The Region's Airports
A policy on air travel for the New York Region

I. INTRODUCTION

Expanding major airport capacity is one of the biggest development decisions the New York Region will be making over the next several years.

A new airport would cover 15-25 square miles—an area that could instead house a complete new town of 75,000-200,000 persons.

An airport is a magnet that with one pole attracts certain kinds of development, like manufacturing and motels, and with another pole repels development by the noise and activity it generates.

Well located, it could draw to it some 100,000 persons per day, for whom a new or partially new transportation system would have to be built. Poorly located, it could be a half-billion dollar white elephant, actually deteriorating the Region's air service.

No one yet knows whether any of the proposed airport sites would relieve pressure on the present three major airports significantly. The Port of New York Authority's past reports suggest they would not.

No one yet knows the relative cost of the several alternatives for meeting the demand for fast inter-city travel. There are several ways of expanding air travel capacity and possible alternatives to air travel for some trips.

And no one has laid out the full costs of even one of the ways so the public can rationally compare the costs of adding capacity for fast inter-city travel with the benefits of the added travel. For example, by continuing present policies on non-airline flying (general aviation), a fifth and probably a sixth major airport would be needed before the end of the century. If the policy toward general aviation were changed to charge private fliers the real costs of their use of the major airports and to discourage use by small planes of fields built for huge airliners, it is even conceivable that no additional capacity for airliner movements would be needed by the turn of the century. The Port Authority’s own projections indicate that added capacity would not be needed by 1980. Yet only Regional Plan Association has presented the issue of general aviation as a critical element in the airport decision.

Persons who use airliners see only the delays they now suffer. They are not told the potential for satisfying air travel demand without adding a fourth airport: diverting general aviation, improving air traffic control, encourag-
ing enlargement of airliners, spreading peak airliner movements, expanding present airports. They do not consider the impact of the added airport on the Region as a whole.

Persons living near the site of proposed airports see only the personal loss they would suffer if a new airport is built.

There is insufficient evidence to convince the flying public that an additional airport is not needed; there is insufficient evidence to convince residents near proposed sites that their sacrifice is necessary for the good of the Region.

This paper points the way to provide more convincing evidence. It argues that before building more airport capacity, this Region should consider what it will be getting for the cost, including not just the cost of constructing an airport but also the cost of transportation to it, the cost to the airlines of operating an additional airport, the cost of noise and the disruption of the development forces a new airport lets loose. Then, all the alternatives for achieving added air travel service should be analyzed and compared. A fourth airport lying far from the Region’s center is not the only way of obtaining it.

This is obvious: who would pay upwards of a half-billion dollars for a commodity and not even know what added service he is really buying? Who would go into a project covering some 20 square miles without exploring possible alternatives?

This Region is about to do just that.

II. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSION 1

There are two emergencies in the New York Region’s air-travel service—neither of which can wait nor need wait for a new airport.

The first is existing congestion on air lanes and runways of three major airports of the Region—Kennedy, LaGuardia and Newark—during peak periods. The second is the prospect of severely intensified congestion on highways leading to Kennedy Airport by 1971.

The air lanes-runway congestion emergency consists of the danger of an accident in airspace crowded with circling planes waiting to land or the possibility of another Black Friday in which planes are stacked up for several hours.

However, the Federal Aviation Administration (FAA) regulation which went into effect June 1 is greatly limiting the peak-hour delays. Before the regulation, any aircraft was allowed to take off or land at any time—first come, first served. Once certified to serve a particular route, an airline could schedule flights for any hour. Frequently, four or five flights, unrealistically, have been scheduled to leave or arrive at exactly the same moment at the same field. And any private plane, no matter how small, could delay a large airliner just by asking for permission to take off or land ahead of the airliner’s request. Under the June 1 regulation, airlines have agreed on limits to scheduled commercial flights during peak hours. No more than 168 airliner movements per hour are allowed. Non-airline flights are limited to 42 during each peak hour when inclement weather requires Instrument Flight Rules (IFR), about 15 percent of the time. In addition, extra sections of the shuttles to and from Boston and Washington are allowed. These 210 flights (plus extra shuttle sections) mean some delays during IFR periods but not lengthy circling nor serious inconvenience for people coming to meet flights. In better weather, under Visual Flight Rules (VFR), more than the 210 movements can be handled without delay.

The June 1 regulation may eventually mean that some persons will have to take airline flights somewhat earlier or later than they prefer. But this is not certain because consolidation of flights may instead mean fewer vacant seats and possibly larger airliners so that fewer flights could end up serving the full peak-period passenger demand.

If large numbers of airline passengers are inconvenienced by the limitation on airliner movements in peak hours, the 42 peak-hour IFR flights allocated to general aviation provide a cushion. They now allow about 100 passengers to pre-empt space that could be used by well over 2,000 persons in airliners. If used for airliners, these 42 flights would allow a 25 percent increase in peak-hour airline passengers. (See below.) Indeed, reduction of general aviation could open sufficient capacity under present conditions to meet all airline passenger demand at least until 1980, according to Port of New York Authority projections.

Furthermore, air traffic control technology is improving and new methods are available, particularly computer-aided spacing of approaching aircraft and area navigation, which could be applied to the New York Region’s air space to raise the number of airplane movements per hour. Hourly capacity at the three major airports has risen considerably over recent years despite frequent allegations that absolutely no more flights per hour could be achieved.

RECOMMENDATION 1

The sense of emergency about the Region’s air service should not be allowed to precipitate construction of a new airport which may not be the best way to provide added air travel capacity and may not even serve the great majority of those seeking to travel from the present three major airports. Instead, the June 1 FAA
regulation on peak-hour movements should be continued, general aviation should be further limited during peak hours if airliner passengers are seriously inconvenienced by a shortage of peak-hour capacity, and the FAA should intensify research on new air traffic controls and their application to raise the number of peak-hour movements possible to and from the present three major airports.

The ground transportation emergency will become acute within three years when a large number of B-747's start landing at Kennedy airport. If six of these planes, each with 65 percent of the seats occupied, land or take off within a five-minute interval, 1,400 airline passengers will have to move through the airport within five minutes. If they all go to or from the airport by car, the vehicles will fill six lanes of expressway solidly for five minutes. Since automobile travel to Kennedy airport is at capacity during the same hours as the airport will be operating at peak, there is much more likelihood of a severe back-up in movement of air passengers on the roads than on the runways if rail service is not rushed.

Regional Plan's analysis indicates that rail service to Kennedy airport would be one of the best transportation buys in the Region, comparing costs and benefits as usually calculated for transportation investment. Cleveland's experience with airport rail service buttresses this finding. There, despite a highly inconvenient airport rail terminal, requiring a 350-foot walk to the check-in counter through a narrow corridor and across a taxi stand, the service has been more successful than anticipated. By contrast, the taxi ramp is all but deserted.

RECOMMENDATION 2

The Metropolitan Transportation Authority, Port of New York Authority and New York City should proceed quickly to conclude agreement on rail service to Kennedy airport and expedite its construction. The rail terminal must get preferential pedestrian access.

A connection from the new Newark Airport terminal to the Penn Central Railroad should likewise be given prompt attention, and provision for it made in the construction of terminal approaches.

CONCLUSION 2

Total demand for air travel capacity over the rest of the century could be far more accurately projected than it is now. Differences in projections of demand lead to different choices for serving air travel in the Region, and therefore to different numbers of additional runways that would have to be built at different locations.

A rail route satisfying New York City Board of Estimate objections was announced by the MTA on October 8, 1968, and the site of an air terminal at Penn Station on June 2, 1969. Still unresolved is the rail terminal plan at the airport (under study by the Port Authority and MTA), and cost and revenue sharing arrangements with the City (still under negotiation). Nor is the design of the East Side rail-air terminal settled.

1. Total airline passenger demand. (For fuller analysis, see pp. 8-9.) Reasonable projections of airline passenger demand for 2000 vary, on the basis of present data, from about five times today's passengers to nearly eight times.

Air travel growth has been very closely tied to rising per capita income over the past two decades. We might assume a continuation of this close correlation, but even so, travel demand could vary between wide limits because the growth rate of per capita income is not easy to predict. The high rate of growth of the 1960's may not continue; the more moderate growth pace of the 1950's may occur instead. The Port of New York Authority's projections parallel the travel demand that would result if per capita income rises at the 1950-67 rate. The FAA projection more nearly follows the higher projection that would result if per capita income continued to rise at the 1962-1968 rate. (See Table 1, p. 8.) Most previous air travel projections for the Region have been low so we cannot rely fully on the lower projections; nevertheless, they are not unreasonable.

While many of the elements that make up a demand projection cannot be known with any certainty, some that contribute to the demand—for example, future fares—can be predicted with some assurance. However, not much effort seems to have been made to do this.

2. Airliner size. (For fuller analysis, see pp. 9-14.) The principal limit in the Region on air travel is the capacity of the air space and the runways, i.e., a limitation on the number of airplanes that can move in and out of the present airports in a specified time. Larger aircraft can increase the number of passengers moving in and out of the Region within the same limit on aircraft movements; therefore, airliner size is a very important variable.

It is reasonable to assume larger aircraft as passenger demand rises. Figure 2 (p. 11) shows the trend in passengers per landing or takeoff. This ratio has remained between a quarter and a sixth of the capacity of the largest airliners flying. The largest airliner will shortly be the B-747, which will have 360 or more seats, compared to the existing B-707, which carries 140-180. (There are only a few DC-8-61's, carrying up to 260, in regular airline service.) If long-term trends in aircraft size continue—as there is every indication they will—in the year 2000, planes will be flying with 1,500-2,000 seats. In fact, planes seating up to 2,000 passengers already are technologically though not yet economically feasible. Given these prospects for larger airliners, the projection of airliner movements in the year 2000 varies—depending on total demand and how fast the planes grow—from 1 million to just under 1 1/2 million per year.

3. General aviation. (For a fuller analysis, see pp. 16-20.) Demand for travel by non-airline planes can be expected to rise at about the same rate as demand for airliner seats—at least five times the present demand by the year 2000. However, while total airliner movements
are kept in check by rising passengers per plane, this is not true of general aviation. Like the automobile and taxicab, general aviation is mainly a personal movement system and therefore is likely to continue to carry very few persons per movement. So the prospective demand for general aviation movements is not a 50-100 percent rise by 2000 like that of airliners, but rather a rise equal to the increased passenger demand, at least five times today's general aviation movements. If general aviation demand were to be accommodated at the major airports in the future, the way it has been in the recent past, general aviation movements would be equal to or exceed airliner movements before the year 2000.

And if this demand were to be accommodated at major airports, the Region would need not one more but at least two more major airports by the end of the century.

However, it is not necessary to provide for small planes the long runways and costly facilities required at major airports for airliners. Furthermore, mixing small and large planes in the air traffic system is inefficient. Therefore, building more major airports mainly for general aviation is not a rational course to take.

General aviation flights carried an average of only 2.7 persons per plane, including the crew, when surveyed last in 1963. Airliners now carry an average of 51 passengers in addition to the crew. It therefore seems both unwise and unfair to delay airliners by allowing free movement of general aviation at the major airports. Since general aviation pays far less than airliners for the same scarce commodity—time on the runway and in the space above the runway—and uses as much or more time as do airliners, the unfairness is even clearer. During peak hours, airliners pay an average of $75 landing fee while general aviation pays $25.

Raising landing fees for general aviation during peak hours at the three major airports from $5 to $25 in August 1968 cut general aviation peak-hour movements by about 30 percent. Raising these fees to the airliner level probably would eliminate most general aviation during peak hours.

**RECOMMENDATION 3**

Landing fees for all flights should be based on time in the immediate landing-takeoff flight path and on the runway, which means that general aviation should pay about the same landing fee as airlines at the three major airports. If this does not reduce general aviation flights to the three major airports enough to allow nearly all airline passengers to fly when they wish, consideration should be given to banning general aviation flights from the three major airports entirely during those hours when there is enough demand for airline flights to fill the airports' capacity. But facilities should be improved for general aviation at Teterboro, Republic, Westchester County and other smaller airports, where serving general aviation would be less costly than at the major airports.

4. **Possible diversion of passengers to V/STOL.** (For fuller analysis, see pp. 14-15, 23.) Short Take-Off-and-Landing and Vertical-Take-Off-and-Landing (V/STOL) aircraft already are feasible for many flights now made to and from the major airports. STOL flights use different airspace from conventional airplanes and need only 1,500-foot runways compared to the 6,000-14,000-foot runways available at the three major airports. To be economically feasible for airliner service, STOL planes must be enlarged to carry at least 100 passengers. Then, even though they would be slower than conventional airliners, STOL planes could theoretically replace up to 43 percent of all airline movements at present airports—those to destinations within 250 miles of the airports—plus all air taxi movements, which represent about half of general aviation movements. But can STOL airports be developed rapidly enough, and can so many STOL flights fit into the Region's airspace? The degree to which STOL and/or a new generation of vertical-takeoff aircraft can divert passenger demand from present airports should be calculable with fair accuracy in the near future.

5. **Possible diversion to high-speed conventional rail service.** (For fuller analysis, see p. 14.) Another possibility for diverting some air travellers, alternative or supplementary to STOL or VTOL, is improved high-speed ground transportation. Conventional rail may be speeded sufficiently to attract a sizable proportion of the air passengers travelling to the five major cities along the Boston-Washington rail line. Future forms of ground transportation, now in the development stages, may divert all such travellers. At present, about 27 percent of the plane movements from the three major airports make a first stop at one of these five cities. Some of these flights would of course continue even if all Boston-Washington corridor travellers used ground transportation, but many might be eliminated.

If STOL or VTOL can handle most persons taking short trips, conventional ground transportation is not likely to provide much additional diversion. But when the V/STOL port capacity fills up, as it could by the end of the century, high-speed ground modes may have to relieve V/STOL along heavily travelled corridors (e.g., to Philadelphia or Providence) and let V/STOL serve destinations where demand is lighter.

6. **Peak-hour movements.** (For further analysis, see pp. 20, 24-27.) The critical element in runway-air space needs is the demand for landings and takeoffs during peak hours. Presently, 8 percent of airline movements on typical days occur during the peak hours.

This peaking factor is important. For example, the 1985 low passenger projection would result in 244 peak-hour plane movements, assuming no diversion to STOL.
or ground modes, if 8 percent of the movements occurred during a peak hour. This is way above the present capacity of 210 per peak hour. However, if only 7 percent of the movements occurred during a peak hour—that is, if peak movements were spread over a little longer period—the number of peak-hour airline movements would be cut to 213, hardly more than the airports’ capacity.

As noted above, the public does not know the data with which to project the effect on passengers of spreading the airplane movement peak by not providing additional peak-period capacity. The number of vacant seats on duplicate flights during peak hours is not public information, and the economics of using larger aircraft if some duplicate peak-period flights are eliminated has not been analyzed. Neither is it known how much it is worth to travellers to leave or arrive during peak periods, i.e., how many passengers would choose non-peak-hour flights if a substantial surcharge were placed on flights in the busiest periods. If the Region is to spend over a half-billion dollars on a massive airport and, in addition, suffer serious disruption just so that 5,000-10,000 persons a day can fly during the exact hour they prefer, we should at least know how much that preference is worth to them individually.

In sum, the low projection of total passenger demand almost certainly could be handled over the rest of the century at the present three airports if STOL and/or high-speed rail divert traffic as anticipated above and if average aircraft size continues to rise at about the rate it has in recent years.

Since airliner size already is limited more by economics than technology—i.e., the size is kept down because larger planes cannot yet be economically filled—whether passenger demand follows the high projection or low and whether part is diverted to STOL or not, it is conceivable that airliner movements can be kept within the capacity of present airports simply by increasing plane size as necessary. In other words, the higher the demand, the larger the plane size that is economic. Particularly if metropolitan areas throughout the world become less and less hospitable to new airports, as seems likely, and airplane movements must be rationed in many places, passenger demand may be satisfied simply by enlarging airliners.

Because of the numerous unanswered questions about demand for airspace and runway capacity, the need for additional runways for the year 2000 could be anywhere from zero to four or even more, depending on which set of assumptions one chooses.

