Planning the Metropolitan Airport System

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In the past airport planning was carried out on a project-by-project basis. Problems of crowded skys and air safety in the rapidly expanding metropolitan areas led to the creation of systems planning and ground-to-air control of air traffic. Now problems of interurban transportation, the expansion of existing airports, the planning of new airports and conflicts between the airport and its neighbors have underscored the need for coordinating airport system planning with metropolitan planning programs.

This paper suggests procedures for planning the metropolitan airport system. The objective is to integrate airport system planning with highway and mass transit planning within the context of a long-range comprehensive planning program. The suggested planning approach is a short-range (5-year) airport system development plan based on the long-range comprehensive planning program for the entire metropolitan area. The operational short-range development plan is composed of three elements: (a) changes in scheduling, (b) expansion of existing airports, and (c) the addition of new airports to the system. The short-range plan should also be coordinated with the highway development plan, the mass transit development plan, and local development and land-use plans for the specific area or political jurisdiction in which existing and planned individual airports are located.

•THE PURPOSE of this paper is to suggest procedures for the planning and development of a metropolitan airport system. The objective here is effectively to integrate airport system planning with highway and mass transit system planning within the context of a long-range comprehensive planning program. As President Kennedy said in 1961: "increasingly, community development must be a cooperative venture toward the common goals of a metropolitan region as a whole." This goal was carried forward by President Johnson in 1964 as necessary to assure that "the taxpayer's dollar is to be wisely used and our communities are to be desirable places in which to live."

The Harvard-MIT Center for Urban Studies recently completed a report (1) for the Senate Subcommittee on Intergovernmental Relations in which it concludes that:

> Metropolitan planning offers strong advantages for the Federal Government in facilitating the efficient administration of oversight and review that is close to the local scene, and can foster wise local use of Federal programs on a coordinated basis; moreover, it does so without necessitating an expansion in the number of Federal personnel in the agencies affected.

The approach suggested in this paper is rather ambitious and farsighted. It encourages metropolitan planning agencies to take the initiative in metropolitan airport systems planning. It outlines a new direction in functional planning which metropolitan planning agencies must seek to undertake if metropolitan plans are going to influence urban growth effectively.

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In terms of airport system planning, this means that the metropolitan agency must shoulder the burden of operational systems planning in addition to long-range comprehensive planning. Clearly, this is no mean task. In the past, planning agencies have not had the necessary staff, skills, or resources to do the job, but now the Federal Government through the Housing and Home Finance Agency (HHFA), the U. S. Bureau of Public Roads (BPR) and the Federal Aviation Agency (FAA) is prepared to provide substantial financial and technical assistance for this important task. The procedures outlined here suggest the direction in which planning agencies should be moving. The FAA is prepared to provide the necessary assistance and technical skills for planning the metropolitan airport system, but the planning agencies themselves must take the initiative in the preparation of system plans.

HOW THE FEDERAL GOVERNMENT ASSISTS TRANSPORTATION PLANNING

On March 8, 1964, the President signed into law an amendment to the Federal Airport Act requiring that airports built with Federal assistance be reasonably consistent with planning programs for the area in which the airport is located. The first sentence of Section 9 (d) (1) of the Federal Airport Act (49 U. S. C. 1108 (d) (1)) was amended to read as follows:

> All such projects and advance planning and engineering proposals shall be subject to the approval of the Administrator, which approval shall be given only if he is satisfied that the project or advance planning and engineering proposals are reasonably consistent with plans (existing at the time of approval of the project or advance planning and engineering proposal) of public agencies for the development of the area in which the airport is located and will contribute to the accomplishment of the purposes of this Act.

With that action, the Federal-aid Airport Program joined the Federal-aid Highway program and the recent Urban Mass Transportation Act in recognizing the necessity of coordinating functional planning programs with comprehensive urban planning programs. The Federal-aid Highway Act of 1962 requires that after July 1, 1965, all Federally aided highway projects in urban areas of more than 50,000 population must be "based on a continuing comprehensive transportation process carried on cooperatively by states and local communities." Long-range highway plans and programs are to be "properly coordinated with plans for improvements in other affected forms of transportation," and are to be "formulated with due consideration to their probable effect on the future development" of the urban area. Under the Urban Mass Transportation Act of 1964, except as specified in the Emergency Program (Sec. 5), no Federal assistance shall be provided unless the HHFA Administrator finds that such assistance is essential to a program proposed or under active preparation for a balanced transportation system as part of the comprehensive metropolitan planning program.

But recognition of need does not automatically assure coordination. Our metropolitan planning programs must now take action to coordinate the transportation planning to meet the challenge of this new airport, highway, and mass transit legislation. In each case, the new legislation requires coordination of functional transportation planning programs with comprehensive planning programs. It does not spell out the form or content or the quality of the required urban planning programs. What it does do is provide a framework for achieving effective coordination of functional transportation planning, perhaps the first step in making metropolitan planning programs effective.

Over the past 10 years, planners have quite properly become increasingly concerned with "effectuating" planning programs. In 1956, Meyerson outlined how long-range planning could be made more effective through the middle-ground community planning function (2). One of the key steps was the "detailed development plan function" to phase specific private and public programs as part of a comprehensive course of action covering not more than 10 years:

> The gap between the developmental policies of government discussed above and a long-range master plan for future development can be bridged by the preparation of short-run plans of five to ten years time span. The Development plan would link measures to deal with current problems with long-range proposals to attain community goals.

What Meyerson suggested 8 years ago is, in effect, required by these new transportation assistance programs today.

The President's 1962 message on transportation called for "balanced transportation systems" which are planned and programmed as part of an overall community planning program. Obviously, in the large urban regions which will emerge in the next 20 years, a balanced transportation program must include airport systems planning. Therefore, airport planning should not be viewed simply as land use but also as a transportation function.

Transportation facilities should be balanced economically and socially, providing freedom of choice in transportation to all people. Each mode of transportation serves particular configurations of functions and people should have the opportunity to choose the mode best suited to their needs—highway, rail or air. The need for choice and a flexible transportation system has become increasingly important in the large, complex metropolitan areas which have emerged in recent years.

While almost everyone in the transportation industry now agrees with the traditional planning goal of a balanced transportation system, the difficult questions of what constitutes a balanced system and how we build it persist. One of the key problems in developing such a system is that airports, highways, railroads, and subways are not built at the same time. To coordinate the various transportation modes, it becomes necessary to plan the entire transportation system. But preparing a plan and effectuating a plan are two different things—a future airport which is generally located on a comprehensive metropolitan plan may or may not be seriously considered by the state highway department or transit authority when decisions are made actually to acquire rights-of-way and build a highway system and transit network. The problem is further complicated by the fact that much of the system is already in place. We must maximize the usefulness and efficiency of the existing system. However, if there is a short-range development plan for each of the functional systems —coordinated within the context of a long-range comprehensive planning program—the critical problems of timing transportation investments can be successfully resolved.

The growth of computer technology has proven very helpful in scheduling actions and investments in the highway building program. These same techniques have also been used in the preparation of metropolitan transportation studies. Techniques for planning the metropolitan airport system should be developed and included in transportation studies.

HOW THE FAA ASSISTS PLANNING AND DEVELOPMENT OF AIRPORTS

Airport planning has traditionally been oriented toward serving the individual community. The metropolitan airport systems approach, suggested here, considers the airport needs of the entire metropolitan region. The metropolitan planning agency should take the initiative in preparing a short-range airport development plan based on the long-range comprehensive metropolitan plan. The FAA will work as closely as possible with the planning agency. The planning agency should request the assistance of of the FAA's District Airport Engineer at the outset of the development of the airport system plan. The objective should be to include each of the individual airport projects in the National Airport Plan (NAP). The NAP is the first step in gaining approval for the project under the Federal-aid Airport Program (FAAP). The basic FAAP provides up to 50 percent matching grants to the local airport sponsor.

The FAA is charged with the responsibility for long-range planning to facilitate the safe and effective use of airspace and landing areas, the formulation of a NAP, and the administration of a FAAP to bring about, in accordance with the NAP, the development of a national system of public airports.

