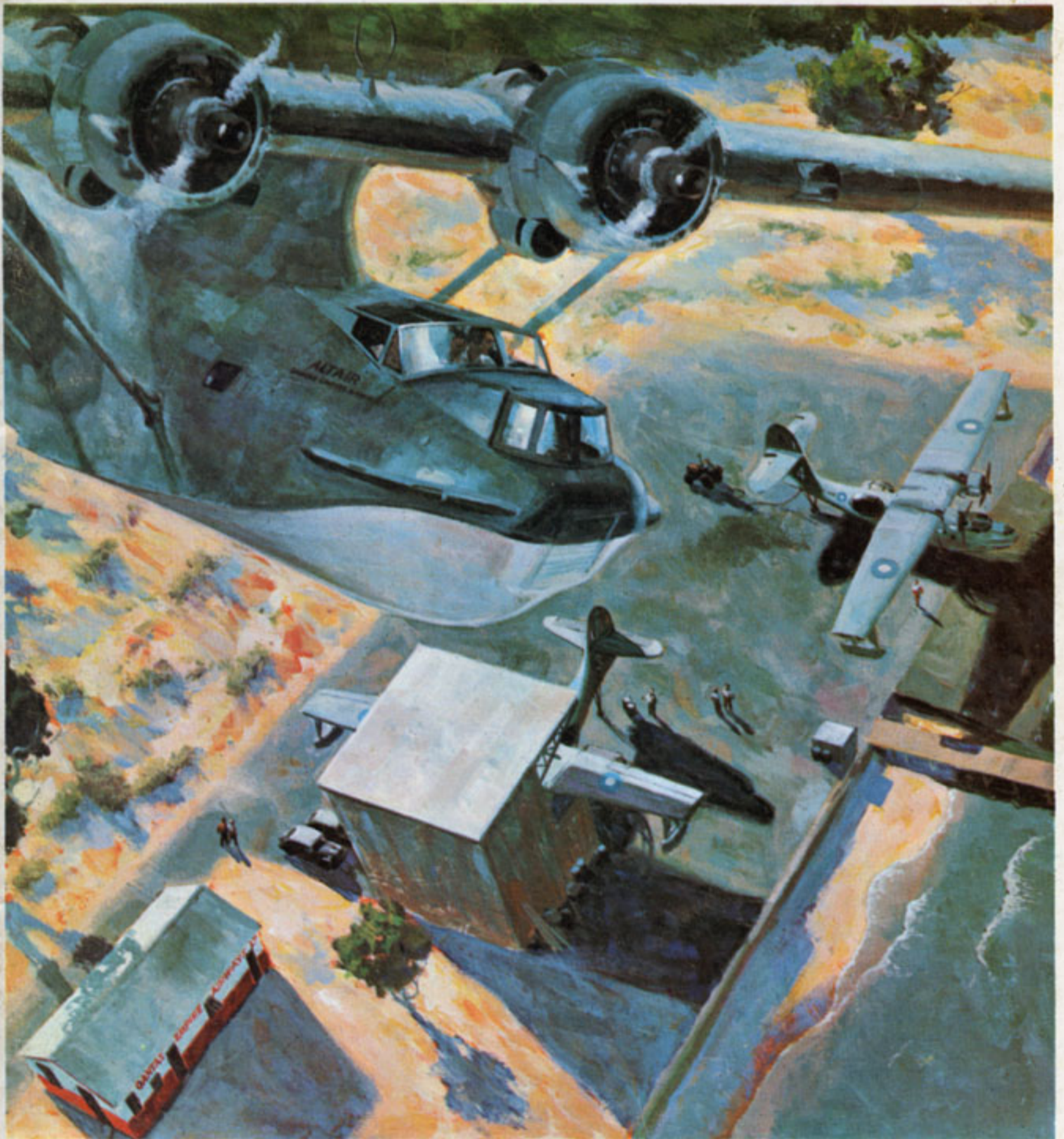




WING TIPS



A DIGEST FOR QANTAS AIRCREW STAFF

wing tips

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COVER PICTURE:

Indian Ocean crossings by Qantas Catalinas were among the epic air transport operations of World War II. This issue of "Wing Tips" features a detailed article about the vital wartime air link by former First Officer E. H. Neal.