CONCLUSION 3

Building a new airport far from the Region’s center may not satisfy air travel demand even if demand grows faster than the peak-hour capacity of the present major airports. (For further analysis, see pp. 26-30.)

Without assignment of present and future passenger demand to specific airport sites—an essential part of estimating the use that these airports would receive—no one can satisfactorily estimate the value of an outlying airport site to the Region.

The Washington experience is instructive: crowded National airport handles eight times the passengers of splendid Dulles airport only because it is twenty minutes closer to downtown Washington. If the largest jets could land at National, the relative passenger traffic at Dulles would be even smaller.

Almost 50 percent of all airline passengers in this Region go to or from Manhattan. At a time when Kennedy airport will be 16-20 minutes from Manhattan by rail, it is doubtful that many persons will voluntarily travel 40-50 minutes by train to an outlying site.

TRAVEL TIMES FROM MANHATTAN TO PROPOSED AIRPORT SITES
(assuming rail service averaging 60 m.p.h.
with two intermediate stops)

<table>
<thead>
<tr>
<th>Location</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solberg-Hunterdon</td>
<td>44</td>
</tr>
<tr>
<td>Pine Island</td>
<td>56</td>
</tr>
<tr>
<td>Allentown (via Princeton Jct.)</td>
<td>60</td>
</tr>
<tr>
<td>Stratford Shoals</td>
<td>65</td>
</tr>
<tr>
<td>Calverton</td>
<td>77</td>
</tr>
<tr>
<td>cf. Kennedy Airport rail service being planned</td>
<td>16-20</td>
</tr>
</tbody>
</table>

As the Region spreads outward, a smaller percentage of air passengers will be coming from or going to Manhattan. Nevertheless, only about 5-15 percent of those likely to want to use the present airports in 2000 can be expected to be diverted to any of the outlying sites now being considered: only that number will live sufficiently close to one of the proposed new airports to choose it over one of the present three airports.

In the comprehensive Port Authority reports issued in 1961 and 1966, Solberg-Hunterdon, which has the largest tributary population and the shortest access time to Manhattan among the sites studied, was said to be too far from the Region’s Core to attract many passengers. The 1961 report read:

The Solberg-Hunterdon site is a poor location in relation to the Region’s traffic generating center and would result in a significant reduction in use by the Region’s potential air passengers.

Of course many of the proposed outlying sites, and foremost among them Solberg-Hunterdon, would serve large numbers of residents now beyond easy access to the Region’s present airports. These airports would, then, be useful for local needs. Solberg, for example, might serve as many people as the Hartford regional airport does now. But it might not relieve the present three airports significantly because people could well behave as they do in Washington now, choosing the close-in airports with some delays or scheduling constraints instead.
CONCLUSION 4

Even if an outlying airport would relieve pressures on the three present airports, it may not be the best way to do it. (For further analysis, see pp. 26-32.)

A new outlying airport would cost upwards of a half-billion dollars. Intermittent noise from the airport loud enough to interfere with outdoor conversation could cover four corridors emanating from the four runways totalling an area of some 240 square miles (an area larger than Bergen County or just over half the size of Hunterdon County, New Jersey). A fourth airport would add considerably to airline operating costs—extra buildings, extra places to man, duplicate flights to places already served from existing airports with no improvement in schedule frequency. It would complicate travel for many passengers since flights would be divided among four airports instead of three; transfers would be more difficult. Furthermore, "it is an axiom of air traffic control design that existing airports should be used to their maximum before building a new airport, because the complexity resulting in the airspace by the addition of another airport is great compared with the increase in capacity that results," as the Airborne Instruments Laboratory, a consultant to the Port of New York Authority, has observed.

Therefore, building such an airport unnecessarily would be a tremendous waste. What we must have before making such an investment is a systematic comparison of the full costs and benefits of the several possibilities for providing added runway space.

Some of the alternatives to an outlying airport are:

1. Expanding present airports. (For further analysis, see pp. 24, 30-32.) Newark airport runways could be doubled by relocating Port Newark and Port Elizabeth. The cost might be as high as $300 million to rebuild the ocean ports before airport construction begins, but there would be travel and ground transportation investment savings, no significant additional noise damages would be incurred because noise patterns would extend over swamplike areas in Staten Island and the Hackensack Meadows, and the airlines probably would have lower total operating costs by retaining three airports than they would have with four major airports.

Kennedy might be expanded by two additional runways in Jamaica Bay. The FAA is studying how much capacity this would add; the Port Authority earlier estimated it at 35 movements per hour, but it could be considerably more than that. The cost would include the elimination of a bird sanctuary, possible ecological damages caused by filling half of Jamaica Bay, and possibly added noise impact on Brooklyn, Queens and Nassau. But significant travel and ground transportation advantages and airline operating savings would accrue compared to building a wholly new airport.

2. Close-in airport in the Ocean or Lower Bay. (For further analysis, see pp. 32-33.) An airport with twice the capacity of Kennedy might be built in the Atlantic Ocean about four miles south of Long Beach, where water is only forty-five feet deep—connected to the mainland with a causeway. This would replace Kennedy. Rail service from Manhattan would be 10-15 minutes longer than to Kennedy. Benefits compared to a new outlying airport would include its central location to the Region's population, frequent schedules at one very large airport, airline operating economies possible by not having to man a fourth major airport, and the elimination of all Kennedy airport's noise damages on Nassau, Queens and Kings Counties. On the other hand, the waste of at least part of the large investment in Kennedy must be considered, likely to be offset only partially by the value of other uses to which that eight square miles might be put. The costs would include over $1 billion just to build the island, although this might also serve other purposes, such as waste disposal (sanitary landfill) and a nuclear power generation site. (Waterside sites for nuclear generating plants are increasingly scarce.) But even applying a cost of $1 billion extra to the airport, passenger use would be so great that the total extra cost would be amortized over twenty years with a $1 surcharge per passenger.

An airport on a new island in the Lower Bay, replacing Newark and LaGuardia, also may be feasible. Cost of building the island would be a third or less than the Ocean island because the water is much shallower and better protected. It could be connected to the land by three approaches, as opposed to one to the Ocean site. Single-point access may be a serious limitation on the usefulness of that site. Also, the Lower Bay site would provide better access for more people, particularly from New Jersey, than an Ocean airport. However, it would not eliminate as much noise damage as the Ocean site. Moreover, under present air traffic patterns, it would subtract almost as much air traffic capacity at Newark and LaGuardia as it would add. Therefore, its feasibility is contingent upon new air traffic patterns—for example, on converting Newark and LaGuardia to exclusive STOL operation.

Among the unresolved problems of these alternatives are construction methods, hydrology, and room for storage for freight containers.

3. High-speed access to distant sites. (For further analysis, see p. 30.) A third alternative will be possible when ground transportation capable of scheduled speeds in excess of 200 miles per hour becomes available. Gravity-vacuum trains, propelled underground by gravity and air pressure in an evacuated tube, offer one possibility of speeds which could bring an airport in the Pine Barrens of central New Jersey or at Stratford Shoals in Long Island Sound off Bridgeport within about 25 minutes of Manhattan with several intermediate suburban stops. Therefore, the rate of development of a high-speed surface or subsurface train will have a tremendous effect on the choice of the best future airport site.
Choosing an alternative. Clearly, some of these options are mutually exclusive. For example, development of an airport in the Ocean is not likely to follow the addition of new runways at Kennedy and substantial new investment in its facilities. Likewise, new runways at Newark may make the development of another airport in New Jersey unnecessary. On the other hand, the development of an outlying airport in the "northwest quadrant" of New Jersey does not conflict with a future Atlantic Ocean airport.

Before future options are precluded by current action, an explicit long-range strategy is needed, justified as being more beneficial to the public as a whole than any alternative solution. The values of the majority who fly only infrequently should be included as well as the values of those who spend a lot of time travelling. The value of a bird sanctuary, the cost of noise pollution, the value of passenger man hours saved, air pollution prevented—all difficult to assess—must be included in an evaluation of social and economic factors. The final answer must consider the great importance to the total economy of the Region of those whose travel minutes are valued in hundreds of dollars. Easy access for them makes it possible for this Region to be the world business capital and home of the United Nations. But this must be balanced by consideration of the quality of environment, which is increasingly important to all residents.

RECOMMENDATION 4
Study of the key unknowns in the airport decision process should be assigned immediately by the three States to a neutral agency, probably the Tri-State Transportation Commission. (Regional Plan Association also will continue research on airport issues.)

RECOMMENDATION 5
Because the final decision must include subjective as well as objective costs and benefits, governmental units responsible directly to all the people of the Region should make the decision—probably the three States.

RECOMMENDATIONS 6, 7, 8
A compatible system of STOL airports should be planned immediately by the Port of New York Authority with the aid of the Tri-State Transportation Commission before opportunistic acquisition of sites precludes an efficient network.

STOL strips for air taxis should be provided quickly at all three major airports.

The U.S. Department of Transportation should foster research on large V/STOL aircraft, taking full benefit of the research of the Defense Department and foreign governments, and on gravity-vacuum technology for ground transportation.

CONCLUSION 5
Once total effective demand has been compared with the full cost of providing the air travel capacity to accommodate it, this Region may determine that at some point the cost of additional air travel capacity is greater than its prospective benefits.

A new airport, for example, may buy a substantial number of additional flights throughout the day, greatly enlarging the number of persons who can speedily reach this Region. But it may only buy the opportunity for a few thousand daily overseas travellers to take off or land during the exact hour they choose, rather than an hour or two earlier or later. Or it might mean only that people of the next decades will be able to fly their cars to Los Angeles and drive them back.

The assumption that all air travel demand must be accommodated at whatever cost is, of course, not valid.

The airspace over an urban region as heavily populated and compact as that of New York-New Jersey-Connecticut is not unlimited. Like the capacity of Manhattan streets to accept additional motor vehicles, the capacity of the Region to accept additional aircraft has its limits even if they are not yet clear. There are other limits to air travel besides airspace. The Region's natural resource base cannot indefinitely accept new airports. Nor can the Region's residential areas accept ever-increasing noise in the sky.

Air access to the Region, therefore, will have to be regulated to encourage the most efficient use of air and land space, and if the potential for air access becomes inadequate, part of the burden will have to be shifted to high-speed ground modes, such as today's high-speed rail and even faster ground modes in the future.

The implication is clear for general aviation. While better accommodations for private and corporate flying to the Region can and should be provided on small fields, almost certainly less general aviation can be accommodated in the Region than will be desired.

CONCLUSION 6
Still, after all elements are adequately considered, a new outlying airport may turn out to be the best long-range solution for the Region as a whole. By that time, however, the best sites for such an airport may very well be built up enough to preclude their use for an airport.

RECOMMENDATION 9
The study of airport needs and alternatives should immediately look into the feasibility of purchasing an airport site or purchasing the development rights to such a site even before it is certain that the site will be needed as an airport. If an outlying airport does not prove likely to be beneficial, the site will be valuable for many other public purposes, for example, for parkland or a new town. In a fast-rising real estate market, no public funds would be lost.
III. ANALYSIS

Air passenger travel demand

Airline passengers at the three major airports of the Region increased tenfold over the past twenty years, from 3.6 million in 1948 to 36.7 million in 1968. The latest Port Authority projection anticipates 45 million in 1970 and 91 million in 1980. This represents a substantial upward adjustment of the Port Authority's 1966 forecast.\(^1\) Other projections, including those of the FAA and the air industry, assume faster rates of growth. For example, if the recent average growth rate of 13 percent annually were to continue into the future, passengers at Port Authority airports would double every five and a half years. While this trend clearly cannot continue—if it did, within twenty-five years every man, woman and child in the Region would be averaging three air trips a month—explosive growth can be expected to continue even though it has begun to slow down.

An adequate short-cut method for projecting air passengers is to look at the relationship between per capita income in the Region and per capita flights from Port Authority airports. As Table 1 shows, in the "jet age" between 1962 and 1968, per capita trips from the three airports rose from .97 to 1.86, while per capita income in constant dollars rose from $3,430 to $4,000. On the average, during that period, a $100 increment in per capita income implied about .16 additional per capita trips. This relationship should not be taken literally, in the sense that people spend some 6 percent of their income on air travel; about half the travellers are nonresidents of the Region and about half of all air travel is business travel,\(^2\) not made directly at the traveller's expense. The relationship is simply a gross measure to tie per capita travel to an index of economic growth, and most of the variation in per capita trips can be explained by changes in income alone. Given a projection of future income, then, future per capita trips can be reasonably estimated. As seen in the second part of Table 1, the resulting projection of all trips, assuming a continuation of the 1950-68 per capita income growth rate, is very close to the Port Authority 1968 forecast.

The salient features of the projection in Table 1 are the total number of trips in the year 2000—250 million, more than a sixfold increase over 1968—and the corresponding figure of 8.25 trips per capita, a more than fourfold increase. Assuming that the Region's residents will continue to account for about half the trips at the three major airports, this projection would imply, as an example, that 90 percent of the Region's population of fourteen years of age or older would make an average of 7 one-way trips a year. If, over the next thirty years, average per capita income is doubled, and the proportion of households with incomes over $10,000 is tripled, as projected from 1950-68 income growth, and if there is a continued relative decline of air fares compared to all other consumer prices, these figures do not appear unreasonable.

But the income forecast in Table 1 is conservative. It assumes that between 1970 and 2000, per capita income in constant dollars will grow at the same rate as it did between 1950 and 1968, namely 2.13 percent annually. In fact, between 1963 and 1967, the rate was closer to 3 percent annually and there was then a parallel acceleration in the rate of growth in air travel.

To prevent an underestimate of air travel demand, it is useful to complement the conservative projection in Table 1 with a "high" projection which assumes that per capita income in constant dollars will continue to grow at an average rate of 3 percent annually. Such an assumption would yield 110 million annual trips in 1980 and 360 million in the year 2000—close to a million daily

---


---

Table 1.  

<table>
<thead>
<tr>
<th>Per Capita Income in 1965 dollars(^{1})</th>
<th>Study Area Population(^{2}) (000's)</th>
<th>Trips to and from PA Airports(^{3}) (000's)</th>
<th>Annual Trips Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>2,698</td>
<td>15,147</td>
<td>5,081</td>
</tr>
<tr>
<td>1955</td>
<td>3,044</td>
<td>16,385</td>
<td>10,729</td>
</tr>
<tr>
<td>1956</td>
<td>3,167</td>
<td>16,633</td>
<td>11,975</td>
</tr>
<tr>
<td>1957</td>
<td>3,191</td>
<td>16,681</td>
<td>13,283</td>
</tr>
<tr>
<td>1958</td>
<td>3,109</td>
<td>17,128</td>
<td>13,428</td>
</tr>
<tr>
<td>1959</td>
<td>3,226</td>
<td>17,376</td>
<td>15,372</td>
</tr>
<tr>
<td>1960</td>
<td>3,280</td>
<td>17,624</td>
<td>15,967</td>
</tr>
<tr>
<td>1961</td>
<td>3,304</td>
<td>17,895</td>
<td>16,301</td>
</tr>
<tr>
<td>1962</td>
<td>3,429</td>
<td>18,167</td>
<td>17,675</td>
</tr>
<tr>
<td>1963</td>
<td>3,444</td>
<td>18,438</td>
<td>19,782</td>
</tr>
<tr>
<td>1964</td>
<td>3,555</td>
<td>18,710</td>
<td>22,864</td>
</tr>
<tr>
<td>1965</td>
<td>3,676</td>
<td>18,981</td>
<td>25,826</td>
</tr>
<tr>
<td>1966</td>
<td>3,782</td>
<td>19,230</td>
<td>28,504</td>
</tr>
<tr>
<td>1967</td>
<td>3,890</td>
<td>19,479</td>
<td>34,195</td>
</tr>
<tr>
<td>1968</td>
<td>4,006</td>
<td>19,757</td>
<td>36,772</td>
</tr>
<tr>
<td>1970</td>
<td>4,230</td>
<td>20,226</td>
<td>46,500</td>
</tr>
<tr>
<td>1975</td>
<td>4,700</td>
<td>21,713</td>
<td>66,200</td>
</tr>
<tr>
<td>1980</td>
<td>5,215</td>
<td>23,385</td>
<td>91,200</td>
</tr>
<tr>
<td>1985</td>
<td>5,930</td>
<td>25,193</td>
<td>128,500</td>
</tr>
<tr>
<td>1990</td>
<td>6,430</td>
<td>27,029</td>
<td>157,000</td>
</tr>
<tr>
<td>1995</td>
<td>7,140</td>
<td>28,668</td>
<td>200,000</td>
</tr>
<tr>
<td>2000</td>
<td>7,950</td>
<td>30,186</td>
<td>250,000</td>
</tr>
</tbody>
</table>

Sources:
3. Through 1968, Port of New York Authority, Airport Statistics; after 1968, calculated on the basis of income, population, and per capita trips, as described in the text.
trips. This is not dissimilar from the forecast used by the FAA,\(^1\) which is carried through 1985. However, the relative drop in air fares built into the FAA forecast may not materialize to the extent anticipated because indirect operating costs of airlines are rising faster than the productivity of the airlines. A comparison of the different projections is given in Table 2 below.

