

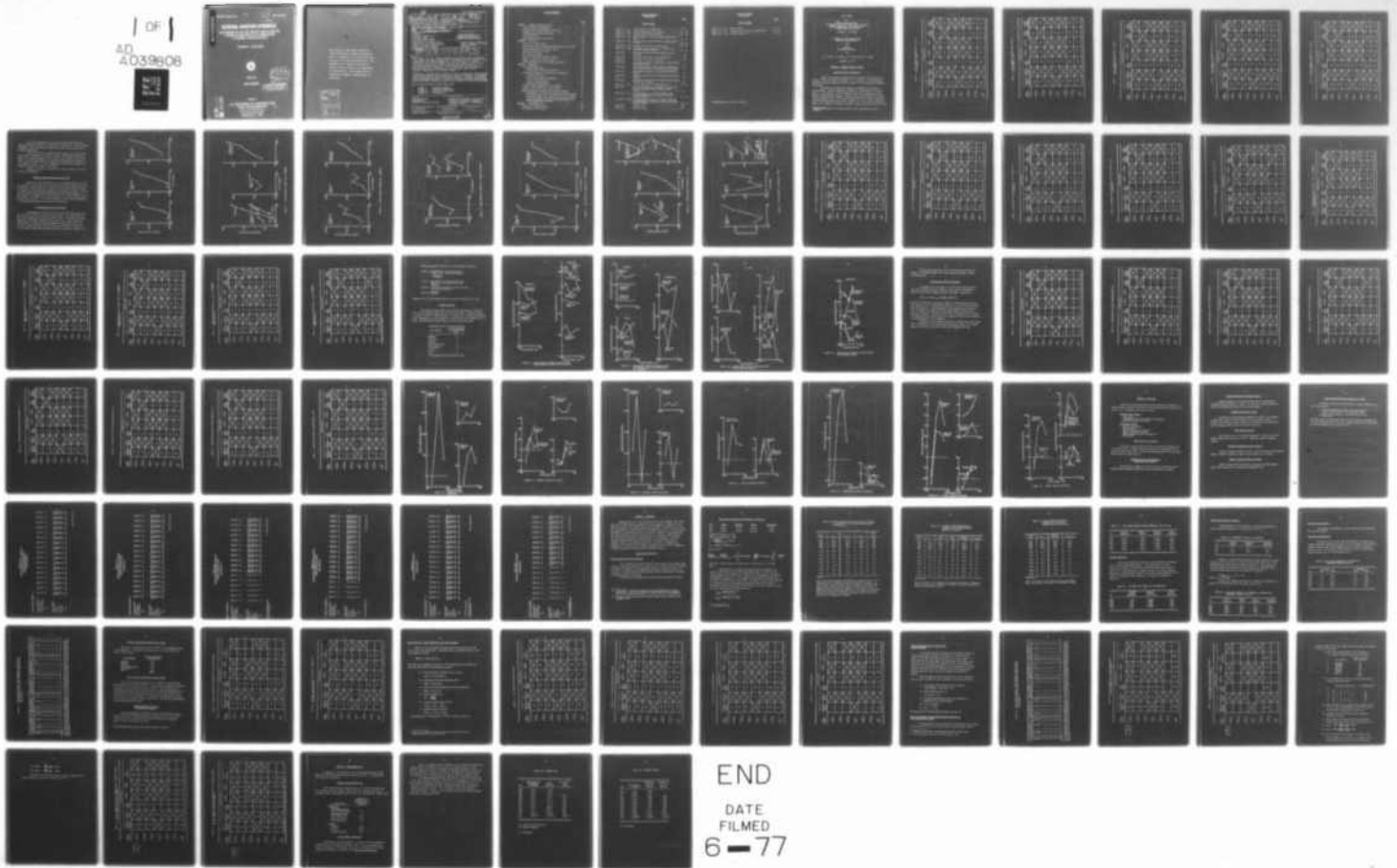
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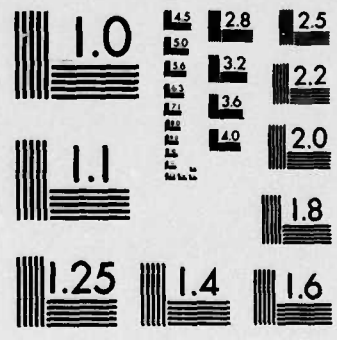
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GENERAL AVIATION DYNAMICS

AN EXTENSION OF THE COST IMPACT STUDY TO INCLUDE
DYNAMIC INTERACTIONS IN THE FORECASTING
OF GENERAL AVIATION ACTIVITY

VOLUME IV. DATA BASE



APRIL 1977

FINAL REPORT

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Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Office of Aviation Policy
Aviation Forecast Branch
Washington, D.C. 20591

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16. Abstract This report, in four volumes, presents the General Aviation Dynamics (GAD) model which was developed for the Federal Aviation Administration by Battelle's Columbus Laboratories. The GAD model is a dynamic simulation model of the general aviation (GA) system and can be used to forecast GA activity, evaluate alternative policy actions, or perform sensitivity analyses. It has three major sectors, depicting the most important state variables in the model; pilot supply, aircraft utilization, and aircraft demand. Essentially, the GAD model consists of a set of nonlinear, simultaneous, first order difference equations which explicitly describe the decision policies followed by users of general aviation. The model is designed to be implemented through an interactive computer dialogue feature that guides the analyst through a series of procedures and analytical options. The volumes included in this report are: Volume I - Executive Summary; Volume II - Research Methodology; Volume III - Planning Guide; and Volume IV - Data Base.		
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FINAL REPORT

on

GENERAL AVIATION DYNAMICS
AN EXTENSION OF THE COST IMPACT STUDY TO INCLUDE
DYNAMIC INTERACTIONS IN THE FORECASTING
OF GENERAL AVIATION ACTIVITY

VOLUME IV. DATA BASE

to

FEDERAL AVIATION ADMINISTRATION
OFFICE OF AVIATION POLICY

from

BATTELLE
Columbus Laboratories

by

M. A. Duffy, G. L. Eiden, C. W. Hamilton, and V. J. Drago

December 31, 1976

CHAPTER 1. GENERAL AVIATION ACTIVITY

Active Aircraft by Primary Use

Tables 4-1 through 4-5 present AA(I,J), the number of active aircraft of type J within the primary use Category I* as of January 1, 1971 through 1975. These data have been obtained from various issues of the "FAA Statistical Handbook of Aviation".

The FAA data are based upon information submitted by the owners on AC Form 8050-73, "Aircraft Registration Eligibility, Identification and Activity Report". As of January 1, 1971, the definition used for determining the active general aviation fleet was changed. Formerly, an active aircraft was one certificated as eligible to fly. Now an active aircraft must have a current registration and have been flown during the previous calendar year. This change in definition makes it very difficult to conduct a consistent analysis with pre and post 1971 data.

*Complete definitions of the aircraft types and user categories are given in Volume II.

TABLE 4-1. ACTIVE AIRCRAFT BY PRIMARY USE - AA(I,J)
AS OF JANUARY 1, 1971

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	20,522		6103			233	
2. Corporate	907		3973	1032	809		166
3. Personal	62,977		2153			232	
4. Aerial		4892	170			383	
5. Instruct.	10,186		446			91	
6. Air Taxi	1797		1903	287	56	298	230
7. Other	8215		1282	139	85	439	193

TABLE 4-2. ACTIVE AIRCRAFT BY PRIMARY USE - AA(I,J)
AS OF JANUARY 1, 1972

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	20,084		6124			244	
2. Corporate	910		3700	1121	863		211
3. Personal	64,696		2273			256	
4. Aerial		4742	150			367	
5. Instruct.	9635		528			139	
6. Air Taxi	1536		1709	239	53	246	274
7. Other	7497		1045	132	75	430	178

TABLE 4-3. ACTIVE AIRCRAFT BY PRIMARY USE - AA(I,J)
AS OF JANUARY 1, 1973

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	21,540		6632			288	
2. Corporate	1130		3864	1170	934		239
3. Personal	71,469		2781			290	
4. Aerial		5312	248			290	
5. Instruct.	10,461		563			165	
6. Air Taxi	1774		2052	241	77	213	329
7. Other	8678		1159	98	112	563	262

TABLE 4-4. ACTIVE AIRCRAFT BY PRIMARY USE - AA(I,J)
AS OF JANUARY 1, 1974

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	25,369		7335			317	
2. Corporate	1169		4256	1434	1133		267
3. Personal	70,312		2486			312	
4. Aerial		5538	318			415	
5. Instruct.	11,622		602			209	
6. Air Taxi	1990		2566	292	117	224	416
7. Other	10,167		1145	139	156	680	303

TABLE 4-5. ACTIVE AIRCRAFT BY PRIMARY USE - AA(I,J)
AS OF JANUARY 1, 1975

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	26,012		7733			393	
2. Corporate	1284		4253	1636	1279		335
3. Personal	73,878		2732			347	
4. Aerial		5712	260			465	
5. Instruct.	11,799		636			213	
6. Air Taxi	2134		2842	338	168	192	553
7. Other	11,045		1331	146	132	736	376

Only those subsegments of user category/aircraft type which had a significant amount of activity are identified. In particular, of the 49 possible subsegments (seven user categories times seven aircraft types) only 29 were considered significant.

All activity within the "business" user category (i.e., aircraft and hours flown) corresponding to turboprop, turbojet, and turbine helicopter was added to the respective column of the "corporate" user category. On the other hand, all activity associated with "corporate" piston helicopter was added to the "business" category. All other insignificant activities were added to the respective column of the "other" user category.

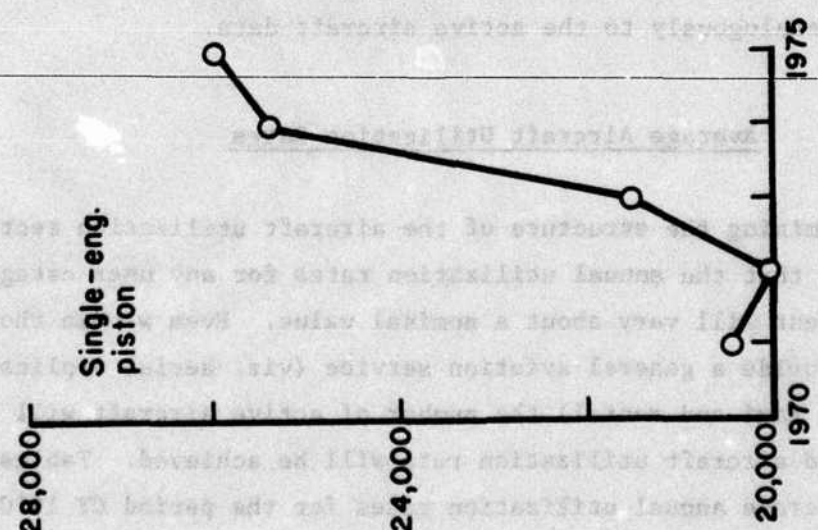
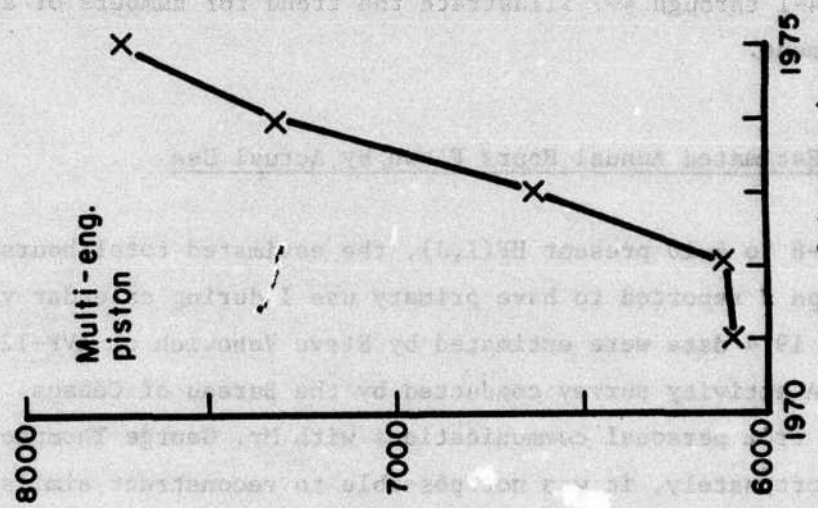
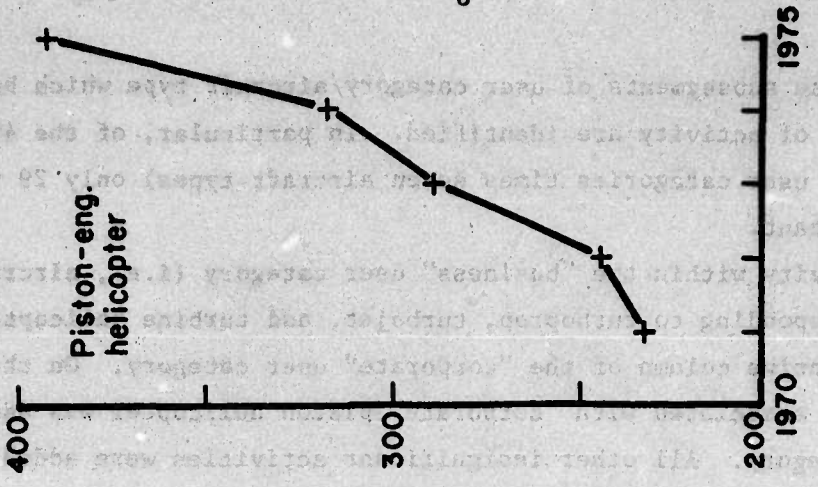
Figures 4-1 through 4-7 illustrate the trend for numbers of aircraft within each subsegment.

Estimated Annual Hours Flown by Actual Use

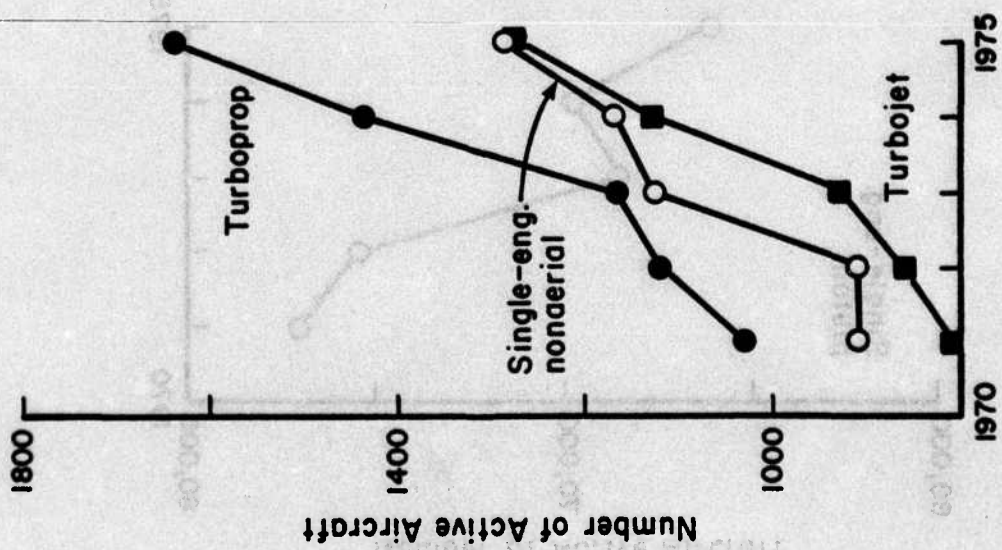
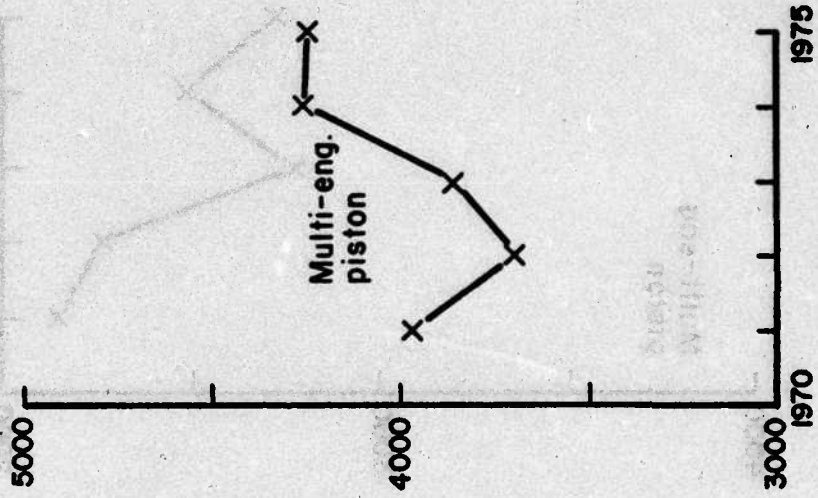
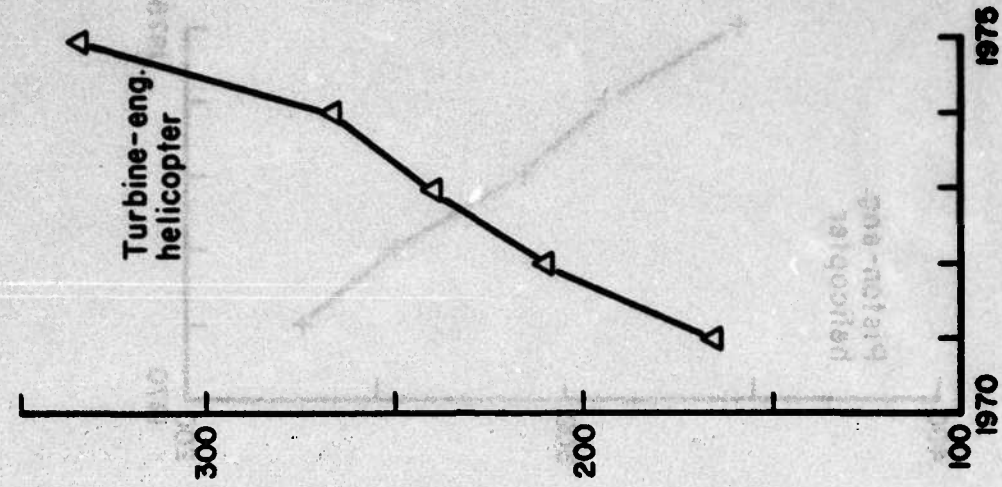
Tables 4-6 to 4-10 present HF(I,J), the estimated total hours flown by all aircraft of type J reported to have primary use I during calendar years 1970 through 1974. The 1974 data were estimated by Steve Vahovich of AVP-120 using the results of a GA activity survey conducted by the Bureau of Census. The other data were obtained from personal communications with Mr. George Thompson of the FAA, AMS-220. Unfortunately, it was not possible to reconstruct similar data for any years prior to 1970. All activity pertaining to the 20 deleted subsegments is re-distributed analogously to the active aircraft data.