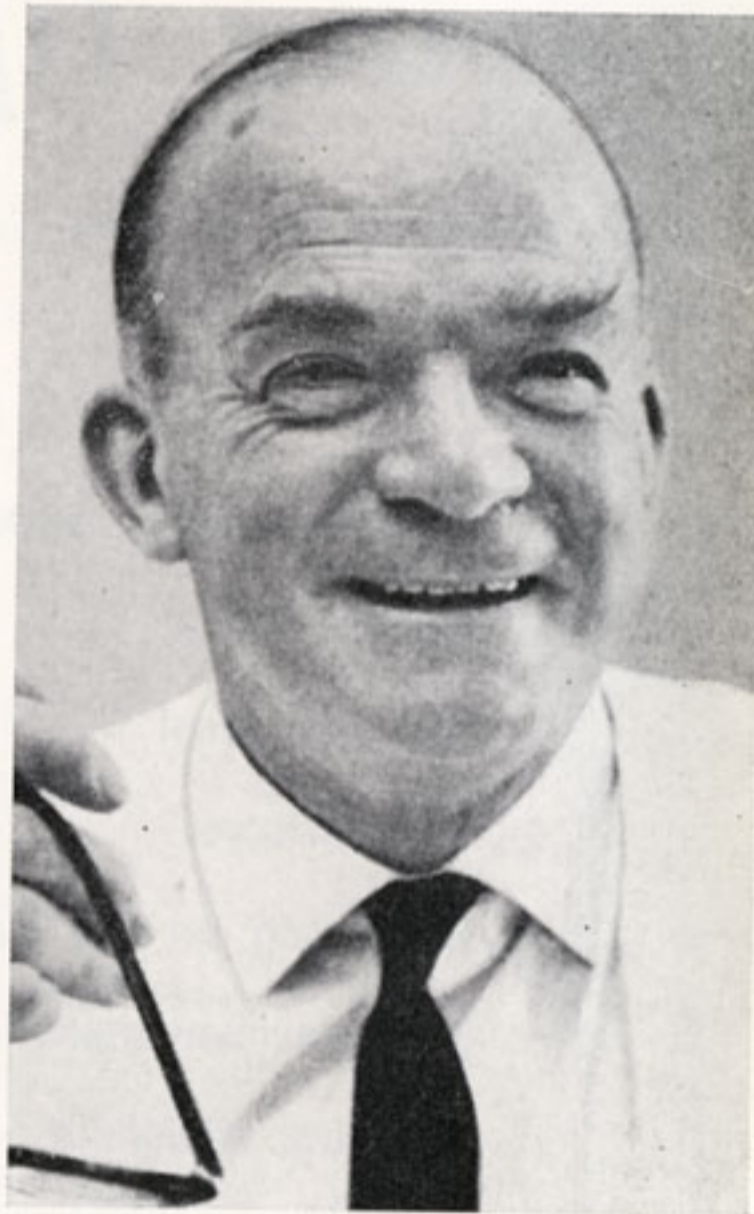
Our cover is from an original painting by Robert Sherry, art director of General Precision Systems Inc., the Link Group. "Wing Tips" thanks and acknowledgements go to both artist and writer.

Dr. K. N. E. BRADFIELD, an airport authority of international renown and chief architect of Australian developments in this field, takes a wide ranging look at the local scene — past, present and future.

Problems about airports

CAN YOU SEE the day when most airline passengers, outward bound from a major city airport, will leave their cars or other initial transport at one of a number of strategically placed suburban terminals and make their way thence to the airport by communal transport? And can you see, in that same era, an active discouragement of non-travelling visitors, welcoming and farewelling groups, and of sight-seers at the airport terminal? It may not happen, but in the view of Dr K. N. E. Bradfield, First Assistant Director-General (Ground Facilities) in DCA, who has, since 1952, had the main responsibility for meeting the fast-growing problems of airport development in Australia, these could be two of the solutions that are needed in coping with mass travel as developed by the Boeing 747s and their bigger successors.

Dr Bradfield, who left the head office staff of DCA at the end of last year to become Australia's representative on the ICAO Council at Montreal, voiced his thoughts in an address to the annual combined meeting of the Melbourne branch of the Royal Aeronautical Society



Dr. K. N. E. Bradfield, Ph.D., B.Sc., B.E., A.M.I.E.A.

and the Aeronautical Engineering branch of the Melbourne division of the Institution of Engineers (Australia) — and combined with it a most interesting background survey of

the history of the Australian airport development.

Why the communal transport, and the discouragement of airport visitors? Summarised, Dr Bradfield's view was that individual private cars and unnecessary airport visitors — together with passenger baggage handling problems — contributed the biggest impediment to a speedy flow of travellers through airport terminals . . .

"It is sometimes not realised that an airport is a place of transit," he said, "and an airport terminal building is a place where a traveller wants to spend a minimum, not a maximum, of time. The efficiency of an airport terminal building is best measured by the time it takes the traveller to pass through it in comfort."

He had listed "noise; the handling of passenger baggage, and surface transport to and from airports" as the three major problems associated with airports facing us today, and he thought the first two rested for solution mainly with aircraft manufacturers. The airport designer was restricted in what he could do to minimise the effect of noise. Airports were already in existence for the main cities of the world and, if they became unusable because of the noise of aircraft, their alternatives would be more remote from the cities; so remote, in some cases, that they could not serve the city effectively. Noise, therefore, "must be tackled much more vigorously at the source." Similarly, with luggage . . . the biggest problem of passenger handling of the jumbo-type aircraft of the future was the matching together of 500 passengers and their 1000 pieces of baggage

after they arrived. It would help if, in the design of such aircraft, the passenger was not separated from a reasonable amount of baggage; if, for instance, each passenger could take one suitcase aboard with him and stow it next to his seat.

Expensive

In Dr Bradfield's view the ground transport problem was capable of good — if "extremely expensive" — solution outside the terminal area "by development of properly planned freeways and expressways joining the airport to the community." This did not, however, solve the terminal problem while passengers used individual vehicles. Assuming a 747 passenger load of 330 and an average set-down or pick-up time at the road kerb of two minutes, the length of kerb line to clear one 747 load, either in or out, in 45 minutes would be about 300 ft. for each of the arrival and departure sections . . . "With the number of aircraft we must expect to handle per hour, the lengths of road kerb line become unrealistically large, if individual surface transport is to be used," he said.

Hence his suggestion of satellite suburban terminals for Melbourne and Sydney, with communal transport to cut down vehicle congestion at the airport, though he conceded that there must always be facilities provided for the passenger for whom it was most convenient to go directly to the airport itself. And for travellers, too, there was need for public facilities — refreshment and dining rooms and the various concessions. But he added this note:

"Concessions to attract the public, rather than to serve the traveller,

have an important part in the financing of many airports today, and they can be a valuable part of the airport as it develops. But they do add to the surface transport problem and they can add to the passenger movement problem in the terminal itself; and in the future, as passenger traffic builds up, they may have to decrease so that the passenger — the basic reason for the airport — can use the airport efficiently."

