Journal of Air Law and Commerce

Volume 17 | Issue 4 Article 1

1950

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THE JOURNAL OF
AIR LAW AND COMMERCE

VOLUME 17 AUTUMN, 1950 NUMBER 4

AIR TRAFFIC FORECASTING FOR THE NEW YORK-NEW JERSEY PORT DISTRICT*

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ON June 30, 1950, The Port of New York Authority completed an air traffic forecast projecting for the next thirty years the volume of commercial air passengers, cargo, and mail, both domestic and foreign. The projection of air traffic was undertaken to assure that the rehabilitation and expansion of the terminal airports in the New York-Northeastern New Jersey Metropolitan Area would be adequate to serve traffic needs and at the same time represent financially sound development.

PURPOSE OF THE AIR TRAFFIC FORECAST

The Forecast, which required almost a year and a half to complete, is the basis for the Port Authority's program for developing terminal type airport facilities for the New Jersey-New York Port. It is the cornerstone for the long range budget and for the planning of all facilities with respect to both size and the scheduling of construction.

Most of the magnitudes required for planning purposes are directly dependent on air traffic volumes, as for example:

1. The number of aircraft movements for which runways, aprons, and parking areas and hangar facilities must be provided depends essentially on the volume of traffic, passengers, cargo and mail.
2. The size of terminal buildings, parking lots, and access highways depends on the number of airline passengers and the volume of visitors and spectators attracted to the airport.
3. The volume of cargo will determine not only the amount of cargo handling space needed but also the extent to which all-

* Adapted from a report entitled, *Air Traffic Forecast, 1950-1980, New York-New Jersey Port District*, prepared for The Port of New York Authority. The study was made under the direction of Mr. Hart and Grahame H. Aldrich with the advice and assistance of three consultants: Joseph D. McGoldrick, Wilfred Owen, and Lewis C. Sorrell. Statistical material presented herein has been drawn from the Appendices to the above-mentioned report.

cargo aircraft are used for freight service; and, therefore the need for separate cargo terminal facilities on the airport.

The Port Authority is committed to a policy of revenue development and management that will result in economic self-sufficiency for the four terminal type airports it operates in the New York Port Area. Since it acquired La Guardia and New York International Airports from New York City under 50 year leases in June 1947 and Newark Airport from the City of Newark under similar long-term lease arrangements in March, 1948, the Port Authority has pioneered in the application of established business practices to the problems of airport management.

An essential management tool in the case of airport operation, where long-term capital commitments up to 50 years are required, is a financial program for 10 to 15 years ahead. Such a summary of estimated revenues and expenditures includes a capital program which places a dollar sign on the "master" plan and thereby determines its economic feasibility. Obviously, a long-range capital program must be considered only as a guide or possible course of action and not as a final decision to construct. Each project in the current year's budget must be subjected to a detailed analysis as to its operational and economic feasibility based on the latest available data. Thus some projects will later be discarded; others may be added. In order to have an up-to-date long-range program that reflects considered judgment of new factors not previously anticipated, the financial program will be revised every three to five years, or more frequently if conditions warrant. Part of this revision will be a reexamination of the long-range traffic forecast. A long-range traffic forecast can be useful only to the extent that it is kept up to date. The Port Authority has a program of traffic analysis that will make it possible to revise the forecast when events require.[1] The estimates were made on a basis permitting periodic review of their component parts and providing a method of revision in the light of changing developments.

Methodology of Forecast

Because air transportation is only one means of transporting persons and property, attainment of the objectives of the forecast requires consideration not only of air transportation and the special problems of the New Jersey-New York Metropolitan Area, but also of all intercity transportation (surface and air) in the nation as a whole. In

[1] Specific examples of such contingencies would be government subsidization of an air merchant marine devoted primarily to cargo carriage or the advent of power units using atomic energy. Certain general assumptions were made where imponderables prevented adequate analysis and valid findings. It was assumed that the national economy would continue to expand during the next three decades, that in spite of cyclical business fluctuations there would be no depression comparable to the 1930's, that the American economy would remain predominantly private enterprise, that the dominant role of the United States in world affairs will result in expanding volume of international trade and travel, that there would not be another large-scale war, and that commercial air transportation will continue to benefit from government expenditures and promotional activities in the field of aviation.

order to estimate what part of the total surface/air market could reasonably be forecast for air transport, equal attention had to be devoted to the competitive relationships between surface and air transport. Adherence to the basic concept that air transportation volumes could not be forecast without consideration of other modes of transport required that the forecast of air traffic volumes be made in three steps:

1. Forecast of the total surface/air market for the nation as a whole.
2. Division of the national forecast among the competing modes of transport.
3. Estimate of the portion of the national air traffic volume that would be handled at New York and Newark airports.

There were several reasons for selecting this method:

1. The growth of traffic volumes for a particular city will depend as in the case of the nation as a whole, on the growth of income and population. The future well-being of a separate city may be considered as resulting from:
   a. Improvement in economic well-being of the entire country.
   b. Special local conditions which result in a rate of growth below or above the national average.
2. Even if it were methodologically desirable to ignore national aspects of transportation, it would not be feasible to do so. A forecast which attempted to estimate directly the volume of local traffic would be confronted with an almost complete lack of adequate local data. Neither trends nor relationships among economic and transportation magnitudes could be determined from available local data.
3. The resulting forecast gives a comprehensive picture of transportation showing the relationship of the components to the total. Since air transportation is only one of the components, the reasonableness of the air forecast has been checked against the forecast for surface transport. This forced detailed consideration of the impact of air transport on the surface carriers and pointed up the fact that overoptimism with respect to air transport is equivalent to overpessimism with respect to surface transportation. In effect, air transportation was placed in its proper prospective within the entire transportation picture.
4. The effect of making the forecast in a series of steps has been to increase the reliability of the air estimates by introducing the possibility of cancellation of compensating errors.
5. By considering first the forecast of total surface/air traffic, so-called "created" traffic (traffic that would not have existed except for the superior speed of air transportation) has been included in the forecast in a simple, logical manner. This avoided the problem of attempting to estimate a quantity that could not be given a precise definition and for which there are no data showing magnitude.

