PROVIDING AIRPORT LANDSIDE CAPACITY

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The capacity of the airport landside (which is the entire airport except runways, taxiways, and parking aprons) generally has not been determined by any set of criteria. Acceptable criteria have had reasonable use in determining capacity requirements for that portion of landside that comprises passenger terminal, cargo terminal, on-airport roadway systems, and automobile parking. Among factors that have contributed to unsatisfactory landside capacity conditions are (a) lack of appropriate business and economic factors; (b) failure to consider landside as a whole and to establish priority of use for available land; (c) unreliability of forecasting; (d) absence of economic justification and cost parameters that result in burdensome costs and do not correlate useful life and investment amortization; (e) escalation of "gamesmanship" and acrimony between airport managements and airline representatives; and (f) lack of nontechnical criteria sufficiently comprehensive to provide coverage of pertinent areas of consideration, including geographical location priorities, economic justifications, effective costing, reasonable forecasting, fixing of responsibilities, and management objectives.

The airside must be separated from the landside and then divided into numerous components for study and analyses. However, basic to an acceptable airport operation is competent management in the planning, implementation, and operating stages. This business management must ensure that total airport development and operation are economically, operationally, technically, and financially feasible.

A single project, irrespective of the quality of its product, will not, by itself, be a solution to the problem. It must become an integral part of a much larger and more comprehensive project. In addition, certain factors should be considered.

1. Effect of varying airport sizes on criteria (for example,

criteria for Chicago probably would be of little value for Waycross, Georgia);

2. Lack of uniformity in acceptance of criteria for forecasting, determination of facility requirements, and determination of needed capacity among airport managements, among airline managements, between airline managements and airport managements, and between industry units and governmental agencies (how can the decision-making process move from the forecast shown in Figure 1 to a statement of required landside capacity that will have a 5- to 8-year lead time?);

3. Uncontrolled and massive variations of unit costs (one terminal may cost $250,000 per gate position while another will cost $2,500,000);

4. Lack of economic parameters in the development of facilities, the cost of which becomes unreasonably burdensome;

5. Increasing acrimony between airport managements and airline representatives;

6. Unreliability of airline industry forecasting due to the fact that airports require a lead time of 3 to 8 years for major development and the perspective of the airlines is normally short range and highly volatile (airline forecasts have been overly optimistic during periods of booming economy and unreliably pessimistic during periods of downturn);

7. Deficiencies of planning process related to properties and facilities in terms of planning input, particularly economic and financial management planning; and

8. Competition for land by the numerous airport landside elements and an effective priority of use between the airport and the surrounding communities, between on-airport and off-airport elements, between airside and landside, and among various landside elements, which include land, access, passenger terminal, cargo terminal, airline support facilities, airport support facilities, and automobile parking system.

OBJECTIVES

This section discusses the following 3 objectives:

1. Existing criteria for decisions relating to terminals and on-airport roadways,
2. Different criteria and recommendations for their research and development, and
3. Method for providing new capacity when improvements to existing facilities are insufficient.

Existing Criteria

No situation comes to mind where criteria have been used for determining requirements for total airport landside capacity. Criteria have been used for determining requirements for that portion of the landside that comprises passenger terminal, cargo terminal, and on-airport roadway systems (including automobile parking). The criteria discussed below are neither standard nor widely used throughout the air commerce world, but they are the best that have been observed during a quarter of a century of airport work.

Air Traffic Forecasts

Basic to a determination of required capacity is an assessment of probable demand. Such demand is based on forecasts of passenger, cargo, and aircraft operations. Passenger (also cargo) forecasts are largely influenced by the socioeconomic environment for air travel and by the type, quality, and cost of available transportation service.

The air trade area of an airport is studied to determine its air commerce need (i.e., industrial, commercial, and recreation) or diversity. The population growth rate and household income in the air trade area are analyzed. Employment and industrial, commercial, and recreational growth coupled with gains in household income are used to

project trends from which demands for air transportation facilities and services can be forecast. The following approach is used in developing the forecasts:

1. Collect, tabulate, and analyze data on historical aviation activity, characteristics, and trends in the air trade area;
2. Determine quantitative and qualitative relation between the historical aviation activity, characteristics, and trends and the socioeconomic and technological environment; and
3. Refine forecasts by reference to national data and forecasts and by judgmental decisions based on no definable methodology (such latter forecasts may be tailored to meet an immediate cash flow situation of the airport or of one or more airlines serving the airport or may be influenced by marketing considerations among airlines, by political considerations in the community, by capability of the project to be financed, by dominance of a technical organization or group that proceeds without appropriate constraints or direction, or by airport and airline guidance that is lacking in knowledge of the nature of or experience in air commerce affairs to make judgmental decisions that are or will be beneficial to the desired objectives).

