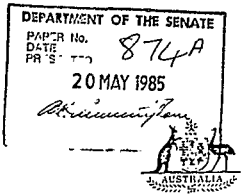

Parliamentary Standing Committee on Public Works

REPORT

relating to the

AUGMENTATION OF TAXIWAY SYSTEM, SYDNEY (KINGSFORD-SMITH) AIRPORT

(Second Report of 1985)

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA
1985

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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

R E P O R T

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(Second Report of 1985)

Canberra 1985

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS
(Twenty-Eighth Committee)

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Percival Clarence Millar, Esq., M.P. (Vice-Chairman)

Senate	House of Representatives
Senator Gerry Norman Jones	John Neil Andrew, Esq., M.P.
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	Colin Hollis, Esq., M.P.
	Leonard Joseph Keogh, Esq., M.P.
	Keith Webb Wright, Esq., M.P.

EXTRACT FROM THE
VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES
NO. 16 DATED 17 APRIL 1985

37 PUBLIC WORKS COMMITTEE - REFERENCE OF WORK - TAXIWAY SYSTEM, SYDNEY (KINGSFORD-SMITH) AIRPORT: Mr West (Minister for Housing and Construction), pursuant to notice, moved - That, in accordance with the provisions of the Public Works Committee Act 1969, the following proposed work be referred to the Parliamentary Standing Committee on Public Works for consideration and report: Augmentation of Taxiway System, Sydney (Kingsford-Smith) Airport.

Mr West presented plans in connection with the proposed work.

Debate ensued.

Question - put and passed.

C O N T E N T S

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

AUGMENTATION OF TAXIWAY SYSTEM, SYDNEY (KINGSFORD-SMITH) AIRPORT

R E P O R T

By resolution on 17 April 1985 the House of Representatives referred to the Parliamentary Standing Committee on Public Works for consideration and report the proposal for the augmentation of the taxiway system at Sydney (Kingsford-Smith) Airport.

The Committee has the honour to report as follows:

THE REFERENCE

1. The proposed work is for the construction of new taxiways, reconstruction of an existing taxiway and provision of larger fillets at taxiway and runway intersections at Sydney (Kingsford-Smith) Airport (KSA).

2. It is envisaged that this work will facilitate more efficient handling of aircraft on the ground and reduce taxiing delays and operating costs. It will also reduce inconvenience to the travelling public.

3. The estimated cost of the proposed work when referred to the Committee was $16.4 million at January 1985 prices. When originally referred to the former Committee the proposal was estimated to cost $16.0 million at June 1984 prices.

THE COMMITTEE'S INVESTIGATION

4. The reference is substantially similar to a proposal which was referred to the former Committee on 6 September 1984, and which subsequently lapsed following the dissolution of the House of Representatives on 26 October 1984.

5. The former Committee received written submissions and drawings from the Department of Aviation (Aviation) and the Department of Housing and Construction (DHC). Evidence from representatives of these departments was taken at a public hearing held in Sydney on 23 October 1984. Written submissions were also received from Qantas Airways Limited, the Australian Federation of Air Pilots (AFAP), the Australian International Pilots' Association (AIPA), and the Civil Air Operations Officers' Association of Australia (CAOOAA), and evidence taken from their representatives at the public hearing.

6. A list of witnesses who appeared at the public hearing and the organisations represented is at Appendix A.

7. On 2 July 1984, whilst at KSA the former Committee was briefed on the proposal by officers of Aviation and DHC and later viewed the sites for the work from the International Terminal Building.

8. Submissions and correspondence received from organisations not appearing at the public hearing were incorporated in the transcript of evidence. Since the public hearing additional correspondence was received from Aviation, DHC, AFAP and a local Council, and was also incorporated in the transcript of evidence.

9. The Committee considered the evidence placed before the former Committee and resolved that, pursuant to section 24 of the Public Works Committee Act 1969, the evidence taken by the former Committee be considered as evidence taken by this Committee. The Committee further resolved an additional public hearing into the proposal was not necessary.

10. The Committee's proceedings will be printed as Minutes of Evidence.

BACKGROUND

11. Sydney (Kingsford-Smith) Airport In 1921 the Commonwealth acquired a 66 hectare site at Mascot to be used as a civil aerodrome to serve the city of Sydney. Initial developments were primitive, with take-offs and landings occurring on a grass airfield. In 1929 the Government referred to the Sixth Parliamentary Standing Committee on Public Works a proposal to develop the aerodrome at Mascot (Parliamentary Paper No. 54/1929). The proposal was the first major airport development project in Australia, and included increasing the size of the aerodrome, provision of facilities and services for the public, construction of buildings, and drainage and improvement work on the landing area. Besides recommending the proposal the Committee urged that a permanent runway be constructed. The recommendations were accepted by the Government and the 1930s saw the completion of three gravel runways, a terminal building and a few hangars. Qantas began overseas flights from the airport in 1934, and two years later the airport was named Kingsford-Smith Airport, a name it retained until the 1950's when it was renamed Sydney (Kingsford-Smith) Airport to accord with international practice.

12. Much development has taken place since World War II. Work commenced in 1947 to divert the Cooks River in order to enlarge the airport and allow the construction of the present 07/25 and

16/34 runways. The 07/25 runway originally was 2469m in length (now 2529m) and was used as the main jet runway since the 16/34 runway was then only 1676m long. However, in 1968 a project to extend the 16/34 runway southwards by reclaiming land into Botany Bay was completed and that runway became the main jet runway at 2774m. The runway was further extended to its present 3962m length in the early 1970s.

13. Despite being the principal airport in Australia KSA is small by international standards. In terms of size it occupies a 670 hectare site which is considerably less than the 3000 hectare site of the new Brisbane Airport and most other major Australian airports. In terms of annual passenger movements Aviation informed the Committee that in 1982 KSA handled 8.46 million passengers, ranking it 35th on a world listing headed by O'Hare International in Chicago, U.S.A., with almost 37 million passengers.

14. KSA has a similar world ranking with respect to annual aircraft movements, presently at around 170,000 per annum although in 1980 there were 182,000 movements. The Committee was advised, however, that major overseas airports have additional sets of runways compared to the one set at KSA. The Civil Air Operations Officer's Association maintained that in terms of relative capacity KSA would be as busy as O'Hare International Airport. The Association went on to point out that for a period in 1978 KSA handled 25 per cent more traffic than San Francisco International Airport, which was then operating on a similar configuration to KSA due to maintenance being undertaken on its other set of runways.

15. Present taxiway system The existing taxiway system and airport layout, together with the proposed works, is depicted in Appendix B.

16. The existing taxiway system is based on planning for the airport carried out in the late 1940s and early 1950s. The original taxiway development associated with the commissioning of the 07/25 runway in 1953 and the 16/34 runway in 1954 comprised:

- Taxiway C parallel to and on the northern side of runway 07/25.

- Taxiway L parallel to and on the eastern side of runway 16/34.

- Taxiway connections between the parallel taxiways and runways and aircraft terminal and maintenance areas in the north east sector of the airport.

17. The original planning envisaged the eventual provision of taxiways parallel to each side of the 07/25 runway and dual taxiways parallel to and on the eastern side of the 16/34 runway. As part of the extensions to the 16/34 runway, parallel taxiway V was constructed on the western side of the runway, together with connections to the runway and terminal.

18. Apart from the recent construction of a few light aircraft taxiways and modifications due to domestic terminal developments, the taxiway system has remained virtually unchanged since 1970. Since then aircraft traffic at the airport has grown by 34 per cent.

THE NEED

19. Evidence submitted to the Committee indicates that KSA encounters congestion problems, particularly during peak periods, and the resultant delays are inordinately long, costly and permeating. Pilots who appeared before the Committee stated that the delays experienced at KSA for both arriving and departing

aircraft are the worst in Australia. Furthermore, because KSA is the main airport in the Australian network, delays emanating from there are felt elsewhere.

20. Delays at Sydney (Kingsford-Smith) Airport The Committee heard evidence that taxiing times at KSA during the peak Thursday and Friday evening periods can take eight to nine minutes for a journey of about a kilometre from the domestic terminal area to the threshold of runway 16. Occasions lasting 30 minutes were also reported to the Committee, when aircraft under tow were awaiting clearances or arriving aircraft did not have a bay available at the terminal.

21. Air Traffic Control (ATC) stated that it is becoming increasingly common for incoming flights to be deliberately delayed. Presently, there are specified airports within approximately 30 minutes flying time from KSA from which pilots must contact and book a time slot to arrive. They are given delays to absorb on the ground and in the air. During the peak periods ATC is having to extend its range to delay flights from Melbourne and Brisbane, 60 minutes flying time away. It also reported instances of delaying Sydney bound flights in Adelaide airspace and even in New Zealand airspace.