The forecast represents a synthesis of estimates derived from five different approaches to forecasting.

1. *National Income Approach.* Estimates of future traffic volumes were obtained by (1) estimating the total population and national

income for the periods under consideration; (2) determining the historic relationships between national income, population, and transportation; and (3) applying these historic relationships to the projections of population and national income, with adjustments to compensate for expectable changes in these relationships during the forecast periods.

2. *Traffic Trend Approach.* Through the Traffic Trend Approach, estimates are made by determining the historic trends in traffic volumes and projecting these trends through the forecast periods. Trend projections, although largely statistical in nature, were modified to allow for new factors that will alter the patterns of the past.

3. *Traffic Pattern Approach.* This method concerns itself primarily with actual patterns of traffic such as the length of haul, direction and frequency of movement, and weight and value of shipment which characterize various classes of traffic moving by competing carriers. In the present inquiry, length of haul—whether the traffic be passenger, cargo, or mail—assumed a most important position because of the advantage aircraft possess in serving long-haul, as contrasted with their equally clear disadvantage in serving short-haul traffic.

4. *Market Approach.* The Market Approach looks at the transportation problem from the point of view of the user of transportation services. By this approach it is possible to identify those travelers and shippers who are substantial or frequent users of air transport services and by analysis of the traffic patterns and habits of each group in relationship to probable future air transportation rates and services determine their future potential as users of air transportation. The forecast used not only market survey data already available but conducted both a national travel survey and one for the New Jersey-New York Metropolitan Area.

5. *The Technological Service Approach.* The choice of methods of travel or carriage of goods will be greatly influenced by the relative rates and services which the airlines can offer in competition with surfaces modes of transport. It was necessary, therefore, to estimate the capacity of air transport to improve its service relative to surface carriers, and to determine the ability of air transportation to reduce rates to levels more in line with those of competitors. Improvements in these service characteristics—dependability, safety, frequency, comfort, cost, and speed—are a direct function of technology. Hence it was necessary to ascertain the important technological changes which are likely to be achieved during the forecast period. This was done through a comparative analysis of all existing aircraft and power plants as well as those in the planning stage based on an extensive survey of both airframe and power plant manufacturers.

In many respects, these five approaches to forecasting traffic volumes represent different methodological approaches to the problem of estimating future traffic. Thus, it was possible to expose projections obtained through the use of one method to the results of other methods, thereby enhancing the reliability of the final results. Moreover, only by using several methods was it possible to take into account all of the important variables affecting future transportation volumes. From a strictly methodological point of view, it would have been preferable if these several methods could have given estimates completely independ-

ent of each other. However, because of the inter-relationship of all economic activity, there is necessarily an overlapping of these several methods.[2]

Forecast of Population and National Income

Because of the primary importance of population and national income in determining the size of the market for transportation services, considerable study was devoted to forecasting these elements.

There are 19 million more persons in this country now than there were only ten years ago. This rapid increase, following a decade of depression during which less than half as many people were added to the population, was not anticipated by students of population growth. As a result, even relatively recent population forecasts have proved to be in substantial error, or are subject to wide disagreement among authorities. The most probable future attainments in the thirty years ahead, has appeared to be an increase of somewhat over 11 million per decade.

A forecast of future national income was arrived at through a study of labor force and productivity trends to obtain per capita income estimates, then through use of the population projection, total national income was forecast for the years ahead.

1. *Labor Force.* The proportion of the people making up the nation's labor force will be influenced in the future by a number of opposing factors. Tending to decrease the number of persons seeking employment will be earlier retirement and expanded opportunities for higher education, while the influx of women into the labor force and the growing popularity of part-time employment will have an opposite effect. It has been concluded that the net effect of these conditions wil not alter appreciably the historic relationship between the population as a whole and the size of the labor force. About two out of every five persons in the country will be at work or seeking work.

2. *Productivity.* How much productive effort the population will account for depends not only on how many people work, but on how much and how effectively they work. The volume of goods and services produced by a given amount of effort has continued to increase throughout the history of the nation with advancing science and technology, development of better business organization, application of improved methods of distribution, and introduction of more efficient credit and banking facilities. Output per man-hour of work increased by fully a third during the period from 1929 to 1941. Available data indicate that this rate of increase in productivity, averaging some two and one-half per cent per year, was probably also achieved over the preceding thirty years.

[2] For example, the national income approach emphasizes the level of national income as a determinent of the volume of transportation use. The traffic trend approach, although not explicitly using the relationship between transportation volumes and national income, nevertheless involves the projection of past traffic trends which in turn have been affected by past levels of national income. Further, it should be appreciated that while population and national income trends have been projected on a theoretically independent basis, estimates of population have been predicated on the concept of a generally expanding volume of national income.

Governmental policies, to a large and increasing degree, will influence and control the extent to which technological innovation can be translated into increased productivity. Such policies may be both beneficial and harmful.[3] For the purpose of this study, a two per cent annual increase in man-hour productivity has been assumed over the entire period to 1980. By 1965 the nation will be producing twice as much goods and services per unit of labor as in 1940, and by 1980 another one-third increase in productivity will be accomplished.[4]

3. *Length of Workweek.* As a result of these productivity trends, it has been possible to progress from an average workday of 12 hours to one of 8 hours, and from a 6 to a 5 day week in many industries. After 1965 it is believed that 35 hours will represent the average length of the workweek for industrial employees, and that the paid vacation will be practically universal.