For the larger problems of airport development — and the development of the aviation industry — Dr Bradfield urged the need, already noted at September's ICAO Assembly meeting at Buenos Aires, for a greater measure of "systems planning" in the introduction of new aircraft types "on the world's air routes, and including our own domestic routes." This required co-ordinated "comprehensive and efficient analysis of all the elements of a plan . . . to ensure they reach maturity at the right time;" in the case of a new aircraft type, the network of ground facilities and services (the "infrastructure") needed for its safe and efficient operation, on the ground and in the air, should be considered concurrently as a complementary element for co-ordinated planning. ICAO Council had been charged with finding the ways and means of promoting this type of systems planning between the aircraft manufacturers, the airlines and the "infrastructure" providers.

"It is apparent that the world airport system generally is not ready for the Boeing 747, and much of this situation is due to insufficient systems planning," said Dr Bradfield. "It is not just a matter of a

requirement for increased lengths and increased strengths of runways. It involves such matters and such problems as:

- The increase of areas of pavement fillets between runways and taxiways to ensure safe distances between aircraft wheels and pavement edges.

- Attention to the shoulders of taxiways since the inner engines of the Boeing 747 are just over the edges of the internationally recommended 75 feet wide taxiways.

- Attention to the lights on the side of the runways since they are directly under the blast of the outer engines of the 747.

- Additional holding rooms and aerobridges at loading points in terminal buildings since the Boeing 747 will require to be loaded and unloaded from 3 or 4 doors forward of the wings, and from both sides of the aircraft.

- Larger fire tenders since the present types would have difficulty in throwing foam sufficiently far enough and do not have enough foam to blanket the huge fuselage of the 747. (A corollary to this is that larger fire station buildings will be needed to house the larger fire equipment.)

- The extremely heavy tugs needed to move the aircraft about on the apron need extremely strong pavements on which to move — much greater than for normal surface vehicles.

"All these things, and many more, must be thought of, planned and provided before the aircraft can be operated efficiently at the airports," said Dr Bradfield. "We, in Australia, are relatively fortunate

since we have looked closely into the infrastructure requirements and made some kind of realistic assessment of them. Before agreeing to the introduction of new aircraft types into Australia the Government, quite understandably and quite rightly, requires the Department to make an assessment of the cost of the ground facilities — the infrastructure — which must be associated with the new aircraft. This was required not only for the Boeing 747, but also the Boeing 727 and the Douglas DC-9, and other aircraft before them.

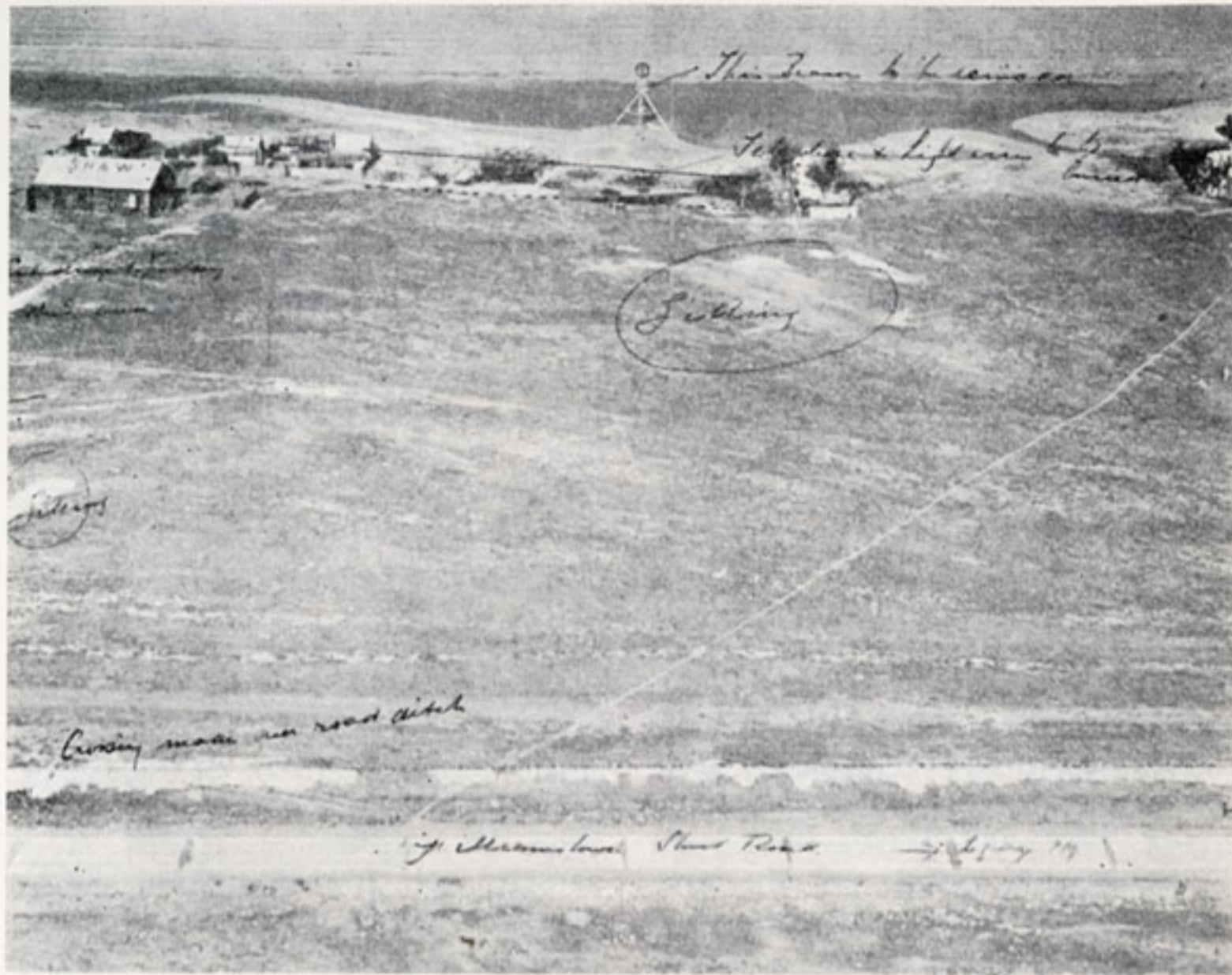
"In this respect the very close working relationship between the Department and the airline companies — particularly Qantas, Ansett-ANA and TAA—have been of inestimable value, and we have been able to come up with some form of realistic assessment of the infrastructure costs involved. As far as the Boeing 727 and Douglas DC-9 were concerned, for example, the Department came forward with an assessment of cost of additional facilities — over and above those required for traffic growth and normal development — of a relatively small total of about \$16,000,000 over a period of five to 10 years. The assessment for the Boeing 747 is a very much larger amount.