Average Aircraft Utilization Rates

In determining the structure of the aircraft utilization sector, the main contention is that the annual utilization rates for any user category/aircraft type subsegment will vary about a nominal value. Even within those user categories that provide a general aviation service (viz. aerial application, instructional, air taxi and rental) the number of active aircraft will vary such that a desired aircraft utilization rate will be achieved. Tables 4-11 to 4-15 present average annual utilization rates for the period CY 1970 to 1974.



Number of Active Aircraft



As of January 1

FIGURE 4-2. ACTIVE AIRCRAFT, PRIMARY USE - CORPORATE

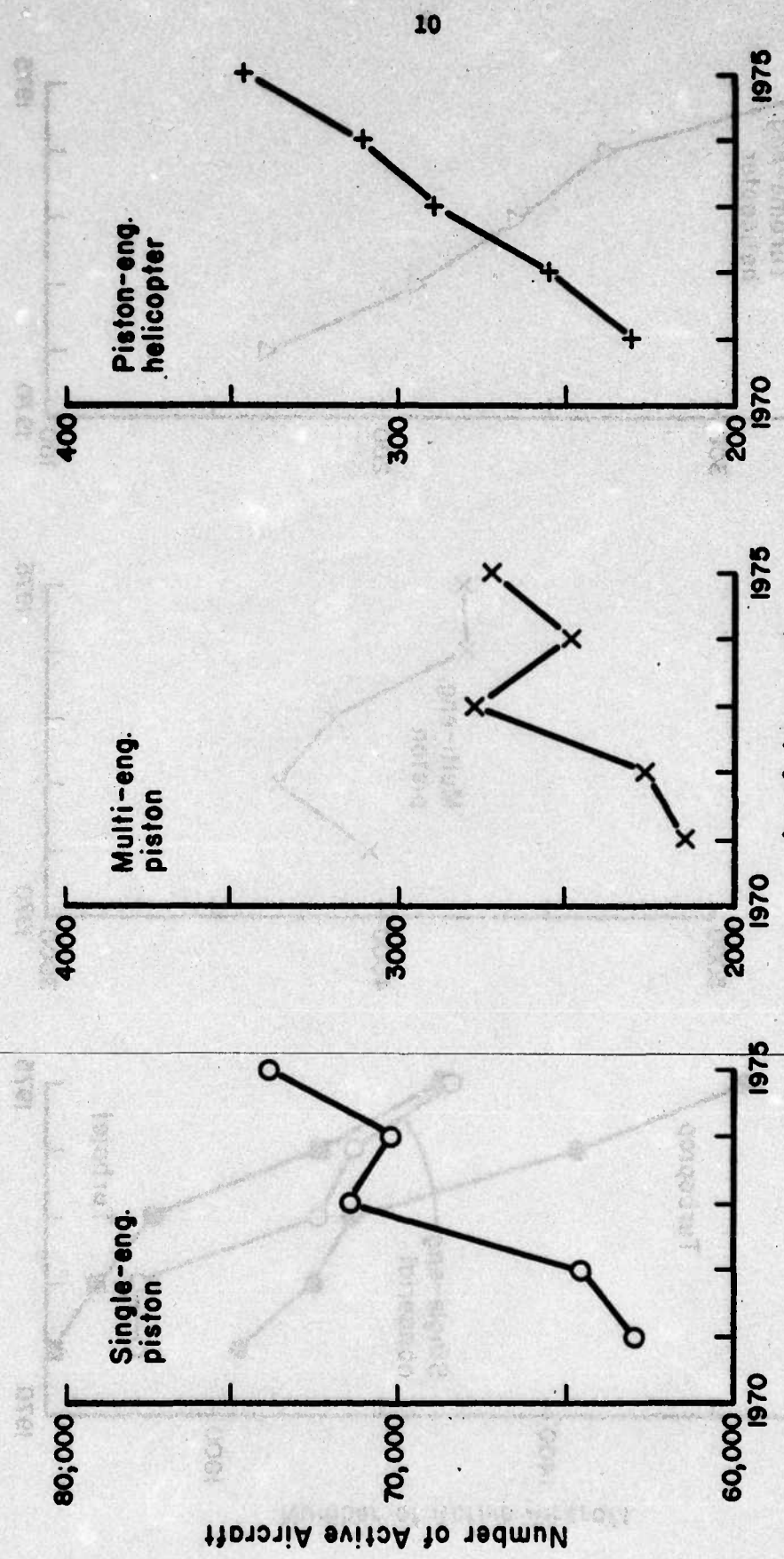


FIGURE 4-3. ACTIVE AIRCRAFT, PRIMARY USE - PERSONAL

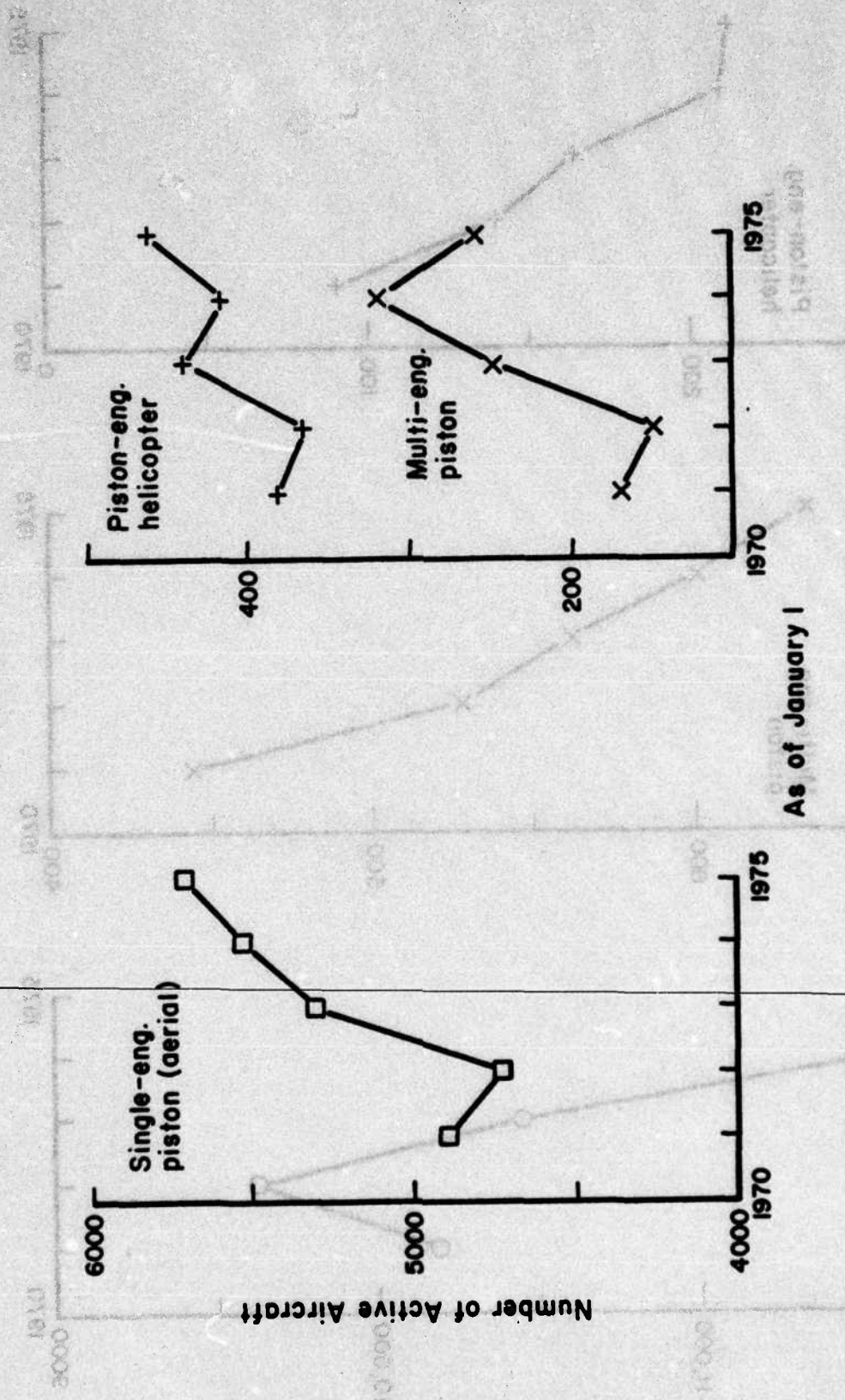


FIGURE 4-4. ACTIVE AIRCRAFT, PRIMARY USE - AERIAL APPLICATION

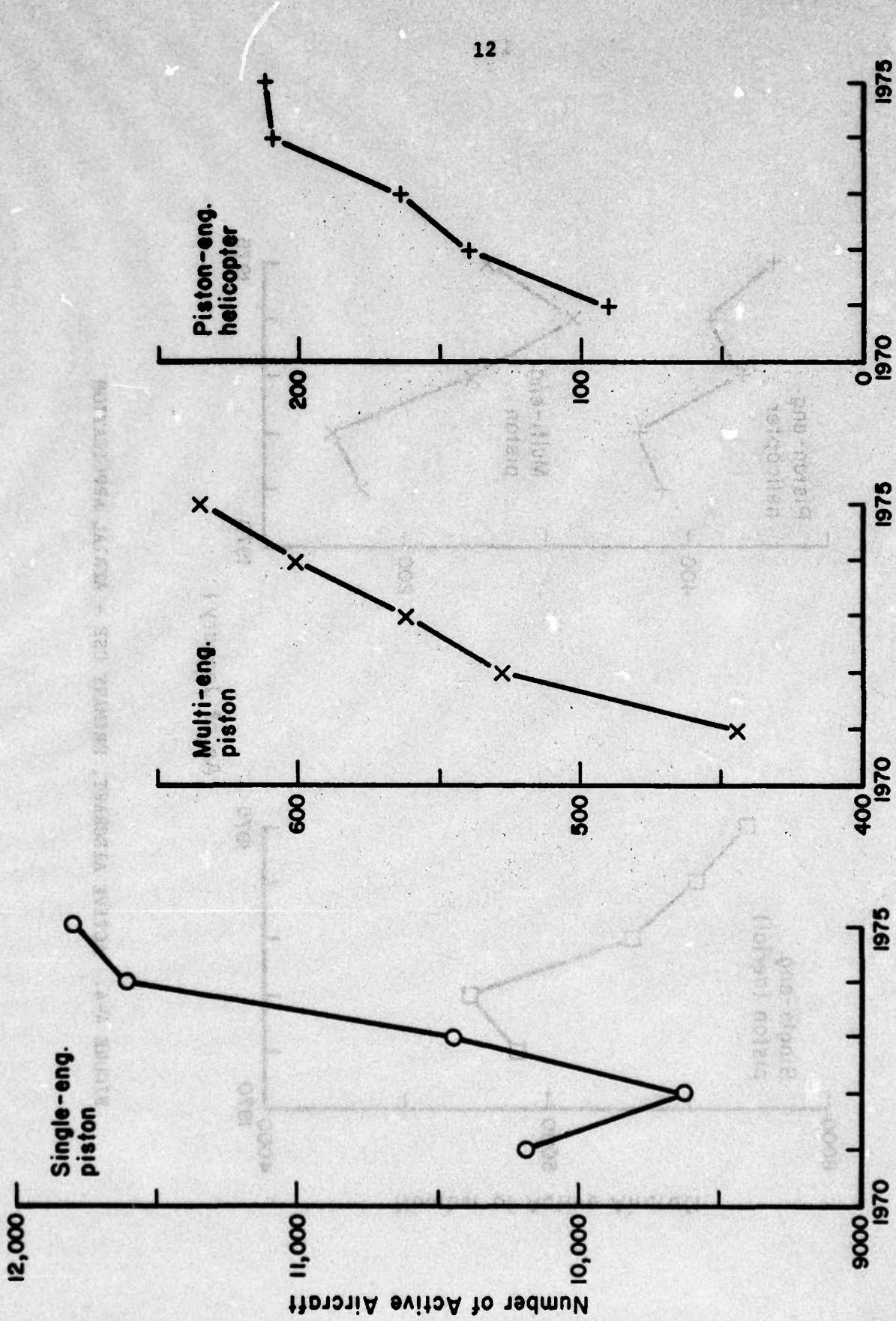


FIGURE 4-5. ACTIVE AIRCRAFT, PRIMARY USE - INSTRUCTIONAL

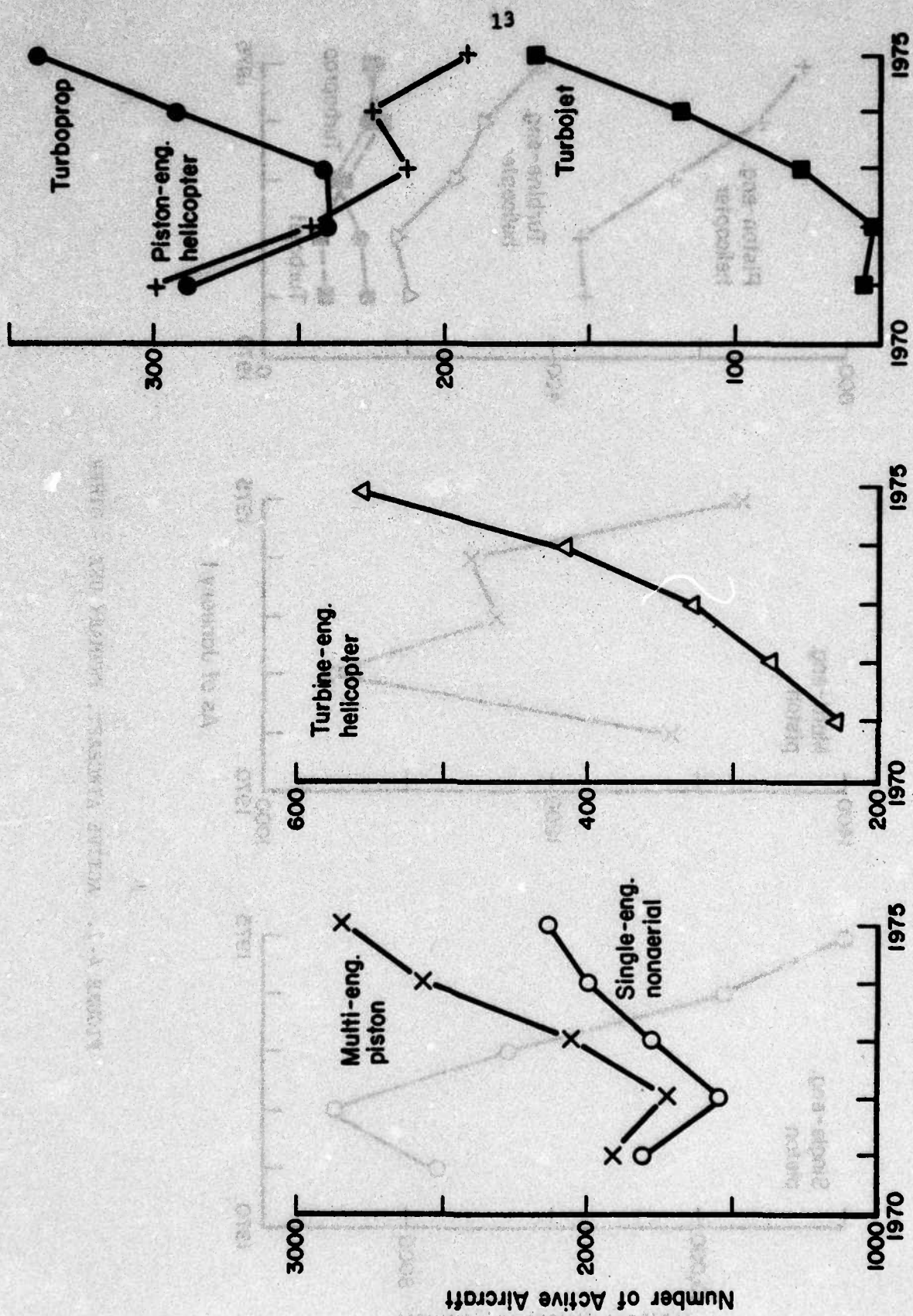


FIGURE 4-6. ACTIVE AIRCRAFT, PRIMARY USE - AIR TAXI

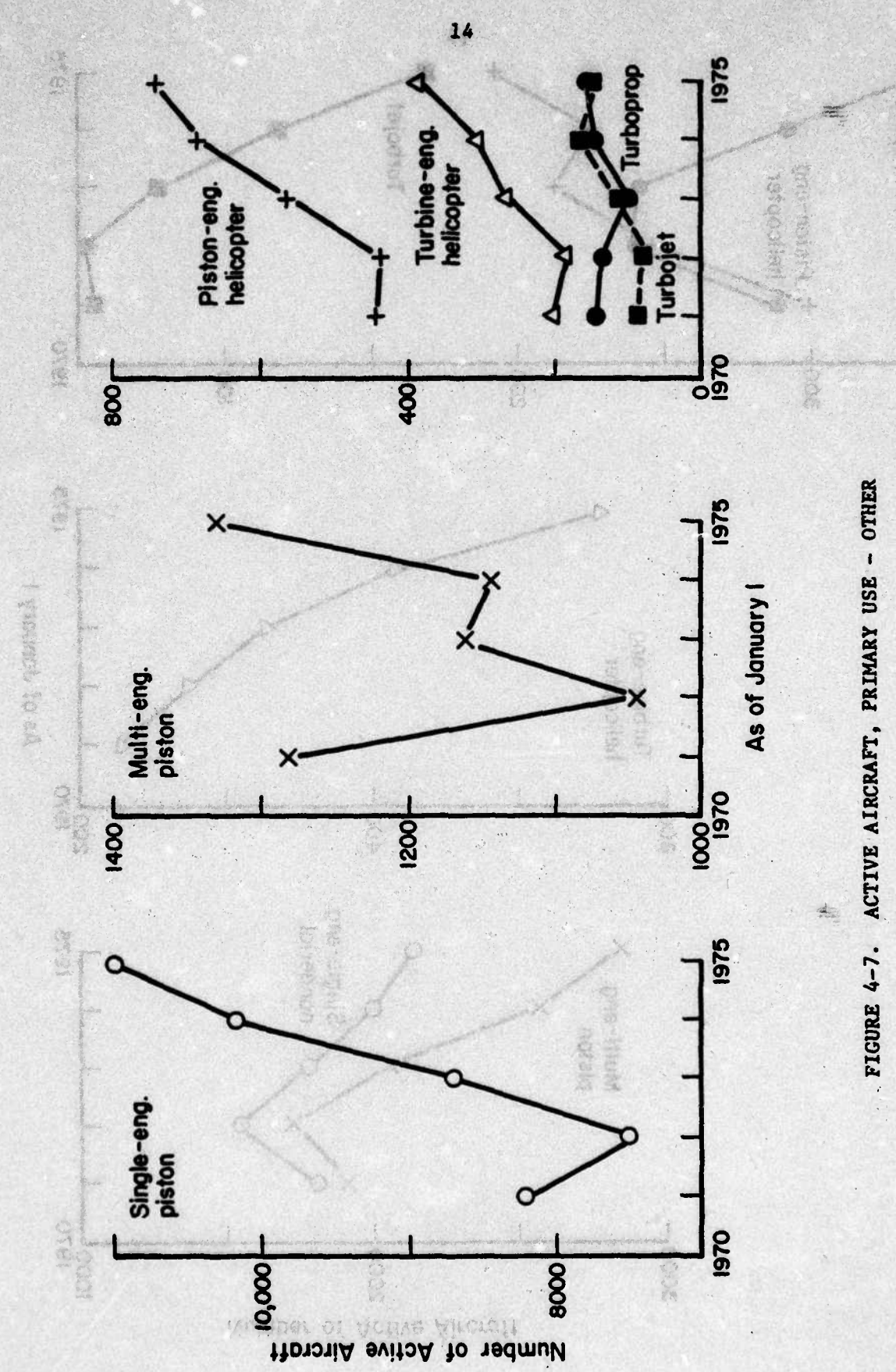


FIGURE 4-7. ACTIVE AIRCRAFT, PRIMARY USE - OTHER

TABLE 4.6. ESTIMATED HOURS FLOWN BY ACTUAL USE - HF(1,J) DURING CY 1970
(thousands)

