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# AVIATION FORECASTS FISCAL YEARS 1970 - 1981



January 1970

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Department of Transportation  
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Office of Aviating Economics  
Aviation Forecast Division

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DEPARTMENT OF TRANSPORTATION  
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## INTRODUCTION

This report presents forecasts of key indicators of aviation activity and of Federal Aviation Administration workload during the period fiscal years 1970-1981. The report has been prepared to meet the planning needs of the various offices and services of FAA for data concerning future trends in aviation activity. During this period significant changes are expected in the volume of air traffic activity and in the type of equipment that will be flying our domestic and international air routes.

Although the report focuses on the period through fiscal year 1976 to provide forecasts required in the preparation of the FAA Five-Year Program, forecasts for fiscal years 1980 and 1981 have also been prepared to meet long-range planning needs. Specific numerical forecasts have also been included for each year from 1970 to 1976 to meet shorter term, fiscal and program planning requirements. It must be recognized, however, that year-to-year fluctuations are difficult to forecast precisely. To a considerable extent, therefore, the data reflect the trend or average conditions expected during the forecast period. In addition, many published forecasts show a range of values reflecting different assumptions. As an aid to uniform planning, only one forecast is presented herein. However, this forecast should be viewed as a level within a band of possible values - some lower, some higher.

## HIGHLIGHTS OF FISCAL YEAR 1969

Fiscal year 1969, as expected, was a year of changing trends in aviation activity. Early in the year most FAA workload measures were moving ahead at rates comparable to the averages for the past several years. Around mid-year, a softening became evident and by the end of the year most rates of growth had slowed considerably. New all-time highs were registered for the twelve-month period, but most series were slightly below the levels forecast by FAA a year ago.

The 168 million scheduled revenue passenger enplanements and the 119.8 billion revenue passenger-miles flown by all U.S. certificated route air carriers in fiscal year 1969 were up 10.1 percent and 12.4 percent, respectively, over fiscal year 1968 and were within one-half of one percent of the amounts forecast a year ago. Reported domestic passenger-miles of 91.9 billion were 12.6 percent higher than in fiscal year 1968 and were within 0.7 billion of last year's forecast. U.S. international passenger-miles were at an all-time high of 27.9 billion, up 12.0 percent over the previous year, but 0.3 billion less than forecast. Both in the domestic and international areas revenue passenger-miles grew at only a little more than half of the preceding year's rate. The growth rate for fiscal year 1968, however, was inflated because of the protracted strike which took place in fiscal year 1967. The outlook for fiscal year 1970 shows continuing gains at a lower rate, particularly in the domestic market.

The air carriers continued to increase their capacity, as expected, in anticipation of the heavier traffic. Between July 1968 and June 1969, U. S. air carriers added 405 jet aircraft to their fleet, nearly matching the 421 added in the prior year. Most of these were two- and three-engine models. The number of turboprops declined from 433 to 402 due primarily to a drop in the four-engine category. The number of piston aircraft dropped by nearly one-half as the air carriers accelerated their retirement.

Revenue airborne hours and miles flown in fiscal year 1969 were up 6.2 percent and 9.8 percent, respectively, over fiscal year 1968. These gains were about one point less than forecast.

The general aviation activity measures for 1969 reflect a mixed year with some series showing record gains and others declining or growing at a slower rate than expected. The aircraft fleet numbered 124,237 as of January 1, 1969, reflecting the largest annual increase, 10,051, since World War II. Reported general aviation hours flown were up 8.3 percent in fiscal year 1969 to 24.8 million, slightly above the amount forecast last year. All categories of flying showed gains but the most noteworthy was in commercial hours flown which increased 17.1 percent from 4.1 million to 4.8 million. This rise is attributed to the continued expansion in air taxi operations. Instructional flying increased from an estimated 6.4 to 6.7 million flight hours, compared with a forecast of no change, despite a sharp decline in the number of new student pilot certificates issued. One industry source has stated this apparent inconsistency reflects an increase in advanced training above the student pilot level.

Production of jet transports increased from 625 in fiscal year 1968 to 665 in fiscal year 1969, a higher production level than was anticipated. Most of the increase was in the two- and three-engine models. Fiscal year 1970 production is expected to be significantly lower.

Production of general aviation aircraft was off slightly from a year earlier continuing the downtrend from the recent high in 1966. The outlook for fiscal year 1970 is for a further decline.

Total aircraft operations at airports with FAA-operated control towers were 55.9 million in fiscal year 1969, 2.6 million less than forecast. This difference was due almost entirely to a softening in both itinerant and local general aviation operations which resulted not only from economic factors but also from the unusually poor flying weather that prevailed during a large part of fiscal year 1969. Total itinerant operations reached 34.6 million, an increase of 6.8 percent over fiscal year 1968. Total local operations increased from 20.6 million in fiscal year 1968 to 21.3 million in fiscal year 1969. The outlook for fiscal year 1970 is for a slight dip in total aircraft operations, the result of an expected drop in general aviation local operations.

Instrument operations in fiscal year 1969 were 16.7 million, an increase of 14.4 percent over fiscal year 1968. The number of IFR aircraft handled increased by 2.5 million in fiscal year 1969 to 20.6 million. This was only 0.3 million less than forecast. Fiscal year 1970 is expected to show a gain of 2.0 million over the previous twelve months.

Total flight services provided by the FAA rose 13.7 percent in fiscal year 1969 reaching 42.2 million for a new all-time high. However, this was 0.3 million less than forecast and reflects a slow-up in the growth rate of general aviation flying. The latter is expected to continue through fiscal year 1970, and total flight services will show only a comparatively modest gain of 7.8 percent over fiscal year 1969.

## AVIATION INDUSTRY FORECASTS

### Air Carrier Traffic

Passenger traffic transported by U.S. certificated route air carriers is expected to grow at more than twice the rate for the rest of the national economy through 1981. However, the long-term growth in total revenue passenger-miles of about 12 percent per year is substantially lower than the 17-percent average annual increase between fiscal years 1965 and 1969. The latter rate resulted from a combination of factors such as the unusually high rate of growth in the nation's economy, the war in Vietnam, and a sharp decline in the average passenger fare. The forecast assumes a return to a more normal and sustainable rate of economic growth than has been experienced in the past four years. In absolute numbers the 119.8 billion revenue passenger-miles flown in fiscal year 1969 will rise to 130.2 billion in fiscal year 1970, to 254.5 billion in fiscal year 1976, and should approach 450 billion by fiscal year 1981 (see Table 1).

U.S. domestic revenue passenger-miles, which grew at an average rate of 18 percent per year between fiscal year 1965 and fiscal year 1969, will increase only 7.5 percent in fiscal year 1970 and 7.2 percent in fiscal year 1971. The combination of higher fares, an expected increase in the ticket tax, and a temporary slowing in the growth of gross national product (GNP) are expected to retard traffic growth in the short run. After 1971, the long-term growth should average about 12 percent annually through fiscal year 1981. This will raise the number of domestic revenue

passenger-miles from 91.9 billion in fiscal year 1969 to 98 billion in fiscal year 1970, to 188.0 billion in fiscal year 1976, and to about 329 billion in fiscal year 1981.

U.S. international revenue passenger-miles, which grew at a slightly lower rate than domestic between 1965 and 1969, are expected to increase by about 12.5 percent in fiscal year 1970, to 31.4 billion from the 27.9 billion level of the preceding year. Over the long term, this sector will grow about 13 percent annually. This will result in some 66.5 billion U.S. international revenue passenger-miles in fiscal year 1976 and 121.0 billion by fiscal year 1981. It is interesting to note that U.S. international air carrier passenger-miles in 1981 are expected to be about equal to the sum of domestic plus international revenue passenger-miles in 1969.