4. *Estimate of National Income.* The composite of these factors indicates that national income will increase from approximately 220 billion dollars a year at the present time to about 416 billion dollars in 1980. This will mean achievement of a national income approximately 88 per cent greater than today. Expressed in per capita terms, national income in 1980 will average $2,239 for every person in the country compared with the present per capita average of $1,477. In terms of actual goods and services enjoyed, each individual, on the average, will be fully 50 per cent better off than he is today.

Domestic Air Passenger Travel

The total volume of intercity travel during the past two decades has been determined largely by two factors, (1) the high productivity of the American economy and (2) the nation's unparalleled expansion of automobile ownership and use. These factors will continue to be the dominant ones influencing travel volumes during the coming decades, with the airplane gradually assuming a more important role.

Changes in the level of national income during the past two decades have been paralleled by fluctuations in the volume of intercity travel. As national income declined from 1929 to 1932, intercity passenger miles decreased by 17 per cent. In 1940, national income recovered substantially from the depression lows accompanied by a 57 per cent increase in intercity passenger miles. By 1949, intercity travel reached almost 170 billion passenger miles representing an increase of 42 per cent over the 1940 prewar peak and corresponding to a 60 per cent increase in national income.

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[3] Government contributions to scientific research, conservation of natural resources, and social security legislation are examples of programs that can be beneficial. On the other hand, governmental subsidies, price controls, military outlays, and extreme progressive income taxes are illustrative of policies that can reduce the real income of the nation.

[4] The estimate of increasing productivity, averaging two per cent per year, is not the mere projection of past trends. The world's fund of scientific knowledge awaiting development is sufficient to sustain a high rate of productivity increase for many years. The application of nuclear energy to peace-time uses, although the most spectacular, is only one example of many developments which will result from the practical application of existing scientific information.

Intercity per capita travel of 1,131 miles in 1949 exceeded the 1929 figure by 378 miles. Much of this increase must be credited to the expanding use of the automobile. Of the net gain of 378 miles, the automobile accounted for 66 per cent, motor bus 22 per cent and commercial air transport 12 per cent. Railroads declined two miles per capita.

National Income and the Total Intercity Travel

Total intercity travel tends to increase at a slower rate than national income but faster than population. This relationship between per capita income and per capita travel may be seen from the data in Table 1. For example, per capita intercity travel increased by 48 per cent from 1933 to 1940 compared with an 80 per cent increase in per capita income and a 5 per cent increase in population. This characteristic of transportation growth in relationship to national income and population has its basis in consumer expenditure patterns. These show that the percentage of income spent for travel declines with increases in income. The data for the period of 1929-49 exclusive of the war years falls into a definite pattern which provides a basis for extrapolating the volume of per capita travel in relation to per capita income and thus provides a basis for forecasting national intercity passenger miles.

TABLE 1—NATIONAL INCOME AND TOTAL INTERCITY PASSENGER TRAVEL, 1933-1980

	Per Capita National Income		*Per Capita Intercity Passenger Travel*		*Total Intercity Passenger Miles*
Year	1935-1939 *Dollars*	*Per Cent Increase Over* 1933	*Passenger Miles*	*Per Cent Increase Over* 1933	(*Millions*)
1933	$ 341.6	...%	610.5	...%	76,680
1937	556.7	63.0	840.5	37.7	108,261
1940	614.4	79.9	906.1	48.4	119,605
1949	866.7	153.7	1,130.9	85.2	169,642
1950	867.8	154.0	1,100.0	80.2	167,200
1965	1,020.0	198.6	1,250.0	104.8	212,500
1980	1,324.2	287.6	1,350.0	121.1	251,100

Forecast of Automobile and Common Carrier Traffic

The estimates of automobile and common carrier traffic reflect the dominant position obtained by the private automobile during the late twenties and thirties. Over the course of the past several decades, the common carriers have been relegated to a secondary role in the intercity travel market. By the late thirties almost 75 per cent of all intercity travel was by private automobile. The common carriers will not regain their former position during the next 30 years. But it is significant also that future contraction of common carrier traffic is not anticipated. Stabilization of the present relationship between the common carrier market and that of the private automobile will be brought

about as the potentialities of the airplane are more fully realized. Travel by both common carrier and automobile will expand with the growth of population and national income.

Service Characteristics of the Common Carriers

In the division of the total intercity common carrier market among rail, bus, and air, particular weight was given to an evaluation of those individual service characteristics which have in the past and which will continue in the future to determine the nature and extent of shifts in travel volume as among competing carriers. These are the characteristics which establish the value of the service to the user and guide his selection of a particular type of carrier.

The more important of these service characteristics are dependability, safety, frequency, comfort, cost, and speed. Air transportation currently has an advantage only in speed and schedule frequency. Though air's relative position in speed and frequency will continue to improve, the greatest opportunities for strengthening its competitive position rest with advances in dependability and safety, and in reductions in fares. Marked improvements can be expected of air transportation in each of these characteristics while rail and bus transportation have reached a stage of mature devolopment where only limited improvement can be expected.

1. *Dependability of Operation*—The postwar period has witnessed the first general reduction in airport minimum landing requirements since such minimums were first established in 1937. Installation of instrument landing systems has made possible halving minimum requirements from a 400 foot to a 200 foot ceiling and from 1 mile to ½ mile visibility. The CAA program for installation of high-frequency omnidirectional ranges, precision approach radar, high-intensity approach lights, and distance measuring equipment should make approaches and landings possible with 100 foot ceilings and visibility of ¼ mile. Completion of the entire air navigational program of the Radio Technical Committee for Aeronautics, projected for about 1965 should see scheduled dependability freed from the vagaries of weather.