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	3175		1267			66	
2. Corporate	206		1459	513	422		70
3. Personal	6574		282			9	
4. Aerial		1249	30			113	
5. Instruct.	4559		105			25	
6. Air Taxi	686		889	417	25	150	158
7. Other	2746		357	41	26	186	83

SOURCE: U.S. DEPARTMENT OF COMMERCE, BUREAU OF ECONOMIC ANALYSIS, AIRCRAFT REGISTERED IN THE UNITED STATES, 1970

TABLE 4-7. ESTIMATED HOURS FLOWN BY ACTUAL USE - HF(I,J) DURING CY 1971
(thousands)

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	3129		1231			67	
2. Corporate	225		1350	587	434		94
3. Personal	6840		340			7	
4. Aerial		1273	30			100	
5. Instruct.	4287		139			35	
6. Air Taxi	643		745	327	26	127	192
7. Other	2524		274	58	22	186	77

TABLE 4-8. ESTIMATED HOURS FLOWN BY ACTUAL USE - HF(I,J) DURING CY 1972
(thousands)

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	3115		1293			64	
2. Corporate	231		1369	568	454		95
3. Personal	7180		376			9	
4. Aerial		1434	40			140	
5. Instruct.	4385		144			51	
6. Air Taxi	672		941	347	49	99	240
7. Other	2855		257	39	24	234	105

TABLE 4-9. ESTIMATED HOURS FLOWN BY ACTUAL USE - HF(I,J) DURING CY 1973
(thousands)

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	3806		1481			67	
2. Corporate	260		1521	683	589		111
3. Personal	7144		349			8	
4. Aerial		1653	54			130	
5. Instruct.	4992		174			62	
6. Air Taxi	849		1173	377	81	91	264
7. Other	3164		262	65	34	276	140

TABLE 4-10. ESTIMATED HOURS FLOWN BY ACTUAL USE - HF(I,J) DURING CY 1974
(thousands)

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	4160		1640			69	
2. Corporate	294		1480	677	590		142
3. Personal	7830		404			10	
4. Aerial		1820	23			97	
5. Instruct.	5180		161			92	
6. Air Taxi	775		1720	460	74		470
7. Other	3420		340	98	139	356	

TABLE 4-11. AVERAGE ANNUAL UTILIZATION RATES - AUR(I,J), $\frac{\text{Hr/Aircraft}}{\text{Yr}}$
CALENDAR YEAR 1970

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	155		208			295	
2. Corporate	227		367	497	522		425
3. Personal	104		131			37	
4. Aerial		255	178			295	
5. Instruct.	448		235			270	
6. Air Taxi	382		467	1453	454	503	687
7. Other	334		278	283	304	424	447

Source: Bureau of Transportation Statistics, Bureau of Economic Analysis, Department of Commerce, Washington, D.C.

TABLE 4-12. AVERAGE ANNUAL UTILIZATION RATES - AUR(I,J), $\frac{Hr/Aircraft}{Yr}$
CALENDAR YEAR 1971

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonairial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	156		201			276	
2. Corporate	247		365	523	503		445
3. Personal	106		150			26	
4. Aerial		268	203			272	
5. Instruct.	445		263			251	
6. Air Taxi	419		436	1368	481	516	701
7. Other	337		262	332	295	433	439

TABLE 4-13. AVERAGE ANNUAL UTILIZATION RATES - AUR(I,J), $\frac{\text{Hr/Aircraft}}{\text{Yr}}$
CALENDAR YEAR 1972

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi- Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	145		195			223	
2. Corporate	204		354	486	486		397
3. Personal	100		135			29	
4. Aerial		270	160			319	
5. Instruct.	419		160			307	
6. Air Taxi	379		459	1440	636	464	729
7. Other	329		222	401	218	415	410

TABLE 4-14. AVERAGE ANNUAL UTILIZATION RATES - AUR(I,J), $\frac{\text{Hr/Aircraft}}{\text{Yr}}$
CALENDAR YEAR 1973

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	150		202			210	
2. Corporate	222		357	477	520		417
3. Personal	102		140			25	
4. Aerial		298	169			313	
5. Instruct.	430		289			299	
6. Air Taxi	427		457	1291	689	408	635
7. Other	311		229	473	217	406	462

TABLE 4-15. AVERAGE ANNUAL UTILIZATION RATES - AUR(I,J), $\frac{Hr/Aircraft}{Yr}$
CALENDAR YEAR 1974

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	160		212			176*	
2. Corporate	229		348	414	462		425*
3. Personal	106		148			28	
4. Aerial		319	90*			208	
5. Instruct.	439		254			433	
6. Air Taxi	363		605	1365*	438	*	631
7. Other	311		256	670	1056*	320	*

*Based on a small sample response

The average annual utilization rate is determined according to

AUR(I,J) = Average annual utilization rate for aircraft type J within user Category I

$$\frac{\text{HR/Aircraft}}{\text{Yr}}$$

AA(I,J) = Total number of active aircraft type J reported to have primary use in user Category I

HF(I,J) = Total actual hours flown by aircraft type J within user Category I

$$\text{AUR(I,J)} = \frac{\text{HF (I,J)}}{\text{AA (I,J)}}$$

Figures 4-8 to 4-11 more vividly display the trends in these data over time.

Aircraft Destroyed

No real data could be found which identified the number of active aircraft actually destroyed during the time period of interest. However, from data presented in "Safety in General Aviation", it appears that the aircraft destruction rate is dependent only on the primary use of the aircraft and the number of hours flown. The following destruction rates were derived from this report:

User Category	Aircraft Destroyed per 100,000 Flight Hours
Business	3
Corporate	3
Personal	7
Aerial Application	6
Instructional	3
Air Taxi	2
Other	7

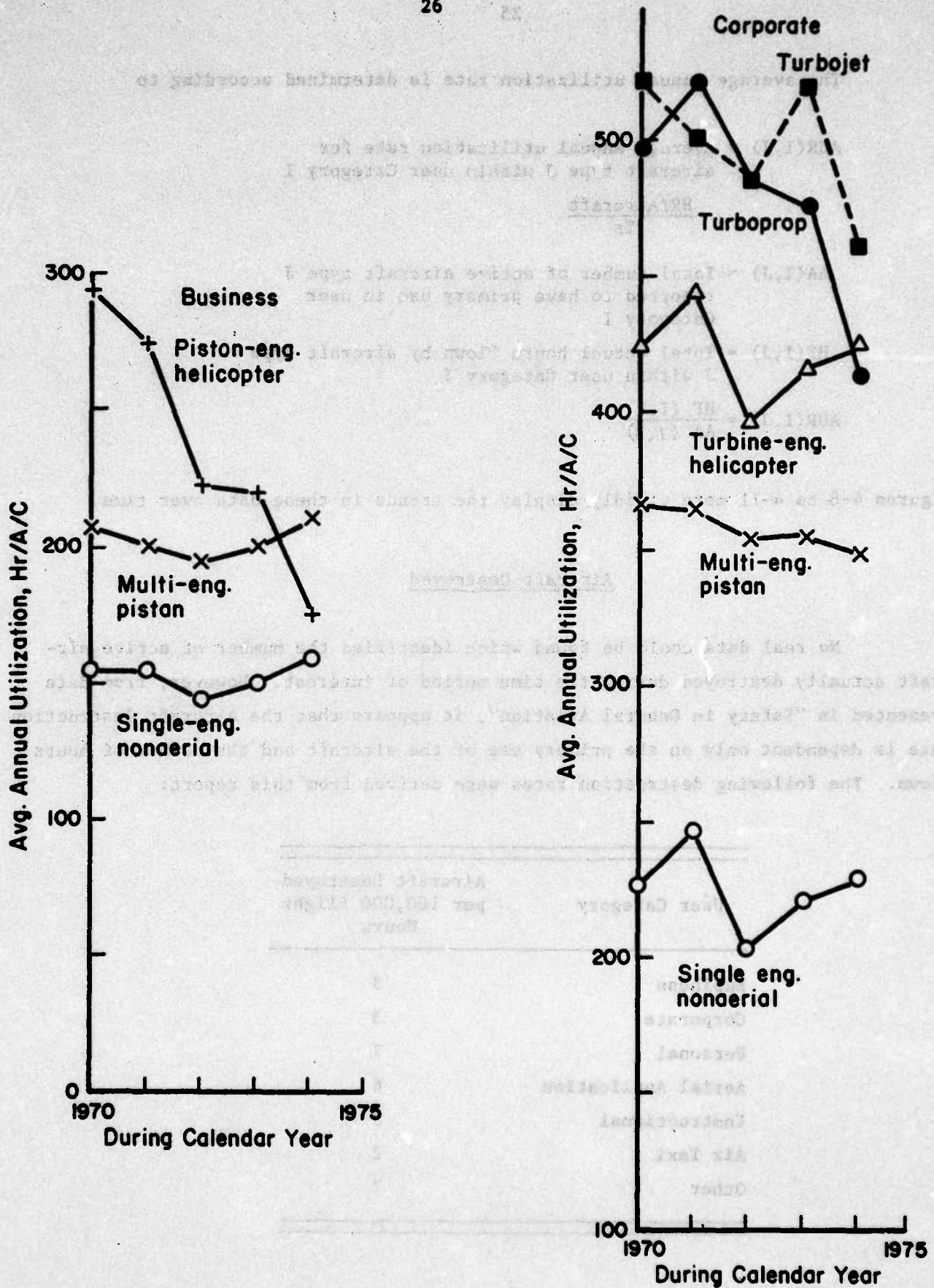


FIGURE 4-8. AVERAGE ANNUAL AIRCRAFT UTILIZATION RATES FOR BUSINESS AND CORPORATE USER CATEGORIES

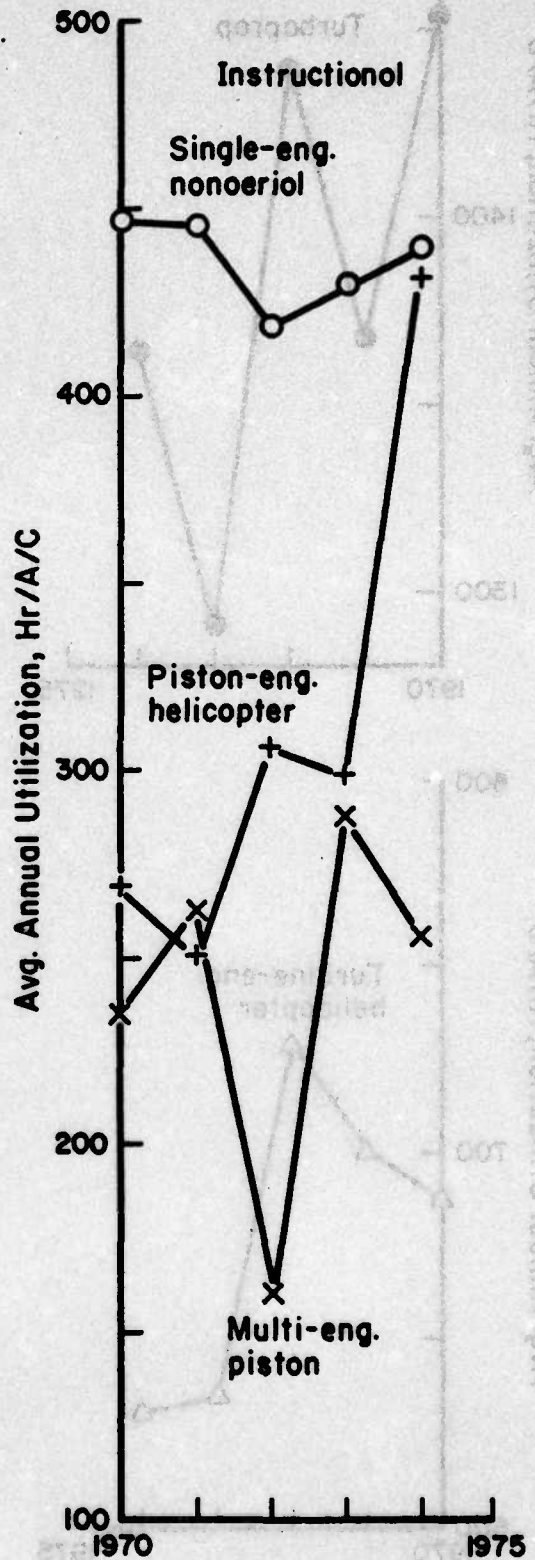
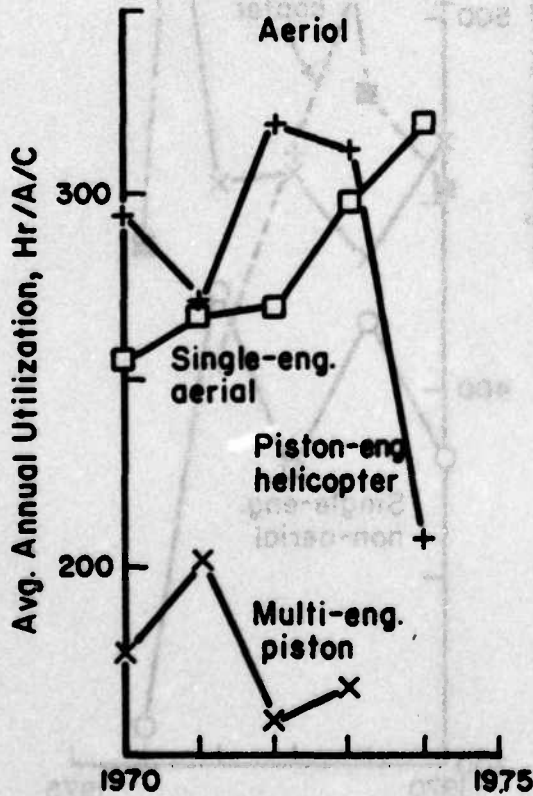
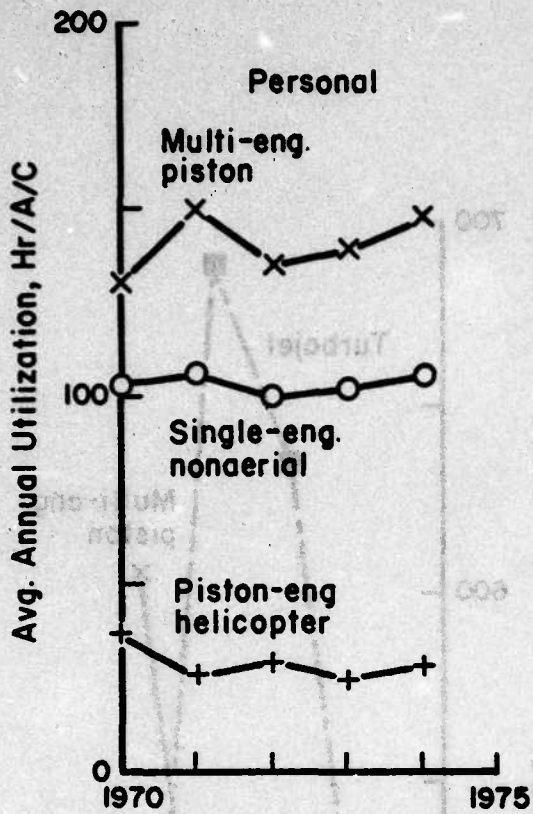
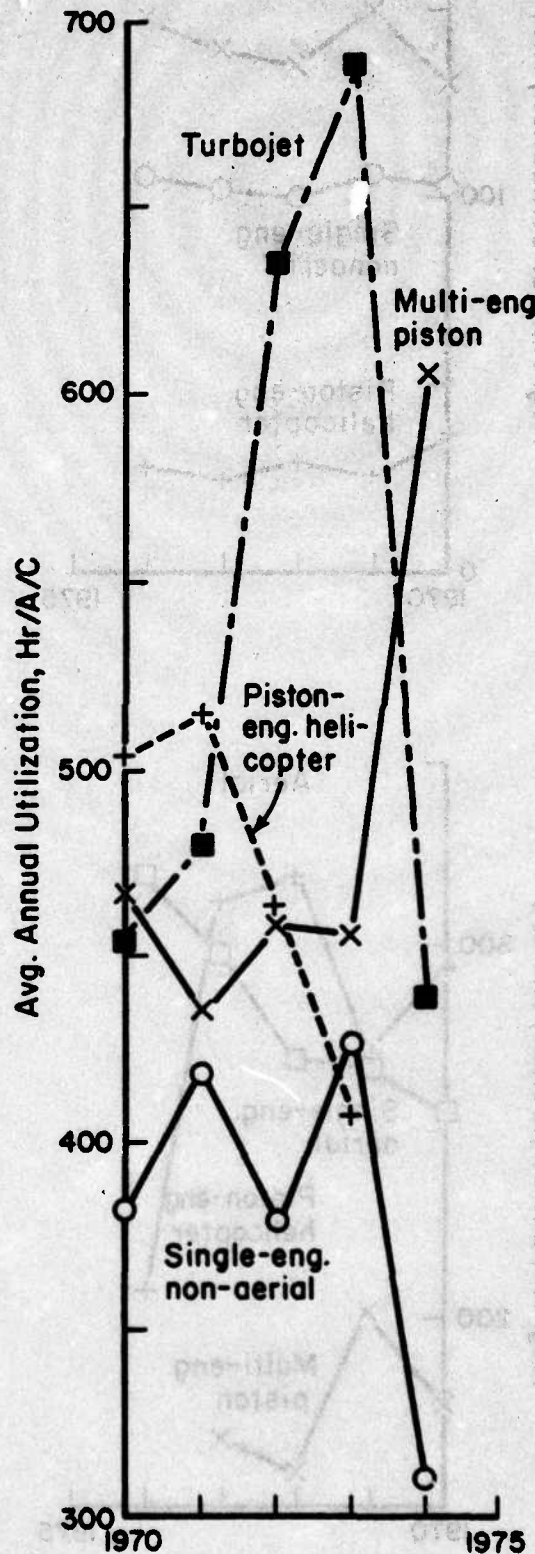
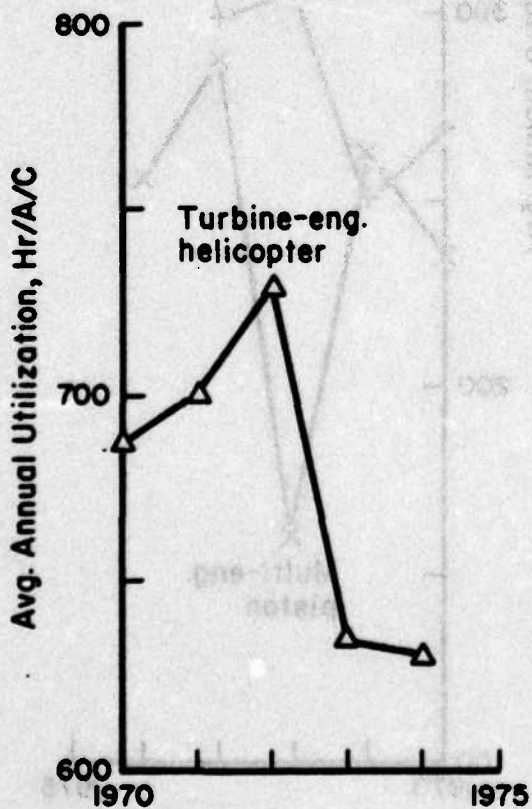
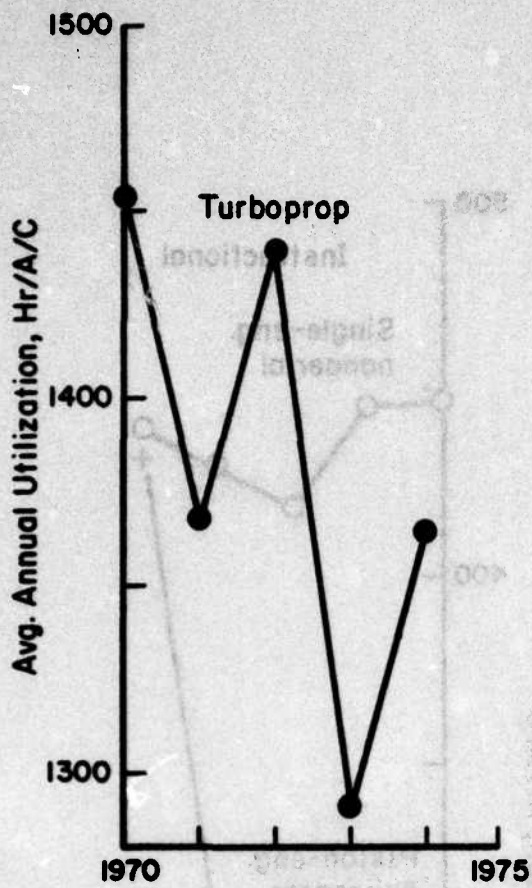


