INSTITUTE OF ENGINEERS

1989 National Transport
Conference
Melbourne 23-25 May 1989

The Future for Non-Motorised Passenger Transport in Australian Capital Cities

A.A. PARKER PH 6893693
Vice-President Town & Country Planning Association (Vic)

SUMMARY

This paper proposes two complimentary strategies for increasing access in outer urban areas by other means than cars with only one passenger. The past trends and future potential of non motorised transport in general and the trip to work in particular are analysed.

In the capital cities the average percentage of bicycle trips to work since 1976 has increased from 0.87% to 1.63% in 1986 and walking trips have declined from 5.8% to 3.8% in the same period. The current trend is that walking will continue to decline as a direct means of travel to work or school or as an access mode to public transport.

Ergonomic data are presented showing that cycling has ten times the potential of walking as an access mode to express trains or buses or to access shared cars. The uncontrolled growth of bicycle theft is a major problem for bike-rail users in Australia and hardware for overcoming this problem are described. Japanese support systems for the 3 million Japanese National Railways (JNR) bike rail users are described.

It is concluded that the bicycle has much greater potential as an access mode in the capital cities than as a direct means of commuting.

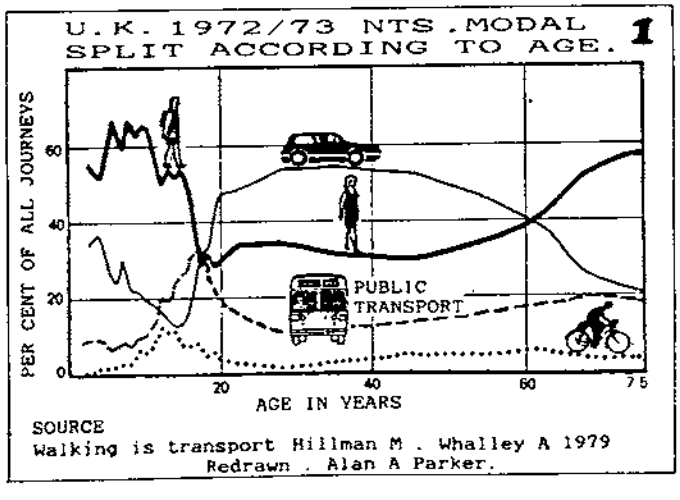
Both walking and cycling have potential as an access mode to innovative forms of car sharing or pooling. These new forms need to be supported by computerised passenger information services and personal tax incentives and will be used mostly for cross suburban trips.

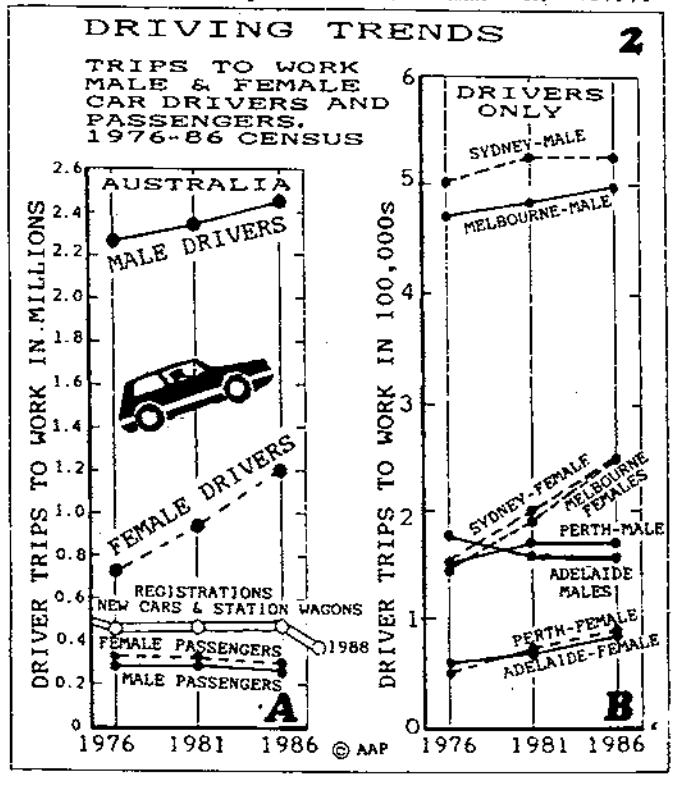
Both Bike/rail and Bike/express bus travel could be used for trips from the outer suburbs to the inner suburbs which have 40% of the work destinations in Melbourne and a similar proportion in other capital cities.

1. THESE FEET ARE MADE FOR WALKING AND PEDALLING

Several ice ages ago our distant ancestors adopted an upright posture and they walked and ran on two legs so the biological need to walk has deep roots in our unconscious. Being able to walk freely on two legs is more important than most of us realise until disablement heightens our consciousness. Walking is not only a means of transport, but a mentally and physically satisfying activity that gives life pleasure and provides a basic level of cardiovascular fitness for most people. This is why walking and any activities that enable the use of our legs, such as cycling, to move about are beneficial, because they are not just means of transport.

Whilst transport planners have considered the safety aspects of pedestrians crossing roads, they ignore the health benefits of walking, as they do with most things they cannot measure. Indeed the majority of walking trips are short and planners mostly ignore the measurable shorter trips (Wigan M. R. 1987). In spite of all this misinformation walking and cycling account for a large proportion of all journeys. In the United Kingdom the most complete transport study (NTS 1972/3) classified trips by age from early childhood to old age and this revealed the overall quantitative importance of walking and to a lesser extent of cycling, as is shown in figure 1. (Hillman M. 1979).





According to Wigan (1987) the trip generation rates for walking in the UK and Australia are similar but the motorised trip generation rate is much higher in Australia. No in-depth study comparable to the NTS STUDY has been made but the data we have for Sydney suggest (figure 5) that people choose to walk even when the household has two cars. Indeed, as far as the young are concerned, irrespective of how many cars are in the household walking is what they do most (HIS 1981). Figure 5a shows that walking is particularly important for households without access to a car. Detracting from the natural need to walk has been the phenomena of uncontrolled urban sprawl which increased the use of single occupancy motor vehicles. The trend is shown in figure 2 for the trip to work since 1976.

2. NATIONAL FITNESS OBJECTIVES.

Australian health fitness professionals want Australians to exercise more as a means of reducing the incidence of cardiovascular disease and some progress has been made in this direction. According to surveys (DASET 1988) which measure the physical activity levels of Australians 49% of those over 12 years of age take exercise to keep fit, 58% surveyed walked and 16% cycled to keep fit, which supports the view that the qualitative aspects of walking and cycling are as important as mere passenger mileage. Only 26% of Australians exercise at a sufficient level of intensity to maintain fitness. The Federal Government targets for increasing exercise levels are shown in figure 3 and to achieve these targets there will need to be a considerable increase in walking and cycling.

Bicycling for recreational purposes has been increasing (figure 3) and bicycle sales have been increasing by 8% per annum for the last 11 years (BITA 1987). Figure 8 shows that bicycles are used to travel to a wide variety of trip destinations and there are a very large proportion of bicycle users who do not cycle to work. When considering non-motorised travel to work, the increase in cycling trips does not compensate for the larger decrease in the number of walking trips.