22. Causes of delay Delays must be expected at any airport operating with high levels of aircraft traffic and result from the inevitable overlapping in time of aircraft arriving, departing and moving about the airport. The ability of an airport to tolerate high levels of aircraft traffic depends on the capacities of the airport's airspace, terminal, runway and taxiway systems.

23. Airspace system At times the airspace system at KSA is the limiting factor on operations at the airport. The problem is not only due to the volume of traffic arriving and departing KSA but

is also caused by traffic using Bankstown airport, traffic overflying Sydney, weather conditions and the prevailing runway utilisation at KSA.

24. Terminal system With respect to the domestic terminal arrangements current facilities are satisfactory and would have negligible impact on delays. However, the international terminal building does have capacity problems and as mentioned above some aircraft are delayed by the lack of available aerobridge parking positions during peak hours.

25. Runway system The limited runway capacity of KSA is a major problem in the Sydney region. With the requirement to fit arriving aircraft in with departures, ATC has found that its operations are constrained by having only a 2-runway system (runways 16/34 and 07/25) available to it. Although proposals have been developed to augment the runway system, (for example, most recently the proposal for a short domestic jet runway parallel to the north-south runway), for various reasons none has reached finality.

26. The current runway system at KSA is able to handle a maximum rate of 54 movements per hour. This rate is reached on a number of occasions during the week, particularly during peak periods, and on Friday evenings demand often exceeds capacity.

27. Preferred runway system For noise abatement reasons ATC operate a preferred runway system, depending on weather conditions. For departures, runway 16 (i.e., the northern end of 16/34) is nominated by ATC as it directs aircraft south over Botany Bay rather than the city. The Committee was told that 83 per cent of all jet departures occur in this direction. The east-west runway (07/25) is the second preference and accounts for 14 per cent of departures, shared equally in each direction. Least favoured is runway 34 which accounts for only 3 per cent of departing aircraft.

28. For arrivals during the day about 40 per cent of aircraft land from the west on runway 07 and a similar proportion land from the north on runway 16. The remaining 20 per cent of aircraft approach KSA from the east and south in equal proportions. During curfew hours all aircraft are required to land on runway 34 (i.e., approaching from Botany Bay) whenever possible.

29. Taxiway system Aviation submitted that the taxiway system is out of balance with the runway system and is the cause of congestion and delay, due to its inability to get aircraft on and off the runway quickly. ATC informed the Committee that an aircraft experiences minimal delay once it has left the runway and proceeds to the terminal area. It considered outbound traffic to be most liable to delay, as aircraft often are required to remain at holding positions either to allow sufficient separation between departing aircraft or waiting for a clear runway.

30. Deficiencies in existing taxiway system Aviation considered that the existing taxiway system is deficient in the following areas:

- Runway entry taxiways There is an inadequate number of runway entry taxiways to allow take-offs from points other than at runway ends (intersection departures) and therefore ATC's efforts to efficiently sequence departing aircraft are impeded.

- Runway exit taxiways Similarly, there is an inadequate number of runway exit taxiways causing landed aircraft to occupy the runway unnecessarily.

- Taxiway radii The taxiway radii at the intersections of taxiways and runways restrict aircraft to a maximum of 14 knots at those points and adversely affect the runway handling rate.

- Other taxiways There is an inadequate number of taxiways for aircraft taxiing between the terminals and runways. At present an aircraft may be delayed while waiting to cross an active runway or waiting for traffic travelling in the opposite direction to pass.

31. Costs The cost of delays is most recognisably reflected in additional fuel costs incurred by the airlines. A recent exercise conducted at Melbourne (Tullamarine) Airport by CAOOAA had revealed that on a peak (Friday) afternoon domestic and international airline operators had scheduled a total of 10 hours and 37 minutes of fuel consumption caused by delays to traffic. The Association concluded that the Sydney figure was likely to be double that allowance. In order to accommodate delays in the air and on the ground Qantas commented that KSA is one of the few places in the world where it is a standing requirement to carry extra fuel above the normal requirements.

32. The Committee was informed that the cost of taxiway operations incurred by the airlines at KSA amounted to $20.41 million in 1982. Aviation estimated the direct operating costs to the airlines of delays due to congestion to be in the order of $7 million per annum. Additionally, since KSA performs a central role in the national air network delays there cost the airlines $5 million per annum elsewhere.

33. Aviation submitted that, while it is difficult to quantify direct operating costs specifically related to deficiencies in the existing taxiway system, any augmentation which would increase the practical runway capacity, however slight, would result in substantial annual cost savings.

34. No value has been ascribed to factors such as lost passenger time and safety. Although the Committee is in no doubt that KSA is managed in a safe manner it does acknowledge that congestion problems attributable to the present taxiway system increase the potential for a major incident to occur.

35. Forecasts In 1980 KSA handled 182,000 aircraft movements. With the introduction of wide bodied aircraft and the general downturn in the nation's economy over the last few years the figure has dropped to about 170,000 movements per annum. Aviation expect that the rate will continue to drop in the immediate future as more aircraft are replaced by others capable of carrying more passengers, and greater numbers of flights bypassing KSA. However, the industry is expected to pick up and by the turn of the century KSA is forecast to have an unconstrained demand of 232,000 aircraft movements per annum.

36. The current maximum hourly handling rate for KSA is determined at 54 movements per hour, or 203,000 movements per annum. According to Aviation forecasts this rate will be reached by 1993.

37. Summary The magnitude of delays experienced at KSA is much greater than at other major Australian airports, and most international airports. Departmental evidence submitted to the Committee indicates that a significant factor causing delays is the inadequate capacity of the existing runway and taxiway systems. This has resulted in a cost penalty to the airlines and ultimately the paying passenger, inconvenience and increases the possibility of an accident occurring. Aviation forecasts do not indicate any long term alleviation of congestion problems at the airport.

38. Committee's Conclusion Aircraft operating to and from Sydney (Kingsford-Smith) Airport are presently subject to excessive delays. Such delays arise mainly from deficiencies in the existing runway and taxiway systems.

THE PROPOSAL

39. The proposal is illustated at Appendix B.

40. Aims The purpose of the proposal is to achieve a reduction in the high costs of congestion and delay at KSA. Specifically, the aims of the project are to:

- reduce the time that each aircraft occupies the runway;
- reduce the distance that some aircraft have to taxi after exiting the runway on arrival;
- reduce taxiing flow conflicts;
- permit aircraft to commence take-off from points on the runways other than at the runway ends, and
- improve the management of the ground movement of aircraft by ATC.

41. In consultation with the industry, ATC and aviation unions, Aviation developed a package of proposals which it considered would meet the aims of the project.

42. The main elements of the proposal, which are detailed at Appendix C, and are listed as item numbers on the plan of KSA, are as follows:

- construction of new entry/exit and connecting taxiways for heavy and light/medium aircraft to:

(i) runway 07/25 (items 5A and 5B, 6D and 6E);

(ii) runway 16/34 (items 3, 7A, 9 and 18);

(iii) QANTAS Base, from intersection taxiways L and G (item 1), and

(iv) 3 inter-connecting taxiways (items 5C, 6A and 7B).

- construction of new partial length parallel taxiway to the 07/25 runway (item 6C).

- enlargement of fillets at taxiway/runway intersections (items 12A, 12B, 12C and 12E, 13A, 13B, 13C, 13D, 13E and 13F, 14B, 14C, 14D, 14F and 14G).

- enlargement of the fillet at a taxiway/taxiway intersection (item 14A).

- reconstruction of existing taxiway G (item 19).

- reconstruction of the section of the Metropolitan Water Sewerage and Drainage Board main outfall sewer (associated with item 9).

43. Taxiways The proposed taxiways are intended to create greater flexibility of aircraft movement around the airport. Either individually or in concert with other taxiways, the proposals will provide pilots and ATC with additional options to enter and/or exit a runway more readily, thereby reducing runway occupancy time and improving traffic flow to and from the terminals.

44. After landing an aircraft is able to use an exit taxiway when it has sufficiently reduced speed. Factors affecting the speed of an aircraft when an exit taxiway is reached include:

- the speed at which the aircraft crossed the runway threshold, which can range from 90 knots (F27 aircraft) to 140 knots (B747 aircraft);

- the effects of headwinds or tailwinds;

- differing distances from runway threshold to touchdown, and

- differing deceleration rates.

45. Further, the approach speed adopted for a particular landing depends on the mass of the aircraft at the time of landing and may be increased to cater for crosswinds, headwinds or tailwinds and reported or expected wind shear.

