to gain from a general attempt to raise 100 - 110 km/h sections up to 120 or 130 km/h, than from:

   - eliminating the very worst sections by selective relocation to the highest standards and accepting high cost; while

   - focussing elsewhere only on those few curves that are 'limiting', i.e. substantially below the sectional average speed capability of an XPT-type train.

STAGE 1 SPECIFIC NEW CONSTRUCTION PROPOSALS (SYDNEY-MELBOURNE-CANBERRA)

37. The following comments are offered on the proposed new sections of line and on the relocations and associated improvements judged necessary to achieve Stage 1 of the project (option numbers relate to Table 4).

Options 6 and 7, the T-Line

38. This new construction is central to the whole project. It involves a new section of the Hume Railway (the top of the T) and a new Canberra connection (the leg of the T). The top of the T by-passes one of the most hilly (1 in 40) and sharply curved (44 curves under 500m radius) sections of the Hume Railway with a new 160 km/h section of approximately the same length but with 1 in 75 grades and 2000m radius curves. The leg of the T reduces the length, curvature and gradient of the Canberra Branch as well as moving its junction with the main line considerably closer to Melbourne.

39. The T-line has four specific purposes:

1. To reduce the journey time and energy intensity of the Sydney-Melbourne passenger service.

2. To improve the Sydney-Canberra service by replacing two circuitous branch lines by a direct, high-speed main line.

3. To make possible a credible Melbourne-Canberra service.

4. To permit standard single-engine goods loads to be extended from Goulburn south to Yass. Coupled with other arrangements, the T-line could reduce double heading from the existing Sydney-Albury * (647km) to Yass-Junee (167km), a cut of 74 per cent in total loco-km. It will also permit diesel fuel savings of some 40 per cent on the N.S.W. sector of the interstate freight run and permit the closure of the Goulburn locomotive depot (which is overdue for rebuilding).

40. The main obstacles to the route suggested for the T-line are the Cullerin Range, the Mundoonen Range and the Yass River. The Change of elevation within the length of the deviation would be over 250m and for the spur, about 100m. There would be two major bridges on the main line. In addition, there would be considerable earthworks and viaducts, but no tunnels appear necessary. Yass would have a new station on the southern edge of the town (the present Yass Junction is 5 km distant).

41. A route which appears practical has been identified and the costs of the Hume section of the T-line have been estimated at $89.7m (1981) including land acquisition and stations. See Appendix A.

Canberra Connection

42. The existing rail link to the National Capital is over a branch of a branch; it is heavily graded, tortuously curved and so roundabout that it is quite impracticable for Melbourne traffic (even a night sleeping car service was withdrawn many years ago). If the National Capital is to perform its function properly, first class transport links with other Australian cities are essential and overdue. In terms of rail links, neither the National Capital nor the State Capital cities to which it is connected should have to suffer the inadequacy of a branch of a branch line.

43. In contrast, the new T-line would bring the main Hume Railway within 45km of Canberra via a similarly graded and curved 160km/h single-track spur. A passenger terminus for the diesel high-speed trains is envisaged at North Canberra in the vicinity of the showground.

44. The inter-city bus system should desirably, be linked with the proposed new terminus, from which spur lines could eventually give freight access to industrial areas such as Mitchell and Fyshwick.

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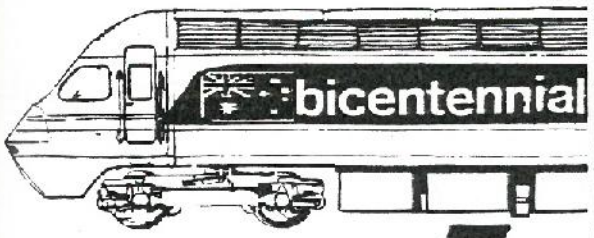
* Because of the extensive double-heading required at present it is a proposition to through-work two units all the way from Sydney to Albury. The reduced requirement after construction of the T-line would for the first time make it operationally practical to reduce through double heading to a short bank-engine type operation.

CANBERRA

PLATFORM 1
Departs 16:15

Canberra Train No 58
National Capital Express
6½ hr XPT Service



ALBURY
WAGGA
JUNEE
COOTAMUNDRA
CANBERRA

SPACE AVAILABLE

MELBOURNE

45. A link to Fyshwick could be made via the Majura corridor. This would permit Queanbeyan and Cooma to be served via Canberra and give N.S.W. the option to close the Goulburn (Joppa Junction) - Queanbeyan section with its heavy grades, tortuous curves and obsolete signalling.

46. The cost of the Bicentennial connection to Canberra Stage 1) is estimated at $37.3m (1981) including land and the temporary terminus. Appendix A.

47. The T-line would reduce the rail distance from Canberra to Sydney by about 12km and that to Melbourne by about 114km.

48. More important than the improvement in speed and decrease in distance would be the creation of a modern service to and from the National Capital which would place it firmly on the main line between the nation's two principal metropolitan areas. Few other single actions could do more to reinforce the status of the National Capital as the heart of the Nation.

49. Improvements are likely to involve (for high-speed operation):

- construct 68km of new 2-track railway to 160 km/h standards from Cullerin (South of Goulburn) to a point south of Yass Junction;
- construct new remotely-controlled triangular junction in Yass River Valley for the North Canberra Branch;
- provide new passenger platform and freight siding connection at Yass (for TOFC)
- adopt clearances for TOFC and electrification for new line (for freight);
- provide siding to add extra locomotive units to southbound freight trains at Yass.

50. Closures and Savings - Close and abandon existing 2-track railway Cullerin/Yass Junction. Avoid need for double-heading Goulburn/Yass. Close Yass Junction and north end of Yass tramway including a dangerous level crossing. Close Goulburn diesel loco depot, which is overdue for modernisation. Avoid need to raise over-line road bridges when electrifying later.

Option 11, Junee-Albury

51. This section generally comprises long, straight sections with the potential for sustained 160 km/h operation. Two minor relocations are proposed to achieve the major freight train operating economies that would result from easing the ruling grade from 1 in 40 to effectively 1 in 66.

52. Improvements would be (for high - speed operation):

- No realignment is envisaged;

(For freight trains):

- regraded ascent from Junee to Harefield;
- regraded ascents and descents into Murrumbidgee River Valley at Wagga (two deviations);
- 1 in 66 grades throughout.

$8m has been allowed for these three relocations, which are essentially earthworks.

53. These three relocations would, coupled with the T-line, reduce double heading of standard goods loads to the Yass-Junee section alone, and concentrate the extra loco activity into a single existing depot at the major junction of Junee.

STAGE 2 CONSTRUCTION PROPOSALS

Option 1, Sydney to Glenfield via 'Direct Southern' Suburban Link

54. The present Main South exit from Sydney is over busy suburban routes from Sydney Terminal, west to:

- Strathfield (6 tracks);
- Lidcombe (4 tracks - including a delay-prone flat) crossover junction) and thence south west over only 2 tracks to
- Liverpool and Campbelltown. Electrification ends at Glenlee, slightly south of Campbelltown.

The route is extremely congested in the peak period. Computer simulation shows a theoretical XPT running time of 36 minutes to Campbelltown (91 km/h start to stop) but congestion means that the Canberra-Monaro Express time of 46 minutes is about the best that can be attained in practice. Long-distance trains conflicting with the suburban peak are frequently delayed outside Sydney; because there are no overtaking tracks, a long-distance train caught behind an 'all stations' suburban must run to essentially the surburban 'all-stations' schedule from Strathfield to Campbelltown and vice-versa. The effect upon quality of service can be disastrous and a solution is proposed for Stage 2.

55. A far better express rail exit from Sydney is via the less-congested Illawarra line to Tempe, thence via the existing East Hills branch and a newly-constructed route crossing the Georges River and running through Crown land to join the main south at Glenfield, well clear of the congested suburban area (see diagrammatic map). The new 'Direct Southern' suburban link has long been planned as a suburban improvement scheme to separate the Western and Southern traffic streams. It is understood that some land has already been acquired and the basic route planning done. The line would be electrified at the N.S.W. suburban-inter-urban system standard of 1.5 kV D.C.

56. The link would also be useful for southern freight traffic, providing a more direct route to Rozelle and Darling Harbour, an alternative route to Enfield, improving the separation of goods and suburban traffic, reducing the passage of heavy freight through built up areas and (with a triangle at Tempe) providing a shorter route for coal to Port Kembla.

57. The Direct Southern route is also relevant to the preferred location for a Second Sydney Airport in the South West zone. Work done for the Major Airport Needs of Sydney study has shown that only an express electric rail link can provide the needed fast access to this relatively remote airport site, and that such a rail link should follow the Direct Southern proposal and not the congested Western Line (it could also connect with a Kingsford Smith Airport link at Tempe).

58. The Direct Southern link, aligned for 130 km/h and having a grade separated junction with the Main South would thus be very advantageous to transport developments planned in the Sydney region. Such a link can be justified in terms of savings of time, because in addition to freight four categories of rail traveller are involved: suburban, South line inter-urban, airport and inter-capital. The freight benefit has been mentioned in paragraph 56 above.

59. The proposed Direct Southern suburban rail exit from Sydney is thus:

- a relevant development, entirely in phase with existing established needs;
- mutually supportive of other plans and proposals;
- able to offer a reliable running time, Sydney-Campbelltown of 32 minutes.