The overall reduction of non-motorised trips to work is 2.24% or 48,000 persons between 1976 and 1986. This trend is unhealthy, because a brisk 15 minute walk or cycle ride to work, school or a rail station each day is considered to be highly benificial to sedentary workers and students health. The Federal Government's target of a 60% physical activity participation rate will not be achieved by the year 2000 given the trend for proportionally fewer non-motorised trips to work.

The hidden health costs of sedentary travel modes could be considerable and it could be argued that in addition to osteo-arthritis and other leg disabling injuries we should add sedentary travel modes as a form of life shortening inactivity.

There are of course lots of other hidden costs due to the overuse of the car that are grossly underrated such as depleted oil reserves, noise, urban air pollution, road accidents and a high tonnage of the greenhouse gases of carbon dioxide and oxides of nitrogen. Most of all, these is a need to stop viewing walking and cycling negatively as safety problems but positively as important transport modes in the future. The basic need to exercise must be regarded as a planning opportunity.

3. WALKING AND CYCLING TRIPS TO SCHOOL

Apart from the trip to work hard data on walking trips for transport purposes are hard to come by in Australia and are rarely in a form for making interstate or inter-city comparisons. Wigan (1987) is the best source for the limited data available before 1986.

The Metropolitan Transit Authority (MTA) survey of trips to school by 220,000 secondary school students at 424 schools in Melbourne added a new dimension to what is known about walking and cycling to school. However the results indicate that there is a reduction in the proportion of cycling and walking trips to school because of the growth in patronage of private schools which are less accessible than state schools. This trend is likely to apply to other capital cities as well. Suburban sprawl is also likely to increase the trip length to school but these data from the MTA survey computer file have not yet been analysed.

Figure 4 was plotted from the MTA survey data and shows secondary school trips to school by age, sex and mode of travel. Figure 4 shows that walking and cycling are responsible for a high proportion of all trips to school but that girls cycle much less than boys. Again using data from the MTA survey file, the male/female data can be broken down by public and private schools. When this is done walking trips are as important as public transport trips in public schools but are only one ninth of the proportion of trips at private schools. There are 2.5 times the proportion of male and female cycling trips at state schools than private schools. (Parker 1988 A).

Using data from the 1981 Melbourne Bikeplan Survey it would appear that over an eight year period there has been a major decline in the percentage of walking trips to school. In 1981 43% of students walked to school but only 19% in 1987. Even if the 1981 data overestimated walking trips by 13% there would still be a large reduction (Parker 1987 B). The proportion of students who cycle to school was much the same over this period so it is reasonable to conclude that the reduction in walking trips to school is why so many students do less exercise each day. This may be why many surveys indicate that secondary school children are less fit than they used to be (Parker 1987 B) and is a consequence of urban sprawl and the increasing proportion of children going to private schools.

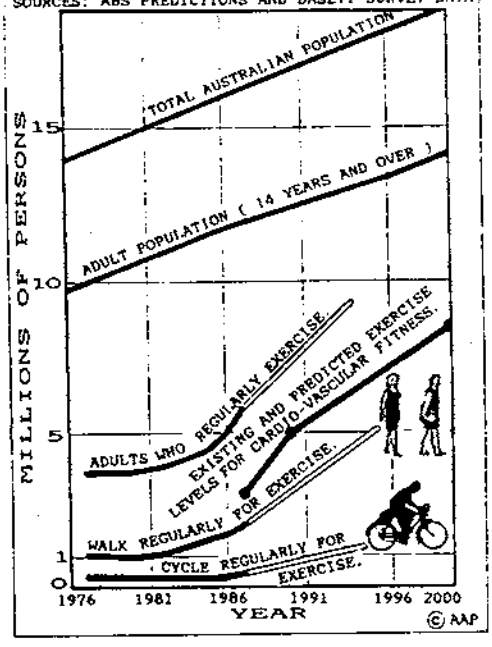
4. THE WALKING TRIP TO WORK

Figure 7 was developed from Australian Bureau of Statistics (ABS) data by separately calculating percentage figures that avoid the double counting of trips involving more than one mode.

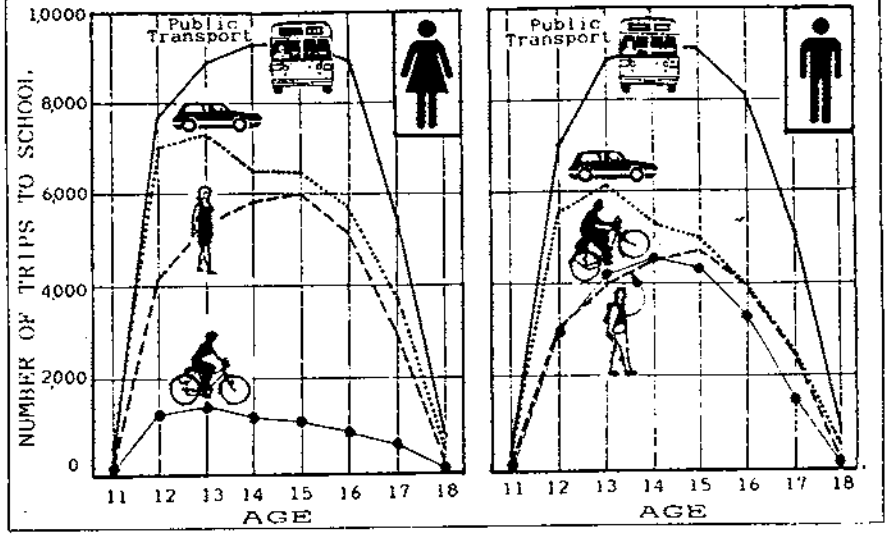
The ABS data apply to 'walking only' trips. Statewide and Australian data are broken down into two categories: the capital city and the 'rest of the state' in figure 13. Figure 13 shows that there has been an overall reduction in the percentage of walking trips to work Australia wide but that the decline has been more uniform and less marked in the capital cities.
Figure 6 shows that there are approximately 40,000 less female walking trips in Sydney and Melbourne. Figure 2 shows an increase of approximately 200,000 female car trips to work. Between 1976 and 1986 there has been a drop in the proportion of passengers carried in cars. The gap between the proportion of males and females who drive to work is narrowing and a significant number of walking trips are being replaced by motoring trips.