46. On runway 16 it is proposed to construct 3 additional exit taxiways (items 7A, 9 and 18 of the proposal). Presently, most domestic aircraft which land on runway 16 and which are unable to exit via taxiway C use either the 07/25 runway (thereby temporarily occupying that runway) or exit via taxiway A, preventing that taxiway from being used as a departure point. Item 9 will provide an exit for aircraft which cannot leave the runway earlier and which otherwise would be forced to exit by taxiway I, resulting in a long taxi route back to the terminals and possible lengthy delays occurring at the two runway crossings they would have to make. Items 7A and 9 together will provide well spaced exits while freeing taxiway A for the queueing of aircraft awaiting take-off on runway 16. Item 18 is further south on runway 16 and is designed primarily for B747 aircraft,

providing an alternative exit taxiway for aircraft unable to exit by taxiway I and which would otherwise have to occupy the runway until taxiway W was reached.

47. Items 6D and 6E will serve as exit taxiways on the 07/25 runway.

48. Some taxiway elements of the proposal are intended to facilitate more efficient entry onto the runway for departures. By allowing better sequencing of departing aircraft ATC would be able to avoid airborne congestion on particular routes. Additional entry taxiways would also enable the separation onto different taxiways of lighter aircraft from jets, thereby avoiding the effects of jet blast which would otherwise necessitate increased separation between departing aircraft. Item 3 of the proposal is an additional entry taxiway onto the main duty runway (16/34), and is situated at a minimum taxiing distance from the domestic terminals. As well as providing ATC with more flexibility for departure sequencing the taxiway would alleviate queueing problems that exist in that area where presently a queue of aircraft on taxiway F may obstruct taxiway E. Similarly, items 5A, 5B and 5C will enable intersection departures on the 07/25 runway, although only for aircraft no heavier than an F27.

49. Other elements of the proposal will contribute to the smoother movement of traffic by providing alternate routes for aircraft taxiing in opposing directions. For example, an aircraft exiting the 16/34 runway at item 7A will be able to taxi to the domestic terminals via items 7B, 6A, 6D and 6E. This route would free the heavily used taxiway L for other traffic. Item 6C is intended to provide an alternative route for B747 aircraft exiting the 07/25 runway and which encounter inadequate clearances while taxiing past the airline maintenance building on taxiway C.

50. Enlarged fillets The speed at which aircraft can enter or exit a runway is constrained by the radius of the curve at each taxiway/runway intersection. The existing fillets are designed with a radius of 42m, restricting aircraft speeds to a maximum of 14 knots. Large aircraft are particularly restricted in their manoeuvreability around turns with small radii. The proposal is to increase the entry/exit radius to 80m at the most frequently used taxiway/runway intersections. Such an increase will permit aircraft to turn at speeds of up to 20 knots, resulting in a saving of approximately 5 seconds on each entry or exit movement. Additionally, the increased radius at runway entry points will reduce the exposure of queueing aircraft to jet blast.

51. Other components As mentioned above it is proposed to reconstruct taxiway G (item 19) in Portland cement concrete. The present taxiway has a bituminous pavement which has developed a depression where aircraft are required to hold. Additionally, there is an adverse grade running up from the holding point onto the runway. In order to get out of the depression and move up to the threshold of runway 16 a pilot has to apply more power than would normally be used to break away from a holding point. As a result, apart from the extra fuel burned, light aircraft behind tend to stay well back to reduce the effects of jet blast, producing inefficient queueing and delays. By reconstructing the taxiway in cement concrete, which has a lower rolling friction than bituminous concrete and does not deform as easily, Aviation believes that aircraft will be able to enter the runway faster.

52. The construction of item 9 will require the strengthening of a section of the Southern and Western Ocean Outfall Sewers which are under the area where the taxiway is proposed. Suitable strengthening of the sewer will permit heavy aircraft to use the taxiway. Item 9 will also force the relocation of the emergency vehicles parking area to the western side of the 16/34 runway.

53. Separately funded at a cost of $1.3 million are works that involve the diversion of existing control and power cables and the provision of taxiway lighting and illuminated taxiway signs.

54. Other works will include augmentation of the existing stormwater drainage system, the re-alignment of parts of the existing airport perimeter roads, the provision of duct banks and regrassing of all disturbed areas. Also, in accordance with the terms of their licences, the oil companies will be required to undertake works to protect existing fuel supply pipelines under the proposed taxiways. Such works will be funded by the oil companies.

55. Expected savings Aviation expects the proposal will permit an increase in the hourly handling rate of one aircraft movement during the peak hour, representing a 2 per cent increase in practical runway capacity. Using its fast time simulation model the Department believes that such an increase will represent a cost saving of about $1.1 million per annum at a demand volume of 208,000 movements per annum, a rate forecast to occur by 1995.

56. Additionally, the proposal is expected to produce cost savings in direct taxiing operations. Savings attributable to reduced average taxiing distance per movement are estimated to amount of $0.56 million per annum by 1995, and savings due to reduced surface movement delays (e.g., holding before crossing an active runway or holding until another taxiway becomes vacant) are expected to be in the order of $0.89 million per annum.

57. By 1995, therefore, the Department expects the proposal to achieve savings of the order of $2.55 million per annum in delay costs and taxiing operations. While conceding that such savings are minimal the Department stated that they do represent an 8 per cent improvement in total delay and taxiing costs at KSA.

58. An economic comparison of the proposal's costs and savings showed an internal rate of return of 10.9 per cent discounted over an expected project life of 25 years.

59. Uncertainty over the future of KSA Although a definitive statement on the future of KSA has not been made, the Committee has received advice which leads it to understand that KSA most probably will continue to fulfil its current role as a major national and international airport.

60. Aviation, in a statement made to another inquiry [Construction of new Commonwealth Offices, Sydney (Kingsford-Smith) Airport, PWC First Report of 1985], stated that overseas experience had indicated that "two major airport" situations were unlikely to become commercially viable until total passenger demand in the region reached somewhere in the order of 25 million per annum. In 1982, 8.46 million passengers passed through KSA. It is therefore unlikely that a second Sydney airport would cater for the same business/traveller market as KSA, but rather for cheap air fare leisure and package flights (both domestic and international) served by innovative operators set up specifically to cater for that sector.

61. Aviation also informed the Committee that it would take between 7 and 13 years to construct a new airport, depending on size. The Committee is satisfied that the need for the proposed works exists, and that work to alleviate the congestion problems at KSA should be undertaken as expeditiously as possible, regardless of what function a second Sydney airport may have.

62. Committee's Conclusion The proposal for the augmentation of the taxiway system appears satisfactory and should result in reductions in congestion and delay at Sydney (Kingsford-Smith) Airport.

RAPID ENTRY FILLETS

63. Aviation has proposed that all entry and exit curves be constructed with a standard 80m radius, thus enabling aircraft to turn at speeds of up to 20 knots. Although the Committee acknowledges the merits of having standardised curve sizes, it does consider that elements catering for significant volumes of traffic should be considered individually where the runway handling rate would benefit by having fillets constructed with larger radii.

64. Runway 16 is the main duty runway. Aviation informed the Committee that it accounts for 76 per cent of all departures, including 83 per cent of all jet departures. The Committee supports the belief of the aviation associations that the potential exists for the handling rate of this runway to be increased if entry to it could be gained more readily. Although a departing aircraft would have to wait until a preceeding arriving or departing aircraft had cleared the runway the opportunity will arise for a departing aircraft to take-off before another aircraft arrives. This opportunity could be used more often if aircraft are able to gain high speed while entering the runway.

65. Item 19 involves the reconstruction of existing taxiway G, which is the northern entry taxiway onto runway 16. Presently, its grade is steeper than desirable and the surface has lost shape in the wheel tracks due to it having a flexible bituminous concrete pavement, and is the only taxiway that enters the runway at such an acute angle. At the public hearing a pilot remarked that it takes an airbus at least 30 seconds following a line up or take-off clearance to carefully move from its holding position on taxiway G onto the runway and be ready for take-off. While the reconstruction of the taxiway will reduce the time taken for an aircraft to enter the runway, the Committee believes that greater benefits can be derived if the entry fillet onto the

runway is constructed with a larger radius. Not only would such a radius permit aircraft to enter the runway at higher speeds but, because a jet aircraft has swept wings which would not be infringing the boundaries of the duty runway for landing aircraft, it could be partially lined up beforehand so that when a take-off clearance is received the pilot could apply power and begin take-off, without subjecting following aircraft to jet blast.

66. When asked by the Committee what proportions of take-offs from runway 16 are anticipated to commence from the various entry taxiways following completion of the proposed work, Aviation replied that it expected decreased use of taxiway G in favour of taxiway F and item 3. Since runway 16 will continue to be the main departing runway, the Committee considers that Aviation should re-examine the size of each entry fillet onto it.