2. *Safety of Operation*—Safety statistics for 1949 indicate 1.3 passenger fatalities per 100 million domestic passenger miles for air as compared with less than 0.1 fatalities for railroads. Marked improvement in airline safety has been recorded over the course of the past twenty years, resulting in air travelers being accepted as normal risks by the nation's insurance companies. Nevertheless, recognition of the apparent greater safety of rail travel over air travel by the traveling public and inevitable front page reporting of most air accidents have been major deterrents to more widespread acceptance of air travel.

Technological development pertaining to air carrier operation may be expected to produce continuing improvement in the safety of airline operations. Airframes will become more sturdy, engines and power plants will improve in dependability, the human factor will become less important, and navigational devices and airway and airport practices will become more reliable.[5] The continuing improvement in safety anticipated during the next thirty years from these combined advances will substantially lessen air transportation's present competitive disadvantage.

3. *Frequency of Service*—Air transport will conform to the pattern of bus operation of high frequency of service with relatively small capacity as compared with the seating capacity of a ten-car streamliner coach train of nearly 500 seats. Air service already compares on a favorable basis at many large metropolitan centers as far as frequency is concerned. Although such advantage can be expected to increase as travel volume grows, this future increase will not be materially important in attracting additional patronage to the airlines.

4. *Personal Comfort*—The trend toward larger aircraft and the coming application of turbine and jet power plants assures smoother riding qualities. Air sickness will become a less serious problem and improvements in ventilation, pressurization, and noise control will enhance air transport's competitive position. On the other hand, aircraft seating accommodations are not expected to approach those provided by the railroads, a disadvantage offset to a large extent by the reduction in travel time as compared with surface travel.

5. *Competitive Fares*—Reductions in costs made possible by continuing innovations in aircraft design, power plant and navigational equipment, together with higher density seating arrangements will make possible air fares comparable to rail coach, but not as low as bus fares.

6. *Speed of Service*—The introduction of turbo-prop and turbo-jet aircraft will make possible speeds in excess of 500 miles per hour compared with current cruising speeds in the neighborhood of 300 miles per hour and 180 miles at the end of the war.

Because of appreciable time savings, air transportation has already captured a large part of the long-haul market. The adoption of turbo-prop and jet power to commercial airliners will have the effect of further increasing the advantage that air transportation already has in the long distance travel market. Because of this speed advantage, together with anticipated reductions in fares and increased safety and dependability, virtually all long-haul common carrier passenger traffic will be

[5] Both the aircraft manufacturers and the airlines are giving increasing attention to the structural strength of aircraft so as to reduce casualties in the event of accident.

moving by air within the period of this forecast. However, the increased speed of aircraft limits air transportation's ability to servicing the long and medium-haul travel market and virtually excludes it from the short-haul market under 150 miles.

On trips under 150 miles, the speed advantage is minimized to the point where it almost vanishes. Past trends in aircraft design have featured larger and faster aircraft. In consequence, the majority of air terminals are situated at or beyond the perimeter of the cities they serve. This has resulted in surface travel time between airports and downtown sections that often dissipates the time savings made possible by aircraft speed. Although the helicopter may alleviate the problem of relative inaccessibility of airports, it is anticipated that air penetration of short-haul travel will lag far behind penetration of the long-haul market.[6]

Traffic Characteristics of the Common Carrier Market

The division of the common carrier market among rail, bus, and air carriers has undergone significant changes during the past several decades. Rail travel has been declining relative to total common carrier travel for many years and it is anticipated that this trend will continue. The railroads transported 78 per cent of common carrier passenger mile travel in 1929, about 61 per cent in 1940, and after a high level of operations during the war, declined further to 51 per cent in 1949.

The motor bus share of common carrier travel, on the other hand, increased from 22 per cent in 1929 to 34 per cent in 1941 and to 37 per cent in 1949. Bus passenger miles increased from 6.8 billion in 1929 to 13.6 billion in 1941 and to 21.5 billion in 1949. The growth of bus patronage, mainly short-haul, has occurred to a considerable extent at the expense of the railroads.

The airplane was not a major factor in the common carrier travel market prior to the war. Only three per cent of common carrier travel used this new mode of transport in 1940. In 1949, however, air transport captured over 11 per cent of the market and flew 6.6 billion passenger miles. Air travel in the past has been largely first-class so that air transport and the rail carriers could be considered as competing for the combined pullman/air market. This is no longer true, and the first-class portion of air travel will become decreasingly important as coach services are further expanded.

Air transportation will remain highly competitive with rail but only to a minor degree with the bus because of its short-haul nature. Accordingly, the future growth of air transportation depends largely

[6] Forecast does not include intercity helicopter traffic since forecast was concerned with traffic to be handled at Port of New York Airports and intercity helicopter service would operate from downtown airports.

on its ability to compete for the combined rail/air market. In addition to the shifts that have occurred in the division of the common carrier market among rail, bus and air, two additional characteristics of rail/air movements are of particular significance to the future growth of air transportation.

1. *Length of Trip*—For the country as a whole, data compiled by the carriers indicate an increase of about 50 per cent in the average length of rail trip over the past two decades, while for air travel the increase exceeded 100 per cent.[7] Although figures for 1929-49 indicate that part of the increases resulted from conditions peculiar to the war years, the postwar decline appears to have been arrested at a level appreciably above the immediate prewar years. This is shown in the following table.

TABLE 2—AVERAGE LENGTH OF PASSENGER TRIP FOR RAIL AND AIR CARRIERS, 1930-1949

	Miles	
Year	*Rail*	*Air*
1930	76	221
1935	77	415
1940	88	375
1945	151	511
1949	120	468

Examination of the mileage pattern for individual cities reveals that the increasing average length of trip represents a shifting of the rail/air pattern from the mileage brackets under 500 miles to those in excess of 1000 miles. The following table shows the 1940 and 1947 rail/air mileage distribution for the metropolitan travel market[8] and similar figures for three individual metropolitan districts.