3 AUSTRALIAN ADULTS WHO EXERCISE REGULARLY & OFFICIAL GOALS FOR LEVELS OF EXERCISE DESIRED TO CONTROL CARDIO-VASCULAR DISEASE 1987 to 2000

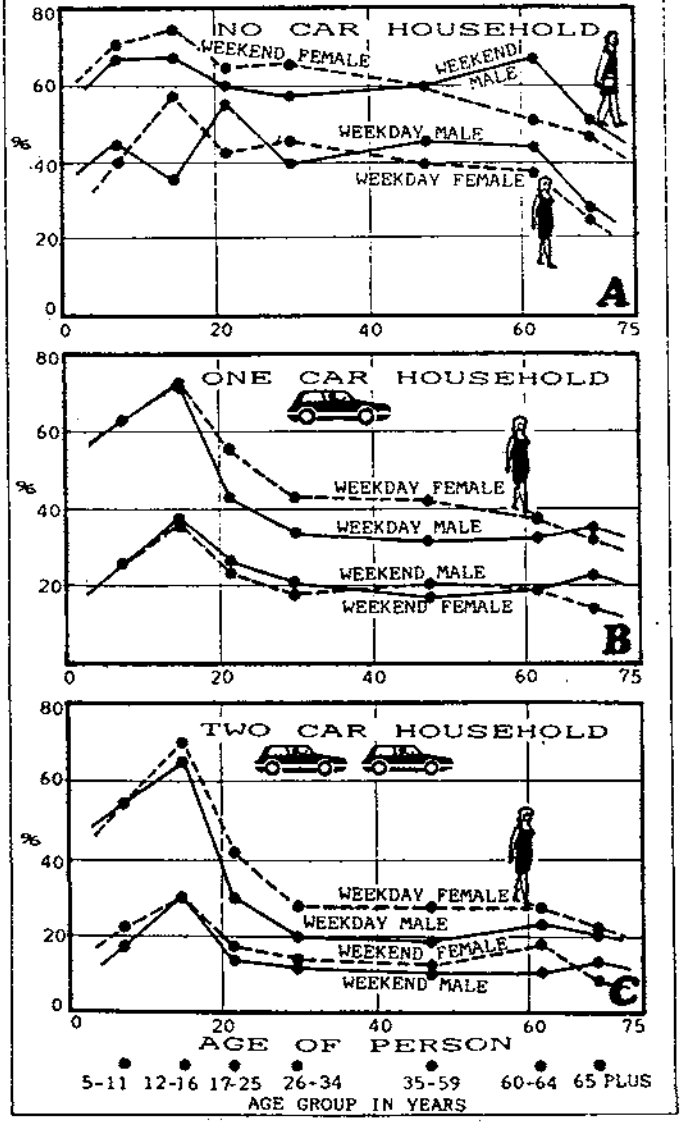
SOURCES: ABS PREDICTIONS AND DASETT SURVEY DATA



4 TRIPS TO SECONDARY SCHOOL BY AGE AND SEX MELBOURNE S.D. 1986

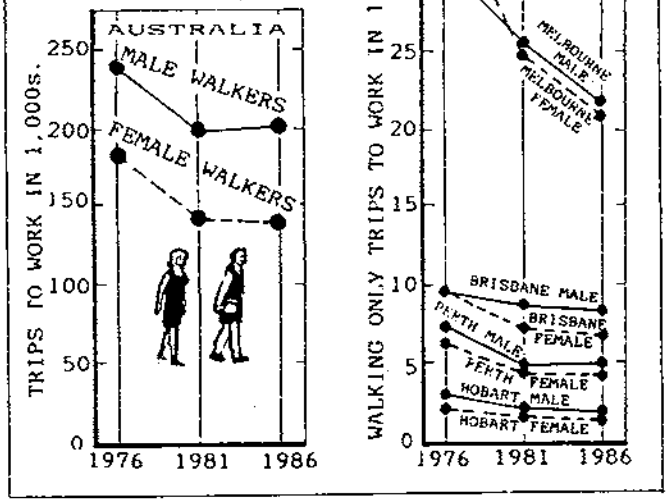


5 PARTICIPATION IN WALKING BY AGE, SEX AND NUMBER OF CARS IN THE HOUSEHOLD SYDNEY 1981. HIS.



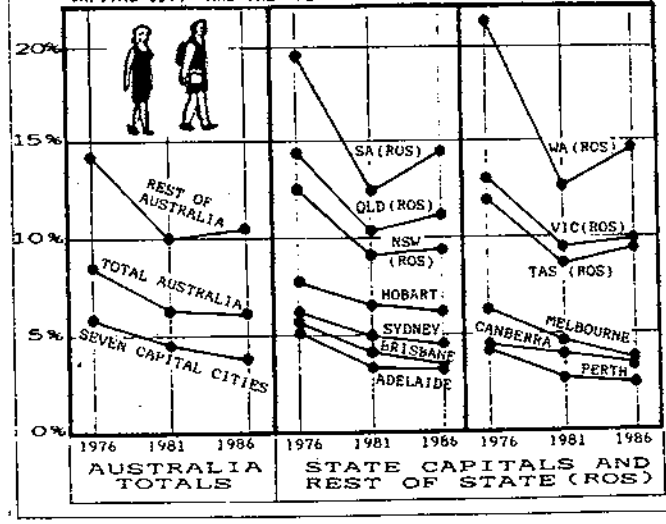
6 WALKING (ONLY) TRENDS

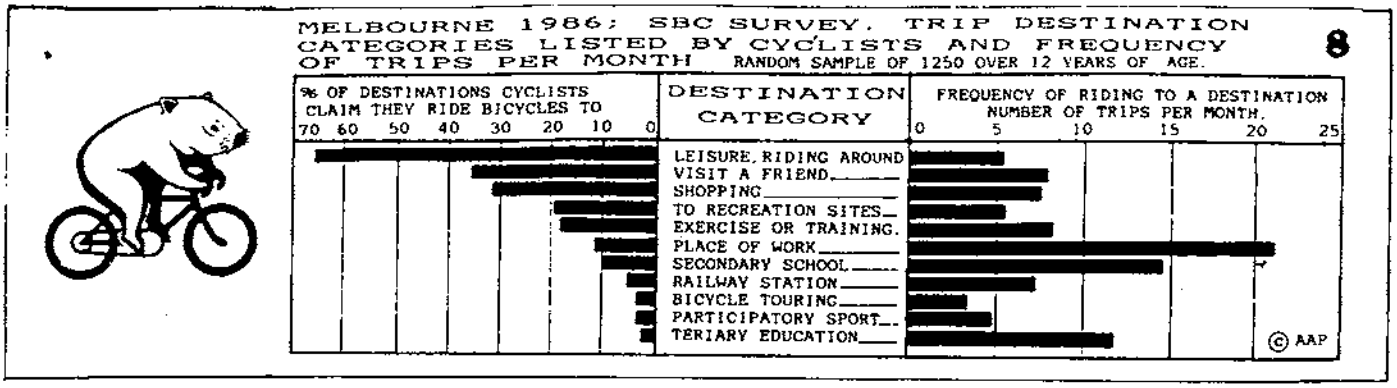
TRIPS TO WORK MALE AND FEMALE WALKING (ONLY) AUSTRALIAN CENSUS 1976-1986



7 PERCENTAGE OF WALKING TRIPS TO WORK 1976-81-86

PERCENTAGES CALCULATED FROM ABS DATA AND ALLOWANCES MADE TO COMPENSATE FOR THE DOUBLE COUNTING OF MULTI-MODE TRIPS. STATEWIDE DATA BROKEN DOWN IN TWO CATEGORIES : THE "CAPITAL CITY" AND THE "REST OF THE STATE".





An analysis of the distribution of walking trips to work clearly shows the higher levels of walking trips in the central and middle suburbs and a lower percentage of walking trips in the outer areas.

The current trend to provide low density housing in areas poorly served by public transport is the principal reason for the large proportion of new car trips and the decline in walking trips in the decade 1976 to 1986.