67. Committee's Conclusion Runway 16 is the most heavily used runway and accounts for 83 per cent of jet departures. The Committee believes that potential exists for the handling rate of the runway to be increased if aircraft can gain easier entry onto it without adversely affecting following aircraft. Accordingly, further consideration should be given to heavily used runway entry points being constructed with larger radii.

RAPID EXIT TAXIWAYS

68. At the public hearing, representatives from AFAP, AIPA and CAOOAA, suggested that the construction of rapid exit taxiways (RET's) would provide greater benefit in terms of relieving congestion and delay than would many of the elements of the proposal. The Committee was informed that the construction of a RET was originally contained in the package of proposals but was subsequently dropped.

69. Rapid exit taxiways enable an aircraft to leave a runway at much higher speeds than a normal right angled exit would permit, thus allowing a reduction in runway occupancy time by landing aircraft and an increase in the runway handling rate. They are employed in airport design world wide, and have been operating successfully at Melbourne (Tullamarine) Airport for a number of years and are incorporated in the design of the new Brisbane Airport currently under construction. For the last year a RET specifically designed for light aircraft landing on runway 16 has been in operation at KSA (taxiway Q). Although Aviation acknowledges that it is working very successfully, the RET is of no use to aircraft larger than an F27 as it is too close to the threshold on runway 16.

70. Aviation had considered including a RET in the proposals to be put before the Committee. The RET would have commenced at the intersection of the 2 runways, cut across item 7A, existing taxiway A and formed a hairpin turn into item 9. It would have been constructed to International Civil Aviation Organisation (ICAO) standards with a design exit speed off the runway of 50 knots. Although it had the potential to reduce runway occupancy time the Department believed that its siting would not prove beneficial to operations at KSA.

71. Since one of the aims of the project is to increase the runway system handling rate by allowing intersection departures from the south-east sector of the airport, Aviation considered that a RET in that area would inhibit such a goal being achieved. Items 7A, 9 and existing taxiway A facilitate intersection departures by enabling arrival and departure traffic to move simultaneously. If the RET was constructed, departing aircraft awaiting clearances on taxiway A would have to hold at a position well back from the runway (160m), consequently resulting in a significant delay in getting onto the runway and negating any benefit on runway handling rate provided by the RET.

72. Further, figures supplied to the Committee by Aviation suggest that the RET would not be in a suitable position to be of use to most jet aircraft. Under calm conditions, of all aircraft decelerating at 1.5 metres per second per second (the rate endorsed by ICAO) only those up to F27 mass would be able to exit via the RET, although F28, B737 and DC9 aircraft could make use of it if deceleration occurred at a rate of 2.0 metres per second per second.

73. Aviation also stated that pilots may be intimidated into opting to not use the RET when they see other aircraft in holding positions on taxiways 7A, 9 and A, and by the degree of the slope from the end of the RET down to General Holmes Drive.

74. For the abovementioned reasons Aviation did not proceed with including the RET in the proposal. Similarly, it could not support the provision of a RET on the 07/25 runway. The Committee accepts the opinion of the Department on this matter. However, it does believe that RET's have the potential to alleviate some of the problems attributable to the universally recognised lack of runway capacity at KSA. Based on Aviation's figures, in calm conditions and decelerating at 1.5 metres per second per second, all domestic jet aircraft would be able to exit the runway by the time they reach item 9, although heavily laden A300 and B767 aircraft may have some difficulty. The Committee feels that a RET situated in the vicinity of taxiway A or item 9 could increase the runway handling rate by the provision of an exit, readily obtainable under conditions which are not always calm, for a variety of domestic aircraft. Such a RET, situated to the south of taxiway A, would not unduly interfere with intersection departures from the south east sector of the airport and therefore would be consistent with the aims of the current proposals under consideration.

75. The Committee does not recommend the inclusion of a RET in this project, due to the capital cost involved and the degree of land reclamation and bridge construction required. However, it does believe that Aviation should conduct a further detailed evaluation of the benefits to be derived from a RET situated south of taxiway A. Should the evaluation deem such a RET to have significant operational advantages then the most appropriate course of action would be for a RET project to take the form of a separate proposal to be considered by the Committee.

76. Summary Rapid exit taxiways have the potential to increase runway handling rates significantly. However, due to the limited space available at Sydney (Kingsford-Smith) Airport such taxiways are difficult to suitably locate to provide maximum benefit while maintaining safety standards.

77. Committee's Conclusion The Committee supports the decision of the Department of Aviation to delete the rapid exit taxiway proposed originally but recommends that it undertake a study into the provision of a rapid exit taxiway south of taxiway A on the 16/34 runway.

CONSTRUCTION DETAILS

78. Materials and Construction Aviation has requested DHC to perform all work to ICAO recommended standards. Portland cement concrete will be used in items 1, 3, 12A, 13A and 19. These elements, located at the northern end of the airport, are expected to be trafficked by heavily laden aircraft which will be required to hold before receiving clearances to enter runway 16. Cement concrete, as distinct from bituminous concrete, is considered more suitable for use in these elements as it does not rut, has a lower rolling friction, and is unaffected by fuel spillage. Each pavement will comprise 400mm of cement concrete laid on 200mm of crushed rock on compacted sand.

79. With the exception of pavements for light and medium aircraft, all other elements will be constructed in flexible bituminous concrete, comprising 50mm bituminous concrete on 600mm of crushed rock on compacted sand. However, in order to minimise the construction time of fillets adjacent to heavily trafficked areas it is intended to lay 400mm thick bituminous concrete directly onto compacted sand, eliminating the need for the time consuming provision of a fine crushed rock layer.

80. Light aircraft pavements, designed to withstand aircraft up to 22,000 kg (e.g., F27), will be constructed with 25mm of bituminous concrete laid on 225mm of crushed rock on compacted sand.

81. Most taxiways will be 23m wide, with 10.5m wide shoulders consisting of a 3m wide inner paved area and a 7.5m wide outer grassed area. Light aircraft taxiways will be 15m wide, with 5m shoulders consisting of a 1.5m wide inner paved area and a 3.5m wide outer grassed area.

82. All pavement construction materials are readily available in sufficient quantities from established quarries and plants. Although the local Botany sand on which KSA is founded provides a satisfactory sub-grade, DHC estimate that approximately 20,000 cubic metres of sand filling will be required. This is available in adequate quantities from the Botany sand previously stockpiled within the airport.

83. Construction timetable It is expected that the project will take 28 months to complete. Construction will necessitate restrictions on aircraft operations at the airport, even though much work will be conducted at night. Restrictions may include withdrawal of all or parts of a runway or taxiway from service, and may be imposed for varying durations. Aviation stated that the construction program is essentially a trade-off between

keeping the airport operational with sufficient runway length available for operators and trying to complete the project within minimal time and cost.

84. DHC has advised that it is proposed to undertake the work in six phases, comprising:

Phase 1 - Taxiway elements 1, 3 and 19 and fillets 12A, 12B, 12C and 13A adjoining the northern end of runway 16/34.

Phase 2 - Taxiway elements 5C, 7A, 7B and fillets 12E, 12F, 13B and 13C.

Phase 3 - Taxiway elements 6A, 6C, 6D, 6E and fillets 14D, 14F and 14G adjoining the eastern end of runway 07/25.

Phase 4 - Taxiway element 9.

Phase 5 - Taxiway elements 5A, 5B and fillets 14A, 14B and 14C.

Phase 6 - Taxiway element 18 and fillets 13D, 13E and 13F.

85. The proposed timetable was discussed with the aviation industry. At the public hearing Qantas expressed some concern that the element which will be of direct benefit to it (item 18) will not be constructed until late in the project. The Committee notes, however, that all airlines will benefit when items proposed to be constructed early in the project become operational.

86. Maintenance Pavements are expected to attain sufficient strength for use by aircraft 28 days after pouring. They have been designed for the aircraft traffic forecast for the 10-year period following construction and during this time should require minimal maintenance. DHC advised the Committee that with the application of necessary maintenance treatments the pavements would be expected to last for up to 30 years, depending on changes in aircraft loading and frequency of operations.

ENVIRONMENTAL EFFECTS

87. In accordance with the provisions of the Environment Protection (Impact of Proposals) Act the former Department of Home Affairs and Environment agreed with Aviation's assessment that the proposal would not be environmentally significant. DHC submitted that noise from construction activities during night hours will not greatly affect nearby residences. However, the State Pollution Control Commission was concerned that temperature inversions, known to occur in the Botany area, could accentuate noise levels from construction plant. The Commission recommended that during night time inversion conditions residential areas should be subject to a maximum noise level of 35dB(A) from the plant.