60. Improvements judged necessary for Stage 2 are likely to involve (all for high-speed operation and punctuality):

- a third and possibly a fourth track from Tempe to Riverwood (10.7 km);
- two extra tracks between Riverwood and East Hills (6.5 km);
- a new 3-track direct link from East Hills to Glenfield (about 9 km);
- grade separated junctions at Glenfield.

Given airport and suburban functions, probably one-quarter to one-third of the cost would be attributable to Stage 2 of the High-Speed Railway Project.

Glenfield to Picton

61. This 2-track section of railway is generally well aligned with long stretches suitable for 130 km/h and some 160 km/h running; only in the foothills of the Razorback Range on the final approach to Picton, does curvature restrict speeds to 90 km/h.

62. Improvements under Stage 2 are likely to involve

(for punctuality);

- an extra loop for fast trains to overtake suburban and goods trains between Glenfield and Campbelltown;

(for high-speed operation);

- minor realignments to 120 km/h standards in the Picton area, where they are cost-effective. (The Maldon Cement works curves are particularly bad);

(later for TOFC operation);

- provide Sydney region TOFC loading facility, with freeway access, in Campbelltown.

No closures are envisaged.

Option 3 Picton to Mittagong

63. The present climb to the Southern Highlands is via a 2-track line dating from World War I and graded at 1 in 75. Frequent sharp curves hold even XPT speeds down to around 90 km/h. There are five tunnels and frequent overhead road bridges that obstruct overhead clearance for electrification, and that exclude the TOFC option.

64. There is also the little-used, more steeply-graded (1 in 30) route, namely the Picton-Mittagong Loop Line originally cut by John Whitton in the 1860s. This has long straight sections, no tunnels, four overhead bridges and better potential as both a high-speed and as a TOFC route despite its severe grade.

65. The Loop Line would need to be realigned for about 5 km at its Picton end, where there are several sharp curves of 320 and 400 m radius. Thereafter, the alignment permits virtually unrestricted speed. Uphill, the train would climb at its balancing speed on gradients which steepen to 1 in 30 to Hill Top; descending, 120 km/h would be a prudent speed.* XPT has modern electro-pneumatic disc brakes engineered for 200 km/h stops. Safe high-speed operation is possible despite the grades.

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* the French TGV line operates at 260 km/h on 1 in 29 grades

66. Freight traffic would continue to use the present less steep but more highly curved line.

67. Improvements judged worth further study involve:

(for high-speed operation):

- new junctions at Picton and Mittagong;
- relocation to ease curves at Picton end;
- replace light rail on the Loop Line;
- replace one short, low, timber-trestle underline bridge;
- replace four over-track road bridges;
- lower track in box culvert subway under present Hume Highway at Mittagong;
- clearances for TOFC and 25 kV A.C. electrification.

68. Closures and Savings - Reduced to freight railway status, the potential exists to single long stretches of the existing 2-track main line. The single-tracking option also avoids costly new tunnel works (daylighting, deviations) for later electrification clearances and permits realigning of curves on a wider roadbed.

Mittagong to Exeter

69. The final climb from Moss Vale to Exeter (summit) at 1 in 66 includes a 325 m curve with a 70 km/h speed restriction. Located right at the foot of the hill, it prevents 'rushing' the grade but can be by-passed by recommissioning the original straight alignment on a heavier 1 in 40 grade, for high-speed traffic.

70. Improvements are likely to involve:

(for high-speed operation):

- recommission original 1 in 40 climb, Werai-Exeter

(for TOFC and later electrification)

- lower floor and recommission disused Gib Tunnel;
- replace (or modify wind bracing of) the rail bridge over the Illawarra Highway at Moss Vale;
- raise clearances under low briges.

Exeter to Goulburn

71. The 2-track Southern Highlands section is generally well aligned, with potential for sustained 130 km/h running and a few reductions to 100 km/h; minor deviations or recommissioning of the original route for high-speed traffic may be necessary (e.g. around Marulan).

72. Improvements are likely to involve

(for high-speed operation)

- selective curve straightening;
- additional refuge sidings (or 2-way reversible workings) for overtaking movements;

(later, for TOFC clearances and electrification):

- replace or raise several over-line road bridges.

Options 5 and 6 Goulburn to Yass

73. In addition to the T-line project already implemented in Stage 1 some useful straightening and regrading could be undertaken between Joppa Junction and Cullerin as part of Stage 2.

Yass to Junee

74. Like the preceding section, the existing Yass-Junee line (2 tracks) has the major disadvantages of sharp curves and steep grades. Unlike the preceding section, however, there is no real alternative route short of constructing an extremely expensive direct transmontaine railway or tunnel. The general pattern is a railway that crosses a number of ridges with 1 in 40 ascent (dating from the 1870s) on the Sydney side of each ridge, and a 1 in 66 deviation* on the Melbourne side. Preliminary work suggests prospects for useful improvements through deviations as set out below.

75. Improvements worth study would involve deviations or straightening at:

- Goondah (5 km new construction);
- Illalong Creek (4 km);
- 356 km (0.7 km);
- 362 km (0.5 km);
- 364 km (1.2 km);
- Galong to Cunningar (14.5 km);
- Harden/Demondrille (12.7 km);
- Nubba (2 km);
- Jindalee (12.5 km).

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* The latter were put in mostly between the wars, to ease the grade against slow, heavy steam-hauled wheat trains bound for Sydney: the price was a longer route with more severe curvature.

As well as straightening and grade easing these deviations have the potential to save over 11 km of distance. The benefit is a single engine freight load from Sydney to Melbourne.

76. Associated Railways - Complementary minor clearance works on the Junee/Narrandera/Roto link would provide an East-West through TOFC route from the Sydney region (Campbelltown) to Adelaide, the Iron Triangle, Darwin and Perth.

Junee to Albury

77. Paragraphs 51-52 addressed Stage 1 regrading. Other Stage 2 improvements would involve:

1. Clearances for TOFC and 25 kV A.C. electrification (final stage)

2. TOFC terminal in the Junee/Wagga region - a major centroid of trucking activity - as determined by market analysis.

Albury to Somerton

78. VicRail's original broad gauge Northeast Main Line is paralleled by the 1962 Standard Gauge Link throughout, on essentially similar curves and grades. Both lines are single track north of Heathcote Junction (near Seymour). They have the potential for sustained 160 km/h running when the existing 47 kg/m rail is replaced by heavier track (planned by 1988).

79. There have also been proposals to convert the entire 1 600mm broad gauge system north of Heathcote Junction to the 1 435mm standard gauge, thus affording considerable operating economies. This is desirable, but not essential for the Bicentennial High-Speed Railway Project. However, the incorporation of several double-track stretches on the through line would enable non-stop crossing and overtaking movements, materially improving flexibility and punctuality.

80. Having crossed the Murray and passed Wodonga, the high-speed trains would run across the plains at 150 - 160 km/h with minor reductions near Chiltern, Glenrowan and Benalla (stop). On the range crossing south of Seymour more 130 km/h running is involved, followed by further sustained 160 km/h to Broadmeadows.

81. Existing grades permit momentum operation of 1 800 t freight trains with one diesel locomotive unit and do not need to be eased.

82. Improvements would be

(for high-speed operation):

- no realignment necessary;

(later, for TOFC and electrification):

- raise clearances on overhead bridges (few) and signal-gantries (many);
- provide Melbourne Region TOFC terminal facility, with freeway access, in the Broadmeadows area.

Option 9, Somerton to North Melbourne

83. The present standard-gauge entry from Somerton and Broadmeadows to Melbourne (Spencer Street) is circuitous: south west to Tullamarine and Sunshine, thence south and east via Footscray, Dynon Junction and the flyover into Spencer Street (interstate side of station).

84. The route is uncongested, but nonetheless relatively slow - 100 km/h to Sunshine and with decreasing permitted maxima thereafter, down to a tortuous 40 km/h final approach through the yards to Melbourne. 1.5 kV D.C. electrification of this track was recommended in the Sydney Melbourne Electrification Study, cross-fed from the broad gauge suburban electrification.

85. The Victorian Government has proposed, but deferred, closure of the (relatively) little-used broad gauge suburban electric railway from North Melbourne through Coburg to the automobile factory complexes near Broadmeadows (which are also served by a standard gauge spur south from Somerton).

86. Study suggests benefits of up to 10 min time saving from converting one of the two tracks of this more direct route into Melbourne to standard gauge. A major problem exists, however, from very frequent level crossings. Use of this route is not assumed in the time calculations but the case merits detailed engineering examination. It pivots upon the future role of this suburban railway and the level crossing issue.

OTHER PROGRESSIVE IMPROVEMENTS

Track

87. The main line railways concerned are progressively being rehabilitated with long-welded 53 and 60 kg rail and resilient fastenings, on plated timber or concrete sleepers with upgraded ballast and drainage.

88. A track structure of this standard is, given maintenance of an adequate top and line, basically suitable for 160 km/h operation. Curvature rather than basic track structure is the critical issue.

Crossing Loops

89. Current upgrading for freight traffic includes providing more crossing loops and extending existing ones on the single-track sections south of Junee. These are needed for crossing overnight inter-capital freight movements. With more daylight high-speed traffic they are also relevant to the problems of refuging slow trains. Such traffic will tend to be grain and non-express goods service.

Signalling

90. The existing obsolete mechanical signalling and block telegraph working is already being replaced by automatic block, colour light signals and Centralised Traffic Control. In N.S.W., provision is being made for electrification. This work will parallel Stage 1.