The number of revenue passenger enplanements will grow at a more moderate pace than revenue passenger-miles, as the average passenger trip length gradually increases. From 168.0 million in fiscal year 1969, total enplanements will increase by 5 percent to 176.4 million in fiscal 1970 (see Table 1). This represents a considerable moderation of the 15.5 percent annual growth that occurred in the fiscal 1965-1969 period. The long-term growth in enplanements should continue at about 10 percent per year through fiscal year 1981 in both domestic and international operations. This will raise the total number of enplanements to 309 million in fiscal year 1976, nearly double the 1969 figure, and to 522 million, or three times the 1969 level, by fiscal year 1981. Because of the much greater trip length characteristic of international

travel, international revenue passenger enplanements account for only about one-tenth of total enplanements.

In fiscal year 1970, domestic passenger enplanements will amount to about 157.1 million as compared with 150.8 million a year earlier. U.S. international enplanements will increase to 19.3 from 17.2 million in the same period. By fiscal year 1976, domestic enplanements will increase to 271 million and international to 38 million. The corresponding estimates for fiscal year 1981 are 460 million and 62 million, respectively.

These forecasts are based on the assumption that GNP expressed in constant 1958 dollars, after slowing substantially in fiscal year 1970, will gradually return to a more normal long-term rate of 4.25 percent by fiscal year 1973 and continue at that average rate through the decade. The increase in the general level of prices is assumed to subside from its present high rate to a more modest 2 percent per year by fiscal year 1973. Domestic fares (including tax) per revenue passenger-mile should increase about 2 percent in 1970 in dollars of constant purchasing power as the effect of fare and tax changes outstrips the increase in the general price level. This situation should be temporary and will quickly give way to a long-term decrease in fares plus tax of 2 to 3 percent annually as larger capacity, and potentially more economical aircraft enter the fleet at a rapid rate. When measured in current dollars, the trend in average fares will be virtually flat throughout the next decade. The proportion of GNP which is spent on air transportation should increase steadily from 0.6 percent in fiscal year 1969 to about 1.1 percent in 1981.

Past experience has shown the level of domestic passenger traffic to be closely associated with these factors. International traffic of U.S. carriers has in the past been closely related to domestic traffic levels. These relationships have been projected to continue in the future.

These assumptions with regard to rates of change in GNP, average fares, and amount spent on air transportation must be viewed as long-term averages and not a prediction of the levels in any given year. It is possible, and likely, there will be divergent movements in some years which will then be offset by corrective adjustments in subsequent years with the net change still on the long-term trend.

The forecasts of domestic and international traffic represent the two categories as currently defined. Any changes in these definitions would directly affect the forecast values. If, for example, Hawaii — mainland traffic is reported as domestic, there would be some gain in domestic at the expense of international traffic. It is also assumed that no radical technological changes will materially affect the characteristics of air travel by 1981.

The present forecasts through 1974 are somewhat lower than those prepared last year. This reduction is greater in enplanements than in passenger-miles. Present efforts to relate fares more closely to costs should stimulate longer trips to a greater degree than short ones. To the extent that average trip length increases, revenue passenger-miles are likely to grow at a faster rate than enplanements. By 1980, the somewhat more favorable outlook for long-term traffic growth brings

enplanements to a level almost identical with last year's forecast, while the 402.5 billion revenue passenger-miles for that year are some 6 percent above last year's forecast.

#### Air Carrier Fleet

U.S. air carriers had 2,386 turbine-powered aircraft in service at the beginning of fiscal year 1970, with an additional 648 on order (see Table 2). Wide-body jets account for slightly over one-half of the aircraft on order and SSTs for an additional 16 percent of the total.

The forecast size and composition of the U.S. fleet through 1981 is shown in Table 3. Included are aircraft on firm order as presented in Table 2 plus an estimate of additional aircraft that will be required during the forecast period. Seat-miles generated by the forecast fleet appear consistent with the revenue passenger-mile forecast shown in Table 1.

The total fleet is expected to increase from 2,586 aircraft on January 1, 1969 to 3,960 aircraft in 1981. The current forecast represents only a slight increase in the number of aircraft from the forecast prepared a year ago. Performance and operating costs are expected to continue to improve with no dramatic technological breakthroughs anticipated. Some V/STOL aircraft may be in the fleet by the end of the forecast period, but the timing and specific aircraft types are too indefinite for separate identification. All-cargo aircraft are included in the fleet, but the numbers are not based on a detailed forecast of the air cargo market.

Jet-powered aircraft will account for 93 percent of the total fleet in 1981, up from 69 percent in 1969. Only a few piston aircraft are expected to remain in operation by 1981. The turboprop fleet will be down to one-half the size existing in 1969 and will consist primarily of two-engine aircraft.

Two- and three-engine jets will be the predominant aircraft in the U.S. fleet toward the end of the forecast period, reflecting a significant build-up of three-engine wide-body aircraft and the assumption that a two-engine wide-body jet will be available in the late 1970's. Four-engine jets will decline after 1972 as lower capacity models are phased out of service. The Concorde is assumed to enter the fleet in fiscal year 1973, and initial U.S. SST airline service will begin in 1978. Both SST aircraft models are assumed to be limited to overwater service.

Forecasts of U.S. air carrier revenue airborne hours and revenue miles flown, by aircraft type, are shown in Tables 4 and 5. Average utilization rates and airborne speeds were developed for each aircraft type for each carrier group based on past trends as well as anticipated future use of the aircraft. These unit values were then applied to the corresponding number of aircraft of the given type in each carrier group. Both series are expected to increase steadily through the forecast period. Revenue miles flown will increase faster than airborne hours reflecting an increase in average air speed.

### General Aviation Flying and Aircraft Fleet

General aviation includes all civil flying of aircraft owned and operated by private individuals and corporations other than air carriers. Its activity ranges from personal and instructional flying in single-engine piston aircraft to scheduled air taxi and business flying in turbine-powered aircraft.

Forecasting future levels of general aviation activity is difficult because of the heterogeneity of the subject and the lack of a comprehensive data base. Such information as is available points to a softening in past growth rates over the next year or two. This will be followed by a return to a strong uptrend for the remainder of the decade.

The general aviation fleet at the beginning of 1969 totaled 124,237 eligible aircraft, an increase of 8.8 percent above the 114,186 eligible aircraft in 1968, and is expected to number 187,000 by 1976 and 235,000 at the beginning of 1981. The single-engine piston aircraft numbered 103,735 in January 1969 and accounted for 83.5 percent of the total. Although their number is expected to reach 184,800 by January of 1981, their proportion of the total fleet is expected to decrease to 78.6 percent. Multiengine piston aircraft are forecast to increase to 31,800 in 1981 from the 14,999 reported in 1969. The largest proportional growth is expected to occur in the turbine fleet. In 1969 there were 1,833 of these aircraft; by 1981 there should be around 9,100. Most of them will be turboprops. The rotorcraft fleet is expected to grow during this period and will number 6,300 units in 1981, accounting for 2.7 percent of the fleet.

Table 7 provides a regional distribution of eligible general aviation aircraft. The number of aircraft in each FAA region is expected to grow throughout the forecast period. The largest proportional growth is still expected to occur in the Western and Southern Regions.

Hours flown in general aviation totaled 24.8 million in fiscal year 1969 and are expected to reach 45.6 million in fiscal year 1981 (see Table 8).

Due to the slowdown in the Nation's economy, a modest increase to 25.3 million hours is forecast in fiscal year 1970. By late fiscal year 1971 the economy is expected to return to a more normal growth rate and general aviation flying will show a corresponding recovery. Another factor that may affect the general aviation series of hours flown and their breakdown by user category is the expected implementation of an FAA Notice of Proposed Rule Making 69-37. This notice changes the method by which general aviation hours flown and purpose of flight are reported to the FAA. At this time it is not known what effect this rule will have on the comparability of the data in this series.