"The decision for Qantas to purchase the Boeing 747 was made in the light of, and with knowledge of, the cost of the infrastructure required, and steps are now being taken to provide this infrastructure in time for the introduction of the aircraft. But all this has had to be done after the aircraft design had been brought to a point where, as

far as its effect on the infrastructure was concerned, it had been virtually decided and determined. It has been a case — as it has been the case at other times in the past — of the aircraft being produced and the infrastructure being made to fit the aircraft. The message which came loud and clear from Buenos Aires in September was that the States around the world who provide the infrastructure want a change in the case of future aircraft, and they look to increased systems planning to bring this about.

"There is a message in all this too, for the airline operator. There is, more and more, a tendency towards placing on the airline operator the financial burden of the facilities he requires — either as a capital cost, or in increased rentals or user-charges. It is in his interests to try to ensure that the aircraft offered to him by the manufacturer is co-ordinated, as well as it can possibly be, with the existing infrastructure — and his contribution will be invaluable, in fact it will be necessary, in the better systems planning which must accompany the introduction of the aircraft of the future, and the future development of our airports in Australia."

That Australia's airport system itself has "Grown like Topsy", and in fits and starts until comparatively recent years was shown in Dr Bradfield's survey back to the "inevitably cloudy" beginnings about 50 years ago when an airport was "a quite small area of flat land desirably grassed and, if you were lucky, fenced to help keep it free from cattle and sheep, the goats and the kangaroos," as he put it.



Australia's first licensed aerodrome, at Fisherman's Bend (Victoria), near the shores of the Bay. The date, 1921; the only occupant, the Shaw Ross Engineering and Aviation Co. This unique view from DCA's files carries the original handwritten development instructions.

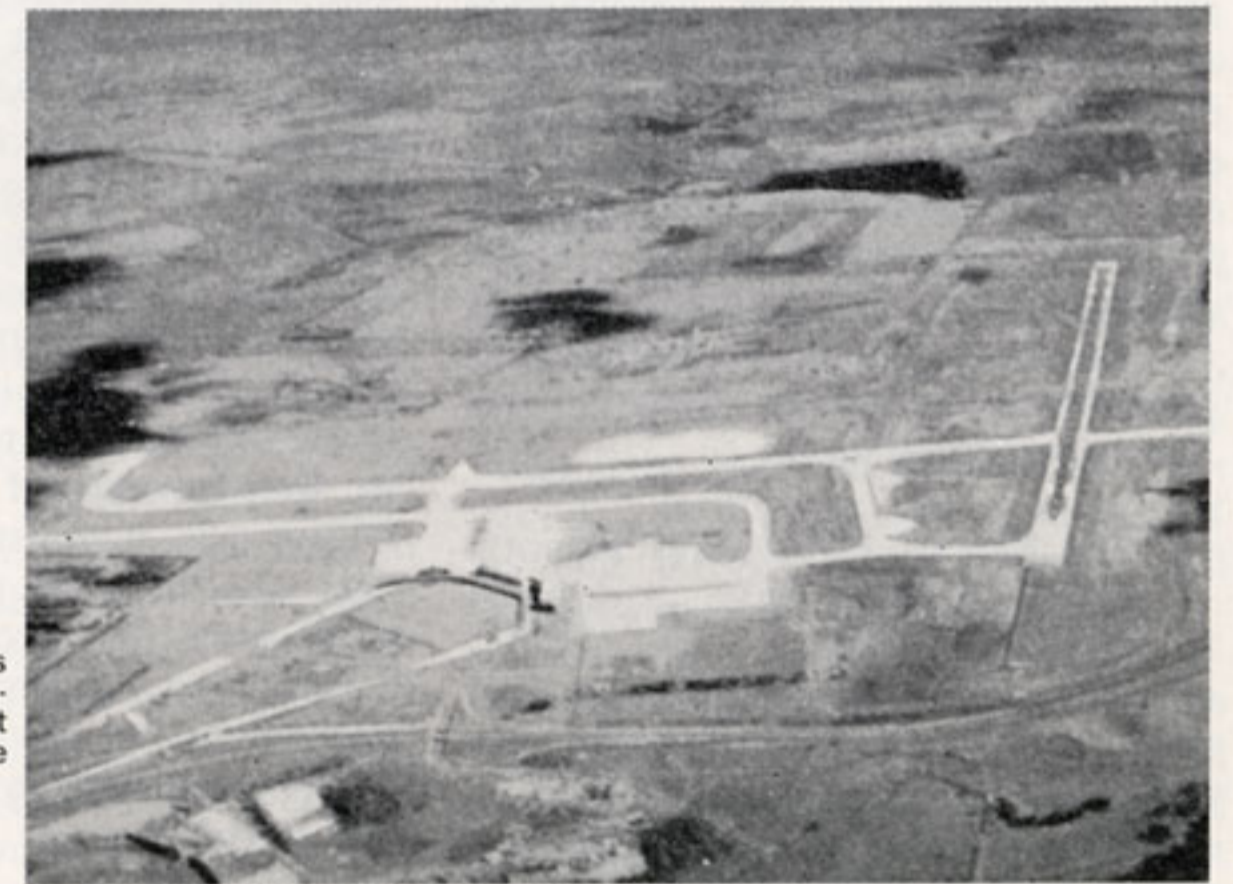
First airport

"There is some doubt about which was actually the first airport in Australia. The Commonwealth purchased 161 acres at Mascot in 1921 for about £9000 and Sydney airport became official; but Nigel Love had been operating there on land leased from the Kensington Racing Club since 1920. Essendon airport — or St John's as it was then called — also dates back to 1921, but Mr R. G. Carey had been using an area at Fishermen's Bend as an aerodrome since 1920. Licensed aerodrome No. 1 was, in fact, at Fishermen's Bend, on the shores of the Bay and near the area