FIGURE 4-9. AVERAGE ANNUAL AIRCRAFT UTILIZATION RATES FOR PERSONAL, AERIAL, AND INSTRUCTIONAL USER CATEGORIES

Air Taxi



During Calendar Year

FIGURE 4-10. AVERAGE ANNUAL AIRCRAFT UTILIZATION RATES FOR AIR TAXI USER CATEGORY

Applying these destruction rates to the annual hours flown data results in the derived number of aircraft destroyed presented in Table 4-11 through 4-13.

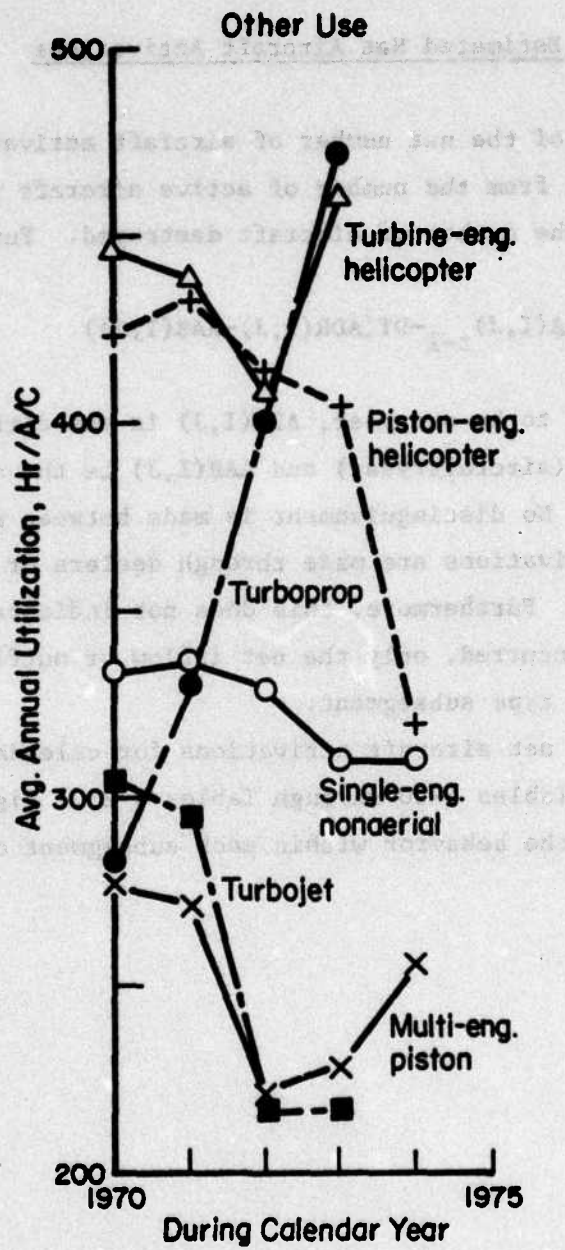


FIGURE 4-11. AVERAGE ANNUAL AIRCRAFT UTILIZATION RATES FOR OTHER USER CATEGORY

Applying these destruction rates to the annual hours flown data, results in the derived numbers of aircraft destroyed presented in Tables 4-16 through 4-19.

Estimated Net Aircraft Activations

An estimate of the net number of aircraft activations during the year can be determined from the number of active aircraft outstanding in successive years and the number of aircraft destroyed. Functionally,

$$AA(I,J)_t = AA(I,J)_{t-1} - DT(ADR(I,J) - AAR(I,J))$$

where DT is understood to be one year, ADR(I,J) is the aircraft destruction rate during that year (aircraft/year) and AAR(I,J) is the aircraft activation rate (aircraft/year). No distinguishment is made between new and used aircraft, nor whether activations are made through dealers or directly from other user categories. Furthermore, this does not indicate the actual number of transactions that occurred, only the net inflow or outflow from a particular user category/aircraft type subsegment.

Estimates of net aircraft activations for calendar years 1971 through 1974 are presented in Tables 4-20 through Tables 4-23. Figures 4-12 through Figures 4-18 indicate the behavior within each subsegment over time.

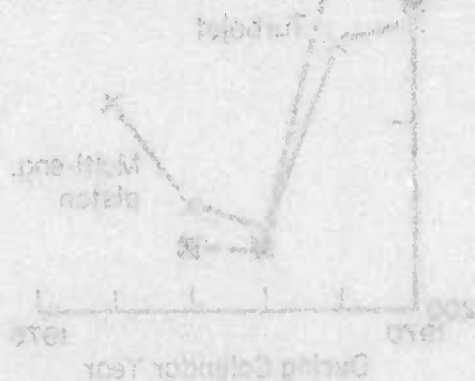


FIGURE 4-12. AIRCRAFT ACTIVATIONS BY USER CATEGORY AND AIRCRAFT TYPE, 1971-1974

TABLE 4-16. DERIVED NUMBER OF AIRCRAFT DESTROYED DURING 1971

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	94		37			2	
2. Corporate	7		41	18	13		3
3. Personal	479		24			0	
4. Aerial		76	2			6	
5. Instruct.	129		4			1	
6. Air Taxi	13		15	7	0	3	4
7. Other	177		19	3	1	13	5

TABLE 4-17. DERIVED NUMBER OF AIRCRAFT DESTROYED DURING 1972

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	93		39			2	
2. Corporate	7		41	17	14		3
3. Personal	503		26			1	
4. Aerial		86	2			8	
5. Instruct.	132		4			1	
6. Air Taxi	13		19	7	1	2	5
7. Other	200		18	3	2	16	7

UNCLASSIFIED SOURCE OF SECURITY INFORMATION DERIVED FROM

TABLE 4-18. DERIVED NUMBER OF AIRCRAFT DESTROYED DURING 1973

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	114		44			2	
2. Corporate	8		46	20	18		3
3. Personal	500		24			1	
4. Aerial		99	3			8	
5. Instruct.	150		5			2	
6. Air Taxi	17		23	7	2	2	5
7. Other	221		18	4	2	19	8

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TABLE 4-19. DERIVED NUMBER OF AIRCRAFT DESTROYED DURING 1974

Aircraft Type J

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	125		49			2	
2. Corporate	9		44	20	18		4
3. Personal	548		28			1	
4. Aerial		109	1			6	
5. Instruct.	155		5			3	
6. Air Taxi	15		34	9	1		9
7. Other	239		24	7	10	25	

TABLE 4-19 DERIVED NUMBER OF AIRCRAFT DESTROYED DURING 1974

TABLE 4-20. ESTIMATED NET AIRCRAFT ACTIVATIONS DURING CY 1971

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	-344		58			13	
2. Corporate	10		-232	107	67		48
3. Personal	2198		144			24	
4. Aerial		-74	-18			-10	
5. Instruct.	-422		86			49	
6. Air Taxi	-248		-179	-41	-3	-49	48
7. Other	-541		-218	22	-9	4	-10

TABLE 4-21. ESTIMATED NET AIRCRAFT ACTIVATIONS DURING CY 1972

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	1549		547			46	
2. Corporate	227		205	66	85		31
3. Personal	7276		534			35	
4. Aerial		656	100			79	
5. Instruct.	958		39			27	
6. Air Taxi	251		362	9	25	-31	60
7. Other	1381		132	-31	39	149	91

TABLE 4-22. ESTIMATED NET AIRCRAFT ACTIVATIONS DURING CY 1973

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	3943		747			31	
2. Corporate	47		438	284	217		31
3. Personal	-657		-271			23	
4. Aerial		325	73			-15	
5. Instruct.	1311		44			46	
6. Air Taxi	233		537	58	42	13	92
7. Other	1710		4	45	46	136	49

SOURCE: FAA, ESTIMATED NET AIRCRAFT ACTIVATIONS DURING CY 1973

TABLE 4-23. ESTIMATED NET AIRCRAFT ACTIVATIONS DURING CY 1974

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonserial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6. Piston Engine Helicopter	7. Turbine Engine Helicopter
1. Business	768		447			78	
2. Corporate	124		41	222	164		72
3. Personal	4114		274			36	
4. Aerial		283	-57			56	
5. Instruct.	332		39			7	
6. Air Taxi	159		310	55	52	-32	146
7. Other	1117		210	14	-14	81	73