5. BICYCLE TRIPS TO WORK

Australian bicycle trips to work increased from .1% in 1976 to 1.63% in 1986. Figure 11 clearly shows that the growth rate is less in the capital cities than in the rest of Australia and the same pattern exists in all states. The overall impression of figure 11 is that cycling to work is increasing in most places, even in places with the most horrid traffic conditions like Sydney. The growth trends outside of the urban areas indicates that bicycle use will continue to increase in rural areas and the provincial cities where trips to work are much shorter.

Figure 10A shows that fewer women are choosing to cycle to work than men and that women are choosing to drive cars to work to a much greater extent than ever before. If we count Australian females who cycle to work as a percentage of all employed females it is only 0.9%. While the number of Australian female bicycle trips to work has increased by nearly 10,000 since 1976 this is not very much when we consider that up to 200,000 bicycles were sold to adult females last year. In Adelaide there has been a decline in the proportion of female trips to work.

Figure 10B shows the number of male and female bicycle trips to work in Australia and the capital cities. The reduction in the number of male bicycle trips to work in Melbourne between 1981 and 1986 (figure 10B) is because of uncontrolled bicycle theft at metropolitan railway stations (figure 9) where over 3000 bicycles were stolen, mainly from adult males. Elsewhere in Melbourne there has been an increase in bicycle commuting, however the loss of bike rail patronage at the rate of 6.5% per annum when bicycle sales were increasing at the rate of 8.5% per annum, has depressed the overall growth in bicycle commuting (Parker 1987).

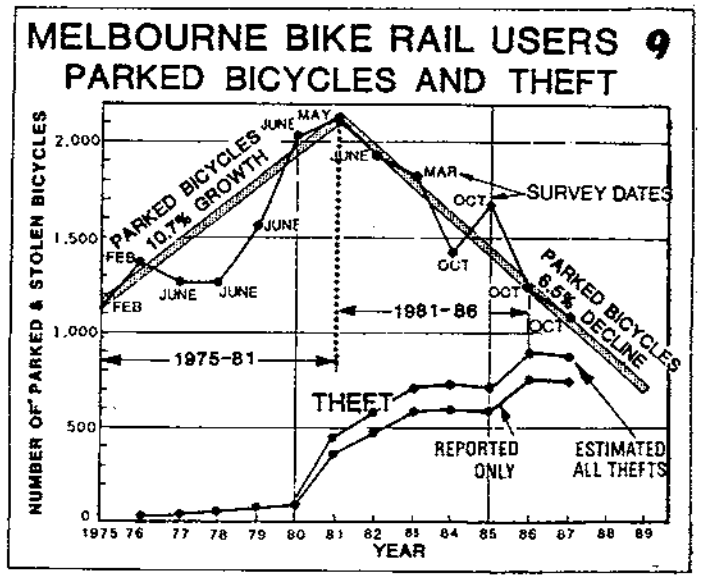
There is a great variation between the male and female distribution of trips to work by suburb in Melbourne (Parker 1988) which reflects a considerable reluctance by women to cycle in heavy traffic (Parker 1988). Other studies show that people would also like the choice of cycling more but do not because of the way our traffic systems have evolved, making cycling on most busy roads a stressful and/or unpleasant activity (SBC 1987).

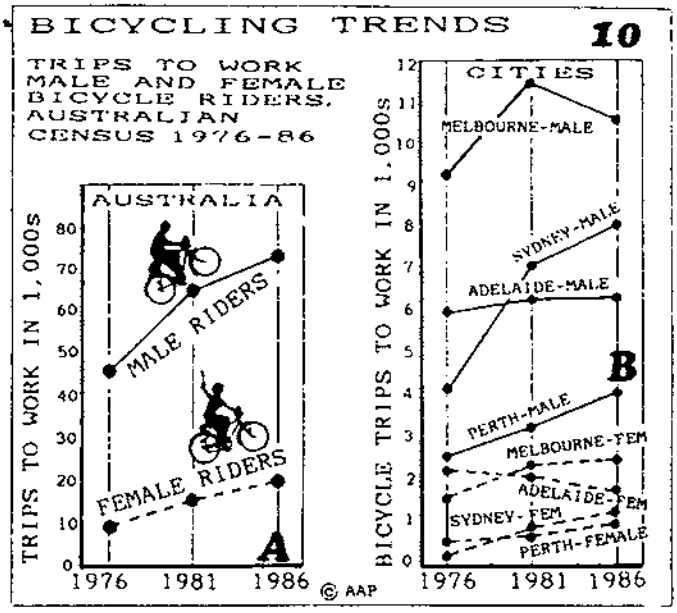
According to a recent research report (SBC 1987) there are approximately 70,000 occasional Melbourne bicycle commuters who do not show up on the census because bicycling is not their main means of getting to work. It appears that these cyclists ride anywhere from twice a week to less than once a month and, while we do not know exactly how often they ride, they show the potential for regular commuting.

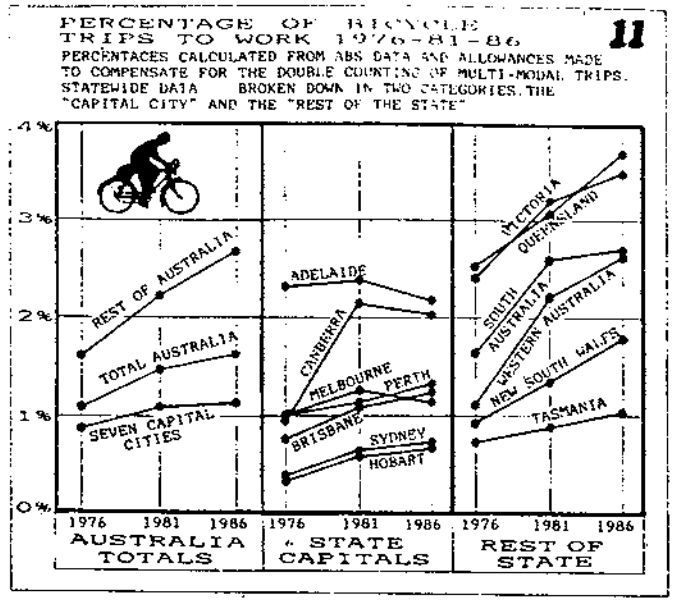
6. THE BICYCLE IN COMPETITION WITH OTHER MODES

Figure 12 shows the relationship between bicycle trips and the other modes for the capital cities expressed as ratios of trips by other modes to bicycle trips. Adelaide and Melbourne show a slight decline in the ratio of car trips to bicycle trips over the decade while Canberra showed a very large decrease between 1976 and 1981 followed by a slight increase between 1981 and 1986. Perth and Brisbane showed a similar decrease of around 70% and Sydney and Hobart showed a large decrease from a very high ratio of car to bicycle trips.

Figure 12A and 12B have the same vertical scale and can be compared with one another. The Melbourne data figures are similar to those for Brisbane and Perth. This similarity also applies to the ratio of bicycle and walking trips. The overall picture is of cycling competing with all other modes and improving its overall share of the passenger transport market. This is slightly different in Adelaide and Melbourne where the bicycle is competitive in relation to walking and public transport and is just maintaining its share of the market in relation to the car. It is not known what former mode cyclists used to use.