now occupied by the overseas shipping terminals. The licensee was the Shaw Ross Engineering and Aviation Company, the date was June 1, 1921, and the dimensions of the grassed field were roughly 460 yd. by 300 yd.

"If we were to accord the name of airport to an area used by a "regular scheduled airline," the first would be in Western Australia on the route flown by Norman Brearley from Geraldton to Broome in 1921, with others coming soon after along the early Qantas route from Charleville to Longreach in 1922.

"One of the very earliest areas of land listed officially as 'approved



Today, Australia's biggest developments are Mascot (left), Tullamarine (right).

for use by aircraft' is the airport site still in use at Cootamundra in New South Wales. This came about since the first airways contract to be considered was between Sydney and Adelaide via Cootamundra, and an early inspection of Cootamundra

was made in the survey of the leg from Cootamundra to Sydney. At that time there were several sites under consideration at both Adelaide and Sydney; and Mascot, for example, had not yet been determined as the site for the airport,

ahead of other possibilities which included the Rose Bay Golf Course and Centennial Park.

"Soon after Cootamundra came an area, subsequently abandoned, at Parkes, and others, also subsequently abandoned, at Geelong and Mildura, and Coolalie, Carrack and several other forgotten sites in New South Wales. Charleville, Tambo, Blackall, Longreach, Winton, McKinley and Cloncurry come in a bunch near the head of the list, and Geraldton, Carnarvon and others in Western Australia also come before Essendon and Sydney entered the list, in the latter part of 1921. Perhaps the fact that Western Australia was so far away explains why the existence of the aerodromes there was not recorded earlier than those on the Queensland route. Certainly it took a long slow boat trip for the Superintendent and the Assistant Superintendent of Aerodromes of the Civil Aviation Branch of the Department of Defence in Melbourne to get to Broome and Derby and back again.

"The files of these early airports — many of them have progressed to that status today — are sprinkled with the names of men who had such a great deal to do with our early airport development in Australia, and who have become part of the history of the Department of Civil Aviation as well — Captain Edgar Johnston, A. R. McComb, R. U. Hoddinott and Major Mann. Airport development was not a complicated business in those days. Design, such as it was, was more concerned with the right type of grass mixture rather than the materials for pavements, and maintenance

was, more likely than not, the cutting of the grass or the burning off of spinifex.

It was inevitably not without its problems, and in those early files you can come across such things as the difficulty in getting the grass cut at Broome because several of the local inhabitants had a prior arrangement with the local authority to graze their stock on the land in question. This one was solved by the Superintendent of Aerodromes buying out their privilege for £5 . . . the grass and general rubbish were then removed from the site for £30, by prison labor.

"The early records of Charleville, in 1921, show that the Qantas agent had made application for the enlargement of what was then called 'the Municipal Aerodrome,' since the Company considered 'that the present landing ground was too small to rise from with certainty,' and that it 'proposed to run a line of aeroplanes from the south via Charleville to the north and that a safe landing site was necessary in the best interest of the town.' That 'Municipal Aerodrome' at Charleville at the time must have been small since the recommendation for the size for aerodromes at the time distributed by the Queensland and Northern Territory Aerial Service Ltd, stated that—

'The minimum area for safety is 300 feet x 300 feet, with no trees, fences, telegraph or telephone wire round the edges. If high trees or the other obstructions mentioned are round the edges, 450 feet x 450 feet is required.'

"The Mayor considered the matter important enough to call a

special meeting of the Council, but it got somewhat of a mixed reception, with some aldermen objecting to the ratepayers being saddled with costs of 'business concerns' and maintaining that Qantas could afford to pay for the aerodrome itself. But the inevitable good sense of a council such as that of Charleville in those days prevailed, and a unanimous decision was taken to enlarge the aerodrome provided that Qantas paid a fee of three guineas a week to use it.

"The Controller of Civil Aviation was a little more conservative as far as the size of airports was concerned and, in 1921, the minimum dimensions of a field 'approved for use by aircraft' was set as 350 yards. The required clearance on the approach was 1 in 10, the overall slope not more than 1 in 50, and the surface had to be smooth enough to allow a T-model Ford to be driven at 20 mph with the driver still comfortably seated. (The T-model Ford was the only vehicle owned by the Civil Aviation Branch of the Defence Department at the time). Approved air routes had to have aerodromes, or emergency landing areas not more than 20 miles apart; and this was based on the argument that if the aircraft was flying at 10,000 feet and lost its engine, it could glide to a spot 10 miles away.