Table 2.

<table>
<thead>
<tr>
<th></th>
<th>COMPARISON OF ANNUAL AIRLINE PASSENGER TRIP PROJECTIONS FOR THE AREA SERVED BY THE THREE MAJOR AIRPORTS (in millions)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port Authority 1967 forecast</td>
<td>FAA 1967 forecast</td>
</tr>
<tr>
<td>1970</td>
<td>45.6</td>
<td>43.5</td>
</tr>
<tr>
<td>1975</td>
<td>69.7</td>
<td>73.7</td>
</tr>
<tr>
<td>1980</td>
<td>91.0</td>
<td>123.0</td>
</tr>
<tr>
<td>1985</td>
<td>184.0</td>
<td>126.5</td>
</tr>
<tr>
<td>1990</td>
<td>157.0</td>
<td>208.0</td>
</tr>
<tr>
<td>1995</td>
<td>200.0</td>
<td>280.0</td>
</tr>
<tr>
<td>2000</td>
<td>250.0</td>
<td>360.0</td>
</tr>
</tbody>
</table>

In subsequent statements, the Port Authority projection is combined with the Regional Plan "low" and called the "low" variant, whereas the Regional Plan "high" is adjusted upward, to the FAA forecast, to yield the "high" variant. The resulting numbers are shown in Table 5 and are represented graphically at the top of Figure 1.

Demand for airliner movements

The tenfold increase in air passengers between 1948 and 1968 was accompanied by a relatively slower growth in airline plane movements at the Port Authority airports. Over the past twenty years, airline passenger plane movements increased about 3.6 times, from 198,000 in 1948 to 720,000 in 1968. This is so because the average number of passengers per plane movement increased nearly three times, from 18 in 1948 to 51 in 1968. Any projection of future airplane movements thus depends upon future passenger load estimates.

Future passenger load per plane is not easy to forecast since it depends on the future route-structure of the airlines:

- How many passengers will fly between different pairs of cities (big planes cannot be used on lightly travelled routes)?
- What frequency of service is desired on different routes (every hour? every half-hour? non-stop service to how many small cities)?
- How many competing airlines will fly the same route?
- How will multiple airports in one city increase the demand for airplane movements?

How will federal regulation of airport capacity affect passengers per plane?

How will the introduction of the relatively small Supersonic Transports (SST) affect the demand for plane movements (e.g., what share of the market will they get)?

Generally, what will be the economics of operating relatively small planes in the age of super-jumbos and how will plane size affect rate structure and hence demand?

Clearly, only a nationwide and partially worldwide systems analysis of the air transport network would be able to yield answers to these questions and project future average load per plane under varying assumptions.

Such a large-scale study with public policy as its objective does not now exist, though the FAA has taken steps in this direction. In its absence, the present paper can only extrapolate recent trends, noting that the pressure of scale economics in the air industry so far has proven quite irresistible, even if countered by the pressure for more frequent service.

Passengers per plane movement and aircraft size. Figure 2 (page 11) and Table 3 (page 12) show the historic trend in airline passengers per plane movement at the three major airports. This number is somewhat smaller than the "load factor" usually employed, the average number of airliner seats occupied. It does not take into account through passengers; it is merely a ratio relating the number of arriving and departing passengers to the number of airliner landings and take-offs. As indicated earlier, this ratio increased from 18 passengers per plane movement in 1948 to 51 in 1968.

Except for two slowdowns in the growth of passengers per airliner movement at the three major New York Region airports, which occurred just before the introduction of larger equipment in the mid-'fifties and the late 'sixties, this trend has been a fairly stable one. If extrapolated into the future, it would suggest about 100 passengers per plane movement in 1980. This closely conforms to the Port Authority projection of 98 passengers per plane movement in 1980. Further extrapolation, much more conjectural, would suggest 300 passengers per plane movement in the year 2000. It is also informative to compare the trend in passengers per plane movement to the trend in the largest available aircraft size. The latter is likewise charted on Figure 2.

The size of the largest available aircraft increased from 89 seats on the DC-6 in 1948 to 259 seats on the DC-8-61 in 1967, or 2.9 times, a growth rate comparable to that of the average passengers per plane. In fact, the passengers per plane have amounted fairly consistently to between one-quarter and one-sixth of the number of seats available on the largest aircraft flying at the time. This suggests that both the profitable load factor (generally close to 60 percent of seats filled) and the relative frequency-distribution of aircraft sizes have remained fairly constant over time. It also suggests that a ratio of 300 passengers per plane movement would mean that the

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Figure 1
PASSENGERS AND PLANE MOVEMENTS
AT THREE PORT AUTHORITY (PA) AIRPORTS
Figure 2

PASSENGERS PER PLANE MOVEMENT AT THREE PORT AUTHORITY (PA) AIRPORTS AND TRENDS IN AIRPLANE SIZE

[Diagram showing historical passenger trends and airplane models from 1940 to 2000.]
Table 3.
AVERAGE PASSENGERS PER AIRLINER MOVEMENT AND ANNUAL AIRLINER MOVEMENTS AT THE THREE MAJOR AIRPORTS, 1948-1968

<table>
<thead>
<tr>
<th></th>
<th>Passengers per Airliner Movement</th>
<th>Annual Airliner Movements (000's)</th>
<th>Maximum Seats on Largest Airliners</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948</td>
<td>18.0</td>
<td>198</td>
<td>89 (DC-6)</td>
</tr>
<tr>
<td>1949</td>
<td>19.9</td>
<td>218</td>
<td>94 (DC-6B)</td>
</tr>
<tr>
<td>1950</td>
<td>23.3</td>
<td>218</td>
<td></td>
</tr>
<tr>
<td>1951</td>
<td>25.3</td>
<td>261</td>
<td></td>
</tr>
<tr>
<td>1952</td>
<td>25.5</td>
<td>268</td>
<td></td>
</tr>
<tr>
<td>1953</td>
<td>27.0</td>
<td>304</td>
<td></td>
</tr>
<tr>
<td>1954</td>
<td>28.4</td>
<td>325</td>
<td></td>
</tr>
<tr>
<td>1955</td>
<td>29.5</td>
<td>346</td>
<td></td>
</tr>
<tr>
<td>1956</td>
<td>29.6</td>
<td>404</td>
<td></td>
</tr>
<tr>
<td>1957</td>
<td>29.8</td>
<td>446</td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>31.1</td>
<td>432</td>
<td></td>
</tr>
<tr>
<td>1959</td>
<td>32.5</td>
<td>473</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>35.3</td>
<td>452</td>
<td></td>
</tr>
<tr>
<td>1961</td>
<td>37.5</td>
<td>434</td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>41.1</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>43.9</td>
<td>451</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>47.6</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>1965</td>
<td>48.6</td>
<td>531</td>
<td></td>
</tr>
<tr>
<td>1966</td>
<td>51.3</td>
<td>555</td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>51.8</td>
<td>660</td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>51.0</td>
<td>720</td>
<td>259 (DC8-61)</td>
</tr>
</tbody>
</table>

Source: Port of New York Authority.

largest available aircraft in the year 2000 would have a capacity of about 1,500 seats—not an unreasonable estimate. If the present growth rate in size of aircraft continues, a 2,000-seat airplane after 1990 would be indicated; it is technically feasible today. However, its economic feasibility is another matter, since three to four dozen of these giants could take care of all the daily traffic on the high-density routes (e.g., New York-Chicago), and production may not be warranted commercially—unless federal policies encourage their use to cut down on airspace and runway demand.

If the “passengers per plane movement” ratio is projected in a straight line to reach 300 in the year 2000, the rate of growth in passengers becomes smaller than the rate of growth in this index after about 1985. That means that after 1985 the annual number of airplane movements would begin to decline, even as the annual number of passengers keeps growing. This might raise questions about the reasonableness of the projection of plane size, but it is not an impossible situation. Between 1959 and 1963, the annual number of plane movements at the three major airports declined from 473,000 to 451,000, while the annual number of passengers rose from 15.37 million to 17.67 million. This, however, was a short-term adjustment related to the introduction of jets. Over a long period, such as fifteen years, such a development appears unlikely; the pressure to maintain existing schedule frequencies is likely to dampen the growth in airplane size so as to keep it in step with the growth in passenger movements. It is for this reason that the projection of passengers per plane movement after 1985 was scaled down from what a straight-line projection would yield, as indicated in Figure 2 (page 11) and in Table 4 (page 12). However, if airport capacity becomes a problem all over the country, landing fees or FAA regulations may create conditions that make even larger planes and therefore fewer plane movements economically feasible. And if passenger demand rises faster, airliner size could well rise faster, too.

Annual airline plane movements. Table 5, below, and the bottom part of Figure 1 (page 10) assume that the trend in passengers per plane movement continues into the ‘eighties at the same rate it has proceeded in the past twenty years and that in the following two decades this growth rate will begin to decline so as not to exceed appreciably the growth rate in passengers.

If our assumptions about the ratio of passengers per plane are valid, annual airline plane movement will register a mild growth and then even out at the level of about 1 million annually after 1985 under the “low” projection of passenger demand. If the “high” projection ensues, i.e., if the national economy grows at the pace of the last five years and if the cost of air fares relative to other consumer prices declines faster than in the past,

Table 4.
AVERAGE PASSENGERS PER AIRLINER MOVEMENT, PROJECTED 1970-2000

<table>
<thead>
<tr>
<th></th>
<th>Straight-line Projection of 1948-1968</th>
<th>Port Authority Projection</th>
<th>Assumed RPA Projection</th>
<th>Maximum Seats on Largest Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>58</td>
<td>57.7</td>
<td>57.7</td>
<td>490 (B-747)*</td>
</tr>
<tr>
<td>1975</td>
<td>78</td>
<td>81</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>100</td>
<td>98</td>
<td>98</td>
<td>844 (C-5A)</td>
</tr>
<tr>
<td>1985</td>
<td>130</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>170</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>230</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>300</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

*For increased standard of comfort, actual seats will be about 360.

Table 5.
PROJECTED PASSENGER DEMAND RELATED TO PROJECTED AIRLINER MOVEMENTS, “LOW” AND “HIGH” VARIANT, 1970-2000, NEW YORK REGION

<table>
<thead>
<tr>
<th></th>
<th>Annual Airliner Movements in thousands of passengers in millions</th>
<th>Annual Airliner Movements in thousands</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“low” variant</td>
<td>“high” variant</td>
<td>Port Authority</td>
<td>“low” variant</td>
</tr>
<tr>
<td>1970</td>
<td>57.7</td>
<td>45.6 (PA)*</td>
<td>46.5</td>
<td>791</td>
</tr>
<tr>
<td>1975</td>
<td>81</td>
<td>69.7 (PA)*</td>
<td>73.7 (FAA)</td>
<td>860</td>
</tr>
<tr>
<td>1980</td>
<td>98</td>
<td>91.0 (PA)*</td>
<td>123.0 (FAA)</td>
<td>929</td>
</tr>
<tr>
<td>1985</td>
<td>125</td>
<td>126.5</td>
<td>184.0 (FAA)</td>
<td>1,012</td>
</tr>
<tr>
<td>1990</td>
<td>160</td>
<td>157.0</td>
<td>240.0</td>
<td>981</td>
</tr>
<tr>
<td>1995</td>
<td>200</td>
<td>200.0</td>
<td>300.0</td>
<td>1,000</td>
</tr>
<tr>
<td>2000</td>
<td>250</td>
<td>250.0</td>
<td>360.0</td>
<td>1,000</td>
</tr>
</tbody>
</table>

*Port Authority
Figure 3

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>DC 3</th>
<th>BOEING 707</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wingspan</td>
<td>947&quot;</td>
<td>195'9&quot;</td>
</tr>
<tr>
<td>Length</td>
<td>64'5&quot;</td>
<td>152'11&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>DC 4</th>
<th>BOEING 747</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wingspan</td>
<td>117'6&quot;</td>
<td>195'</td>
</tr>
<tr>
<td>Length</td>
<td>93'11&quot;</td>
<td>227'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>LOCKHEED CONSTELLATION</th>
<th>BOEING SUPersonic (early version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wingspan</td>
<td>122'</td>
<td>122'</td>
</tr>
<tr>
<td>Length</td>
<td>92'1&quot;</td>
<td>306'</td>
</tr>
</tbody>
</table>

**AIRCRAFT CAPACITY GROWTH TREND**

- **ALL ECONOMY SEATING - SUBSONIC**
- **SINGLE CLASS SEATING - SST'S**

the annual number of airliner movements would reach about 1.5 million by 1985 and then level off. For the sake of comparison, in 1968 the three major airports handled 720,670 airliner movements and 276,595 general aviation and freight movements, for a total of 997,265 movements, or close to 1 million, which is about the capacity of the three airports under present conditions.

In other words, if plane movements at the three major airports were confined to airliners, the low projection of these plane movements would not exceed the present capacity of the airports. The high projection would exceed it by almost 50 percent.

**Potential for diversion**

All the above projections of airline passenger and airline plane movement demand assume no diversion of passengers from using airliners for inter-regional trips to and from the three major airports. But diversion is possible, in four different directions:

1. to other existing airports,
2. to high-speed conventional rail transport,
3. to STOL aircraft operating in a separate airway system, independent of the present system, and
4. to new forms of high-speed ground transportation, such as Tracked Air Cushion Vehicles or interurban Gravity-Vacuum Trains (GVT).

The effect of each of these on air passenger and plane movement demand is sketched briefly below.

**1. Diversion to other airports.** Aside from the three major airports operated by the Port of New York Authority, there are within the New York Region\(^1\) five minor airports to which scheduled air carrier service is provided: White Plains, Islip, Bridgeport, New Haven and Trenton. As of 1965, the passenger volume at all of these airports taken together amounted to less than 1 percent of the volume at the three major airports.

Though recent and proposed increases in scheduled airline service at some of these fields, notably White Plains and Islip, have received publicity, the effect of the minor airports is bound to remain negligible at the regional scale: even if their traffic were to increase at three times the rate of the major airports, they would still account for less than 3 percent of the total traffic in the year 2000.

Another form of diversion is the switching of international flights from New York to other cities to reduce through traffic. While the number of international flights from cities other than New York has been increasing, the share of international trips in the New York travel volume has been increasing as well: in 1948, 10 per cent of the air trips to and from New York were overseas; in 1968 this figure reached 20 percent. Of the overseas travellers from the three major airports who are residents of North America, over one-half reside in the 31-county New York Region and close to two-thirds reside in the urban belt from Maine to Virginia. The proportion of the Region’s residents has been steadily rising, indicating that some diversion has been taking place spontaneously. This gradual diversion is thus included in the projections of travel demand. Efforts to accelerate it, however, would not be very productive. Altogether, overseas plane movements account for only 13.6 percent of all plane movements (though they carry 20 percent of all passengers). Prohibiting non-residents of the Region from flying overseas from New York (unrealistic as this would be) would cut the demand for plane movements by less than 7 percent. It also would cut some tourism in the New York Region, which would be resisted by the City and its tourist industries.

**2. Diversion to high-speed rail transportation.** Air passenger trips to and from the five major cities along the Boston-Washington rail line account for roughly 17 percent of all domestic and overseas trips that have an origin or destination in the New York Region, judging from 1966 Civil Aeronautics Board (CAB) origin and destination data. The proportion of plane movements involved is much higher—on the order of 27 percent of the plane movements from the three major airports have their first stop in one of these cities. The reason for this discrepancy lies in the route structure of the airlines—a large share of passengers on board a plane whose first stop is, say, Philadelphia are not destined for Philadelphia but rather for points beyond. Therefore, reductions in passenger demand to these cities will not necessarily lead to proportional reductions in plane movements.