88. Noise from construction traffic will be insignificant compared to existing traffic in the area. Arrangements will be made to minimise any adverse effects of construction traffic at night by stockpiling all practicable construction materials during daylight hours.

89. All disturbed areas of ground will be re-instated to avoid erosion and to blend in with surroundings.

CONSULTATION

90. In May 1983 Aviation developed a package of taxiway proposals for KSA. The proposals received approval for inclusion in the 1983/84 Civil Capital Works program and the Department subsequently initiated discussions with the aviation industry, aviation unions, appropriate State Government departments and local government representatives.

91. The discussions yielded a set of proposals which was considered to improve the taxiway system and also increase runway capacity. The package was estimated to cost $29 million. Through further meetings with the industry the package was refined to those of this reference currently before the Committee. Aviation found it necessary to drop some proposals due to perceived technical disadvantages or on the grounds of not being cost effective.

92. Besides liaising with Aviation on the scope of the work and restrictions to be placed on construction activities, DHC consulted the Metropolitan Water Sewerage and Drainage Board in connection with the reconstruction of the main outfall sewer under item 9.

93. The Committee wrote to Local Councils within the vicinity of KSA, apprising each of the details of the proposal. Several Local Councils responded to the Committee, and generally did not express any concern over the proposed development at KSA. Aviation stated that Local Councils surrounding the airport had been kept fully informed through regular briefings at Sydney Noise Abatement Committee meetings.

OBSERVATIONS FOR FUTURE CONSIDERATION

94. The Committee accepts that the congestion problems experienced by all aircraft will be alleviated by the construction of the work proposed in this reference. It does, however, acknowledge that if the forecasts for future aircraft movements materialise, congestion problems will return with the same, if not greater, magnitude within the next 20 years.

95. Most of the proposed taxiway works will be of direct assistance to jet aircraft. Statistics supplied to the Committee indicate, however, that jet aircraft do not constitute the majority of movements at KSA. In 1982 there were 175,429 aircraft movements at KSA. International and interstate domestic airlines accounted for only 40 per cent of those movements, although they were responsible for the vast majority of total passenger movements. Commuter airline and general aviation traffic constituted 39 per cent and 21 per cent of aircraft movements, respectively.

96. The Committee is aware that light aircraft traffic has the potential to increase airborne congestion. For instance, being significantly slower, light aircraft approaching KSA can effectively use up to 3 approach slots which could be used by faster aircraft.

97. Aviation stated that it would be possible to divert commuter aircraft to Bankstown airport, but it had received strong objections from country areas to such a proposal. Concern was felt that any move to relocate commuter and charter operations would render them unviable, and that passengers from country areas who transfer to jet services at KSA would be greatly inconvenienced. The Committee notes the valuable role played by commuter airlines and general aviation in providing services over many routes considered by the major airlines to be uneconomic to operate, owing to the size of their equipment.

98. At the public hearing AFAP, AIPA and CAOOAA all advocated the construction of a general aviation runway at KSA. The associations believe that such a runway could provide significant benefits. It could be built parallel to the 16/34 runway in a similar position to the proposed (but not proceeded with) short domestic runway, or in the general aviation sector of the airport, since it was contended that most commuter services could be accommodated on a 1000m runway.

99. The Committee requests that the suggestion put forward by the aviation associations be further studied and the Minister for Aviation announce the result of such study.

LIMIT OF COST

100. When referred to the former Committee the limit of cost estimate for the proposal was $16.0 million at June 1984 prices.

101. The limit of cost of the proposed work when referred to the Committee was $16.4 million at January 1985 prices.

102. Additionally, a sum of $1.3 million, to be funded from Aviation's Technical Capital Works vote, will be required for the diversion of existing control and power cables and the provision of taxiway lighting and illuminated taxiway signs.

PROGRAM

103. The construction timetable has yet to be finalised, however, the proposed staging has been determined and was detailed in paragraph 84. The project will be constructed following approval to proceed and at the time of the hearing was anticipated to be completed late in 1987.

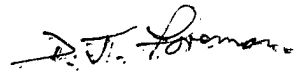
104. Committee's Recommendation The Committee recommends the construction of the work in this reference.

RECOMMENDATIONS AND CONCLUSIONS

105. The recommendations and conclusions of the Committee are set out below. Alongside each is the paragraph in the report to which it refers.

		Paragraph
1.	AIRCRAFT OPERATING TO AND FROM SYDNEY (KINGSFORD-SMITH) AIRPORT ARE PRESENTLY SUBJECT TO EXCESSIVE DELAYS. SUCH DELAYS ARISE MAINLY FROM DEFICIENCIES IN THE EXISTING RUNWAY AND TAXIWAY SYSTEMS.	38
2.	THE PROPOSAL FOR THE AUGMENTATION OF THE TAXIWAY SYSTEM APPEARS SATISFACTORY AND SHOULD RESULT IN REDUCTIONS IN CONGESTION AND DELAYS AT SYDNEY (KINGSFORD-SMITH) AIRPORT.	62
3.	RUNWAY 16 IS THE MOST HEAVILY USED RUNWAY AND ACCOUNTS FOR 83 PER CENT OF DEPARTURES. THE COMMITTEE BELIEVES THAT POTENTIAL EXISTS FOR THE HANDLING RATE OF THE RUNWAY TO BE INCREASED IF AIRCRAFT CAN GAIN EASIER ENTRY ONTO IT WITHOUT ADVERSELY AFFECTING FOLLOWING AIRCRAFT. ACCORDINGLY, FURTHER CONSIDERATION SHOULD BE GIVEN TO HEAVILY USED RUNWAY ENTRY POINTS BEING CONSTRUCTED WITH LARGER RADII.	67

		Paragraph
4.	THE COMMITTEE SUPPORTS THE DECISION OF THE DEPARTMENT OF AVIATION TO DELETE THE RAPID EXIT TAXIWAY PROPOSED ORIGINALLY BUT RECOMMENDS THAT IT UNDERTAKE A STUDY INTO THE PROVISION OF A RAPID EXIT TAXIWAY SOUTH OF TAXIWAY A ON THE 16/34 RUNWAY.	77
5.	THE LIMIT OF COST OF THE PROPOSED WORK WHEN REFERRED TO THE COMMITTEE WAS $16.4 MILLION AT JANUARY 1985 PRICES.	101
6.	THE COMMITTEE RECOMMENDS THE CONSTRUCTION OF THE WORK IN THIS REFERENCE.	104



