Possible Effects of New Transport Technologies on the Tourism Industry in the 21st Century

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Abstract:

The health of the nations tourist industry is inextricably tied to the efficiency of the transport industry This paper will examine how new technologies may change the relationships between transport modes within the nations transport system The likely outcomes of proposed technologies such as Hypersonic aircraft and Very Fast Trains will be briefly assessed and their impact on Tourism discussed

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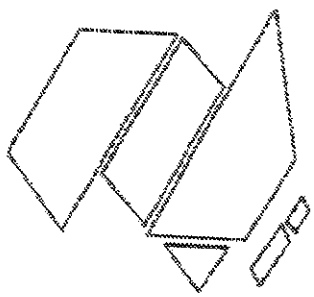

POSSIBLE EFFECTS OF NEW TRANSPORT TECHNOLOGIES ON THE TOURISM INDUSTRY IN THE 21ST CENTURY.

1. INTRODUCTION

Tourism makes a significant contribution to the Australian economy generating gross expenditure of approximately $A26 2B in 1991-92 (Department of Tourism 1993) and contributing 5 6% of Gross Domestic Product in the same period. A key element of the continued growth of the nations domestic and international tourism industry is the ability of trasport providers to move both passengers and freight in a safe and efficient manner. The health of the nations tourism industry is inextricably tied to the efficiency of its transport system and it is from this perspective that this paper will attempt to suggest some of the impacts that new transport technologies may have on the shape and viability of the nations domestic and international tourism industry in the 21st century.

2. THE ROLE OF TRANSPORT

The relationship between transport and tourism is almost as old as recorded history. Dickman (1989) noted that in Ancient Greece during the time of Alexander the Great up to 700,000 tourists annually visited Greek colonies in what is current day Turkey supporting a tourism industry that included the ancients equivalent of restaurants, theatres, tour guides and hotels. Excellent road systems, efficient sea transport and an organised land transport system that included rest houses and the facility to change or refresh teams of horses at regular intervals made this early tourist industry possible. As long ago as the 1890's the emerging professional leisure industry, the predecessor of today's tourism industry, was catering for beachside holidays either on a day or overnight basis in the newly established beachside resorts of Sandgate and Southport in South East Queensland. Railway services from metropolitan Brisbane enabled large numbers of Brisbane residents to travel to the beach. Lawson (1973) noted that on New Year's Day 1899 8,000 people or 8% of Brisbane's entire population travelled by train to Sandgate 16 kilometres from the city. Subsequent developments in transport technology in the ensuing century have continued to stimulate growth in the states tourism industry with the introduction of scheduled air services and widespread use of the private car facilitating spectacular growth in the last thirty years.

Figure 1 illustrates in a very simplistic manner the importance of transport to the nations tourism industry. Each component of the model relies on the efficiency of the other two components for its continued health. For example, should the standards of the accommodation component decline it is highly probable that tourist numbers will fall irrespective of how cheap, safe and efficient the support transport modes may be.

Figure 1 The Tourism Triangle

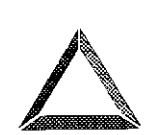

Table 1 illustrates the significance that various transport modes play in both domestic and international tourism Of particular interest is the pre-eminent role of the private motor vehicle in domestic tourist transport and of air transport in international visitation Air transport is the method of entry to Australia used by 99 96% of all visitors (the remaining 04% of passengers arriving by boat) Air transport is also used by 44 46% of international tourists once in Australia

Table 1 Total Domestic Trips by all Transport Used in the Period 1991 (International) and 1991/92 (Domestic)

Mode of Transport	International	Domestic
	1991 (a)	1991/92
Plane	44 46	11 8
Bus/Coach	96 51	8 2
Private Vehicle	45 23	80 7
Rented or hire vehicle	14 69	4 0
Train	5 38	5 5
Ship/Boat/Ferry	41 63	2 7
Other (Taxi, Local Transport)	71 2	3 1
TOTAL	319.1	100.0

