Session 6a

RAIL - PASSENGER SERVICE

THURSDAY 29 AUGUST 3.30 - 5.30PM

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PREDICTING DEMAND FOR HIGH SPEED RAIL IN THE SYDNEY-CANBERRA CORRIDOR

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ABSTRACT

Accessibility by High Speed Rail (HSR) services between major cities within a nation and across borders is growing in popularity. Currently 15 nations are evaluating new HSR along the lines of the successful systems in Japan, France and Germany. An HSR link between Sydney and Canberra is currently in the feasibility stage. A major market study undertaken in 1994-95 by the institute of Transport Studies identified the size of the potential market for HSR in a corridor currently dominated by air travel for business trips and car travel for non-business trips. This paper presents details of a joint revealed preferences/stated choice model system to evaluate the choice of fare type conditional on mode and the choice of mode for business and non-business travel in the Sydney-Canberra corridor with and without the proposed new HSR system. The full choice set of modes in the corridor is conventional train, charter coach, scheduled coach, plane and car. Plane and HSR offer a range of fare classes. We identify the current travel profile and predict HSR patronage under alternative fare regimes, taking into account diverted traffic, induced traffic and growth. The paper argues that previous studies which have treated fare class as exogenous are poor representations of the real choice context facing potential patrons of HSR

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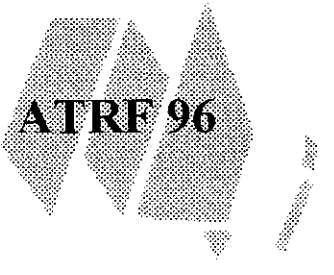
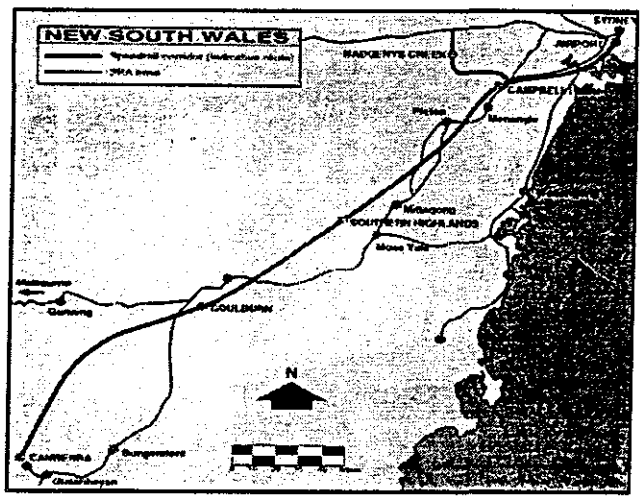


1. Background

High speed train services between Sydney and Canberra have received considerable attention over the last decade. During the 1980's there occurred a series of major studies for a private consortium investigating the feasibility of connecting Sydney, Canberra and Melbourne with a "Very Fast Train" (VFT) service. While this project has never eventuated, the perceived need for high speed train services in the corridor has remained.

Speedrail Pty Ltd have proposed a new high speed rail system to link Sydney and Canberra, primarily on a new alignment. This will allow passenger operations between Sydney and Canberra to take approximately one hour and fifteen minutes. It is proposed that the service will begin at Central Station, Sydney, and end at a new rail terminal near Canberra airport. There will be intermediate stations serving Sydney (Mascot) airport, Campbelltown, the Southern Highlands and Goulburn (see Figure 1). It is envisaged that the service will be high frequency (about one trip an hour, more in peak times), with fares considerably lower than the current air fares.

Figure 1. The Sydney-Canberra Corridor



This paper summarises a market study designed to evaluate the potential of the proposed Speedrail service. It details the approach which has been used to produce best estimates of the current traffic in the Sydney-Canberra corridor, together with estimates of potential switching and trip inducement associated with the introduction of a high speed train service. The key components of this paper are:

1. A survey of travellers and residents in the Sydney-Canberra corridor.

2. Preparation of the survey data into a population-based data set used to derive trip purpose specific origin-destination trip tables for 1994.

3. Estimation of a mode choice model based on revealed and stated preference data of the choice between a sampled traveller's currently chosen mode for a specific trip purpose and origin-destination.

4. Calculation of induced demand in the corridor in the presence of a high speed train service.

5. Compilation of secondary data on total traffic volumes, growth rates and projections of traffic and socio-demographic features in the corridor which may influence future travel activity.

6. Development of predictions of market potential under alternative service and fare level scenarios.

A broad range of fare levels, types of fares and levels of travel time are evaluated. This, we believe, is the most detailed investigation of fare structures and their influence on the demand for high speed train services in the Sydney-Canberra corridor, and represents a state of the art market study for high speed train services.

2. Structure of the Market Study

There are many market opportunities for high speed rail in the Sydney-Canberra corridor. The markets can be characterised by trip purpose, trip length and current mode of travel. The markets investigated were:

1. scheduled air travel between Sydney and Canberra
2. car travel between Sydney and Canberra
3. scheduled coach travel between Sydney and Canberra
4. non-scheduled coach travel between Sydney and Canberra (and on to the snow fields)
5. visitors to intermediate destinations along the corridor (Bowral, Berrima)
6. residents of intermediate destinations along the corridor (Bowral, Moss Vale, Mittagong, Goulburn)
7. inbound tourists (a separate analysis due to difficulty in picking up non-english speakers in surveys)
8. Countrylink train services (from detailed secondary data)

Within each market, differentiation is made between trips for business and non-business purposes. There are several small markets not captured by this survey process. They include the business market to Goulburn and the Southern Highlands from Sydney, the scheduled coach market to intermediate destinations in the Sydney-Canberra corridor, and induced travel by current non-travellers in the corridor. In addition, while visitors were surveyed in Bowral and Berrima, other areas of the Southern Highlands and Goulburn were not surveyed for visitors. This slight undercounting of the Speedrail market makes patronage and revenue more conservative than they otherwise would be.