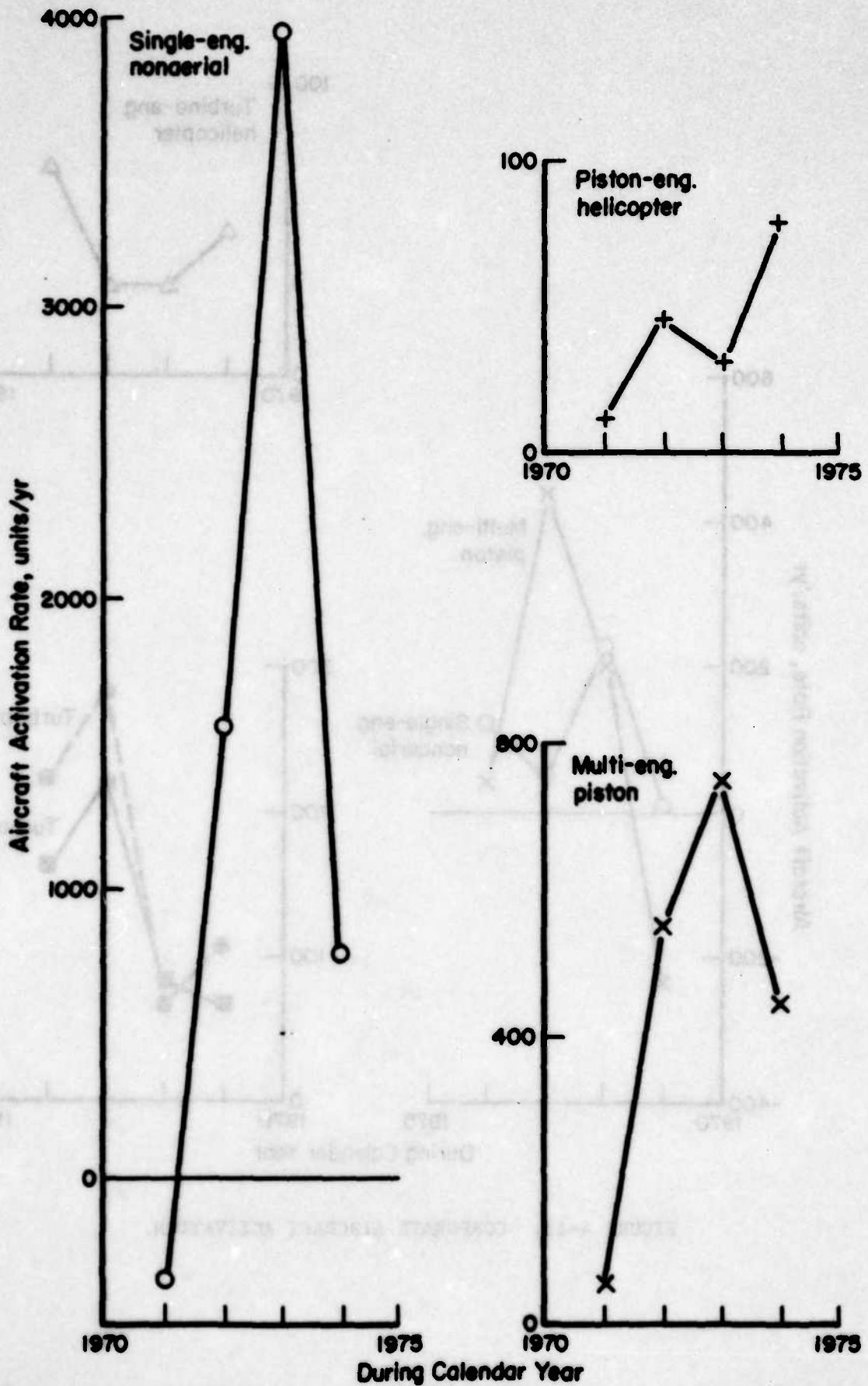


FIGURE 4-12. BUSINESS AIRCRAFT ACTIVATION

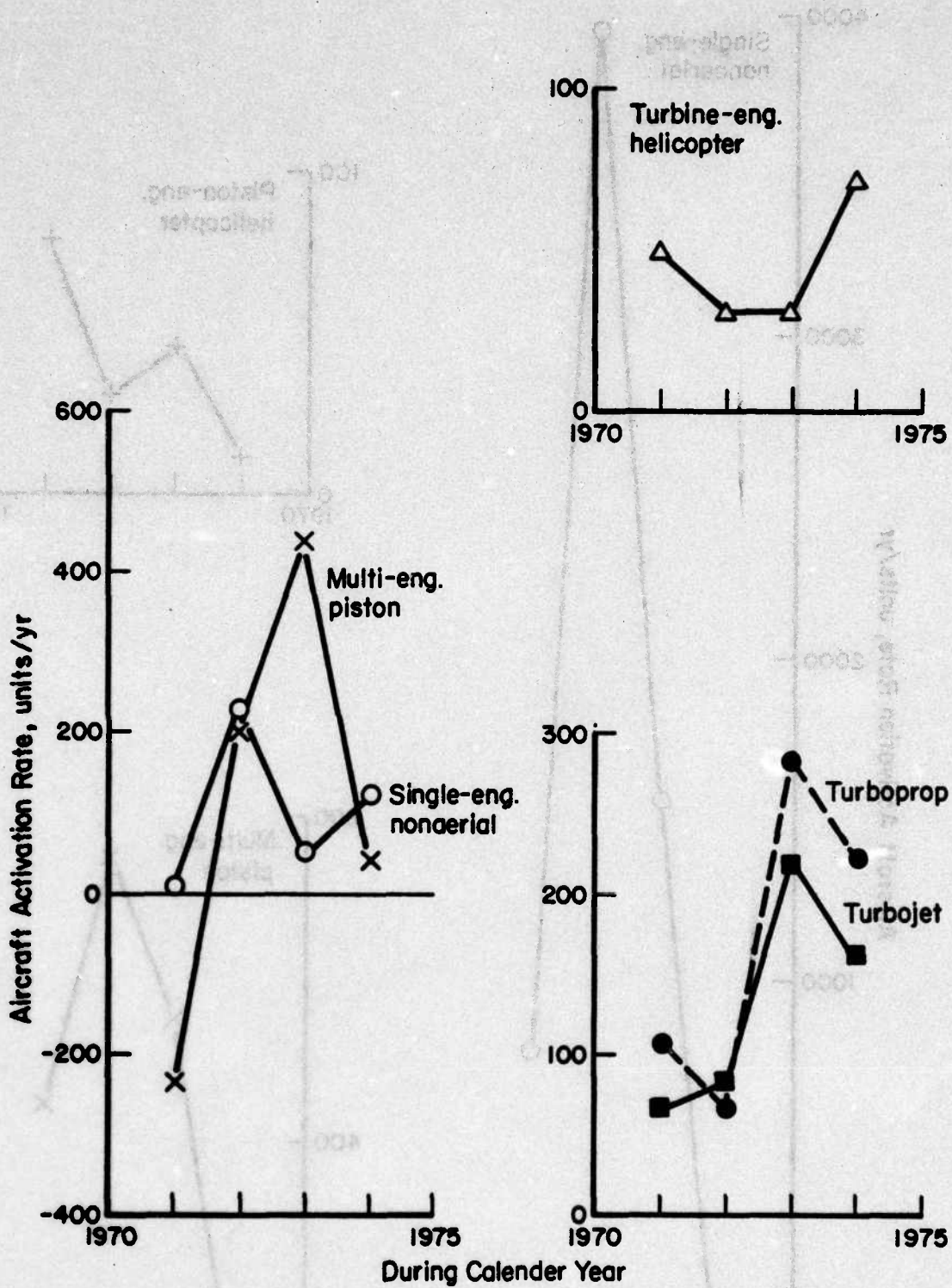


FIGURE 4-13. CORPORATE AIRCRAFT ACTIVATION.

