METHODOLOGY IN AIRPORT STUDIES AND THE GUIDANCE TO DECISION MAKERS

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ABSTRACT:

This paper reviews the decision process for airport investment over the past twenty years. It outlines the present state of the art of planning for a major airport project, showing the interaction between economics, social, environmental, financial and political considerations. It concludes with suggestions where the planning process could be improved in the future.

AIRPORT STUDIES AND DECISION PROCESS

INTRODUCTION

Aim of Paper

This paper has been written to outline for others in the transport planning field the process by which decisions on major airport investment are taken in Australia. The evaluation of the planning process since the second world war is briefly reviewed, followed by details of the current practice. In the present planning arena a number of areas are identified where the process tends to fail. It is only due to the effort of a large number of people that these stumbling blocks are overcome. Indeed, past history has shown that success has not always resulted. The paper concludes by considering a number of ways in which the planning process can be improved to overcome these difficult areas and thus hopefully reduce wasting the limited planning manpower resources available to do this task.

History

At the conclusion of the second world war, Australia like many other countries, found herself blessed with hundreds of military airfields and a great need for regular public transport by air. Because of the many other demands on limited national resources it was decided to utilise as many of the old civil and newer military aerodromes as could practically be developed. These were the days of the DC4/DC3 aircraft fleets.

At that time it was apparent to aviation bodies throughout the world that aviation would expand to a major transport industry and that steps should be taken to standardise all facets of aviation. This would then negate the costly errors that had been apparent with other transport modes developing without compatible standards. Hence the International Civil Aviation Organisation (ICAO) was born. Australia has always been a solid supporter of and leader with ICAO's development. ICAO's recommendations are the standard by which Australian airports are planned. Annex 14 to the ICAO Convention thus forms the major planning criteria for airport planning.

With the growth of air services, the airlines decided to improve their fleets by larger aircraft which could fly faster and higher thereby providing a safer service. These aircraft consisted mainly of DC6, Convair 240 and Viscount types which required longer runways, capable of withstanding higher tyre pressures and with smooth gravel-free surfaces. Many of the existing aerodromes such as Sydney(Kingsford-Smith) Airport needed major changes whilst others such as Adelaide and Brisbane required a change of location because they could not be expanded except at a great cost to the surrounding community.

Most of these changes were made at a relatively small investment to the Government as the sites for the airport

were located where residential expansion had not taken place. Further the provision of runways represented the major expenditure because terminal buildings were still small and unsophisticated - aircraft were still relatively small and passenger demand well below present levels.

The next major step forward took place in the late 1950s when it became evident that pure jet aircraft were to become the efficient means of air transport which now exists. These aircraft not only were bigger but flew at twice the speed of the aircraft that they replaced. Their demand on airports were to require runways twice as long, wider, greater bearing capacity and with much more stringent longitudinal gradings. The approaches to runways, together with other manoeuvring requirements demanded much larger volumes of airspace. Because aviation was expected by the travelling public to perform with greater regularity, additional land area on the ends of runways was required for navigational instruments to enable operations to take place under reduced visibility.

With this greater regularity (and safety) a further increase took place in the demand for air travel. This was especially so in the case of international travel where the real price of the ticket has been constantly falling. Hence we see the Qantas fleet growing from about seven B707 aircraft in 1960 to some fifteen B747 aircraft in 1978. It was during this early 1960 period that a new airport had to be provided for Melbourne and major runway extensions and new, much enlarged terminal facilities had to be provided at all other major airports.

It also became apparent during that period that aviation was becoming of age and no longer could expect the special treatment that it had been used to during its adolescent stage of growth. The community no longer accepted the disbenefits of aviation for the great benefits that it bestowed. The community which had expanded its residential areas to the boundary of the airports to take benefit of the better employment chances, access and services, began to object to the intrusion of the airports' physical expansion into their development. The greatest intrusion was seen to be the noise of the new jet engined aircraft. To a lesser extent was its effect on television and radio, and fear of accidents activated by the news media's penchant for reporting most major aircraft accidents. Throughout the world all this has lead the aviation industry to take immensely costly self-regulating action to reduce noise levels, reduce TV and radio interference and improve yet further the safety of aircraft operations. The Government has assisted by providing safer air traffic control and other regulations to ensure that aircraft maintenance and crew performance are kept to the highest practical standard.