The foregoing discussion of forecasting briefly touches on a major cause of the staggering inadequacy of airport facilities. Figure 1 shows 10 forecasts of annual enplaned passengers for the same airport. Even a hasty glance reveals how step 1 above creates far more questions than it answers. An elementary consideration surfaces at once: Which forecast is to be used as a parameter for the program? Also, how will unanimous or even substantial support for any one forecast ever be obtained?

Aircraft Operations Forecast

Forecast of annual air carrier operations is based on enplaned passenger forecasts and estimates of average number of passengers enplaned and deplaned per aircraft operation. This estimate may be obtained from historical data and projections of average aircraft seating capacity through the forecast period. This element contains a number of steps involving judgmental factors. To this forecast it may be necessary to add factors for general aviation activity and military operations, each of which will be based largely on judgmental factors applied to historical data.

Busy-Hour Aircraft Operations

Forecast of busy-hour aircraft operations is the keystone to most of the determinations of size of landside elements. These forecasts are based on historical data and trends. Normally it is assumed that the percentage of operations occurring in the busy hours will decrease as annual traffic increases and peak periods of activity are spread over longer portions of the day. Again, judgmental factors have a substantial influence on the end product.

Passenger and Vehicular Activities and Forecasts

Conversion of passenger traffic forecasts to passenger terminal unit and area requirements may be accomplished by an analysis of existing activities as they relate to existing traffic volumes and by the use of an extrapolation applied to the forecasts. One step in this process is to obtain a detailed count of the terminal area activities and a detailed count of vehicular traffic.

A basic purpose of a terminal activity survey is to obtain hourly data on passenger, vehicular, and associated airline activities from which typical peak-hour demands, volumes, and activities can be established. These data may then be related to the annual traffic of record and subsequently used in establishing future facility demand

forecasts. A 7-day survey during a peak month produces data relating to

1. Vehicular traffic at the main entrance;
2. Terminal curbside use by vehicle type and occupancy time for enplaning and deplaning activities;
3. Number of persons entering or leaving the terminal by mode, i.e., automobiles in the parking lots or vehicles (by type) at the curb;
4. Employee parking lot use and periodic parking lot inventory;
5. Hourly passenger enplanements and deplanements and information on passenger enplanements and deplanements such as baggage on and off and aircraft parking use for the survey period;
6. Use of public automobile parking lots and analysis of parking duration; and
7. Detailed information on hourly rentals and returns and daily inventories of parking lot automobile rentals.

Peak-Hour Passenger Activity

Data obtained on passenger enplanements and deplanements for at least 2 peak periods of activity of 3 or more days of the survey period should be tabulated and processed through a computer. The computer run of data on enplanements and deplanements should be analyzed for the 60-minute period (not necessarily a clock hour) of the greatest volume of activity for both total enplaned and total deplaned passengers. A program should be developed to display data on the 100 highest peaks of activity during 60-minute periods for the survey days for which detailed counts of passenger activity were recorded.

By definition, typical peak-hour passengers constitute the number of passengers, enplaning or deplaning, during a typically busy 60-minute period. This is a level of passenger activity that is expected to occur or be exceeded 100 to 150 times per year. It is a level below the observed absolute peak 60 minutes of activity. This typical peak-hour passenger figure represents a percentage of the total annual passenger traffic. By checking this percentage against percentages for other airports with similar passenger volumes, one can to some degree validate the survey work. This typical peak hour of passengers may be used as the design level of activity for 12 months of traffic. It may be related to forecast passenger traffic for facilities planning.

Many required quantitative aspects of terminal facilities are dependent on the total passenger activity. Others, such as airline check-in facilities or baggage claim facilities, are related to either enplaning or deplaning peak-hour passenger volumes. Separate analyses should be made for enplaning and deplaning passenger activity to determine typical peak-hour enplaning and deplaning volumes by methodology similar to that used for determining total typical peak-hour passenger activity.