These factors notwithstanding, all categories of general aviation are expected to show significant growth over the forecast period. Commercial and personal flying will experience the greatest rate of growth. The increasing use of air taxis, a major component of the commercial user group, in supplementing the air carrier service to small communities which do not generate enough passenger traffic to warrant the use of large transport aircraft, will contribute much to the growth in this user group. In addition, many air taxi operators are under

contract to the Post Office Department and this contributes significantly to the annual air taxi traffic.

Although the growth in personal flying will be influenced by the current softening in the economy, rising per capita incomes along with demands for more recreational outlets will contribute to a healthy growth rate during the forecast period. Instructional flying will be stimulated by these same long-term growth factors, but in the short-term will be depressed by the current decline in the number of new students. It is expected with the impetus of learn-to-fly programs and the pool of Vietnam veterans eligible for GI flight training that by 1972 instructional flying will return to an uptrend. Over the long-term its growth is expected to be somewhat below the high rates of the past few years.

Business flying will continue to account for the largest segment of general aviation hours flown and is forecast to increase to 13.4 million hours in 1981 from 7.2 million in fiscal year 1969. As may be expected, its growth is closely tied to the overall national economy, and its growing importance in providing convenient, rapid transportation to business executives will insure its continued growth during the forecast period.

#### Domestic Aviation Fuel Consumption

Fuel consumed in U.S. domestic civil aviation totaled 7.8 billion gallons in fiscal year 1969 and is expected to increase nearly 70 percent by fiscal year 1976 and to be 140 percent greater by fiscal year 1981 (see Table 9). Jet fuel consumption will account for almost all of the

change as users increase consumption from 7.2 billion gallons in fiscal year 1969 to 12.2 and 17.7 billion gallons, respectively, in fiscal years 1976 and 1981. In fiscal year 1969 the air carriers consumed approximately 98 percent of the jet fuel, and they are expected to maintain this relative percentage throughout the forecast period.

Aviation gasoline consumption is expected to decline from 597 million gallons in fiscal year 1969 to 575 million gallons in fiscal year 1970 as the air carriers continue to retire piston-powered aircraft from service. By fiscal year 1971 increases in general aviation gasoline consumption will have offset declines in the air carrier portion and total aviation gasoline consumption is expected to be back to the current level. By fiscal year 1981, the total should be about 985 million gallons, 65 percent above fiscal year 1969.

It should be noted that during the past year the FAA changed to a new and more accurate method of developing estimates of general aviation fuel consumption. Because of this change fiscal year 1969 figures and the forecast data are not precisely comparable with the historical series shown in Table 9.

#### Civil Aircraft and Engine Production

Although total civil aircraft production in fiscal year 1969 was approximately 400 units less than in 1968, the total of 14,673 aircraft was not significantly different from the high reached in fiscal year 1966. The level of production has been relatively stable over the past four years. Table 10 shows the civil aircraft produced since 1965 and a forecast through fiscal year 1981. During fiscal year 1969 air carrier

transport deliveries reached their highest total in history with 665 airframes produced.

Although general aviation production is forecast to more than double by 1981, economic measures and actual deliveries so far in fiscal year 1970 indicate production will be depressed in the near term. It is expected that the growth rate will not return to an upswing until the latter part of fiscal year 1971 or the beginning of 1972. The past demand for new aircraft by type will not change significantly during the forecast period. Piston aircraft will account for the bulk of the deliveries with single-engine piston types comprising about 82 percent and multiengine piston 14 percent of total production. Rotorcraft and turbine aircraft will each contribute approximately 2 percent. Over the past years the trend has been toward higher performance, more sophisticated aircraft types and this trend is expected to continue.

The forecast of air carrier transport aircraft production was based on both the announced orders and additional estimated orders for those U.S. and foreign air carriers which will require additional aircraft to remain competitive and to accommodate the forecast increase in traffic demand. Although some types of current two-, three-, and four-engine jets will continue to be produced for the next few years, there will be an increasing demand for the new wide-body jets. The total number of transport aircraft manufactured each year is expected to be less than the record produced in fiscal years 1968 and 1969 because of the substantial increase in capacity per aircraft.

The forecast of civil aircraft engine production, as shown in Table 11, was based on the aircraft production figures shown in Table 10 and provides

for necessary spares. Piston engine production was based solely on general aviation aircraft requirements, while the number of turbojet and turboprop engines account for air carrier requirements as well as general aviation. By fiscal year 1981 the majority of rotorcraft produced will use turbine engines. The turboprop engine production assumes a portion of general aviation aircraft will be equipped with foreign-manufactured engines.

## FAA AIR TRAFFIC ACTIVITY FORECASTS

The projected overall growth in civil aviation during the forecast period, fiscal years 1970 to 1981, will be reflected in significant increases in all FAA airport and airway workload measures. General aviation and air carrier operational activity will increase substantially, particularly during the middle and later years, while military activity will remain relatively stable throughout the period. Tables 12 through 18 show the various measures of air traffic activity and workload at FAA terminal and en route facilities and flight service stations.

### Aircraft Operations at Airports with FAA Traffic Control Service

Table 12 shows that total aircraft operations are expected to remain comparatively static during fiscal year 1970 and will show only a modest increase during fiscal year 1971. This departure from the long-term trend is attributed to such factors as: (1) generally poor flying weather during the early months of fiscal year 1970; (2) no new tower installations during fiscal year 1970; (3) some shift in general aviation local operations in congested areas to less active non-tower airports; and (4) the general slowdown in the Nation's economy. After 1971 a return to more normal conditions is expected as the economy picks up and new towers are added at a greater than average rate. By fiscal year 1981 total operations at airports with FAA traffic control service are forecast to be 1/4.2 million, an increase of 212 percent over fiscal year 1969.

Historically the FAA has installed an average of about ten new towers per year. Because of the existing backlog of airports eligible to receive towers and increased public concern over air safety, it is anticipated that starting in fiscal year 1971 towers will be added at a higher rate than in past years. It is planned that 14 towers will be commissioned during fiscal year 1971, 30 in 1972, 26 in 1973, and an average of 16 per fiscal year during the remainder of the forecast period. These newly commissioned tower airports will have a significant effect on the total operations count, particularly in the latter half of the forecast period.

Table 13 shows that total itinerant operations will increase from 34.6 million in fiscal year 1969 to 99.3 million in 1981, an increase of 187 percent. General aviation itinerant operations are expected to increase their proportion of total operations from 64 percent in fiscal year 1969 to over 80 percent in fiscal year 1981, rising from 22.3 million to 80.2 million, a gain of 260 percent.

Air carrier itinerant operations are forecast to increase from 10.7 million in fiscal year 1969 to 11.1 million in fiscal year 1970, a growth of less than 4 percent. This low growth rate during 1970 is attributable to the increasing use of larger capacity aircraft and an expected tightening of flight schedules to achieve higher load factors and to aid in combating congestion problems. By the last half of fiscal year 1971 the economic situation should improve and stimulate air carrier operations to a faster rate of growth. However, the rate of growth in operations throughout the next decade will not approach the

rates recorded in the last half of the 1960's as the air carriers will handle more and more of their traffic with the substantially larger capacity wide-body jets. For example, domestic passenger-miles are expected to be three and one-half times higher in 1981 than in fiscal year 1969, while air carrier operations will increase by only 66 percent.

Military itinerant operations are expected to continue to decline slowly from 1.5 million in fiscal year 1969 to 1.3 million in fiscal year 1981.

Local operations are forecast to increase from 21.3 million operations in fiscal year 1969 to 74.9 million operations in fiscal year 1981. All of the growth in local operations will stem from general aviation flying, since military local operations are expected to decline slowly from 1.8 million in fiscal year 1969 to 1.4 million in fiscal year 1981 (see Table 14).