91. Given extensive 160 km/h operation on the Hume railway and the T-line it is desirable that adverse signals, major yards and any potentially dangerous speed-restricted curves be protected by a suitable form of automatic warning system, backed up by a positive, automatic train-stopping feature should a restrictive indication be ignored by the driver and overrun. This would be included in Stage 2.

Train Radio

92. Ground-to-train radio is an essential feature for efficient routine operation, and an invaluable emergency aid; it is envisaged in Stage 2.

ELECTRIFICATION

93. Full electrification is envisaged as the final stage of the Bicentennial High-Speed Railway Project. In the case of the Hume Railway, electrification was the subject of a comprehensive study in 1980 which found that over and above an 'improved diesel railway' (Stage 2 of the present proposals would be superior to this base case):

- fixed electrification works Sydney to Melbourne would cost $258m (1980 $);
- 43 electric locomotives (an extra $86m) would release 53 diesels worth $58m;
- starting at the Sydney end, electrification would take:
  - 4½ years to reach Goulburn (1985-1990);
  - another 2 years to Junee (1992);
  - another 2 years to Albury (1994);
  - another 2 years to Melbourne (1996);

- 1994 would be practical were Albury approached from both directions;

- the existing Canberra Branch line (via Queanbeyan) would not be an economic proposition to electrify;

- a deviated Hume Railway should be examined before money is spent electrifying existing poor alignments.

94. The maximum economic benefits of electrification are for freight trains. Broadly speaking, the project is already quite economic to Goulburn, and a break-even proposition on to Junee. Beyond Junee its net benefits depend upon the escalation of diesel fuel and achievable increases in market perforamnce for freight traffic. This finding was confirmed by an independent ARRDO study.

95. Electrification would cut the freight train journey from Sydney to Melbourne via the existing line from 18 h with 1 000 - 1 250t trains, to 14 h with 1 400 - 1 600t trains. (The T-line would cut this further).

96. In passenger terms, electrification would not cut the diesel-electric XPT journey time by more than a few minutes. The essential limits are curvature and maximum speed, rather than electric versus diesel-electric power van output. Nonetheless, electrification would reduce XPT fuel and traction maintenance costs very substantially, and would also improve reliability and punctuality.

97. Electrification from Sydney to Junee via the T-line would:

1. Probably make it economic to electrify the much shorter North Canberra spur (it could be fed from the main Hume Railway).

2. Permit the Sydney-Canberra XPT sets' diesel-electric power vans (plus spares) to be replaced by equivalent dual-voltage electric power vans, thus effecting considerable operating economies and cascading these diesel vans for other XPT service growth elsewhere. Alternatively the vans could be modified for straight-electric operation.

3. Probably permit an environmentally acceptable (lower noise) tramway-type operation down the Northbourne Avenue median strip into the Civic Centre.

98. Electrification right through to Melbourne would release a further eight valuable diesel-electric power vans (plus spares) for other services.

99. Electrification proposals were supported by the Commonwealth at the political level. N.S.W. and Victoria were then only lukewarm. The Bicentennial High-Speed Railway Project is not predicated upon electrification, but does make full provision for it. Electrification is treated as a separate issue from other upgrading.

NEW PASSENGER TRAINS

100. The passenger trains proposed are modern high-speed non-tilting stock such as the N.S.W. Express Passenger Train (which uses a proven British technology) or equivalent.

101. These trains cost $8m each and comprise five modern day coaches, including a buffet car, mounted on modern bogies and marshalled in a push-pull configuration between two streamlined 4-axle diesel-electric power vans (i.e. special locomotives) each powered by a 1 680 kW V 12 engine (two plus five configuration).*

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* A shorter 'one plus three' set is proposed for the Adelaide-Melbourne service.

102. These trains weigh 334t, seat 310 people and have a power to mass ratio of 10 kW/tonne. Coupled with electro-pneumatic disc brakes, and a 160 km/h maximum speed, this gives them the potential for extremely high performance compared with existing conventional loco-hauled 115 km/h trains. The performance calculations are based on a 'two plus six' set, giving extra confidence in the times quoted. The above 'two plus five' consist, designed for 1 in 30 ruling grades, thus has the potential of being expanded to 'two plus six'. The XPT has operated 'one plus three' on maximum grades of 1 in 40 equivalent to those on the Adelaide-Melbourne route.

103. If the proposed freight-train oriented improvements are effected on the Hume Railway to ease the ruling grades to 1 in 66, the Sydney-Melbourne-Canberra XPT sets can be up to 'two plus eight', affording considerable extra seat capacity and specific fuel economy.* Such matters are relevant because a 3-hour Sydney-Canberra service has considerable commerical potential for the inclusion of an extra-fare Executive Class coach for parliamentary, business and government traffic. XPT is easily modified to permit coupling two 'two plus five' or 'two plus six' sets to form longer trains of ten or even twelve passenger coaches as traffic develops. It would be prudent to equip XPT with stout cow-catchers for 160 km/h operation outside N.S.W.

104. XPT-type stock would be thoroughly proven in N.S.W. by the time it was ordered (in 1984) for the 1988 Bicentennial. It would represent a 'minimum risk' train to exploit the new railway. Other options also exist, see paragraph 15.

PASSENGER TIMETABLES

Journey Times

105. Appendix C analyses practical journey times. It is based on a computer printout for full-power 'two plus six' XPT running at 20 percent overspeed on existing curves on the existing SYD-MEL, SYD-CBR and BNE-SYD routes (in both directions). Trials of the half-set (one plus three) in September 1981, during which XPT attained 183 km/h, have shown that the train can match or exceed the contract performance reflected in the computer simulation. Approximate stop times, recovery margins and crossing allowances have been added in Appendix C to develop practical traffic schedules.

* This excludes, however, the use of the Picton-Mittagong Loop line option, where the grade is 1 in 30.

Running times over the proposed T-line have been calculated with a desktop computer.

106. The ADL-MEL schedule is a manufacturer's estimate for the 'one plus three' half-set. While conservative and judged attainable it has not yet been modelled on the computer and might well be improved upon.

The key findings summarise thus:

Existing Track	Existing Train	Computed XPT	Stage 2 XPT
Sydney-Melbourne	12 hr 35 min	Under 10 hr	Under 9 hr
Sydney-Canberra	4 hr 44 min	Under 4 hr	Under 3 hr
Melbourne-Canberra	NO LINE - NO SERVICE		Under 6½ hr
Brisbane-Sydney	15 hr 44 min	Under 13 hr	Under 12 hr
Adelaide-Melbourne	13 hr 30 min	About 9 hr (a)	Under 8 hr (a

Note (a) Not yet modelled on the computer.

107. Bicentennial Schedules (Stage 1)

The above speed capability offers the following potential timetables (the workings are shown in Appendix C, Diagram 1)

SYDNEY - MELBOURNE (9½ hours)

SYD	Dep.	08.00	12.00	MEL	Dep.	08.00	12.00
MEL	Arr.	17.45	21.45	SYD	Arr.	17.45	21.45

SYDNEY - CANBERRA (3 1/4 hours)

SYD	Dep.	06.15	15.15	18.30	CBR	Dep.	07.15	10.30	14.
CBR	Arr.	09.30	18.30	21.45	SYD	Arr.	10.30	13.45	22.

MELBOURNE - CANBERRA (6 3/4 hours)

MEL	Dep.	07.00	CBR	Dep.	15.15
CBR	Arr.	13.45	MEL	Arr.	22.30

108. A pool of six train sets is needed for the above schedule.

109. The Brisbane run is too long for 'out and back' workings in a day and will require two train sets. These services can be scheduled to connect with the Aurora from and to Melbourne, as follows:

BRISBANE - SYDNEY (13 hours)

BNE	06.30	SYD	09.30
SYD	19.30	BNE	22.30

110. For the Adelaide run an initial one-way run each day is envisaged using two short sets. Again the Aurora provides the Sydney connection.

ADELAIDE - MELBOURNE (about 9 hours)

MEL	Dep.	10.00	ADL	Dep.	10.00
ADL	Arr.	19.00	MEL	Arr.	19.00

Stage 2 Schedules

111. A speed-up of journey times allows not only faster service, but several extra services from a marginally - increased number of train sets. (See Appendix C Diagram 2).

SYDNEY - MELBOURNE (9 hours)

SYD	Dep.	06.05	11.00	14.00	MEL	Dep.	06.00	08.00	13.30
MEL	Arr.	15.05	20.00	23.00	SYD	Arr.	15.00	17.00	22.30

SYDNEY - CANBERRA (3 hours)

SYD	Dep.	06.00	16.00	19.00	CBR	Dep.	07.00	10.00	19.30
CBR	Arr.	09.00	19.00	22.00	SYD	Arr.	10.00	13.00	22.30

MELBOURNE - CANBERRA (6½ hours)

MEL	Dep.	07.00	16.15*		CBR	Dep.	06.00	15.00
CBR	Arr.	13.30	22.45		MEL	Arr.	12.30*	21.30

* Adelaide connection

One extra set would enable two extra services to be worked on this triangulated pattern of services.

BRISBANE - SYDNEY (Under 12 hours)

BNE	Dep.	07.30	SYD	Dep.	10.00
SYD	Arr.	19.30	BNE	Arr.	22.00

Again two sets are needed

ADELAIDE-MELBOURNE (8 hours)

ADL	Dep.	07.15	14.00		MEL	Dep.	07.00	13.30*
MEL	Arr.	15.15*	22.00		ADL	Arr.	15.00	21.30

* Canberra connection

112. With innovative timetabling there are many other possibilities. For example, the morning Canberra-Sydney service could be worked (via Strathfield) directly through to Brisbane thus:

CBR 07.00, SFD 10.00, BNE 22.00 approximately

Sydney area passengers would join at Campbelltown, Liverpool, Strathfield or Hornsby, as convenient. Melbourne passengers (ex Aurora) would change at Campbelltown. Similar possibilities exist for the reverse trip:

BNE 07.30, SFD 19.15, CBR 22.15

The above assumes provision of some full reclining chair-car service on the Aurora.