Vehicular Activity

Hourly vehicular traffic data should be obtained for the survey period. These data should be obtained at several locations on the airport roadway system such as the entrance road, terminal entrance or exit road, terminal and parking lot road, terminal and parking lot recirculation road, terminal enplaning road, terminal deplaning road, and roads serving the post office, the cargo complex, and the catering facilities. When related to recorded airline passenger traffic, these data will develop average annual daily traffic and design-hour volumes for current vehicular traffic. When adjusted to reflect increases in traffic, the developed data and factors may be used to forecast future vehicular roadway capacity requirements.

Summary

Application of the foregoing criteria and numerous judgmental decisions results in unit and area capacity requirements for several elements, including aircraft parking positions, public automobile parking areas, employee parking spaces, rental car storage, terminal curb lengths, passenger processing facilities, and airline facilities. Errors in the passenger forecasts and errors in the judgmental decisions can and do produce weird capacity requirement figures.

Different Criteria and Recommendations

The criteria outlined in the preceding objective are considered adequate and sufficient for the elements to which they are applied. They represent work of an outstanding airport terminal planner and early author (3) and should be applied many more times to airport and facility developments than they have been. The basic problems are not related to these criteria as such but are of an entirely different nature and involve much broader vulnerable areas.

1. Needed are criteria that are applicable to the airport as a unit and complementary criteria that can be used for airside as well as landside;
2. The landside criteria should have application to total landside and be supplemented by consistent criteria for the various elements of landside;
3. Needed are better methodologies for forecasting and better guidelines for applying criteria to forecasts;
4. Economic parameters must be effective to ensure that cost effectiveness will not be overridden by application of technical criteria or other similar considerations;
5. A set of priorities, particularly a priority of location and of sizing, must be included in the landside criteria as well as in the total airport criteria;
6. Satisfactory lead time for providing funding of capital costs of facility development must be determined and enforced; and
7. Essential to the foregoing and basic to determining and providing landside capacity requirements is sound business and financial management.

It is recommended that

1. The problem be clearly defined;
2. Landside be clearly defined;
3. If the problem remains fragmented into parts for study, the other parts and interface considerations be clarified for orientation;
4. The solution, when determined, be a practical action program as distinguished from a theoretical answer to a purely technical question;
5. The solution be accompanied by an action plan that can be implemented; and
6. The implementation plan include organization chart, staff by personnel qualifications, schedule of events, budget, and source of budget support.

New Capacity When Improvement Is Insufficient

Too frequently the Band-Aid method has been employed. This method is characterized by creating new capacity whenever land areas will permit, without regard to functional layout and access and to what effect it will have on the use of other facilities. A basic cause is that the situation is governed by the law of inertia until it becomes an emergency. At that point it is governed by expediency to meet the emergency and not by either long- or short-term planning. This emergency method normally is not in accordance with any land use plan, is inconsistent with good functional planning, is expensive, and paves the way for further unbalancing of facility usage. Occasionally, an appropriate methodology will be employed in 2 parts:

1. Long-term planning will outline a reasonable program for the period beginning approximately 10 years in the future and extending well beyond; and
2. Consistent with the long-term plan, a short-term, low-cost treatment of existing facilities will produce a temporary fix for the period while the long-term plan is being developed and implemented.

A basic key to comparative ease in use of this method is sufficient land at a reasonable cost either as a part of the existing airport or adjacent to it. If sufficient land is not available, the method is still recommended but will take longer for it will require location of a new airport site and all the complications of the development of a completely new airport and disposing of the old one when the new airport is ready for occupancy. The latter method should always be used when improving the use of existing facilities will not suffice.

DIFFERENT CONCEPT OF THE PROBLEM

What is the problem? Is it a question of whether criteria are used? whether criteria are adequate or sufficient? whether research should develop a new set of criteria? whether research should develop a new methodology for using an acceptable set of criteria? In short, will the problem be solved if the criteria situation (whatever it may be) is changed, altered, or corrected? Does the problem relate to criteria, or have we failed to recognize and identify the basic problem? In my opinion, the problem has not been accurately identified or appropriately related.

A practical situation exists and has existed for many years: At numerous airports, air commerce has been constrained by lack of landside capacity. This situation is not new. It has been discussed for nearly a quarter century. In 1949, the author wrote the following in a letter to the Airlines National Terminal Service Company:

> Air transportation is headed for two severe bottlenecks (inadequate airport ground support facilities and a lack of access roadways) which could lead to strangulation, due to inadequate senior officer attention to development of airport and ground transportation facilities.

