INTERMODAL TRANSFER : BRISBANE AIRPORT'S NEW INTERNATIONAL TERMINAL COMPLEX

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ABSTRACT

Brisbane opened its new International Terminal to traffic in September 1995, three months ahead of schedule The design of landslide transport facilities at the terminal was required by the Federal Airports Corporation to allow maximum efficiency in modal transfer and to provide flexibility for future growth

The four-level terminal building with three one-way roads along the terminal face (two elevated) and a separate service road through the building has exceeded all expectations in practice The terminal is operating efficiently despite major changes in the passenger profile with consequent impacts on landslide transport demands

The terminal design highlights the importance of close consultation with user groups and the need for design flexibility to accommodate future growth and changes in aviation policy and direction

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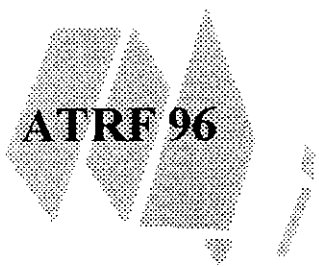


1.0 INTRODUCTION

The new International Terminal at Brisbane Airport opened to traffic in September 1995, three months ahead of schedule. It is a major gateway into Australia, now second after Sydney in terms of the number of international passengers processed. Currently, the terminal handles over two million passengers per year and is achieving a growth rate in passenger numbers of greater than 10% per annum. The Terminal is owned and operated by the Federal Airports Corporation (FAC) which is a government business enterprise which operates 22 airports in Australia including all capital city airports.

The project team for its construction comprised:

Client/Developer	Federal Airports Corporation
Project Manager/Builder	Civil & Civic
Architect	Bligh Voller
Airside Civil Engineer	Airplan
Landside Civil Engineer	Connell Wagner
Traffic Engineer	Connell Wagner
Structural Engineer	Connell Wagner
Building Services Engineer	Connell Wagner
Hydraulic Engineer	Ledingham Hensby & Oxley
Geotechnical Engineer	Golder Associates
Landscape Architect	Belt Collins

The major components of the project are:

- a four-level terminal building and three-level concourse with a total floor area of 66,000 square metres;
- eleven aircraft positions, eight with aerobridges;
- 140,000 square metres of apron paving;
- elevated arrivals and departures roads; and
- parking for 1900 cars and 70 buses.

This paper examines:

- the efforts made to ensure that the new terminal provides a smooth transition between air and land based transportation modes for terminal users; and

- the impact of major reforms in the air transport industry coupled with burgeoning Asian tourism on land-based transport modes serving the terminal.

2.0 INTERMODAL TRANSFER

2.1 APPROACH

An airport terminal building is the means of transferring people and goods between aircraft and a variety of land based transport modes. A number of aspects of the procedure, such as the need to meet time constraints, check-in and luggage handling procedures and customs and immigration procedures often combine to make the transfer process a stressful one.

Consequently in the design of the new International Terminal Complex for Brisbane Airport considerable effort was made to minimise the stress and inconvenience associated with international travel at the arrival/departure point. This approach resulted in a number of innovations within the terminal building itself such as the viewing balcony complete with "wire wall". This wall maintains audible contact between departing passengers and farewellers and provides views of air side operations. It enables departing passengers to remain visible to farewellers following customs and immigration checks almost until they board the aircraft. The wire wall avoids the reflections associated with glass and retains security.

The FAC's requirement for a user-friendly terminal applied equally to the terminal's landside interface. The landside facilities were designed to:

- minimise pedestrian/vehicle and vehicle/vehicle conflict to provide a high level of safety and convenience;
- minimise walking distances;
- maximise kerb space at the terminal face;
- provide a high standard of interchange for modes other than private car; and
- allow for future expansion.

2.2 DESIGN SOLUTION ADOPTED

The main elements of the Brisbane International Terminal are shown in plan view in Figure 1 and in section in Figure 2. The main transportation elements of the design are described in the following sections.

2.2.1 Frontage Road System

The design finally adopted to achieve the requirement for a high standard of intermodal transfer features a three level one way road system along the terminal face. A three level system is unusual (most multi deck terminals have two levels) but it is the key element in providing a smooth transition between travel modes. In practice it has been found to offer major benefits exceeding initial expectations.