While itinerant operations reflect a transportation function, local general aviation operations are primarily a training or recreational activity. The training portion is influenced both by the number of currently rated airmen maintaining or improving their flying skills and by the number of students attempting to obtain a private license. This latter group, as measured by the number of student certificates issued, has declined significantly in the past year and accounts in part for the lack of any significant growth in general aviation local operations during fiscal years 1969 and 1970. In addition, adverse flying weather had a profound effect on the level of local operations during the past year.

The pleasure or recreation portion of general aviation local flying is strongly influenced by economic factors such as income levels and operating costs. The letup in overall pilot training activities and the softening economy point to a lower volume of local flying in fiscal year 1970 than in the previous twelve months.

By 1971, as the economy picks up and as new towers are commissioned, general aviation local operations are expected to return to more normal growth patterns and should reach 73.5 million operations in fiscal year 1981, an increase of 277 percent over 1969.

Instrument operations shown in Table 15 include operations at airports with FAA traffic control service as well as FAA-operated military radar approach control facilities. The forecast shows an increase to 42.7 million instrument operations in fiscal year 1981 compared with 16.7 million operations in fiscal year 1969, an increase of 156 percent. Most of this growth will be attributable to an increasing use of air traffic facilities by general aviation flyers.

The forecasts of operations at airports with FAA traffic control service as shown in Tables 12 through 15 are predicated upon the continuation of present operating rules and procedures. If these are changed or the new tower installation schedule is significantly revised, the forecasts would have to be adjusted accordingly.

#### FAA En Route Traffic Control Activity

The number of IFR aircraft handled is used as a measure of IFR activity and workload at the FAA air route traffic control centers.

From fiscal year 1969 to fiscal year 1981, this measure is forecast to increase 120 percent, rising from 20.6 million to 45.3 million. Although air carrier IFR aircraft handled will nearly double by 1981 and will continue to be the largest segment of total IFR aircraft handled, its percentage of the total will decline from 61 percent in fiscal year 1969 to about 52 percent in fiscal year 1981. This forecast assumes that for all practical purposes all air carrier flights will operate IFR by the end of fiscal year 1970.

General aviation is the fastest growing segment of IFR aircraft handled. This is a reflection of the increasing IFR capability of general aviation pilots and aircraft and the growth of itinerant general aviation flying. In fiscal year 1969 there were 3.2 million general aviation IFR aircraft handled; this figure is forecast to grow to 16.9 million in fiscal year 1981, a fivefold increase. Military IFR aircraft handled are forecast to remain relatively stable throughout the forecast period between 4.7 and 4.9 million per year.

The forecasts of IFR aircraft handled assume no change in the number of air route traffic control centers and present-day operating rules and procedures. The forecasts would have to be modified if any of these elements change.

#### FAA Flight Services

Tables 17 and 18 show measures of workload and activity at FAA flight service stations and combined station/towers. Total flight services, which is a weighted workload measure consisting of aircraft contacted, flight plans originated, and pilot briefs, are forecast

to increase from 42.2 million in fiscal year 1969 to 153.0 million in fiscal year 1981, assuming no basic change in the flight service station system. This is a gain of over 260 percent.

Total flight plans originated are estimated to increase from 5.6 million in fiscal year 1969 to 15.8 million in fiscal year 1981, a 182-percent increase. In the past, the plans have been about evenly distributed between IFR-DVFR and VFR flights. With the increasing sophistication of general aviation flying, IFR flight plans are expected to increase at a faster rate than VFR flight plans. By fiscal year 1981, the former will be more than twice as large as VFR flight plans originated.

Pilot briefs have been the largest in volume and the fastest growing service provided by the flight service stations. This trend is expected to continue with pilot briefs increasing from 10.7 million in fiscal year 1969 to 47.4 million in fiscal year 1981, a 343-percent increase.

Total aircraft contacted by flight service stations are expected to reach 26.6 million in fiscal year 1981, a 174-percent increase over the 9.7 million reported in fiscal year 1969. General aviation will account for the major portion of this growth increasing from 8.3 million aircraft contacted in fiscal year 1969 to 25.4 million in fiscal year 1981. Air carrier aircraft contacted are expected to increase slightly while military aircraft contacted are forecast to decline from 0.7 million in fiscal year 1969 to 0.2 million in fiscal year 1981.

Both IFR-DVFR and VFR contacts will increase during the forecast period, but VFR aircraft contacted will still dominate by a wide margin. Historically, VFR aircraft contacts have represented about 90 percent of the total; this is expected to decrease slightly to approximately 84 percent by 1981.

## AIRMEN FORECASTS

### Number of Active Pilots

The data in Table 19 represent the number of active pilots as carried in the FAA airmen certification records. The count is based upon the number of pilots with current medical certificates and as such includes pilots who no longer fly but for various reasons maintain their status by periodic medical examinations.

Table 19 shows that the 691,695 pilots on January 1, 1969 will increase to 1,540,500 by January 1981, a gain of 123 percent. A period of relatively slow growth is shown for 1970 and 1971 and is related to the forecast slowdown in the nation's economy.

The number of student pilots is forecast to decline from 209,406 on January 1, 1969 to 204,000 at the beginning of calendar year 1970. This downturn is expected to continue through 1971. The trend is then forecast to turn upward and by January 1981, student pilots are expected to number 415,000, or approximately double the current level.

The primary criteria for advancement above the student level is the number of hours logged by the pilot. A private pilot license requires 40 flying hours, a commercial license 200 hours, and an air transport rating 1,500 hours. In addition, to become IFR rated a pilot needs 40 hours of instrument time. Some instrument time is also a requirement for the commercial and ATR certificates. The commercial pilot must have ten instrument hours and the ATR 75 instrument hours before certification.

Since 1965, the number of private pilots has increased at a rate of more than 20,000 per year. Because of the expected decline in the number of student pilots which form the base for growth in the private category, this growth rate is forecast to be cut in half over the next two years. Beginning in fiscal year 1972, the growth should return to the 20,000 plus rate per year and by 1981 private pilots are forecast to number 676,000 and account for nearly one-half of all pilot registrations.

Commercial pilots numbered 164,458 on January 1, 1969, and are forecast to increase to 385,000 by January 1981, an increase of 134 percent. The number of pilots in this category has been influenced in the last five years by the issuance of commercial licenses to military personnel upon graduation from military flight schools. Because of the uncertainty of future military requirements, this series is particularly difficult to forecast. The forecast does reflect a letup in military activity, but it must be recognized there could be significant deviations from the numbers shown depending on the accuracy of the forecast of this factor.

Airline transport rated pilots are forecast to increase to 46,800 by January 1981, an increase of 64 percent over the 28,607 as of January 1, 1969. This series is closely allied to the growth in the air carrier fleet, although it does include pilots who are not engaged in piloting air carrier aircraft.

The growth in the number of helicopter pilots has been influenced in the past few years by military demands associated with the Vietnam

buildup. This demand is expected to subside in the near future as military requirements decline. However, growth in civil flying is expected to increase and push the helicopter pilot inventory to 8,900 by January 1981, or 181 percent over the January 1, 1969 level. Glider pilots are expected to increase from 2,193 in January 1969 to 8,800 in January 1981, an increase of 300 percent.

The number of instrument rated pilots has increased sharply in the last five years. The rate of growth is expected to accelerate in the years ahead as greater proficiency will be required to fly in tomorrow's air traffic system. A growth of 170 percent is forecast between January 1969 and January 1981, or from 139,346 to 376,000.