To be eligible for Federal aid, ownership in the airport must be vested in a public agency and the airport must be included in the NAP. The NAP is revised each year and submitted to Congress by the Administrator. The plan specifies, in terms of general location and type of development, the projects considered necessary to provide a system of public airports adequate to anticipate and meet the needs of civil aeronautics. These projects include all types of airport development eligible for Federal aid under the Act (6) and are not limited to any classes or categories of public airports. (In 1964 eligible projects were limited to the following: land acquisition, site preparation, runways, taxiways, aprons, lighting, runway distance markers, fire and rescue equipment building, snow removal equipment building, utilities, roads on airport site, parking, landscaping, turfing, erosion control, fencing, sidewalks, obstruction removal and relocation or modification of navigational aids.) The plans have been based on projected needs over a variable period of time. Before Fiscal Year 1953, the plans were based on needs over a 3-year period. In 1953 the plan projected needs over a 7-year period, and in Fiscal Years 1954, 1955, and 1956 the plans were based on an 8-year period. The 1959 and 1960 plans are based on a 4-year planning period. The 1962 plan is based on a 5-year planning period. Of the funds that are appropriated each year by Congress, approximately 75 percent[1] are apportioned to the states in proportion to area and population ("one-half in the proportion which the population of

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[1] "Sec. 4. Section 5(d) of such Act (49 U.S.C. 1104 (d)) is amended by adding at the end thereof the following new paragraphs:

"(4) For the purpose of carrying out the 1964 amendments to the Federal Airport Act in the several States, in addition to other amounts authorized by this Act, appropriations amounting in the aggregate to $199,500,000 are hereby authorized to be made to the Administrator over a period of three fiscal years, beginning with the fiscal year ending June 30, 1963. Of amounts appropriated under this paragraph, $66,500,000 shall become available for obligation, by the execution of grant agreements pursuant to section 12, beginning July 1 of each of the fiscal years ending June 30, 1965, June 30, 1966, and June 30, 1967, and shall continue to be so available until expended.

"(5) For the purpose of carrying out this Act in Hawaii, Puerto Rico and the Virgin Islands, in addition to other amounts authorized by this Act, appropriations amounting in the aggregate to $4,500,000 are hereby authorized to be made to the Administrator over a period of three fiscal years, beginning with the fiscal year ending June 30, 1965. Of amounts appropriated under this paragraph, $1,500,000 shall become available for obligation, by the execution of grant agreements pursuant to section 12, beginning July 1 of each of the fiscal years ending June 30, 1965, June 30, 1966, and June 30, 1967, and shall continue to be so available until expended. Of each such amount, 40 per centum shall be available for Hawaii, 40 per centum shall be available for Puerto Rico, and 20 per centum shall be available for the Virgin Islands.

"(6) For the purpose of developing, in the several States, airports the primary purpose of which is to serve general aviation and to relieve congestion at airports having high density of traffic serving other segments of aviation, in addition to other amounts authorized by this Act for such purpose, appropriations amounting in the aggregate to $21,000,000 are hereby authorized to be made to the Administrator over a period of three fiscal years, beginning with the fiscal year ending June 30, 1965. Of amounts appropriated under this paragraph, $7,000,000 shall become available for obligation, by the execution of grant agreements pursuant to section 12, beginning July 1 of each of the fiscal years ending June 30, 1965, June 30, 1966, and June 30, 1967, and shall continue to be so available until expended."

each state bears to the total population of all states, and one-half in the proportion which the area of each state bears to the total area of all the states.") and the remaining 25 percent, known as the discretionary funds, may be used by the Administrator for expenditures on approved projects in the several states as the Administrator may deem most appropriate for carrying out the NAP.

The maximum Federal grant for any specific project is 50 percent of the total project costs, except in those states where there are large areas of land owned by the Federal Government. In such cases, the 50 percent is increased up to 62 ½ percent:

> In the case of any State containing unappropriated and unreserved public lands and nontaxable Indian lands (individual and tribal) exceeding 5 per centum of the total area of all lands therein, the United States share under subsection (a) (1), and the maximum United States share under subsection (a) (2), shall be increased by whichever is the smaller of the following percentages thereof: (1) 25 per centum, or (2) a percentage equal to one-half the percentage that the area of all such lands in such State is of its total area. (3)

Large airports like those of New York, San Francisco, Los Angeles, and Chicago require runway lighting of very high intensity. These lights are more expensive than the ordinary medium-intensity lights installed at the majority of the airports. Congress, recognizing that high-intensity lighting, runway distance markers, in-runway lighting and land for approach light systems is in a sense a part of an integrated instrument landing system financed and operated by the Federal Government, increased the Federal share of the cost of purchasing and installing these types of lighting to 75 percent. The Federal share for the installation of medium-intensity lights remains the same as for all the other eligible items in the project.

If the projects in a particular state are not able to make use of the entire apportionment to that state within 2 years from the time the funds are appropriated, the entire balance is placed in a discretionary fund.

DEVELOPING AIRPORT SYSTEM PLAN AS INTEGRAL PART OF COMPREHENSIVE PLANNING PROGRAM

The need for the advanced planning grants authorized by the 1964 amendments to the FAAP is underscored by the basic changes that have occurred in the airport planning as a result of changes in (a) aeronautical technology including the dynamic growth in both commercial air commerce and general aviation, (b) the size and complexity of modern airports, and (c) the rapid expansion of metropolitan areas.

These same changes have also created a need for metropolitan airport systems planning. The need for airport facilities is not confined to the municipal boundaries of a particular airport sponsor. In many cases a facility serves several neighboring communities and approach zones, and takeoff patterns extend beyond municipal boundaries into neighboring political jurisdictions. In future years, many of the metropolitan areas included in the NAP will be based on regional airport systems. It is the responsibility of each metropolitan planning agency to take necessary steps to prepare an airport system plan in advance of program implementation. Sufficient lead time should be allowed to permit review and approval by the FAA and local public officials who will be primarily responsible for financing and developing the airport system.

The question of how and by whom the airport plan is going to be carried out is very important. If the development plan for a metropolitan airport system is to be realistic, the character and content of the plan will reflect the way it is to be implemented. Critics have emphasized that planning studies too often become hopelessly entangled in a web of socio-economic theory to the point that they lose sight of their original objectives and that there is the danger of such studies turning into an abstract socio-economic "goals rush" of limited practical value. Now, it must be remembered that the comprehensive metropolitan plan is by necessity an abstract statement of socio-economic goals and objectives. The short-range development plan for a single

metropolitan function such as airports can provide a bridge; it can translate the comprehensive plan into a practical, action-oriented development program.

The FAA is in the process of changing its procedures to require that local government sponsors in metropolitan areas coordinate airport development with metropolitan planning programs. Further, the FAA will provide technical assistance to metropolitan planning agencies in the preparation of areawide airport plans. It is apparent that review by the metropolitan planning agency will be much more meaningful if the Agency has in advance prepared a short-range (5-year) airport development plan. The functional development plan then becomes a yardstick for evaluating the specific airport proposal. A 5-year development plan is suggested because that is the project forecast period used for the NAP. The coordination of metropolitan airport systems with the NAP looks to the time when the NAP will be composed of a series of metropolitan systems which will provide a refinement of the present FAA "hub" concept.[2] The NAP designates large, medium and small hubs. The 21 large hubs coincide with major metropolitan areas. Over the next 20 years, most of the Nation's economic growth is expected to occur in metropolitan areas. The value of integrating metropolitan development plans with national development is immediately apparent because it is how the cash flows that determines how development projects are carried out. However, it is through the functional development programs that metropolitan plans are implemented.

Problems of airspace congestion created the initial thrust behind metropolitan airport system planning. Unlike most metropolitan problems which are either dealt with or ignored on a piecemeal basis by "fragmented" government, control of airspace is the responsibility of the Federal Government, specifically the FAA. The FAA is responsible for air control everywhere in the United States, including metropolitan areas. Air control must be dealt with on an areawide basis. Therefore, the metropolitan airport system must be planned on an areawide basis.

Airports in and around metropolitan areas must be planned and operated as a system so that their interactions (airspace, etc.) are not detrimental to their capacities and so that their functions are complementary. Furthermore, as air traffic continues to increase, more of these airports will approach and exceed a practical operating limit. Therefore, each airport in a metropolitan area should be planned as part of a system of airports to obtain the most efficient traffic flow and the most effective use of facilities.

But it is not enough to create an efficient air transport system that will simply transfer the congestion to the terminal area and ground transportation. Therefore, the FAA is now emphasizing the importance of comprehensive metropolitan planning to achieve a balanced transportation system. As FAA Administrator Najeeb E. Halaby stated in his testimony in the 1963 FAAP hearings before the Aviation Subcommittee of the Senate Commerce Committee:

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[2]The air traffic hubs are the cities and metropolitan areas which the airlines serve. These communities are classified in terms of percentages of the national domestic airline passenger total as follows:

Large,	1.00 percent or more;
Medium,	0.25 to 0.99 percent;
Small,	0.05 to 0.24 percent; and
Nonhub,	less than 0.05 percent.