The Questionnaires

The questionnaires for all travellers in the corridor had three main purposes. They were designed to elicit *who* is travelling *where* currently, and *what* use they are likely to make of the proposed Speedrail service. A set of 6 questionnaires was designed to provide information of current modal activity, as well as the potential for switching to high-speed rail, and the inducement effect of the presence of the new mode.

To find out *who* was travelling, questions were asked about the socio-demographics of the respondent and their travelling party. Details of the current trip which were collected included (where appropriate) trip origin and destination, main travel mode, time spent on the main mode, access and egress modes and the time taken to access and egress the main mode, trip purpose and length of stay. In addition, respondents recorded their total travel, by travel mode and purpose, between Sydney and Canberra in the last 12 months.

Given that high-speed rail in Australia in general and the Sydney-Canberra corridor in particular is not currently available, the ability to extrapolate Speedrail patronage from the current usage of existing modes is not possible. Resort must be made to methods which offer the surveyed population a choice between travel on their current mode and the proposed high speed train service under alternative scenarios of fares, levels of service, and frequency.

In addition to identifying potential modal switching, we have sought the likelihood of additional trips occurring for the same trip context under the offered regime of fares, frequency and travel times. Respondents were also asked to nominate the Speedrail station they would use.

Suitability of Stated Choice Methods

Stated choice (SC) survey methods, in which respondents are presented with hypothetical future alternatives (constructed according to an experimental design) and asked to choose among them, are popular in transport planning (Hensher 1994). An effective SC instrument should recognise the current trip context (revealed preference (RP)), and use the SC approach to identify responses to deviations in opportunities relative to the current travel. Our approach emphasises a comparison between the attributes of a current trip and the attributes offered by Speedrail in undertaking the same trip by high speed rail.

Combined stated preference and revealed preference data take advantage of the strengths of both types of data while recognising that some of the weaknesses of one data type are a strength of the other data type.

RC data are best described as:

1. depicting the world as it is now (current market equilibrium)
2. having built-in relationships between attributes (technological relationships are fixed)

3. only having existing alternatives as observable

4. embodying market and personal constraints on the decision-maker

5. having high reliability and face validity

6. yielding one observation per respondent at each observation point.

SC data are best described as:

1. depicting virtual decision contexts (flexibility)

2. having controlled relationships between attributes (permitting mapping of utility functions with technologies from existing ones)

3. including existing and/or proposed and/or generic choice alternatives

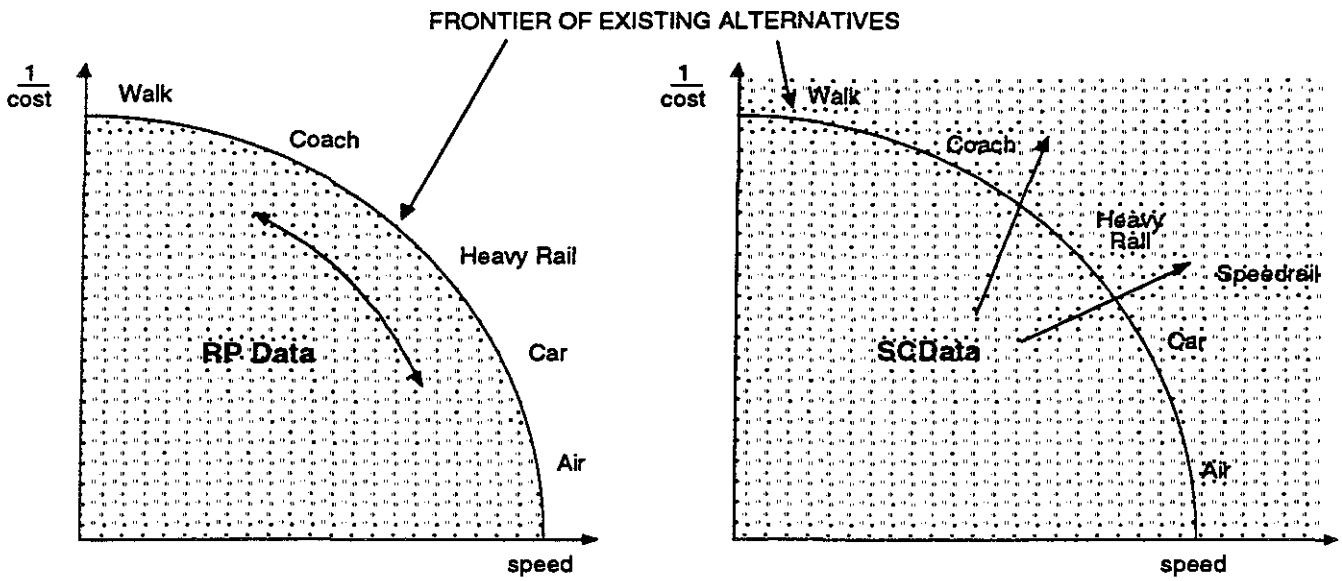
4. having difficulty (if not impossibility) to effectively represent changes in market and personal constraints

5. being reliable to the extent that respondents understand the task, are committed to the task, and can really respond to the task

6. yielding multiple observations per respondent at each observation point.

The distinguishing appeal of the two types of data can be illustrated diagrammatically in the context of mode choice (Figure 2). RP data provides information on the current market equilibrium for the behaviour of interest and is useful for short term forecasting of departures from the current equilibrium. In contrast SC data is especially rich in attribute tradeoff information, but is to some extent affected by the degree of 'contextual realism' that we can establish for the respondents.