Still, with the new Metroliner train schedules (2 1/2-3 hours, New York to Washington, compared to 3 1/2-4 with conventional trains), rail is becoming more competitive with air and may divert a substantial proportion of passengers from flights to Washington, Baltimore and Philadelphia. When New York to Boston trains are speeded further, a small proportion from flights to Boston and Providence may be diverted. Yet, even if half the air passengers on these routes were to switch to rail, the difference would be only 8.5 percent in the total domestic and overseas air passenger volume at New York airports.

**3. Vertical or Short-Take-Off and Landing (V/STOL) aircraft.** A more significant source of diversion than either the peripheral airports or high-speed conventional rail is likely to be STOL aircraft. A commercially available model, the Breguet 941, seating 64 passengers and cruising at 250-280 mph, has been undergoing tests under the auspices of Eastern Airlines and American Airlines. STOL can make inroads into the entire short-haul market—not just the major cities in the Northeast Corridor, perhaps all destinations within 250 miles of New York. These destinations currently account for 23 percent of all domestic and overseas air trips from the Region and for 43 percent of all plane movements. Since only part of the difference is explainable by the scheduling effect

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\(^1\)The area used as the basis for the air passenger demand calculations of this paper. For a full analysis of this Region’s demography, see Regional Plan Association, The Region’s Growth (1967).
noted in relation to high-speed ground transportation diversion—the rest of the difference is accounted for by small average airplane size on routes to small, close-in cities—the diversion could be greater than the 23 percent and might come close to the 43 percent.

STOL planes considered for future application will be slower than jets (cruising speed on a 200-mile trip would be about 350 mph, rather than 500 mph). Also, they would be somewhat more expensive to operate. Finally, they would provide a bumpier ride than conventional airplanes because of their light wing loading. Their advantages are that they can take off from 1,500-foot runways and use low-altitude airspace, separate from that of regular aircraft. The full use of these advantages hinges on two premises:

1. that separate STOL ports are built which are closer to population centers than conventional airports so that the time lost en route by the STOL planes is more than made up by a shorter access time on the ground;
2. that a separate airspace control system is established which does not infringe upon the operation of conventional planes.

Assuming the existence of a separate STOLport system, a simulation of the short-haul market in California by the McDonnell Corporation for the FAA has shown that some 40 percent of short-haul air trips would be diverted to a STOL system without public subsidy or regulation, based strictly on advantages to users. In addition, a substantial amount of new traffic would be diverted from ground modes or induced. Of course, the planes considered in this simulation are not yet in production and probably are five to seven years away from operation.

The development of a wholly new network of STOLports or VTOLports within the Region and in surrounding cities is clearly a transportation decision of basic importance that has to be faced immediately. The possible capacity of the system and its capability of handling the potential traffic volumes, the impact of the system on ground modes such as intercity and commuter rail and buses, the impact of the system, if fully developed, on environment (the noise issue is specifically raised by the McDonnell study) are all unclear. Nor is it clear whether a truly separate air traffic control system can be devised for STOL that does not infringe upon the capacity of conventional airspace.

However, given the capacity limitations of existing airport runways at the three major airports and the resulting delays, as well as the costs of a new jetport, it is conceivable that:

1. a reliable and frequent STOL service from separate runways at existing airports would gain patronage even without “city center” STOLports;
2. conventional runways might be restricted to longer-haul flights so that STOL would inherit all short-haul air trips.

Finally, even though the costs of Vertical-Take-Off and Landing aircraft (VTOL) so far have been unreasonably high for airline application, it is not unreasonable to assume that some of the technological and cost barriers will be broken with larger and faster aircraft in the coming decade. To be sure, machines such as compound helicopters (helicopters with short wings and propellers added for horizontal flight) will always be inherently more expensive to operate than STOL planes because of their greater mechanical complexity and greater power consumption, but these added costs may be offset by their minimal land requirements and their ability to enter high-density urban areas virtually directly. A STOLport with provision for a crosswind runway will still require a minimum area of about 75 acres, which is not easy to come by in the Core of the New York Region or in other cities of the Atlantic Seaboard. A VTOLport with a somewhat smaller capacity would only take up 4-5 acres. (Several of these conceivably could be located near traffic generating centers.) VTOL compound helicopters envisaged now to compete for the STOL market would carry 80-90 passengers at top speeds of about 260 mph for distances of 100-300 miles, but extensive development and design work is necessary before these planes become operational.

4. New forms of high-speed ground transportation.

New forms of high-speed ground transportation, be it Gravity-Vacuum Trains (GVT) or some variant thereof with linear electric motor propulsion, are unquestionably going to be capital-intensive and hence warranted only in high-density corridors. Small and dispersed destinations are likely to remain the domain of V/STOL. Hence, the potential for diversion lies in the 17 percent of passengers and 27 percent of plane movements destined to the large cities along the Northeast Corridor. This market may be the domain of V/STOL within a decade, whereas interurban, ultra-high-speed ground transportation is somewhat further in the future, both in technology and demand.

However, hourly air travel demand to and from the major cities in the Northeast Corridor probably will reach 10,000 passengers in the 1987-95 period (early in the period if the high projection proves true, late if the low projection proves true). Then, high-capacity ground transportation would become economically feasible, and V/STOL could go on to satisfy demand in less heavily-travelled corridors.

One STOLport (two runways) is expected to have a capacity of about 10,000 passengers per hour. By contrast, interurban GVT would have a capacity of 35,000-44,000 per hour in one direction. GVT could make

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1Note that the Gravity-Vacuum Train might be feasible much earlier for in-city use. See Regional Plan Association, The Second Regional Plan, a draft for discussion (1968).
the run from downtown Manhattan to either downtown Washington or Boston in 75 minutes with twelve intermediate stops and a frequency of eight trains per hour. This would clearly divert conventional air travel between the major cities and would be quite competitive with STOL, assuming that STOL aircraft will make a non-stop New York to Washington or Boston flight in 40 minutes and that an average of 17 minutes is needed to and from the terminal at each end, even to an “in-city” STOLport.

Moreover, if GVT connects not just city centers but airports as well, a certain proportion of flights to other cities is likely to be diverted to it: for example, New York area passengers destined for smaller cities in the South which do not have direct service from New York might find it advantageous to take GVT all the way to Dulles Airport and board a direct local flight to the South there.

The most important difference GVT could make, however, is in airport access, a point discussed on pages 29-30.

Demand for general aviation and cargo plane movements

So far we have dealt with the demand for airliner movements, which, in 1968, constituted 72.3 percent of the airplane traffic at the three major airports. Of the remaining plane movements, 23.7 percent was general aviation, distributed as follows:

- Business and private: 12.5%
- Air taxi: 11.2%

Cargo flights accounted for 3.7 percent of the total movements, military for .3 percent.

The historic trend in general aviation and cargo plane movements at the three Port Authority airports is shown in Table 6.

Table 6.

GENERAL AVIATION AND CARGO PLANE MOVEMENTS AT THREE MAJOR AIRPORTS, 1948-1968 (in 000’s)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Movements</th>
<th>General Aviation*</th>
<th>Scheduled Cargo</th>
<th>Percent General Aviation</th>
<th>Percent Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948</td>
<td>261</td>
<td>54</td>
<td>9</td>
<td>20.1%</td>
<td>3.4%</td>
</tr>
<tr>
<td>1949</td>
<td>278</td>
<td>46</td>
<td>14</td>
<td>16.5</td>
<td>5.0</td>
</tr>
<tr>
<td>1950</td>
<td>271</td>
<td>37</td>
<td>16</td>
<td>13.6</td>
<td>5.7</td>
</tr>
<tr>
<td>1951</td>
<td>322</td>
<td>46</td>
<td>15</td>
<td>14.2</td>
<td>4.5</td>
</tr>
<tr>
<td>1952</td>
<td>324</td>
<td>44</td>
<td>13</td>
<td>13.5</td>
<td>3.8</td>
</tr>
<tr>
<td>1953</td>
<td>370</td>
<td>53</td>
<td>14</td>
<td>14.3</td>
<td>3.6</td>
</tr>
<tr>
<td>1954</td>
<td>403</td>
<td>66</td>
<td>12</td>
<td>16.3</td>
<td>2.8</td>
</tr>
<tr>
<td>1955</td>
<td>454</td>
<td>76</td>
<td>14</td>
<td>16.7</td>
<td>3.1</td>
</tr>
<tr>
<td>1956</td>
<td>503</td>
<td>83</td>
<td>16</td>
<td>16.5</td>
<td>3.2</td>
</tr>
<tr>
<td>1957</td>
<td>554</td>
<td>91</td>
<td>17</td>
<td>16.4</td>
<td>3.0</td>
</tr>
<tr>
<td>1958</td>
<td>545</td>
<td>99</td>
<td>14</td>
<td>18.1</td>
<td>2.5</td>
</tr>
<tr>
<td>1959</td>
<td>605</td>
<td>118</td>
<td>14</td>
<td>19.5</td>
<td>2.3</td>
</tr>
<tr>
<td>1960</td>
<td>603</td>
<td>134</td>
<td>17</td>
<td>22.2</td>
<td>2.8</td>
</tr>
<tr>
<td>1961</td>
<td>596</td>
<td>143</td>
<td>19</td>
<td>23.9</td>
<td>3.2</td>
</tr>
<tr>
<td>1962</td>
<td>606</td>
<td>158</td>
<td>18</td>
<td>26.0</td>
<td>3.0</td>
</tr>
<tr>
<td>1963</td>
<td>635</td>
<td>165</td>
<td>20</td>
<td>25.9</td>
<td>3.0</td>
</tr>
<tr>
<td>1964</td>
<td>687</td>
<td>185</td>
<td>22</td>
<td>26.9</td>
<td>3.1</td>
</tr>
<tr>
<td>1965</td>
<td>765</td>
<td>209</td>
<td>25</td>
<td>27.3</td>
<td>3.2</td>
</tr>
<tr>
<td>1966</td>
<td>853</td>
<td>271</td>
<td>27</td>
<td>31.7</td>
<td>3.1</td>
</tr>
<tr>
<td>1967</td>
<td>939</td>
<td>248</td>
<td>31</td>
<td>26.4</td>
<td>3.3</td>
</tr>
<tr>
<td>1968</td>
<td>997</td>
<td>239</td>
<td>37</td>
<td>24.0</td>
<td>3.7</td>
</tr>
</tbody>
</table>

*Includes military flights.

Source: The Port of New York Authority, Aviation Department.

Future general aviation demand. Table 6 shows that general aviation movements at the three major airports increased at a much faster pace than other plane movements until the last two years. The increase over twenty years has been roughly fivefold. Like air passenger trips, general aviation plane movements show a very close correlation with per capita income, and a rough projection can be made by the method used in Table 1. Such a projection yields rather staggering results:

Table 7.

PROJECTION OF DEMAND FOR GENERAL AVIATION MOVEMENTS AT THREE MAJOR AIRPORTS

<table>
<thead>
<tr>
<th>Year</th>
<th>Unconstrained Projection, Annual Movements (000’s)</th>
<th>Port Authority Projection, Annual Movements (000’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>320</td>
<td>318</td>
</tr>
<tr>
<td>1975</td>
<td>460</td>
<td>408</td>
</tr>
<tr>
<td>1980</td>
<td>580</td>
<td>498</td>
</tr>
<tr>
<td>1985</td>
<td>780</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>980</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>1,230</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1,510</td>
<td></td>
</tr>
</tbody>
</table>

In other words, if growth in general aviation at the three airports were left to its own devices, it would approach the total present capacity of the airports by 1990 and would reach 1.5 million annual movements by the year 2000. That is, general aviation demand would equal or exceed the demand for airliner movements.

General aviation activity in the Region as a whole—not just at the three major airports—consisted in 1963 of about 7 percent air taxi flights, 24 percent business flights, 28 percent pleasure flights, 32 percent instruction flights and 7 percent other, including such pursuits as crop dusting and aerial photography. On a normal August day in 1963, a Tri-State Transportation Commission survey counted 3,550 general aviation movements (excluding about 3,000 “touch-and-go” practice landings) at the Region’s 70 large and small airports, compared to 1,500 commercial airline movements at all the Region’s airports. Only 11 percent of this huge volume of general aviation activity took place at the three major airports.

More than half took place at 16 well-equipped secondary airports, those with paved runways over 3,200 feet long and some navigational equipment. The remaining third took place at 51 minor airports, with runways under 3,200 feet, mostly unpaved, and with minimal equipment.

If one assumes that the growth of general aviation in the Region as a whole will follow the trends in Table 7, by 2000 annual general aviation plane movements (not counting practice landings) would be anywhere from 8 million (Port Authority trend) to 13 million (unconstrained projection), or 22,000 to 37,000 average daily movements. If we assume that two-thirds of this volume will require well-equipped airports, anywhere from 23 to 38 well-equipped secondary airports would be needed to

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handle the traffic (including practice landings). This compares with 16 such airports in 1963 and a total of 29 recommended for 1985 by the Tri-State report, which, incidentally, foresees the closing of some 28 minor airports due to economic pressures of urban development.

In view of the political resistance that the Metropolitan Transportation Authority has encountered in implementing the Tri-State plan in New York, notably in Westchester and Rockland Counties, it seems unlikely that unconstrained general aviation growth can be accommodated. More likely, demand will be dampened by limitations of capacity. Some of the more accessible secondary airports, such as Westchester County Airport, already are experiencing occasional peak-hour congestion. Unrestricted access by air into the world's largest urban region just does not seem feasible in the long run.

The degree of mobility by air attainable in Arizona or Manitoba cannot be a standard for this Region.

For the near future, however, the capacity of existing well-equipped secondary airports, taken together, is theoretically adequate to take care of all general aviation traffic until 1980-85, both the traffic that would choose to go to them and the general aviation traffic that would have chosen to use the three major airports were it not priced out. Shifting the 11 percent of general aviation that now uses the three major jetports to the secondary airports appears reasonable because:

1. most general aviation planes can get by with runways 4,000 feet long or less (though business jets do need 6,500 feet) as against the 6,500-14,000 feet provided at the major airports, and they do

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**AIR TRAFFIC DENSITY OVER THE UNITED STATES.**

Equidensity contours of total hours per 1° x 1° cell, busy day in 1960.

Traffic density is highest over populated metropolitan areas, and a few military training areas. It is concentrated primarily in coastal corridors of the Atlantic Urban Region and California. The cells containing New York, Los Angeles, San Francisco and the military training area of Pensacola, Fla. had over 1000 hours of aircraft flying per day. Only 30 other cells had over 500 aircraft airborne hours per day in 1960, and a large majority of the cells had less than 100. In the New York area, the utilization of the total airspace by user groups in 1960 was as follows:

- **Airlines** — 17%
- **Military** — 20%
- **General aviation** — 63%

not need the three airports’ elaborate equipment and facilities;

2. a condition where little more than 1 percent of the passengers (those using general aviation) pre-empt 20 percent of scarce capacity (peak-hour movements) at the major airports seems both inefficient and inequitable.

Specialization of airports by type of aircraft served seems in order. The existing airport system of the Region is already quite specialized, as Table 8 indicates.

Table 8.
1963 GENERAL AVIATION MOVEMENTS
BY TYPE OF AIRPORT, BY PURPOSE

<table>
<thead>
<tr>
<th></th>
<th>3 Major Airports</th>
<th>16 Well-Equipped Secondary Airports</th>
<th>51 Minor Airports</th>
<th>All Airports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of taxi flights</td>
<td>45</td>
<td>39</td>
<td>16</td>
<td>100</td>
</tr>
<tr>
<td>Percent of business flights</td>
<td>28</td>
<td>55</td>
<td>17</td>
<td>100</td>
</tr>
<tr>
<td>Percent of pleasure flights</td>
<td>1</td>
<td>56</td>
<td>43</td>
<td>100</td>
</tr>
<tr>
<td>Percent of instruction flights</td>
<td>0</td>
<td>51</td>
<td>49</td>
<td>100</td>
</tr>
<tr>
<td>Percent of other flights</td>
<td>4</td>
<td>47</td>
<td>49</td>
<td>100</td>
</tr>
<tr>
<td>Percent of all General Aviation flights</td>
<td>11</td>
<td>52</td>
<td>37</td>
<td>100</td>
</tr>
</tbody>
</table>

Average persons per flight, including crew: 2.7 1.4


Close to one-half of the air taxi flights and over a quarter of the business flights in the Region were—in 1963—concentrated at the three major airports; their share of other types of flights was negligible. The concentration of the air taxi and business flights at the three major airports relates to the destinations of their passengers, shown in Table 9.