FAA uses the air traffic hub structure to measure the concentration of all the social and economic factors that determine a community's ability to generate air carrier or general aviation traffic. The hub structure is constructed from airline data because these constitute the longest, most reliable series of air traffic facts available. It is expressed in terms of passengers since they are the principal source of airline revenue and since the distribution of passengers, mail, and cargo by types of communities is well correlated. A community's air traffic hub classification is based on its percentage of the scheduled domestic enplaned airline passengers within the conterminous United States. The hub designation is based on the community's share of the air passenger market of the United States rather than on a fixed number of passengers for a given time period. Of the 21 large hubs, nine have two or more air carrier airports.

> We could go ahead with airport layout planning in the absence of comprehensive metropolitan planning. However, we hope that those instances would be rare because what we are all interested in is safe, convenient, and efficient transportation from door to door.
>
> The traveler really does not care how much time he spends afoot, on wheels, or on the wings. He does not analyze it that way. He wants to get from here to there safely and quickly. We will need, as the metropolitan population centers expand, a great deal more regional and metropolitan planning that will provide for rapid transportation from door to door. We hope that these can move forward in formation with airport development.
>
> We will come later to a point where we say, and I think with conviction, that the problem has already become so serious, not to mention how much more serious it will be in the supersonic era, where as much time is spent on the ground as in the air on several different transcontinental flights. Therefore, we are going to look very carefully and may, in certain selected instances, exercise judgment in withholding Federal-aid-to-airport grants where the community has taken no steps to provide for accessibility to and from the airport.

The objective here is a metropolitan airport system developed within the context of a continuing comprehensive metropolitan planning program. In theory, the general procedure for planning the metropolitan airport systems is as follows: (a) prepare the long-range (20-year) comprehensive metropolitan plan; (b) prepare a short-range (5-year) operational plan for airport development including basic inputs from the long-range plan; and (c) make necessary revisions to the long-range plan based on the short-range plan. In practice, however, most metropolitan planning agencies have not yet developed long-range plans. Therefore, the short-range operational plan for airport development should be integrated with highway and mass transit development programs to create a short-range metropolitan transportation plan. This plan is, in effect, the primary method of implementing the initial phases of the long-range transportation plan. This, in turn, is a key part of carrying out the long-range comprehensive plan. In terms of the continuing planning programs, operational planning influences the long-range plan and the long-range plan provides the basic development goals for operational planning. Again it must be emphasized that most planning agencies have not yet achieved the degree of sophistication necessary to perform both long-range and operational planning functions. As was stated at the outset, this represents a rather ambitious and hopefully farsighted view of the direction in which metropolitan planning agencies should be moving to make metropolitan planning programs effective.

The next question is how does the metropolitan planner develop an operational systems plan? Since all major metropolitan areas are presently served by one or more air carrier and general aviation airport, he must first analyze the existing airport system. The methodology outlined here is presented as an example of one way in which the airport system can be analyzed. Like most methodology, it should be reviewed in terms of the transportation requirements of the individual metropolitan area and changed to meet the needs of both the area and the metropolitan planning program. The methodology was developed for the FAA by Warskow and Wisepart of the Airborne Instruments Laboratory, and does not necessarily reflect the official views or policy of the FAA.

METHODOLOGY FOR ANALYZING CAPACITY OF AIRPORT SYSTEMS

Many of the large metropolitan areas and their suburbs are now served by several airports. Because of the interactions between these airports, they should be examined as a system to insure their most reasonable and economic use by: (a) determining

when the airport will become congested, (b) finding ways to relieve congestion, and (c) minimizing the need for new facilities.

Method of Analysis

To determine if an airport is to be included in the airport system, it must be decided whether the activity level in the present or projected period warrants its consideration. In general, an airport is part of the system if:

1. An FAA control tower is or will be established (that is, it has attained an activity level sufficiently high for air traffic control), or
2. Its airspace requirements conflict, in either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR), with those of any other airport (civil or military) in the system.

The study of airports for a systems analysis can be limited to aircraft operations. Figure 1 indicates the major items to be considered. These items must be examined to determine the extent of their interaction between airports. Then, each subsystem of each airport must be examined to obtain an overall view of the operation of that airport and its relation to the system. To work in quantitative terms, the methodology used in the analysis evaluates the many items affecting the operation of a system of airports and shows how their effect on the practical peak annual capacity (PANCAP) of an airport can be determined. A technique for determining the PANCAP of an airport is then used to derive the interrelationships between airports and to determine quantitatively when congestion will occur at one airport or in a system of airports. Figure 2

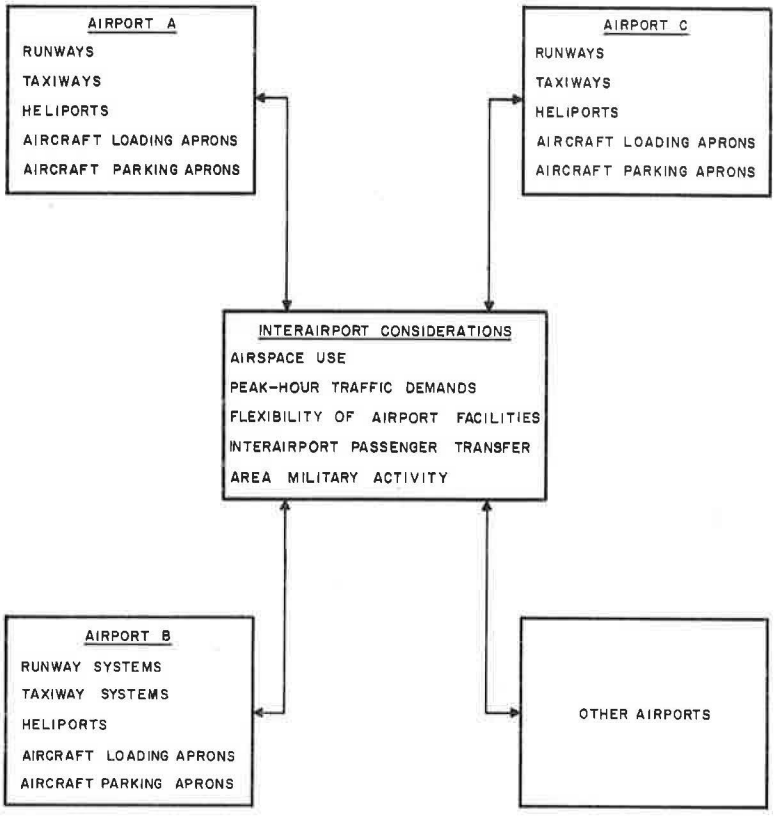

Figure 1. Operational subsystems involved in airport system analysis (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

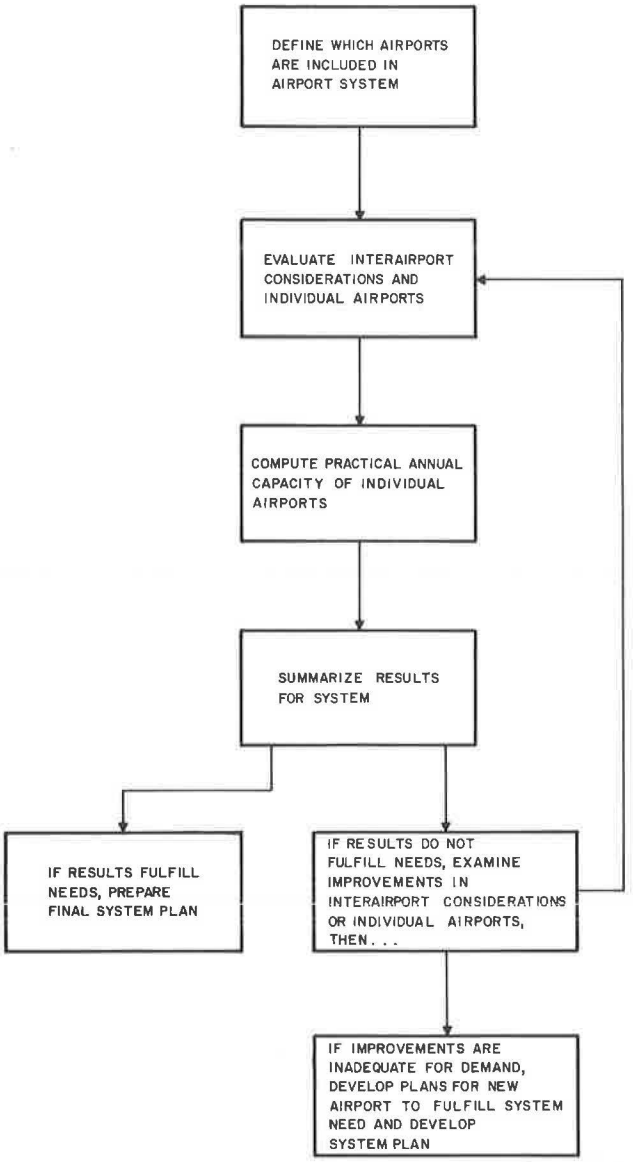

Figure 2. Summary of procedure for airport system analysis (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

summarizes the procedures for the systems analysis. It is a cyclical analysis process designed to result in a system plan.