Figure 2: Attribute space of RP and SC data



SC data is useful for forecasting *changes* in behaviour. The more strategic our objectives (ie a longer time horizon), the greater the need and opportunity to use SC data, along with RP data. The benefits include an ability to map trade-offs over a wider range of attribute levels than currently exists (adding robustness for forecasting), and an ability to introduce new choice alternatives (accommodating technological change in an expanded attribute space).

3. The Experimental Design

The stated choice experiment requires a sampled traveller to evaluate a high speed rail option against the mode used on the current trip and to choose the preferred way of travelling between Sydney and Canberra. The set of attributes in the choice design are the travel time by high speed rail, the frequency of the service, the range of fares, and the discount available for a family/group. Access and egress travel times are sought from the respondent and added into the final calculation of trip time by high speed rail.

The attribute levels are summarised in Table 1, for a 3^7 full factorial design. Since all the attributes are ratio scaled the possibility of dominating or dominated combination exists and must be eliminated from the final fractional factorial design. Using principles of experimental design we can reduce the full factorial down to a parsimonious number of combinations of levels of attributes while also preserving the richness of the information in the design.

Table 1 The attribute set and levels

Attribute	Levels
Station to station travel time (minutes)	3: high, medium, low (3 hours, 2 hours, 1 hour)
Daily one-way service frequency/headway	3: high, medium, low (hourly, 2-hourly, 3-hourly)
First class fare (one-way)	3: high, medium, low ($115, $95, $75)
Full economy class fare (one-way)	3: high, medium, low ($70, $60, $50)
Discount economy fare (one-way)	3: high, medium, low ($45, $35, $25)
Off-peak discount fare (one-way)	3: high, medium, low ($40, $30, $20)
Additional Discount for a family (2 adults, at least 1 child <16 yrs old)	3: high, medium, low (50%, 30%, 10%)

An 18 replication fraction was selected for this study, with the combinations shown in Table 2 used. Each respondent is given 3 replications, so there is maximum of 6 sets of three. The residual degrees of freedom are 3 and there are no independent two-factor interactions. The software used to generate this design has randomised sets of three replications as:

{17, 2, 18} {4, 13, 3} {16, 12, 5} {1, 15, 6} {7, 11, 9} and {8, 10, 14}:

Combining the attribute levels from Table 1, the design from Table 2 and the partitioning of design into sets of three choice sets produces the Sydney-Canberra experimental levels

summarised in Table 3. The attribute levels in Table 3 refer to a trip between Sydney and Canberra. The sampling strategy allows for travel to intermediate locations along the Sydney-Canberra corridor. The predominant intermediate activity occurs between (i) Sydney and the Southern Highlands (ii) Canberra and Goulburn, (iii) Sydney and Goulburn, and (iv) Canberra and the Southern Highlands. The attribute levels for the within-corridor travel origin-destination pairs (i) and (ii) are based on one-third of the Sydney-Canberra fare levels and travel time; OD pairs (iii) and (iv) are based on two-thirds of the fare and travel times for Sydney-Canberra. Frequency and group discount levels are the same for all OD-pairs.

4. Data Collection Strategy

The choice of data collection strategy is determined by the ability to secure reliable information from the population of interest. Some markets, such as rail, already collect detailed passenger information, so a new survey was deemed unnecessary. Most other markets do not have the necessary data, thus a new survey was required. The sampling is choice-based to ensure that sufficient data points are obtained for each of the modes currently chosen by each traveller. A random sample of residents in the corridor and a sample of visitors to intermediate tourist destinations were also identified for a specific activity type so that the set of traffic forecasts are true demand estimates.

Table 2 The full set of attribute combinations

Set	*Time*	*Frequency*	*1st class fare*	*Full Y fare*	*Discount Y fare*	*Off-peak Disc fare*	*Family /gp Disc.*
1	L	L	L	L	L	L	L
2	L	M	M	H	M	M	M
3	L	H	H	M	H	H	H
4	M	L	M	M	M	H	L
5	M	M	H	L	H	L	M
6	M	H	L	H	L	M	H
7	H	L	H	H	M	L	H
8	H	M	L	M	H	M	L
9	H	H	M	L	L	H	M
10	L	L	H	M	L	M	M
11	L	M	L	L	M	H	H
12	L	H	M	H	H	L	L
13	M	L	L	H	H	H	M
14	M	M	M	M	L	L	H
15	M	H	H	L	M	M	L
16	H	L	M	L	H	M	H
17	H	M	H	H	L	H	L
18	H	H	L	M	M	L	M

Table 3 The final set of stated choice attribute combinations for Speedrail

STANDARD COMBINATIONS

Set	Time	Frequency	First Class	Full Economy	Discount Economy	Off-Peak	Family/Group Discount
A01	3 hours	2 hourly	115	70	25	40	10
A02	1 hour	2 hourly	95	70	35	30	30
A03	3 hours	3 hourly	75	60	35	20	30
B01	2 hours	hourly	95	60	35	40	10
B02	2 hours	hourly	75	70	45	40	30
B03	1 hour	3 hourly	115	60	45	40	50
C01	3 hours	hourly	95	50	45	30	50
C02	1 hour	3 hourly	95	70	45	20	10
C03	2 hours	2 hourly	115	50	45	20	30
D01	1 hour	hourly	75	50	25	20	10
D02	2 hours	3 hourly	115	50	35	20	50
D03	2 hours	3 hourly	75	70	25	30	50
E01	3 hours	hourly	115	70	35	20	50
E02	1 hour	2 hourly	75	50	35	40	50
E03	3 hours	3 hourly	95	50	25	40	30
F01	3 hours	2 hourly	75	60	45	30	10
F02	1 hour	hourly	115	60	25	30	30
F03	2 hours	2 hourly	95	60	25	20	50

Primary Data Collection

The following survey methods were used in each market, with specific details of each survey location and timing given in Table 4 and response rates in Table 5:

1. *Scheduled air travel between Sydney and Canberra*

   A self administered questionnaire was designed for completion by passengers on board the aircraft whilst travelling between Sydney and Canberra. Questionnaires were custom designed for both the Sydney - Canberra trip and the Canberra - Sydney trip and were distributed at both airports and collected as passengers disembarked. Flights were sampled over several days and at various times of the day so as to capture both the peak business market and off-peak travellers.