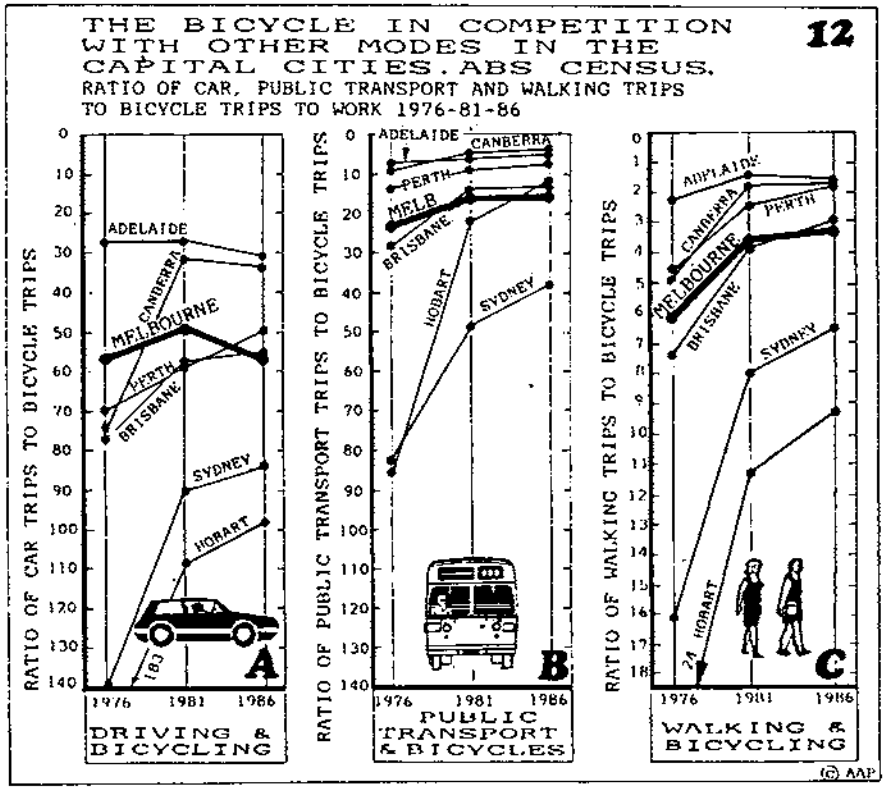


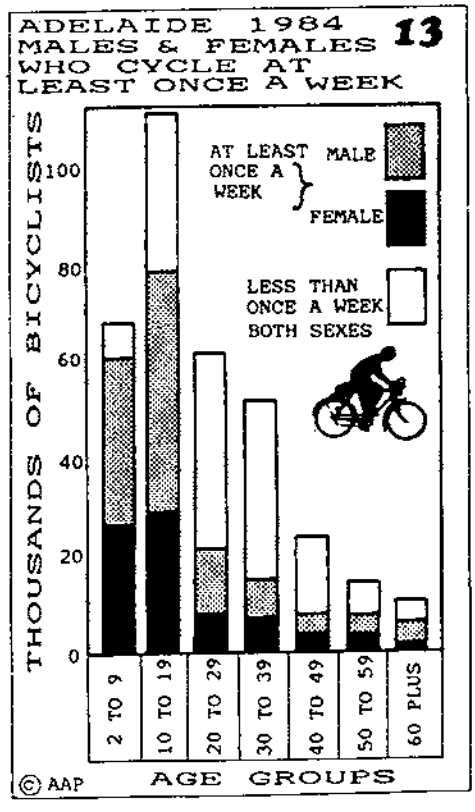
The only large scale sample survey that provides accurate data on bicycle use for all purposes is the ABS Survey of Bicycle Use and Safety in Adelaide (Oct 84). This survey identified 200,000 cyclists who cycled at least once a week who are shown by age group in figure 13. In 1986 only 2.2% of all trips to work were by bicycle in Adelaide (Census 1986) and most were for other purposes. Of the 80,700 female cyclists who cycled at least once a week, less than 2,500 cycled to work regularly in 1984. In the census on trips to work two years later there were only 2,281 female bike commuters.

Figure 13 shows that in all age groups that cycled at least once a week there were about four women for every five men. This dispels the myth that men cycle a lot more than women. Figure 13 also indicates the potential for convincing once a week bicycle users to make more frequent trips by bicycle. The bicyclist is better able to cope with longer trips to work and low density urban sprawl. Figure 14 shows the ergonomic data that prove how more mobile the cyclist is in low density areas than the walker.

7. COPING WITH THE PROBLEMS OF URBAN SPRAWL

Australian cities sprawl across the landscape dispersing homes from places of work and recreation in a way that increases the distance people must travel to do what they want and need to do. In the long term, infra-structure costs will escalate as this form of growth is unsustainable and generates more and more traffic. There is a need to ensure that better use is made of housing land in the future. For the foreseeable future immigration will increase by 125,000 per year and account for well over half the population growth in our cities. Immigration fuels the increase in housing prices and forces young families to trade the surplus nervous energy needed for long car trips to work for lower house prices in the outer suburbs. Many do this, not





because they want to, but because they have to. Australian families are getting smaller so building larger houses on larger blocks is simply an overall housing market aberration that has been allowed to create sprawl. While acknowledging that the better use of land - the key issue in new urban development - is beyond the scope of this paper, transport is still an important issue in new areas and absolutely crucial in coping with the urban sprawl that already exists. Indeed there is going to be a growing demand for cross suburban trips and trips to the inner suburbs, that is not going to be adequately met by existing long term plans.

There is an access role for walking and bicycling as part of a technically sophisticated transport system of tomorrow but this will not happen if present policies are continued. What exists is not going to be changed by either scrapping the car or walking to the bus or train station. What will work is making better use of cars by sharing them and using computerised passenger information systems, to enable pedestrians and cyclists to access shared cars. What will also work is using bicycles as feeders to rail stations and express bus stops in low density areas of population.

The significance of encouraging bicycles access to the public transport system can best be understood appreciating the catchment area implications of ...e graph in figure 14. A cyclist can travel 3 to 4 times faster than a walker for the same physical effort, but gives a catchment area increase of between 10 and 14 times. For example in Melbourne several studies (MTA 1987) have shown that, while 15% of Melbourne's population is within walking distance of a station, 85% is within easy cycling distance. Despite these new studies most transport planners seem unaware of the bicycle's potential as an access mode. In the 1970's one of the sacred cows of the transport planning fraternity was the notion that the rail system only acts as a feeder to the central business district. This need not be so, as using bicycles as an access mode at the city end of the trip enables Metrail to more adequately service all the inner suburbs and make cross city trips to other suburbs feasible.

The Public Transport Users Association (PTUA) have regularly been confronted with this 'sacred cow' and in their submission to Metplan stated: "The Met's unstated approach ignores the importance of e inner areas as trip destinations. Although ...ly 10% of the jobs are in the CAD the inner areas account for 40% of Melbourne's jobs, as well as much of it's shopping, restaurants, night clubs and so on. Most of the people coming to these destinations come from the outer areas". (PTUA 1988). The potential of bicycle access to shared cars or express public transport services has never been spelled out in any transport study dealing with the future growth of Melbourne and this needs to be done in a properly conducted planning study. Indeed this needs to be done for all Australian cities.