Airport congestion occurs when the annual demand exceeds the PANCAP of that airport. Congestion can be relieved by increasing capacity, shifting demand away from the airport, and redistributing the demand.

Interairport Considerations

Figure 1 shows the interairport considerations that are involved in the analysis of an airport system. Some of these must be examined both as a part of the system and as a part of the individual airport's performance. Their effect on the PANCAP of an airport and the system capacity must be assessed and accounted for appropriately.

Airspace Use.—To establish how a group of airports use, or should share, airspace may involve three distinct analyses:

1. Determining how this traffic at the airport would like to use the airspace, accomplished by examining both the scheduling practices of the airlines and general aviation flow patterns;
2. Determining how the traffic at the airport must use the airspace, for example, by observing and recording the radar pictures of current traffic flow; and
3. Determining where a new airport could be located to have minimum interference with existing facilities; this will require consideration of improvements in air traffic control (such as the common IFR room) and reductions in IFR spacings.

Peak-Hour Traffic Demands.—The hourly traffic distribution for each of the airports in the airport system should be developed to determine whether there is any possibility of sharing the load at the airports during certain hours of the day. If the peak hours coincide and the airports are loaded, this would, of course, not be possible. However, it may be possible to share the traffic between airports until all reach their peak hour capacities, and therefore, some means would have to be developed to shift the demand for each airport. Shifting airline schedules or inducing general aviation to use lightly loaded airports would accomplish this.

Flexibility of Airport Facilities.—If the airports in an airport system are to operate in a complementary manner such that traffic can be moved between airports to satisfy unusual traffic demand or weather situations, it is important that there be some flexibility in the use of facilities. For example, runways must be long enough to satisfy aircraft that usually use airports with longer runways. This would also extend into other areas of airport design such as gate space. The greater the equality between airport facilities, the greater is the possibility of exchanging traffic between the airports.

Interairport Passenger Transfer.—An efficient plan for transferring passengers between the airports must be developed as part of the system plan. This plan should provide for the transfer of passengers between connecting flights—particularly those between domestic and international accommodations to one airport in the metropolitan system. To encourage the system approach to the distribution of traffic between airports, it may be necessary to have a superior means of transferring passengers between the airports. In many cases, current surface transportation is not satisfactory for this purpose. The possibility of using helicopters has great promise for the future.

Area Military Activity.—In many of our metropolitan areas, military activity is conducted from civil airports or from military airports within the system area to provide a convenient training place for reserve personnel. In these cases, military traffic may occur at the peak periods of civil activity. If this can become a problem, ways of controlling or reducing the military activity during these periods must be found.

Individual Airport Considerations

Each airport in an airport system must be analyzed to determine its PANCAP. Figure 1 shows five airport subsystems that must be analysed to determine the subsystem that limits the airport capacity. Although the runway subsystem is the major airport consideration in computing the PANCAP, taxiways, heliport facilities, and apron areas can also be significant factors. Limitations in any of these areas must be accounted for in computing the PANCAP of an airport.

Runway Subsystem.—The most important airport subsystem in an airport-capacity analysis is the runway subsystem. Congestion occurring in the other operations subsystems can usually be relieved to the point where the runways become the limiting factor. A runway subsystem involves several factors (Table 1) that should be clearly specified for the capacity analysis. A wide range of procedural and physical improvements can be implemented to increase airport capacity.

Taxiway Subsystem.—Certain phases of taxiway design affect runway operation, such as turnoffs from the runway and the holding-apron capacity. Other phases of taxiway design that can cause congested situations at the airport include:

TABLE 1

FACTORS FOR RELIEVING AIRPORT CONGESTION

Factors	Procedural Improvements	Physical Improvements
Runway layout		More runways; lengthen runways to remove operating restrictions; modify thresholds and/or intersections; modify runway/taxiway crossings; add and improve turnoffs.
Taxiway layout	Use runways as taxiways.	Improve bypass areas, use runways as taxiways.
Airspace layout	New and additional departure fixes; share airspace assigned to other airports.	New and additional departure fixes.
Operating procedures	Remove any restrictions on runway use.	
Traffic demand	Reschedule air carrier; reduce general aviation; reduce military.	Reduce general aviation.
Navigational aids	Provide more flexibility for approach/departure routes; provide IFR dual-approach capacity.	Provide more flexibility for approach/departure routes; provide IFR dual-approach capacity.

1. The lack of a two-way taxiway capability around the terminal buildings and between the terminal and the runways or hangars;
2. The lack of proper space for taxiing around parked aircraft at terminal locations;
3. Taxiway layouts that use runways as taxiways (thereby limiting the use of the runway wherever this is necessary); and
4. Taxiway layouts so close to a runway that exiting aircraft must mix with aircraft on the parallel taxiway.

The delay resulting from these situations should be evaluated to determine whether it affects annual capacity and can be decreased. The evaluation involves comparing the delay and taxi time of the present system with the delay and taxi time of the improved system. The computation of PANCAP must make appropriate allowances for taxiway problems that reduce runway capacity and cannot be solved.

Heliport Facilities.—In an airport system, the means of interconnection between airports becomes more important as traffic increases, particularly as the airports approach capacity. The rapid means of interconnections that are so important in some cases can most readily be satisfied by helicopters. Since they operate in the same airspace and the same operating parts of the airport as fixed-wing traffic, helicopters should be considered in planning airport operating facilities for metropolitan areas. In general, heliport facilities should be planned to avoid, if possible, any interference with fixed-wing runway use, yet be located for passenger convenience.

Apron Areas.—Aircraft loading and parking areas for general aviation airports are a necessary facility and, in general, do not limit airport capacity because these areas can usually be adequately provided around the operational runway areas. If the parking areas for air carrier aircraft on terminal aprons are inadequate, congestion can occur. Directly observable results will be the tie-up of adjacent taxiways and possibly a delay of scheduled arrivals and departures.

An evaluation should be made to insure that a reasonable level of service is provided and that the delays are not excessive. The number of gate positions required at any specific future date can be determined in relation to the growth in enplaned passengers forecast for a particular airport. The first step is an analysis of present gate use and requirements (Fig. 3).

The results of the analysis of current gate requirements in conjunction with the forecast of enplaned passengers are used to determine the future gate requirements.

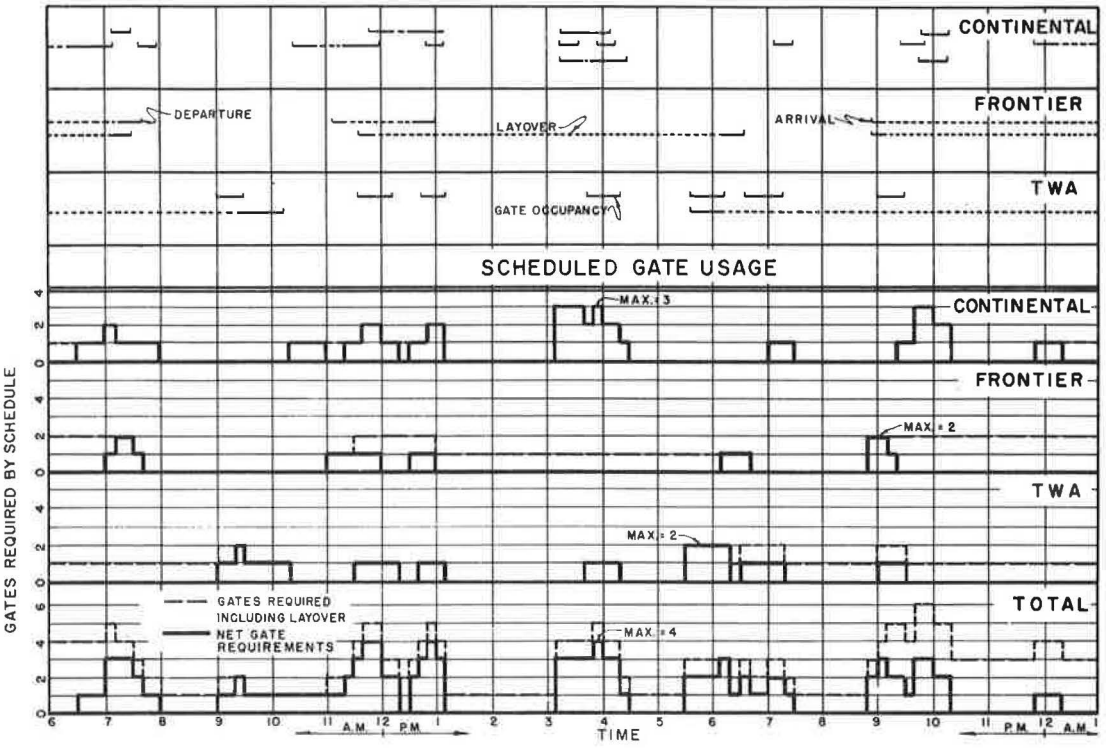

Figure 3. Scheduled gate occupancy, Alburquerque, December 1961 (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