2. *Car travel between Sydney and Canberra*

   A self administered questionnaire was designed which was distributed to motorists travelling north and south on the Federal Highway north of Canberra. Motorists were screened for travel between Sydney and Canberra/Snow resorts (ie. shorter or longer distance travellers were excluded) before asking them to take part in the survey. The questionnaire was accompanied by a reply paid envelope. The initial intercept point was on the Federal highway just inside the northern ACT border. However, after half a day of surveying, Federal Police permission was withdrawn because of a single complaint, and the intercept location was moved. The two new intercept points were the Tourist Information Centre on the northern outskirts of Canberra, and the traffic lights at the intersection of Stirling Avenue and the Federal Highway, where

motorists were intercepted in both the north and south bound directions. The sample data was adjusted to take into account the different sampling locations. The field team was given instructions with regard to sampling both business travellers and non-business travellers so that both markets were represented.

3. *Scheduled coach travel between Sydney and Canberra*

A similar self administered questionnaire was designed for distribution on board scheduled coach services in the Sydney - Canberra corridor. Interviewers distributed the questionnaires as passengers boarded the coaches at the Sydney terminal and travelled with the coach before collecting the completed questionnaires and disembarking at a stop on the southern outskirts of Sydney. Coaches were sampled over a number of days of the week and times of day to ensure that the sample was representative of the full range of traveller segments.

4. *Non-scheduled coach travel between Sydney and Canberra (and on to the snow)*

A self administered questionnaire was used for a survey of selected non-scheduled coach services in the Sydney - Canberra corridor. Questionnaires were distributed onboard the coaches of a major provider of day sight seeing trips to Canberra. Passengers on tours leaving Sydney on Friday night for the snowfields were also surveyed before they boarded their coaches. A separate survey of non-scheduled coach operators in the corridor was undertaken to determine the size of this market segment.

5. *Visitors to intermediate tourist destinations along the corridor (Bowral, Berrima)*

Visitors to these two main tourist destinations in the Southern Highlands were intercepted over two weekends. Respondents had to be visiting the area on either a day trip or staying one or more nights, from a destination in the Sydney or Canberra area. This was an interviewer administered questionnaire conducted at the point of intercept.

6. *Residents of intermediate destinations along the corridor (Bowral, Moss Vale, Mittagong, Goulburn)*

A computer aided telephone interview (CATI) was conducted of residents in the Southern Highlands area extending from Mittagong to Goulburn. This survey also collected important information from residents on their opinion of the impact that a high speed rail service between Sydney and Canberra would have on the Southern Highlands area.

Table 4 shows the location and timing of the fieldwork for each market segment. The fieldwork involved an 11% validation of surveys. Validation involves the fieldwork supervisor checking the responses obtained by the field team. The method of checking varies with different survey types. For telephone surveys, the supervisor calls respondents back to check their responses, while for interview-type surveys close observation is used to ensure data is collected in a valid way.

Table 4 Location and timing of each survey

Market Segment	Date of Surveys	Location of Surveys
Motorist Intercept	9/9/94	Police intercept on Federal Hwy near information bay
	24/9-27/9/94	Intercept at traffic lights at corner of Federal Hwy and Stirling Ave, as well as the Tourist Information Centre
Sydney to Canberra Air	19,21,24/9/94	Qantas Sydney Domestic Terminal
Canberra to Sydney Air	19,21,24/9/94	Qantas Canberra Domestic Terminal
Scheduled Coach	20/9-27/9/94	Interviewer embarked coach in Sydney City and alighted at Liverpool or Parramatta
Non-Scheduled Coach	16/9-1/10/94	For those travelling to snow, distribution and collection of questionnaires at Circular Quay terminal.
		Day trip interviewers travelled with coach from Sydney City to Wiley Park
Highlands Residents	28/9-5/10/94	Computer aided telephone interview (CATI) of residents in corridor between Mittagong and Goulburn
Highlands Tourists	10,11,16,17 and 18/9/94	Weekend street intercept interviews in Bowral and Berrima

The response rate to the surveys in all market segments was very good. These are summarised in Table 5.

Table 5 Survey response rates from all the market segments

Market Segment	Number of people approached	Number of surveys handed out	*Number of respondents*	*Response rate (of all people approached)*	Response rate (of surveys handed out)
Motorist Intercept	3002	2982	*763*	*25%*	26%
Sydney to Canberra Air	846	677	*423*	*50%*	62%
Canberra to Sydney Air	873	672	*336*	*38%*	50%
Scheduled Coach	505	-	*402*	*80%*	-
Non-Scheduled Coach	373	-	*163*	*44%*	-
Highlands Residents	337	na	*303*	*90%*	na
Highlands Tourists	215	na	*200*	*93%*	na

5. Modelling the Speedrail Market Share

A series of mode choice models have been estimated to identify the probability of each sampled traveller choosing their current main mode and each of the fare classes of travel by Speedrail. A distinction is made between business and non-business trips. The models are applied in the context of scenarios defining Speedrail fare classes and levels, travel time and frequency between Sydney and Canberra, to provide estimates in the year 2000 of the market potential (revenue and trips) for the new high speed rail service. Induced demand is taken into account together with the growth of traffic in the corridor up to the year 2000. Four Speedrail fare classes were defined - first class, full economy, discount economy and off-peak. The modal/fare choice experiment was repeated a total of three times, each time with different levels of Speedrail fares, travel time and frequency.