PRESENT SITUATION

The airport facilities necessary to meet the changes in the demand for aviation, need to be constantly upgraded

or the standard of service to the travelling public (and movement of air freight) will deteriorate. Any improvement is usually expensive and needs detailed justification before any public or private expenditure takes place. In many cases a stage is reached where it no longer remains economic to continue expansion or improvement to the present facility but that a new facility should be provided.

In many parts of the world airport planners have been faced with forecasts of demand for air travel which has shown that the existing airports will no longer serve the existing city (or country) with the level of service that it desires. In some cases, such as Paris (Charles de Gaulle), Washington (Dulles) and Fort Worth/Dallas it has been possible to provide an additional airport. Usually this has been accomplished at an enormous cost which has been put down to national pride. There are many other cases where very large studies have been undertaken, but to date no new airport has eventuated. In these cases the existing airports have had to cope with the increased demand by traffic management techniques, enlargement of certain parts of the existing airport or part of the demand suppressed - London, New York, Chicago and Sydney airports are but a few cases.

What are the problems that could not be resolved with these later studies? Obviously, they differ for each case and are complex in origin. However in the main they all have as a common base, the fact that at least one section of the public sees that the project will produce to them greater disbenefits than benefits. In many cases the disbenefit is quickly identified and magnified by those who see some political or financial gain. This produces two areas where the present process can be improved. The Pareto justification should be fully carried out and all persons should be compensated to the extent where nobody has an overall disbenefit. This is not practicable at this time but could be further pursued than at present. The other and connected area is that all beneficiaries and disbeneficiaries should be identified at an early stage of planning. Means to offset the loss to disbeneficiaries should then be devised and entered into the investigation. It seems to the authors that this necessary step is missing from most large transport investment studies such as airports and freeways. As the benefits are spread over the general population most of the community accepts its need, while the disbenefits accrue to an easily identifiable local group which appears to receive little recompense from the development.

It is of interest to note that in airport planning, compensation of the disbeneficiaries is not new. In the USA, the Doolittle Report of 1952 recommended this approach. However that report was quick to recommend an old land purchase idiom that "the purchaser should fully inform himself before purchase". That is, those who purchase knowing that they will be subject to a nuisance are not to be compensated. Similar remarks are contained in the 1977 US Airport and Aircraft Noise Reduction Act which, among other things, provides airport operators with funds to protect the future of their

airports. The UK has similar legislation with regard to London (Heathrow) Airport while to a lesser degree actions in Australia to preserve extensions to certain runways could be construed as setting a precedent for future action. It appears that in many countries the compensation of those disadvantaged by public works is currently being reviewed.

PLANNING

Formal Planning Requirements

Before proceeding with details of the present planning methodology the reader should be aware that in the existing Commonwealth Government system the following are necessary pre-requirements that must be met before any major project can be undertaken:

- although the planner may identify issues, develop solutions and carry out their evaluations, it is the Government through its Minister which makes the final decision
- before expenditure of large amounts can be made on a major project a public hearing before a Parliamentary Committee on Public Works must be held and an appropriate acceptance gained
- an Environment Impact Statement must be prepared. This may require a public hearing if deemed necessary by the Minister for Environment, Housing and Community Development
- that the project has proceeded through a financial programming process that ends with funds being provided through the budget.

Present Airport Planning Methodology

It is firstly necessary to clearly define issues which will affect the future of an airport. Further, it is necessary to identify this change in effect over time. For without such knowledge it is impossible to determine the optimum time to provide a change to the facility.

Examples of issues are:

- changes in demand or capacity. These may be caused by changes in demand over a period of time or changes in capacity due to new standards of operation e.g. wake turbulence.

  It is often found that the various sections of an airport have different levels of capacity and that one section of the system becomes saturated before the others. The planners must try to balance the system to ensure that no section is oversupplied with capacity at the expense of the whole airport.