(D.J. FOREMAN)
Chairman

Parliamentary Standing Committee
on Public Works
Parliament House
CANBERRA

18 April 1985

APPENDIX A

LIST OF WITNESSES

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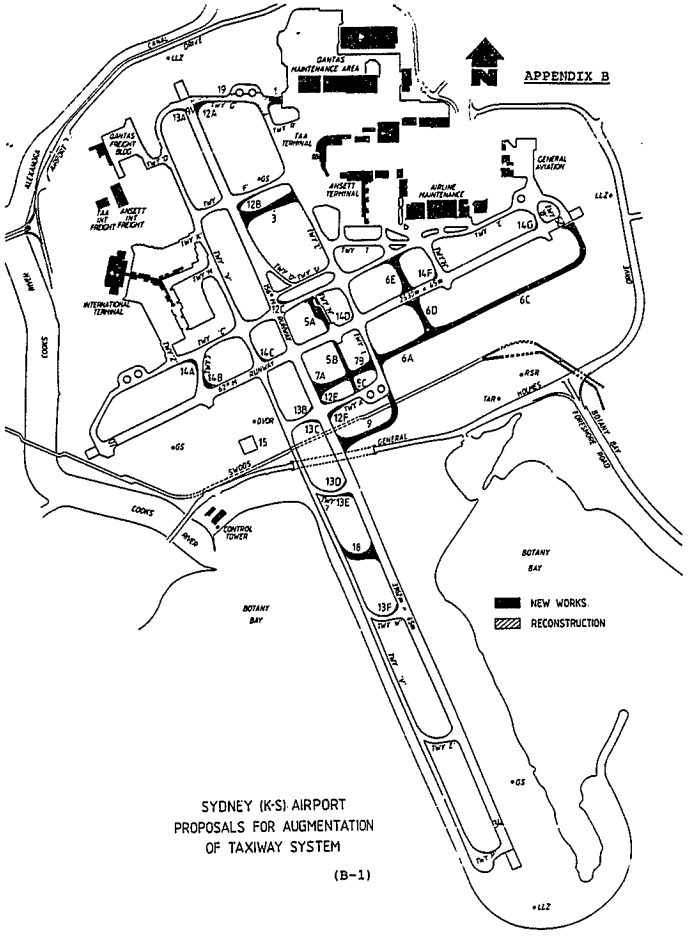
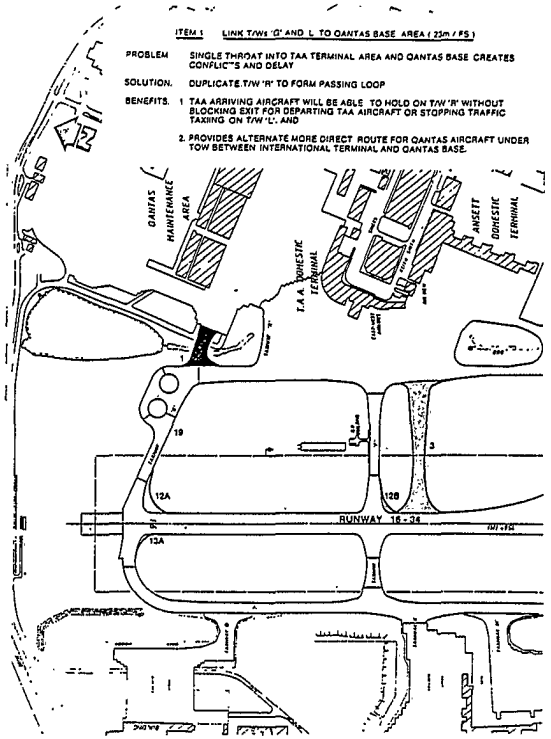
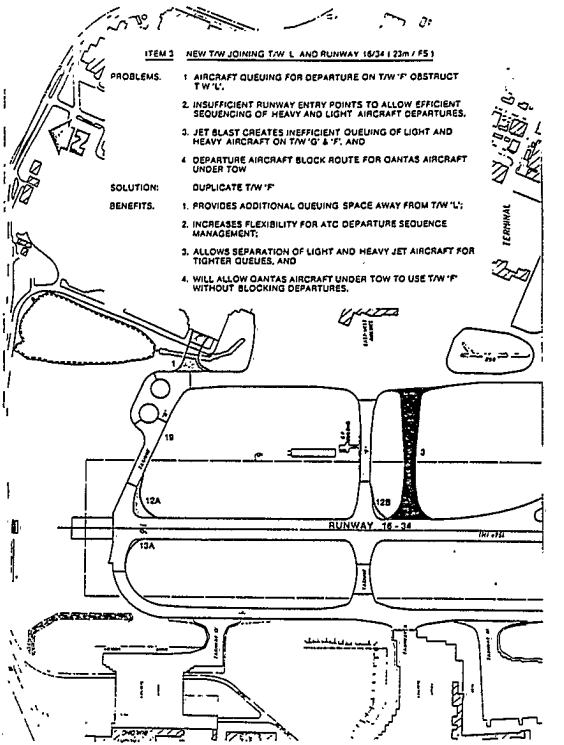


SYDNEY (K-S) AIRPORT
PROPOSALS FOR AUGMENTATION
OF TAXIWAY SYSTEM

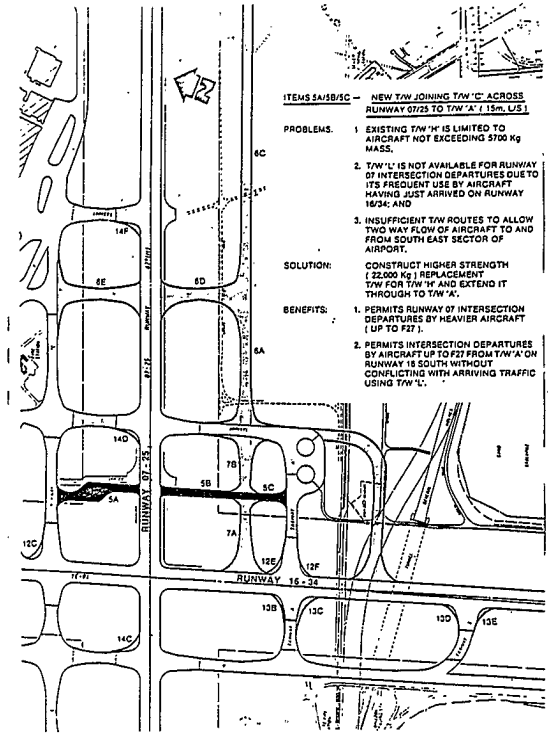
(B-1)

APPENDIX C

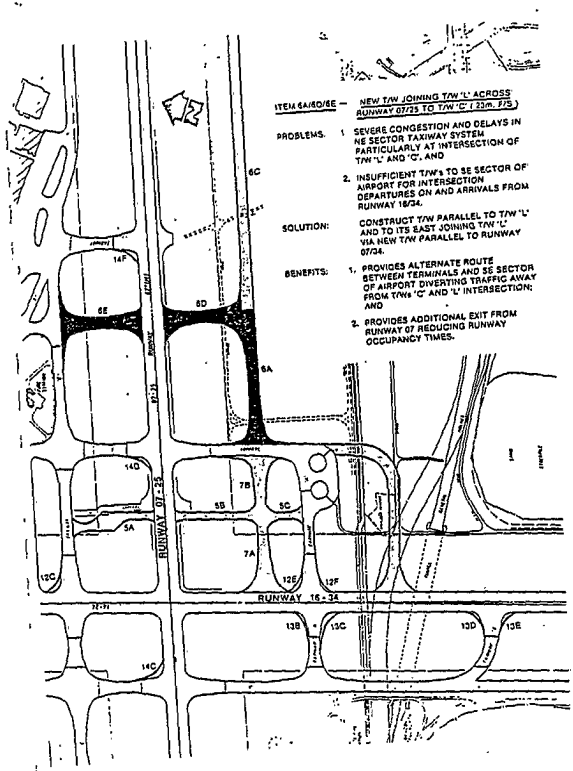

ITEM 1 LINK T/Ws 'G' AND L TO QANTAS BASE AREA (23m / FS)
PROBLEM SINGLE THROAT INTO TAA TERMINAL AREA AND QANTAS BASE CREATES CONFLICTS AND DELAY
SOLUTION. DUPLICATE T/W 'R' TO FORM PASSING LOOP
BENEFITS. 1 TAA ARRIVING AIRCRAFT WILL BE ABLE TO HOLD ON T/W 'R' WITHOUT BLOCKING EXIT FOR DEPARTING TAA AIRCRAFT OR STOPPING TRAFFIC TAXIING ON T/W 'L', AND
2. PROVIDES ALTERNATE MORE DIRECT ROUTE FOR QANTAS AIRCRAFT UNDER TOW BETWEEN INTERNATIONAL TERMINAL AND QANTAS BASE.
QANTAS MAINTENANCE AREA
T.A.A. DOMESTIC TERMINAL
ANSETT DOMESTIC TERMINAL
19
12A
12B
RUNWAY 16 - 34
13A


ITEM 3 NEW T/W JOINING T/W L AND RUNWAY 16/34 (23m / FS)
PROBLEMS.
1. AIRCRAFT QUEUING FOR DEPARTURE ON T/W 'F' OBSTRUCT T/W 'L'.
2. INSUFFICIENT RUNWAY ENTRY POINTS TO ALLOW EFFICIENT SEQUENCING OF HEAVY AND LIGHT AIRCRAFT DEPARTURES.
3. JET BLAST CREATES INEFFICIENT QUEUING OF LIGHT AND HEAVY AIRCRAFT ON T/W 'G' & 'F', AND
4. DEPARTURE AIRCRAFT BLOCK ROUTE FOR QANTAS AIRCRAFT UNDER TOW
SOLUTION: DUPLICATE T/W 'F'
BENEFITS.
1. PROVIDES ADDITIONAL QUEUING SPACE AWAY FROM T/W 'L';
2. INCREASES FLEXIBILITY FOR ATC DEPARTURE SEQUENCE MANAGEMENT;
3. ALLOWS SEPARATION OF LIGHT AND HEAVY JET AIRCRAFT FOR TIGHTER QUEUES, AND
4. WILL ALLOW QANTAS AIRCRAFT UNDER TOW TO USE T/W 'F' WITHOUT BLOCKING DEPARTURES.
TERMINAL
1
4
19
3
12A
12B
RUNWAY 16 - 34
13A