Notes

(a) Column percentages add to more than 100% because survey respondents have used more than one type of transport during their stay The percentages in this row equal the sum of all types of transport used On average visitors used three types of transport during their stay in Australia in 1991

Source B T R (1992) Australian Tourism Trends 1992 Update BTR, Canberra

The history of large scale tourism in Australia can be attributed to the growth of international aviation with significant milestones being the introduction of Boeing 707 services and Boeing 747 services

3. ROLE OF TECHNOLOGY

The ability of the transport industry to service the needs of the tourist industry is largely driven by the key consumer demands for speed, convenience, safety, comfort and affordability. Throughout history the ability of the transport industry to satisfy these key requirements has been dependent upon the level of available technology. Simple technologies such as the wheel in part facilitated the expansion of the Roman Expire whilst more sophisticated maritime technologies employed by English naval designers allowed the United Kingdom to carve out an enormous empire spanning every continent. An understanding of the role that new technological developments played in the evolution of transport systems in the past gives a glimpse of the manner by which future technological advances may completely change the patterns of travel and tourism in the future.

The key to understanding the impact of technology is the application of the concept of the systems approach as a means of studying how the transport industry operates both on the level of individual and competing modes and at the collective industry or system level. Adoption of a systems approach enables the impact of new technologies to be studied either on the basis of a specific mode in isolation or on the collective industry as a whole. A system can be defined as having a set of two or more interrelated and interdependent elements (in this case modes) which have the following characteristics:

- The behaviour of each element of the system affects the behaviour of the whole,
- the behaviour of each element of the system depends upon the behaviour of at least one other element, and
- every possible subgroup of elements in the set reveals the above two properties of interdependence.

Thus a system is more than the sum of its parts. As a consequence it is necessary to examine the elements of the system and the manner in which the various elements, or modes in the case of transport, are interrelated and how changes in one mode will impact on the other modes. The primary advantage of using the systems approach is that it allows transport agencies to assess the impact that change, in this case induced by new technologies, will have on individual modes as well as the entire industry. Again turning to recent Australian history it is evident that the growth in private car ownership and the growth of domestic trunk airlines in the 1950s resulted in the demise of scheduled coastal passenger shipping and great reductions in the popularity of intercity and interstate passenger rail services. By 1959 the numbers of Australians travelling overseas by air exceeded those carried by sea (Review Committee, 1978). The introduction of scheduled Boeing 707 services signalled the end of scheduled international passenger shipping in the 1960s.

Whilst consumer demand for cheaper, faster and safer transport has largely underpinned the need to constantly upgrade the transport system it is worth examining other factors that have also had significant impacts on the rate at which new technology is adopted. Primary amongst these factors has been government regulations, the system of national economic organisation, spatial factors, operational characteristics of individual modes and environmental factors.

4. THE FUTURE

The following discussion assesses the likely impacts that new technologies may have on the tourist industry from a modal perspective.

Sea.

Whilst in total tonnage terms sea remains one of Australia's largest freight modes, new technologies have been applied in areas other than the speed at which vessels travel Today's ships are larger, more fuel efficient, less manpower intensive and cheaper to operate than ships of 80 years ago, however until recently, speeds have remained relatively static in terms of average cruising speed. Ships of the next century, both freight and passenger, may be able to cruise at much faster speeds if new technologies currently being tested by the Japanese are successful

On 28 January 1992 the Japanese launched an experimental 150 tonne boat, the Yamoto 1, powered by superconducting magnetics and with a shape bearing a resemblance to a water bound version of the space shuttle The boat has the potential to travel at 100 knots per hour Superconducting coils, cooled to 4 degrees above absolute zero surround a duct through which sea water flows Electrodes immersed in the water create a current running at right angles to the magnetic flux By the rules of electromagnetism a force is induced in the conductor, in this case water, driving it backwards through the duct The water jet drives the ship forward at much higher speeds than existing water jet engines In terms of shipping the successful application of this new technology will enable new generations of shipping, including cruise boats and ferries to travel at speeds up to four times greater than today's vessels In heavily trafficked areas such as Asia, the Carribean and Europe faster shipping could have significant effects on competing modes particularly aviation Australia is less likely to benefit from this technology in the tourism area with the possible exception that faster freight shipping could result in reduced freight costs for the many tourism inputs imported into Australia and scheduled passenger services between some centres may become viable as the cost of travel falls whilst the speed of travel increases

Rail.