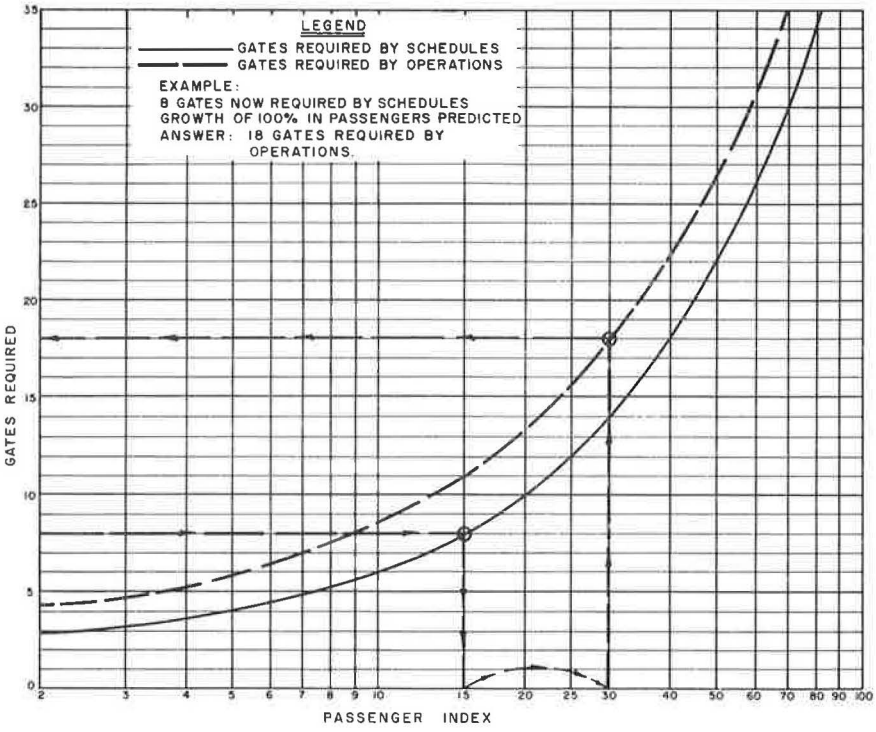

Figure 4. Example of gate requirements (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

The procedure illustrated in Figure 4 is used to determine gate requirements and will permit operations with only 2 percent or less of the flights being delayed for an available gate.

It may be necessary to analyze gate requirements more than once to accommodate various traffic demands projected as part of the overall airport system study. There may be valid reasons for examining alternative approaches to assigning or distributing traffic between the airports. When gate requirements use all areas available for terminal building development, it may be necessary to reverse the procedure and determine the effect of this on the total traffic at the airport.

This material can be applied by maintaining a correlation between gate development and the increase in enplaned passengers. The equivalent demand in annual movements must then be obtained and accounted for in determining the PANCAP of the airport.

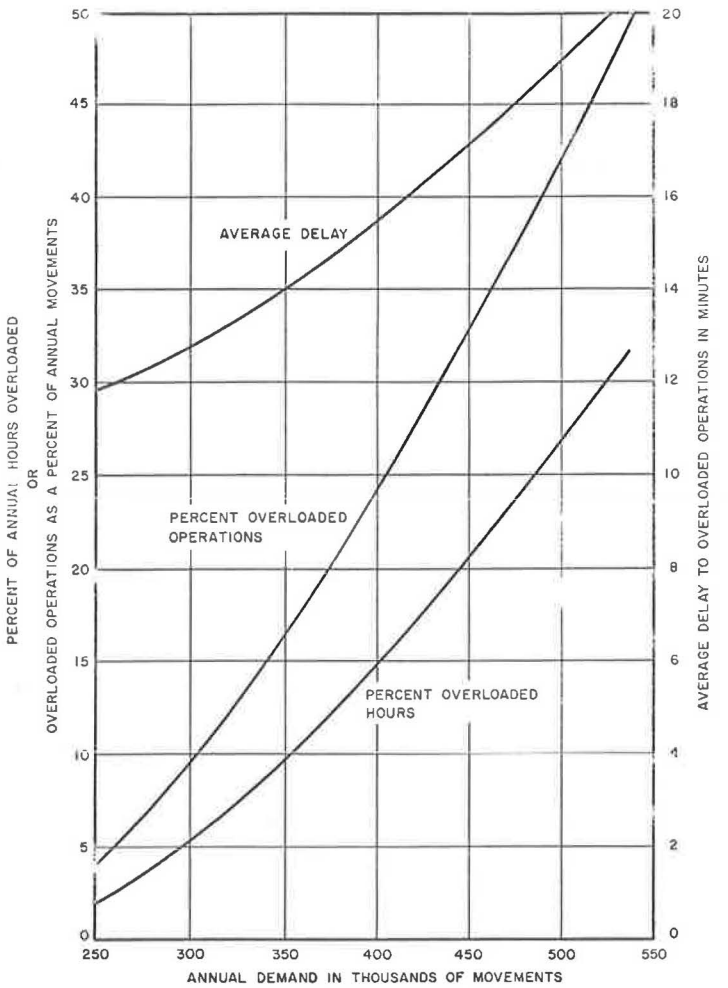

Figure 5. Data required to determine practical annual capacity (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

Practical Annual Capacity of Individual Airports

The PANCAP of an airport is determined by comparing the demand (existing or anticipated) on that airport with its capacity. This comparison is accomplished using a technique that examines, for a period of 1 year and for various annual traffic demands, the following factors:

1. Percent of hours during the year that the hourly demand exceeds the hourly capacity (called percent overloaded hours);
2. Percent of annual operations occurring during the overloaded hours (called overloaded operations); and
3. Average delay to overloaded operations.

Note that the analysis considers only those hours of the year when the airport operates in an overloaded condition. These hours determine, for the most part, the quality of service that an airport provides.

The PANCAP is computed using the technique shown in Figure 5. The input data to the PANCAP computation consists of the following:

1. Variation of daily demand levels throughout a year—There are nine VFR levels and nine IFR levels. The nine VFR levels relate to VFR demands on peak, average,