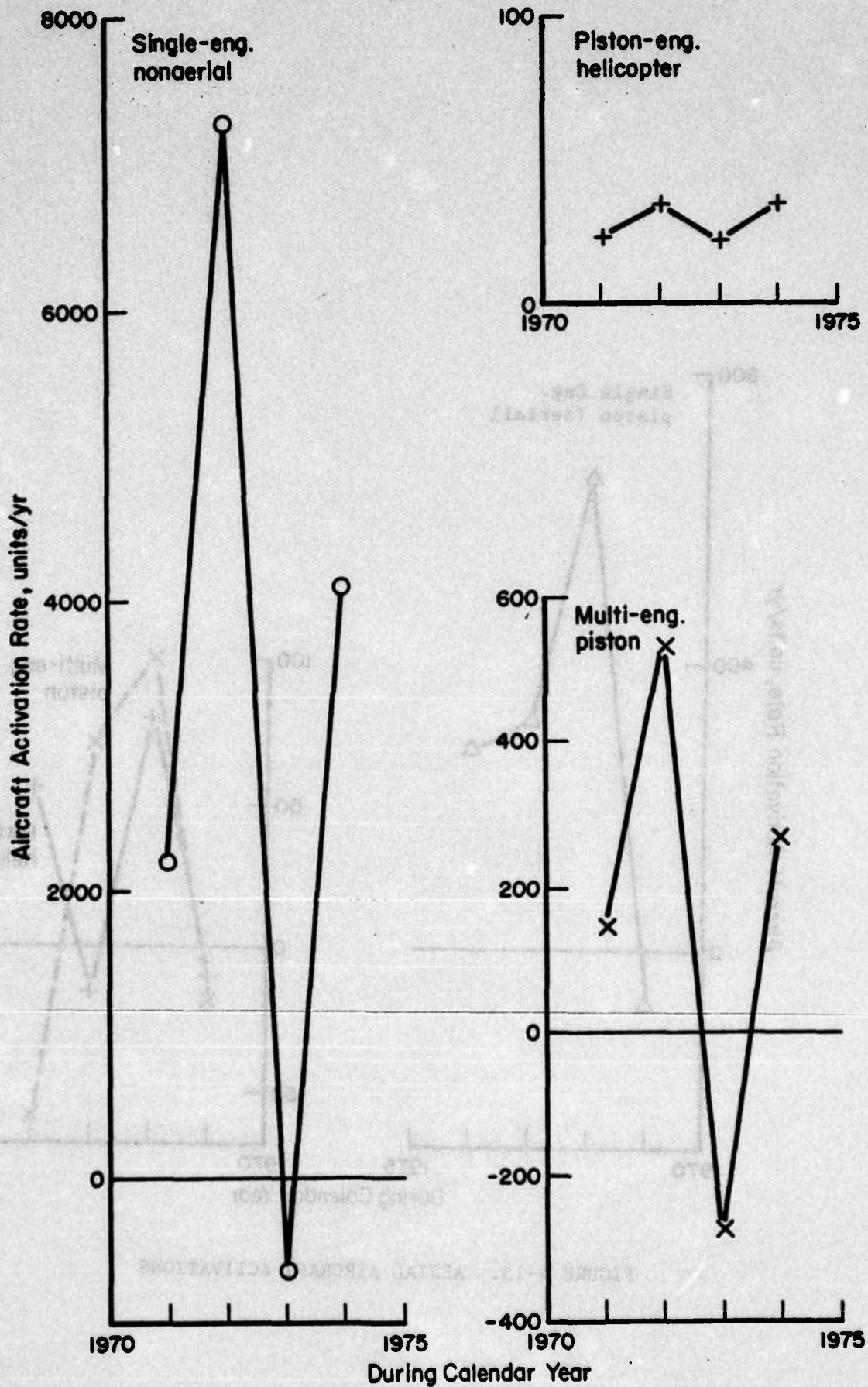


FIGURE 4-14. PERSONAL AIRCRAFT ACTIVATIONS

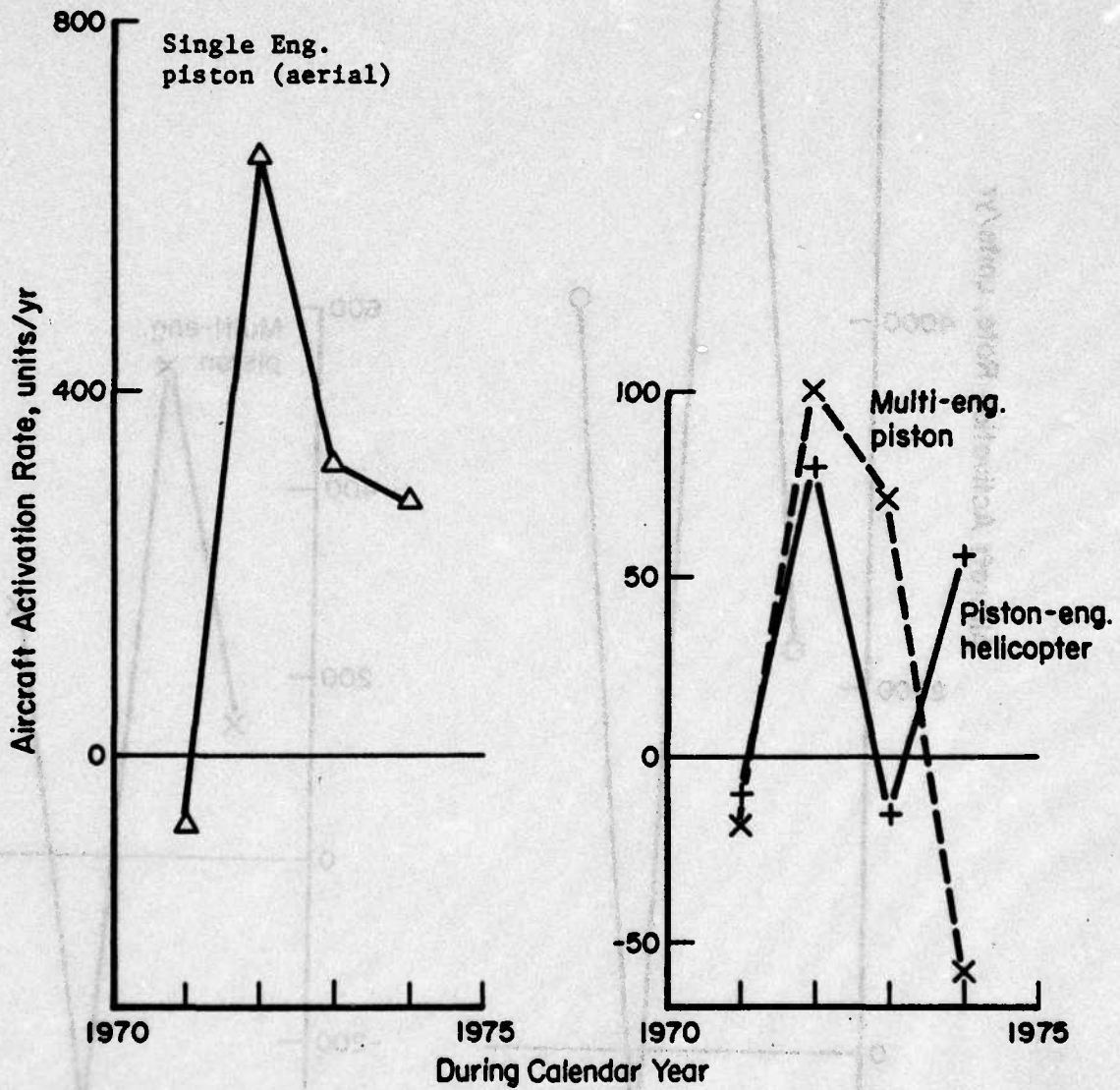


FIGURE 4-15. AERIAL AIRCRAFT ACTIVATIONS

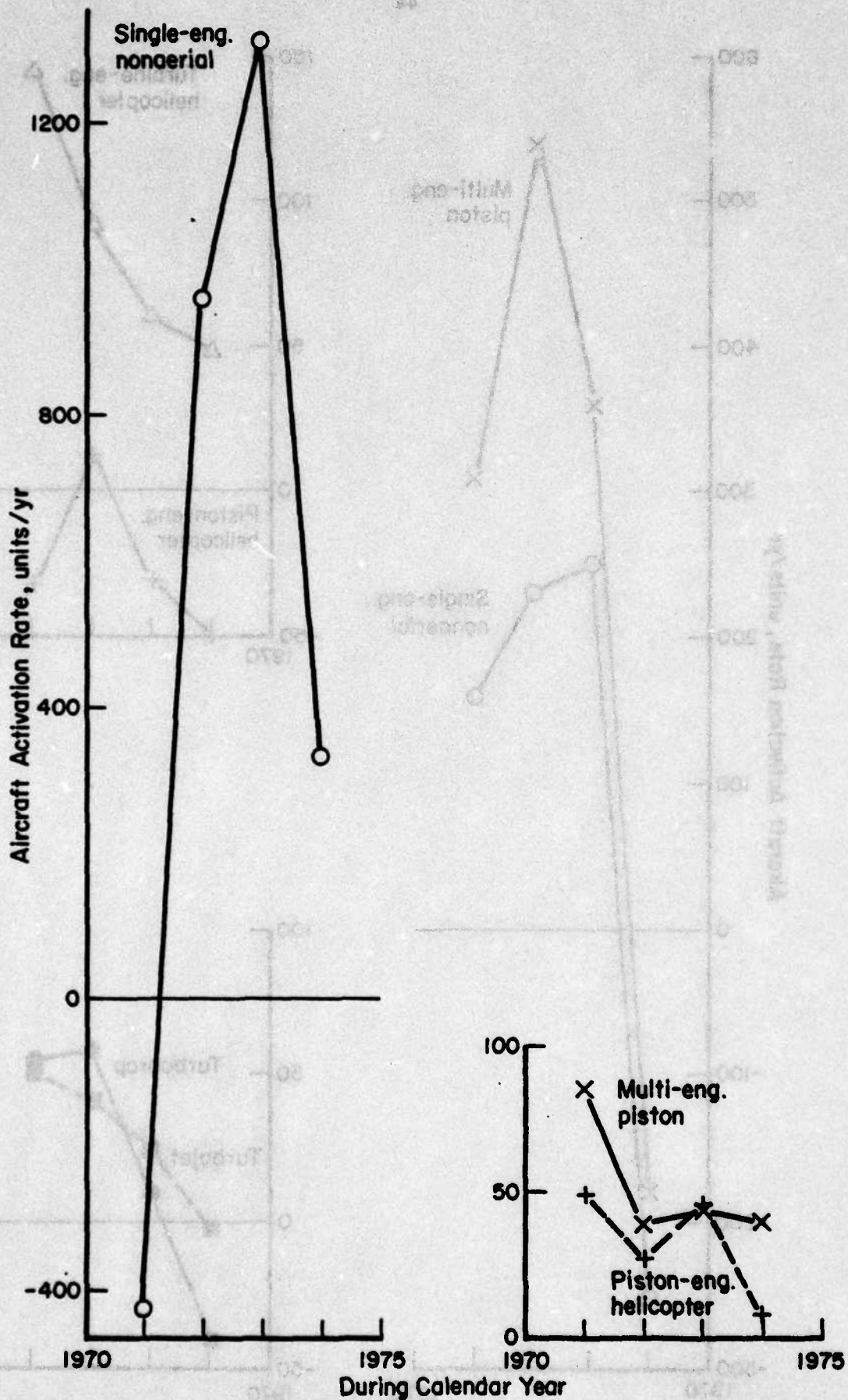


FIGURE 4-16. INSTRUCTIONAL AIRCRAFT ACTIVATIONS

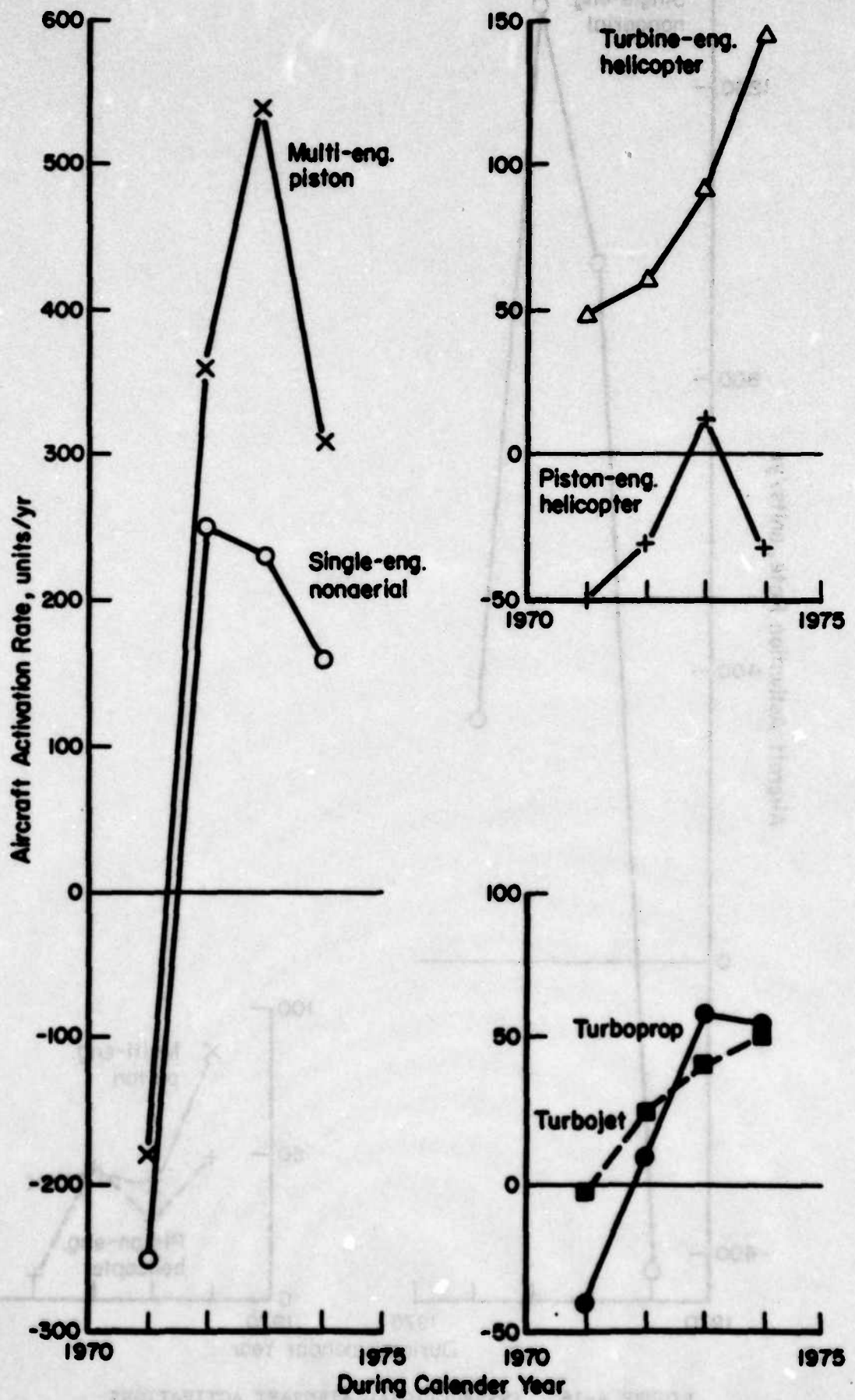


FIGURE 4-17. AIR TAXI AIRCRAFT ACTIVATIONS

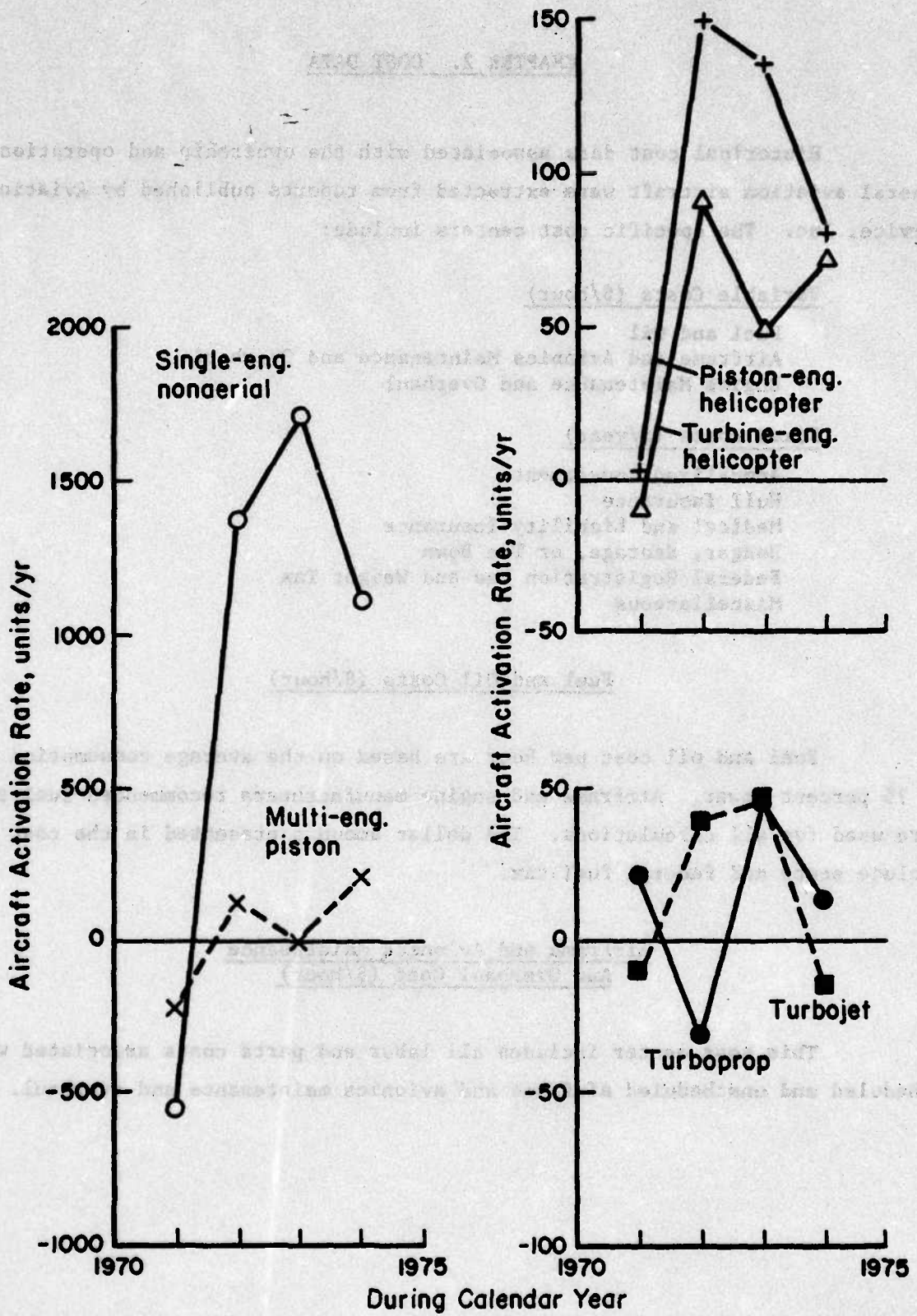


FIGURE 4-18. "OTHER" AIRCRAFT ACTIVATIONS

CHAPTER 2. COST DATA

Historical cost data associated with the ownership and operation of general aviation aircraft were extracted from reports published by Aviation Data Service, Inc. The specific cost centers include:

Variable Costs (\$/hour)

Fuel and Oil
Airframe and Avionics Maintenance and Overhaul
Engine Maintenance and Overhaul

Fixed Costs (\$/year)

Annualized Investment
Hull Insurance
Medical and Liability Insurance
Hangar, Storage, or Tie Down
Federal Registration Fee and Weight Tax
Miscellaneous

Fuel and Oil Costs (\$/hour)

Fuel and oil cost per hour are based on the average consumption rate of 75 percent power. Airframe and engine manufacturers recommended fuel type were used for all calculations. The dollar amounts presented in the cost tables, include state and federal fuel tax.

Airframe and Avionics Maintenance And Overhaul Cost (\$/hour)

This cost center includes all labor and parts costs associated with scheduled and unscheduled airframe and avionics maintenance and overhaul.

Engine Maintenance and Overhaul (\$/hour)

Engine maintenance and overhaul includes costs for scheduled and unscheduled engine maintenance, overhaul, 100, 1000 and/or annual inspections. Includes also midpoint and cycle costs for turbine engine.

Annualized Investment (\$/year)

The purpose of the annualized investment cost center is to represent an annual dollar amount for the ownership cost of the aircraft itself. A straight line annualizing schedule applied to the aircraft's first year retail price, including 3 percent sales tax, has been used by ADS.

Hull Insurance (\$/year)

Hull insurance cost is the annual premium paid to insure the aircraft against damage while in motion or at rest. A deductible amount is normally included.

Liability and Medical Insurance (\$/year)

Liability insurance premiums are paid to insure the aircraft owner against damage to persons or property by reason of his operation of the aircraft.

Hangar, Storage and Tie Down (\$/year)

Hangar, storage and tie down rates are averages from known regional hangar rates, parking fees, and manufacturer suggested rates.

Federal Registration Fee and Weight Tax (\$/year)

The Federal registration fee and weight tax became effective July 1, 1970. The rates are

- Reciprocating powered aircraft - \$25 plus \$0.02 per pound for aircraft over 2,500 pounds gross weight.
- Turbine powered aircraft - \$25 plus \$0.035 per pound gross weight.

Operating costs for six aircraft types are given in Tables 4-24 through 4-29.

All costs associated with aircraft type 2 (single-engine piston, aerial application) were assumed equal to aircraft type 3.

TABLE 4-24.
SINGLE-ENGINE PISTON AIRCRAFT
FOUR SEATS AND OVER
NON-AERIAL APPLICATION
Operational Cost

AIRCRAFT TYPE CATEGORY -- 1

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1976
VARIABLE COSTS PER HOUR																	
Fuel and Oil (Inc. Trend)	4.10	4.32	4.55	4.79	5.04	5.31	5.59	5.74	5.76	5.81	6.98	6.53	8.72	7.37	7.91	9.17	9.30
Airframe and Avionics Reserve	1.35	1.42	1.49	1.57	1.65	1.74	1.83	1.95	2.06	2.18	2.37	2.58	2.79	3.00	3.30	3.90	4.39
Eng. Maint. and Overhaul Reserve	1.27	1.32	1.38	1.44	1.50	1.58	1.63	1.68	1.53	1.58	1.65	1.81	1.97	2.11	2.32	2.74	3.08
TOTAL	6.72	7.06	7.42	7.80	8.19	9.64	9.05	9.37	9.34	9.55	9.99	10.92	11.48	12.48	13.53	15.81	17.37
ANNUAL FIXED COSTS																	
Amortized Investment	2,500.00	2,803.00	2,939.00	2,946.00	2,932.00	3,000.00	3,087.00	3,221.00	3,499.00	3,660.00	3,848.00	3,921.00	4,212.00	4,278.00	4,869.00	5,275.00	5,235.00
Int. Mail	667.00	772.00	784.00	759.00	782.00	800.00	825.00	900.00	909.00	953.00	974.00	985.00	1,099.00	1,140.00	1,461.00	1,582.00	1,662.00
Int. Lic. & Mod.	306.00	306.00	308.00	306.00	308.00	306.00	306.00	306.00	306.00	308.00	306.00	308.00	308.00	306.00	306.00	306.00	308.00
Mpr. & Tie Down	338.00	356.00	375.00	395.00	415.00	430.00	459.00	478.00	495.00	525.00	553.00	582.00	610.00	638.00	702.00	842.00	1,010.00
Federal User Charges	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	80.00	80.00	76.00	70.00	78.00	78.00
Miscellaneous	72.00	75.00	78.00	81.00	85.00	89.00	93.00	97.00	101.00	105.00	110.00	115.00	120.00	125.00	131.00	144.00	158.00
TOTAL	3,983.00	4,402.00	4,482.00	4,478.00	4,520.00	4,831.00	4,770.00	4,982.00	5,310.00	5,557.00	5,791.00	5,969.00	6,337.00	6,581.00	7,545.00	8,275.00	8,142.00

Prepared by J. Hoffmann, March 31, 1976

TABLE 4-25.
TWIN ENGINE PISTON AIRCRAFT
UNDER 12,500 LBS. TOGW
Operational Cost

AIRCRAFT TYPE CATEGORY - 3

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
VARIABLE COSTS PER HOUR																
Fuel and Oil (Inc. Taxes)	9.84	10.36	11.47	12.07	12.71	13.32	14.19	14.73	15.08	16.27	16.77	16.00	16.20	19.00	23.17	24.75
Airframe and Avionics Reserve	4.74	4.99	5.53	6.02	6.13	6.46	7.26	7.67	8.36	8.75	8.75	8.36	9.50	10.36	12.36	14.25
Eng. Maint. and Overhaul Reserve	5.72	5.96	6.47	6.74	7.02	7.31	7.87	8.41	9.33	9.59	9.59	9.26	9.29	10.13	17.00	19.94
TOTAL	20.30	21.31	23.47	24.83	25.86	27.14	29.34	29.12	33.37	34.61	36.44	36.64	36.99	48.16	47.00	54.94

ANNUAL FIXED COSTS

Annual Investment	10,630.00	12,005.00	12,100.00	13,006.00	13,637.00	13,800.00	14,160.00	16,115.00	17,465.00	17,701.00	17,805.00	18,833.00	17,830.00	21,570.00	23,073.00	27,543.00
Ins. Held	1,415.00	1,000.00	1,021.00	1,010.00	1,011.00	2,031.00	2,302.00	2,428.00	2,209.00	2,240.00	2,240.00	2,632.00	2,470.00	3,071.00	3,542.00	3,956.00
Ins. Lic. & Med.	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
Rep. & Tie Down	655.00	600.00	753.00	803.00	845.00	889.00	1,036.00	1,172.00	1,197.00	1,252.00	1,275.00	1,293.00	1,291.00	1,530.00	1,830.00	2,293.00
Federal User Charge	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	158.00	148.00	148.00	148.00	148.00
Miscellaneous	116.00	122.00	134.00	141.00	146.00	155.00	162.00	169.00	176.00	184.00	187.00	200.00	200.00	200.00	240.00	264.00
TOTAL	12,176.00	14,776.00	17,017.00	18,759.00	18,744.00	17,004.00	18,241.00	21,099.00	21,835.00	21,800.00	22,441.00	23,366.00	27,216.00	28,856.00	28,793.00	34,373.00

Prepared by J. Hoffmann, March 31, 1976

TABLE 4-27.
TWIN ENGINE TURBOJET/FAN AIRCRAFT
UNDER 20,000 LBS. TOGW

Operational Cost

AIRCRAFT TYPE CATEGORY - 5

VARIABLE COSTS PER HOUR	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Fuel and Oil (Inc. Taxes)	-0-	-0-	-0-	-0-	82.73	97.81	102.75	105.41	100.40	106.20	108.04	123.80	170.30	141.13	158.20	190.56	210.24
Airframe and Avionics Reserve	-0-	-0-	-0-	-0-	28.46	29.96	31.54	35.08	41.56	44.87	45.03	46.81	48.26	51.05	55.84	68.36	71.56
Eng. Maint. and Overhead Reserve	-0-	-0-	-0-	-0-	37.80	38.26	40.90	41.26	38.82	38.83	39.00	40.00	40.00	42.30	46.11	54.99	58.30
TOTAL	-0-	-0-	-0-	-0-	148.99	166.03	175.19	182.65	180.00	188.70	193.27	210.71	218.53	234.48	260.11	319.91	341.10
ANNUAL FIXED COSTS																	
Amortize J Investment	-0-	-0-	-0-	-0-	97,000.00	71,163.00	79,794.00	78,120.00	101,813.00	101,920.00	100,000.00	100,853.00	100,635.00	95,797.00	113,100.00	117,300.00	128,773.00
Ins. Hull	-0-	-0-	-0-	-0-	9,540.00	11,840.00	12,000.00	12,200.00	14,950.00	14,764.00	14,500.00	14,530.00	13,095.00	12,454.00	13,873.00	14,100.00	15,217.00
Ins. L.A. & Med.	-0-	-0-	-0-	-0-	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00	1,300.00
Mp. & Tie Down	-0-	-0-	-0-	-0-	14,250.00	14,650.00	3,000.00	3,313.00	3,350.00	3,755.00	4,672.00	5,500.00	8,115.00	9,187.00	10,910.00	12,872.00	14,435.00
Federal User Charges*	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	613.00	613.00	613.00	613.00	613.00	613.00
Miscellaneous	-0-	-0-	-0-	-0-	2,000.00	3,000.00	3,120.00	3,862.00	3,862.00	3,937.00	4,160.00	4,154.00	4,217.00	4,373.00	4,581.00	5,050.00	5,555.00
TOTAL	-0-	-0-	-0-	-0-	124,870.00	101,853.00	99,774.00	98,971.00	125,161.00	124,657.00	131,560.00	133,126.00	136,645.00	123,724.00	143,204.00	150,721.00	163,958.00

*Federal use taxes not applicable until 1970.

Prepared by J. Hoffmann, March 31, 1976

TABLE 4-28.
ROTARY WING PISTON AIRCRAFT
 Operational Cost

AIRCRAFT TYPE CATEGORY - 6

VARIABLE COSTS PER HOUR	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Fuel and Oil (Inc. Tax ^a)	2.65	3.05	4.05	4.25	4.48	4.72	4.97	5.25	5.25	5.32	5.40	6.04	6.17	6.74	7.05	9.00	10.50
Airframe and Aircraft Reserve	6.58	6.53	7.25	7.57	8.37	8.40	8.94	9.15	9.20	8.80	9.83	10.80	10.20	10.40	11.44	13.64	15.14
Eng. Maint. and Overhead Reserve	3.54	2.85	3.75	3.87	3.99	3.11	3.24	3.12	3.21	3.20	3.20	3.40	3.50	3.57	4.00	4.77	5.25
TOTAL	12.78	13.43	14.10	14.69	15.84	16.82	17.15	17.36	17.70	19.22	19.80	19.50	20.00	20.50	23.10	28.21	30.93
ANNUAL FIXED COSTY																	
Amortized Investment	5,075.00	4,807.00	4,804.00	4,900.00	4,904.00	5,112.00	5,372.00	5,203.00	5,281.00	6,432.00	6,832.00	6,897.00	7,470.00	7,912.00	7,101.00 (a)	8,205,000 (a)	17,575.00
Int. Hull	4,500.00	3,750.00	3,747.00	3,827.00	3,907.00	4,400.00	4,587.00	4,707.00	4,835.00	5,915.00	5,215.00	5,212.00	5,750.00	6,000.00	5,771.00	5,400.00	6,000.00
Int. Lic. & Mat.	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00
Wor. & Tr. Costs	251.00	370.00	300.00	411.00	433.00	455.00	400.00	495.00	510.00	520.00	550.00	575.00	600.00	675.00	687.00	825.00	910.00
Federal User Charge ^b	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	25.00	25.00	54.00	54.00	54.00	54.00
Miscellaneous	50.00	50.00	100.00	107.00	104.00	105.00	100.00	110.00	112.00	114.00	110.00	110.00	120.00	122.00	120.00	140.00	140.00
TOTAL	10,372.00	9,215.00	9,271.00	9,800.00	9,750.00	10,907.00	11,207.00	11,007.00	12,000.00	12,441.00	13,154.00	13,277.00	14,265.00	14,820.00	14,801.00	13,054.00	16,103.00

^aFederal user charge not applicable until 1972.

(a) Should include 47 mil for spare parts P&P Reserve.
 (b) Should include 47 mil until 1974.

Prepared by J. Hoffmann, March 29, 1975

TABLE 4-29.
ROTARY WING TURBINE AIRCRAFT
Operational Cost

AIRCRAFT TYPE CATEGORY - 7

	1959	1960	1961	1962	1964	1966	1968	1969	1970	1971	1972	1973	1974	1976
VARIABLE COSTS PER HOUR														
Food and Oil (Inc. Taxes)	-0-	-0-	-0-	-0-	-0-	8.00	9.20	9.40	10.75	11.20	12.43	14.01	17.00	18.72
Airframe and Ancillary Reserve	-0-	-0-	-0-	-0-	-0-	13.00	13.91	14.43	14.94	15.45	15.99	17.32	20.66	22.30
Eng. Maint. and Overhaul Reserve	-0-	-0-	-0-	-0-	-0-	10.75	10.33	20.00	20.50	16.97	17.46	19.83	22.70	24.60
TOTAL	-0-	-0-	-0-	-0-	-0-	40.83	42.44	43.83	46.29	43.73	45.10	50.26	61.01	65.71
ANNUAL FIXED COSTS														
Accumulated Investment	-0-	-0-	-0-	-0-	-0-	12,974.00	14,110.00	14,904.00	14,622.00	16,264.00	16,825.00	18,625.00	20,472.00	22,100.00
Ins. Hill	-0-	-0-	-0-	-0-	-0-	9,950.00	9,075.00	10,150.00	10,150.00	11,250.00	11,875.00	11,915.00	14,623.00	15,850.00
Ins. Lin. & Med.	-0-	-0-	-0-	-0-	-0-	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
Mgr. & Trg. Costs	-0-	-0-	-0-	-0-	-0-	612.00	704.00	736.00	763.00	800.00	821.00	900.00	1,000.00	1,200.00
Federal User Charge*	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	25.00	25.00	137.00	131.00	131.00	137.00
Maintenance	-0-	-0-	-0-	-0-	-0-	107.00	190.00	193.00	196.00	200.00	204.00	214.00	235.00	250.00
TOTAL	-0-	-0-	-0-	-0-	-0-	23,643.00	25,120.00	26,333.00	26,421.00	29,189.00	30,328.00	30,420.00	31,217.00	40,403.00

*Federal use fee not applicable until 1972.
 **This aircraft type category not applicable until 1968.