Thus, general aviation passengers would be diverted voluntarily from the three major airports in large numbers only if separate general aviation airports are provided with fast and convenient access to New York City. This means providing Teterboro airport, the one sub-

Table 9.
IMMEDIATE DESTINATIONS OF GENERAL AVIATION PASSENGERS AT 3 MAJOR AIRPORTS

<table>
<thead>
<tr>
<th>Destination</th>
<th>Percent of General Aviation Passengers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manhattan south of 59th Street</td>
<td>50.0%</td>
</tr>
<tr>
<td>Rest of New York City</td>
<td>7.7</td>
</tr>
<tr>
<td>Airline or general aviation connection</td>
<td>25.9</td>
</tr>
<tr>
<td>Business at airport</td>
<td>2.7</td>
</tr>
<tr>
<td>Other</td>
<td>13.7</td>
</tr>
</tbody>
</table>

Source: Port of New York Authority.

the major airports voluntarily. Only higher landing fees or regulations will reduce general aviation traffic at the three airports. (See Regional Plan Association policy statement, February 20, 1967.) Both have been applied mildly. The Port Authority raised rush-hour general aviation minimum landing fees from $5 to $25 in August 1968. (Outside of peak hours, the fee remains $5.) And FAA regulations limiting peak-hour general aviation movements under IFR conditions to 42 (one-fourth of the airliner movements) went into effect June 1, 1969. (The regulation allows general aviation 10 out of 90 flights at Kennedy, 12 out of 60 at LaGuardia and 20 out of 60 at Newark.) In the absence of accessible alternate general aviation facilities, this approach will damage total general aviation demand, probably diverting passengers from small planes to airliners.

That even a modest increase in landing charges can reduce demand for general aviation movements is indicated by the fact that general aviation traffic at Kennedy, LaGuardia and Newark in August 1968 was respectively 24 percent, 30 percent and 12 percent below August 1967, according to FAA figures. The demand elasticity for business and private flying remains somewhat obscure (large corporations may be willing to pay very high fees for their business jets). It seems plausible, however, that an increase in minimum landing fees to the neighborhood of $60, closer to the average of what airlines pay (their fees generally range between $30 and $160 and average about $75), would reduce business and private flying to about 50 percent of the demand that existed with $5 landing fees. The effect of these policies on annual general aviation demand is shown in Table 10 below.

Few air taxis are divertable to other airports because a large percentage connect with airline flights. Air taxis comprise 44 percent of general aviation movements at the three airports now, and that share would grow with unconstrained demand to 67 percent in 1980 and 80 percent in 2000. The major hope for eliminating their interference with airline traffic (unless demand is to be suppressed) is to convert all tax flights to V/STOL equipment. Small STOL planes, suitable for air taxi service, are increasingly available, and their operation poses fewer problems than that of STOL planes large enough for regular airline service. STOL runways are in operation now at Kennedy and LaGuardia, and the Port Authority is pursuing a policy of diverting air taxis to them.

The cost of not shifting general aviation from the main runways of the major airports is alluded to in the FAA study previously quoted (Alternative approaches . . .): At congested airports, general aviation aircraft that operate from the same runways as air carriers add substantially to the delays. A small aircraft using an air carrier runway can increase the delay to every user of that runway by one minute. Should the congested period last two hours and involve 100 aircraft, the additional delay due to that one general aviation flight would be 100 minutes. For an airport serving predominantly large jets, this flight would cost the other operators about $1,000.

Equitable general aviation user charges that would be related to the basic scarce resource in question—namely, the time of runway occupancy and the type of runway used (rather than the size or weight of the airplane)—would not only dampen demand but also make the provision of alternative general aviation facilities economically attractive. Executive access to Manhattan by business jets is valuable for the economic well-being of the Region; therefore, total removal of general aviation from the Region's Core may not be desirable. But there is no reason why 98 percent of the air travellers should, in effect, subsidize general aviation.

In summary, to free the major airport runways for airline use almost exclusively during peak periods without simply eliminating nearly all private flights to the Region's Core in those hours, it will be necessary to:

1. expand both VFR and IFR capacity of secondary airports within about fifteen miles of Manhattan, and make available limousine and taxi service; or

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Table 10.

**POSSIBLE REDUCTIONS IN GENERAL AVIATION DEMAND AT THE THREE MAJOR AIRPORTS**

(if landing fees are above $5 and all air taxis use STOL)

(annual plane movements in 000's)

<table>
<thead>
<tr>
<th>Unconstrained Demand (Table 7)</th>
<th>Minus Projected Percent of Air Taxis</th>
<th>Remaining Business and Private</th>
<th>22% Reduction (Present Minimum Peak-hour Fees @ $25)</th>
<th>50% Reduction (Minimum Fees About $60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>320</td>
<td>53%</td>
<td>150</td>
<td>117</td>
</tr>
<tr>
<td>1975</td>
<td>460</td>
<td>63</td>
<td>170</td>
<td>133</td>
</tr>
<tr>
<td>1980</td>
<td>580</td>
<td>67</td>
<td>190</td>
<td>148</td>
</tr>
<tr>
<td>1985</td>
<td>780</td>
<td>73</td>
<td>210</td>
<td>164</td>
</tr>
<tr>
<td>1990</td>
<td>980</td>
<td>75.6</td>
<td>240</td>
<td>187</td>
</tr>
<tr>
<td>1995</td>
<td>1,230</td>
<td>78</td>
<td>270</td>
<td>211</td>
</tr>
<tr>
<td>2000</td>
<td>1,510</td>
<td>80</td>
<td>300</td>
<td>234</td>
</tr>
</tbody>
</table>

19
provide fast rail service to farther-out general aviation airports (which would have to tap in on a line serving other purposes);

2. charge general aviation according to the time it uses the runways of the three major airports rather than by airplane weight so private planes pay about the same landing fees as airliners at the three major airports;

3. provide STOL runways at existing airports for air taxi service.

**Future air freight demand.** As indicated in Table 6, air cargo plane movements have accounted for 3-4 percent of all plane movements at the three major airports in two out of three years since 1948. Air cargo has grown at a slightly faster rate than air passengers, registering a twofold increase over twenty years: from 68,600 short tons in 1948 to 850,000 short tons in 1968. Indications are that the scale economies of very large jets will raise air cargo demand more than air passenger demand; they will be large enough to carry large containers that can be handled mechanically. The Port Authority has projected a cargo increase to about 4 or 5 million tons annually by the 1980's, but the projection of the Tri-State Transportation Commission is for 12.4 million tons a year by 1985. An even more bullish projection was made recently by Albert E. Blomquist, a consultant to the Governor's Economic Evaluation Committee for an Intercontinental Jetport for New Jersey (July 1968): 27.6 million tons annually by 1985, based in part on FAA projections. At that rate, air cargo volume would exceed air passenger volume (counting 10 passengers with baggage as the equivalent of 1 ton of cargo) before 1985, and by that year 7 percent of all cargo in the Region would be moving by air. More evidence is necessary before such high forecasts are accepted for planning purposes.

Though a much larger share of this freight will be carried by cargo-only flights (as against mixed passenger-cargo), sharply increased airplane size makes it probable that air cargo plane movements will hardly exceed 10 percent of passenger airplane movements as against 5 percent today. Their impact on critical peak-hour capacity will be even less since, as the Port Authority states, "past records of all-cargo aircraft movements, by month, day of week and hour of day, clearly indicate that only a few of the all-cargo plane movements operate in peak periods." The Port Authority's 1966 forecast for 1980 was five peak-hour freight movements under IFR conditions. However, the huge amounts of cargo that airlines are likely to want to carry in the jumbos on mixed flights will adversely affect the efficiency of aircraft gate positions and apron space, possibly backing up traffic during peak hours.

The importance of the incipient air freight expansion thus lies in its impact on ground handling facilities at airports: 12 million short tons (Tri-State's 1985 projection) is 20 times more freight than is now handled at Kennedy airport and 3 times more than is handled at Newark-Elizabeth Port Authority marine piers, with their extensive container storage area. Large ground areas would be needed for mechanized handling and there would have to be access for many large trucks. With this volume, center-city assembly and distribution depots, linked to the airports by rail, as contemplated by the City of New York, become plausible.

**Major airport capacity related to peak-hour demand**

The capacity of an airport is the ability of its runways to accept a given number of plane movements (i.e., landings and takeoffs) in a given period of time, without exceeding some established standard of delay. For example, in good weather (under VFR conditions), a single runway may be able to handle 40 aircraft per hour with an average delay of 4 minutes, or 48 per hour with an average delay of 12 minutes. The capacity, however, varies over a fairly wide range, depending on aircraft mix (planes that occupy a runway for a shorter time increase capacity accordingly), on the physical layout of the runways (whether they are sufficiently far from other runways to operate independently), on weather (under some weather conditions, only rather restrictive combinations of runways may be usable), on the number of exit taxways (the more exits, the faster planes can leave the runway).

In bad weather (under IFR conditions), which prevails in the Region about 15 percent of the time, more stringent criteria for the separation of planes apply; then the presence of independent Instrument Landing Systems (ILS) and the spacing required between planes become critical. Reduced space between planes under radar control, the introduction of computer-aided spacing and sequencing of aircraft as they make their final approaches to the runway, and various procedural changes in air traffic control can all increase IFR capacity.

Outside the airport proper, the adequacy of the arrival and departure paths for the individual runways, noise abatement procedures and the interference from nearby airports have an impact on capacity.

**Present and projected capacity of three major New York airports.** The good-weather (VFR) capacity of the three major airports is close to 250 movements per hour. The June 1, 1969, FAA regulations establish a ceiling of 210 operations for IFR weather (Boston and Washington shuttle flights are exempt from this ceiling), of which 90 would be at Kennedy, 60 at LaGuardia and 60 at Newark. This assumes some delay. An Airborne Instruments Laboratory (AIL) study for the Port Authority in 1966 estimated the IFR capacity of the three airports in the post-1970 period to be 173, with 74 movements at Kennedy, 50 at LaGuardia and 49 at Newark with minimum delays. The 173 movement-per-hour IFR capacity represents a substantial upward revision from 137 estimated for 1965. It results from improvements in navigational systems and in air traffic control as well as a new runway at Newark. A further increase would result from the es-
NEW AIRCRAFT OF THE SEVENTIES

Supersonic Transports
The Soviet TU-144 (top right), the first prototype of which flew on December 31, 1968, and the Anglo-French Concorde (top left), test-flown in France on March 2, 1969, and in England on April 9, are expected to go into commercial service around 1974. The planes are designed to carry 130 to 145 passengers at top speeds of 1,350 to 1,500 mph. Because of the sonic boom problem, it is expected that the planes will be confined to routes over water or uninhabited areas when flying at supersonic speeds. At the approach to airports, they will fly at conventional speeds and use conventional runways. Their impact on airport capacity is not expected to be substantial in the near future. While their relatively small passenger capacity is likely to increase the number of overseas plane movements, their short travel time (3 hours 20 minutes New York to London) will lead to very late evening and hence off-peak arrival and departure times at New York for convenient schedules to Europe.

Jumbo Jets
The Lockheed C-5A (left), which first flew in July 1968, and the Boeing 747 (bottom left), test-flown on February 9, 1969, are the first of the giant airliners whose impact on air transportation will exceed by far that of the more glamorous and more controversial SSTs. Designed initially for military use, the C-5A is able to carry 165 tons of cargo or up to 900 passengers, but no commercial passenger version is under consideration now. The Boeing 747, though suitable for cargo use, is primarily a passenger aircraft, with a capacity of 360 to 490 persons (depending on spacing between seats). This contrasts with 139 seats on the Boeing 707. The first planes, with a cruising speed of over 600 mph, are expected to go into commercial service late in 1969 or early in 1970, and 167 of them are now on order for 28 airlines. They will serve primarily intercontinental and transcontinental routes. An 800 passenger successor aircraft is in the planning stage for introduction by about 1979.
"Air Buses"

The DC-10 by McDonnell Douglas (right), and the Lockheed L-1011 (below), now being built for service in 1971-1972, are designed to carry 220 to 300 passengers on relatively short intra-continental routes, superceding present two-engine and three-engine jets with about 100-passenger capacity. (A present two-engine-jet is seen between two DC-10s in the American Airlines rendering of LaGuardia airport at right). Both the DC-10 and the L-1011 are designed to enter airports with relatively short, 6,000-foot runways, like LaGuardia's. A distinguishing feature of these new planes, as well as of the B-747, will be a wide, 20-foot fuselage, resulting in more spacious seating, as shown in the mock-up photo below.
Short-Take-Off-and-Landing Aircraft

The McDonnell Douglas 188 turbo-prop (top left), a modified version of the French Breguet 941 military assault transport, shown in a composite photo taken in a three-second sequence during an American Airlines test program. A similar test program has been conducted by Eastern Airlines. The purpose is to devise specifications for a commercially viable Short-Take-Off-and-Landing (STOL) airliner. The McDonnell Douglas 188 can land in 500 feet and take off in 1,000 feet. It carries 60 passengers at a cruising speed of 250 mph.

Experimental STOL runway (top right) provided by the Port Authority at LaGuardia airport.

The De Havilland Twin Otter—a STOL plane now in commercial service (below), gaining popularity with commuter airlines and air taxi services. The plane seats up to 20 passengers and cruises at 200 mph. Planes of this type hold promise for diverting the fast-growing air taxi component of general aviation from the main runways at major airports.

Vertical Take-Off Aircraft

The Sikorsky S-61F compound helicopter (above), a prototype of possible future Vertical-Take-Off-and-Landing (VTOL) air buses. The speed of a conventional helicopter is limited to 200 mph at most because the tips of the rotor blades cannot move faster than the speed of sound. A compound helicopter, by contrast, derives part of its lift from short wings and has jet engines for forward thrust, as seen in the photo. The model shown has been flown at 250 mph. Higher speeds are possible, and VTOL planes are planned to cruise at over 260 mph, with 80 to 90 passengers over distances of 50 to 230 miles. The direct operating cost will be higher than that of STOL planes but may be made up by the lower land requirement and hence lower cost of landing facilities.
establishment of “common IFR room” toward which the air traffic system here is now progressing. This eliminates the three-mile buffer zones between Kennedy, LaGuardia and Newark and treats the airspace over the three airports as if it were that of one airport. However, noise abatement procedures to keep takeoffs and landing paths away from dense residential areas may prevent the full benefits of “common IFR room” from being realized.

Computer-aided approach spacing, which would even out the intervals between arriving aircraft, could increase IFR capacity by anywhere from 6 to 15 percent at airports similar to New York’s, according to the FAA study previously noted (Alternative approaches for reducing delays . . .). If, in addition, minimum separation standards were reduced following the development of more accurate instruments such as collision warning devices, IFR capacity with minimum delays could be increased another 15 to 30 percent, to above 200 movements per hour.

To expand capacity further, the most obvious way is the construction of new runways at existing airports. This can be especially advantageous when it allows the classification of aircraft by performance and size or by direction of movement, thus substantially increasing runway efficiency. However, to be able to operate fully independently under IFR conditions, a new parallel runway has to be at least 5,000 feet from an existing one, according to present separation criteria. This kind of space is not easy to come by in the vicinity of the three existing airports. Locating runways closer together than 5,000 feet would increase IFR capacity by only about 30 percent of one runway’s maximum capacity, though under VFR, maximum capacity could be achieved. This would aid general aviation mostly, a relatively small portion of which currently flies in IFR weather. Airlines, on the other hand, must set their schedules on the basis of IFR capacity.