The choice experiment was administered to current travellers in 4 modal markets - car, plane, scheduled coach and non-scheduled coach. Separate mode choice models were

estimated for each market and for each trip purpose - business and non-business. These markets comprise all travellers using the Sydney-Canberra corridor whose origin and destination lie at an end or within the corridor. This includes in-bound tourists who arrive in Sydney on an international flight and transit in Sydney en route to Canberra as well as visitors to, and residents living in, towns along the route (e.g. Bowral, Goulburn, and Mittagong).

The modal choice models were estimated as multinomial logit, with the choice set defined as the current mode plus the four fare classes of Speedrail. Alternative hierarchical logit models were evaluated. The set of statistically significant influences on choice of mode in each market are summarised in Table 6.

Table 6 The final modal choice model influences: current mode vs. Speedrail

	Car- Business:
U(car)	casc, invc, invt
U(srfc)	srfcasc, invc, invt , acegt
U(srfy)	srfyasc, invc, invt , acegt
U(srdy)	srdyasc, invc, invt , acegt
U(srop)	invc, invt , acegt
	Car Non-Business:
U(car)	casc, invc, invt
U(srfc)	srfcasc, invc, invt , acegt
U(srfy)	srfyasc, invc, invt , acegt
U(srdy)	srdyasc, invc, invt , acegt
U(srop)	invc, invt , acegt
	Air-Business:
U(airfc)	invc, invt , acegt, pinc
U(airbsn)	airbsnasc, invc, invt , acegt, pinc
U(airfy)	airfyasc, invc, invt , acegt, pinc
U(airdy)	airdyasc, invc, invt , acegt
U(srfc)	srfcasc, invc, invt , acegt, pinc
U(srfy)	srfyasc, invc, invt , acegt, pinc
U(srdy)	srdyasc, invc, invt , acegt
	Air Non-Business:
U(airfc)	airfcasc, tchinc, invt, acegt
U(airbsn)	airbsnasc, tchinc, invt, acegt
U(airfy)	airfyasc, tchinc, invt, acegt
U(airdy)	airdyasc, tchinc, invt, acegt
U(srfc)	srfcasc, tchinc, invt, acegt
U(srfy)	srfyasc, tchinc, invt, acegt
U(srdy)	srdyasc, tchinc, invt, acegt
U(srop)	sropasc, tchinc, invt, acegt
	SchCoach-Business:
U(SchCoach)	invc, invt
U(srfc)	srfcasc, invc, invt, ln(acegt)
U(srfy)	srfyasc, invc, invt, ln(acegt)
U(srdy)	srdyasc, invc, invt, ln(acegt)

Table 6 continued: Definition and notes

U(srop)	sropasc, invc, invt, ln(acegt), ln(pinc)
	SchCoach-NonBusn:
U(SchCoach)	tchinc, ln(invt), acegt
U(srfc)	srfcasc, tchinc, ln(invt), acegt
U(srfy)	srfyasc, tchinc, ln(invt), acegt
U(srdy)	srdyasc, tchinc, ln(invt), acegt
U(srop)	sropasc, tchinc, ln(invt), acegt
	Non-SchCoach:
U(NonSchCch)	tcst, ln(invt), ln(hinc)
U(srfc)	srfcasc, tcst, ln(invt), freq
U(srfy)	srfyasc, tcst, ln(invt), freq
U(srdy)	srdyasc, tcst, ln(invt), freq
U(srop)	sropasc, tcst, ln(invt), freq
invc	= main mode cost (dollars)
invt	= main mode travel time (minutes)
acegt	= access plus egress time (minutes)
tchinc	= main mode cost *(nadults + 0.5*nkids)/hinc
tcst	= main mode cost *(nadults + 0.5*nkids)
nadults	= number of adults in travelling party
nkids	= number of children in travelling party
hinc	= annual household income ($'000's)
pinc	= annual personal income ($'000's)
freq	= Speedrail frequency is every hour from 6 am to 11 pm (=1), 0 otherwise
Train	Utility expressions for scheduled coach are applied to the train mode
Model Form	All models are of the multinomial logit form.

The parameter estimates associated with each market were embedded in a series of linked spreadsheets to evaluate the market for Speedrail under various scenarios and assumptions.

Current Traffic Profile

Table 7 summarises the levels of service for trips from Sydney to Canberra and the socioeconomic profile at the average of travellers using each existing mode for business and non-business trips. Trips to and/or from intermediate destinations have a different set of levels of service. Car costs are based on a behavioural perceived unit cost of 7 cents per kilometre. The distances between each of the key locations in the corridor are:

Sydney-Canberra = 270 km Sydney-Bowral = 115 km

Sydney-Goulburn = 190 km Bowral-Canberra = 155 km Canberra-Goulburn = 80 km

Scheduled coaches and planes do not serve the intermediate locations, which are currently served by train and non-scheduled coach. Train fares for intermediate stations

have been applied; however for non-scheduled coach trips we have used a single fare for each of the two markets since there is little variation whether one goes to Canberra or to an intermediate location. The coach fee is built into an all inclusive tour fee.