113. In the case of Adelaide, connections to and from Canberra are possible in a single day. After eventual conversion of the ADL-MEL line to standard gauge, these connections can be replaced by a through working. Through-train operation over a break of gauge would be possible were TALGO-type equipment used behind XPT power vans (which would have to be changed).

114. Other centres that are relevant for direct connections with the above Bicentennial High-Speed Train services include:

N.S.W.
- Inter-urban electric services to Newcastle, Port Kembla, Blue Mountains;
- Canberra - Wollongong - Sydney (scenic tourist connection);
- XPT services to Central, Western and New England areas.

VICTORIA
- "Tangerine Train" services to principal country centres;
- Geelong inter-urban services.

S.A.
- Connections from Port Pirie to and from Melbourne (via 14.00 ADL-MEL, and 07.00 MEL-ADL. After gauge - standardisation these could run through);
- "New Ghan" connection.

W.A. . Indian Pacific and Trans-Australian connections.

QLD . 'Lander train connections (assuming standard gauge into Roma Street and somewhat later evening departures).

Skilled timetablers would be able to develop superior 'network' solutions to the above and extract the maximum utilisation from equipment.

115. The points that matter are:

1. The Bicentennial High Speed network breaks the nexus of 'a night, a wait, and a day' for most intercapital railway connections in Eastern and S.E. Australia today.

2. The services must be planned as a total network, including night trains where retained.

3. The services must be marketed as a total package and operationally co-ordinated from a central point. There is only one organisation that can do this: Railways of Australia.

Operated thus and marketed as a coordinated network, massively increased patronage is assured.

116. The new trains would be maintained in the new Express Passenger Train Maintenance Depot at Marrickville, N.S.W., with necessary outstation inspection at Brisbane, Canberra and Melbourne, according to standard XPT maintenance procedures. Broad gauge trains would be maintained at Melbourne and Adelaide.

FREIGHT TRAINS

117. No change to freight train equipment is envisaged.

118. For maximum exploitation of the Hume Railway, most diesel locomotives would be high-powered 2 460 kW units, e.g. Vic Rail C Class, N.S.W. Clyde units on order. The standard load would apply throughout, with an assisting diesel put on (under multiple control) between New Yass and Junee in each direction.

119. After electrification to Junee it would be most economic to through-work all diesels from Junee to Melbourne with single loads.

120. Conventional wagon and piggyback TOFC technology is envisaged in all cases.

PROGRAMME FOR ACTION

121. It is not necessary to call for further reports on the desirability of upgrading the rail links concerned. The Sydney-Melbourne-Canberra line in particular has already been studied to death, and this report reflects the results of these and other studies.

122. What is necessary - and it can be done safely on the basis of existing knowledge - is the political commitment to build the critical T-line, to ease three grades in the Riverina that have (for want of relatively trivial expenditure) been a major operating nuisance for a century, and to purchase the trains needed to run a Bicentennial Express service far, far better than anything previously seen in this country.

123. These three factors, and the commitment to spend are the key decisions.

124. Given the commitment, the detailed design of the T-line and the deviations can be undertaken quickly, and other related action taken. The Stage 2 improvements and ultimate electrification options, which will need careful analysis, can follow later. And much of the signalling and track upgrading will happen in any event.

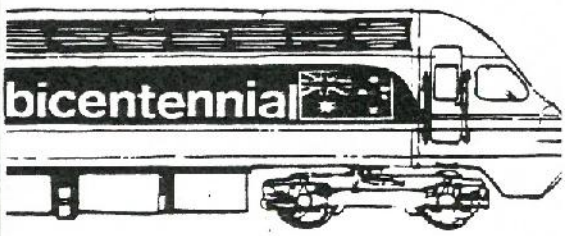
125. The key decision needed today is to build the T-line, the three freight deviations and the trains. Given a positive approach to this, the Bicentennial High-Speed Railway can indeed be operating by 1988, as an Engineering Project of widespread and national benefit, in which all Australians can be justifiably proud.

SYDNEY

PLATFORM 2
Arriving 10:15 ON TIME

From CANBERRA
GOULBURN
MOSS VALE

Train No 38
Bicentennial Limited
3 hr XPT Service



CANBERRA

APPENDIX A

THE T-LINE CONSTRUCTION AND COSTS

SUMMARISED FIGURES

	CULLERIN - YASS	CANBERRA SPUR
Tracks	Double	Single
Route	67.75 km	43.5 km
Total Cost	$99.9m	$37.3m
	$137.2m	
Less Offset	$10.2m	
NET COST	$127m	

ASSUMPTIONS AND UNIT COSTS

Land Acquisition

Acquisition of a 40m wide strip of land was assumed along the double track section and 30m strip along single track. An average value of $6 000 per ha was assumed. This is a generous allowance for land in this area and also assumes that all land crossed is in private ownership, when in fact some would be Crown land. No additional allowance was made for land cut off from a property. Allowance was made for stations and sidings.

Earthworks

Maps were 1:50000 with 20 m contour intervals.

Average batter slope 2:1

Average height of cutting or embankment taken at 2/3 of maximum height.

Average width of formation : 13 m (double track)
9 m (single track)

Balanced cut and fill assumed.

Allowance of \$3.80 m^3, cut, filled and compacted. (Based on Hume Highway costs in the Goulburn-Yass area of \$3/m^3 in 1980, inflated to end 1981 prices, and with 10 per cent added to allow for the increased probability of rock in cuts that are of greather average depth.

SPUR

Allowance of 2 per cent for drainage.

Because the use of 20 m contours tends to hide the effect of minor earthworks which may be significant over long distances it was further assumed that 50 per cent of the distance indicated as being at ground level actually involves earthworks of an average height of 5 m.

Bridges

Creek crossings: \$85 000 per culvert

Swamp crossings: \$340 000 i.e. 4 culverts

River crossings: \$500 000 each

Minor road bridges: \$400 000 each (includes an allowance for some rearrangement of local roads to reduce the number of railway crossings). It was assumed that all crossings would be by bridge i.e. no level crossings.

Highway Crossings: Single carriageway \$0.9m

Dual carriageway \$1.7m

Civil engineering overheads: 20 per cent added to cover surveys, design, supervision for earthworks, bridges and track.

Track Cost

$235 000/km. This estimate is based on current cost information obtained from a large construction company currently engaged in track laying in N.S.W.

The figure pre-supposes a single contractor using advanced machinery and includes:

- 60 kg/m rail at $750/t (this price is based on actual small orders and could probably be reduced for a large job)
- rail lengths of 110m, all welded
- 300 mm of ballast under sleepers
- concrete sleepers
- FIST or Pandrol fasteners
- $1/hr site allowance
- allowance for km boards, lubricators and glued joints.

An additional lump sum of $3 m was allowed for sidings, passing loops, cross-overs, catch points, junctions and track car takeoffs.

Fencing

Allowed at $4200/km of fence (based on Dept of Agriculture figure for 1979, inflated).

Stations

Allowed at $1 m each.

Signalling

Allowed at $40 000/track km.

Communications

Not included. Should be possible to use existing equipment. If the opportunity is taken to instal new equipment this is not a valid charge against the project.

Electrification

Not included.

QUANTITIES

	Cullerin-Yass	Canberra Spur
Land required (ha)	272	140
Route length (km)	67.75	43.5
Track length (km)	136.5	48.5
Major earthworks (million m^3)	4.3	1.0
Minor earthworks (million m^3)	0.5	0.5
Minor road crossings (road over rail)	11	4
(rail over road)	8	7
Highway crossings (road over rail)	4	0
Swamp Crossings	1	0
Creek Crossings	95	39
River Crossings	1	1
Major river bridges	1	0
Stations	1	1

COST ESTIMATES ($m)

(All costs in end 1981 dollars)

	Cullerin-Yass	Canberra Spur
Land	1.6	0.8
Major earthworks	16.4	3.8
Minor earthworks	1.9	1.9
Drainage	0.4	0.1
Minor road crossings	7.6	4.4
Highway crossings	6.0	0.0
Swamp crossings	0.3	0.0
Creek crossings	8.1	3.3
River crossings	0.5	0.5
Major river bridges	2.0	0.0
Track laying	32.1	11.4
Points, sidings, loops etc.	0.7	2.3
Civil engineering overheads	15.2	5.5
Fencing	0.6	0.4
Stations	1.0	1.0
Signalling	5.5	1.9
TOTAL	99.9	37.3
Offset	10.2	0.0
Net cost	89.7	37.3

COST OFFSETS

$75 000/track km or $10.2 m has been allowed for the value of materials reclaimed from the bypassed section of the existing Hume Railway.

This is a conservative estimate because it ignores the avoidance of expenses, or the incurring of benefits, as follows:

- avoided deferred maintenance and upgrading of the bypassed section of the Hume Railway;
- strengthened potential (after Stage 2 - Majura rail corridor in A.C.T.) to close Joppa Junction/Queanbeyan railway and recover materials; or
- avoidance of resignalling, Joppa Junction - Queanbeyan, section with CTC;
- avoidance of need to raise or replace over-line road bridges on bypassed sections of Hume Railway for subsequent electrification.