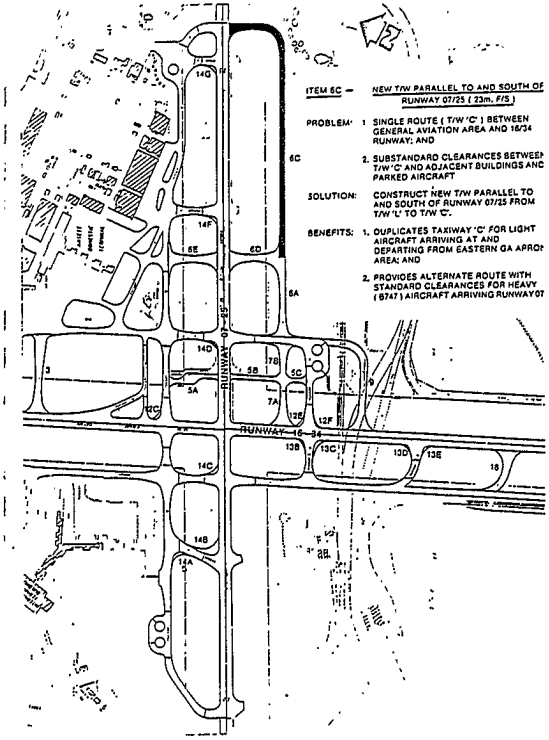
APPENDIX C

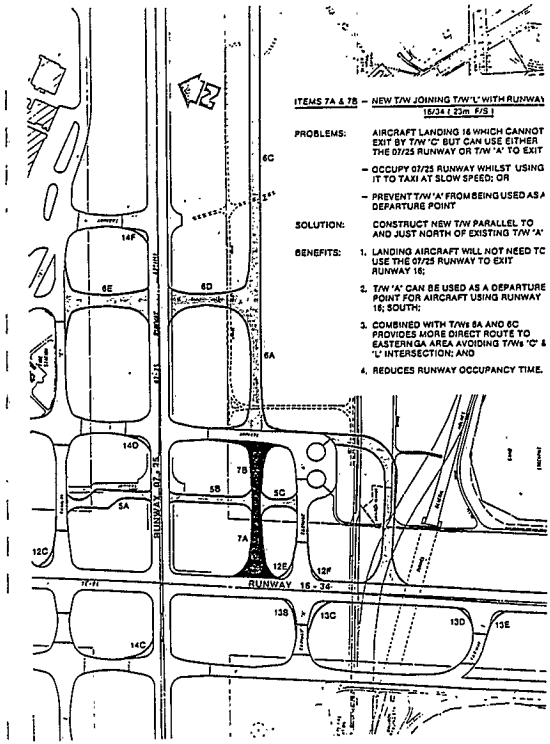

ITEMS 5A/5B/5C – NEW T/W JOINING T/W 'C' ACROSS RUNWAY 07/25 TO T/W 'A' (15m, US)
PROBLEMS.
1. EXISTING T/W 'H' IS LIMITED TO AIRCRAFT NOT EXCEEDING 3700 Kg MASS.
2. T/W 'L' IS NOT AVAILABLE FOR RUNWAY 07 INTERSECTION DEPARTURES DUE TO ITS FREQUENT USE BY AIRCRAFT HAVING JUST ARRIVED ON RUNWAY 16/34; AND
3. INSUFFICIENT T/W ROUTES TO ALLOW TWO WAY FLOW OF AIRCRAFT TO AND FROM SOUTH EAST SECTOR OF AIRPORT.
SOLUTION:
CONSTRUCT HIGHER STRENGTH (22,000 Kg) REPLACEMENT T/W FOR T/W 'H' AND EXTEND IT THROUGH TO T/W 'A'.
BENEFITS:
1. PERMITS RUNWAY 07 INTERSECTION DEPARTURES BY HEAVIER AIRCRAFT (UP TO F27).
2. PERMITS INTERSECTION DEPARTURES BY AIRCRAFT UP TO F27 FROM T/W 'A' ON RUNWAY 16 SOUTH WITHOUT CONFLICTING WITH ARRIVING TRAFFIC USING T/W 'L'.
RUNWAY 07 - 25
RUNWAY 16 - 34
6C
6D
6E
6A
14F
14D
14C
5A
5B
5C
7A
7B
12C
12E
12F
13B
13C
13D
13E

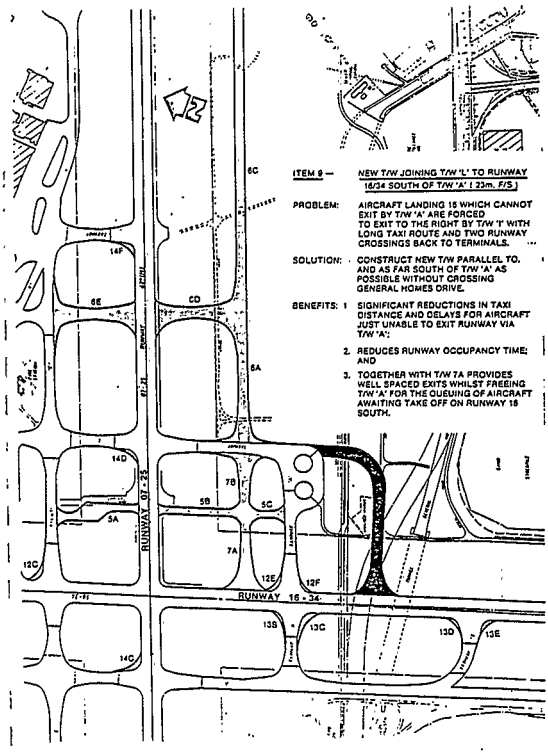
APPENDIX C

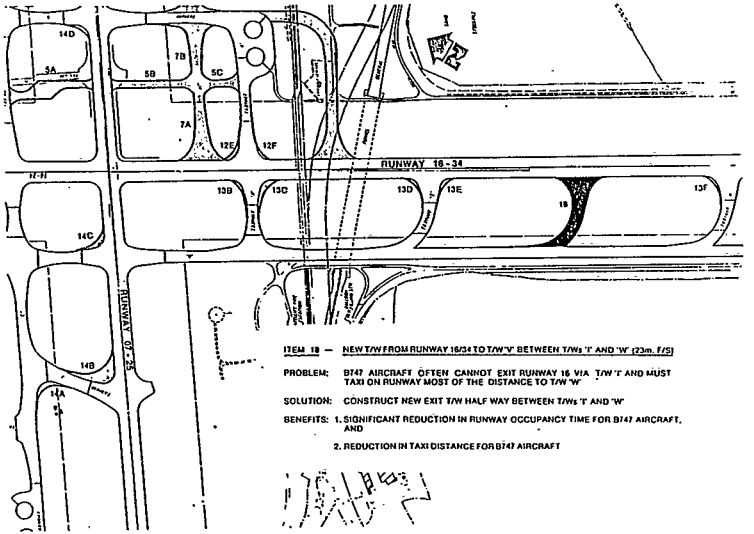

ITEM 6A/6D/6E – NEW T/W JOINING T/W 'L' ACROSS RUNWAY 07/25 TO T/W 'C' (23m. P/S)
PROBLEMS. 1. SEVERE CONGESTION AND DELAYS IN NE SECTOR TAXIWAY SYSTEM PARTICULARLY AT INTERSECTION OF T/W 'L' AND 'C'. AND
2. INSUFFICIENT T/W's TO SE SECTOR OF AIRPORT FOR INTERSECTION DEPARTURES ON AND ARRIVALS FROM RUNWAY 16/34.
SOLUTION: CONSTRUCT T/W PARALLEL TO T/W 'L' AND TO ITS EAST JOINING T/W 'L' VIA NEW T/W PARALLEL TO RUNWAY 07/34.
BENEFITS: 1. PROVIDES ALTERNATE ROUTE BETWEEN TERMINALS AND SE SECTOR OF AIRPORT DIVERTING TRAFFIC AWAY FROM T/W's 'C' AND 'L' INTERSECTION; AND
2. PROVIDES ADDITIONAL EXIT FROM RUNWAY 07 REDUCING RUNWAY OCCUPANCY TIMES.
6C
14F
6E
6D
6A
14D
7B
5B
5C
5A
7A
12C
12E
12F
RUNWAY 07 - 25
RUNWAY 16 - 34
13B
13C
13D
13E
14C

APPENDIX C


ITEM 6C — NEW T/W PARALLEL TO AND SOUTH OF RUNWAY 07/25 (23m. F/S)
PROBLEM: 1. SINGLE ROUTE (T/W 'C') BETWEEN GENERAL AVIATION AREA AND 16/34 RUNWAY; AND
2. SUBSTANDARD CLEARANCES BETWEEN T/W 'C' AND ADJACENT BUILDINGS AND PARKED AIRCRAFT
SOLUTION: CONSTRUCT NEW T/W PARALLEL TO AND SOUTH OF RUNWAY 07/25 FROM T/W 'L' TO T/W 'C'.
BENEFITS: 1. DUPLICATES TAXIWAY 'C' FOR LIGHT AIRCRAFT ARRIVING AT AND DEPARTING FROM EASTERN GA APRON AREA; AND
2. PROVIDES ALTERNATE ROUTE WITH STANDARD CLEARANCES FOR HEAVY (B747) AIRCRAFT ARRIVING RUNWAY 07
6C
6A
RUNWAY 16-34
RUNWAY 07-25
14D
14F
6E
6D
14E
5B
7B
5C
3
3A
7A
12B
12F
13B
13C
13D
13E
14C
14B
14A