In a letter in 1955 to the then Senator Lyndon B. Johnson, the author stated:

> This design criterion does not receive the weight it should, for a natural reason. It is immaterial to the airlines; the taxpayers (who put up the money) have no voice in the matter; and the politically minded operator has neither business experience nor an incentive to conduct the project on a sound financial basis.
>
> The foregoing is... suggesting that the problem in its uncontrolled, unguided development is destined to become much worse. It will become so serious that it will impair air transportation, it will impede industrial development where air commerce could be a contributing factor, and it will be a weak spot in our overall national defense.
>
> The appropriate solution would be to put airports on a business basis to be designed, constructed and operated by businessmen. It can be done.

The problem is far more basic than merely establishing and applying criteria. It is a lack of mature business and financial management (i.e., control and direction) of airport planning and implementation. This definition of the problem is not new. In the author's 1955 letter to Senator Johnson, he stated:

> For technical assistance and advice on design, size, operation and management of airport facilities the cities looked to the airline operators. But for paying the construction and operation costs, the cities looked to the taxpayers. [It is fundamental that when construction and operational authority is divorced from financial responsibility on any subject, the project is doomed as a financial undertaking.] The inherent weakness of the overall program was further accelerated by failure of the airlines to supply technical assistance of appropriate caliber. Neither the airline industry (as it developed from miscellaneous operators) nor the individual operators supplied top managerial

or administrative talent to work on the problem. Instead, they developed a method of appointing local airport committees. The committees consisted of lower echelon employees, who had no grasp of the overall existing problem, no understanding of the inherent financial requirements and no concept of how to cope with the rapidly changing airport requirements as the industry developed and became of age.

This uncontrolled and nonguided effort has developed certain gargantuan monsters that have torn the financial fabric of airport systems into shreds. Certain recent airport developments have been characterized as "engineering triumphs over economy and good sense." Airports in this category have created unit use costs that are prohibitive. They unbalanced the entire airport picture by concentrating intolerable costs in a few facilities. These data were openly discussed at the airline industry management level as early as 1968 (1).

> Each of you knows that airport and facilities development are now governed by technical aspects—NOT financial. You know that normal procedure is for airlines to "state their technical requirements" via a technical committee to an Airport Management. Then the Airport Management treats the matter as one involving engineering, design and construction, totally uncontrolled and unguided by economic guidelines. Each project "goes all out"—new engineering firms spend millions "learning the problem" and guessing solutions, so do the architects, so do the contractors and so the bill comes in for $200 million to $500 million for each Redevelopment or $½ billion to $1 billion for a new airport.
>
> Conversion of these cost elements to unit costs--per enplaning passenger or something—makes it startlingly eloquent that "the dog won't hurt"—the industry can't affort this uncontrolled, nonguided parade of dollar investments which will balloon costs of doing business up so that "the most successful in getting volume goes busted first." This has historically been the result when any activity gets in the position that unit costs increase as unit volume increases. The real "shocker" today is that unit costs appear to be increasing at a much higher percentage than the exploding increases in unit volume.
>
> To illustrate the basic narrow point of this discussion, we suggest a brief comparison of costs (landing fees and terminal connected cost items) per enplaning passenger before and after development.... They show that during an eight-year period individual stations should have upwards of 300 percent increase in enplaning passengers and that current discussions indicate there will be simultaneously increases of Unit Costs (cost per enplaning passenger) upwards of 1000 percent. Application of the increased cost per enplaning passenger to the increased number of enplaning passengers shows the following increased annual dollar cost for the eighth year:
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> | | |
> |---|---|
> | Newark—1967 cost of $3,853,000 increases to 1975 cost of ..... | $31,875,000 |
> | Dallas (Love Field)—1967 cost of $933,650 increases to (Dallas/Ft. Worth) 1975 cost of ..... | $37,300,000 |
> | Atlanta—1967 cost of $2,728,000 increases to 1975 cost of ..... | $27,056,000 |
> | Total (EWR, DAL/FW, ATL) 1967 cost of $7,514, 650 increases to 1975 cost of ..... | $96,231,000 |
>
> These data [Figure 2] may be somewhat discounted as not truly typical and possibly inaccurate in some details. Nevertheless, they should serve to identify an area in which the industry must recognize there exists a very critical problem.