These savings have not been costed in depth but capitalised, could more than double the sole offset credited by this report.

OTHER BENEFITS

Construction of the T-line will, together with the three grade-easing projects in Southern N.S.W., permit a single locomotive interstate goods load to apply for all sections save Yass - Junee (at present, double locos work from Sydney to Albury). In other words, loco kilometrage working these trains could be cut 74 per cent (paragraph 39.4 of main text).

On the assumption that equivalent of five double-headed interstate freights are worked each way 300 days per annum from Enfield to Albury, the annual loco kilometrage is around 3.8 m, thus:

10 x 2 x 300 x 630 = 3.8 m

trains locos days km

The cut of 74 per cent would reduce this to under 1.0 m, and the saving of 2.8 m loco km/annum would be worth at least $3m p.a. in avoided diesel loco maintenance cost alone, plus at least as much again in avoided diesel fuel costs. The brake and wheel wear cost penalties and benefits of increased crew and train productivity, could easily result even at existing levels of traffic, in total savings of around $8 to $10 million p.a. on interstate freight trains alone on the Hume Railway section of the T-line costing (in round figures) $90m.

APPENDIX B

PASSENGER MARKET ANALYSIS

Sources Used

B1. The overall picture is somewhat confused and has been analysed in some depth.

B2. The Bureau of Transport Economics' National Travel Survey (NTS) of 1977-78 (BTE Occasional Paper 42) reports travel relevant to the Project. The NTS techniques used were satistical sampling via a postal survey, corrected by follow-up interview and, for the corridor analysis, an gravity modelling technique. Figures are 'round trips' originated by people in the 'ex' column; the total of these are doubled for equivalent one-way journeys (which may be via a more circuitous route, e.g. a leisure car trip MEL-SYD via Hume Highway, SYD-MEL via Princes Highway). The NTS corridor travel figures do not reflect travel to and from intermediate points, e.g. SYD-Goulburn, Riverina, Albury and do not show through trips such as SYD-MEL-ADL; both of these are highly relevant to rail travel as any user of the existing Intercapital Daylight train service will attest, NTS did conclude that its estimate of the non-road market shares might be low). NTS figures also include people driving trucks, motor cycles or travelling by ship; these have been ignored as either irrelevant to potential modal shifts, or numerically of no consequence. Table B1 presents the NTS findings relevant to use of the proposed rail services.

B3 In contrast, the figures in Table B2 provide actual ridership on the key long distance trains in 1978. They are based on seat occupancy checks.

B4. The above figures include (in all cases but the Southern Aurora) relevant long distance intrastate travel in N.S.W., but exclude considerable intrastate travel on the VicRail broad gauge, e.g. to Benalla, Ballarat and Ararat.

B5. When the NTS rail estimates for 1977-78 are compared with sector flows computed from these seat occupancy figures for 1978-79 and others published in the Sydney-Melbourne Electrification Study report, it is clear that the NTS estimate considerably understates the rail task: see Table B3.

Existing Rail Patronage

B6. The following points are clear:

1. Rail's 1978-79 market performance, as measured by sector flow figures based on seat occupancy that include through travel to other capitals, and a very substantial component of intrastate travel, is far better than postal survey-based NTS statistics for 1977-78 suggest.

2. Rail's performance on the Canberra sector has further improved vis-à-vis air (air travel was down some 35 per cent after recent fare increases).

B7. If we accept the NTS figure for total travel (and there are no better figures) and the actual rail seat counts of Table B2 (because they are factual), the trains present market shares line up as follows:

Sector	NTS	Actual
SYD-MEL	5%	17%
SYD-CBR	2%	5%
MEL-CBR	Nil	4%
BNE-SYD	3%	17%
ADL-MEL	6%	22%

While these figures include some intrastate and some onwards-booked travel, they nonetheless give a very different picture from the popular misconception of long-haul passenger rail as an irrelevant mode in decline.

Market Impact

B4. Table B4 relates the capacity of the proposed services to total NTS estimated travel and to market shares. It concludes that reasonable targets to build rail's market share are as follows:

1. SYD-MEL

Rail's present 17% includes about 6% daylight traffic. Increase the latter to 13%, plus a residium of sleeping-car patrons. The high speed option would probably further permit withdrawal of the 'Spirit of Progress' chair cars (replaced by the 'Afternoon Daylight' XPT) and their redeployment on internal VicRail

service - say a 4 per cent switch. The increased rail patronage would come from air's 57 per cent, the motor car's 44 per cent and some newly-generated business.

2. SYD-CBR

Increase rail's 7 per cent (based on two very slow trains) to 13 per cent. As well as new business, these patrons would mostly come from the motor car's 79 per cent. Most air traffic (14 per cent in 1978) that is likely to be lost has already been lost because of post-Holcroft fare increases and Ansett-NSW cheap flights are poorly patronised.

3. CBR-MEL

There is no direct railway, no night service at all and the slow inconvenient day service involves change and a long wait at Yass Junction. The estimate is that high-speed rail would boost the 4 per cent existing rail-bus share several times, to around 36 per cent, at the expense of air (31 per cent in 1978) but mostly road (67 per cent in 1978 and today probably as high as 80 per cent). While this is ambitious, the 6 3/4 hour Stage 1 service would compare with an 8 - 9 hour drive. As on the ADL run, a short 'one plus three' train could be used in the early stages of this service; the 36 per cent target applies to a standard '2 + 5 pool' train.

4. BNE-SYD

The night train already has 17 per cent of the total market about 12 per cent of which comprises chair-car patrons. The faster 13 hour daylight service is reckoned to secure another 7 per cent of the total market. (The NTS estimate is 60 per cent air, 37 per cent motor cars.)

5. ADL-MEL

On seat count the Overland's share of the market is 22 per cent of ADL-MEL corridor travel; presumably some of this is through traffic to Perth via the Trans-Australian and the Indian Pacific. Nevertheless in a corridor where (NTS figures) air has 30 per cent, the motor car 59 per cent of the market, and there is no daylight train, a target figure of 8 per cent for high-speed

eight-hour daylight rail service is a sensible expectation. This figure is based on running a short ('one plus three') XPT - type train; a decision to run a full XPT, or a long and a short train, could well permit withdrawal of the Overland, which occupies valuable overnight freight-train track capacity and will itself need to be replaced in 10-15 years' time.

B9. In all respects, therefore:

1. the potential market is there

2. the estimates of the market share that high speed rail would win is entirely defensible.

The trains would certainly be well-used.

TABLE B1 BICENTENNIAL RAILWAY CORRIDORS
PERSON-TRIPS (IN THOUSANDS) AND MARKET SHARES (%)
SUGGESTED BY THE BTE NATIONAL TRAVEL SURVEY OF 1977-78

Round Trips			Road			Relevant Totals
ex	-	to	air	bus	car	train	
SYDNEY-MELBOURNE							
SYD	-	MEL	217	0(a)	183	20	
MEL	-	SYD	278	4	237	25	
Total Round Trips			495	4	420	45	964
Total One-Way			990	8	840	90	1928
% Market Share			51%	0.6%	44%	5%	100%
SYDNEY-CANBERRA							
SYD	-	CBR	50	23	333	10	
CBR	-	SYD	35	11	159	3	
Total Round Trips			85	34	492	13	624
Total One-Way			170	68	984	26	1248
% Market Share			14%	5.4%	79%	2%	100%
MELBOURNE-CANBERRA							
MEL	-	CBR	26	2	98	0 (a)	
CBR	-	MEL	29	1	21	0 (a)	
Total Round Trips			55	3	119	0	177
Total One-Way			110	6	238	0	354
% Market Share			31%	1.7%	67%	0 (a)	100%
MELBOURNE-ALBURY/WODONGA							
MEL	-	ALY/WOD	7	1	128	14	
ALY/WOD	-	MEL	3	0	145	12	
Total Round Trips			10	1	273	26	310
Total One-Way			20	2	546	52	620
% Market Share			3%	0.3%	88%	8%	100%

TABLE B1 (Continued)

Round Trips ex - to	air	Road bus	car	train	Relevant Totals
BRISBANE-SYDNEY					
SYD - BNE	97	0	138	10	
BNE - SYD	138	4	69	5	
Total Round Trips	335	4	207	15	561
Total One-Way	670	8	414	30	1122
% Market Share	60%	1%	37%	3%	100%
ADELAIDE-MELBOURNE					
MEL - ADL	90	12	143	19	
ADL - MEL	34	6	97	7	
Total Round Trips	124	18	240	26	408
Total One-Way	248	36	480	52	816
% Market Share	30%	4%	59%	6%	100%

NOTE
(a) Unlikely to be correct in view of observed bus patronage

TABLE B2 ACTUAL RIDERSHIP ON RELEVANT TRAINS IN 1978

Service	Train	Total Seats/ Berths	Occupancy % Down	Up	Equiv. Journeys Per Annum (Total)
SYDNEY-MELBOURNE-CANBERRA TRIANGLE					
SYD-MEL	Southern Aurora	198	55	57	80 950
	Spirit of Progress	372	59	60	161 600
	Intercap. Daylight	303	52	44	90 750
	Totals	-	-	-	333 300
SYD-CBR	CBR Monaro Express	155	66	57	59 500
	Cooma Mail	130	11	7	8 500
	Totals	-	-	-	68 000
Interstate NSW	Riverina Express	155	34	50	40 600
	SW Mail	138	37	37	37 000
	Totals	-	-	-	77 600
Total Rail Passengers SYD/MEL/CBR					478 000

BRISBANE-SYDNEY

Total annual patronage on the Brisbane Limited (the only train, and which is normally booked out) is 190 000 one-way trips.