TABLE 3—MILEAGE DISTRIBUTION OF RAIL/AIR TRAVEL, 1940 AND 1947

Mileage Interval	*Metropolitan Travel Market*		*N. Y./Newark*		*Dallas*		*Washington*	
	1940	1947	1940	1947	1940	1947	1940	1947
0- 150	10.0%	8.1%	13.3%	10.9%	1.4%	1.0%	10.1%	8.8%
151- 500	35.8	31.8	30.7	27.1	25.7	23.0	49.4	45.6
501-1000	25.7	24.2	31.6	28.8	42.0	37.2	24.6	24.2
1001-2000	13.4	17.3	10.8	15.8	30.4	37.7	9.1	10.8
Over 2000	15.1	18.6	13.6	17.4	0.5	1.1	6.8	10.6
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

[7] Average length of passenger trip has been derived by dividing revenue passenger miles by number of revenue passengers as reported by the carriers to the appropriate federal regulatory agency. Differences in reporting practices over the course of the years such as varying numbers of reporting carriers, varying methods of treating interline and connecting traffic, and varying methods of computing interstation distances have caused some non-comparability of data.

[8] The metropolitan market, as used herein, represents travel among 17 selected major metropolitan districts and between each of the 17 and 38 other selected districts throughout the nation. This metropolitan market accounts for 43 per cent of total rail/air travel and 68 per cent of air travel. The 55 cities included account for 40 per cent of the national population.

The significance of this changing rail/air patern is twofold. First it indicates a shift of short-haul travel from rail to the bus and automobile. Second, it involves the development of an increasingly large proportion of long-haul common carrier travel.

2. *Air Penetration of the Rail/Air Market*—Air penetration increases rapidly with length of trip. In 1947 the metropolitan travel market showed less than 3 per cent air penetration in travel under 150 miles compared with 48 per cent beyond 1000 miles. This same pattern was evident in 1940. Although individual cities show variations from the metropolitan market, the stability of the pattern is clearly evident.

Between 1940 and 1947 the increase in penetration has been greatest in the mileage brackets above 500 miles. The degree of air penetration for travel beyond 1000 miles increased from 18 to 48 per cent or almost threefold compared with only a twofold increase for travel under 500 miles.

TABLE 4—AIR PENETRATION OF THE RAIL/AIR TRAVEL MARKET*
1940 AND 1947

Mileage Interval	*Metropolitan Travel Market* 1940	1947	*N. Y./Newark* 1940	1947	*Dallas* 1940	1947	*Washington* 1940	1947
0- 150	1.4%	2.6%	0.7%	0.8%	3.6%	11.0%	1.5%	1.4%
151- 500	9.5	19.0	10.0	17.0	15.9	35.0	13.2	19.0
501-1000	11.3	25.5	10.8	20.7	16.7	36.6	14.0	27.0
1001-2000	20.1	51.9	26.9	61.7	40.9	67.2	28.6	52.4
Over 2000	16.6	44.7	21.2	48.9	30.7	79.0	37.9	65.3
Average	11.6%	29.7%	12.4%	28.9%	23.8%	48.0%	15.3%	27.9%

* Air Traffic derived from records of scheduled airlines. Traffic of the irregular carriers not included.

Forecast of Air, Rail, and Bus Travel

Travel in excess of 1000 miles, which now constitutes about 35 per cent of rail/air travel of the metropolitan market, will increase to 40 per cent by 1965 and to nearly 50 per cent by 1980. The shift in the travel pattern for the remainder of the country, however, will not be as marked as for this metropolitan market.

The percentage of long distance common carrior travel accommodated by air transport will continue to increase. By 1965 virtually all rail/air travel of the metropolitan market beyond 1000 miles will be by air. By 1980, air penetration will reach 75 per cent in the 500-1000 mile bracket and 50 per cent between 150 and 500 miles. For the remainder of the country, which generates proportionately less long-haul travel, it is believed that air penetration will average only about one-half that attained in the metropolitan travel market.

The forecasts in Table 5 for air, rail, and bus indicate that air transportation will attain over 35 per cent of the common carrier market by 1980. In terms of growth over the next thirty years, air travel

will increase 239 per cent and bus travel 10 per cent, while rail travel will decrease 42 per cent.

TABLE 5—ESTIMATE OF INTERCITY COMMON CARRIER TRAVEL, 1950-1980

(Millions of Passenger Miles)

Year	*Total Common Carrier*	*Rail*	*Air*	*Bus*
1949 (Actual)	57,600	29,500	6,600	21,500
1950	53,960	25,906	7,300	20,754
1965	57,120	19,843	16,707	20,570
1980	63,054	17,000	22,353	23,701
Per cent Change 1980 over 1949	+9.5%	—42.4%	+238.7%	+10.2%

NEW YORK DOMESTIC AIR PASSENGER TRAFFIC

The ability of the New York-Newark area to maintain its dominant position in the intercity air transport market rests upon the stability of its economic structure and upon the development of untapped air markets.

The economic character of the New York-Northeastern New Jersey Metropolitan District and of most of the other major districts within the United States has not changed materially during the past several decades, and is not likely to be altered significantly during the next thirty years. The presence of unexploited air markets has been confirmed through intensive examination of the integral parts of the New Jersey-New York District's total travel market.

Stability of the New York-Northeastern New Jersey Market

Stability of transportation patterns is the cornerstone of traffic forecasting. Without a high degree of constancy in the primary elements of traffic, there is no basis for forecasting. Such stability does exist. Moreover, the constancy of transportation patterns can be traced directly to stability of municipal economic characteristics.