More importantly, while either independent or close parallel runways can greatly expand the capacity of an isolated airport, there are limits to how many additional runways can be usefully jammed into the 20-mile-diameter circle within which the three major airports plus Teterboro are located. These limits are posed by airspace requirements and are not easy to quantify. The FAA “Alternative approaches . . .” study points out that otherwise independent runways in the New York complex are becoming mutually dependent because of airspace interference, with a resulting loss of 5 to 10 percent in capacity. This condition may get worse, especially with an added volume of general aviation flying. And the AIL 1966 study for the Port Authority estimated that the addition of two new runways to JFK airport in Jamaica Bay would only add 35 peak-hour IFR movements to its capacity, thus raising it from 74 to 109. These calculations are currently under further review, involving complex simulation studies, and there is a good possibility that a far greater addition to capacity might be achieved by added runways at Kennedy.

In summary, then, the existing system of three major airports in the Region has a combined good-weather capacity of 250 movements per hour; the poor-weather capacity with minimum delays can be expected to be brought up from the present 173 to 200 or 225 with foreseeable technological improvements in traffic control and without added runways. Further increases could be achieved with new runways, such as in Jamaica Bay or in the Port Newark-Port Elizabeth area, but it is unclear how much capacity such construction would add.

Peak-hour demand for airline passenger plane movements. The critical dimension of any transportation demand is the expected peak period rather than an annual total. To translate annual plane movements, as presented in Table 5, into peak-hour demand, a further factor is needed—the peaking characteristic. At present, airliner movements on an average peak day (the average of 36 highest days of the year) represent 110 percent of the annual average daily airliner movements at the three major airports. (This figure is 105 percent for domestic flights and 118 percent for overseas flights at Kennedy, with the other two airports in between.) The peak hour, in turn, accommodates 8 percent of the flights on a peak day—a peaking factor not unlike that of automobile travel.

Some variations in the peaking factor can be expected over time. For example, introduction of the Super-Sonic Transport (SST) would reduce overseas peaking in the daily cycle (inconvenient arrival times abroad would result from peak-hour departures). In the recent past, largely as a result of faster travel, the trend has been toward a sharper peak. In fact, between 1958 and 1964, the degree of peak-hour concentration increased by over 20 percent in this Region. For the purposes of this paper, the peaking factor is assumed to remain constant over time if no restrictions on demand are imposed.

Regulations rationing peak-hour demand, such as those that went into effect June 1, would eventually spread the peak: the percent of seats occupied during the peak hour would rise, passengers unable to get reservations for peak-hour flights would shift to less preferred hours, and additional non-peak flights would be scheduled to take care of them.

Actually, a reduction of the peak-hour volume from 8 percent to, say, 7 percent of the daily total would inconvenience relatively few people, at the most only a few more than 2 percent of the daily passengers, by forcing them to fly approximately two hours earlier or three hours later. But a further reduction of the peak would be very difficult. One can assume that a 6 percent peak is an absolute minimum. A 6 percent peak would mean, for example, that there would be 9 hours of constant demand during the day (at the 6 percent level), 7 hours of demand at the 5 percent level, and that the remaining 11 percent of travel would occur during the 8 nighttime hours.
For purposes of illustrating the effect of a spread peak on airport capacity requirements, subsequent calculations show the effect of both an 8 percent peak (which appears to be a reasonable reflection of consumer demand) and a hypothetical 6.5 percent peak (which, in fact, existed prior to 1958 when more people were flying at night because slower speeds made many trips last all night). The peak-hour demand for airline passenger plane movements given these two peaking conditions is shown in Table 11 for both the “low” and “high” passenger demand variants.

Table 11.
PROJECTION PEAK-HOUR DEMAND FOR AIRLINER MOVEMENTS AT THREE MAJOR AIRPORTS

<table>
<thead>
<tr>
<th>Year</th>
<th>“Low” Passenger Demand Variant</th>
<th>“High” Passenger Demand Variant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8% Peak</td>
<td>6.5% Peak</td>
</tr>
<tr>
<td>1967</td>
<td>166</td>
<td>154</td>
</tr>
<tr>
<td>1970</td>
<td>191</td>
<td>168</td>
</tr>
<tr>
<td>1975</td>
<td>207</td>
<td>182</td>
</tr>
<tr>
<td>1980</td>
<td>244</td>
<td>198</td>
</tr>
<tr>
<td>1985</td>
<td>237</td>
<td>192</td>
</tr>
<tr>
<td>1990</td>
<td>241</td>
<td>196</td>
</tr>
<tr>
<td>2000</td>
<td>241</td>
<td>196</td>
</tr>
</tbody>
</table>

It should be emphasized again that the above figures reflect the “passengers per plane movement” ratios developed in Table 4. It is the application of the trend in these ratios to the passenger growth trends (“low” and “high” variants) that results in the slight fluctuations in the numbers above, which should be taken as an outgrowth of the methodology used, not as a forecast.

If one assumes the FAA ceiling of 210 aircraft movements per hour to be the present and foreseeable capacity of the three major airports (i.e., that the “uncongested” IFR capacity of 173 will be brought up to 210 by technological improvements in control), the following picture of peak-hour capacity vs. demand emerges. In all these instances, major runways at the three airports are assumed to be used by airliners exclusively during peak periods:

1. Under the “low” passenger demand variant, with an 8 percent peak, capacity of the three major airports is adequate through 1976, and the equivalent of one additional unobstructed runway (assuming the capacity of the latter to be 50 movements per hour) will be needed thereafter.

2. Under the “low” passenger demand variant, with the peak flattened to 6.5 percent of the daily volume by scheduling controls, runway capacity is adequate throughout the forecast period, i.e., at least to 2000.

3. Under the “high” passenger demand variant, with an 8 percent peak, capacity is adequate through 1973, and the equivalent of three additional unobstructed runways will be needed by 1990.

4. Under the “high” passenger demand variant, with scheduling controls flattening the peak to 6.5 percent of the daily volume, capacity is adequate through 1977, and the equivalent of two additional unobstructed runways will be needed by 1990.

As pointed out previously, the only major prospect for diversion in the fairly near future lies in STOL aircraft. On the basis of the California McDonnell simulation, and keeping in mind that the potential for STOL is much more favorable in the Northeast United States than in California, one could tentatively assume that nearly half of the short-haul flights, or 20 percent of all flights, would be diverted to STOL. Since large STOL planes, which would be economically competitive with jets on short-range flights, are unlikely to be available until 1975, reduction of the figures in Table 11 by 20 percent or so is warranted only for the years 1980 and thereafter. The results for these years would be roughly the same as those of reducing the peak from 8 percent to 6.5 percent.

For the “high” passenger demand variant, even if both scheduling controls to effect a lower peak and a 20 percent diversion to STOL are assumed, the equivalent of one additional runway would still be needed after 1981.

Peak-hour demand for general aviation. General aviation peaks are much sharper than those of air carriers. The peak day (average of 36 highest days of the year) is about 147 percent of the average day, according to Port Authority data, and the peak hour is 11.6 percent of the daily volume. These figures are generally confirmed by the 1965 R. Dixon Speas study, noted above. During IFR conditions, general aviation demand is substantially reduced—by about 50 percent—either because general aviation aircraft are not equipped with appropriate instruments or because pilots are not expert enough to use them. However, both these impediments can be expected to decrease, especially at the three major airports where pricing will weed out the more poorly equipped planes first. Purely for purposes of illustration, a 30 percent

Table 12.
PEAK-HOUR DEMAND FOR GENERAL AVIATION MOVEMENTS UNDER RESTRAINED CONDITIONS
(all air taxis eliminated; pricing as indicated below)

<table>
<thead>
<tr>
<th>Year</th>
<th>VFR Conditions</th>
<th>IFR Conditions (30% Reduction)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Present Pricing</td>
<td>Pricing Comparable to Airliners (−22%)</td>
</tr>
<tr>
<td></td>
<td>(−22%)</td>
<td>(−50%)</td>
</tr>
<tr>
<td>1970</td>
<td>54</td>
<td>35</td>
</tr>
<tr>
<td>1975</td>
<td>60</td>
<td>39</td>
</tr>
<tr>
<td>1980</td>
<td>69</td>
<td>44</td>
</tr>
<tr>
<td>1985</td>
<td>76</td>
<td>49</td>
</tr>
<tr>
<td>1990</td>
<td>86</td>
<td>56</td>
</tr>
<tr>
<td>1995</td>
<td>98</td>
<td>63</td>
</tr>
<tr>
<td>2000</td>
<td>108</td>
<td>70</td>
</tr>
</tbody>
</table>

*Percent of movements before August 1968 when landing fees were $5. The amount of reduction assumed with increased landing fee is arbitrary. This factor is unknown now.
reduction in demand under IFR conditions is assumed in Table 12. Also, the table assumes that all air taxis are STOL planes and so use different runways and airspace.

The table indicates that even if air taxis were totally diverted to STOL and pricing policies were pursued which cut previous demand for business and private flights by 50 percent, the equivalent of one-half to one full unobstructed runway capacity would be needed over the study period just to accommodate general aviation. At the end of the study period, peak-hour general aviation movements under this assumption would still amount to 25 percent of airliner movements if the low passenger demand variant occurred and the airline peak was depressed to 6.5 percent. They would be only 14 percent of airline plane movements if the high passenger demand variant occurred and the high airline peak were allowed. For purposes of comparison, the June 1 FAA regulation limits general aviation at the three airports to 42 IFR movements compared to 168 airline plane movements, or 25 percent.

Summary of airplane capacity requirements. The purpose of the foregoing exercises was not to come up with a single-minded forecast based on hidden assumptions but rather to reveal the consequences of assumptions with regard to the various factors that influence the demand for airplane movements at the Region’s major airports.

Assuming that:
1. trends in airplane size continue as indicated in Table 4, column 4, and
2. all air taxis are converted to STOL operation, and the remaining business and private flights at the three airports are cut by 50 percent, compared to the period when landing fees were $5 at all times, by raising landing fees as in Table 10, column 5, the following will be the peak-hour demand for airline plus general aviation plane movements:

<table>
<thead>
<tr>
<th></th>
<th>1975</th>
<th>1985</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. “High” passenger demand projection, peak hour 8 percent of daily traffic, no diversion of airliners to STOL</td>
<td>246</td>
<td>389</td>
<td>396</td>
</tr>
<tr>
<td>b. “High” passenger demand projection, peak hour 8 percent of daily traffic, 25 percent airliner diversion to STOL after ’75</td>
<td>246</td>
<td>300</td>
<td>309</td>
</tr>
<tr>
<td>c. “High” passenger demand projection, peak hour reduced to 6.5 percent, 25 percent airliner diversion to STOL after ’75</td>
<td>205</td>
<td>250</td>
<td>260</td>
</tr>
<tr>
<td>d. “Low” passenger demand projection, peak remains at 8 percent, 25 percent airliner diversion to STOL after ’75</td>
<td>249</td>
<td>236</td>
<td>255</td>
</tr>
<tr>
<td>e. “Low” passenger demand projection, peak reduced to 6.5 percent, 25 percent airliner diversion to STOL after ’75</td>
<td>195</td>
<td>182</td>
<td>196</td>
</tr>
</tbody>
</table>

Depending on which set of assumptions one selects, one can prove either that no additional runway capacity will be needed at all through the year 2000 (case e), or that a doubling of capacity will be required (case a).

So both the realism and the desirability of the assumptions have to be weighed. Concerning case a, the assumption of no airline traffic diverted to STOL is probably unrealistic, whereas in case e, the “low” passenger demand probably should not be counted upon since projections of this type have proven to be too low twice over the past twelve years.

These demands should be compared to:

a. the present “no-delay” capacity of 173 movements per hour, resulting in the FAA ceiling (with some delays) of 210 movements per hour;
b. a prospective “no-delay” capacity, with technological improvements, of 200-225 movements per hour, leading, possibly, to an ultimate ceiling (with minor delays) of 240 or more.

Thus, the ultimate need for the equivalent of at least one fully used, unobstructed additional runway (though not necessarily a full new airport) appears probable, though not inevitable, depending on what policies are pursued.

Possibilities for expanding airport capacity

There are at least three ways worth exploring in which additional runways in the Region can be provided:

**Alternative 1:** Build one or two new airports at the periphery of the Region, leaving the existing Core airports in operation.

**Alternative 2:** Expand the capacity of the existing airports in the Core by adding runways to Kennedy in the Jamaica Bay area and/or to Newark in the Port Newark-Elizabeth area.

**Alternative 3:** Build one new “super-airport” close to the Region’s Core, phasing out some of the existing facilities.

These options have to be evaluated in terms of:

1. total access costs (time and money) to users of the entire system (not just to users of the new capacity provided);
2. total costs of schedule inconvenience to passengers;
3. total operating costs to airlines and supporting agencies (minimizing duplication of services and schedules);
4. total disbenefits to non-users (principally the noise impact on residential areas but also the preemption of esthetically valuable landscapes, which seems to be a prime concern of the political opposition to new airport sites);
5. total costs of acquisition and construction (including such items as the immediate and long-term costs of the relocation of air traffic patterns if required by one of the alternatives).
1. Scheduled flights by hour as a percent of daily flights. A Friday in July, 1964, 3 major airports. The peak hour is 8.3 percent of the daily total; nearly 50 percent of all flights occur in the 7 hours between 4 and 11 PM; 5.3 percent of all flights occur during the nighttime hours between 1 and 7 AM.

2. An illustrative reduction of the peak from 8.3 percent to 7 percent. 2.4 percent of the daily flights are inconvenienced by having to fly either 2 hours earlier or 3 hours later; there are 7 hours of constant demand at the peak level of 7 percent, from 4 to 11 PM.

3. An illustrative reduction of the peak from 7 to 6.5 percent. An additional 3.5 percent of the daily flights are inconvenienced by having to fly about 4 hours earlier or later; there are 9 hours of constant demand at the peak level of 6.5 percent, from 3 PM to midnight.

No effort to undertake such a comprehensive study, systematically evaluating a broad range of alternate policies and costs, has been made. If made, it would kill the simplistic notion that “we have congestion—let’s build another airport, no matter how far—60 or 70 miles from the Region.” It might also suggest that ideas previously labelled as “enormously expensive and impractical” are most prudent in the long range for the public as a whole. What follows is a shorthand effort to guess some results of such an unmade study with regard to access, airspace, compatibility with environment, and construction costs.

Accessibility. In 1965, 83 percent of the Region’s population lived within one hour of at least one of the three major Core airports. Since close to 50 percent of their traffic originated in Manhattan alone, substantially over 90 percent of the actual air travellers were within one hour of a Core airport. As a result of the Region’s projected growth patterns, the present 83 percent living within one hour of at least one of the three major airports is likely to decline to about 72 percent in the year 2000. The served and the unserved parts of the Region are tabulated below.

Table 14.
POPULATION WITHIN AND BEYOND ONE-HOUR’S DRIVE OF THREE MAJOR AIRPORTS, 1965 AND 2000

<table>
<thead>
<tr>
<th></th>
<th>1965 Population</th>
<th>2000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within one hour by automobile of one of the three existing airports</td>
<td>15.7 million</td>
<td>21.5 million</td>
</tr>
<tr>
<td>Beyond one hour by automobile of one of the three existing airports but within the Region:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwestern Connecticut</td>
<td>1.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Western New Jersey</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Northern New York</td>
<td>.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Eastern Long Island</td>
<td>.2</td>
<td>.5</td>
</tr>
</tbody>
</table>

27
Table 15.
POPULATION WITHIN ONE HOUR’S DRIVE OF FIVE PROPOSED AIRPORT SITES

<table>
<thead>
<tr>
<th></th>
<th>2000 Population (in millions)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outside One Hour’s Drive of Three Major Airports (but in Region)</td>
<td>Within One Hour’s Drive of Three Major Airports</td>
<td>Rail Miles to Mtn. CBD</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>1. Allentown (N.J.)</td>
<td>2.0 +</td>
<td>3.0 = 5.0*</td>
<td>60</td>
</tr>
<tr>
<td>2. Calverton (Suffolk County, N.Y.)</td>
<td>.8 +</td>
<td>2.0 = 2.8</td>
<td>77</td>
</tr>
<tr>
<td>3. Pine Island (Orange County, N.Y.)</td>
<td>1.0 +</td>
<td>.5 = 1.5</td>
<td>56</td>
</tr>
<tr>
<td>4. Solberg-Hunterdon (N.J.)</td>
<td>2.0 +</td>
<td>5.0 = 7.0**</td>
<td>44</td>
</tr>
<tr>
<td>5. Stratford Shoals† (L.I. Sound near Bridgeport)</td>
<td>2.6 +</td>
<td>3.0 = 5.6***</td>
<td>65</td>
</tr>
</tbody>
</table>

*Plus possibly 2.0 million in the Camden-Philadelphia area.
**Plus possibly .7 million in Pennsylvania.
†Assumes bridge across L.I. Sound.
$n.a.$—not applicable

New airport sites at the periphery of the Region, suggested over the past twelve years by various public or private bodies, would mainly serve residents who now live more than an hour’s drive from one of the three major airports. Table 15 above shows tributary populations (within one hour travel time) of five possible sites outside and within the “travelshed” of the existing airports, as well as possible rail distances.