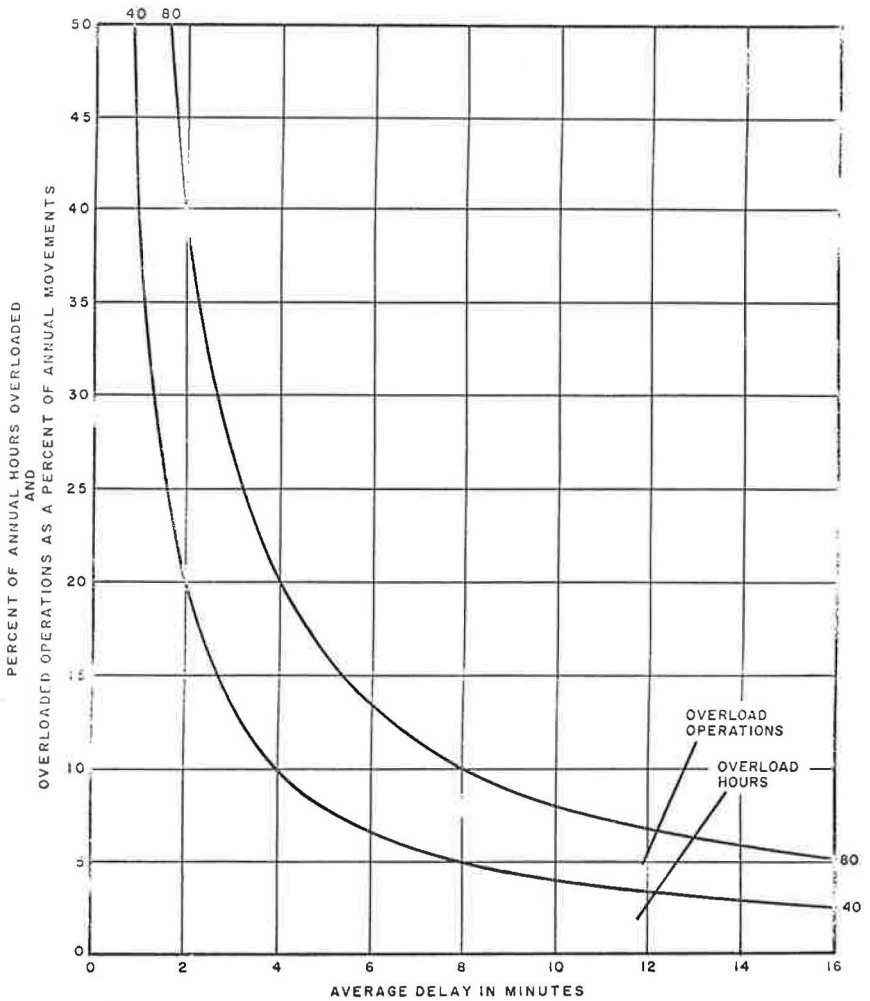

Figure 6. Determination of practical annual capacity (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

and low days of peak, average, and low months; the nine IFR levels are similarly classified.

2. Occurrence over a year of each of the relative levels of hourly demand.
3. Typical hourly distributions of demand throughout the day—Different hourly distributions are used for VFR and IFR weather.
4. Ratio of landings to takeoffs for each hour.
5. For each possible combination of runway use, the capacity (for example, at a 4-min average departure delay in VFR) and amount of use during the year.
6. Test demands—These are expressed in terms of the number of aircraft desiring to use the airport runways in a peak hour of a peak day of a peak month.

After these results have been obtained for all of the six hourly test demands, they are curve fit (least squares) and plotted as shown in Figure 6.

Data obtained from Figure 6 are replotted on Figure 7. The average delay at the intersection of the percent overloaded hours curve with the constant-40 curve is noted. The average delay at the intersection of the percent overloaded operations curve with the constant-80 curve is also noted. The PANCAP of an airport is the annual demand that yields the smaller average delay.

Figure 7 is based on the following reasoning. Suppose that we plot the percent overloaded hours as a function of average delay from curves such as shown in Figure 6. We have found that good airport operation exists at annual demand levels representing the portion of the curve below and to the left of the constant-80 curve. The constant-80 curve represents the hyperbola obtained by setting the product of the two axes equal to 80; for example, 10 percent of annual operations occur during overloaded hours and experience an average delay of 8 min.

The procedures used for determining the PANCAP are summarized in Figure 8. The starting point is the existing airport with the runway, taxiway, airspace layout, and the operating procedures and navigational aids in use. If the annual capacity is greater than the current annual demand, then the only need for reexamination is for future conditions. If, however, the analysis shows that the annual demand is greater than the annual capacity, then the analysis must continue by considering improvements to the runway system (Table 1), recomputing the annual capacity, and comparing the revised annual capacity with the annual demand. Thus, the cycle continues until either the annual capacity exceeds the annual demand or all possible ways of increasing the annual capacity have been examined. If it is still impossible to provide adequate capacity, then an attempt should be made to decrease the demand by encouraging the excess demand to use other facilities.

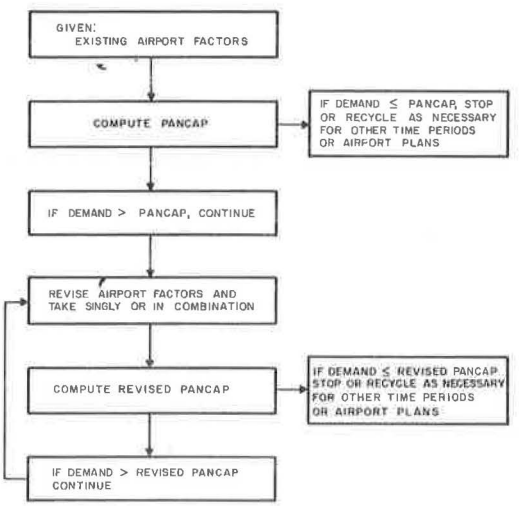

Figure 7. Flow chart for analysis of practical annual capacity (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

Capacity of Airport System

After determining the PANCAP of each airport in the system, the system capacity can be derived. A system of airports is congested if one or more of the airports is congested after all reasonable and economic ways of relieving the congestion at the particular airport have been tried. Thus, the comparison of individual airport capacity with the demand of that airport is most important. The systems approach to analyzing the individual airports is vital in order to include airport interrelationships. However, it may be more meaningful to treat the airports individually when comparing the demand with the capacity.

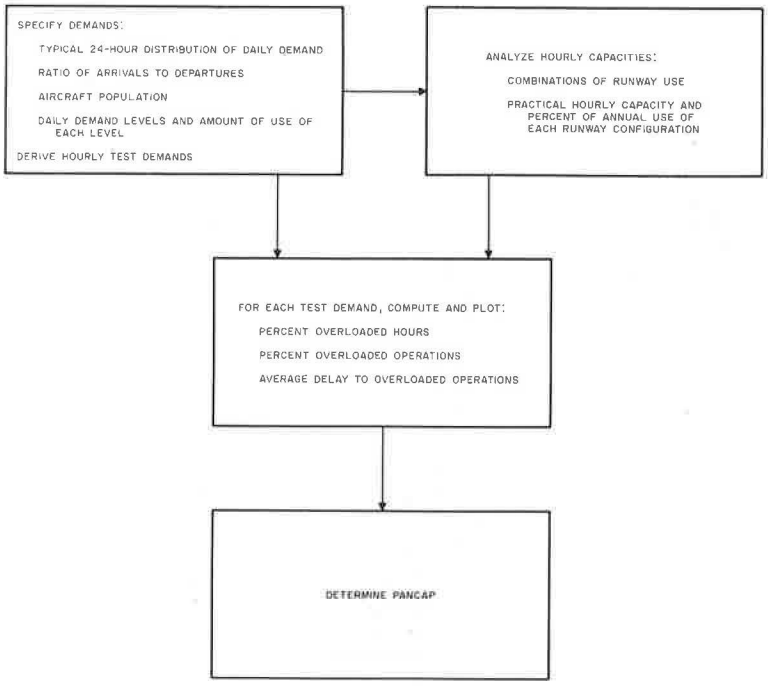

Figure 8. Computation of practical annual capacity of airport (source: Airborne Instruments Laboratory, 1964, Contract FAA/BRD 403).

A suggested procedure for analyzing the meaning of the annual capacities and the airport system capacity is as follows:

1. The cyclical process of Figure 8 should be completed, if not already done. In this step, either adequate capacity is or can be made available or the ultimate capacity has been determined.
2. The capacity analysis will have been based on annual demand, probably both current and forecast. These demands must be compared with the computed capacities to determine which airports will become congested.
3. The demand for the congested airport is analyzed to determine whether demand can be lowered by diverting traffic to airports with excess capacity.
4. If diversion is not practical or if the amount of diversion is so small that a capacity problem still exists, new airports must be provided to relieve capacity.

OPERATIONAL SHORT-RANGE DEVELOPMENT PLAN

After completion of the analysis of the existing airport system, the next step is the preparation of the operational short-range (5-year) development plan. The plan is composed of two parts: (a) planned expansion of the capacity of existing airports, and (b) the addition of new airports to the system based on the long-range comprehensive plan.

Almost all of the growth of the United States is occurring in metropolitan areas. Further, most of our urban expansion is occurring at the periphery of metropolitan areas. This poses some particularly difficult problems for airport planning because airports are large consumers of land for runways, approach zones, takeoff patterns, etc. With more and bigger jets they will also become an increasingly noisy neighbor. Such problems have underscored the need for airport system planning. The short-range plan is a practical device for pinpointing where conflicts between the airport and its neighbors are likely to occur. Moreover, by coordinating airport expansion and development with local city and county planning programs, these painful and emotional

conflicts can be resolved before the dollars are committed for construction. The short-range plan represents an opportunity to provide service to the whole metropolitan area without negotiating with each individual community. It is an opportunity to plan the system on a rational basis, providing a guide for future investment in the system.