1. *Stability of Economic Structure*—The basic economic structure [9] of the Metropolitan District of New York and Northeastern

[9] Municipal communities may be classified objectively into four economic groups:

Distribution Center: A community which draws its economic strength primarily from wholesale trade and distribution.

Industrial Area: A community which is predominantly manufacturing in character.

Balanced City: A community which possesses wholesaling and manufacturing activities in about equal proportion.

Institutional Place: A community which is primarily a center for other types of activities such as recreation, education, government, finance, or insurance.

For further information, see Airport Planning Pamphlet, Economic Character of Communities, published by Civil Aeronautics Administraton, November, 1948.

New Jersey has been unchanged for many years. The area has handled between 40 and 50 per cent of the nation's dollar value of foreign trade for the past fifty years. It has been the nation's largest Distribution Center for over a century. More than 25 per cent of the nation's wholesale sales are made in this one District. Services related to finance and business management are unexcelled. The New Jersey-New York District's position as the nation's number one distribution, banking, and management center will be maintained. Other major Distribution Centers such as Atlanta, Dallas, Minneapolis, Kansas City, and San Francisco have displayed similar permanence in basic economic structure. Cities whose major economic activity is manufacturing exhibit the same stability of economic structure as do Distribution Centers. Pittsburgh, Detroit, Lowell, Scranton, Akron, and Youngstown have been outstanding Industrial Areas for generations.[10]

2. *Stability of Air Traffic in Relation to Economic Structure*— Distribution Centers are good air travel cities. Analysis of the traffic at 90 metropolitan districts and 123 additional cities discloses that of the four economic types, Distribution Centers as a class have always accounted for the highest per capita air travel. Institutional Places are a close second, Balanced Cities third. The air travel of Industrial Areas is, almost without exception, in fourth place. The following table shows the relative air traffic generating ability of major metropolitan districts.

TABLE 6—AIR PASSENGERS PER 10,000 POPULATION AT MAJOR METROPOLITAN DISTRICTS 1939-1948

*Economic Group**	1939	1940	1941	1947	1948
Distribution	710	1011	1521	6660	6170
Institutional	471	643	1257	5749	5142
Balanced	422	549	759	2485	2430
Industrial	199	362	548	1483	1430
Average of Major Metropolitan Districts	511	754	1087	4571	4410

	Deviation from Average				
	1939	1940	1941	1947	1948
Distribution	+38.9%	+34.1%	+39.9%	+45.7%	+39.9%
Institutional	— 7.8	—14.7	+15.6	+25.8	+16.6
Balanced	—17.4	—27.2	—30.2	—45.6	—44.9
Industrial	—61.1	—52.0	—49.6	—67.6	—67.6

* Includes air passenger traffic originated and terminated at all of the major metropolitan districts of the United States with population of over 250,000 except the Lowell-Lawrence-Haverhill District where comparable air service was not available in all the selected time periods.

[10] Air Traffic Generation in the New York Metropolitan District, a monograph prepared for the Port of New York Authority by Grahame H. Aldrich, February, 1949.

Since the ability of any city to generate air traffic is inherently linked to its economic structure, and because of the demonstrated constancy of these economic groups, there is assurance that each city will retain its relative traffic position. A good traffic city can be expected to remain such. The full import of the stability or constancy of the air traffic economic group relationships can now be made aparent. Data for the nine major Distribution Centers of the United States reveal no significant shifts in the ranking of individual cities over a span of almost ten years.

TABLE 7—AIR PASSENGER TRAFFIC AT MAJOR DISTRIBUTION CENTERS
(Number of Passengers and Rank)
1940-1947-1948

Metropolitan District	*Number of Passengers* Sept. 1940	Sept. 1947	Sept. 1948	*Rank* Sept. 1940	Sept. 1947	Sept. 1948
New York-Newark	76,800	294,400	301,900	1	1	1
San Francisco	13,100	95,700	81,700	2	2	2
Kansas City	6,500	37,200	30,800	3	4	5
Seattle	6,500	46,700	38,400	4	3	3
Dallas	6,100	37,100	37,600	5	5	4
Minneapolis	6,100	34,100	28,900	6	6	7
Atlanta	5,700	31,400	30,700	7	7	6
Memphis	2,600	16,700	15,900	8	8	8
Omaha	2,200	12,100	11,100	9	9	9

3. *Stability of New York-Northeastern New Jersey Transportation Pattern*—The New York-Northeastern New Jersey mileage pattern is another factor in the stability of traffic movement to and from this area in that its rail/air travel market has always been one of short trips. More than 95 per cent of its combined rail and air passengers in 1933 moved at distances less than 500 miles. By 1948 this percentage had decreased only slightly to 93 per cent. In total, the New Jersey-New York District rail/air pattern shows but a minor shift towards the higher mileage brackets.

TABLE 8—DISTRIBUTION OF NEW YORK-NORTHEASTERN NEW JERSEY RAIL/AIR PASSENGERS ACCORDING TO LENGTH OF TRIP
1933 and 1948

Length of Trip (Miles)	*Percentage Distribution* 1933	1948
Under 150	78.0%	70.0%
151- 500	17.2	22.8
501-1000	3.6	4.6
1001-2000	0.7	1.8
Over 2000	0.5	0.8
Total	100.0%	100.0%

The factors underlying this Region's present travel pattern limit the extent to which a shift to longer trips will occur. In many respects the New York-New Jersey District pattern is similar to other metropolitan areas in the northeastern part of the United States and these, in turn, are different from most cities in the remainder of the country. The railroad data in Table 9 illustrate this important transportation characteristic.