ADELAIDE-MELBOURNE

Total annual patronage on the Overland (the only train, which is quite heavily booked) is 180 000 one-way trips.

It follows that even on today's figures, with relatively little rail use by Australians, 850 000 trips are being made over the rail links concerned each year.

TABLE B3 NTS ESTIMATE (POINT/POINT) 1977/78 VERSUS ACTUAL RAIL SEAT OCCUPANCY FOR 1978/79

Rail Sector	Rail Sector Flow (and Source)	NTS Rail Estimate 1977/78	Comment
Sydney-Goulburn	803 000 (a)	116 000	NTS:SYD/MEL + SYD/CBR
Goulburn-Junee	455 000 (a)	90 000	NTS:SYD/MEL + CBR/MEL (nil)
Junee-Albury	393 000 (a)	90 000	NTS:SYD/MEL + CBR/MEL (nil)
Albury-Melbourne (through Standard Gauge only)	367 000 (a)	142 000	NTS:SYD/MEL = CBR/MEL (nil) + ALY-WOD/MEL
Canberra-Melbourne	16 000 (b)	Nil	NTS says Nil
Sydney-Brisbane	190 000 (c)	15 000 (d)	Note: Major discrepancies attributable to small NTS sample
Adelaide-Melbourne	180 000 (c)	26 000 (d)	As Above

Notes

a. Sector flow figures are from Sydney-Melbourne Rail Electrification Study Report.

b. Estimated from average of 25 Yass-Canberra bus and ACT - registered motor car passengers who join/leave the Intercapital Daylight at Yass Junction (observation).

c. From Table B2

d. From Table B1

TABLE B4 BICENTENNIAL (STAGE 1) RAIL SERVICE: CAPACITY AND TARGET MARKET SHARE ANALYSIS

Sector	Trains Daily (each way)	Seats Offered Daily (a) (2 Way Total)	Journeys/ Annum (b)	Existing Total Market (NTS)	Rail Market Share	
					Target High Speed Rail	Total Existing Rail (c)
SYD-MEL MEL-SYD	2	1 240	253 000	1 928 000	14%	17%
SYD-CBR CBR-SYD	3	1 860	379 000	1 248 000	30%	5%
MEL-CBR CBR-MEL	1	620	126 500	354 000	36%	4% (no direct service)
SYD-BNE BNE-SYD	1	620	126 500	1 122 000	7%	17%
ADL-MEL MEL-ADL	1	320	65 300	816 000	8%	22%

NOTES

a. 'Two plus five' XPT consist, 310 seats per train, except MEL-ADL 'One plus three' consist with 160 seats per train.

b. Assuming average 60% load factor and total service train density per annum equivalent to a 340-day year (conservative)

c. Rail seat count (Table B2) as a % of NTS estimate of total corridor travel (Travel B1).

APPENDIX C

RUNNING TIMES, TRAIN DIAGRAMS AND ROLLING STOCK NEEDS

References

Table	C1	Sydney to Melbourne
	C2	Sydney to Canberra
	C3	Melbourne to Canberra
Diagram	C1	Stage 1 Service (six trains)
	C2	Stage 2 Service (seven trains)

Running Times

Tables C1 to C3 are based upon existing timetables, a computer-developed simulation of a 'two plus six' N.S.W. Inter-City XPT set operating over existing tracks to 145 km/h maxima, at 20 per cent overspeed on curves, and recalculated schedules for 160 km/h operation - over deviations where these are proposed.

C2. A similar modelling over the BNE -SYD line has shown a (Stage 1) trip time of 12 hours 56 minutes (say 13 hours). Ultimately, it should be feasible to reduce this to about 12 hours.

C3. The ADL - MEL route has been assessed in the context of distances, grades, curves, section maxima and XPT performance on broadly similar sections; it has not been run on the computer and this is a conservative, indicative estimate:

Stage 1 about 9 hours

Stage 2 under 8 hours

Train Diagrams

SYD-MEL-CBR Diagrams have been drawn, with minimum 60 minutes turnaround in SYD or MEL and a 45 minutes turnaround in CBR on the basis of pooled stock for this service.

SYD-BNE is treated as a separate service, with a single run in each direction each day, worked by two sets. There are prospects of these two train sets also working a CBR-SYD-BNE service (see main text, paragraph 112).

MEL-ADL. Because of the broad gauge, this is programmed as a separate service, like BNE-SYD. Two 'short' sets are diagrammed. Paragraph 113 addresses the prospects for through running to CBR and paragraph 114 for through-running into the Iron Triangle. The sets could be rotated for maintenance by cutting in spare cars overnight.

Stage 1. Diagram C1 indicates the Stage 1 (Bicentennial) services on the central Sydney-Melbourne-Canberra routes. A minimum of six sets is required. The pattern is three round trips daily SYD-CBR, two SYD-MEL, and one MEL-CBR. This is achieved by

- stabling one set overnight in CBR, and running CBR-SYD, SYD-MEL.
- Two sets overnight in SYD, one running two round trips SYD-CBR-SYD and the other a direct trip SYD-MEL.
- Three sets overnight in MEL, running one to CBR and back, one to SYD and thence to CBR, and one to SYD alone.

Note how the stock is rotated through the diagrams for cyclic maintenance.

Stage 2. Diagram C2 exploits higher speed to work two extra long-haul trips with one extra set.

- Two sets are stabled overnight in CBR. One forms the morning train to MEL and then the afternoon MEL-SYD service; the other runs to SYD and forms the late morning SYD-MEL service.
- Two sets are stabled in SYD. One runs to MEL and back to CBR and the second to CBR, back to SYD and on to MEL (a very long and profitable daily diagram).

. Three sets are stabled overnight in MEL. One runs to CBR and back, lone to SYD, SYD-CBR, and back to SYD (a second very long daily diagram) and one

Stock Needs

The following estimates of XPT stock are made:

Stage 1 Bicentennial Services

			$m
SYD-MEL-CBR services			
6 trains @ $8m each			48.0
BNE-SYD services			
2 trains @ $8m each			16.0
SPARE CARS (standard gauge)			
2 power vans	5.0		
1 coach	0.6		
1 buffet-coach	0.8		6.4
ADL-MEL services			
2 'short' trains @ $4.5m each			9.0
SPARE CARS (broad gauge)			
1 power van	2.5		
1 coach	0.6		
1 buffet-coach	0.8		3.9
Total stock committed			83.3
Less Offsets			
. 2 trains that would otherwise be provided for CBR-SYD by 1988		16	
. 1 train that would otherwise be provided for SYD-Kempsey service by SRA of NSW		8	
. Spare cars for above three trains, allow			
1 power van	2.5		
1 coach (equivalent)	0.6	3.1	27.1

Net investment in extra rolling stock	=	56.2
Plus		
Extra spare parts committment/ depot modifications allow		8.0
Rolling stock costs chargeable to the project case.....$64m		$64.2

TABLE C1

SYDNEY TO MELBOURNE

Section	Existing Daylight Express	Computed XPT (note a)	Inter-City Limited XPT (note b)
Sydney Terminal	0-12	0-10	
Strathfield	0-02	0-02	by-passed
	0-32	0-24	0-32
Campbelltown	pass	pass	pass
	0-22	0-17	0-17
Picton	pass	pass	pass
	0-57½	0-38	0-30
Moss Vale	stop 0-01	stop 0-01	pass
	0-58½	0-42	0-37
Goulburn	stop 0-04	stop 0-04	stop 0-04
			0-25
Canberra Jc.	on new line		pass
	1-19	0-57	0-18
Yass Jc or New Yass	stop 0-01	stop 0-01	pass 0-01
	0-59	0-43	0-36
Harden	stop 0-01	stop 0-01	pass 0-01
	0-41	0-27	0-20
Cootamundra	stop 0-01	stop 0-01	stop 0-01
	0-46	0-32	0-32
Junee	stop 0-04	stop 0-04	stop 0-04
	0-26	0-21	0-20
Wagga Wagga	stop 0-01	stop 0-01	stop 0-01
	1-27	0-58	0-51
Albury	stop 0-08	stop 0-04	stop 0-04
		0-50	0-47
Benalla	pass	stop 0-01	stop 0-01
	3-32	2-18	2-06
Melbourne (Spencer St)	stop	stop	stop
Total Run Time		9-17	8-11
Stop Time		0-16	0-17
Recovery Margin	inc. in schedule	0-25	0-25
Practical schedule	12-35	less than 10 hrs	less than 9 hrs

Notes:
a Two power cars and six trailers on substantially existing track.

TABLE C2

SYDNEY TO CANBERRA

Section	Existing Canberra - Monaro Express	Computed XPT (note a)		National Capital Limited XPT (note b)
Sydney Terminal	0-12	0-10		
Strathfield	0-01	0-01	by passed	0-32
	0-18	0-13		
Liverpool	0-01	0-01	by passed	
	0-14	0-11		
Campbelltown	0-01	0-01		0-01
	0-21	0-17		0-17
Picton	0-01	0-01		0-01
	0-49	0-39		0-30
	0-01	0-01		0-01
Moss Vale	0-59	0-42		0-37
Goulburn	0-04	0-04		0-04
Canberra Triangle Jc	1-47 via Queanbeyan	1-27 via Queanbeyan		0-25
Canberra or Canberra N.				0-18
Total Run Time		3-35		2-39
Stop Time (note c)	0-13	0-13		0 07
Recovery Margin	included in schedule	0-10		0-10
Practical schedule	4-49	less than 4 hrs		less than 3 hrs

Notes:

a Two power cars and six trailers. Canberra-Goulburn time estimated on basis of computed main line runs.

b Two power cars and five trailers on upgraded and realigned track.

c Per existing schedule, or estimated at 2 min. per stop.

b Two power cars and five trailers on upgraded and realigned track.

c Per existing schedule, or estimated at 2 min. per stop.