Table 7 Summary profile of the levels of service associated with current transport for the Sydney-Canberra Corridor

Current Main Mode	invc	invt	acegt	pinc	hinc	nadults	nkids
Car: Business	21	230	0	48.37	74.36	2.4	0.1
Car: Non-Business	21	230	0	37.76	64.5	2.6	0.57
Air: Business: FC	212	60	104	67.2	91.4	1.45	0.01
Air: Business:BC	177	60	104	67.2	91.4	1.45	0.01
Air: Business:FY	141	60	104	67.2	91.4	1.45	0.01
Air: Business: Disc Y	99	60	104	67.2	91.4	1.45	0.01
Air: Non-Busn: FC	212	60	113	53.76	80.64	1.48	0.08
Air: Non-Busn:BC	177	60	113	53.76	80.64	1.48	0.08
Air: Non-Busn:FY	141	60	113	53.76	80.64	1.48	0.08
Air: Non-Busn:Disc Y	99	60	113	53.76	80.64	1.48	0.08
SchCoach:Business	22.73	250	29	23.9	55.2	1.58	0.01
SchCoach:Non-BusN	22.56	250	78.7	18.12	46.15	1.27	0.05
Train:Business	50	360	80	24	50	1.5	0
Train: Non-Business	25	360	80	18	40	1.5	0.1
UnschCoach	24.17	240	64.35	35.6	71.02	1.58	0

Speedrail Times and Fares

Speedrail fares and times have been established in consultation with Speedrail. The base fare for each class of travel is given as a medium scenario: first class = $115, full economy = $75, discount economy = $60 and off-peak discount = $40. These fares are based on a flagfall and a cost per kilometre:

First class: $30 plus $0.315 per km

Full economy: $20 plus $0.2 per km

Discount economy: $15 plus $0.165 per km

Off-peak discount: $10 plus $0.111 per km

A higher fare regime and a lower fare regime are evaluated together with two travel times — 70 minutes from Sydney to Canberra (averaged over the three Sydney Stations) and 90 minutes. These times assume a non-stop train. Intermediate stations have times calculated on all-stop trains. The scenarios evaluated are summarised in Table 8.

Table 8 Speedrail Scenarios for Travel Times and Fares

ACTUAL ONE-WAY TRIPS 1994	SYD-CAN	CAN-SYD	SYD-BOW	BOW-SYD	SYD-GOUL	GOUL-SYD	CAN-BOW	BOW-CAN	CAN-GOUL	GOUL-CAN
Low Scenario:										
Speedrail first class fare $1994	95	95	63	63	84	84	74	74	53	53
Speedrail full economy fare $1994	60	60	41	41	54	54	48	48	34	34
Speedrail discount economy fare $1994	40	40	32	32	43	43	38	38	27	27
Speedrail off-peak fare $1994	30	30	21	21	29	29	25	25	18	18
Medium Scenario:										
Speedrail first class fare $1994	115	115	66	66	90	90	79	79	55	55
Speedrail full economy fare $1994	75	75	43	43	58	58	51	51	36	36
Speedrail discount economy fare $1994	60	60	34	34	46	46	41	41	28	28
Speedrail off-peak fare $1994	40	40	23	23	31	31	27	27	19	19
High Scenario:										
Speedrail first class fare $1994	130	130	70	70	96	96	84	84	58	58
Speedrail full economy fare $1994	80	80	45	45	62	62	54	54	38	38
Speedrail discount economy fare $1994	60	60	36	36	49	49	43	43	30	30
Speedrail off-peak fare $1994	40	40	24	24	33	33	29	29	20	20
Travel Times:										
Speedrail access plus egress time (minutes)	60	60	40	40	40	40	40	40	20	20
Speedrail travel time (minutes)	70/90	70/90	55/71	55/71	75/96	75/96	45/58	45/58	21/27	21/27

Induced Demand for Speedrail

In addition to diverted traffic, there is induced (or generated) traffic. Induced traffic is the consequence of improved corridor accessibility in the presence of Speedrail. We have allowed for the additional traffic, holding land use fixed (ie. no allowance has been made for growth in commercial and residential activities in the corridor due to Speedrail).

Induced traffic due to the presence of Speedrail is an important source of traffic. High-Speed rail in France and Japan has produced generated or induced traffic as high as 35% and typically greater than 30%. The definition of the induced traffic percentage however must be treated carefully. Taking induced demand as a percentage of the base diverted

traffic will give a higher percentage than a definition in which induced demand is the percentage of all traffic which is not diverted.

To calculate induced demand we have to know something about the average trip rate per traveller currently in the corridor. In the present study we did not interview non-travellers and so induced demand as first time travel in the corridor as a consequence of the presence of Speedrail is not included. The travel surveys sought information of each travellers frequency of travel by mode and purpose in the corridor over the last 12 months. This data provides a base trip rate for each mode and purpose. The average annual one-way trip rates for current corridor users in each of the modal and trip purpose markets are:

Car/business	= 1.5
Car/non-business	= 3
train/business	= 1.5
train/non-business	= 3
plane/business	= 1
plane/non-business	= 1.5
scheduled coach/business	= 0.2
scheduled coach/non-busn	= 2
non-scheduled coach	= 0.03

Given the induced demand response to a series of questions associated with a particular Speedrail fare and travel time scenario, we were able to identify the percentage increase in the one-way trip rate and adjust the diverted traffic accordingly, though this does not include travel that may be induced among current non-travellers.

Projection of Speedrail Patronage

For each of the 6 Speedrail fare/travel time scenarios we have calculated the amount of one-way trips in the year 2000 diverted from each current mode for business and non-business, based on an average 6% annual growth rate of traffic from 1994 up to 2000. In addition we present revenue projections for the year 2000, based on the predicted one-way trips with allowance for the mix of adults and children (a child is assumed to pay half of the equivalent adult fare within the chosen fare class).