The use of air carrier service, air cargo transportation, business flying, and pleasure flying have all been expanding in recent years. Since the demand for air transportation facilities will probably be accelerating in the future, the need for operational, short-range development planning becomes particularly important. It seems evident that both elements of the short-range plan will need to be expanded to accommodate the demand for airport facilities. The nature and degree of the changes will, of course, depend on the increase in each of the different kinds of air traffic which are forecast for the 5-year planning period. The FAA has developed methods for forecasting air traffic demand and will provide guidance and assistance to airport system planners.

The analysis of the capacity of the existing system will identify the factors causing congestion in the existing system. From the analysis the planners can determine what kind of rescheduling, expansion, or new facilities will be needed to resolve current problems and to avoid future problems in the metropolitan airport system. For instance, in the Atlanta metropolitan area, there are 20 scheduled flights for 5:00 p.m. at the major air carrier airport. Needless to say, this creates severe congestion around 5:00 p.m. The obvious solution is to reschedule, but because of the nature of the workday and the demand for business commuting by air, none of the airlines wants to give up its priority position on the demand schedule. Therefore, additional facilities might be necessary to handle peak hour loads, but the cost of additional facilities must be weighed against the cost of the convenience to the air passenger, the business community, and the airlines. The consequences, both intentional and unintentional, of these decisions can be clarified and defined within the short-range development plan. Thus, wiser decisions can be made. Wiser decisions mean greater benefits for the community, the passenger, and the air industry.

One of the key objectives of the short-range development plan is a "balanced transportation system." All expansion and new airport development must be coordinated with metropolitan highway and mass transit planning. Peak hour traffic at airports often coincides with the congestion of rush hour commuting. The decisions relating to one transportation mode will influence the planning of other modes. The need for coordination of short-range transportation planning is clear.

Although this kind of coordinated transportation planning has not yet been achieved in any metropolitan planning program, the promise of greater financial support, increased responsibility, and improved technological skills point to more effective metropolitan planning agencies capable of coordinating transportation planning within the context of comprehensive planning programs.

INFLUENCE OF NEW AIRCRAFT TECHNOLOGY ON DESIGN OF METROPOLITAN AIRPORT SYSTEMS

Changes in aircraft technology have influenced airport design in the past. New aircraft technology will influence the design of the metropolitan airport systems in the future. The helicopter, the vertical and short takeoff (VTOL, STOL), etc., will introduce new planning requirements but they will not replace the need for old-fashioned airports with long runways.

The implications of rapid changes in the technology of air transport were explored with considerable imagination and insight by Branch (4), who points out that:

> Use of commercial helicopters in cities is expanding rapidly. Continued growth in this use and the development of other means of aerial travel could create a new set of city planning problems.

The new aircraft technology presently foresees the future development of VTOL, STOL helicopter, and the SST (supersonic transport). Looking at the future prospects

for each of these new developments, we can foresee a demand for a greater variety and specification of "airports." The subsidies for commercial helicopters have not changed much over the last several years. The commercial operation of helicopters is actually less than it was a few years ago. The problems are high costs, reliability, and maintenance of schedules in all weather. If the helicopter is confined to speeds of 60 to 80 knots, economical transportation may be possible. The improvement of jet engines might also lead to lower costs. More research is needed to improve the flying and handling qualities of the helicopter to achieve all-weather operation. The objectives of such research are to improve the utility of helicopters for short-range transportation in urban areas.

At present, there is no aircraft that adequately provides short- and medium-haul needs. American industry has the technology to provide such vehicles, costs of development are high. Here again, more research is needed. Aircraft with short-field takeoff may be developed utilizing modern turbine engines, the latest developments in high-lift devices and perhaps the application of boundary layer control. Such a vehicle could reduce airport traffic control problems.

At present, all types of aircraft—short-haul, long-haul, propeller aircraft, and jet transport—use the same runway, causing a large part of the congestion problem. Using the same runways, they come in over the same approach zone and leave the airport in the same direction. The shorter haul aircraft, perhaps with cruise speeds of 350 knots, can be designed to operate in and out of new shorter runways separate from existing low-speed characteristics. With improvement in airborne collision detection equipment and improvement in tower air traffic control systems, much congestion can be avoided.

G.E.M.'s (ground effect machines) merit special discussion. They appear to have several fundamental problems. As the speed of these vehicles increases, their efficiency is seriously limited. When the speeds exceed about 30 to 40 knots, the proportion of the momentum of the incoming air which is required to support the machine becomes a very small proportion of the total momentum of the air handled. At 100 knots, not more than one-fifth of the total momentum of the incoming air is used in the production of lift. At lower speeds, on the order of 30 knots, the efficiency is much better. Because this problem is inherent in the G.E.M., it might represent a fundamental technological limitation. The FAA and the Civil Aeronautics Board (CAB) have jointly determined that G.E.M.'s are not considered to be aircraft.

The long-haul aircraft are far more highly developed than the short- and medium-haul aircraft. There is a growing long-haul air transportation market in most of our larger metropolitan areas. Ninety percent of all transcontinental trips are made by air. The latest advance in the long-haul air transportation is the development of supersonic transport or SST.

The United States is now engaged in a multimillion dollar design and study program aimed at development of a supersonic transport. Initial design proposals from industry were evaluated early this year by a government team and the airlines, and improved designs are currently being studied.

The SST would serve the long-haul air market, that is, 800 mi or more. Shorter hauls will probably continue to be served by subsonic commercial jets. The SST will probably command large economic market areas. Therefore, it is anticipated that relatively few strategically located SST capability airports will be needed to serve the entire long-haul air market of the United States. If asked to define "relatively few," I would say that they will probably be limited to 20 to 30 large hubs; and further, there will probably be only one SST capability airport to serve each of our major metropolitan areas. This means that all modes of medium- and short-haul transportation will play an increasingly important role in providing connecting service to long-haul supersonic aircraft.

Several different kinds of transportation in addition to a well-developed highway system may be needed to provide the passenger with adequate total trip transportation. For instance, connecting transportation to an SST flight originating in New York might require both a rapid transit connection to serve passengers originating in Connecticut and a short-haul aircraft connection to serve passengers originating in Albany.

Similarly, an SST flight originating in Los Angeles might require rapid transit service to Riverside and a short-haul aircraft connection to Las Vegas. Obviously, developments of this nature will have planning implications for highway and transit planning as well as airport planning.

Business flying will also be affected; management will probably make even greater use of privately owned aircraft to provide direct connections from the office or the plant to the SST airport. If the SST is going to serve a large regional market, it will have planning implications for several types of transportation.

From this brief review of new aircraft technology, it is apparent that the new aircraft will supplement but not supplant the existing aircraft. Therefore, we will continue to need the traditional type of airports as well as new kinds of airports for the VTOL, STOL, and helicopters. The use of these new aircraft for interurban transportation is dependent on the development of power plants that are far more efficient in terms of power-weight ratio than the present models. They will also have to be far more compatible with the highly sophisticated air traffic control and navigation installations that are responsible for directing air traffic in the growing metropolitan areas. Major modifications in ground installations, pilot procedures, and airborne electronic equipment will be necessary if any significant amount of helicopter, VTOL, or STOL traffic is to be properly coordinated with existing types of aircraft.

NEED FOR RAPID TRANSIT SERVICE TO METROPOLITAN AIRPORTS

In the past, ground transportation to the airport has been predominantly highway oriented, largely because there is no direct rapid transit service to major airports. With the passage of the 1964 Urban Mass Transportation Act and the prospect of fast, safe, comfortable, and economic transit service, mass transit may provide a practical alternative to the auto, taxi, and limousine.

Fixed rapid transit, such as rails, subway, or monorail with its heavy costs per mile and the considerable number of miles to be traversed, cannot be justified as a facility to serve the airport alone. However, in major metropolitan areas such as New York, Detroit, Chicago, Cleveland, San Francisco, Los Angeles, and Boston, airports are part of a total urban complex. Within such consolidated metropolitan areas, the best opportunity for the economic success of rapid transit service to the airport will be where a new metropolitan transit line can be extended from an existing system to the airport. For instance, in Cleveland the Transit Authority is developing a $1\frac{1}{2}$-mi rapid transit extension from the West Side Terminal. With Federal assistance, it will be able to add another $2\frac{3}{4}$ mi to link Cleveland Hopkins Airport to downtown. In Tokyo, a monorail was recently completed between Hannada Airport and downtown. The trip which formerly took $1\frac{1}{2}$ hr by car can now be made in 15 min. The time saved is perhaps equal in significance to the development of the SST.