TABLE C3

MELBOURNE TO CANBERRA

Section	Existing Daylight Express	Computed XPT	National Capital Limited XPT (Note a)
Melbourne (Spencer Street)			
stops as per Table 1	NO DIRECT RAIL SERVICE	NO DIRECT RAIL SERVICE	
Canberra Jc			5-44
			pass
Canberra North			0-18
Total run time			5-48
Stop Time			0-13
Recovery margin			0-20
			6.21
Practical schedule	PRESENT RAIL AND BUS SCHEDULE IS OVER 9 HOURS		less than 6½ hours

(a) Two power cars and 5 trailers on upgraded and realigned track.

DIAGRAM C1 . TRAIN DIAGRAMS, SYD-MEL-CBR, STAGE 1

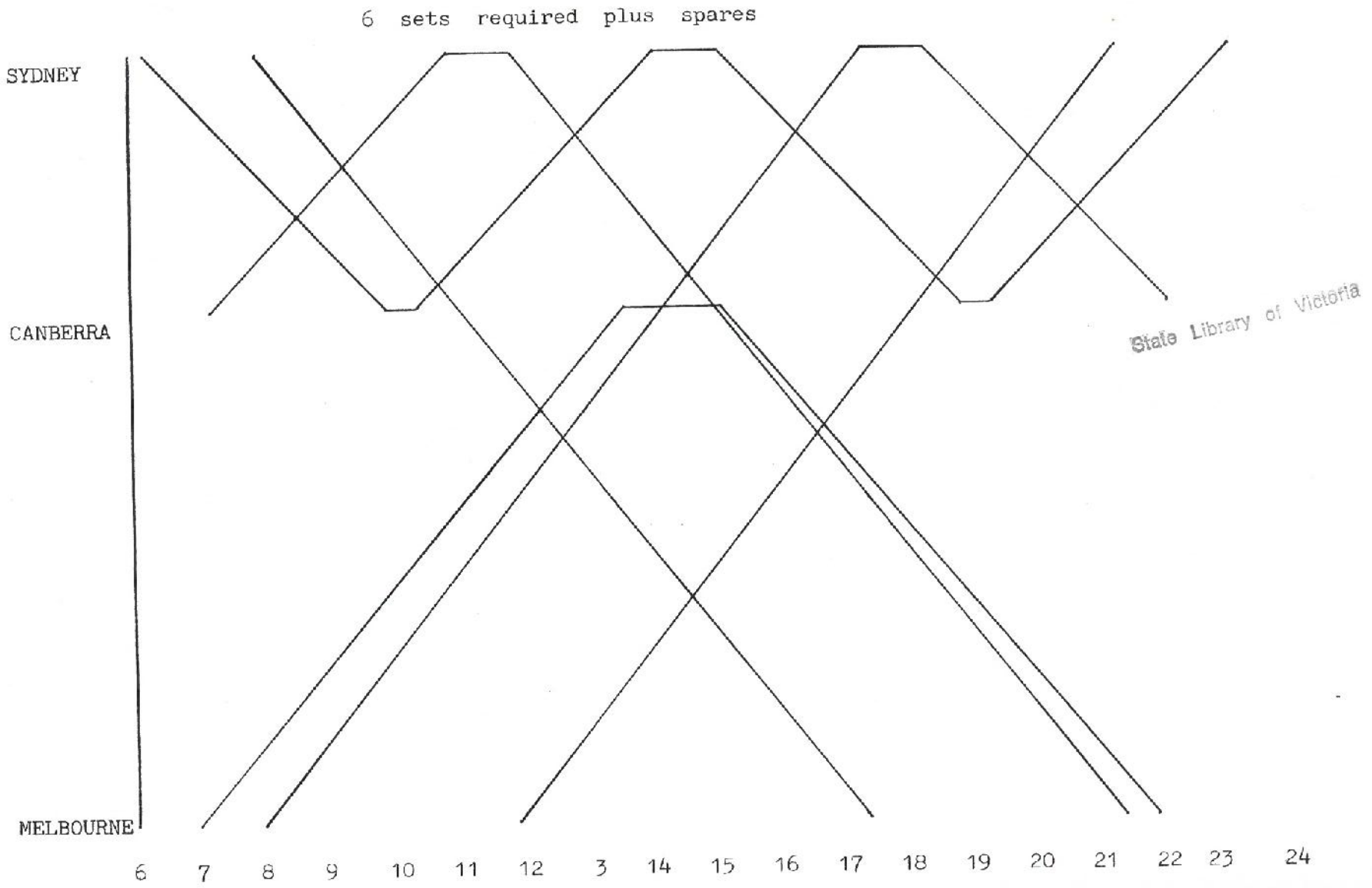
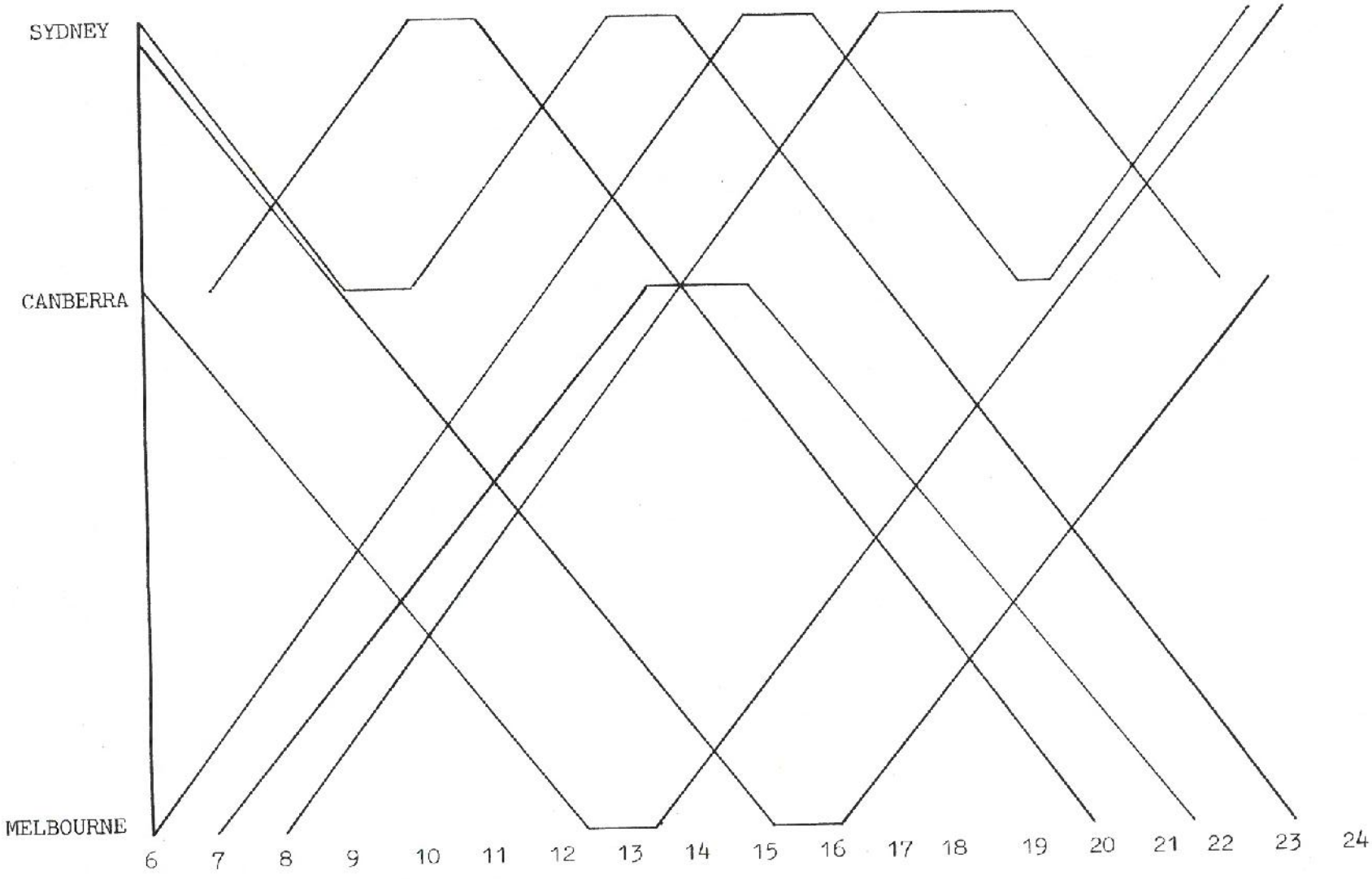
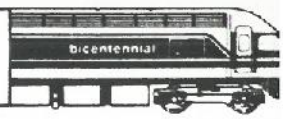


DIAGRAM C2 TRAIN DIAGRAMS, SYD-MEL-CBR, STAGE 2

7 sets required plus spares



The Bicentennial High Speed Railway Lobby



Phone (Bruce Sinclair) (02) 439 2866
(Ian Macfarlane) (062) 47 3333

PO Box 164 St Leonards NSW
Telex AA 26462

MEMORANDUM TO: Members of the High Speed Bicentennial Railway Lobby Interim Committee

FROM: A B Sinclair 21 September 1982

SITUATION REPORT

Since the last time I communicated with you we have done the following:

- extensive lobbying and publicity amongst politicians and business leaders,
- discussed details of the project with Alec Carmichael of SRA,
- received advice from Hon. Ralph Hunt that he supports the project but, as the benefits principally go to the states, he would look to them for funding,
- received approximately similar advice from Hon. Peter Cox, indicating that he would support the project if the funding is principally from the Commonwealth,
- noted that the Commonwealth Government and the Bicentennial Authority have endorsed the Australian Bicentennial Road Development Project, (estimated cost $2 000 million) as a major Bicentennial transportation project.