Good service

"Those early makers and maintainers of airports have served us well. Certainly many of the early names of aerodrome sites are no longer on the books; as aircraft became more reliable the need to have

them not more than 20 miles apart vanished. Some sites have been changed and early fields abandoned. But in the case of major airports there has been an outstanding permanence, when you consider the way in which the aircraft, and its demands, have changed. Mascot, chosen by Nigel Love, and secured for the Commonwealth by Captain Johnston, 47 years ago, is still being used and, despite the utterances of a small but vocal section of the community who, significantly, do not come from the aviation industry, it is still a fine airport, and capable of its present development as a really front line international airport of the world. Essendon dates back to 1921 and we are also still using the original sites chosen at Brisbane, Parafield and Cambridge near Hobart. Maylands at Perth has bowed out to Guildford and to Jandakot, and Fannie Bay to RAAF Darwin; but throughout the length and breadth of the country we are still using, and using well, sites which were chosen by the Johnstons, the McCombs, the Hoddinotts, the Manns and a little later by the Royles, the O'Neales, the Augensons and the Mowbrays.

"There is another name which comes up frequently in this period — not as a person then concerned directly with civil aviation but rather from the Department of Defence itself, but who was obviously called in to give his opinion on many occasions — Wing Commander Allan Hepburn, who later was to come to Civil Aviation and take a more direct part in Australia's airport development; and it is good that this was so, with his incisive approach to problems.

"The proposal to develop Fishermen's Bend as the main airline airport for Melbourne is an illustration of this. People are still talking about the development which might have been at Fishermen's Bend as Melbourne's major airport — and I draw a distinction here between a major airline airport and a small general aviation field which would have been possible. Wing Commander Hepburn dismissed the possibility of it more than 30 years ago with the simple and unanswerable argument that you could not properly co-ordinate regular and frequent operations of large aircraft with the shipping on the Yarra, which would cause an obstruction to the northern and western approaches to the airport every time a ship moved up or down the river; both aircraft and shipping movement would have to be restricted and the air traffic controller would be faced with an impossible task since you cannot quickly and effectively, and with certainty, control a ship which is under-way. Just a simple, practical, logical argument — I have no doubt that the files in the department on the Fishermen's Bend site would be much larger if it had not been used so early.

Grass fields

"All this was in the decade of the 1920s. It started with a handful of small grassed fields in Australia — but remember that the aircraft itself as a vehicle was only 17 years old by December 17, 1920. It finished with our first major airport development project — large enough to require being placed before the Parliamentary Standing Committee on Public Works on May 2, 1929.

This consisted of drainage and improvement of the landing area at Mascot which, with roads, footpaths, sewerage, water supply and 'suitable buildings' came to an estimated £40,670; and with acquisition at £54,175 for 62 acres of land, the whole project totalled £95,845. In addition it was proposed to acquire a further 160 acres from the State 'at a nominal price.' The committee recommended that the project be put in hand and also another proposal — that a runway 1800 feet long at an estimated cost of £12,000 — be constructed as soon as possible.

"The list of witnesses who appeared before the Public Works Committee to give evidence in support of the proposal reads like a page from our early aviation history and includes Colonel Brinsmead, Norman Brearley, Charles Ulm, Hereward de Havilland, Frank Follett, Geoffrey Hughes, Edgar Johnston and Allan Hepburn. The only opposition came from a strong contingent from Bankstown, who wanted the aerodrome established there.

"The end of the 1920s marked the beginning of the end of the grassed field, and eyes were turned towards runways — simple unsealed gravel strips but still runways. But airport development was relatively slow in the early 1930s and, apart from a few runways at places such as Sydney, Cloncurry, Brunette Downs and Wyndham there were no large developments until the picture was dramatically changed by the outbreak of war in September, 1939.

"One reason was that this was the era of the flying boat, and its popularity had something of an inhibiting effect on the development of land-based aircraft and with this the land aerodromes used by them. The Qantas DH.86, operating as it did as far as Singapore on the route to the United Kingdom, could use grassed fields satisfactorily. It was to be replaced in 1938 with the flying boat service all the way, and flying boat bases were developed at Sydney, Brisbane, Townsville, Karumba, Groote Eylandt and Darwin. Domestic aviation was being flown with aircraft no more demanding than the DH.86 of Holyman Airways until the Douglas DC-2 arrived on the scene in 1936.

"September 3, 1939, changed all that, the pressure of war, coupled with an unemployment relief grant of several million pounds in the closing stages of 1939, opened the way for an all-out effort of aerodrome development throughout Australia. Advanced Operational Bases were established around the coast from Cairns to Mallacoota, to Albury and back again to Derby and beyond. Aerodromes for Elementary Flying Training Schools were set up in many country areas, and the Inland Ferry Routes later brought additional runway development. There was little potential available for civil aviation aerodrome development as such, but a great deal of the military development was subsequently to be useful for civil purposes and, by the end of the war, 135 runways had been built in places where they were of subsequent value to civil aviation.

"It was both an interesting and demanding time for everyone con-

cerned with airport development at that time. Everything was needed and had to be done in a hurry. It was a time for quick decisions in design and fast actions in construction. I well remember the directive given to a young engineer in DCA at the time when being sent up the Queensland coast concerning the development of some of the early Advanced Operational Bases. At Cairns he was to — prepare designs and specifications for establishment of a runway 3600 feet long; prepare preliminary plans for extension of the main runways to 5000 feet, and for other supporting runways; and prepare a Master Plan for the development of Cairns Airport. He put in for approval an itinerary with a stay of three days at Cairns, to be asked why he wanted to spend so much time there.

"One interesting aspect of this wartime period is that it did not result in much significant development of the capital city airports. Brisbane had its Amberley, Sydney its Richmond and Melbourne its Laverton and Point Cook, and there was no need for any very large scale development at the civil airports. There was certainly some airfield construction but the main development at these capital city airports was the erection of hangars for maintenance and overhaul of military aircraft by the larger airline companies of the day, such as Qantas, Australian National Airways and Ansett Airways Pty Ltd.

"Essendon was an exception, where the construction of the two existing runways was in progress when the war finished in 1945. The initial planning for the first major

developments at Sydney was also going on at that time, requiring diversion of Cooks River and of various major roads and sewer lines and storm water drains. Construction of the project was to start in 1947.