8. RECENT EXPERIENCE IN JAPAN AND EUROPE

The Japanese have been extraordinarily competent in encouraging bike rail trips on their suburban rail network. The Japanese have bicycle theft under control and neither theft nor vandalism has constrained the increase in bike/rail patrons. The Japanese rail engineers have developed innovative and cost effective means of storing large numbers of bicycles and they do not waste valuable space on car parking. An automated bicycle storage building over a station is shown on figure 15. This is one of their range of storage facilities for up to 2000 bicycles over rail lines.

Fast and effective rail commuter systems are the backbone of the Japanese passenger transport system and they are the reason that large Japanese cities use one fourth of the transport energy of Australian capital cities. We cannot copy the high density living of Japanese inner and middle suburbs but we can learn from how they cope with their equivalent of suburban sprawl. Instead of low density sprawl they have satellite and dormitory towns that are just as far away from people's work as they are in Australia, but they still manage to use public transport. In the outer areas of their cities they use bicycles to access the rail station. Not just a few but three million over the entire JNR network in a mere 15 years. Unlike Holland there was no tradition of cycling to the station. In Japan what exists is creative planning as a response to the resurgence in bicycle use. Australian rail managements could learn from this creative planning approach and the innovative engineering involved in catering for the needs of bike/rail users.

In the book Bicycles and Public transportation; New Links to Suburban Transit Markets. Replogle (1983) states that bicycle access to public transport is growing elsewhere:

"The growing importance of bicycle access to public transportation, particularly in suburban and rural areas, small cities, and towns, is not limited to Japan. Indeed, in countless European communities 10% to 55% of railway patrons and up to 20% of bus riders arrive at their transit boarding point by bicycle. In the Netherlands, over one-third of all access to rail stations nationwide is by bicycle, making this the predominant access mode. The share of all travel involving a combination of bicycles and transit has more than doubled in Denmark since 1971, reaching 5% of all trips, according to the Danish Traffic Directorate. Similar growth has been observed in many parts of West Germany."

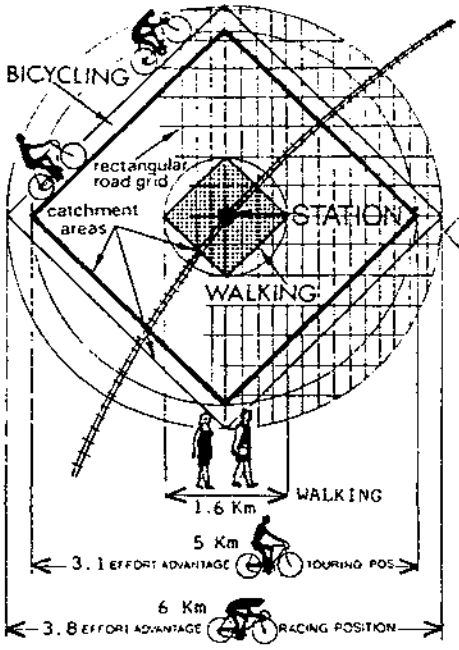
Fostering bike-transit programs requires developing plans and designs that make it easy and safe for bicyclists to securely park their bikes. Overseas, rail authorities encourage local government to provide safe bicycle routes to the stations. Fundamentally it is a matter of forming a policy then following through step-by-step with the necessary implementation measures. The whole system must be thought through and properly engineered. The most sensible way of doing this is to copy the Japanese who have a national bicycle parking policy and a special unit in their Ministry of Construction to develop new hardware in conjunction with the private sector. Given an Australian Government commitment to do something about the multi-million dollar bicycle theft problem, it would then become much easier for the state transport authorities to develop bicycle transit strategies that incorporate the provision of secure storage facilities and marketing programs.

9. USING BIKES TO MAKE BETTER USE OF CARS

The decline in the proportion of car passengers since 1976 shown in figure 2 means that the informal system of sharing cars is contributing to an overloaded road system. Clearly the great potential to make better use of cars is being

CATCHMENT AREA DATA

Showing how much more efficient bicycling is than walking for gaining access to stations, bus stops and shared cars.



TYPICAL 75 Watts for STATION 7.6 minutes CATCHMENT

COMPARISON OF CATCHMENT CHARACTERISTICS

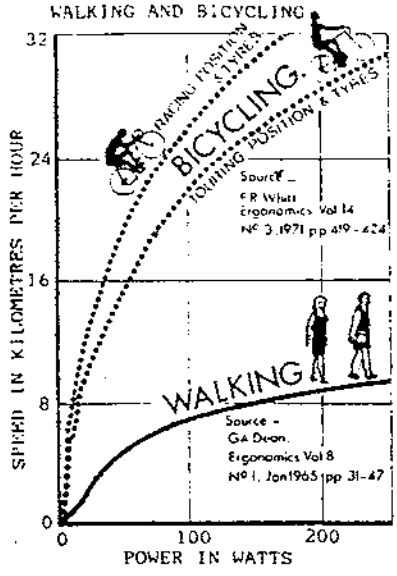
Station catchment area data for constant output of physical effort (75 W) for 7.6 min

Data FOR RECTANGULAR ROAD GRID			
EFFORT ADVANTAGE	1.0	3.1	3.8
SPEED Km/h	6.1	20	23
DISTANCE Km	0.8	2.5	3
CATCHMENT Km 2	1.3	12.4	19

SOURCE: Alan A Parker (1977)