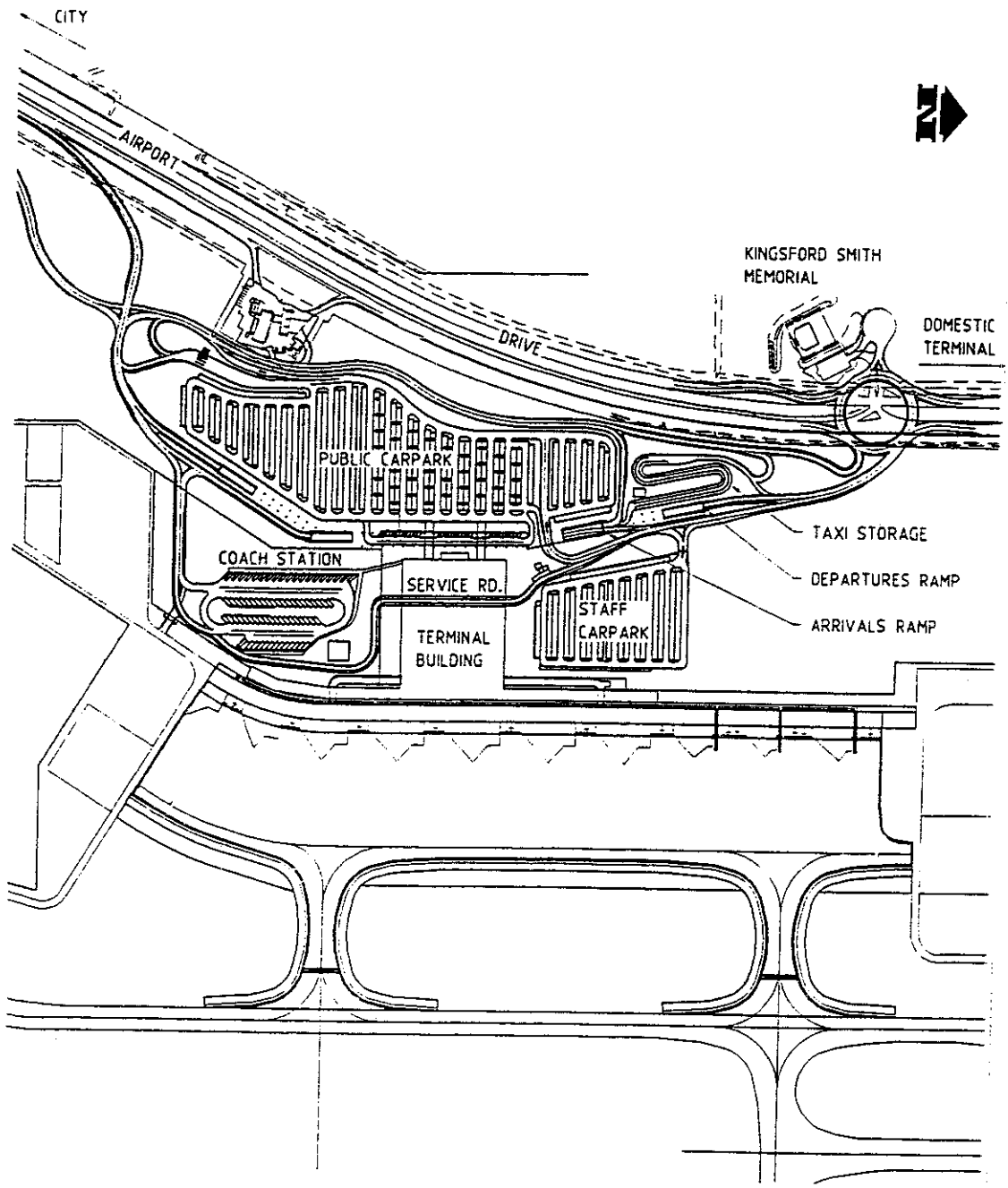
The three separate levels provide:

- maximum kerb space for departing passenger set down on the upper level; with 130m available for cars and taxis and 50m for buses and coaches.
- taxi and shuttle bus pick up (to the Domestic Terminal and to the City and Gold Coast) on the mid level; and
- passenger car and limousine pick up within the car park at ground level.

A fourth roadway level provides service vehicle access to the basement of the terminal.