We consider the assumption of medium fare level and 70 minute average travel time between Sydney and Canberra (see Table 8 for details) to be the most likely Speedrail scenario. Unless otherwise stated, the results presented in this section refer to the "medium 70" scenario. The results suggest that with an annual growth rate of traffic of 6%, a market potential exists for Speedrail in the year 2000 to carry about 5 million passengers, yielding $283m revenue in 94 dollars. Over the last 5 years car traffic in the corridor has grown by over 10% per annum. The 6% growth rate reflects a conservative approach to the market growth, being based on a 20 year trend. The results of traffic

projections are very sensitive to the assumed growth rate of traffic in the corridor. Inbound tourist growth to Australia is currently about 12%, and can be expected to increase in the lead-up to the 2000 Olympics. Such an increase would be a bonus for Speedrail and would be an add-on to our figures.

Figure 3 shows what the market is likely to look like in 2000 if it grows at an assumed 6%, without the presence of Speedrail. Growth rates in the range 4-5% have also been evaluated.

Figure 3 Sydney-Canberra trips in 2000 without Speedrail

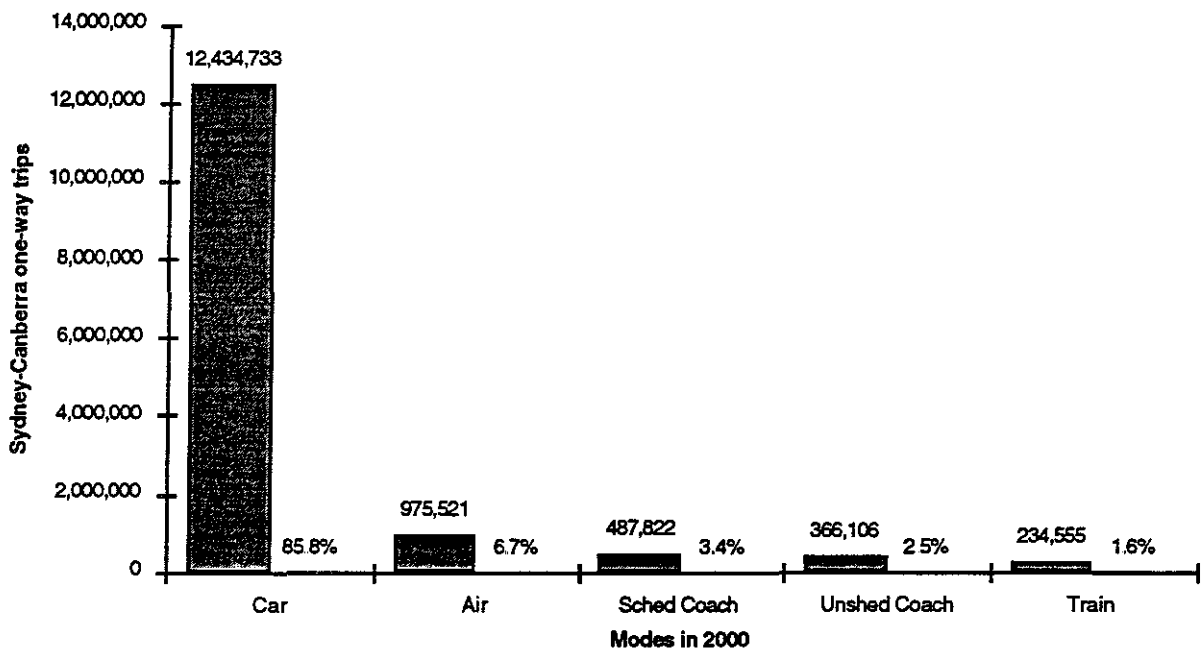


Figure 4 shows the difference if Speedrail is introduced into the corridor, based on the medium fare assumption and a 70 minute travel time. It indicates that Speedrail has the potential to capture approximately one third of the Sydney-Canberra travel market, with car dominating other traffic. The airlines share of the market falls from almost 7% to below 2%.

Speedrail is forecasted to carry just over 5 million one-way trips in 2000. If the assumed growth rate continues to 2005, predicted patronage increases by approximately one third to 6.9 million. Figure 5 shows the source of Speedrail patronage, detailing the percentage gained from each mode as well as the traffic induced by the presence of Speedrail in the market. The most important point is that car travellers are by far the largest source of Speedrail traffic. Induced travel is the next largest source, followed by air travellers. This indicates that air travellers will be an important niche market for Speedrail, but that most effort needs to be expended in attracting car travellers. Packaging of services such as hire cars, bus tours and accommodation with the Speedrail fare may be a way to introduce the

greater flexibility often required by those travelling by car, remembering that most are travelling for non-business purposes. Current coach travellers will also be an important source of patronage.