ITEMS 7A & 7B – NEW T/W JOINING T/W 'L' WITH RUNWAY 16/34 (23m F/S)
PROBLEMS:
AIRCRAFT LANDING 16 WHICH CANNOT EXIT BY T/W 'C' BUT CAN USE EITHER THE 07/25 RUNWAY OR T/W 'A' TO EXIT
– OCCUPY 07/25 RUNWAY WHILST USING IT TO TAXI AT SLOW SPEED; OR
– PREVENT T/W 'A' FROM BEING USED AS A DEPARTURE POINT
SOLUTION:
CONSTRUCT NEW T/W PARALLEL TO AND JUST NORTH OF EXISTING T/W 'A'
BENEFITS:
1. LANDING AIRCRAFT WILL NOT NEED TO USE THE 07/25 RUNWAY TO EXIT RUNWAY 16;
2. T/W 'A' CAN BE USED AS A DEPARTURE POINT FOR AIRCRAFT USING RUNWAY 16; SOUTH;
3. COMBINED WITH T/Ws 5A AND 6C PROVIDES MORE DIRECT ROUTE TO EASTERN GA AREA AVOIDING T/Ws 'C' & 'L' INTERSECTION; AND
4. REDUCES RUNWAY OCCUPANCY TIME.
RUNWAY 07 - 25
RUNWAY 16 - 34
6C
6E
6D
6A
14F
14D
7B
5B
5C
5A
7A
12C
12E
12F
13B
13C
13D
13E
14C


ITEM 9 — NEW T/W JOINING T/W 'L' TO RUNWAY 16/34 SOUTH OF T/W 'A' (23m. F/S)
PROBLEM: AIRCRAFT LANDING 16 WHICH CANNOT EXIT BY T/W 'A' ARE FORCED TO EXIT TO THE RIGHT BY T/W 'T' WITH LONG TAXI ROUTE AND TWO RUNWAY CROSSINGS BACK TO TERMINALS.
SOLUTION: CONSTRUCT NEW T/W PARALLEL TO, AND AS FAR SOUTH OF T/W 'A' AS POSSIBLE WITHOUT CROSSING GENERAL HOMES DRIVE.
BENEFITS: 1 SIGNIFICANT REDUCTIONS IN TAXI DISTANCE AND DELAYS FOR AIRCRAFT JUST UNABLE TO EXIT RUNWAY VIA T/W 'A':
2. REDUCES RUNWAY OCCUPANCY TIME; AND
3. TOGETHER WITH T/W 7A PROVIDES WELL SPACED EXITS WHILST FREEING T/W 'A' FOR THE QUEUING OF AIRCRAFT AWAITING TAKE OFF ON RUNWAY 16 SOUTH.
RUNWAY 07 - 25
RUNWAY 16 - 34
6C
14F
6E
6D
6A
14D
7B
5B
5C
9A
7A
12C
12E
12F
13B
13C
13D
13E
14C



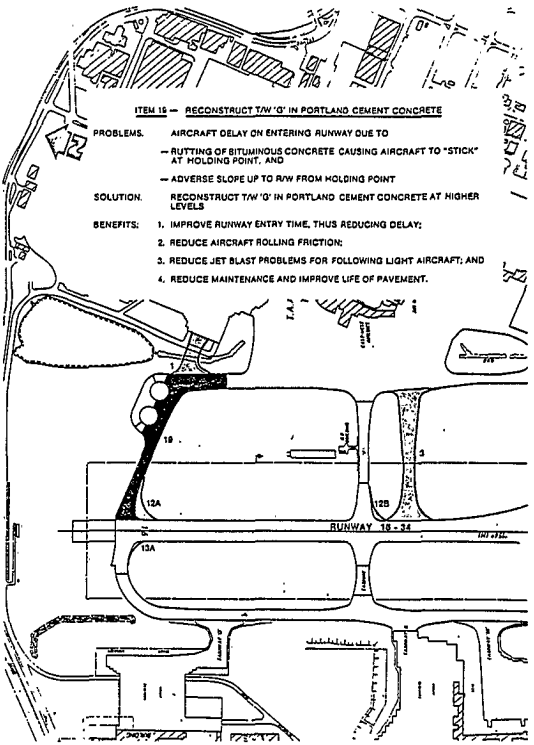
ITEM 16 — NEW T/W FROM RUNWAY 16/34 TO T/W 'V' BETWEEN T/Ws 'I' AND 'W' (23m. F/S)

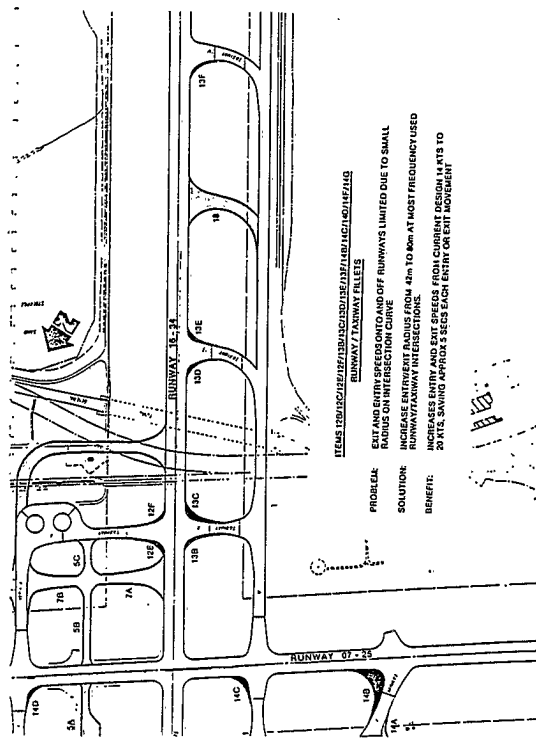
PROBLEM: B747 AIRCRAFT OFTEN CANNOT EXIT RUNWAY 16 VIA T/W 'I' AND MUST TAXI ON RUNWAY MOST OF THE DISTANCE TO T/W 'W'

SOLUTION: CONSTRUCT NEW EXIT T/W HALF WAY BETWEEN T/Ws 'I' AND 'W'

BENEFITS: 1. SIGNIFICANT REDUCTION IN RUNWAY OCCUPANCY TIME FOR B747 AIRCRAFT, AND

2. REDUCTION IN TAXI DISTANCE FOR B747 AIRCRAFT


ITEM 19 — RECONSTRUCT T/W 'G' IN PORTLAND CEMENT CONCRETE
PROBLEMS. AIRCRAFT DELAY ON ENTERING RUNWAY DUE TO
— RUTTING OF BITUMINOUS CONCRETE CAUSING AIRCRAFT TO "STICK" AT HOLDING POINT, AND
— ADVERSE SLOPE UP TO R/W FROM HOLDING POINT
SOLUTION. RECONSTRUCT T/W 'G' IN PORTLAND CEMENT CONCRETE AT HIGHER LEVELS
BENEFITS: 1. IMPROVE RUNWAY ENTRY TIME, THUS REDUCING DELAY;
2. REDUCE AIRCRAFT ROLLING FRICTION;
3. REDUCE JET BLAST PROBLEMS FOR FOLLOWING LIGHT AIRCRAFT; AND
4. REDUCE MAINTENANCE AND IMPROVE LIFE OF PAVEMENT.
19
12A
12B
RUNWAY 16 - 34
13A


RUNWAY 16-34
RUNWAY 07-25
ITEMS 12B/12C/12E/12F/13B/13C/13D/13E/13F/14B/14C/14D/14E/14G
RUNWAY / TAXIWAY FILLETS
PROBLEM:
EXIT AND ENTRY SPEEDS ONTO AND OFF RUNWAYS LIMITED DUE TO SMALL RADIUS ON INTERSECTION CURVE
SOLUTION:
INCREASE ENTRY/EXIT RADIUS FROM 42m TO 60m AT MOST FREQUENCY USED RUNWAY/TAXIWAY INTERSECTIONS.
BENEFIT:
INCREASES ENTRY AND EXIT SPEEDS FROM CURRENT DESIGN 14 KTS TO 20 KTS, SAVING APPROX 5 SECS EACH ENTRY OR EXIT MOVEMENT.