Domestically rail accounted for only 3% of interstate trips and 4% of intrastate trips as the main mode of transport in 1991/92 (DTM 1993 p 47) The demand for long distance rail has been in decline since the 1950s when tourists turned to the private automobile and to airlines as the major modes for holiday travel In recent years significant technological advances have occurred in rail design that have the potential to alter this pattern in the next century if new technologies already developed overseas are adopted by Australian rail organisations

Rails greatest potential lies in the area of Very Fast Trains (V F T) The first country to build a dedicated high speed passenger rail network was Japan which opened the first section of its Shinhansen network in 1964 In the period since speeds have increased from 210 kilometres per hour in 1964 to 240 kilometres per hour in 1991 with the network growing to in excess of 1800 kilometres with further extensions planned (VFT, 1990). The VFT concept has been adopted extensively in Europe with the TGV operating in France and Germany's Inter City Express (ICE) linking Hamburg, Frankfurt and Munich In Europe plans exist for the development of a further 29,000 kilometres of high speed lines over the next decade (Business Week,

Apr 19, 1993. p.54) France alone is intending to increase its current fleet of 240 IGV's by an additional 500 units by the end of the decade and spend an estimated $A188 Billion upgrading 4,000 kilometres of tracks over the next twenty years (Business Week, April 19, 1993 p 54) The goal of French transport planners is to largely substitute plane and car travel with IGV services on routes shorter than 500 kilometres

In Australia a private consortium of companies headed by BHP and operating under the name VFT Joint Venture, has proposed Very Fast Train services for the Melbourne, Canberra, Sydney corridor with possible future extensions to Adelaide and Brisbane. Currently on hold due to lack of Federal Government support, the proposal, if eventually adopted, would have a significant impact on the manner by which people travel between the cities connected by the VFT network Table 2 (VFT, 1990 p 38) illustrates the composition of the forecast VFT market in 1995 by mode and purpose of trip VFT Joint Venture research indicates that traffic diverted across all modes is relatively higher for business travellers than VFT or other purposes. By contrast induced traffic is proportionally greater for VFT and to a lesser extent travel for other purposes

Table 2 Travel Patterns Between Sydney and Melbourne With and Without the VFT in 1995 (millions)

	1995 NO VFT	1995 WITH VFT	1995 CHANGE
CAR			
Business	1 19	.68	(Diverted)
Visit FR	1 90	1 53	-0 51
Other	1 95	1 60	-0 37
TOTAL	5 04	3 81	-0 35
			-1 23
AIR			
Business	2 34	1 17	(Diverted)
Visit FR	55	.28	-1 17
Other	74	46	-0 27
TOTAL	3 64	1 91	-0 28
			-1 73
COACH			
Business	09	04	(Diverted)
Visit FR	83	41	-0 05
Other	46	27	-0 42
TOTAL	1 38	71	-0 19
			-0 67
TRAIN			
Business	01	00	(Diverted)
Visit FR	19	08	-
Other	08	04	-0 11
TOTAL	28	12	0 04
			-0 16
VFT			
Business	-	2 31	(Total Div)
Visit FR	-	2 03	+1 75
Other	-	1 49	+1 17
TOTAL	-	5 83	+0 87
			+3 78
TOTAL			
Business	3 63	4 19	(Induced)
Visit FR	3 47	4 32	+0 56
Other	3 24	3 86	+0 85
TOTAL	10.34	12.38	+0 62
			+2.04

Source Adapted from VFT (1990) The Economics of the Very Fast Train VFT Joint Venture, Canberra, p 39