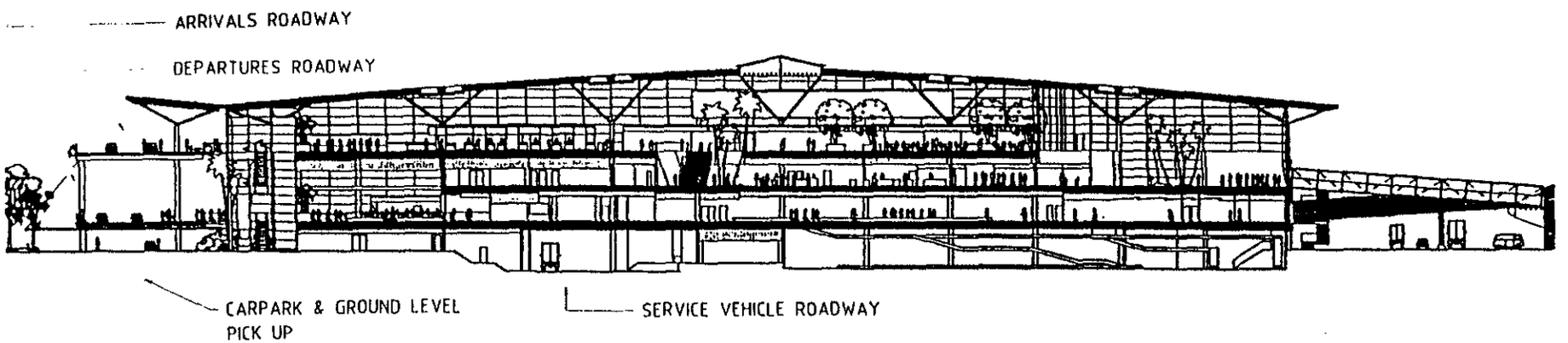
For car passengers the standard of safety and convenience is extremely high with the multi-level system compared with a single level terminal. The option of a single level terminal was explored thoroughly at the design development stage and finally discounted. While there were passenger movement issues within the terminal building itself that suggested a multi level terminal would offer a superior solution there were also sound reasons at the road/terminal interface to prefer the multi-level system. These included:

- sufficient kerb length for the ultimate number of vehicles;
- minimisation of walking distance between the carpark and terminal;
- easier segregation of different vehicle modes;
- elimination of weaving required between departures and arrivals kerbs for a single level terminal;



LAYOUT PLAN
INTERNATIONAL TERMINAL
BRISBANE AIRPORT

FIGURE 1.



SECTION
INTERNATIONAL TERMINAL
BRISBANE AIRPORT

FIGURE 2.

- flexibility for future expansion and compatibility with ultimate grade separated access from Airport Drive; and

- avoidance of traffic delay and pedestrian safety concerns since the multi-level arrangement virtually eliminates at-grade conflict between pedestrians and road traffic.

The elevated roadways are marked as three lanes (one parking, one for overflow parking and through movement and one exclusively for through movement) with the ability to add additional lane capacity in the future.

2.2.2 Taxi

Considerable attention was given to the design of taxi facilities to ensure a high standard of service for international travellers.

Taxi facilities were designed in close consultation with the Taxi Council to ensure that the end result was a workable arrangement that would benefit the three interested parties; taxi drivers, the FAC as owner/operator and international passengers.

The design allows for:

- an eight car rank at the arrivals level;

- line of sight between the arrivals level rank and the 90 car storage feeder rank;

- flight information monitor at the feeder rank;

- provision of basic facilities for waiting drivers such as toilets and food and drink vending machines;

- escape routes on the feeder rank; and

- down hill slope on the final stage of the feeder rank to allow unpowered move-up.

2.2.3 Coaches/Buses

Tourist buses provide direct connection between the airport and City and Gold Coast hotels. A growing number of full size and mini coaches consequently require parking facilities at the terminal. These facilities were also designed in close consultation with representatives of the major tourist coach companies. A set down area was provided at both arrival and departure levels for a scheduled City bus connection and also a shuttle bus connection to the domestic terminal, 2 km to the north.

At the separate bus/coach station beside the terminal building, provision for sheltered parking for 19 coaches has been made with additional uncovered parking for 52 coaches. Access to the coach parking area for incoming passengers is via an inclined walkway from the arrivals level.

The bus station is located on the departure side of the terminal. Consequently once tourists board their coach they have virtually uninterrupted access to the arterial road network with a freeway standard link between the terminal and the Gold Coast.

Landscaping in the bus terminal area was given particular attention with a specific "photo opportunity" focal point provided.

2.2.4 Hire Cars

A separate hire car storage area is designated within the main public carpark for the return of rented vehicles. Arriving passengers can collect their vehicle from the convenient under cover rental car pick-up carpark on the ground level beneath the elevated roadways. This area is also used as a waiting area for limousines.