Table 1

UNITED STATES CERTIFICATED ROUTE AIR CARRIER  
SCHEDULED PASSENGER TRAFFIC

Fiscal Year	Revenue Passenger Enplanements (millions)		Revenue Passenger-miles (billions)	
	Total	Domestic	Total	International
1965	94.5	84.5	62.6	15.3
1966	113.9	102.2	76.4	18.5
1967	126.4	113.5	86.3	20.6
1968	152.6	137.5	106.6	24.9
1969	168.0	150.8	119.8	27.9
1970*	176.4	157.1	130.2	31.4
1971*	187.2	165.7	141.3	35.4
1972*	203.9	180.3	156.3	39.4
1973*	226.0	199.5	176.5	45.0
1974*	252.0	222.0	200.0	51.5
1975*	280.0	245.5	227.0	59.5
1976*	309.0	271.0	254.5	66.5
1980*	471.5	415.0	402.5	107.5
1981*	522.0	460.0	450.0	121.0

\*Forecast.

Note.—Detail may not add to total due to independent rounding.

Table 2  
TURBINE-POWERED AIRCRAFT ON ORDER BY UNITED STATES AIR CARRIERS

Aircraft Type	Aircraft Fleet 6/30/69	Additional Aircraft on Order for Delivery					Total
		1969	1970	1971	1972	1973 or Later	
<b>Total Aircraft</b>	<b>2,386</b>	<b>137</b>	<b>146</b>	<b>69</b>	<b>89</b>	<b>207</b>	<b>648</b>
<u>Jet</u>	<u>1,969</u>	<u>128</u>	<u>140</u>	<u>69</u>	<u>89</u>	<u>105</u>	<u>531</u>
2-engine: BAC-111	60	-	-	-	-	-	-
Boeing 737	123	24	6	-	-	-	30
Douglas DC-9	311	13	15	-	-	-	28
Hansa 320	1	-	-	-	-	-	-
Sud Caravelle	20	-	-	-	-	-	-
3-engine: Boeing 727	589	52	27	-	-	-	79
McDonnell-							
Douglas DC-10	-	-	-	17	35	32	84
Lockheed L-1011	-	-	-	8	45	73	126
4-engine: Boeing 707	425	6	-	-	-	-	6
Boeing 720	134	-	-	-	-	-	-
Boeing 747	-	-	81	44	9	-	134
Convair 880/990	47	-	-	-	-	-	-
Douglas DC-8	259	33	11	-	-	-	44
<u>Turboprop</u>	<u>402</u>	<u>9</u>	<u>6</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>15</u>
1-engine: Turbo Porter	7	-	-	-	-	-	-
2-engine: F-27/FH-227	100	-	-	-	-	-	-
Convair 580/600	142	-	-	-	-	-	-
DeHav. Twin Otter	7	4	-	-	-	-	4
Grumman G-21T	1	-	-	-	-	-	-
Grumman Gulfstream	1	-	-	-	-	-	-
Nihon YS-11	10	5	6	-	-	-	11
Nord 262	9	-	-	-	-	-	-
Short Skyvan	2	-	-	-	-	-	-
4-engine: AW-650 Argosy	8	-	-	-	-	-	-
Canadair CL-44	10	-	-	-	-	-	-
Lockheed Electra	82	-	-	-	-	-	-
Lockheed Hercules	19	-	-	-	-	-	-
Vickers Viscount	4	-	-	-	-	-	-
<u>Helicopters</u>	<u>15</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
1-engine: Bell JetRanger	3	-	-	-	-	-	-
2-engine: Boeing Vertol 107	4	-	-	-	-	-	-
Sikorsky S-61	8	-	-	-	-	-	-
<u>Supersonic Transports</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>102</u>	<u>102</u>
Concorde	-	-	-	-	-	38	38
U.S. - SST	-	-	-	-	-	64	64

Note.—Included here are all turbine-powered aircraft on order by United States certificated route, supplemental, intrastate and commercial air carriers to the extent reported by the aircraft manufacturers and air carriers through November 1969. Aircraft on option are excluded. Aircraft leased or to be delivered under a lease agreement are included. Supersonic transport figures relate only to reserved delivery positions.

Table 3

## TOTAL AIRCRAFT IN THE SERVICE OF UNITED STATES AIR CARRIERS

(As of January 1)

Aircraft Type	Reported 1969	Forecast									
		1970	1971	1972	1973	1974	1975	1976	1980	1981	
<u>Total Aircraft</u>	<u>2,586</u>	<u>2,709</u>	<u>2,800</u>	<u>2,890</u>	<u>2,990</u>	<u>3,070</u>	<u>3,190</u>	<u>3,270</u>	<u>3,800</u>	<u>3,960</u>	
<u>Fixed-wing Aircraft</u>	<u>2,570</u>	<u>2,689</u>	<u>2,782</u>	<u>2,870</u>	<u>2,969</u>	<u>3,047</u>	<u>3,166</u>	<u>3,245</u>	<u>3,770</u>	<u>3,930</u>	
<u>Jet</u>	<u>1,781</u>	<u>2,066</u>	<u>2,213</u>	<u>2,311</u>	<u>2,439</u>	<u>2,545</u>	<u>2,678</u>	<u>2,772</u>	<u>3,502</u>	<u>3,679</u>	
2-and 3-engine	965	1,174	1,233	1,307	1,453	1,589	1,740	1,858	2,529	2,697	
4-engine	816	892	980	1,004	986	953	914	876	888	880	
SST	-	-	-	-	-	3	24	38	85	102	
<u>Turboprop</u>	<u>458</u>	<u>374</u>	<u>367</u>	<u>382</u>	<u>370</u>	<u>355</u>	<u>353</u>	<u>348</u>	<u>228</u>	<u>216</u>	
1-and 2-engine	291	272	279	297	299	294	296	293	223	211	
4-engine	167	102	88	85	71	61	57	55	5	5	
<u>Piston</u>	<u>331</u>	<u>249</u>	<u>202</u>	<u>177</u>	<u>160</u>	<u>147</u>	<u>135</u>	<u>125</u>	<u>40</u>	<u>35</u>	
1-and 2-engine	249	172	134	122	114	106	97	90	30	25	
4-engine	82	77	68	55	46	41	38	35	10	10	
<u>Helicopter</u>	<u>16</u>	<u>20</u>	<u>18</u>	<u>20</u>	<u>21</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>30</u>	<u>30</u>	
Piston engine	3	3	-	-	-	-	-	-	-	-	
Turbine engine	13	17	18	20	21	23	24	25	30	30	

Note.—Included here are all passenger and cargo aircraft owned or leased by, and in the domestic or international service of the United States certificated route, supplemental, intrastate and commercial air carriers. Aircraft used for training and aircraft that have been withdrawn from service and are awaiting disposal are not included here. Aircraft in the service of air taxi operators are shown in the general aviation aircraft fleet on another page of this report.

Table 4

## TOTAL REVENUE AIRBORNE HOURS, UNITED STATES AIR CARRIERS

(Fiscal years — In millions)