I have also been overseas during recent months and took this as an opportunity to test the response from various people with whom we have canvassed the project. This has been minimal, varying from mild encouragement to no response at all.

It is appropriate therefore to reappraise our position at the present time as our next steps would involve substantial cost and effort.

If one looks at the roads situation one sees the following factors:

- there is a national highways system being an accepted responsibility of the Federal Government and supported by the states,
- the highway industry is supported by strong national lobbies such as the Australian Automobile Association, ARTF, Long Distance Hauliers, Australian Good Roads Association, TWU, etc. These bodies have been active in supporting the Bicentennial Road Development concept,

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- there is a close unity between the various State Highways Commissioners in presenting a competent united front on national highway issues,

- fuel tax presents a relatively painless source of funding,

- road operations are in the hands of private sector forwarders and operators, who carry out their tasks and offer their services on a diverse customer-specific and efficient basis.

In contrast if we examine the railway project, the following adverse factors have become apparent:

- there is no "national" railway system; each system being the perogative of a state. In this regard ANR can be seen as similar to a state system, and ROA is not seen as a fully national enterprise,

- there is no responsible national lobby of railway users and supporters. Such lobby groups as do exist relate particularly to consumer complaints at local levels and are not seen as potential sources of political support by railways administrations,

- there is no readily apparent "soft" source of funds which could be tapped without agonising arguments with Treasury and large fund allocations to the project,

- some of the euphoria surrounding the XPT has faded,

- railways operations, particularly freight, draw criticism in regard to scheduling delays, lack of reliability, security and entrepreneurship, as compared to road.

All the above considerations, road and rail, would appear to substantially put present odds against the acceptance of our project.

The principal benefits which we perceived for the Bicentennial High Speed Railway Project were:

- building a new main line section of modern alignment, thus breaking the attitude of perpetual entrenchment of the obsolete 1890's track geometry, leading to full utilisation of modern equipment, and to pressure for similar improvements in other sections.

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- introduction of improved schedules, services and equipment to Australian travellers,

- the opportunity to improve rail freight operations thus creating a significant reduction in road freight traffic on the Sydney-Melbourne corridor,

- linking Canberra to the main Sydney-Melbourne corridor and creating a viable modern Melbourne-Canberra service.

In short, we were looking to bringing equipment, track and operations to a matched level related to current international standards and expectations.

As to replacing the track with modern geometry, that is a task which can always be taken up in the future. While we pay a substantial operating penalty in the meanwhile we would hope that the existing alignment is not further entrenched by costly infrastructure and support facilities.

As to freight, perhaps we did not think "big" enough! Should we have put forward a project which would have upgraded running speeds, grades and curvatures on the entire length between Sydney and Melbourne (about $600 million) which would have provided for either complete single heading or much longer and heavier trains and faster running times through the whole corridor without "banking."

In our economic studies we have been able to demonstrate that the payback period for expenditure on the 60 km section of new track is about 15 years. Unfortunately conventional economic theory discounts long term benefits to nothing, and ignores the national benefits, tangible and intangible, of laying the groundwork for development of a really modern and efficient system.

We also asked ourselves "If you had the money to invest, is the Bicentennial project the application which gives the greatest benefit?" The answer is undoubtedly "No." The SRA's current priorities in relation to improving coal lines, electrification to and beyond Newcastle, and other items in their priority list are more pressing and are occurring. If one wanted to signficiantly improve the railway share of freight in the Sydney-Melbourne corridor one would provide major railroad depots at the outskirts of Sydney and Melbourne, such as are provided in Brisbane, Adelaide and Perth, so that overnight freights do not have to suffer the delays of running the gauntlet of commuter traffic. These improvements can and will occur anyway. What will not normally occur anyway would be the development of new modern high speed track. The Bicentenary would have been an imaginitive catalyst to this end.

The next steps in the Lobby's activities would be a relatively expensive brochure, stepping up our political lobbying, going public in the media and incurring substantial costs. In view of the issues set out above, I ask the comments of each member before committing ourselves to this course.

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In this regard we should ask ourselves the following questions:

- is it necessary for there to be a National Railways Association working in association with the respective Commissioners to provide political force to the concept of national railway improvement? If so, is our Lobby the nucleus of such an association?

- what other steps should occur, eg greater national government involvement in trunk railways, before the ingredients are right for the same constructive commitment to railways improvement as has now been made to roads?

- what should be our next steps?

Bruce Sinclair

Bruce Sinclair

FIG. 1 BICENTENNIAL HIGH - SPEED RAILWAY PROJECT

- THE FINAL PROJECT

(Further Progressive Expenditure)

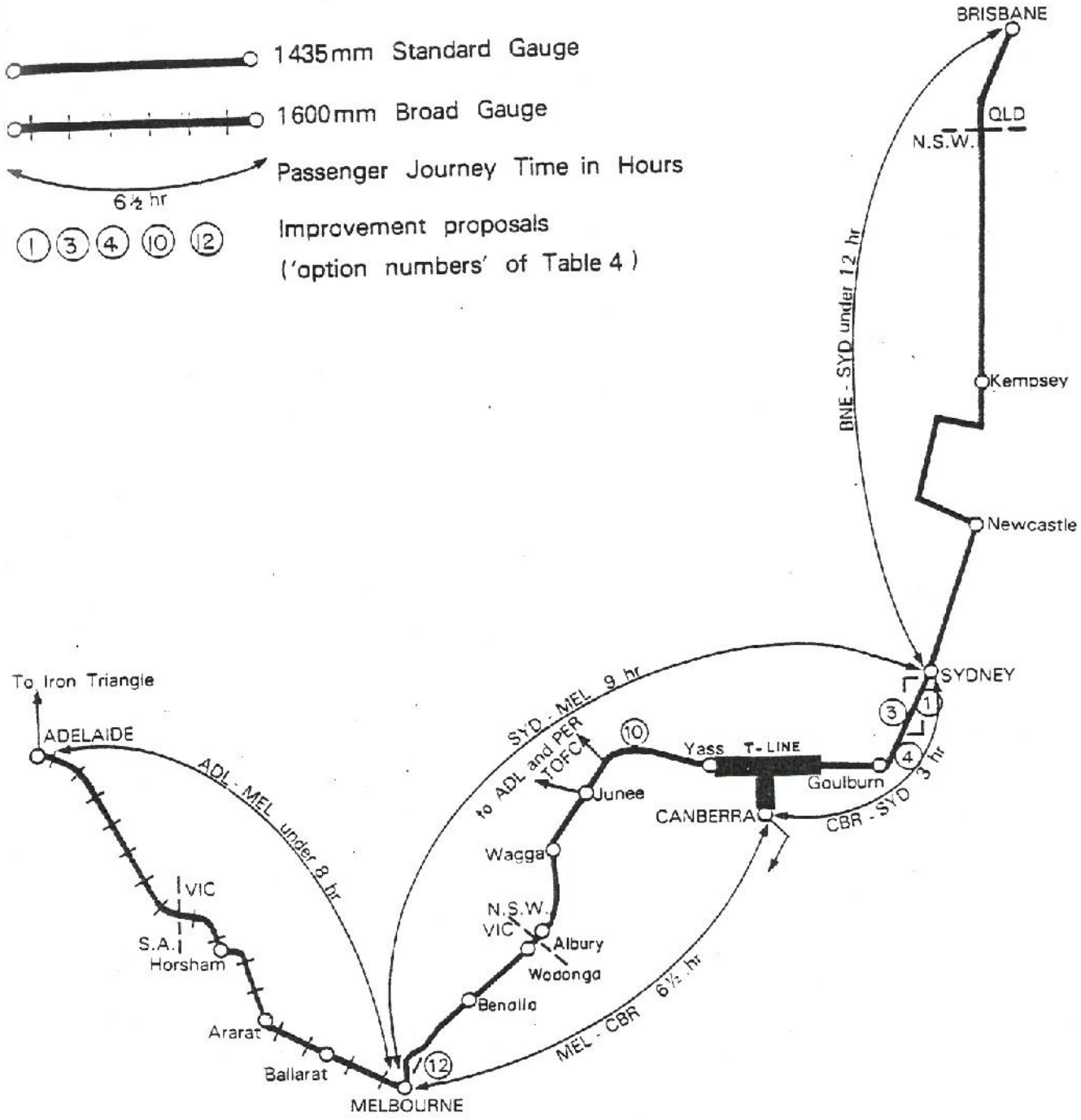

FIG. 2 BICENTENNIAL HIGH - SPEED RAILWAY PROJECT

- STAGE 1 FOR 1988 BICENTENNIAL

(Under $200m, including trains)