Ownership — and other Postwar problems

“The end of the war in 1945 brought its own problems as far as airport development was concerned. Australia had to move from a wartime to a peacetime environment and economy, and there were many demands on the sources of manpower and materials available, and particularly the demand of housing and home development. The upsurge of civil aviation activity in the years immediately following the war could not be matched by airport development. The major projects at Essendon and Sydney continued, but elsewhere there was relatively little airport activity, and only 26 runways were built in Australia between 1945 and 1957, including those at Melbourne and Sydney. One of the reasons for this was the situation which had by then arisen, regarding the ownership of airports.

“From the earliest days of aviation in Australia some aerodromes had been owned by the Commonwealth and some by the Local Authority. Aerodromes such as Mascot, Essendon and Cootamundra were Commonwealth. Others such as Hay, Mildura and Whyalla were locally owned. There was certainly a move towards ownership by local authority quite early in the piece and, when dealing with the reference to them of the first early

developments at Mascot in 1929, the Parliamentary Standing Committee on Public Works made the following remarks in its report to Parliament:—

‘During the course of its investigations it was stated in evidence that, with the establishment of a network of air routes throughout Australia, the cost of the provision of necessary aerodromes and emergency landing grounds will reach considerable proportions. It is represented that in some other parts of the world the responsibility in this direction is undertaken by the local governing bodies, thus relieving the central Government of a considerable burden. This system commends itself to the committee, and it is recommended that with the exception of terminal airports, an effort should be made at once to have landing grounds on air routes provided and maintained by the various municipalities concerned. As civil aviation develops however, the Committee is of the opinion that ultimately the whole of the landing grounds on air routes, including terminal ports, should be under the control of local authorities.’

“At the beginning of the war aerodromes such as Mackay and Rockhampton in Queensland, Parkes and Narromine in New South Wales, and Benalla and Ballarat in Victoria, were all owned and operated by the Local Councils. But when it came to develop these during the war, it was found that, in order to comply with the Commonwealth’s financial procedures, they must be acquired by the Commonwealth since the relatively large

sums of money involved could only be spent on land owned by the Commonwealth. Furthermore, the necessary land for new aerodromes developed for military purposes was also acquired by the Commonwealth and so, at the end of the war in 1945, the vast majority of aerodromes in Australia on which there had been much significant development were Commonwealth owned.

“There were many country towns in Australia which had not benefited by wartime aerodrome construction, places such as Goondiwindi in Queensland and Griffith in New South Wales, and they needed aerodromes to take advantage of the spreading civil aviation network. But not being Commonwealth owned, Commonwealth monies could not be spent thereon. A policy was devised under which the original development cost of a new aerodrome was met by the local Council on the understanding that if, thereafter, a regular scheduled airline service developed to the aerodrome, it would be acquired, with its development works, by the Commonwealth. The Local Authority had to take the risk on this, and many of them did, with the minimum development needed to attract an air service, generally flown at that time with a Douglas DC-3 or some smaller ex-wartime aircraft.

Birth of local ownership plan

“The growing enthusiasm of local councils to have their own airport, at relatively small initial cost and with the chance of it being purchased by the Commonwealth, and all future development costs to the Commonwealth, was matched by a waning enthusiasm on the part of the Commonwealth to do this, and

a rather confused situation developed. On the one hand there were the ‘haves’ — the communities whose airports were developed and maintained completely by Commonwealth monies; on the other hand there were the ‘have nots’, who had to find the cost of all this themselves, and in the middle there was a growing number of communities who had paid for their initial airport development, who had a regular scheduled air service (perhaps only one service a week but still a regular service) but whose airport had not been taken over by the Commonwealth as they had been led to expect.

“Out of all this came the introduction of the Aerodrome Local Ownership Plan in 1957 — a milestone date in Australian airport development history.

“Under this plan it became possible to spend Commonwealth monies on airports which were owned by local authorities by making a development grant, normally on a 50-50 basis with the Local Authority. The local authorities were encouraged to take over from the Commonwealth the airports which were already serving their communities; and about 60 councils who had developed airports in the expectation of later acquisition by the Commonwealth were paid in full for their development, while retaining ownership of their airports. I believe the continuation and the general acceptance of this plan to be of the utmost importance in the future development of airports in Australia.

“There are today about 160 airports being developed and maintained by Local Authorities under

this Plan, with a 50 per cent grant from the Commonwealth; and, in the past 10 years there has been a very marked increase and improvement of runways and other facilities throughout the country aerodromes in Australia and particularly in Queensland, New South Wales and Victoria.

"Following the relatively slow airport development in Australia in the 1950s, another surge forward came about 1962. Prior to 1962, airport development in Australia and its Territories was running at the rate of about \$4,000,000 a year, and the total amount spent on all civil airport developments, since the early days of 1920 and 1921, was not much above \$100,000,000. Today, expenditure on airport development is running at more than \$20 million a year, and a large development programme lies ahead.

"This has been brought about by airport developments required to meet the Boeing 707, the Douglas DC-8 and now the Boeing 747 at our international airports such as Sydney, Melbourne, Brisbane and Perth; and to meet the introduction of jets — the Boeing 727 and the Douglas DC-9 — on our domestic trunk routes. At this present time, the immediate picture ahead includes the completion of the new international terminal area complex in Sydney — a \$30,000,000 project, with some further facilities required for the Boeing 747 such as an additional holding room at gate positions to allow loading and unloading from the starboard as well as the port side of the aircraft, and the use of three instead of one aerobridge at each gate position. There is also the extension of the main

runway to 13,000 ft. — a project of \$23,000,000 with the necessary reclamation into Botany Bay. The new terminal building is scheduled to come into operation in 1970, and the runway extension fully completed early in 1972.