Aircraft Type	Reported	Forecast									
	1969	1970	1971	1972	1973	1974	1975	1976	1980	1981	
<u>Total Aircraft</u>	<u>6.38</u>	<u>7.23</u>	<u>7.39</u>	<u>7.66</u>	<u>8.02</u>	<u>8.17</u>	<u>8.47</u>	<u>8.69</u>	<u>10.19</u>	<u>10.81</u>	
<u>Fixed-wing Aircraft</u>	<u>6.36</u>	<u>7.20</u>	<u>7.36</u>	<u>7.63</u>	<u>7.99</u>	<u>8.13</u>	<u>8.43</u>	<u>8.65</u>	<u>10.15</u>	<u>10.76</u>	
<u>Jet</u>	<u>5.14</u>	<u>6.19</u>	<u>6.42</u>	<u>6.68</u>	<u>7.07</u>	<u>7.26</u>	<u>7.59</u>	<u>7.81</u>	<u>9.61</u>	<u>10.24</u>	
2-and 3-engine	2.38	3.08	3.21	3.35	3.78	4.12	4.56	4.89	6.57	7.09	
4-engine	2.76	3.11	3.21	3.33	3.29	3.13	2.97	2.82	2.79	2.83	
SST	-	-	-	-	-	.01	.06	.10	.25	.32	
<u>Turboprop</u>	<u>.82</u>	<u>.77</u>	<u>.77</u>	<u>.80</u>	<u>.79</u>	<u>.74</u>	<u>.73</u>	<u>.73</u>	<u>.51</u>	<u>.48</u>	
1-and 2-engine	.59	.61	.63	.67	.68	.64	.64	.64	.50	.47	
4-engine	.23	.16	.14	.13	.11	.10	.09	.09	.01	.01	
<u>Piston</u>	<u>.40</u>	<u>.24</u>	<u>.17</u>	<u>.15</u>	<u>.13</u>	<u>.13</u>	<u>.11</u>	<u>.11</u>	<u>.03</u>	<u>.04</u>	
1-and 2-engine	.27	.16	.10	.09	.08	.08	.07	.07	.02	.03	
4-engine	.13	.08	.07	.06	.05	.05	.04	.04	.01	.01	
<u>Helicopter</u>	<u>.02</u>	<u>.03</u>	<u>.03</u>	<u>.03</u>	<u>.03</u>	<u>.04</u>	<u>.04</u>	<u>.04</u>	<u>.04</u>	<u>.05</u>	
Piston engine	*	-	-	-	-	-	-	-	-	-	
Turbine engine	.02	.03	.03	.03	.03	.04	.04	.04	.04	.05	
* Less than 0.005.											

Note.— Included here are revenue hours flown by all passenger and cargo aircraft that are owned or leased by, and are in the domestic or international service of the United States certificated route, supplemental, intrastate and contract air carriers. Hours for fiscal year 1969 are partially estimated.

Table 5

## TOTAL REVENUE STATUTE MILES, UNITED STATES AIR CARRIERS

(Fiscal years — In millions)

Aircraft Type	Reported	Forecast									
	1969	1970	1971	1972	1973	1974	1975	1976	1980	1981	
<u>Total Aircraft</u>	<u>2,526</u>	<u>2,909</u>	<u>2,977</u>	<u>3,097</u>	<u>3,264</u>	<u>3,353</u>	<u>3,517</u>	<u>3,629</u>	<u>4,526</u>	<u>4,840</u>	
<u>Fixed-wing Aircraft</u>	<u>2,524</u>	<u>2,906</u>	<u>2,974</u>	<u>3,094</u>	<u>3,261</u>	<u>3,349</u>	<u>3,513</u>	<u>3,625</u>	<u>4,521</u>	<u>4,834</u>	
<u>Jet</u>	<u>2,260</u>	<u>2,688</u>	<u>2,774</u>	<u>2,893</u>	<u>3,068</u>	<u>3,169</u>	<u>3,334</u>	<u>3,448</u>	<u>4,409</u>	<u>4,731</u>	
2 and 3-engine	940	1,202	1,242	1,294	1,484	1,649	1,828	1,969	2,736	2,954	
4-engine	1,320	1,486	1,532	1,599	1,584	1,514	1,440	1,375	1,385	1,410	
SST	-	-	-	-	-	6	66	104	288	367	
<u>Turboprop</u>	<u>191</u>	<u>174</u>	<u>167</u>	<u>174</u>	<u>169</u>	<u>158</u>	<u>158</u>	<u>157</u>	<u>106</u>	<u>98</u>	
1- and 2-engine	125	127	127	135	136	129	130	130	103	96	
4-engine	66	47	40	39	33	29	28	27	3	2	
<u>Piston</u>	<u>73</u>	<u>44</u>	<u>33</u>	<u>27</u>	<u>24</u>	<u>22</u>	<u>21</u>	<u>20</u>	<u>6</u>	<u>5</u>	
1- and 2-engine	45	26	17	14	13	12	11	11	3	4	
4-engine	28	18	16	13	11	10	10	9	3	1	
<u>Helicopter</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>5</u>	<u>6</u>	
Piston engine	*	*	-	-	-	-	-	-	-	-	
Turbine engine	2	3	3	3	3	4	4	4	5	6	

\* Less than 0.5.

Note.— Included here are revenue miles flown by all passenger and cargo aircraft owned or leased by and in the domestic or international service of the United States certificated route, supplemental, intra-state and contract air carriers. Miles for fiscal year 1969 are partially estimated.

Table 6

## ACTIVE GENERAL AVIATION AIRCRAFT BY TYPE OF AIRCRAFT

As of January 1	Total	Piston			Turbine	Rotorcraft	Other
		Single-engine	Multiengine				
1965	88,742	76,136	10,346	306	1,306	648	
1966	95,442	81,134	11,422	574	1,503	809	
1967	104,706	88,621	12,671	915	1,622	877	
1968	114,186	96,471	13,439	1,281	1,899	1,096	
1969	124,237	103,735	14,999	1,833	2,350	1,320	
1970*	133,000	110,000	16,300	2,400	2,800	1,500	
1971*	142,000	116,900	17,400	2,900	3,100	1,700	
1972*	151,000	123,700	18,700	3,400	3,400	1,800	
1973*	160,000	130,300	20,000	4,000	3,800	1,900	
1974*	169,000	137,000	21,300	4,500	4,100	2,100	
1975*	178,000	143,500	22,700	5,200	4,400	2,200	
1976*	187,000	150,100	24,100	5,700	4,700	2,400	
1980*	225,000	177,700	30,100	8,400	5,900	2,900	
1981*	235,000	184,800	31,800	9,100	6,300	3,000	

\*Forecast.

Table 7

## ACTIVE GENERAL AVIATION AIRCRAFT BY FAA REGION

As of January 1	Total	FAA REGION						
		Eastern	Southern	Southwest	Central	Western	Alaskan	Pacific
1965	88,742	18,275	10,032	12,985	24,464	21,304	1,476	136
1966	95,442	20,159	11,110	13,964	25,741	22,661	1,600	146
1967	104,706	22,514	12,562	15,063	27,691	24,930	1,717	145
1968	114,186	24,576	14,145	15,794	30,337	27,353	1,697	175
1969	124,237	27,037	15,892	17,011	32,156	29,841	1,956	188
1970*	133,000	29,100	17,300	18,100	33,900	32,000	2,150	200
1971*	142,000	31,200	18,700	19,200	35,800	34,500	2,300	210
1972*	151,000	33,400	20,100	20,400	37,600	36,850	2,400	225
1973*	160,000	35,550	21,600	21,450	39,400	39,200	2,550	240
1974*	169,000	37,700	23,150	22,650	40,900	41,600	2,700	250
1975*	178,000	39,700	24,750	23,700	42,700	44,000	2,800	275
1976*	187,000	41,700	26,150	24,900	44,500	46,400	3,000	300
1980*	225,000	49,700	33,100	29,500	51,900	56,650	3,600	400
1981*	235,000	51,700	35,300	30,600	53,950	59,100	3,800	450

\*Forecast.

Note.— Totals include a small number of aircraft located in other areas.

Table 8  
HOURS FLOWN IN GENERAL AVIATION  
(In millions)

Fiscal Year	Total	Business	Commercial	Instructional	Personal	Other
1965	16.2	5.8	3.3	3.0	3.9	0.2
1966	18.9	6.5	3.4	4.5	4.3	0.2
1967	21.6	6.8	3.7	6.0	4.9	0.2
1968	22.9	6.8	4.1	6.4	5.4	0.2
1969	24.8	7.2	4.8	6.7	5.8	0.3
1970*	25.3	7.4	5.2	6.6	5.9	0.2
1971*	26.8	7.9	5.6	6.7	6.3	0.3
1972*	28.5	8.4	6.0	6.9	6.9	0.3
1973*	30.3	8.9	6.4	7.1	7.6	0.3
1974*	32.1	9.3	6.8	7.3	8.4	0.3
1975*	34.1	9.8	7.2	7.6	9.2	0.3
1976*	36.0	10.4	7.7	7.8	9.8	0.3
1980*	43.6	12.8	9.8	8.8	11.8	0.4
1981*	45.6	13.4	10.4	9.1	12.3	0.4

\*Forecast.