2.2.5 Service Vehicles

Unless there are specific, convenient facilities for service vehicles, unloading will take place kerbside with a resultant reduction in kerb length available for passenger loading or unloading.

The design therefore incorporates a one-way service road running almost centrally through the terminal at a basement level. This roadway primarily allows access for the delivery of goods used in the operation of the terminal and removal of refuse. Importantly however it also provides a central area close to the terminal operating systems (air conditioning, emergency power, baggage handling etc) for maintenance personnel to park vehicles containing essential equipment. This roadway and associated loading dock area can accommodate in excess of 16 vehicles ranging from small and medium rigid trucks to articulated transports.

3.0 DESIGN CONSIDERATIONS

3.1 BACKGROUND

The design of landside traffic elements was based on estimates of peak hour passengers that would use the terminal. In turn these estimates were controlled not so much by arrival rates but by the physical processing of passengers through customs and immigration.

Design was based on an initial Busy Hour Rate (BHR) of 1200 passengers (8 gates) an hour (arriving or departing) with expansions required at a BHR of 1500 passengers and 2000 passengers with the final expansion at a BHR of 2450. The Busy Hour Rates chosen were based on estimates of future travel demand through Brisbane Airport produced for FAC by British Airports Authority.

In sizing landside transport facilities it is important to have some knowledge of the likely share of passenger numbers between the competing land transport modes, as well as the BHR. Further considerations are the number of additional people attracted to the terminal for each flying passenger or crew member (meeters/farewellers and terminal staff) and the average occupancy expected for vehicles in each transport mode. Data relating to these variables for Brisbane International were obtained by survey but their use was moderated by the knowledge that:

- modal split at Brisbane International Airport can vary significantly for each arriving or departing aircraft depending on its origin or destination; and

- International air travel is a rapidly changing industry and many of these changes have profound impacts on land transport facilities.

Consequently survey data were used only as a starting point for design. Final sizing decisions took into account the variations in mode split between different flights and also the likely future trends in the aviation industry (as assessed by industry experts).

3.2 SURVEY DATA

Surveys were conducted late in 1992 of weekday and weekend traffic through the "old" international terminal.

Critical design parameters observed included:

			Weekday	Weekend
• Passenger/visitor ratio	-	departure	1:0.84	1:0.97
		arrival	1:1.16	1:1.34
• Average vehicle occupancy	-	cars setting down at departure kerb	1.70	1.98
	-	cars directly entering the carpark	1.87	2.33

•	Mode split departure	-	Private Car N/A	56%
			Taxi	27%
			Coach	11%
			Hire Car/Limousine	6%
•	Mode split arrival	-	Private Car N/A	54%
			Taxi	10%
			Coach	30%
			Hire Car/Limousine	6%

These results were based on averages observed over a full survey day. During the day, demand for individual facilities such as kerb space or bus parking, recorded peak demands depending on the make-up of air traffic at the time. These peak demands were also recorded and used in the design process.

Because the new terminal design proposed a large separate coach terminal for arriving passengers, the critical kerb length for the design was the departure kerb where buses, taxis and private cars would all compete for drop-off space in close proximity to the terminal doors.

4.0 THE TERMINAL IN PRACTICE

4.1 IMPACTS OF AVIATION REFORM & INCREASES IN TOURIST ACTIVITY

Major reforms and changes have occurred in the aviation industry over recent years that have potentially significant impacts on aspects of the terminal design. Some of the changes include:

- deregulation of domestic and international aviation (ownership, route options etc);
- carriage of domestic passengers on international flights within Australia;
- development and promotion of competing new international "gateways" to Australia (eg Cairns International); and
- rapid development of different market segments.

The change that has had the most obvious impact on Brisbane's International Airport is the marked increase in Asian tourism Figure 3 shows the changes in percentage terms of passenger origins for Brisbane's International Airport (arriving and departing) between 1991 and 1995 Most Asian tourists travel on "packaged" tours with pre-arranged coaches and mini-buses collecting them from the airport The impact of the increase on bus and coach facilities is obvious given the number of Asian visitors has increased from 306,000 in 1991 to 887,000 in 1995

4.2 TERMINAL OPERATION

Since opening to traffic, the new terminal has achieved considerable success (despite industry changes) in meeting its design objectives both in terms of the building design and the supporting landslide infrastructure that allows efficient intermodal transfers