TABLE 9—DISTRIBUTION OF RAIL PASSENGERS OF SELECTED CITIES ACCORDING TO LENGTH OF TRIP
1933

	Percentage Distribution				
	Northeastern Sector			*Other Large Cities*	
Length of Trip (Miles)	*New York-Newark**	*Philadelphia*	*Boston*	*Los Angeles**	*Chicago**
Under 150	82.7%	96.0%	75.4%	15.4%	36.9%
151- 500	12.1	2.5	20.8	49.0	42.5
501-1000	4.0	1.2	1.4	4.8	16.0
1001-2000	0.8	0.2	2.0	11.5	3.1
Over 2000	0.4	0.1	0.4	19.3	1.5
Total	100.0%	100.0%	100.0%	100.0%	100.0%

* Travel via Electric Railways is excluded from the above table and, to that extent, movements in the Under 150-Mile bracket are understated. Data for Los Angeles omit traffic by the Pacific Electric Railway, while data for Chicago do not include traffic of the Chicago, North Shore and Milwaukee; Chicago, South Shore and South Bend; and Chicago, Aurora and Elgin railroads. In addition, data for the New York Region exclude traffic carried by the Long Island Railroad.

The reason for the similarity in the travel pattern of most cities in northeastern United States is twofold: (1) The cities are relatively close to each other and to New York, the transportation hub of the area; (2) Most of the cities in this area are Industrial or Balanced Cities which characteristically have a short-haul travel market.

The New York Rail/Air Travel Market

The ability of the New Jersey-New York Port Area to maintain its dominance of the intercity air travel market rests not only upon the stability of the underlying economic factors but also upon the development of potential air markets. To a large extent the development of these markets awaits the improved service and lower fares which are anticipated during the period of this Forecast.

In order to permit a more detailed study of developing trends, the rail/air travel market of New York-Newark can be divided into four subclassifications and analyzed through the application of market research techniques. Significantly, data obtained by such methods reveal that two-thirds of air transportation traffic now comes from a single group—*visiting business travelers.*

TABLE 10—DISTRIBUTION OF THE NEW YORK-NORTHEASTERN NEW JERSEY PASSENGER MARKET ACCORDING TO RESIDENCE AND PURPOSE OF TRIP

(Based on Rail and Air Trips over 150 Miles)
1948

Purpose of Trip	*Percentage Distribution* *Rail and Air Passengers*	*Air Passengers*	*Rail Passengers*	*Air Penetration of Rail/Air Travel*
Business Travel				
Non-Resident	28.2%	66.0%	13.7%	65%
Resident	19.0	12.8	21.4	19
Total	47.2%	78.8%	45.1%	46%
Personal Travel				
Resident	30.5%	15.5%	36.3%	14%
Non-Resident	22.3	5.7	28.6	7
Total	52.8%	21.2%	64.9%	11%
All New York-Northeastern New Jersey Travel	100.0%	100.0%	100.0%	28%

Although considerable business travel remains as a potential for air services, the future growth of air transport will depend primarily on penetration of the relatively untouched personal travel market. In particular, that part of the resident pleasure travel market involving trips over 1000 miles represents a prime market for air transport development. This market alone represents 45 per cent of the region's rail/air travel over 1000 miles with only one-quarter of these long-haul passengers using air service. The rapid expansion of air coach services during recent years is tangible evidence of the air market for personal travel at lower fares. Significantly, surveys of air coach passengers reveal that two-thirds of these passengers are traveling for personal reasons as compared with only one-third of regular fare passengers.[11]

Combining the estimated potentials from these four travel groups, it is found that business travel by air can be expected to increase 70 per cent by 1980 while pleasure travel will increase more than 450 per cent. Table 11 shows the composition of the New Jersey-New York air travel market today and for 1980.

TABLE 11—NEW YORK-NORTHEASTERN NEW JERSEY AIR PASSENGER TRAFFIC BY MARKET GROUP

(Based on Rail and Air Trips over 150 Miles)
1948 and 1980

Year	*Passengers (Thousands)* *Total*	*Business*	*Personal*	*Percentage Distribution* *Business*	*Personal*
1948 (Act'l)	3,857	3,040	817	78.8%	21.2%
1980	9,757	5,199	4,558	53.3	46.7
% Increase 1980/1948	153.0%	71.0%	457.9%		

[11] Domestic Sky-Coach Survey, Civil Aeronautics Board, April-May, 1949.

Estimate of New York-Newark Domestic Air Passenger Traffic

Since the maintenance of the New York-Newark area's position in the intercity air transport market is founded on its stable economic structure and upon the existence of untapped air markets awaiting development, the national rate of growth of air passenger travel becomes a logical base for the estimation of New York and Newark's future air traffic. Economic factors applicable to this Metropolitan Area and to the principal cities with which it exchanges traffic also were considered in the determination of the final forecast. The resultant estimate indicates an increase of 160 per cent by 1980, only slightly less than the forecasted national increase of 166 per cent. This is shown in Table 12.

TABLE 12—ESTIMATE OF NEW YORK-NEWARK DOMESTIC AIR PASSENGER TRAFFIC

(Thousands of Passengers)
1950-1980

Year	*U.S. Total**	*New York-Newark*** *(In & Out)*
1949 (Actual)	14,859	3,904
1950	15,532	4,150
1965	28,805	7,404
1980	39,563	10,136
Per Cent Increase 1980/1949	166.3%	159.6%

* The national passenger forecast is derived from the national passenger mile forecast.

** New York-Newark air traffic includes passengers originating or terminating their trips at, and through passengers arriving at and departing from, the three major airports in the District—La Guardia, Newark, and New York International—as reported to the Port Authority by the individual carriers.

OVERSEAS AIR PASSENGERS

More than half of all United States international sea and air passengers pass through the New Jersey-New York Port District. Most of this Port of New York travel moves to and from Europe, but the Americas constitute a secondary market of considerable importance. Only minor amounts of traffic are exchanged with points in Africa, Asia, and the Pacific. The following tabulation shows the Port of New York's share of the nation's total international travel by market area.[12]

[12] International air passenger traffic includes that moving to and from all points outside the United States except that over land borders, to and from Canada and Mexico, and that to and from the insular territories of the United States such as Puerto Rico.