CHAPTER 3. OPERATIONS

Within any particular user category/aircraft type subsegment, the average trip time (or flying time per operation) should be relatively constant over time. Using the results of two studies conducted for the FAA,^(1,2) estimates for the average flying time per operation within each subsegment were derived. Further estimates were made for dividing operations into local versus itinerant at both towered and non-towered airports, and into IFR versus VFR at all airports. These estimates are also based upon behavioral characteristics of each subsegment. Therefore, although average flying times and the fraction of operations attributed to itinerant, IFR, etc. are assumed constant over time within a subsegment, the changing mix of operations is preserved by considering activity within subsegments. A detailed description of general aviation operations follows.

Total Annual Operations

Towered Versus Nontowered Operations

Data presented in the Phase V Syscon⁽¹⁾ report were used to estimate total operations from known operations at towered airports. Although the data in Reference 1 pertains to 48 states, it was assumed that the results could be applied to all 50 states. It appears that air taxi operations were not included under the heading of general aviation in this study.

The method for determining total annual operations proceeds as follows:

-
- (1) Final Report: Nationwide, Regional and Statewide Estimates for General Aviation (G.A.) Activity at Nontowered Airports During CY 1972 (Revised) and CY 1974, Systems Consultants, Inc., 1975, Contract No. DOT-FA72WA2774.
 - (2) Aviation Forecasts Fiscal Years 1975-1986, Federal Aviation Administration, September, 1974.

Total Annual Operations from Reference 1 (Millions)

<u>CY</u>	<u>Tower</u>	<u>Nontower</u>	<u>Total</u>	<u>Tower/Total</u>
1972	36.964	78.470	115.434	0.320
1974	42.018	83.700	125.718	0.344

$$(\text{Number of Towers})_{\text{CY } 72} = 328$$

$$(\text{Number of Towers})_{\text{CY } 74^*} = 369$$

$$A = \Delta \left(\frac{\text{Tower}}{\text{Total}} \right)_{72, 74} = 0.014$$

$$B = \Delta (\text{Number of Towers})_{72, 74} = 41$$

$$\frac{A}{B} = 3.4 \times 10^{-4}$$

$$\left(\frac{\text{Tower}}{\text{Total}} \right)_{\text{CYN}} = \left(\frac{\text{Tower}}{\text{Total}} \right)_{\text{CY } 72} + \frac{A}{B} \left\{ (\# \text{ Towers})_{\text{CYN}} - \left[\frac{50}{48} \right] (\# \text{ Towers})_{\text{CY } 72} \right\} \quad \text{Equation (4-1)}$$

The factor (50/48) adjusts the formula from a 48 state base to a 50 state base.

Using Equation 4-1 together with data presented in Reference 2 on aircraft operations at airports with towers (Tables 4-30, 31 & 32) the total annual operations for the years CY 70 through CY 75 were evaluated. The results are presented in Table 4-33. It was assumed that the number of towers listed in Table 4-30 represent end of year values. The number of towers used in Equation 4-1 represents start of year values and adjustments were made accordingly. Throughout the analysis data were converted between fiscal year values and calendar year values using the following equations:

$$X_{\text{CYN}} = \frac{X_{\text{FYN}} + X_{\text{FY}} (N + 1)}{2}$$

$$X_{\text{FYN}} = \frac{X_{\text{CY}} (N - 1) + X_{\text{CYN}}}{2}$$

* As of January, 1974.

TABLE 4-30. TOTAL ITINERANT AND LOCAL AIRCRAFT OPERATIONS
AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE
(In millions)

Fiscal Year	Total	Itinerant	Local	Number of Towers
				319
1970	56.2	34.9	21.2	331
1971	54.2	33.6	20.6	343
1972	53.6	33.6	20.1	348
1973	53.9	34.0	19.9	362
1974	56.8	36.1	20.8	394
1975*	61.6	38.1	23.6	427
1976*	66.4	40.8	25.6	432
1977*	69.4	42.6	26.8	437
1978*	72.6	44.6	28.0	442
1979*	75.5	46.4	29.1	447
1980*	78.6	48.3	30.3	452
1981*	86.1	52.0	34.1	457

* 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 4-31. ITINERANT AIRCRAFT OPERATIONS AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE (In millions)

Fiscal Year	Total	Air Carrier	Air Taxi	General Aviation	Military
1970	34.9	10.8	4.7	20.9	1.5
1971	33.6	10.1	4.8	20.2	1.5
1972	33.6	9.7	2.0	20.4	1.5
1973	34.0	9.8	2.1	20.6	1.5
1974	36.1	9.5	2.4	22.9	1.3
1975*	38.1	9.8	2.5	24.4	1.4
1976*	40.8	10.3	2.6	26.5	1.4
1977*	42.6	10.7	2.7	27.8	1.4
1978*	44.6	11.2	2.9	29.1	1.4
1979*	46.4	11.6	3.0	30.4	1.4
1980*	48.3	12.0	3.1	31.8	1.4
1981*	52.0	12.3	3.4	34.9	1.4

* Forecast.

Note.--See Table 11 for definition of itinerant operations. Detail may not add to total due to independent rounding. Air taxi included with general aviation prior to 1972.

TABLE 4-32. LOCAL AIRCRAFT OPERATIONS AT
AIRPORTS WITH FAA TRAFFIC
CONTROL SERVICE (In millions)

Fiscal Year	Total	General Aviation	Military
1970	21.2	19.4	1.9
1971	20.6	18.6	2.0
1972	20.1	18.1	2.0
1973	19.9	18.1	1.8
1974	20.8	19.3	1.5
1975*	23.5	21.8	1.7
1976*	25.6	23.9	1.7
1977*	26.8	25.1	1.7
1978*	28.0	26.3	1.7
1979*	29.1	27.4	1.7
1980*	30.3	28.6	1.7
1981*	34.1	32.4	1.7

* Forecast.

Note.--See Table 11 for definition of local operations.
Detail may not add to total due to independent rounding.

TABLE 4-33. TOTAL ANNUAL GENERAL AVIATION OPERATIONS, LESS AIR TAXI

CY	Towered Operations	Number of Towers	(Tower/ Total)	Total Operations
1970	39.55	325.0	0.3143	125.8
1971	38.65	340.5	0.3196	120.9
1972	38.60	345.5	0.3213	120.1
1973	40.45	355.0	0.3245	124.6
1974	43.20	378.0	0.3324	130.0

Air Taxi Operations

No data were found which relates air taxi operation at towered airport to those at nontowered airports. It was assumed that the ratio of air taxi operations at towered and nontowered airports was the same as that for G.A. Using Equation 4-1 together with data on air taxi operations, performed at towered airports (Table 4-31), the total annual operations for the years CY 70 through CY 75 were estimated. The results are presented in Table 4-34.

TABLE 4-34. ESTIMATED TOTAL ANNUAL AIR TAXI OPERATIONS

CY	Air Taxi Towered Operations	(Tower/ Total) G.A.	Total Air Taxi Operations
1970	1.75	0.3143	5.57
1971	1.90	0.3196	5.94
1972	2.05	0.3213	6.38
1973	2.25	0.3245	6.93
1974	2.60	0.3324	7.82

Local Versus Itinerant Operations

The percentage of local operations at towered and nontowered airports obtained from Reference 1 are reproduced in Table 4-35.

TABLE 4-35. PERCENTAGE OF LOCAL G.A. OPERATIONS

CY	Towered Airport	Nontowered Airport	Towered + Nontowered
1972	46.8	59.2	55.3
1974	44.9	58.6	54.7

Reference 2 indicates that the percent of local operations at towered airports was 47.01 percent for CY 1972 and 45.73 percent for CY 1974. These percentages are close to those presented in Reference 1. The percentage of local operations at towered plus nontowered airports was calculated by the following formula based upon the data presented in Reference 1.

$$\% \text{ Local}_{\text{CY}(71 + N)} = 55.6 - 3N$$

where N is a time index.

The local and itinerant operations for towered plus nontowered airports for CY 1970 through CY 1974 are listed in Table 4-36.

TABLE 4-36. LOCAL AND ITINERANT G.A. OPERATIONS AT TOWERED PLUS NONTOWERED AIRPORTS (Millions)

CY	Total Operations	Percent Local	Local Operations	Itinerant Operations
1970	125.8	55.9	70.3	55.5
1971	120.9	55.6	67.2	53.7
1972	120.1	55.3	66.4	53.7
1973	124.6	55.0	68.5	56.1
1974	130.0	54.7	71.1	58.9

Local Air Taxi Operations

In accordance with Reference 2, local operations are excluded from the air taxi category.

IFR Versus VFR Operations

The number of G.A. and air taxi IFR operations at towered and non-towered airports was assumed to be equal to twice the number of IFR departures handled at FAA Air Route Traffic Control Centers as listed in Reference 2 (see Table 4-37). The total IFR and VFR operations for G.A. and air taxi are listed in Table 4-38 for CY 1970 through CY 1974.

TABLE 4-38. IFR AND VFR OPERATIONS AT TOWERED PLUS NONTOWERED AIRPORTS (Millions)

CY	G.A.		Air Taxi	
	IFR	VFR	IFR	VFR
1970	2.5	123.3	0.6	4.97
1971	3.0	117.9	0.7	5.24
1972	3.7	116.4	0.8	5.58
1973	4.2	120.4	0.9	6.03
1974	4.6	125.4	1.1	6.72

TABLE 4-37. IFR AIRCRAFT HANDLED, IFR DEPARTURES, AND OVERS BY USER CATEGORY FAA AIR ROUTE TRAFFIC CONTROL CENTERS (In millions)

Fiscal Year	Total			Air Carrier			Air Taxi			General Aviation			Military		
	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs
1970	21.6	8.4	4.9	13.5	5.2	3.1				3.6	4.5	.5	4.5	1.6	1.3
1971	21.3	8.2	5.0	13.0	4.9	3.1		.7		3.8	4.6	.5	4.6	1.6	1.4
1972	22.0	8.5	5.1	12.4	4.6	3.2	.8	.4	0	3.9	4.9	.6	4.9	1.8	1.4
1973	22.8	8.9	5.1	12.6	4.7	3.2	.9	.4	0	4.6	4.7	.6	4.7	1.7	1.2
1974	22.9	9.0	4.9	12.4	4.6	3.1	1.1	.5	0	5.1	4.3	.7	4.3	1.6	1.1
1975*	24.5	9.6	5.3	12.9	4.8	3.3	1.1	.5	.1	6.2	4.3	.8	4.3	1.6	1.1
1976*	25.5	10.0	5.5	13.4	5.0	3.4	1.3	.6	.1	6.5	4.3	.9	4.3	1.6	1.1
1977*	26.5	10.4	5.7	13.9	5.2	3.5	1.3	.6	.1	7.0	4.3	1.0	4.3	1.6	1.1
1978*	27.9	11.0	5.9	14.6	5.5	3.6	1.5	.7	.1	7.5	4.3	1.1	4.3	1.6	1.1
1979*	29.1	11.5	6.1	15.1	5.7	3.7	1.7	.8	.1	8.0	4.3	1.2	4.3	1.6	1.1
1980*	29.8	11.8	6.2	15.4	5.8	3.8	1.7	.8	.1	8.4	4.3	1.2	4.3	1.6	1.1
1981*	31.5	12.5	6.5	15.7	5.9	3.9	2.1	1.0	.1	9.4	4.3	1.4	4.3	1.6	1.1

* 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 a reduction of one ARTCC in 1975. Air taxi included with general aviation prior to 1972.

Percent of Total Operations by User Category

Based upon a Civil Air Patrol (CAP) survey⁽³⁾ of over 40,000 operations the percentage of G.A. operations (excluding air taxi) by user category was found to be as follows:

<u>User Category</u>	<u>Relative Percentage of Operations</u>
Business	26.4
Corporate	5.0
Personal	37.0
Aerial Applications	.9
Instructional	26.3
Other	4.4
	<u>100.0</u>

Percent of Total Operations by Aircraft Type

In the CAP survey 8,027 operations were recorded in which the origin and destination airports were different. For this group the number of operations by aircraft type was given for each user category. It was assumed that the percentage of operations by aircraft type for this sample was representative of the percentage of operations by aircraft type for total general aviation operations (local as well as itinerant). The percentage of operations by aircraft type for each user category is given in Table 4-39. Note that no distinguishment is made between helicopter types.

Annual Operations by Aircraft
Type and User Category

Using the percentage of operations by aircraft type and user category given above, along with the data contained in Tables 4-31 and 4-32 the total operations Oij, for each aircraft type and user category can be estimated. Table 4-40 lists the results for CY 1972.

⁽³⁾ 1972 General Aviation Activity Survey, DOT/FAA, July 1974.

TABLE 4-39. PERCENT OF OPERATIONS BY AIRCRAFT TYPE FOR EACH USER CATEGORY

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6 & 7 All Helicopters	
1. Business	59.2		31.9	5.0	3.1	.8	
2. Corporate	16.9		41.4	24.3	15.9	1.5	
3. Personal	88.2		10.7	.3	.4	.4	
4. Aerial		66.6	26.7			6.7	
5. Instruct.	90.3		7.3	1.2	.7	.5	
6. Air Taxi	46.7		44.6	6.0	1.9	.8	
7. Other	75.9		14.8	.8	1.5	7.0	

TABLE 4-40. ESTIMATED CY 1972 TOTAL ANNUAL OPERATIONS BY AIRCRAFT TYPE AND USER CATEGORY (MILLIONS)

User Category	Aircraft Type J						667 All Helicopters
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Engine Piston	4. Turboprop	5. Turbojet	5. Turbojet	
1. Business	18.77		10.12				.25
2. Corporate	1.01		2.49	3.05	1.93		.19
3. Personal	39.19		4.76				.18
4. Aerial		.72	.29				.07
5. Instruct.	28.53		2.3				.16
6. Air Taxi	2.99		2.84	.38	.12		.05
7. Other	4.01		.78	.55	.48		.37

Hours/Operation by User Category/Aircraft Type Subsegment

Tables 4-41 and 4-42 present estimated annual aircraft hours flown for CY 1972 and CY 1973 respectively. The average hours per operation HPO_{ij} for 1972 were obtained as follows

$$(HPO_{ij})_{72} = (HF_{ij})_{72} / (O_{ij})_{72}$$

The results are presented in Tables 4-43. The average hours per operation for each year other than 1972 were obtained as follows

- (1) Preliminary Annual Operations PO_{ij}; in year χ

$$(PO_{ij})_{\chi} = (H_{ij})_{\chi} / (HOP_{ij})_{72}$$

- (2) Preliminary Total Annual Operations PTO:

$$(PTO)_{\chi} = (\sum_i \sum_j PO_{ij})_{\chi}$$

- (3) Actual Total Annual Operation ATO were obtained from Tables 4-31 and 4-32.

- (4) Correction Factor CF*:

$$(CF) = \frac{(ATO)_{\chi}}{(PTO)_{\chi}}$$

- (5) Corrected Annual Operations CO_{ij}:

$$(CO_{ij})_{\chi} = (CF)_{\chi} \cdot (PO_{ij})_{\chi}$$

- (6) Average Hours per Operation:

$$(HBO_{ij})_{\chi} = (H_{ij})_{\chi} / (CO_{ij})_{\chi}$$

The average hours per operation for CY 1973 are shown in Table 4-44.

* Actually two separate correction factors were calculated, one for general aviation and one for air taxi.

TABLE 4-41. CY 1972 ANNUAL AIRCRAFT HOURS (MILLION)

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6 & 7 All Helicopters	
1. Business	3.115		1.293			.064 .159	
2. Corporate	.231		1.369	.568	.454	.095	
3. Personal	7.180		.376			.009	
4. Aerial		1.434	.04			.140	
5. Instruct.	4.385		.144			.051	
6. Air Taxi	.672		.941	.347	.049	.339	
7. Other	2.855		.257	.039	.024	.340	

TABLE 4-42. CY 1972 ANNUAL AIRCRAFT HOURS (MILLIONS)

User Category I	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Eng. Engine Piston	4. Turboprop	5. Turbojet	6 & 7 All Helicopters	
1. Business	3.806		1.481			.067	
2. Corporate	.260		1.521	.684	.589	.111	
3. Personal	7.144		.349			.008	
4. Aerial		1.654	.054			.130	
5. Instruct.	4.992		.174			.062	
6. Air Taxi	.849		1.173	.377	.081	.355	
7. Other	3.164		.262	.066	.034	.416	

TABLE 4-43. CY 1972 HOURS/OPERATION

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6 & 7 All Helicopters	
1. Business	.166		.128			.256	
2. Corporate	.229		.550	.186	.235	.50	
3. Personal	.183		.078			.05	
4. Aerial		1.99	.138			2.0	
5. Instruct.	.154		.063			.319	
6. Air Taxi	.224		.331	.913	.409	6.78	
7. Other	.711		.329	.071	.05	.919	

TABLE 4-44. CY 1973 HOURS/OPERATION

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6 & 7 All Helicopters	
1. Business	.18		.14			.38	
2. Corporate	.25		.59	.20	.25	.75	
3. Personal	.2		.08			.05	
4. Aerial		2.12	.15			1.86	
5. Instruct.	.16		.07			.34	
6. Air Taxi	.26		.38	1.05	.48	8.88	
7. Other	.76		.35	.08	.02	.99	

IFR and VFR Operations by Aircraft Type
and User Category

In the CAP survey 8,027 operations were recorded in which the origin and destination airports were different. For this group the number of IFR flight plans filed was given for each user category. It was assumed that the percentage of IFR flight plans filed $PTIO_{ij}$ by aircraft type and user category (as a function of total IFR flight plans filed) for this sample was representative of the percentage of IFR operations by aircraft type and user category for the entire population of aircraft operations (local as well as itinerant) for each year of interest.