Based on estimates made by the VFT Joint Venture introduction of the VFT would radically alter travel patterns between Sydney and Melbourne with trips by cars falling 24 4%, trips by plane falling 47 5% and coach falling by 48 6% The extent of any change between modes will be largely dependent on the final price of VFT travel versus price of travel by plane, car and coach In the 1989 Draft Report on Travel and Tourism, the Industries Assistance Commission found that *"The main impediments to the development of tourism and its contribution to the Australian economy lie in the provision of transport services Air travel is too expensive and restricted, rail services are inefficient, and coaches are regulated in part to protect railways Even the cost of private transport is inflated by the high purchase cost of vehicles (due to high tariff protection) and various taxes on fuel."* (IAC, 1989, p xiii)

Even allowing for the subsequent deregulation of domestic airlines and easing of quantitative restrictions on the operation of long distance coaches the impact of the VFT on the cost of transport will be substantial Reductions in transport costs, which make up 12 4% of total international visitor expenditure will tend to stimulate both domestic and international tourism

Aside from the VFT type technology of electrically powered steel wheel on steel track, other possible high speed rail technologies include a proposal by Grumman Corporation of the United States of America to develop a Maglev system that employs superconducting magnetics to propel a rail carriage suspended above a T shaped rail track by magnets and capable of speeds of up to 480 kilometres per hour (Business Week, April 19, 1993, p 54) A similar type of system developed by a consortium of German and Japanese companies, the Transrapid Maglev will also utilise magnetic forces for propulsion and be capable of running at speeds up to 480 kilometres per hour A demonstration Transrapid Maglev system is being built in Florida, USA to convey tourists from the Orlando airport to a terminal adjacent to Disney World Initial speeds of up to 400 kilometres per hour are planned (Business Week April 19, 1993, p 55)

A Swedish rail innovation, the tilt train, has been designed to achieve speeds of up to 240 kilometres per hour on existing track The train has axels which swivel during turns and railcars that are capable of tilting to off-set centrifugal forces Ultimately the highest speeds will only be achievable on good quality track In itself the tilt train has enormous potential to improve the quality of Australia's existing passenger rail services Queensland Rail plans to introduce tilt trains on the Brisbane to Rockhampton service later this decade Widespread adoption of this technology particularly on the longer intercity and intrastate routes may be of significant benefit to the tourist industry providing prices are competitive with airlines

Road.

Revolutionary technology able to transform travel by road appears to be some way off Recent innovations that improve the quality of travel have been restricted to engineering designs that improve the quality of ride of the vehicle and enhance the safety of vehicle occupants New engine developments such as the orbital engine and the split cycle engine will improve the efficiency of vehicle engines and reduce running costs The Split Cycle Engine developed by Gold Coast inventor Rick Mayne is one-tenth of the size, one-quarter of the weight and one-third of the cost of a conventional

engine due to the absence of a crank shaft and 700 other moving parts (The Sun-Herald, June 27, 1993 p 4) Interestingly the engine has the potential to be run on steam or cheap non-polluting fuels such as natural gas. Unfortunately final research and development will be moved in the near future to Slovakia where the Demog-Novotrend Corporation will further develop and manufacture the engine

In the long term there is potential to develop high speed cars that could travel along roads using sensors embedded in the road to assist a car mounted computer controlled remote steering system to control the operation of the car Drivers would hand over control on designated highways to the cars onboard computer system for the entirety of the journey Once leaving the highway drivers would regain control but at much lower speed Such a system would eliminate accidents on suitably equipped highways and if anti collision sensors were incorporated, reduce accidents in other areas

The enormous flexibility of cars in respect to departure times and routes would make vehicles equipped with this system extremely popular and would boost tourism in Australia by reducing travel time between destinations Domestic tourism would receive a considerable stimulus if tourists were able to retain the existing flexibility of private motoring and at the same time enjoy the benefits of reduced travel times