Clearly, Calverton and Pine Island will have minimal tributary populations even in the year 2000. Stratford Shoals, Solberg-Hunterdon and Allentown, by contrast, will have tributary populations of 6-8 million if population outside the Region is included. This appears sufficient to support a jetport if the service area wants one.

But as to relieving the load on the three major airports, the relevant fact is not total tributary population in Pennsylvania or elsewhere but the population residing within the service area of the three airports. Tied to this must be the distance from Manhattan, which now accounts for nearly 50 percent of all trips by air from the Region. These two facts define the number of people who would voluntarily choose to use an outlying airport instead of one of the three existing major airports. Based on preliminary estimates, the five sites would be able to attract roughly the following percentages of the potential users of the three Core airports in the year 2000:

Table 16.
POSSIBLE RAILROAD TRAVEL TIMES TO MANHATTAN FROM FIVE PROPOSED AIRPORT SITES

<table>
<thead>
<tr>
<th>Site</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solberg-Hunterdon</td>
<td>15.5</td>
</tr>
<tr>
<td>Allentown</td>
<td>8.5</td>
</tr>
<tr>
<td>Stratford Shoals</td>
<td>7.6</td>
</tr>
<tr>
<td>Pine Island</td>
<td>5.0</td>
</tr>
<tr>
<td>Calverton</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Only Solberg-Hunterdon would be able to achieve a noticeable diversion from the existing airports, and even this would be modest. Allentown runs a poor second. To make Solberg-Hunterdon effective in relieving the three major airports, Stratford Shoals may be needed also. This would achieve a diversion of about 23 percent that could make new runways at the Core airports unnecessary.

The effect of Calverton and Pine Island on the Core airports can be considered negligible on the basis of voluntary passenger diversion; they would be workable only with a forced segregation of flights by destination—for example, if overseas flights could only land at Calverton. This, of course, would impose high access costs on over 20 percent of the air travellers—those going overseas—and would relieve the Core airports of only some 14 percent of aircraft movements. The distant sites appear almost irrelevant to the Region’s airport problem unless ultra-high-speed access existed, such as gravity-pneumatic trains could provide. Present-day suburban rail equipment (such as the Penn-Central’s or the Long Island Rail Road’s) makes possible 60 mph average speeds including a few intermediate stops if the right-of-way is upgraded. This would result in schedule times of:

Table 17.
POSSIBLE RAILROAD TRAVEL TIMES TO MANHATTAN FROM FIVE PROPOSED AIRPORT SITES

<table>
<thead>
<tr>
<th>Site</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solberg</td>
<td>44 minutes</td>
</tr>
<tr>
<td>Pine Island</td>
<td>56 minutes</td>
</tr>
<tr>
<td>Allentown via Princeton Junction</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Stratford Shoals</td>
<td>65 minutes</td>
</tr>
<tr>
<td>Calverton</td>
<td>77 minutes</td>
</tr>
</tbody>
</table>

However, all these will have to compete with a 16-20 minute railroad running time from Manhattan to Kennedy planned by the Metropolitan Transportation Authority. The only way to match that (providing about an
18-minute trip to Solberg or 23 minutes to Allentown with three intermediate stops) is by gravity-pneumatic propulsion.

**Airspace.** Next to access for people to the airport, access for airplanes must be considered. The airspace over the Region is tightly parcelled out for airways, holding patterns and approach paths to existing airports. To fit in a whole new airspace system serving a new airport so that present traffic would not be interfered with is not easy, given existing safety standards for separation between aircraft. The heaviest flow of air traffic is in the northeast-southwest direction, and there is a tight tangle of movements within about 35 miles of Manhattan.

The only relatively vacant airspace exists to the west of this pattern, encompassing sites such as Solberg-Hunterdon or Pine Island. Airports at Stratford Shoals or Calverton would create some airspace problems. The capacity of a site at Allentown would be severely limited by overflights to existing airports.  

Changes in air traffic control technology and standards can and should be anticipated, but they cannot be the basis for locating an airport that is designed to go into operation in the near future.

**Environment.** The third basic consideration is the impact of the airport on its environment. Incremental reductions in engine noise should be anticipated, but on the whole, jet noise seems here to stay.

Present long-range jets, taking off without special noise abatement procedures, subject an area of about 68 square miles around a hypothetical airport to intermittent noise levels in excess of 100 PNdB (perceived noise decibels). That noise is comparable to an accelerating truck at a distance of 50 feet or a diesel freight train at a distance of 200 feet. An area of about 240 square miles in four corridors around an airport could be subject to intermittent noise in excess of 90 PNdB, which interferes with outdoor speech.

Only an offshore site, such as Stratford Shoals, would cause relatively little noise damage. Pine Island, Calverton, Allentown and Solberg-Hunterdon, in rapidly ascending order, will affect a substantial population with noise.

Also to be considered is the impact of an outlying airport on scenic values and general amenity. Especially in view of its extensive freight-handling facilities, an airport cannot be considered a good residential neighbor for such areas as Solberg-Hunterdon or Calverton. But is that reason enough to veto a location which other factors favor?

Summarizing in unweighted fashion the four factors of tributary population, passenger diversion from Core aircarports, airspace availability and environmental impact, and ranking the position of each site from 1 (best) to 5 (worst), the following picture emerges:

**Table 18.**

<table>
<thead>
<tr>
<th>Site</th>
<th>Tributary Population</th>
<th>Relief to Existing Airports</th>
<th>Availability of Airspace</th>
<th>Compatibility with Environment</th>
<th>Composite Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solberg-Hunterdon</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Stratford Shoals</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Pine Island</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Allentown</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Calverton</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

None of the outlying sites is unequivocally desirable. The net results of Alternative solution 1, namely, the provision of one or two new outlying airports, would be:

- **on the benefit side**—
  1. some relief for the three major airports;
  2. some reduction of total access time for those living in outlying areas near the proposed sites;
  3. opportunity for air travel in areas which are presently too remote from major airports to allow frequent air travel;

- **on the cost side**—
  1. substantially increased air carrier operating costs because of the need to add a fourth set of schedules and operations people and introduce inter-airport transfers;
  2. substantially increased complexity of the airspace system;
  3. substantially expanded area within which population would be subjected to noise;
  4. large investment in the airport and access to it;
  5. large tract of land taken from other uses.

If the opposing forces of air passenger access costs and airport economies of scale were to be weighed, quantified and related (as should be done), the addition of one or two major airports may not prove too favorable.

Conditions would change radically if 20-25 minute access to far-out airports were to be provided by new technology like gravity-pneumatic propulsion. This version of a new outlying airport would even open the vista of dispensing with the present Core airports by building two very large airports on the periphery. Amenity would be gained—mainly decrease in noise over populated areas—without loss of accessibility. However, in view of the huge volumes of future air travellers, the costs of such a solution would be very high. And the time-horizon is uncertain.

If a satisfactory outlying site like Solberg is not politically feasible, Alternative 2, the expansion of existing Core airports, should be considered.
POTENTIAL AIRPORT EXPANSION SITES IN THE CORE

- 90 decibel noise contour
- 16 square miles
- Possible new runway
- Possible relocation of Port Newark
Providing new runways at Kennedy and Newark by encroaching on adjacent land (Jamaica Bay park and conservation areas, Port Newark-Elizabeth) would be costly but would yield, on the benefit side:

1. operating economies to air carriers due to larger airport size without duplication of ground services;
2. convenience to users due to more frequent schedules from centralized locations and fewer transfer frictions than in Alternative 1;
3. minimal expansion of the populated area subjected to noise.

To be considered on the cost side:
1. longer access times for the growing population on the periphery of the Region, ameliorated somewhat by high-speed inbound rail access;
2. no added air travel opportunity for people living on the Region's periphery;
3. tightening airspace problems in the Region's congested Core;
4. tightening passenger access problems on the confined sites of the existing airports and very little space for freight handling.

With regard to the latter two points, it is possible that:

a. airspace restrictions and noise abatement procedures would not allow a sufficient utilization of additional runways at Kennedy and Newark;
b. the huge passenger volumes anticipated could not be physically accommodated on the existing sites, even with mass transit access, if LaGuardia, Newark and Kennedy were to be called upon to serve, for example, 35 million, 55 million and 220 million annual passengers respectively, compared with their present volumes of 10 million, 7 million and 20 million.

This then leads to the consideration of Alternative 3, namely to phase out, eventually, one or even two of the existing Core airports and replace them with a super-airport that maintains a roughly comparable accessibility but has more runway capacity, more airspace and more room for passenger and freight handling and eliminates noise over presently affected areas. The only place which satisfies these requirements is that quadrant of the Region's Core which is the Atlantic Ocean; the best site in that quadrant appears to be about four miles south of Long Beach, replacing Kennedy. The first-stage cost of creating a man-made island with a surface of some seven square miles in water averaging 45 feet deep would be on the order of $1 billion. However, in view of the huge passenger volumes involved, that cost could be amortized by what amounts to a per-passenger fee of about $1 over 20 years. On the benefit side, one should figure:

1. operating economies to air carriers due to larger airport size and no duplication of ground services;
2. convenience to users due to more frequent schedules from a centralized location and fewer transfer frictions;
3. complete elimination of noise impact of Kennedy airport on residential communities in Nassau County, Queens, and Brooklyn, without creating new noise impact areas (ends of runways would be some eight miles from the closest residential areas);
4. loosening-up and simplification of airspace patterns in the Region's Core;
5. potential for expansion;
6. potential for more intensive urban and industrial reuse of the present Kennedy airport property.

To be considered on the liability side, aside from the physical construction cost and the lengthened construction period:

1. total access times somewhat greater than in Alternatives 1 and 2 but probably still less than present travel times; from Manhattan, access time would be about 30 minutes by rail or 13 minutes by gravity-pneumatic train with two intermediate stops;
2. no added travel opportunity for people living on the Region's periphery and poorer access to New Jersey residents (unless new ultra-high-speed ground transportation were to be extended west);
3. problems of accommodating huge passenger volumes on a confined site at the end of a causeway, with single-point access;
4. writing off the huge (over ½ billion dollars) investment in Kennedy, on which the financial position of the airlines is highly dependent.

An airport in the Lower Bay, replacing both Newark and LaGuardia, also would be possible. It would not fit present air traffic corridors, but air space could be organized for it to be compatible with Kennedy. Although a Lower Bay airport would not provide as much relief from noise over developed areas as the Ocean airport, it would have several advantages over the Ocean site: it would cost perhaps a third as much for the island just because of shallower water; it would be more accessible, especially for New Jersey residents; it could be connected to the mainland from three points rather than one. Both the replaced airports, LaGuardia and Newark, could be converted to STOLports, if air traffic patterns can be worked out.

Altogether, it appears that both the Atlantic and the Lower Bay site possibilities merit further investigation within a broad systems analysis of the Region's air transportation problem. Problems associated with offshore sites must be studied, also:

1. construction methods,
2. hydrology and climatology,
3. access,
4. impact of such concentration of air travel on the Region's land use, travel patterns and form.

FAA interest in offshore airport developments, proposed for Chicago, Cleveland, Boston and other cities,
has prompted it to undertake a study of the economic, operational and technical feasibility of such sites. The results are to be available early in 1970.

Additional information for evaluating the three alternative policies should be forthcoming from FAA studies of the national airline network, from the FAA simulation of new runways in Jamaica Bay, from current Port Authority studies of airport access and from forthcoming studies by the Regional Plan Association. Thus, within the next two years, a much clearer picture of the costs and benefits of the available long-range options should emerge.

IV. UNKNOWN FACTORS

The following questions should be answered as thoroughly as possible before a decision is made to expand the number of runways in the New York Region. All answers are or soon will be calculable to some extent, but little is presently known.

A. AIRLINE PASSENGER DEMAND

1. Will per capita demand continue to grow in proportion to per capita income, or is there some degree of saturation in sight? If so, why and when?
2. What will be the trend in the cost of air travel? How will the balance between declining direct operating costs of large aircraft and the increasing indirect operating costs (ground handling, delays, user charges for airports and airways) work out?
3. Will user charges pay the full cost of air travel, or will some subsidies continue?

B. AVERAGE AIRPLANE SIZE

1. Will public policy encourage airline mergers or joint use of large aircraft to cut down on competing flights along the same routes and so cut the number of peak-hour movements without reducing passenger capacity?
2. Will public policy encourage development of larger airplanes in lieu of investment in more airports?
3. What will be the economics of flying today's relatively small airplanes in the age of "jumbo-jets"? Will the investment in the present generation of airliners lead to their use for new non-stop services on lightly-travelled routes, thus proliferating schedules and the demand for runway space, or will they be phased out in about a decade, as propeller aircraft were?
4. What will be the balance between frequency of service (thus passenger convenience) and the economics of flying large aircraft?
5. What will be the economics of the relatively small and costly Super-Sonic Transports (SST) on overseas routes in competition with the slower but more economical jumbo-jets? What share of the market will the SST's capture? (It should be noted that SSTs to Europe will impinge little on peak-hour demand for aircraft movements since they will have later departure times for overnight flights.)

C. DIVERSION TO GROUND MODES

1. Will public response to high-speed trains, such as the Metroliners now running between New York and Washington, continue to be favorable? What diversion has taken place from airlines to the Metroliners?
2. Will a vigorous effort be made to convert all the Northeast Corridor's non-commuter high-density rail routes, like New Haven-New York-Washington, to new high-speed equipment and to improve roadbeds and track alignments at least moderately? What is the cost-benefit comparison of speeded rail service vs. air service in high-density corridors?
3. Will attractive high-speed rail service be feasible on other routes, such as to Boston, Hartford, Albany, Harrisburg?
4. Will a vigorous federal research and development program be undertaken on Gravity-Vacuum Trains (GVT)?

D. DIVERSION TO STOL

1. Will the FAA, the airlines, the airport operators and aircraft manufacturers soon agree on the specifications for a desirable STOL or VTOL airliner, and how soon will it go into production?
2. Will the efforts to design an independent V/STOL airspace system be successful? How soon? How will operation characteristics affect STOLport location requirements?
3. What effects will STOL have on the environment? Will these effects be sufficiently negative to warrant limiting STOL's full potential?
4. Will public agencies in the Region move vigorously to plan and build a regional STOLport system? What will be its hourly capacity in and near the Core?
5. How much new air travel will STOL planes induce and how much will be diverted from airline movements, from air taxi movements, from other general aviation movements? Will STOL actually achieve a breakthrough in short-haul air travel, or will it merely repeat the disappointing performance of the helicopter, on which so many hopes were pinned some twenty years ago?

E. DIVERSION OF GENERAL AVIATION

1. How responsive will general aviation be to further increases in landing fees (i.e., what is the demand elasticity for general aviation movements)?
2. Can peripheral general aviation airports, with improved facilities and ground access, provide an essential minimum of access to Manhattan and the Region's Core?
F. DEMAND FOR AIR FREIGHT
1. What is a realistic projection of future air-freight demand?
2. How much ground space and what forms of access will that require at airports? Will a spacious outlying airport be required because of freight alone? Is it justified for freight alone?