Solutions to the congestion issue need not be by the provision of additional capacity. Reduction in the level of service, relocation of certain services to another airport or suppression of demand during certain periods are alternative actions that should be investigated.

- change in community acceptance. As previously stated this may be noise nuisance or TV interference. However, it could also conflict with other community desires such as provision of alternative public usage for the airport property such as port or freeway development. It may also affect the private individual who sees a better use for the land as a residential or recreational area.

- change in aircraft type service. Here is the case where the need for longer runways, additional runways or increased operations may not be acceptable to the community.

- changes in ease of access to the city. The growth of urban development may increase the time for a large portion of the community to obtain air service. In this case either improved access or satellite airport development may be warranted.

Secondly, having identified the issues it is necessary that all alternatives be identified. As base case the effect of the "null" case of doing nothing should be clearly stated.

It is also important to introduce a varying scale of solutions. It is a planner's folly to compare only massive solutions.

The third part of the process is to evaluate the alternative solutions that have been identified.

A process of reducing the often "almost infinite" number of alternative solutions must be devised. The usual solution is to eliminate inferior "like" solutions until a short list of options remain. A check should then be made that the remaining solutions do not contain options which are impractical e.g. require a time for construction which cannot be met. It is also necessary that the short list of alternatives have distinct differences.

This reduction of alternatives should be done with broad values and not by wasting resources which could more profitably be spent on detailed evaluation of the short listed alternatives.

At the present time most of the planning effort is spent on the comparison of the short listed alternatives by a cost/benefit technique. This is undertaken for both quantifiable and unquantifiable effects. The main areas of investigation are -

Airspace Congestion. The runway and its approach and departure tracks have only a limited ultimate capacity for a specified mix of aircraft types. As this limit is approached delays to all operations increase at an exponential rate until infinite delay is reached at the ultimate capacity. The planner is faced with either accepting this escalating cost of delay, changing the aircraft mix by suppressing certain operations or suppressing demand.

Land Use Effects. Airport development usually requires additional land which has an opportunity cost for other purposes. In a highly developed area such as Sydney this cost is high. The development of a new airport also has a large effect as a land use planning tool for town planners. The new airport will act as an attractor for better services and will be a source of income for many. This effect will either improve or blight an area and can have a severe effect on town planning.

Airport Staff Source. In conjunction with the above it is very important to know that the location of the airport will enable airport and airline operators to achieve staff without high cost. The airport employs large numbers of people and should not be located where it provides high competition with other industries, places a high cost of housing or travel on its employees, or creates a single industry town.

Access. Air travel exists by selling a minimum time for a total trip be it for business, leisure or education purposes. Where the access time becomes too great alternative transport for the trip or suppression of demand takes place. In valuing alternatives, the various components of the likely demand should be considered. The location of an airport has a different effect on the commuter, intrastate, interstate and international traveller components of demand.

Present and Future Investment. The cost and values to the Governments, airlines and others both immediately and in the future must be clearly identified.

Noise. Although attempts have been made to place a monetary value on noise it now appears more meaningful to quote the number of persons and institutions that will be affected and the degree that they can expect to be affected. Most of the present studies tend to show that the noise level will reach a maximum at 1985 traffic levels and thereafter increasing numbers are balanced by elimination of the noisier aircraft types and improved technology.

Environmental Impact. Considerable experience has now been gained with the environmental areas which need to be reviewed. The problem is to identify the real environmental issues which will have a bearing on the decision to be taken. When identified a comparison should be made between the airport and the possible non-airport alternative use of the issues of the area. In many cases an airport can preserve a delicate environment whereas other developments will have it

destroyed. Whatever environmental issues are identified, proper weighting must be given to them when evaluating the alternatives.

Level of Service. An airport provides a service to the public and a poor service will provide a poor public response. After consideration of the above factors, the resulting level of service must be judged. If the level of service is very poor then its reflection on the city it serves and whether the community will accept such a low level must be appraised. It must be remembered that an airport is not an isolated facility but part of a total air service network. The axiom of one rotten apple in a barrel can be applied to this situation.