Note.—Hours for 1965-1968 have been developed from calendar year data shown in FAA Statistical Handbook of Aviation.

Table 9

## FUEL CONSUMED BY UNITED STATES DOMESTIC CIVIL AVIATION

(In millions of gallons)

Fiscal Year	Jet Fuel			Aviation Gasoline			Total Jet Fuel And Aviation Gasoline
	Air Carrier <u>1/</u>	General Aviation <u>2/</u>	Total	Air Carrier <u>1/</u>	General Aviation <u>2/</u>	Total	
1965	3,058	61	3,119	557	277	834	3,953
1966	3,907	94	4,001	464	333	797	4,798
1967	4,568	122	4,690	335	385	720	5,410
1968	6,043	152	6,195	230	412	642	6,837
1969**	7,063	128 <u>3/</u>	7,191	94	503 <u>3/</u>	597	7,788
1970*	7,850	155	8,005	60	515	575	8,580
1971*	8,300	185	8,485	45	550	595	9,080
1972*	8,950	210	9,160	35	585	620	9,780
1973*	9,900	235	10,135	30	625	655	10,790
1974*	10,550	260	10,810	25	665	690	11,500
1975*	11,250	290	11,540	20	710	730	12,270
1976*	11,900	315	12,215	20	755	775	12,990
1980*	16,000	430	16,430	5	930	935	17,365
1981*	17,200	470	17,670	5	980	985	18,655

\*Forecast.

\*\*Preliminary.

1/ Partially estimated for fiscal years 1965-1969.2/ Estimated for fiscal years 1965-1969; actual fuel consumption by general aviation aircraft is not reported. 3/ 1969 and forecast data not exactly comparable to prior years due to change in base.

Note.—Domestic civil aviation is defined for purposes of this table to include all civil aircraft flights which originate and terminate within the 48 conterminous states, within Hawaii and within Alaska. Fuels consumed by airframe and aircraft engine manufacturers, whether for flight testing or ground testing, are not shown here because they are not available for the domestic industry as a whole and cannot be estimated with any assurance of accuracy. Estimates of fuel consumed by the supplemental, contract and intrastate air carriers are included in the "Air Carrier" columns.

Table 10  
 CIVIL AIRCRAFT PRODUCTION IN THE UNITED STATES  
 (Number of Aircraft)

Fiscal Year	Air Carrier Transport Aircraft	General Aviation Aircraft	Total
1965	189	10,861	11,050
1966	284	14,879	15,163
1967	372	14,799	15,171
1968	625	14,419	15,044
1969	665	14,008	14,673
1970*	360	13,400	13,760
1971*	270	14,200	14,470
1972*	240	16,000	16,240
1973*	260	18,700	18,960
1974*	265	20,900	21,165
1975*	235	22,900	23,135
1976*	200	24,600	24,800
1980*	400	30,900	31,300
1981*	420	32,400	32,820

\*Forecast.

Note.— Civil aircraft for export are included. Excludes all aircraft produced for military use whether for the United States or for a foreign government. All helicopter production, including air carrier transport helicopters, is included in the column for general aviation aircraft.

Table 11

## CIVIL AIRCRAFT ENGINE PRODUCTION IN THE UNITED STATES

(Number of Engines)

Fiscal Year	Turbojet	Turboprop	Piston	Total
1965	1,058	52	15,356	16,466
1966	1,840	149	20,407	22,396
1967	2,170	318	18,324	20,812
1968	2,780	633	17,806	21,219
1969	2,245	787	18,758	21,790
1970*	1,750	600	18,100	20,450
1971*	1,500	650	19,100	21,250
1972*	1,300	800	21,500	23,600
1973*	1,250	900	25,100	27,250
1974*	1,250	1,000	28,150	30,400
1975*	1,150	1,050	30,900	33,100
1976*	1,000	1,100	33,300	35,400
1980*	1,850	1,450	41,750	45,050
1981*	2,000	1,550	43,700	47,250

\* Forecast.

Note.— Civil aircraft engines for export are included. Excludes all aircraft engines produced for military use whether for the United States or for a foreign government.

Table 12

TOTAL ITINERANT AND LOCAL AIRCRAFT OPERATIONS  
AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE

(In millions)

Fiscal Year	Total	Itinerant	Local
1965	35.6	22.8	12.7
1966	41.2	26.0	15.2
1967	47.6	29.1	18.4
1968	53.0	32.4	20.6
1969	55.9	34.6	21.3
1970*	55.7	34.9	20.8
1971*	58.7	37.1	21.6
1972*	64.7	40.5	24.2
1973*	72.7	45.1	27.6
1974*	80.9	49.7	31.2
1975*	89.6	54.5	35.1
1976*	99.8	60.0	39.8
1980*	155.6	89.7	65.9
1981*	174.2	99.3	74.9

\* Forecast.

Note.—An aircraft operation is defined as an aircraft arrival at or a departure from an airport with FAA traffic control service. A local operation is performed by an aircraft that: operates in the local traffic pattern or within sight of the tower; is known to be departing for or arriving from flight in local practice areas; or executes simulated instrument approaches or low passes at the airport. All aircraft arrivals and departures other than local (as defined above) are classified as itinerant operations. Detail may not add to total due to independent rounding.

Table 13

ITINERANT AIRCRAFT OPERATIONS  
AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE

(In millions)

Fiscal Year	Total	Air Carrier	General Aviation	Military
1965	22.8	7.5	13.6	1.7
1966	26.0	8.2	16.2	1.6
1967	29.1	8.6	19.0	1.5
1968	32.4	9.9	21.0	1.5
1969	34.6	10.7	22.3	1.5
1970*	34.9	11.1	22.3	1.5
1971*	37.1	11.6	24.0	1.5
1972*	40.5	12.2	26.8	1.5
1973*	45.1	12.8	30.9	1.4
1974*	49.7	13.1	35.2	1.4
1975*	54.5	13.5	39.6	1.4
1976*	60.0	13.9	44.7	1.4
1980*	89.7	17.0	71.4	1.3
1981*	99.3	17.8	80.2	1.3

\* Forecast.

Note.—See Table 12 for definition of itinerant operations.  
Detail may not add to total due to independent rounding.

Table 14  
**LOCAL AIRCRAFT OPERATIONS  
 AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE**  
 (In millions)

Fiscal Year	Total	General Aviation	Military
1965	12.7	10.8	1.9
1966	15.2	13.5	1.7
1967	18.4	16.7	1.8
1968	20.6	18.8	1.8
1969	21.3	19.5	1.8
1970*	20.8	19.1	1.7
1971*	21.6	19.9	1.7
1972*	24.2	22.5	1.7
1973*	27.6	26.0	1.6
1974*	31.2	29.6	1.6
1975*	35.1	33.5	1.6
1976*	39.8	38.3	1.5
1980*	65.9	64.5	1.4
1981*	74.9	73.5	1.4

\*Forecast.

Note.—See Table 12 for definition of local operations.  
 Detail may not add to total due to independent rounding.

Table 15

INSTRUMENT OPERATIONS AT AIRPORTS  
WITH FAA TRAFFIC CONTROL SERVICE

(In millions)

Fiscal Year	Instrument Operations
1965	9.6
1966	10.7
1967	12.1
1968	14.6
1969	16.7
1970*	18.0
1971*	19.2
1972*	20.5
1973*	22.1
1974*	23.6
1975*	25.5
1976*	27.4
1980*	39.3
1981*	42.7

\* Forecast.