Airports or facility elements that are sorely needed are not developed for many reasons:

1. Lack of ability to produce functional facilities that have any degree of cost effectiveness,
2. Staggering costs and nonfunctional facilities,
3. Difficulties in developing financing programs, and
4. Acrimony between airport managements and airlines.

Until mature business and financial management assumes responsibility in the overall picture, corrective action cannot seriously be expected. Such management exists and

Figure 1. Various enplanements for the same airport.

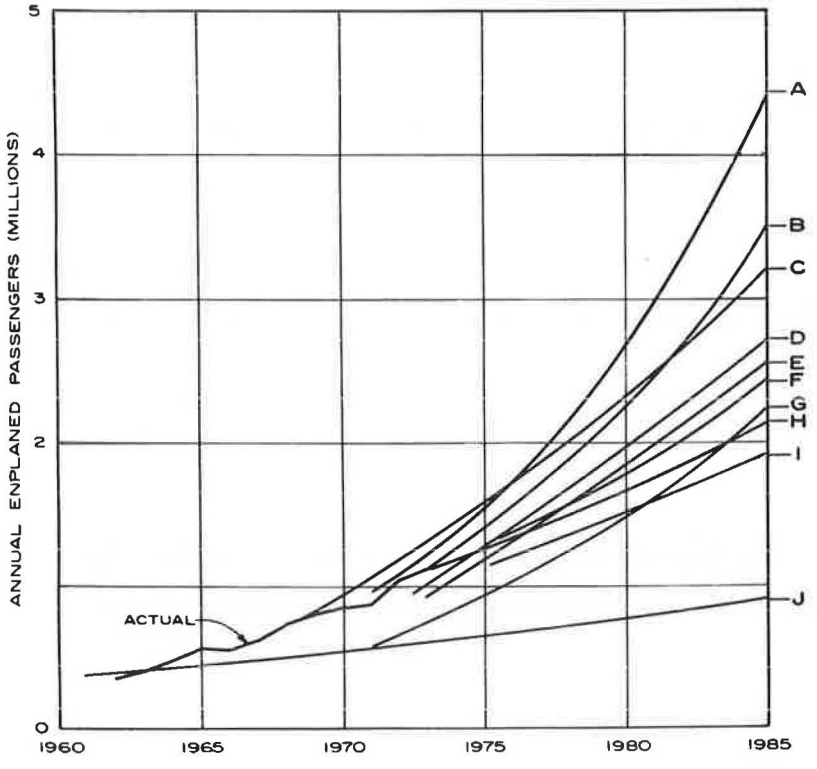
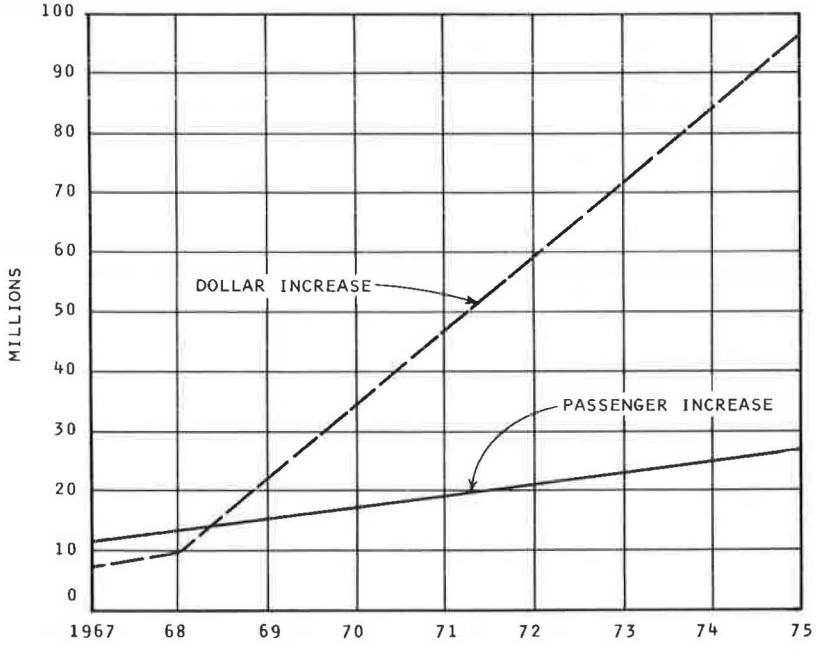


Figure 2. Projections for Newark, Dallas-Fort Worth, and Atlanta.



could become available. Discussion of these points was included in the author's 1955 letter:

> There is enough air terminal know-how available to develop a sound businesslike air terminal industry, but some direction is seriously needed to point up the gravity of the problems and to establish authority and responsibility in a workable, doable manner. Unless something constructive is done promptly, airports and airport facilities increasingly will become a retarding bottleneck to air commerce and national defense as it relies upon air commerce.