The impact of changes in passenger breakdown is evident in the comparison between mode split observed during the design and that observed in June 1996 There has been a substantial increase in bus and coach traffic, and such vehicles now form the dominant land based transport mode

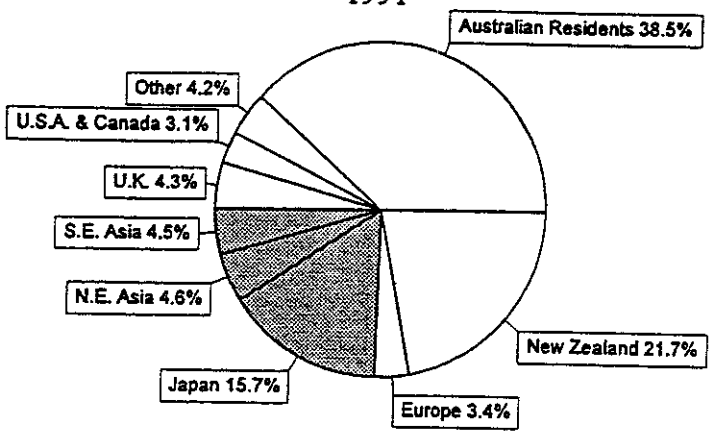
In practice the terminal has been found to be very "user friendly" in terms of transfer from, or to, land based vehicles

The critical element in terms of demand is the departure level kerb length This has proven to be adequate at current demand with minimal policing of kerb dwell time Because of the proximity of the car park to the terminal face and the absence of conflicting traffic there has been a noticeable trend for passengers being dropped off by others to walk with their luggage from the car park in preference to kerbside set-down This trend eases pressure on kerbside space Within the terminal, passengers moving between the ground floor and the departures level have the choice of lifts or escalators

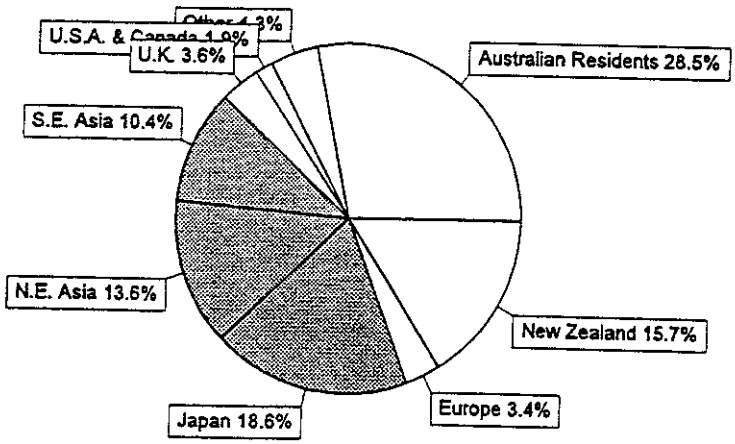
Similarly for arriving passengers, the expected amount of private car pick up either at the arrivals level or at the ground level pick-up kerb has not eventuated The convenience of a travelator down from the arrivals level to the ground level and again the absence of vehicular traffic at the ground level has meant that most passengers leaving by car, tend to walk to their vehicle within the car park

For tour bus passengers the level difference between the bus station and the arrivals hall allows easy control of a luggage trolley over the short distance involved With such a high demand for coach parking space some form of control will eventually be required to efficiently and equitably manage the most convenient bus parking spaces close to the terminal

1991



1995



CHANGES IN ANNUAL PASSENGER BREAKDOWN FOR BRISBANE INTERNATIONAL AIRPORT

FIGURE 3

(Source FAC)

5.0 CONCLUSIONS

In assessing the landslide traffic arrangements after almost the first year of operation the main conclusions that can be drawn are that:

i) the elevation of both the arrival and the departure roadways provides significant benefits in terms of pedestrian safety and efficiency of vehicle access to kerbside facilities. In combination with a high standard of vertical transportation within the terminal (especially travelators) this arrangement also reduces kerbside demand at both the arrivals and the departures level;

ii) a large capacity bus terminal in a discrete but easily accessible location is essential at airports, like Brisbane International, where a high proportion of tourists travel in packaged tour groups;

iii) attention to user groups needs during the design development phase has resulted in an arrangement where all parties are satisfied with the facilities provided. It is particularly important to consult closely with representatives of taxi drivers, bus and coach companies, the carpark operator and the hire car and limousine operators;

iv) because of the changing nature of the aviation industry an important aspect of the landslide road network and sizing of facilities must be design flexibility.