14

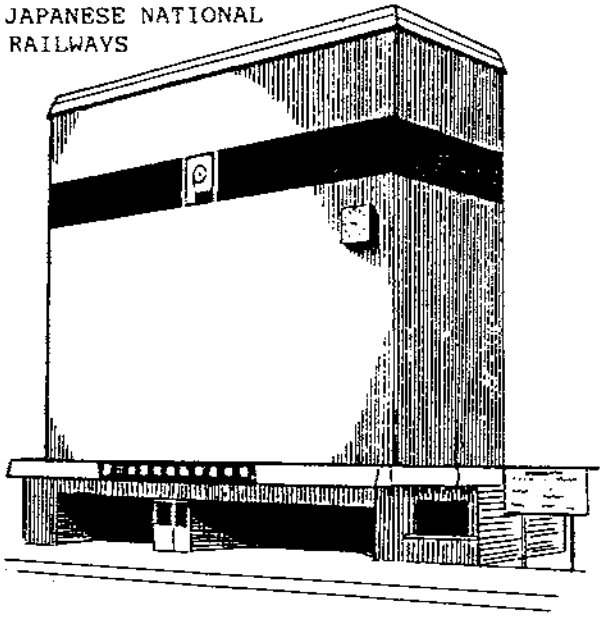
COMPARISON OF EFFORT WALKING AND BICYCLING

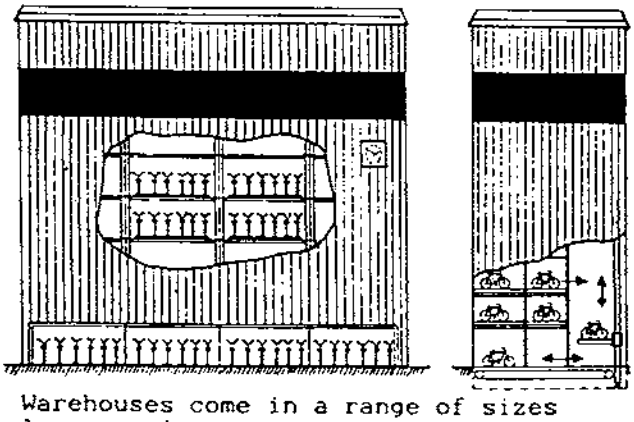


AUTOMATED WAREHOUSE STORES BICYCLES AT RAILWAY STATIONS

15

JAPANESE NATIONAL RAILWAYS



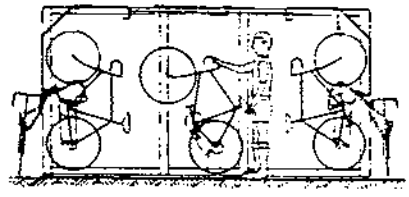


Warehouses come in a range of sizes larger units can store 1,800 bicycles and handle 3,000 bicycles per day © AAP

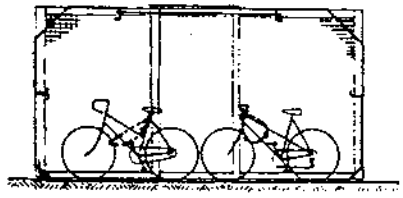
LOCK UP CAGE

16

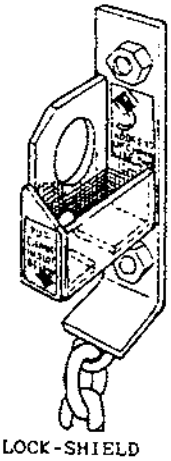
INSIDE 10 BIKES. OUTSIDE 4 BIKES.
8 OF THE BIKES ARE HUNG VERTICALLY ON THE INSIDE. USERS ALL HAVE KEYS FOR DOOR. HARDENED CHAINS AND LOCK SHIELDS ARE PROVIDED FOR ALL BIKES INSIDE AND OUTSIDE.
CAGES ARE TO BE BATCH PRODUCED AND SUPPLIED IN KIT FORM TO ALLOW ASSEMBLY WITHOUT THE USE OF A CRANE.



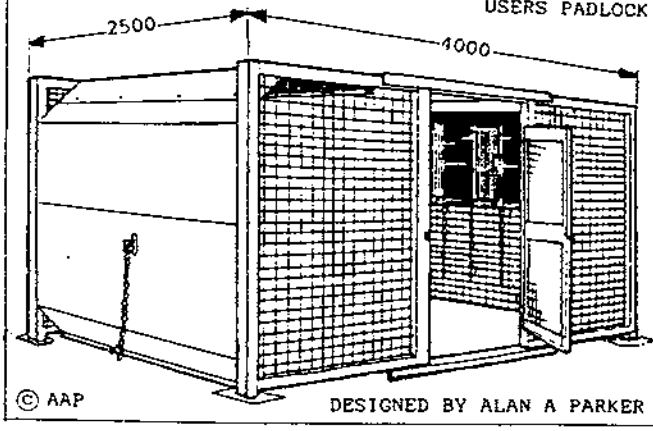
SECTION THROUGH SHOWING BIKES HUNG VERTICALLY



SECTION SHOWING BACK WALL WITH BIKE STORAGE FOR WOMEN CYCLISTS



LOCK-SHIELD WITH HARDENED CHAIN PROTECTS THE HASP OF USERS PADLOCK



© AAP

DESIGNED BY ALAN A PARKER

ignored by government whose policy of doing nothing has reduced the proportion of passengers carried. By providing the personal incentives missing from failed car sharing schemes overseas, and using bicycles as well as walking as an access mode, car sharing has great potential now. For the future, car sharing will have even greater potential because by 2001 there will be another 650,000 people living in Melbourne and another 700,000 in Sydney and most of the new housing to accommodate this increase will be in the outer suburbs with very poor provision for cross suburban trips by public transport. By 2001 the proportion of households with access to serviceable bicycles is expected to increase from one half today to around 80%. This is another reason why this concept of the bike/shared car transport service needs to be developed and trialled because the potential market for such a service exists in the outer suburbs now and will continue to grow.

Most cyclists do not ride all the way to work because it is too far, or because they perceive road hazards. Surveys show that women make shorter work trips and are more traffic wary than men, with a greater preference for back road or off-road routes. Gaining access to shared cars is therefore ideally suited to women cyclists because most of the potential drivers will be in the middle and outer suburbs in quiet residential areas that can be reached by residential street back routes. Figure 2 shows the higher rate of increase in the number of female car drivers between 1976 and, 1986 and if this is considered with the large increase in recreational and occasional bicycle commuters, there is a great potential for using bicycles as feeders to shared cars.

Bicycle/car sharing arrangements could take many different forms but what is needed is tax relief which creates a financial incentive to car drivers so that they seek out one or more paying passengers who cycle or walk to their homes or a pick up point that is convenient to the driver. Cars or minibuses could be used for this purpose and the scale of recommended fares would be such as to motivate drivers and passengers to continue the sharing arrangement. Commercially available bicycleracks for cars give potential users more convenient access at both ends of the trip. This proposal would have the opposite effect of free company cars for employees who do not need them for their work, which results in many more cars on the road. Phasing in incentives for shared cars, and disincentives for the use of company cars are policies that should be pursued simultaneously. Priority could be given to the encouragement of cross suburban trip making so as to avoid conflict with other strategies for improving access to public transport.

What is needed is a computer program (that possibly exists) that can not only tell drivers or passengers who they might share with, but short list them in terms of compatibility to special needs such as hours of work. Then surely it would be possible for hundreds of thousands of people nation wide to be able to come together to share cars. With a computer matching system the limited contact people have now at their work is greatly increased. It is not limited to a few people they know but extends to the locations, which may include many factories and offices.

At the home end of the shared car trip the cycling catchment area shown in figure 14 would apply generally.

Cyclists would mostly ride from within a 3 kilometer radius, that is an 8 square kilometer catchment area. Hazardous road routes could be excluded from the catchments in computer memory, thus enabling the computer matching system operators to print out recommended safe routes and automatically match cyclists to only those drivers within these relatively safe catchment areas.

The computer hardware required is now lower in cost than ever before and provided there is a proper feasibility study, the constraints that made most shared car schemes in the seventies fail could be overcome. If a tax incentive were available to shared car users then it is difficult to see how such a scheme could fail in the long term. Computer systems could be developed as an extension of public transport passenger information systems currently being developed in several states but the necessary feasibility study is really a Federal Transport Department responsibility and would be so in those countries pioneering new transport systems.

10. RECENT DEVELOPMENTS IN AUSTRALIA

In Australia about 30,000 bicycles are recorded by police forces as being stolen every year and 14,500 were stolen in Victoria in 1987. Bicycle theft is an Australia wide problem, and is a serious deterrent to bicycle use, when cyclists have to use public bicycle parking facilities. In Melbourne (see figure 9) the growth of bicycle park and ride at suburban stations is minimal due to the high bicycle theft rates. Approximately 900 bicycles are stolen from the vicinity of Met Rail stations each year, and of these only about 650 are reported to the police each year and most are never recovered.