G. INCREASES IN PRESENT RUNWAY AND AIRSPACE CAPACITY
1. How soon will computer-aided spacing and sequencing of aircraft on approaches be introduced and with what effect?
2. What will be the effect of procedural improvements, such as common IFR room over the Core of the New York Region?
3. Will reduced separation criteria between aircraft be safe with more sophisticated electronic equipment?
4. Will area navigation replace the present rigid air lanes not only in the STOL airspace system but also in the airspace system for conventional aircraft?

H. REDUCTION OF THE PEAKING FACTOR
1. How much spreading of the peak will the flying public tolerate, at what cost? For example, would a 25 percent surcharge on flights leaving or arriving during peak periods lower demand significantly?

2. How many more passengers could be accommodated without increased plane movements if only one or two airlines were allowed to serve a single destination at peak hours? Would substantial landing fee surcharges during peak periods achieve this result without CAB regulation?

I. NATIONAL AIR TRANSPORTATION POLICY
1. Are limitations of airspace, ground access and airport site availability in the largest urban regions of the nation sufficiently interrelated to warrant a national air policy?

J. ADDING RUNWAYS IN THE NEW YORK REGION
1. Which geographic distribution of runways in the Region will minimize the sum total of the following costs:
   a. the access costs to users (time and money),
   b. the costs of schedule inconvenience,
   c. the total operating costs to airlines and the airport operating agencies,
   d. the total disbenefits to non-users (principally the noise impact), and
   e. the total acquisition and construction costs.

Forthcoming RPA research will primarily be focused on question J.

An architect’s conception of a floating offshore airport, prepared by Charles Gallichio II and Jan Dabrowski, indicating one of numerous approaches being proposed. Airports on fill or in polders appear more feasible for the near future, but the feasibility of various offshore structures is being studied by the FAA.
May 7, 1969

Mr. John P. Keith, President
Regional Plan Association, Inc.
230 West 41st Street
New York, New York 10036

Dear John:

We have just received copies of your planners' paper on "The Region's Airports," which you have sent to the news media for release on May 12 and we are astounded that the Regional Plan Association would issue such an array of vague speculations in the form of "recommendations" when the well-being of the metropolitan area is dependent upon positive and quick action.

The air transportation needs of this region have been studied almost continuously for a decade by the Port Authority, the Federal Aviation Administration, the New Jersey Department of Conservation and Economic Development, the Metropolitan Transportation Authority, the airlines, and numerous consultants with professional qualifications in the aviation, engineering and community problems involved. On the basis of these studies, reports were issued in 1959, 1961, 1963, 1964, 1965, 1966, 1967, 1968 and 1969.

During the first half of this decade, some of the reports questioned the need for a new airport and discussed alternative solutions. The studies and the experience of the past few years, however, have brought unanimous agreement among public agencies and industry organizations on the need for a new major airport.

It therefore dismays us to see the Regional Plan Association proposing to turn the clock back ten years and start the discussions and studies all over again, with no new facts or ideas to justify such a reconsideration.

For example, the paper discusses expanding the existing airports as one of the alternatives to a new airport, but does not mention any previous consideration of this possibility. Over $450 million is being spent to maximize the capacity of existing airports, and the possibility of further expansion instead of building a new airport was thoroughly studied on a number of occasions by the Port Authority, two different consultants retained by the Port Authority, the FAA, a group of airlines, and a consultant retained by that group of airlines. These studies gave full consideration to the passenger capacity of future aircraft and to the potential utilization of STOL-type aircraft in short-haul service. Even with all of this and improved short-haul ground transportation systems, the Port Authority, the FAA and the airlines are now convinced that the region must have a new major airport as soon as possible.

Similarly, your paper discusses rail access to Kennedy Airport as though it were a new idea and comes up with the recommendation that the MTA and the Port Authority "should proceed quickly to negotiate agreement on rail service to Kennedy Airport." It makes no reference to the fact that plans for a rail line to Kennedy were publicly announced by MTA last October and that a joint MTA-Port Authority-Airlines task force known as the Kennedy Airport Access Project has been working full time on the implementation of those plans.

The most irresponsible feature of the RPA paper, however, is its fascination with far-out ideas which have no practical relationship to today's problems. For example, it suggests "relocating Port Newark and Port Elizabeth," completely ignoring the fact that there is no other possible location in the Port for these facilities which handle nearly half of the Port's cargo. Cover about 1,600 acres, represent an investment of $200 million, and provide jobs for more than 7,500 people.

It is equally impracticable to suggest that the solution to the airport problem lies in abandoning Kennedy Airport —where $1 billion will have been invested by 1970—and replacing it with a new airport four miles out in the ocean where, according to your report, over $1 billion more would be required "just to build the island."

The Port Authority, as a member of the Regional Plan Association, laments that the Association, in the midst of the need for serious, hard, public policy decisions, would becloud the issues with such frivolous speculations. We can only hope that these speculations will not prevent public notice of your final recommendation that a site for a new major airport should be acquired immediately because, if this is not done, "the best sites for such an airport may very well be built up enough to preclude their use for an airport."

Sincerely,

Austin J. Tobin
Executive Director

35
May 16, 1969

Mr. Austin J. Tobin
Executive Director
The Port of New York Authority
111 Eighth Avenue
New York, New York 10011

Dear Austin:

We have given careful thought to your letter of May 7 concerning Regional Plan Association’s study, “The Region’s Airports.” We also have reread the Port Authority’s reports to which you referred us. We again find in them persuasive evidence in support of our position that the case for a fourth major airport has not been made.

It is not “vague speculation” to say that there is time in which to provide the necessary information to make a reasoned decision on the proposed jetport.

The two most important steps with which to relieve airport congestion immediately are already accepted in principle by the Port of New York Authority and the Federal Aviation Administration.

First, following a Regional Plan proposal of 1967, the Port Authority has increased charges on general aviation from $5 to $25 and thereby significantly cut peak-hour flights by these non-commercial airport users. We urge now that all planes pay an equal landing fee for the commodity they are buying—time in the flight path and on the runway. Probably this would average, as airliner fees now do, about $75. It would open to airline use many of the 42 peak-hour flights reserved for general aviation under the Federal Aviation Administration regulation going into effect June 1. This alone would accommodate some 2,000 passengers during each peak hour, a figure that would rise as airliner size rises.

Second, the impending FAA regulation will limit the total peak-hour aircraft movements to and from the Region’s major airports. This will space out the peak demand where necessary after filling peak-hour flights now unfilled that simply duplicate service or that use smaller aircraft than could be available.

These two principles—virtual elimination of general aviation in peak hours and spreading of peak hour commercial aviation flights—should be pushed vigorously.

Also, immediately before us is the prospect of larger aircraft. Using Port Authority projections of plane size and passenger demand, there is little question that the demand can be satisfied over the next decade, certainly long enough to provide the information needed to make a rational airport judgment. In 1980 the Port Authority expects 91 million airline passenger trips to and from the Region. And the Port Authority projects an average of about 100 passengers per plane movement by 1980. Under these two Port Authority assumptions, annual airliner movements in 1980 would be about 900,000—well below the 1,000,000 present capacity of the three major airports, if general aviation is eliminated.

It is for these reasons that we feel confident that there is time to take a relook at the fourth jetport issue.

Why do we think a relook is mandatory? The Port Authority’s own published reports first alerted us to the need.

1. In the comprehensive Port Authority reports, issued in 1961 and 1966, Solberg was said to be too far from the Region’s Core to attract many passengers. The Port Authority seems to have changed its conclusions without any change in published evidence or analysis.

The Authority’s 1961 report read, at page 129:

The Solberg-Hunterdon site is in a poor location in relation to the region’s traffic generating center and would result in a significant reduction in use by the region’s potential air passengers.

This same statement was repeated in the Authority’s 1966 report at page 43.

Our own more recent projections of employment, population and land use in the Region to the year 2000 support the conclusion of these Port Authority reports. It appears that the amount of voluntary diversion to a Solberg-Hunterdon airport from the present airports would be minimal. Since the experience in Washington, D.C., is that travelers prefer crowded National airport to spacious and little-used Dulles, only 20 minutes farther from downtown Washington, we raise the question of whether a Solberg airport at least 25 minutes farther from Manhattan than Kennedy would be a similar underserved facility.

2. Also in the 1966 report, rail service to an outlying airport was called uneconomical and, therefore, impractical. Again, the current assumption apparently held by the Port Authority that fast rail service would be provided for a Solberg airport appears as a new conclusion with no new evidence.

The 1966 Port Authority report states at page 35: “...it is clear that the financial results of airport rail service would be most uneconomic.” The present assumption, then, that fast rail service would be provided to Solberg must imply severe financial losses. To whom? Also, assumptions by the State of New Jersey and the New York Metropolitan Transportation Authority that the full peak-hour capacity of the Pennsylvania Railroad tunnel from New Jersey would be used for added commuter trains means a conflict with the rail needs of a Solberg airport.

3. There are no numbers in these reports or the subsequent ones to which you refer that answer any of the questions we suggest need answers before subjecting the Region to the tremendous cost and impact of an additional airport, nor are there arguments that persuade us that these answers are not essential for a rational decision on added airport capacity.

There are no assignments of present and future passenger demand to specific airport sites, an essential part of
estimating the use that these airports would receive. Without these, no one can satisfactorily estimate the value of an outlying airport site to the Region. We feel it is simply not enough to estimate the number of future air passengers and private flyers, divide by the presently predictable plane size, divide by the number of airports, and then say that since you come out short, another airport is needed, irrespective of location. Furthermore, to assume that the major airports must accommodate all general aviation at highly subsidized rates could lead to a fifth and even a sixth jetport.

If a Solberg airport were built and then used only for very few passengers, the cost to the Port Authority might be supportable, but it could be a tremendous error for the Region as a whole. And that's our point: no one knows. The full cost to the Region as a whole has never been calculated to our knowledge.

Now, let us turn to some of our “far out ideas.”

Our study was submitted in draft to many parties at interest and experts in providing air service in the Region, including your own staff and the other agencies your letter mentioned. None replied that the points “have no practical relationship to today's problems.” In fact, the replies substantiated the practicality of speeding the introduction of STOL aircraft, exploring ways to divert passengers to ground transportation, and pressuring for the enlargement of air space capacity through better guidance systems.

Nobody said that an airport in the ocean definitely could not work. On the contrary, the FAA has reported that it is studying water sites for several major cities, and New York City first proposed that location for exploration.

Nobody said that enlarging Kennedy is impossible or unreasonable. In fact, the Port Authority, the FAA and the airlines are studying it right now.

You state flatly that Newark Airport cannot be extended into the area now occupied by Ports Newark and Elizabeth, but the objection that there is nowhere else to locate these ocean ports seems hard to believe in view of the extent of seaport facilities abandoned over recent years. Of course this alternative would be costly. But it is far from clear that it would be more costly for all concerned than an outlying airport, if the costs of travel to the airport (including travel time for passengers) and the cost of noise and other damages are included. If the relocation of the ports is physically possible, but too costly for the Port Authority’s balance sheet, then we raise a question of whether the Region’s balance sheet should not take precedence. You will recall that both balance sheets were accommodated when new commuter rail cars were purchased by the State of New York through the Port Authority without calling on the Port Authority’s credit.

Nor did Regional Plan say that an outlying airport was certain to be impractical. Quite the opposite. We suggested that the Tri-State Transportation Commission consider the feasibility of immediately purchasing an airport site, or purchasing the development rights to such a site, even before it is certain that the site will be best for new runway capacity. This we felt was prudent because, of all the potential sites for additional runways, an outlying airport is the only one that might not be available in a year or two when the necessary studies are completed. We do say, however, that to divert enough travellers from the present airports voluntarily, some new form of very high-speed city to airport transportation would be needed. But we have not received support from the Port Authority in pressing the federal Department of Transportation for study of new transportation technology.

At our press conference, we made it clear that Regional Plan Association had supported the transfer of management of the Region's airports to the Port of New York Authority in 1947, based on the “Airports of Tomorrow” study conducted with you and others at that time. The fundamental premise of that report, you will recall, was that there should be one airport operator in the Region.

It is the reluctance of the Port Authority to build and operate secondary airports that endangers the concept of a single regional aviation system to which both the Port Authority and Regional Plan subscribed in 1947. This reluctance has spawned what could become complete fragmentation: New York City looking forward to re-entering the airport business by building STOLports; the Metropolitan Transportation Authority being assigned to provide missing parts of the regional airport system in New York State; New Jersey and Connecticut contemplating the establishment of state airport authorities.

The operation and responsibility for airports being fragmented, Regional Plan concludes that a single plan for a total regional airport system is essential. We suggested that the Tri-State Transportation Commission is appropriate for that task, but we will continue to study the subject ourselves with your cooperation.

We find nothing, then, in your response to Regional Plan's airport analysis that shakes our conclusions or weakens our determination to bring them to public attention. At the same time, we find little in these conclusions that cannot be accommodated in the Port Authority's operations. Our disagreement is perfectly understandable in that our view as a general planning organization for the Region must encompass wider considerations than your assignment calls for. But the states, being general agencies of government, should consider this wider view, and, we trust, will do so.

Sincerely yours,

John P. Keith
President
Mr. John P. Keith, President  
Regional Plan Association, Inc.  
230 West 41st Street  
New York, N.Y. 10036

June 10, 1969

Dear John:

I have your letter of May 16 in answer to my letter of May 7. Your letter repeats many of the points in your planners’ paper on “The Region’s Airports” and, so far as we can see, does not contain any arguments or information not contained in that paper.

We have already fully expressed our opinions in our conversations with you and Mr. Pushkarev prior to the release of his paper and in my letter of May 7 to you.

Obviously you are still in disagreement with us, the airlines, the Air Line Pilots Association, the FAA, the U.S. Department of Transportation, and the agencies of the two States which have studied the problem over the past ten years. I do not think that any purpose would be served by further, repetitious discussion or correspondence.

Sincerely,

Austin J. Tobin  
Executive Director

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SELECTED FURTHER READINGS

The following report is of general historic interest.

Regional Plan Association. AIRPORTS OF TOMORROW; REPORT OF THE REGIONAL AIRPORT CONFERENCE ON ITS PLAN FOR THE DEVELOPMENT OF AN AIRPORT SYSTEM FOR THE NEW YORK METROPOLITAN REGION. 1947. 47 pp. and appendix.

The following reports, listed in chronological order, trace the development of the airport issue through the last decade.

Port of New York Authority. A NEW MAJOR AIRPORT FOR THE NEW JERSEY-NEW YORK METROPOLITAN AREA; A REPORT ON PRELIMINARY STUDIES. December 14, 1959. 36 pp.


COMPUTER SIMULATION OF AIRPORT OPERATIONS APPLIED TO DEVELOPMENT PLANNING—NEW JERSEY-NEW YORK METROPOLITAN AREA. September 1966. 139 pp.


Metropolitan Commuter Transportation Authority. JETPORTS AND GENERAL AVIATION IN THE NEW YORK METROPOLITAN AREA; A REPORT TO GOVERNOR NELSON A. ROCKEFELLER. March 1967. 28 pp.

Somerset County Planning Board, A REPORT ON THE PROPOSED JETPORT. June 20, 1967. 41 pp., bibliography and map.

U.S. Federal Aviation Administration. ALTERNATIVE APPROACHES FOR REDUCING DELAYS IN TERMINAL AREAS. November 1967. 69 pp. and appendices.


______ A FUTURE SYSTEM OF AIRPORTS FOR NEW JERSEY, VOLUME II; PHASE B REPORT ON DETERMINATION OF NEW JERSEY AIRPORT REQUIREMENTS, prepared by Albert E. Blomquist, Frederic P. Kimball, and Peter Bardos. July 1968. var. pag.

______ A FUTURE SYSTEM OF AIRPORTS FOR NEW JERSEY, VOLUME I; PHASE B REPORT ON DETERMINATION OF NEW JERSEY AIRPORT REQUIREMENTS, prepared by Albert E. Blomquist, Frederic P. Kimball, and Peter Bardos. July 1968. var. pag.


On the subject of aircraft noise, the following reports are recommended:


Janice Stewart

Region Plan Association
230 West 41st Street New York, N.Y. 10036 565-1714

A citizens organization dedicated to the development of an efficient, attractive and varied three state metropolitan region surrounding the Port of New York.

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editor: William B. Shore
design: Caroline Jewels
maps: Gustavo Pinto