Figure 4 Sydney-Canberra trips in 2000 with Speedrail

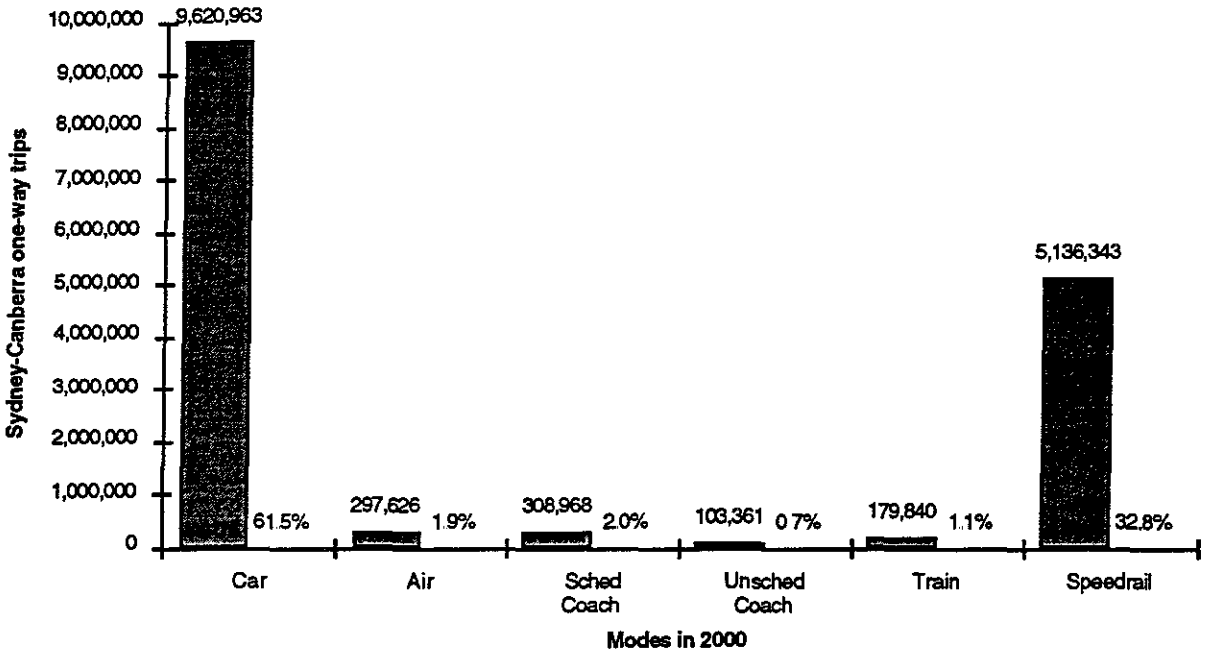
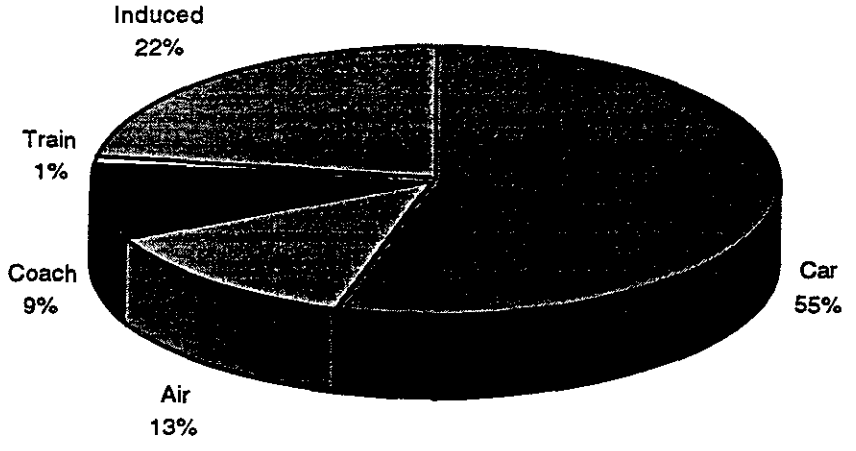


Figure 5 Source of Speedrail patronage in 2000



Sensitivity Testing

The results are sensitive to the assumptions about traffic growth in the corridor. In addition, Table 9 shows how sensitive patronage are to changes in the fare level and travel time. The "low 70" generates thegreatest number of passengers.

Table 9 Speedrail patronage for various scenarios (in millions)

6% traffic growth	High70	Medium70	Low70	High90	Medium90	Low90
Patronage	4.92	5.14	6.23	4.52	4.73	5.78

Additional Sources of Patronage

There are a number of potential sources of additional patronage which could add to the forecasted base revenue.

A likely influence on Speedrail patronage is the response of the airlines to Speedrail's competition on the Sydney-Canberra route. Given Speedrail's planned fares, frequency and travel time, it seems quite likely that commercial air services may see value in ceasing operations on the city-pair route, choosing instead to code-share with Speedrail. If this was the case, Speedrail revenue would increase.

Speedrail has tentative plans for some services to originate/terminate at Parramatta joining the main Speedrail route at Glenfield. The use of Parramatta as a terminal for some services would dramatically reduce the access and egress times and costs for passengers from western Sydney, and would undoubtedly have a positive effect on patronage, though information to quantify the exact effect is not available.

Inbound tourism leading up to the 2000 Olympics is expected to increase even further from levels already in excess of 10%. This growth has not been accounted for in the forecasts, which assume a uniform 6% growth rate, so there is potential for a higher base patronage and revenue figure if growth in the corridor is higher than assumed. We estimate that these three sources of additional patronage could add up to substantial additional patronage.

6. Conclusion

There appear to be very strong market opportunities for Speedrail. Data collected from all major travel markets in the Sydney-Canberra corridor indicates that Speedrail could conservatively carry 5 million passengers in the year 2000. This result is conservative because it does not account for a number of factors which are likely to increase Speedrail patronage above that predicted. We have assumed that traffic will grow at an average of 6% in the corridor.

Inbound tourist growth in particular is currently over 10% per annum, and predicted to rise even further in the lead-up to the 2000 Olympics. This growth is not accounted for in

the results presented here, and if Speedrail could effectively market itself to these tourists, it could lead to significant revenue gains. The results also assume that the airlines will keep operating, though at a reduced level. However, given Speedrail's planned operating attributes, it is possible that it will become uneconomic for the airlines to continue to operate scheduled passenger services on the Sydney-Canberra route, preferring perhaps to code-share with Speedrail.

7. Caveat

Since completing the market study, we have established that the *estimated* car traffic counts obtained from the NSW Roads and Traffic Authority for 1994 were higher than the finally reported *actual* counts. We have revised the car base year traffic levels and recalculated the amount of diverted and hence induced Speedrail traffic from this source. The downward adjustment in total car traffic is no more than 400,000 trips per annum, of which less than 25% switch to Speedrail. We have also adjusted the growth rate for air travel to 4% and revised the estimates of Speedrail patronage from this source. The overall impact of both adjustments is a reduction in Speedrail patronage not exceeding 400,000 trips off of a total of 5.14 million in the year 2000.

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