Aviation

The significance of aviation to Australian tourism is apparent from the statistics that indicate that 99 96% of international visitors travel to Australia by air and 44 46% use domestic airline services whilst in Australia Similarly 11 8% of domestic tourists use air services as their primary mode of transport Recent improvements to aviation have centred on reducing the cost per seat kilometre and increasing the number of passengers carried Earlier endeavours to increase the speed of civilian airlines have not met with a great deal of success with limited numbers of supersonic passenger Concordes built for BA and Air France and Tu144 SST operated by Airoflot for only a limited period of time Future technological advances in aviation appear to be focused in two directions; increased carrying capacity and increased speed Advances in both areas appear likely to be in place commercially in the first decade of the 21st Century and will greatly enhance the ability of aviation to carry more passengers, faster, safer and cheaper

In respect to carrying capacity several projects are currently in the predesign stage with commercial operations possible by the end of this decade Australian Aviation (July 1993, p 7) recently reported that Boeing has stated that preliminary studies with BAe, Aerospatiale, CASA and Deutsche Aerospace have confirmed that there is a market for 400 to 500 Very Large Commercial Transports (VLCT) in the first decade of the next century Preliminary design concepts for the VLCT envisage an aircraft that would carry 600 passengers over ranges to 11,000 kilometres Follow on versions of the VLCT could be stretched to accommodate more passengers carried over longer distances MacDonnel Douglas's proposed MD12 would also carry up to 600 passengers over very long routes Aerospatiale has proposed, as part of a consortium of European firms including the CIS nations, a family of planes to cover the 500/800 seat market in the long range sector (Aircraft June 1993, p 4) Designated as the ASX family, seating would range from 501 in the ASX500 to 803 in the ASX600 with

maximum take-off weight ranging from 433 Tonnes (ASX500) to 570 tonnes (ASX600) flying at speeds of Mach 0 85

Aircraft of this size whilst travelling as fast as today's generation of airlines offer far greater economies of operation which will lower seat costs by a large margin For Australia aircraft of this size will reduce the transport component of travel costs to Australia making Australia more competitive for long haul travellers from Europe and the Americas as well as medium haul travellers from Asia Some redesign or redevelopment of existing airport terminals may be necessary to cope with these large aircraft Consideration may also need to be given to amending safety procedures and upgrading runway facilities

The area of aviation that has the greatest potential to expand Australia's international tourism industry is the development of supersonic passenger aircraft Boeing (De Vore, 1991) is currently working on a design for a supersonic airplane designated the High Speed Civil Transport (HSCT) and is currently targeting development studies to support an introduction to service by 2005 The proposed HSCT would seat 300 passengers, fly at Mach 2.4 and have a range of 9,300 Kilometres Initial studies indicate that the HSCT will require a fare premium of 10% to 20% to ensure the aircrafts viability The attractiveness of this or similar aircraft lies in the reduction of travel times The Los Angeles to Sydney sector would be reduced from 14 hours by conventional subsonic aircraft to 7 hours by supersonic aircraft Initially the HSCT is unlikely to have a significant impact on Australia's international tourism if ticket costs are substantially higher than those anticipated from the proposed VLCT range of jetliners Tourist traffic is generally very price sensitive and generally willing to forego savings in time for savings in purchase price of the airline ticket

Whilst the HSCT concept would largely utilise existing technology new developments including the scramjet have the potential to increase the speed of travel to Mach 7 or greater Professor Stalker and his team from the University of Queensland (University News, 2 June, 1993) have developed a complete scramjet prototype which has successfully operated in a University shock tunnel facility The scramjet (supersonic ramjet) works by intaking air at hypersonic speeds, mixing it with hydrogen fuel and propelling it to create thrust Unfortunately the considerable funds required to develop the scramjet to its full commercial potential do not appear to be available and foreign competitors may overtake Australia's present lead and bring the engine into commercial production If technical risks and development cost could be contained hypersonic aircraft powered by scramjets would dramatically reduce travel times enabling flights from Sydney to Los Angeles to be reduced to about two hours Again the acceptance of these aircraft will largely depend on the cost of airline tickets The significant reduction in the time of travel might be sufficient to induce time sensitive travellers to pay a premium for travel in exchange for a longer stay at their destination In Australia's major source markets such as Japan, where tourists generally have high personal incomes, the sensitivity to price may not be as high as the sensitivity to time and consequently not a major inhibitor to the introduction of hypersonic jet services