Availability of Finance. No matter how desirable a project may appear, an airport is in competition with other projects for a slice of the total national budget. If the planner cannot produce an argument to show that the airport project has priority over other public demands for funds then his work is lost.

This then brings us to the fifth and most important part of the planning process - the political consideration of the project. Although the Commonwealth Government supplies the funds for the construction and operation of the airport, the other two levels of Government have a great interest in its development. The State Government is responsible for land use planning, the provision of access and services such as electricity, water, sewerage. The adjacent local government usually provides health and other minor services. The capital city is seen to be the greatest beneficiary of a good major airport service.

To ensure that each level of Government is fully involved in the airport development process it has been the custom to establish Commonwealth/State/City Committees to plan the airport needs for capital cities. Examples of the current committees are the Major Airport Needs for Sydney (MANS), Port Phillip Airport Needs Study (PPANS), Perth and Adelaide Airport studies. Brisbane and Canberra studies have previously been completed.

These committees report to their elected representatives who if they agree with the recommendations take the necessary action to ratify the decision. If it is a simple and obvious solution then the Governments are likely to accept the recommendations. This occurs in cases where no change or a slow evolution is recommended to the present airport plans. Where a new airport or a revolutionary solution is recommended a positive result from all Governments is difficult to obtain. The reason is mainly because battlelines are quickly drawn between those who appear to have most to lose and the proposer of the project. It is difficult for Governments to be seen to go against minority groups especially when such items become newsworthy and any action is seen as high handedness.

Such difficulties have lead to the introduction of public participation techniques. Unfortunately, as was seen at the Third London Airport Inquiry this quickly focusses interested parties into extreme positions. Where public participation has been kept to a small representative group with a genuine desire to select the "best" solution (as in some road studies) a very good outcome has resulted. This does not seem to be possible with a major airport site selection project.

Because the public also demands that their city shall not be disadvantaged through the lack of airport facilities it has meant that existing facilities have had to be expanded beyond their economic size. It also means that many smaller airports have had to be enlarged and operated with severe constraints to meet the demands of the adjoining community. London, New York and Chicago are good examples of this trend.

In summary, planning must consider the economic, environmental, social, financial and political aspects of airport development. The question is do we have the right proportions of each aspect?

In the final analysis a decision is made by Governments and not the experts. However the expert must present results in a way that permits proper consideration of the important issues. In studies of this nature a large number of factors emerge along each study path and can lead to a matrix of incomprehensible proportions. There are a number of methods that can be used but it is the view of the authors that simplified listings of the more important issues are necessary for decisions to be reached.

Possible Changes to the Planning Process

It appears to the authors after reviewing previous overseas and local airport studies, that a large portion of the task could have been eliminated if Governments could have been more greatly involved in the planning process as it proceeded. Not only should Governments draw up or approve the terms of reference but they should also agree to a broad activity diagram which shows the critical events at which interim decisions must be made, and they should be satisfied that the study has successfully completed the broad activities leading to a critical event before the study can proceed to the next activity. It is seen that the decision makers (the Governments) would be involved in making decisions say three or four times during the study instead of being involved in the final decision only after the study has been concluded. By this means the planner can be kept more aware of the Governments' desires. Indeed, it could save much unnecessary work on alternatives which are considered politically unacceptable. To ensure that a robust study is carried out it would be necessary for the reasons for political rejection to be stated.

With the experience gained from a number of overseas and local major airport studies it is now possible to isolate

the major factors to be considered. Perhaps a bold statement of these factors together with broad quantitative and qualitative values of alternatives is all that is required for the decision makers. It is considered an imbalance for a heavy economical study to be mounted when social, environmental and political considerations to a different evaluation standard often have a more powerful influence on the decision. Here multi-disciplinary teams to provide reports on each of the above considerations may be more effective.

CONCLUSION

The airport planning process has evolved significantly over the past thirty years. By constant monitoring of the various studies being made throughout the world it is possible to improve the present technique. Unless it is possible to continue to provide improved ground facilities, then a severe restriction will be placed on the aviation industry.

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