TABLE 13—U.S. INTERNATIONAL PASSENGER TRAFFIC BY MARKET AREA
(Number of Passengers)
1949

Market Area	*U.S. Total*	*Port of New York* *Total*	*% of U.S.*
Europe	843,446	775,056	91.9%
Asia	88,615	14,661	16.5
Pacific	33,551	510	1.5
Africa	13,240	10,119	76.4
North America	660,588	110,826	16.8
Central America	89,118	19,650	22.0
South America	135,871	60,801	44.8
Total All Areas	1,864,429	991,623	53.2%

Although more than half of the nation's international passengers passed through the Port of New York during 1947-1949, about 53 per cent in 1949, this share is not as high as in the past. During the 5-year period 1931-1935, the New York Port District's share exceeded 75 per cent and fluctuated between 64 and 74 per cent during the subsequent 5-year period, 1936-1940.

The diminished Port of New York share can be laid primarily to the changing status of Europe and to the increasing importance of travel between the United States and other countries. Intercontinental overwater movements have exhibited a relative decline which cannot be discounted as a wartime phenomenon. Canadian and Mexican travel, conversely, have shown substantial growth and sustained ability to hold their gains.

Travel to and from Europe reached its peak in the years just prior to World War I. Most of these trips were due directly to immigration from Europe and to related journeys by first and second generation Americans returning or receiving visits of friends and relatives. The declining number and increasing age of the European foreign-born population of this country will continue to exert a retarding influence on further expansion of travel between the United States and Europe.

It is significant, however, that 45 per cent of all international passenger movements still are concentrated between the United States and Europe. An additional 35 per cent of the total is exchanged with offshore points in North America, primarily Bermuda, Cuba, and the nearby Caribbean Islands. The future course of the European travel market will determine in large measure the future volume of travel clearing through New York.

International Travel Through the New Jersey-New York Port District

Air transport itself has contributed to the Port of New York's recent decline in importance as an international travel center. Such a paradox is traceable to the operational characteristics of the airplane and of the air routes which it flies. Twenty years ago, commercial air

routes to European and Latin American destinations were virtually nonexistent. There were no international airports to compare with today's Washington, Miami, Tampa, New Orleans, or Houston airports. Vessel departures to Europe and South America were concentrated, as they are today, at the Port of New York. Thus, the individual who desired passage to any of the principal overseas areas had little choice but to take his journey through this port.

The development of commercial aircraft has expanded United States gateway facilities, particularly for individuals wishing transportation to areas in Latin America. To illustrate, a resident of Chicago may currently go to Buenos Aires by air through the Port of New York, Miami, Tampa, New Orleans, Dallas, San Antonio, or Houston. In 1931, the same person would undoubtedly have used rail to New York and cleared by ship to Buenos Aires.

The unfavorable impact of multiple international air gateways upon air passenger traffic in the New York-Northeastern New Jersey District cannot be avoided, nor can it be characterized as a temporary condition. Passengers from the interior of the United States can generally be expected to move directly to the gateway nearest their destination. On the other hand, the Port of New York's location is a distinct advantage in maintaining its position as the key port for travel to and from Europe.

With the further recovery of trans-Atlantic travel and the introduction into service of aircraft overflying the southern gateways, the New York share of total international traffic will increase gradually to 65 per cent by 1965. The forecast of total United States international travel by sea and air and New York's share of this traffic is shown in the following table.

TABLE 14—FORECAST OF INTERNATIONAL PASSENGER MOVEMENTS
(Thousands of Passengers)
1950-1980

Fiscal Year	*Total U.S.*	*Port of New York*
1949 (Actual)	1,864	992
1950	2,072	1,347
1965	2,417	1,571
1980	2,770	1,801
Per Cent Increase 1980 over 1949	48.6%	81.6%

Changing Trends in Service Characteristics of Aircraft in International Operation

International aviation services currently hold a decided advantage over marine transport in the factors of speed and frequency of scheduled services. The technological development of international air transport, which will parallel similar developments for aircraft used

in domestic service, will greatly improve the competitive position of the air carriers.

The steamship, however, will remain popular for overseas pleasure travel. It is a hotel and recreation center as well as a means of transportation. Moreover, it is expected that improvements in steamship travel will be confined largely to additional passenger comfort accommodations. The shipping industry will continue experimentation with types of service designed primarily to attract a broader segment of the public traveling for pleasure. This is a continuation of a trend which started in the thirties.

From a small beginning in the Caribbean area in the early thirties, when air transport obtained about one per cent of the international travel market, gradual development produced almost six per cent air penetration by 1939. During the war, as much as two-thirds of international travel used air transport. The percentage of air penetration diminished considerably by 1949, but more than half of this travel still moves by air.

Concentration of shipping services at the Port of New York will keep the New York-Northeastern New Jersey air penetration of international passenger travel below that attained for the nation as a whole. However, continuing improvement in air transport services will give air transportation an increasing share of the total market. The percentage of international passengers using air carriers out of the Port of New York is expected to reach 50 per cent by 1970 and 55 per cent by 1980.

The New York Port Area overseas forecast for the period 1950-1980 is given below.

TABLE 15—FORECAST OF OVERSEAS AIR PASSENGER TRAFFIC TO BE HANDLED AT THE PORT OF NEW YORK *
1950-1980

Fiscal Year	*Passengers (Thousands)*
1949 (Actual)	437
1950	553
1965	810
1980	1,084
Per Cent Increase 1980 over 1949	148.1%

* Includes insular traffic.

(To Be Continued†)

†Part II will present forecast for domestic and overseas air cargo, express and mail.