During the 1960s, the author had such a discussion at the airline industry management level (1):

> Please pardon a personal opinion. Being full of youthful optimism, I am fully convinced that we can recover from this problem if we will recognize its existence. I am convinced that we have or can get persons and talent that can produce airports and facilities that (1) will conveniently accommodate passengers and cargo, (2) will be satisfactorily functional, and (3) can be afforded and paid for by industry.

During 1970, effective business management take-over and control were expressed as a hope to the American Institute of Aeronautics and Astronautics (2):

> Revolutionary, rather than evolutionary changes in airport design and design criteria will accompany the early years of the era of wide-bodied (jumbo) and supersonic (SST) aircraft types.
>
> However, overshadowing these changes resulting from technical decisions will be changes caused by management decisions predicated upon economic considerations. A controlling test of facility feasibility will be that of cost effectiveness. Development of facilities will be progressed only after master planning shall have prescribed tolerable economic parameters and after implementing procedures shall have reasonably insured satisfactory controls.
>
> This will be an era when management will exercise control of facilities development from concept planning through construction and utilization, to insure that technical deliberations do not override acceptable economic guidelines.

Some efforts have been made to organize a summit managing committee to proceed with a crash program to produce remedial results. As early as 1969, the author recommended that a crash program be addressed to the 20 major hub airports by a committee of a senior representative of the U.S. Department of Transportation, a chief executive of a major airline, an influential member of AOCI, and an outstanding financial spokesman. I urged these steps because of my opinion that aircraft deliveries would (a) require greatly increased capital commitments and cash disbursements for flight equipment; (b) cause strangulation in passenger, baggage, and cargo processing areas in terminals on route segments where large capacity aircraft will be in use; (c) cause strangulation in egress and ingress facilities to major airports; and (d) generally unbalance the economics of the industry sufficiently to threaten its existence as a free enterprise. It is rather obvious that I think that a continuation of the present ineffectiveness will develop a crisis of major proportions rather soon.

Municipal Management

Relatively new and extremely important is the dimension of management and control of business planning. Its necessity becomes more acute and its rewards become more massive as municipal management moves deeper and deeper into functions of proprietary planning and financing and operating business activities, which are essential to community welfare.

These new functions have changed the traditional concept of municipal government into a concept of pseudogovernment and pseudobusiness enterprise, by nature more complicated than management of a corporate conglomerate. Management and control of planning and implementation, including financial, operational, and technical aspects,

are essential to success. A deep-seated major element is the requirement that the new functions, particularly providing transportation facilities and services (including public ground transportation and airports), be based on sound economic and business management principles.

No longer is it merely a technical matter. The economic impact has changed it to basically a management matter. For example, a few years ago a city proceeded with air terminal planning by leading architects, uncontrolled by economic guidelines, until, after 2 years of planning and enormous amounts of technical fees had been incurred, the project estimate was announced at 200 percent of what was financially doable. As a result, the project was scrubbed, massive fees were paid for a lost cause, and for years the city was without much-needed air transportation facilities. These results are due to one error: The city failed to exercise management and control. It relinquished these elements to technical organizations that had purely architectural and engineering disciplines and used no economic parameters.

Procedurally, top municipal management has 2 acceptable options: (a) increase staff to include a qualified program planner and controller or (b) retain a similarly qualified consultant. In either event, the line of responsibility and reporting should be direct without intervening agencies or organization. For example, the city, which was referred to above, would not have saved its program had it retained a program planner and controller but directed him or her to be responsible to and report through the architectural and engineering firm that wrecked the project because it had no economic guidelines.

It is recommended that appropriate research be directed to the management of proprietary business activities by municipal governments to produce an effective capability that can control planning and implementation adequately to provide airport capacity requirements.

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