Note.—An instrument operation is defined as the handling by an FAA terminal traffic control facility of the arrival or departure at an airport of an aircraft on an IFR flight plan or the provision of IFR separation to other aircraft by an FAA terminal traffic control facility.

Includes instrument operations at FAA-operated military radar approach control facilities.

Table 16

IFR AIRCRAFT HANDLED, IFR DEPARTURES, AND OVERS BY USER CATEGORY  
FAA AIR ROUTE TRAFFIC CONTROL CENTERS  
(In millions)

Fiscal Year	Total			Air Carrier			General Aviation			Military		
	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs
1965	12.2	4.6	3.0	6.3	2.5	1.3	1.3	.6	.2	4.6	1.5	1.6
1966	13.5	5.2	3.1	7.4	3.0	1.5	1.7	.7	.2	4.4	1.5	1.4
1967	15.1	5.8	3.4	8.5	3.4	1.7	2.2	1.0	.3	4.3	1.5	1.4
1968	18.1	7.0	4.0	10.8	4.3	2.3	2.8	1.2	.4	4.5	1.6	1.4
1969	20.6	7.9	4.7	12.6	4.9	2.7	3.2	1.4	.4	4.7	1.6	1.5
1970*	22.6	8.7	5.2	14.0	5.4	3.2	3.7	1.6	.5	4.9	1.7	1.5
1971*	24.2	9.3	5.6	15.1	5.8	3.5	4.2	1.8	.6	4.9	1.7	1.5
1972*	25.4	9.8	5.8	15.9	6.1	3.7	4.6	2.0	.6	4.9	1.7	1.5
1973*	26.9	10.4	6.1	16.7	6.4	3.9	5.3	2.3	.7	4.9	1.7	1.5
1974*	28.1	10.9	6.3	17.3	6.6	4.1	5.9	2.6	.7	4.9	1.7	1.5
1975*	29.6	11.5	6.6	17.9	6.8	4.3	6.8	3.0	.8	4.9	1.7	1.5
1976*	31.5	12.3	6.9	18.5	7.0	4.5	8.1	3.6	.9	4.9	1.7	1.5
1980*	42.0	16.8	8.4	22.5	8.5	5.5	14.7	6.6	1.5	4.8	1.7	1.4
1981*	45.3	18.2	8.9	23.6	8.9	5.8	16.9	7.6	1.7	4.8	1.7	1.4

\*Forecast.

Note.—Detail may not add to total due to independent rounding. The aircraft handled count consists of the number of IFR departures multiplied by two plus the number of overs. This concept recognizes that for each departure there is a landing. An IFR departure is defined as an original IFR flight plan filed either prior to departure or after becoming airborne. An over flight originates outside the ARTC area and passes through the area without landing. The forecast data assume present operating rules and procedures and the present number of air route traffic control centers.

Table 17

FLIGHT SERVICES, PILOT BRIEFS, FLIGHT CONDITION MESSAGES  
AND FLIGHT PLANS ORIGINATED  
FAA FLIGHT SERVICE STATIONS AND COMBINED STATION/TOWERS

(In millions)

Fiscal Year	Flight Services	Pilot Briefs and Flight Condition Messages	Flight Plans Originated		
			Total	IFR-DVFR	VFR
1965	24.5	4.1	4.1	2.2	2.0
1966	29.1	5.8	4.4	2.3	2.2
1967	34.0	7.5	4.8	2.4	2.4
1968	37.1	8.6	5.2	2.7	2.4
1969	42.2	10.7	5.6	3.0	2.5
1970*	45.5	11.8	6.0	3.4	2.6
1971*	49.2	13.0	6.4	3.7	2.7
1972*	53.2	14.2	6.8	4.0	2.8
1973*	59.6	16.4	7.3	4.3	3.0
1974*	67.5	19.1	7.9	4.7	3.2
1975*	75.5	21.8	8.6	5.2	3.4
1976*	85.0	24.9	9.5	5.9	3.6
1980*	136.2	41.9	14.2	9.4	4.8
1981*	153.0	47.4	15.8	10.7	5.1

\*Forecast.

Note.—Flight Services is a weighted workload measurement used in Airway Planning Standard No. 5 (the ATS Staffing Standard). The work units reported by each FSS and CS/T which make up this measurement are aircraft contacted, flight plans originated, pilot briefs and flight condition messages. A flight plan may be filed orally or in writing to qualify for inclusion in the activity count shown here. Detail may not add to total due to independent rounding.

Table 18

AIRCRAFT CONTACTED  
FAA FLIGHT SERVICE STATIONS AND COMBINED STATION/TOWERS

(In millions)

Fiscal Year	Total	IFR-DVFR	VFR	Air Carrier	General Aviation	Military
1965	8.1	.9	7.2	.7	6.5	.9
1966	8.6	.9	7.7	.7	7.1	.8
1967	9.3	1.0	8.3	.7	7.9	.7
1968	9.5	1.1	8.4	.7	8.1	.7
1969	9.7	1.3	8.5	.8	8.3	.7
1970*	9.9	1.3	8.6	.8	8.5	.6
1971*	10.4	1.4	9.0	.8	9.0	.6
1972*	11.2	1.5	9.7	.8	9.9	.5
1973*	12.2	1.6	10.6	.8	11.0	.4
1974*	13.5	1.8	11.7	.8	12.3	.4
1975*	14.7	2.0	12.7	.8	13.5	.4
1976*	16.2	2.3	13.9	.9	15.0	.3
1980*	24.0	3.7	20.3	1.0	22.8	.2
1981*	26.6	4.2	22.4	1.0	25.4	.2

\*Forecast.

Note.— Aircraft contacted represent a record of the number of aircraft with which FAA facilities (FSS, CS/T) have established radio communications contact. One count is made for each en route, landing or departing aircraft contacted by a facility, regardless of the number of contacts made with an individual aircraft. A flight involving contacts with five different facilities, disregarding the number of contacts with each, would be counted as five aircraft contacted. The data forecast in this table are based upon the current number and configuration of the FSS and CS/T. Any change in their number or operation would have a corresponding change in the forecast. Detail may not add to total due to independent rounding.

Table 19

## ACTIVE PILOTS BY TYPE OF CERTIFICATE

As of January 1	Total	Students	Private <sup>1/</sup>	Commercial	Airline Transport	Helicopter	Glider	Instrument Rated <sup>2/</sup>
1965	431,041	120,743	178,013	108,428	21,572	1,058	1,227	84,442
1966	479,770	139,172	198,690	116,665	22,440	1,392	1,411	93,637
1967	548,757	165,177	224,703	131,539	23,917	1,819	1,602	107,171
1968	617,931	181,287	256,253	150,135	25,817	2,573	1,866	122,573
1969	691,695	209,406	283,865	164,458	28,607	3,166	2,193	139,346
1970*	721,300	204,000	302,000	177,000	31,400	4,300	2,600	155,900
1971*	729,900	197,000	310,000	183,000	31,800	5,000	3,100	157,000
1972*	775,600	209,000	330,000	194,000	33,600	5,400	3,600	167,000
1973*	828,500	223,000	354,000	207,000	34,700	5,700	4,100	182,000
1974*	895,400	242,000	383,000	224,000	35,600	6,200	4,600	199,000
1975*	973,900	264,000	417,000	244,000	37,000	6,800	5,100	220,000
1976*	1,058,800	289,000	454,000	265,000	37,900	7,300	5,600	242,000
1980*	1,440,500	390,000	628,000	361,000	44,800	8,600	8,100	346,000
1981*	1,540,500	415,000	676,000	385,000	46,800	8,900	8,800	376,000

\* Forecast.

<sup>1/</sup> Includes pilots previously classified as "other".<sup>2/</sup> Not included in total.