A further area of great potential for the tourism industry are the Space Plane projects currently under consideration in the USA, Britain and Germany Proposed Space Planes have the potential to dramatically reduce flight times for point to point earth

travel and open space for commercial operations A British proposal, the Skylon, will use Synergetic Air-Breaking and Rocket Engines (SABRE) to achieve speeds of up to Mach 24 and be capable of achieving a final orbit of 300 kilometres above earth (Champkin, 1992) Taking off from a conventional runway the SABRE engines remain air breathing to Mach 5, and then convert to liquid oxygen/hydrogen rocket fuel at 26 kilometres above earth At the anticipated design speeds the Skylon could either enter earth orbit to launch payloads of up to 10 tonnes or be used for passenger flights that would give a London to Sydney journey time of 1 hour

A German proposal envisages a two stage to orbit aircraft utilising a piggyback concept of a large hypersonic aircraft, Horus, carrying a smaller space plane the Sanger The mother aircraft Horus would use Scramjets technology to achieve speeds of up to Mach 7 whilst Sanger would use hydrogen fuel to launch off Horus into earth orbit carrying cargo and passengers By itself Horus has the capacity to undertake hypersonic point to point earth flights carry up to 200 passengers with a range of 10,000 kilometres

Either of these projects or others currently under consideration have the potential to revolutionise international air transport as long as the price is not exorbitant Cost sensitive passengers are unlikely to pay premium prices as demonstrated by the Concorde where the extra price surcharge on tickets has generally deterred tourists from travelling on the aircraft If ticket prices were competitive Australia would become very accessible to almost any foreign country where hypersonic services were available Hypersonic aircraft have the potential to stimulate international tourism in the way that the earlier introduction of the Boeing 707 and Boeing 747 resulted in increased tourism in the past

Space.

True space travel for commercial reasons still appears to many to lie in the realms of science fiction, however, commercial passenger operations may be only one or two decades away NASA is currently developing the X-30 spaceship which takes off like a plane and accelerates to speeds of 25 Mach (Dunn, 1992) Existing funding levels should see the first experimental flights occurring about the turn of the century The X30 is about the size of a DC-10, weighs 159 tonnes when fuelled and is capable of earth orbit at much lower launch costs than the existing NASA Shuttle program

Japan's Shimizu Corporation (Mansfield, 1993) recently released concept plans for a lunar base that would utilise release of oxygen contained in lunar rocks for use by lunar base inhabitants and for fuel to power spacecraft returning to earth The potential of projects such as the X-30 and Skylon to provide cheap space travel utilising reusable spacecraft have the potential to revolutionise space travel in the way that the DC-3 revolutionised air travel in the 1940s Potential impacts on tourism are probably much further away and will depend on the enormous establishment costs of technological design and infrastructure provision being paid for by Governments and commercial users before passenger costs fall sufficiently to make tourist space travel a reality

5. CONCLUSION

Transport systems are in a constant state of change as new technologies supersede older technologies and as demand patterns generate new markets Today's transport system is a product of previous technological innovations New innovations in each mode will continue the process of change into the future The impact of change induced by New Technologies can only be estimated in the most general of terms as demonstrated in this paper Promising new technologies such as the SST Concorde sometimes fail to achieve significant change making the task of prediction all that much more difficult

In terms of Australia's tourism industry it is important that the nations transport system be able to provide fast, safe and cheap transport New technologies discussed in this paper have the potential to make Australia's transport system safer, faster and cheaper and in doing so will greatly benefit the tourism industry by assisting it attract more international visitors to Australia

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