Transit time from the passenger's point of orgin to the airport is a matter of major concern. In many cases, the ground time exceeds the air time. With the introduction of jet transports, the margin has increased even more. For a journey of 400 mi between two large metropolitan areas, ground times are as much as double air time.

Surveys made of ground transport to the airport indicate that in the United States the majority of passengers, visitors, and airport and airline employees travel by private automobile. Indications are that this trend will continue in the future. Travel desire lines to and from the airport appear to be widely scattered; this is especially so with travelers residing in the area served by the airport. Out-of-town passenger origins and destinations seem to concentrate more in centralized hotel locations near business centers. On the other hand, many of these travelers are making use of rented automobiles.

Because of the lack of concentration of origins and destinations of air passengers in a metropolitan area and the popularity of the automobile as a personal means of transportation, the use of public transit up to now has not been large. However, as air transport keeps growing, the volumes of passengers may be large enough to warrant special means of transportation to the airport. This is especially true in large urban areas whenever the normal peak vehicular traffic periods coincide with the peak traffic

periods at the airport (often 5:00 to 6:00 p.m.). In some cities in Europe, such as Brussels and London, a train connects the airport with a downtown terminal. Other cities in Europe are planning similar installations. 'Although these installations are undoubtedly quite expensive and probably cannot be economically justified on the basis of serving the airport alone, they become useful in the future as part of a rapid transit system for an entire metropolitan area, accommodating peak hour traffic at the large metropolitan airport. Transit planners and officials should be encouraged to explore the economic feasibility of serving major airports with an "airport special" during peak ground traffic hours which are often coincidental with peak air traffic hours. The "airport special" could provide a faster, direct, perhaps nonstop trip to the airport from a convenient central city terminal in a comfortable air-conditioned atmosphere. Since the peak airport hours are usually coincident with surface transportation peaks, the transit planners might have to provide additional equipment to serve the airport needs adequately during the critical peak hour periods. Airlines could provide downtown terminal facilities and service to handle baggage from the cab or automobile at the downtown terminal straight through the airport to the destination.

Metropolitan planners should include airport service feasibility studies in their mass transit planning programs. The FAA Regional Office and the District Airport Engineer will provide assistance. It is particularly important to initiate coordination with the FAA, the airport sponsors, and transit officials at an early stage to coordinate airport transportation planning at the outset of metropolitan transportation system planning.

CONTROL OF LAND-USE DEVELOPMENT AROUND THE AIRPORT

The control of land-use development around the airport is the responsibility of the local political jurisdiction in which the airport is located. The metropolitan planning agency should review local plans, but the administration of land-use controls is a function of the local authorities. Therefore, the FAA must rely on the local community to implement the FAA standards for development of land adjacent to airports.

Land-use control is an extremely complex problem. In areas of rapid urban growth, zoning should be regarded as an interim or stopgap measure. It is not the ultimate solution. The FAA has prepared a "Model Airport Zoning Ordinance" to provide guidance for communities, but like any guide it is the implementation of guidance that counts. The power to zone the height of structure around airports is now well established under the state's police power to "promote and protect the public health, safety, morals, comfort, and general welfare of the people." With the introduction of jets, however, noise has become the critical problem.

A recent HHFA demonstration grant project (5) to determine the noise effects of jet aircraft operation on land uses in the environs of a major jet airport (the Detroit Metropolitan Wayne County Airport) concluded that "Land in the area affected by aircraft noise is not suitable for residential development."

If residential development should be restricted in the airport approach and takeoff pattern, how can owners of the land be reasonably compensated? The answer is that they cannot without a massive program of purchasing development rights around airports. Buying development rights is politically and economically unrealistic at this time. Therefore, the best approach is to (a) encourage a vigorous enforcement of zoning regulations around existing airports, (b) encourage public land acquisition at both ends of the runways of existing airports whenever feasible, and (c) require the protection of new airports by coordinating other public land acquisitions with airport development. In other words, land should be reserved at both ends of the runway for publicly owned parks, reservoirs, sewage treatment plants, landscape nurseries, aboretums, riding academies, golf courses, ets. The FAA now provides matching grants to purchase land in clear zones and the HHFA can provide up to 30 percent grants of land in approach zones. The FAA is also working with the Department of Interior to develop procedures for coordinating land acquisition programs which will be assisted by grants from Bureau of Outdoor Recreation under Public Law 88-578.

In areas where new highways are proposed near airports, highway planners should consider the feasibility of running the highway down the center of the airport approach zone for noise abatement purposes.

The purpose of this land-use coordination effort is to maximize the usefulness of the airport by avoiding conflicts between the airport and its neighbors. Guidelines for land-use planning around airports have been developed for the FAA by Bolt, Beranek, and Newman (6). Although it is not the last work in land-use planning with respect to aircraft noise, it does represent the latest state of the art in calculating composite noise ratings around airports.

The HHFA's Open-Space Land Program authorizes the Federal Government to make grants to localities of up to 30 percent of the cost of undeveloped land for recreational and conservation purposes. In the first 3 years of the program, from 1961 to 1964, the $32 million in Federal Grants for open land were primarily concentrated in large fast-growing metropolitan areas. It is also in fast-growing metropolitan areas where the need exists to protect airports from the encroachment of subdivisions and other incompatible neighbors. Clearly, much greater coordination of open space planning with airport planning should be encouraged. It is worth noting that open space grants include a 10 percent additional incentive if open space planning is carried out as part of a comprehensive metropolitan planning program.

With the expansion of airports for jets and the increasing urbanization partly attracted by the airport itself, the control of land use around airports has become an increasingly difficult and complex task. The local community or adjoining community may not be able to do the job by themselves. The Federal Government may have to provide assistance for excess land acquisition or for the preservation of open space around airports. This is one of the many problems which will not be quickly resolved but planners must take the initiative now to explore methods for avoiding conflicts between airports and their neighbors before such conflicts become frozen in place and the only solution is legal action which can only result in marginal adjustments and unhappy homeowners.

SUMMARY AND CONCLUSION

Airport system planning represents a new dimension and a new challenge to the urban planner. Metropolitan transportation planning programs should include areawide airport system planning. The planner should take the initiative in the development of airport system plans. He should seek the guidance and assistance of the District Airport Engineer in developing the airport system plan.

The planning approach suggested here is a short-range (5-year) airport system development plan based on the long-range comprehensive planning program for the entire metropolitan area. The operational short-range development plan is composed of two elements: (a) the expansion of existing airports, and (b) the addition of new airports to the system. The short-range plan should also be coordinated with the highway development plan, the mass transit development plan, and local development and land-use plans for the specific area or political jurisdiction in which individual airports, both existing and planned, are located.

The capacity of the existing metropolitan airport system should be analyzed to determine where problems of congestion are presently occurring and where problems are likely to emerge within the 5-year development period.

To make metropolitan planning programs more effective, the planner should place much greater emphasis on coordinating the short-range development plans of the functional agencies responsible for highways, mass transit, and airports, even to the extent of preparing areawide system plans for such agencies. The HHFA's 701 Urban Planning Assistance Program, which provides up to two-thirds of project cost for metropolitan planning, specifically authorizes airport planning as follows:

> a. Determination of the Number, Type, and General Locations of Airports Needed for Both Commercial and General Aviation. and

b. Relationship of Airports to Community Development, Including Consideration of Economic Factors, Land Use Controls, and the Overall Transportation System. (7)

Further, under HHFA's 702 Public Works Planning Program, the local airport sponsor in coordination with the metropolitan planning agency can also receive a 100 percent advance to cover the cost of preparing a detailed design or development plans for individual airport projects, or the local airport sponsor can use the 50 percent planning grant under the Federal-aid Airport Program which, unlike the 702 Program, does not have to be repaid at the time the specific airport project is undertaken.

The Metropolitan Planning Review Bill (S. 855), which has at the time of this writing unanimously passed the Senate and is pending in the House, would require that a number of Federally supported projects, including airports and other transportation facilities, be reviewed by official metropolitan planning agencies for consistency with each other and with general development plans and policies for the area as a whole. However, even if S. 855 does not pass, future legislation affecting functional development programs will require review by metropolitan planning agencies. Metropolitan planning must take the initiative now to make these review procedures meaningful in the future. This opportunity to make planning programs effective has presented the metropolitan planner with a great opportunity and a tremendous challenge to produce the kind of practical and realistic, yet farsighted and inspirational, planning program that is needed to create a more efficient and workable urban environment.

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