"At Tullamarine, the new airport, at a cost of approximately \$50,000,000 is scheduled to come into operation for international operations late in 1969. Here, too, our planning is to have its runways extended, and the necessary additional terminal facilities ready by the time they are needed for the Boeing 747. At Perth the 10,500 feet of runway already available should be sufficient for the Boeing 747 on the relatively short stage lengths to be flown by it from that airport — for quite a number of years at least. But additional taxiways and apron will be needed, and some expansion of terminal facilities. Brisbane requires more runway and other airfield facilities, and planning is in hand on the new terminal facilities needed, not only for the Boeing 747, but for civil aviation traffic generally.

"On the domestic scene, runways recently improved at Launceston, Cairns and Mt. Isa are well in operation, and other projects are in hand — runways 6500 feet long, and strong enough for the DC-9 and Boeing 727, at Coolangatta, Cairns, Mackay and Rockhampton. There is still some further work to be done for these aircraft on the trunk routes. We need, for example, a flight planning alternate for the DC-9 in western Queensland to cover the Brisbane-Mt. Isa route and some improvements on the Adelaide-Darwin route and possibly

some in north-western Tasmania, but the bulk of the necessary work for these aircraft in Australia is already in hand.

Mt. Isa's terminal

"Quite a large new terminal was brought into operation at Mt Isa several months ago, and extensions are in hand to the terminals at Canberra and Adelaide. But there is still work to be done in improving the domestic terminal facilities at Sydney, and at a number of other airports such as Mackay, Townsville and Port Hedland, and increasing traffic can only bring the need for expansion of some existing terminals such as Hobart. Past the immediate future we can see the need for parallel runways, as traffic increases, at Sydney and Melbourne, and we have planned for their future need elsewhere in places such as Brisbane, Adelaide and Perth.

"The course for the next few years is fairly set. It is the development beyond which is, perhaps, more interesting. The first thing to think about when considering this long-term future airport development is the future of the aircraft itself. Airports are not built for themselves but for aircraft; and the airport planners and the designers must, in their forward planning, try to anticipate what the aircraft designers and the aircraft manufacturers will do.

"In the last 30 years in Australia we have moved from the Douglas DC-2 to the Boeing 707, with the Boeing 747 and the Concorde only a few years away. What can we expect in the next 30 years, to bring us to about the turn of the century? On international services we must

make provision for large supersonic aircraft, and even larger, very long range subsonics, and aircraft weights of the order of 1,500,000 lb. are not out of order. On the domestic services the 'airbus' is only a few years ahead for the high density routes such as those between capital cities, with the existing types such as the Douglas DC-9 and the Boeing 727 pushing further and further into the domestic network as traffic to the major provincial cities increases. We can expect the turboprops to give way to the pure jets on the smaller country services.

"Overseas interest in VTOL and STOL aircraft would indicate that we will see these types on short-haul routes. Their usefulness, however, could be challenged by developments in high speed surface transport. As far as the airport designer is concerned, I believe he must 'keep his options open'; he must make provision for the possibility of STOL and VTOL on inter-city routes such as between Sydney and Melbourne but make provision also for the more conventional type of aircraft in the event that the others do not, and certainly until they become an economic and community-acceptable vehicle with significant advantages over the conventional types.

"Considering some of the airport requirements for these aircraft of the future, the first thing which comes to mind is the length of runways required at our major airports. I am hopeful that we have reached the ultimate, as far as we in Australia are concerned, with runways of a length of 13,000 feet. Longer runways could be needed at high

altitude airports such as Johannesburg and Mexico City, in very hot areas such as Bahrain or in places where it is necessary to cater for down-wind takeoffs, such as Nadi in Fiji; but for conditions at or near sea level, and with the summer temperatures we get in Australia, I would hope and expect that 13,000 feet will be sufficient, provided, of course, that the approaches are good and clear.

"As far as runway strength is concerned, we in Australia are in a good position. Runways such as those at Sydney and Tullamarine can take, quite satisfactorily, the loadings of aircraft such as the Boeing 747, even at its new weight of 775,000 lb., and the Concorde and the United States supersonic as now planned. We must look to larger aircraft in the future, maybe to double the size of the Boeing 747. But as aircraft size increases we can expect that their undercarriages will expand and the number of wheels increase in general proportion, with a greater spreading of the load on the pavement.

Difficulty foreseen

"The only real point of difficulty I foresee here is where airports have structures incorporated in their runway and airfield pavements, such as the tunnel for General Holmes Drive at Sydney. There are a number of such structures at large airports throughout the world and the aircraft manufacturer must take account of these, since their strengthening would inevitably be a very major, and in some cases, an impossible, task. This will require not only a multiplicity of individual aircraft wheels for the very

large aircraft, but wide spreading of those wheels to keep the aircraft loadings on such structures to reasonable limits. There is an opportunity and in fact a necessity, for the aircraft manufacturer and the airport provider to get together in this regard and in the early stages in the design of the aircraft.

"This brings forward a possible problem of the future in the width of runway pavements. The present international recommended practice is for runways at major airports to be constructed with a width of 150 feet and with 25 feet shoulders of lesser strength on each side. If the wheels of the extremely large aircraft of the future are spread too far laterally, an increase in the width of the high-strength runway pavement may become necessary, and this would certainly pose very considerable problems and expense for the airport provider. It is not simply a matter of strengthening the shoulders. If a pavement overlay is placed on the shoulders to do this, it must be placed also on the whole of the runway itself, and, in some cases, the overlay alone would not be sufficient and some form of sub-grade treatment necessary, with complete reconstruction of the pavement.

"Taxiway widths and fillets at intersections between taxiways and runways could also be affected. There will need to be some very careful design in the undercarriages of these very large aircraft of the future if we are not to be faced with a situation where they will have difficulty in being accommodated at the world's leading airports."

— *From "Aircraft" Magazine*