The percentages of annual IFR operations by user category/aircraft type PI_{ij} and VFR, PV_{ij} , were obtained for each year as follows:

- (1) Total annual IFR operations, TIO were obtained from Reference 2 (See Table 4-45)*
- (2) Annual IFR operations, I_{ij} .
$$I_{ij} = PTIO_{ij} \cdot TIO.$$
- (3) Corrected Annual Operations CO_{ij} were obtained as described in the previous section.
- (4) $PI_{ij} = I_{ij}/CO_{ij}^{**}$
- (5) $VI_{ij} = 1 - PI_{ij}.$

PI_{ij} and V_{ij} for CY 1973 are shown in Tables 4-46 and 4-47.

Local and Itinerant, Towered and Nontowered Operations by
User Category/Aircraft Type

The percentages of annual operations by aircraft type user category/aircraft type which were local towered, PLT_{ij} --local nontowered, PLN_{ij} --

* Separate analyses were performed general aviation and air taxi.

** If PJ_{ij} was less than .001 it was set equal to .001.

TABLE 4-45. IFR AIRCRAFT HANDLED, IFR DEPARTURES, AND OVERS BY USER CATEGORY FAA AIR ROUTE TRAFFIC CONTROL CENTERS (In millions)

Fiscal Year	Total			Air Carrier			Air Taxi			General Aviation			Military		
	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs
1970	21.6	8.4	4.9	13.5	5.2	3.1		.7		3.6	3.5	.5	4.5	1.6	1.3
1971	21.3	8.2	5.0	13.0	4.9	3.1		.3		3.8	3.6	.5	4.6	1.6	1.2
1972	22.0	8.5	5.1	12.4	4.6	3.2	.8	.4	0	3.9	3.7	.6	4.9	1.3	1.2
1973	22.8	8.9	5.1	12.6	4.7	3.2	.9	.4	0	4.6	4.0	.6	4.7	1.7	1.2
1974	22.9	9.0	4.9	12.4	4.6	3.1	1.1	.5	0	5.1	4.2	.7	4.3	1.6	1.1
1975*	24.5	9.6	5.3	12.9	4.8	3.3	1.1	.5	.1	6.2	5.0	.8	4.3	1.6	1.1
1976*	25.5	10.0	5.5	13.4	5.0	3.4	1.3	.6	.1	6.5	5.2	.9	4.3	1.6	1.1
1977*	26.5	10.4	5.7	13.9	5.2	3.5	1.3	.6	.1	7.0	5.5	1.0	4.3	1.6	1.1
1978*	27.9	11.0	5.9	14.6	5.5	3.6	1.5	.7	.1	7.5	5.8	1.1	4.3	1.6	1.1
1979*	29.1	11.5	6.1	15.1	5.7	3.7	1.7	.8	.1	8.0	6.0	1.2	4.3	1.6	1.1
1980*	29.8	11.8	6.2	15.4	5.8	3.8	1.7	.8	.1	8.4	6.2	1.2	4.3	1.6	1.1
1981*	31.5	12.5	6.5	15.7	5.9	3.9	2.1	1.0	.1	9.4	6.5	1.4	4.3	1.5	1.1

* 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 a reduction of one ARTCC in 1975. Air taxi included with general aviation prior to 1972.

TABLE 4-46. CY 1973 PERCENT OF G.A. IFR AND VFR OPERATIONS FOR EACH AIRCRAFT TYPE AND USER CATEGORY

		Aircraft Type J						
User Category I	7. IFR % VFR	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6 & 7 All Helicopters	
		1. Business		.033 .967	X X	.097 .903	X X	X X
2. Corporate		.052 .948	X X	.126 .874	.173 .827	.201 .799	.017 .983	
3. Personal		.016 .984	X X	.042 .958	X X	X X	.039 .961	
4. Aerial		X X	.004 .996	.016 .984	X X	X X	.001 .999	
5. Instruct.		.004 .996	X X	.008 .992	X X	X X	.001 .999	
6. Air Taxi			X X					
7. Other		.009 .995	X X	.043 .957	.001 .999	.004 .996	.001 .999	

TABLE 4-47. CY 1973 PERCENT OF AIR TAXI IFR AND VFR OPERATIONS FOR EACH AIRCRAFT TYPE AND USER CATEGORY

User Category	Aircraft Type J						
	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6 & 7 All Helicopters	
1. Business	X	X	X	X	X	X	
2. Corporate	X	X	X	X	X	X	
3. Personal	X	X	X	X	X	X	
4. Aerial	X	X	X	X	X	X	
5. Instruct.							
6. Air Taxi	.072		.176	.227	.241	.001	
7. Other	.928		.824	.773	.759	.999	

X IFR
Z VFR

itinerant towered, PIT_{ij}--and itinerant nontowered PIN_{ij} were obtained for each year as follows:

- (1) The following percentages of local operations by user category PL_i were obtained from Reference 1,

I	User Category	Percent of Total Local Operations
1	Business	.09
2	Corporate	.01
3	Personal	.38
4	Aerial	.01
5	Instruct	.46
6	Air Taxi	.0
7	Other	<u>.05</u>
		1.00

- (2) It was assumed that each PL_i was distributed between aircraft types as follows:

I	J	Individual Weight (WI _{ij})							Total Weight (WT _i)
		1	2	3	4	5	6	7	
1		10	-	1	-	-	-	-	11
2		10	-	1	0	0	0	-	11
3		10	-	1	-	-	0	-	11
4		-	10	3	-	-	0	-	13
5		200	-	9	-	-	1	-	210
6		0	-	0	0	0	0	-	0
7		10	-	1	0	0	0	-	11

- (3) The percentage of total towered and nontowered traffic which is local, PTLOC and PNLOC, respectively, can be found from the data presented in Table 4-35.
- (4) Corrected Annual Operations OC_{ij} were obtained as described previously.
- (5) Total Annual Towered Operations TTO and Nontowered Operations TNO were obtained from Tables 4-33 and 4-34.
- (6) $PLT_{ij} = \frac{TTO \cdot PTLOC \cdot PI_{ij} \cdot WI_{ij}}{WT_{ij} \cdot CO_{ij}}$
- (7) $PLN_{ij} = \frac{TNO \cdot PNLOC \cdot PI_{ij} \cdot WI_{ij}}{WT_{ij} \cdot CO_{ij}}$
- (8) For case where WI_{ij} was assumed to be equal to zero, PLT_{ij} and PLN_{ij} was set equal to .001 (except for air taxi operations which are not local by definition).

$$(9) \text{ PIT}_{ij} = \frac{\text{TTO}}{\text{TTO} + \text{TNO}} - \text{PLT}_{ij}$$

$$(10) \text{ PIN}_{in} = \frac{\text{TNO}}{\text{TTO} + \text{TNO}} - \text{PLN}_{ij}$$

The percent of local and itinerant traffic at towered and non-towered airports is presented in Tables 4-48 and 4-49.

State	City	Type	Local Traffic		Itinerant Traffic		Total Traffic
			Towered	Non-Towered	Towered	Non-Towered	
Alabama	Montgomery	T	100	0	0	0	100
	Mobile	T	100	0	0	0	100
Alaska	Anchorage	T	100	0	0	0	100
	Fairbanks	T	100	0	0	0	100
Arizona	Phoenix	T	100	0	0	0	100
	Tucson	T	100	0	0	0	100
Arkansas	Fayetteville	T	100	0	0	0	100
	Little Rock	T	100	0	0	0	100
California	Los Angeles	T	100	0	0	0	100
	San Francisco	T	100	0	0	0	100
Colorado	Denver	T	100	0	0	0	100
	Fort Collins	T	100	0	0	0	100
Connecticut	Hartford	T	100	0	0	0	100
	New Haven	T	100	0	0	0	100
Delaware	Dover	T	100	0	0	0	100
	Wilmington	T	100	0	0	0	100
Florida	Miami	T	100	0	0	0	100
	Tallahassee	T	100	0	0	0	100
Georgia	Atlanta	T	100	0	0	0	100
	Savannah	T	100	0	0	0	100
Idaho	Boise	T	100	0	0	0	100
	Idaho Falls	T	100	0	0	0	100
Illinois	Chicago	T	100	0	0	0	100
	Springfield	T	100	0	0	0	100
Indiana	Indianapolis	T	100	0	0	0	100
	Fort Wayne	T	100	0	0	0	100
Iowa	Des Moines	T	100	0	0	0	100
	Sioux Falls	T	100	0	0	0	100
Kansas	Wichita	T	100	0	0	0	100
	Topeka	T	100	0	0	0	100
Kentucky	Cincinnati	T	100	0	0	0	100
	Louisville	T	100	0	0	0	100
Louisiana	New Orleans	T	100	0	0	0	100
	Shreveport	T	100	0	0	0	100
Maine	Bangor	T	100	0	0	0	100
	Portland	T	100	0	0	0	100
Maryland	Baltimore	T	100	0	0	0	100
	Washington	T	100	0	0	0	100
Massachusetts	Boston	T	100	0	0	0	100
	Worcester	T	100	0	0	0	100
Michigan	Detroit	T	100	0	0	0	100
	Lansing	T	100	0	0	0	100
Minnesota	Minneapolis	T	100	0	0	0	100
	Rochester	T	100	0	0	0	100
Mississippi	Jackson	T	100	0	0	0	100
	Meridian	T	100	0	0	0	100
Missouri	St. Louis	T	100	0	0	0	100
	Springfield	T	100	0	0	0	100
Montana	Billings	T	100	0	0	0	100
	Great Falls	T	100	0	0	0	100
Nebraska	Omaha	T	100	0	0	0	100
	Lincoln	T	100	0	0	0	100
Nevada	Las Vegas	T	100	0	0	0	100
	Reno	T	100	0	0	0	100
New Hampshire	Manchester	T	100	0	0	0	100
	Portsmouth	T	100	0	0	0	100
New Jersey	Newark	T	100	0	0	0	100
	Atlantic City	T	100	0	0	0	100
New Mexico	Albuquerque	T	100	0	0	0	100
	Las Cruces	T	100	0	0	0	100
New York	New York	T	100	0	0	0	100
	Buffalo	T	100	0	0	0	100
North Carolina	Raleigh	T	100	0	0	0	100
	Charlotte	T	100	0	0	0	100
North Dakota	Grand Forks	T	100	0	0	0	100
	Minot	T	100	0	0	0	100
Ohio	Columbus	T	100	0	0	0	100
	Cleveland	T	100	0	0	0	100
Oklahoma	Oklahoma City	T	100	0	0	0	100
	Tulsa	T	100	0	0	0	100
Oregon	Portland	T	100	0	0	0	100
	Medford	T	100	0	0	0	100
Pennsylvania	Philadelphia	T	100	0	0	0	100
	Pittsburgh	T	100	0	0	0	100
Rhode Island	Providence	T	100	0	0	0	100
	Pawtucket	T	100	0	0	0	100
South Carolina	Columbia	T	100	0	0	0	100
	Charleston	T	100	0	0	0	100
South Dakota	Sioux Falls	T	100	0	0	0	100
	Sioux Falls	T	100	0	0	0	100
Tennessee	Memphis	T	100	0	0	0	100
	Nashville	T	100	0	0	0	100
Texas	Dallas	T	100	0	0	0	100
	Houston	T	100	0	0	0	100
Utah	Salt Lake City	T	100	0	0	0	100
	Provo	T	100	0	0	0	100
Vermont	Montpelier	T	100	0	0	0	100
	Rutland	T	100	0	0	0	100
Virginia	Richmond	T	100	0	0	0	100
	Norfolk	T	100	0	0	0	100
Washington	Seattle	T	100	0	0	0	100
	Olympia	T	100	0	0	0	100
West Virginia	Charleston	T	100	0	0	0	100
	Martinsburg	T	100	0	0	0	100
Wisconsin	Madison	T	100	0	0	0	100
	Green Bay	T	100	0	0	0	100
Wyoming	Cheyenne	T	100	0	0	0	100
	Casper	T	100	0	0	0	100

Source: Bureau of Transportation Statistics, U.S. Department of Transportation, Bureau of Economic Analysis, National Transportation Statistics, 1980-1981.

TABLE 4-48. CY 1973 PERCENT OF LOCAL AND ITINERANT TRAFFIC AT TOWERED AIRPORTS FOR EACH AIRCRAFT TYPE AND USER CATEGORY

		Aircraft Type J						
User Category I	1. Single-Eng. Piston Nonaerial	2. Single-Eng. Piston Aerial	3. Multi-Engine Piston	4. Turboprop	5. Turbojet	6 & 7		
						All Helicopters		
1. Business	.071	X	.014	X	X	X	.001	X
	.254	X	.311	X	X	X	.324	X
2. Corporate	.159	X	.007	.001	.001	.001	.001	.001
	.166	X	.318	.324	.324	.324	.324	.324
3. Personal	.176	X	.154	X	X	X	.001	X
	.149	X	.171	X	X	X	.324	X
4. Aerial	X	.183	.119	X	X	X	.001	X
	X	.142	.206	X	X	X	.324	X
5. Instruct.	.268	X	.142	X	X	X	.226	X
	.057	X	.183	X	X	X	.099	X
6. Air Taxi	0	X	0	0	0	0	0	0
	.325	X	.325	.325	.325	.325	.325	.325
7. Other	.203	X	.112	.001	.001	.001	.001	.001
	.122	X	.213	.324	.324	.324	.324	.324

% Local
% Itn.

TABLE 4-49. CY 1973 PERCENT OF LOCAL AND ITINERANT TRAFFIC AT NONTOWERED AIRPORTS FOR EACH AIRCRAFT TYPE AND USER CATEGORY

		Aircraft Type J					
User Category I	% Local % Itn.	1.	2.	3.	4.	5.	6 & 7
		Single-Eng. Piston Nonaerial	Single-Eng. Piston Aerial	Multi-Eng. Engine Piston	Turboprop	Turbojet	All Helicopters
1. Business		.189	X	.038	X	X	.001
		.486	X	.637	X	X	.674
2. Corporate		.425	X	.017	.001	.001	.001
		.250	X	.658	.674	.674	.674
3. Personal		.470	X	.411	X	X	.001
		.205	X	.264	X	X	.674
4. Aerial		X	.489	.318	X	X	.001
		X	.186	.357	X	X	.674
5. Instruct.		.674*	X	.379	X	X	.603
		.001	X	.296	X	X	.072
6. Air Taxi		0	X	0	0	0	0
		.675	X	.675	.675	.675	.675
7. Other		.542	X	.300	.001	.001	.001
		.133	X	.375	.674	.674	.674

* Local actually was calculated to be .717 which exceeded allowable limit of .675.

CHAPTER 4. SUPPLEMENTARY DATA

In addition to the cost and activity data already discussed, several additional parameters were needed during model construction. For completeness, these data are now presented.

Average Fuel Consumption Rate

The following average consumption rates at 75 percent power were used in calculating annual fuel usage. These values are consistent with the fuel consumption rates used by Aviation Data Service, Inc. in determining variable costs.

<u>Aircraft Type</u>	<u>Average Fuel Consumption at 75 Percent Power (gal/hr)</u>
<u>Aviation Gas</u>	
Single-engine piston Non-Aerial Application	11.9
Single-engine piston Aerial Application	13.5
Multi engine piston	33.6
Piston Helicopter	14.0
<u>Jet Fuel</u>	
Turboprop	63.1
Turbojet	336.0
Turbine Helicopter	25.7

Price Deflator, GNP and DPI

The purpose of the price deflator is to convert cost data expressed in current dollars to 1972 dollar equivalents. Prior to 1972, this parameter is actually an inflator to 1972 dollars. The basis for price deflator is the GNP implicit price deflator as presented in the Survey of Current Business.

Table 4-50 presents data for GNP implicit price deflator, GNP measured in current dollars, but indexed to 1972, and DPI (per capita) measured in 1972 dollars. These data are used to construct the following parameters in Table 4-51; the price deflator to convert to 1972 dollars, GNP measured in constant dollars and indexed to 1972, and DPI measured in constant dollars and indexed to 1972.

All economic parameters (costs, GNP, DPI etc.) used in the construction of this model are first converted to 1972 dollars, then indexed by the 1972 value. When estimating regression equations - which include time series price data, a conversion to constant dollars prior to estimation reduces the possibility of obtaining spurious correlation. This is especially true in the presence of continuous inflation. Indexing of cost variables permits more realistic analyses when pooling cross-sectional data.

Year	GNP (Current)	GNP (Indexed)	DPI (1972)
1970	100.00	100.00	100.00
1971	105.00	105.00	105.00
1972	110.00	110.00	110.00
1973	115.00	115.00	115.00
1974	120.00	120.00	120.00
1975	125.00	125.00	125.00
1976	130.00	130.00	130.00
1977	135.00	135.00	135.00
1978	140.00	140.00	140.00
1979	145.00	145.00	145.00
1980	150.00	150.00	150.00

(1) Source: Bureau of Economic Analysis

(2) Source: Bureau of Economic Analysis

(3) Source: Bureau of Economic Analysis

TABLE 4-50. ECONOMIC DATA

Year	GNP Implicit Price Deflator (1958=100) ⁽¹⁾	GNP ⁽²⁾ (1972=100)	Per Capita ⁽²⁾ DPI (1972 \$)
1965	110.9	74.32	
1966	113.9	76.76	
1967	117.6	79.02	3371
1968	122.3	82.57	3464
1969	128.2	86.72	3515
1970	135.2	91.36	3619
1971	141.6	96.02	3714
1972	146.1	100.00	3837
1973	154.3	105.92	4068
1974	170.1	116.20	3981
1975	185.9 ^(p)	126.35 ^(p)	4012 ^(p)

(1) Survey of Current Business

(2) Economic Indicators

(p) Preliminary

TABLE 4-51. ECONOMIC INDICES

Year	Price Deflator to 1972 \$	GNP/GNP ₁₉₇₂ (both in 1972 \$)	DPI/DPI ₁₉₇₂ (both in 1972 \$)
1965	1.3174	.7906	
1966	1.2827	.8377	
1967	1.2423	.8605	.8786
1968	1.1946	.8981	.9028
1969	1.1396	.9212	.9161
1970	1.0806	.9182	.9432
1971	1.0318	.9457	.9679
1972	1.000	1.000	1.000
1973	0.9469	1.0532	1.0602
1974	0.8589	1.0338	1.0375
1975	0.7859 ^(p)	1.0131 ^(p)	1.0456 ^(p)

(p) Preliminary

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