On the Sydney and Brisbane rail systems the number of bike rail users or the number of bike thefts is not known. In Adelaide the bicycle lockers on the 'O' Bahn express bus system have been successful but there are still too few lockers. The main problem in both Melbourne and Sydney is that there are not enough lockers. The greatest planning deficiency is that no study has been done of potential users who do not currently use the rail system. A study has been done of existing bike/rail and other rail patrons in Melbourne (MTA 1987) however the very much larger group of potential patrons who do not use the system have never been surveyed.

There are over 5000 people in Melbourne who have had a bicycle stolen from a rail station since 1980. Bike rail patrons tend to be non-enthusiasts and rarely use expensive theft prevention devices of their own. Most utility cyclists are not conscious of the theft problem and just stop cycling when their bicycles get stolen or go by car.

Inspection of bicycles stored at Metrail rail stations revealed that over 80% of the racks provided could only be used for locking one wheel and the racks were not suitable for locking the bicycle frame. Fortunately Metrail have now stopped installing these racks. Most racks were disastrously located off the platforms, in places where thieves like then to be. Over ten years more than 2,000 bike racks had been put where thieves could conveniently park, cut through locks and chains with bolt cutters and load up in about one minute.

11. BICYCLE FACILITIES ON MELBOURNE METRAIL STATIONS

In Melbourne there are around 200 operational bicycle lockers in use. Unfortunately the inferior construction means that they are corroding away very rapidly, especially in the bayside suburbs where the salt just eats through the sheet steel. In Sydney there are privately leased lockers that do not suffer from the corrosion problem because they are made from plastic and Zincallume coated steel sheets.

In 1987 Metrail installed 900 bolt cutter proof chains and lockshields on station platform fence posts but these units are not being used. The reason for this is the failure to trial prototypes with potential users and then rectify the detail design to make them easy to use. A secondary problem is the failure to provide station staff with the right literature at the right time showing how these devices could be used and to ensure that station staff encourage bike/rail patrons to use the facilities provided.

Another interesting development with benefits for bike/rail patrons has been the use of a video camera at Frankston station with bike racks on the platforms. A video overlooking a bicycle storage installation seems to have a considerable effect as deterrent to both bicycle thieves and vandals.

A lock-up cage (see figure 16) with bolt cutter proof internal locking devices has been designed by this writer for Metrail and is being tested on a Metrail station with users. The cage is meant to be batch produced for around $2000 and reduce the cost of storing a bicycle to one third of that of a bicycle locker. As there is an immediate need for 500 secure and vandal resistant bicycle locking devices each year for the foreseeable future the lock-up cage would save a considerable amount of money.

The real problem that bicycle parking programs have no real status and most funds allocated to private vehicle access at stations are spent on providing car parking spaces. There is no properly thought out overall vehicle parking program.

12. CONCLUSIONS

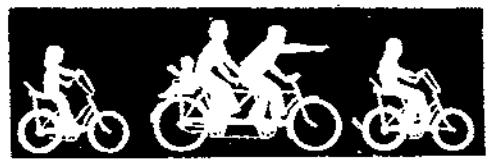
Unless both strategies for improving access are properly developed and funded to satisfy the need for travel towards and across the centre as well as outer suburban cross travel then walking even part of the way to work will continue to decline and cycling to work is unlikely to increase. Meanwhile recreational cycling will greatly increase in off road areas and on back roads. The only form of bike dual mode travel that will significantly increase will be in the carriage of bicycles on the back of cars for recreation.

In the long term the way to encourage walking and cycling is to recognise their potential as access modes. In Japan and Holland the extra patronage that is possible as a result of providing for bicycle users is an important contribution to the overall economic efficiency of the rail systems. This in turn leads to better services for other users.

In the long term there could be over 200,000 bike/rail bike/express bus users in our capital cities given funding and a creative approach to planning for cyclists needs.

There could be a similar number of bike/shared car users but less is known about making such a system work and any estimates would be pure speculation. The concept seems to have sufficient potential to justify a feasability study.

Above all what is needed is an innovative approach to the design of new transport systems and to stop viewing cycling and walking negatively as just safety problems.



REFERENCES

BITA (1987) How big is the market. Bicycle Industry Trade Association Newsletter Sept 1987 No 10.

DASET 1988 Physical activity levels of Australians. Department of Arts, Sport, the Environment and Tourism. Australian GovernmentPublishing Service. Canberra 1988.

HILLMAN M 1979 Walking is Transport by L Hillman Vol XLV No 583.. Policy Studies Institute. Sept 1979. pp34.

HIS 1981 Sydney Household Interview Survey 1981.

MTA 1988 The 1987 Melbourne school traffic survey report 2. Analysis Melbourne Transit Authority. March 1988.

MTA 1987 Provision of bicycle facilities at railway Stations. Loder and Bayly and Alan Parker Design. Metropolitan Transit Authority March 1987.

NTS 1972/73 National travel survey 1972/1973 /cross-sectional analysis of passenger travel in Great Britian, Dept. of the Environment, HMSO 1975.

PARKER 1987 Bike-rail patrons ripped off by Alan A Parker. Freewheeling July/August 1987. Issue No 43 Parker.

PARKER 1988(a) Women and cycling.by Alan A Parker. Freewheeling Issue No 52 Nov/Dec 1988.

PARKER 1988(b) Cycling to School in Melbourne by Alan A Parker. Freewheeling Issue No 50 July/Aug 1988.

PTUA 1988 A Response to the draft Metplan. Public Transport Users Association and the Town and Country Planning Association. August 18 1988.

REPLOGLE 1983 Bicycles and Public Transportation. New links to suburbs transit markets by Michael A Replogle Bicycle Federation of America. Washington 1983.

SBC 1987 Survey of cyclists characteristics and cycling patterns. State bicycle Committee of Victoria 1987.

WIGAN M R 1987 Australian personal travel characteristics. Special report No 8. Australian Road Research Board 1987.

Accelerating the Future: The Economic Impact of the Emerging Passenger Economy. Autonomous Vehicle Service (AVS). Report Snapshot.Â The Passenger Economy will stimulate value creation from the adoption of Mobility-as-a-Service and other new mobility services as well as emerging new applications and services as well as from savings in time and money associated with vehicle use and from the resulting freedom of movement. Our research finds that autonomous driving technology will enable a new Passenger Economy worth US$7 trillion in 2050.Â Regulation: Traffic congestion, pollution and safety are significant issues for every city in the world. Congestion is bad in emerging and mature markets alike. Trends in capital city passenger travel. In the almost seven decades since the end of the Second World War, many Australian cities have gradually transformed from quite tightly knit layouts (typically with â€˜core-and-spokeâ€™ configurations, well suited to passenger movement by mass transit systems), to more sprawling suburban (generally low-density) configurations.Â In terms of total pkm (i.e. both motorised and non-motorised), estimated 2013 private light road vehicle share becomes about 86% for metropolitan (8 capitals) travel and 87% for all Australian urban travel (i.e. including provincial city travel as well as the capital cities). 2. 59.Â Therefore, future increases in Australian urban passenger-kilometres, as