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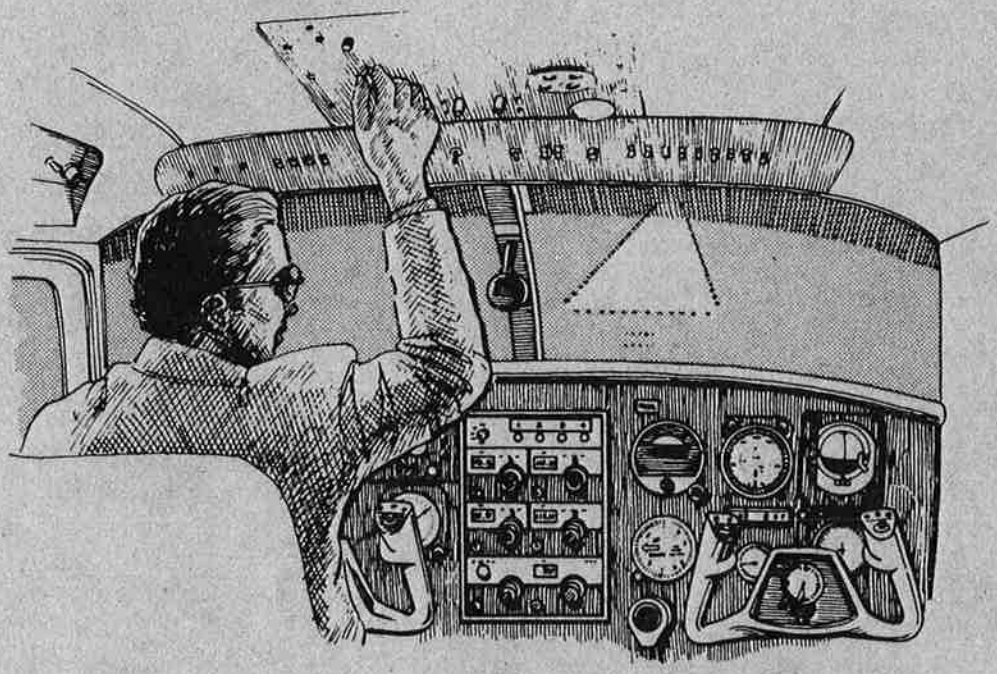
GENERAL AVIATION AVIONICS STATISTICS



APRIL 1981

ANNUAL REPORT
1979 DATA

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SPRINGFIELD, VIRGINIA 22161

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION
OFFICE OF MANAGEMENT SYSTEMS
INFORMATION AND STATISTICS DIVISION

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16. Abstract

This report presents avionics statistics for the 1979 general aviation (GA) aircraft fleet and is the sixth in a series titled General Aviation Avionics Statistics. The statistics are presented in a capability group framework which enables one to relate airborne avionics equipment to the capability of a GA aircraft to function in the National Airspace System. The word "capability" is used in this report to mean in what segments of the airspace an aircraft can fly, under what flight rules it can fly, and at what airports it can land. The framework permits the GA fleet to be divided into groups according to their capabilities as dictated by the avionics configurations of the aircraft. Differences in various characteristics of the aircraft are examined among the capability groups. The FAA's Sample File of results from the 1979 GA Activity and Avionics Survey is the source of all the statistical data used in this report.

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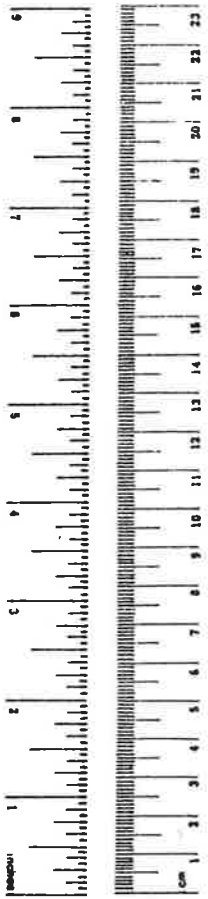
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

PREFACE

This report describes the 1979 avionics data study performed by the Transportation Systems Center (TSC) and Wilson Hill Associates, Inc., under Project Plan Agreement FA-143 sponsored by the Federal Aviation Administration (FAA), Office of Management Systems, Information and Statistics Division. It is the sixth in the series General Aviation Avionics Statistics, which TSC produced for the same sponsor. TSC performed the previous studies as part of a continuing program to assure the quality and usefulness of general aviation data. The study is based on information collected by the FAA and processed by the TSC.

The authors would like to acknowledge the contributions to this report by several people: Carolyn Edwards of FAA-AMS-220, assisted and guided the project as sponsor; Paula Shafer and Preeti Pandit of Wilson Hill Associates were responsible for manipulating the data, writing the computer programs to produce the tables appearing in this publication, and performing the data analysis.

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EXECUTIVE SUMMARY

This document is the sixth in the General Aviation Avionics Statistics report series, and presents avionics statistics and other descriptive information for the 1979 general aviation (GA) aircraft fleet. The report series results from a study which was designed first, to develop a framework for the GA fleet relating airborne avionics equipment to aircraft capability to perform in the National Airspace System (NAS), and second, within this framework to analyze the activity and other characteristics of the GA fleet.

The source of data for the study was the FAA's 1979 Sample File of results from the GA Activity and Avionics Survey, conducted in 1980 by the Federal Aviation Administration (FAA) to obtain information on the activities and avionics of the 1979 general aviation aircraft fleet, the major component of civil aviation in the United States. The FAA selected a statistically designed sample of about 14.2 percent of the registered general aviation fleet to participate in the survey. The sampled aircraft represented all states and FAA regions, and all of the major manufacturer - model groups of aircraft.

In developing the framework for analyzing capabilities of the GA fleet, the main assumption was that the avionics equipment contained in an aircraft determined the maximum capabilities of that aircraft to perform in the NAS. The word "capability" was used to mean where and under what type of flight rules an aircraft could fly, at what airports it could land, and to what extent it could participate in various navigation, communication, and landing systems. Capability groups were defined, each group consisting of a combination of avionics equipment and the associated capabilities. By computing estimates of the number of GA aircraft in each

capability group according to aircraft avionics configurations, and then studying the differences in characteristics among the groups, relationships between the level of avionics in an aircraft and other physical and operating characteristics could be drawn.

Some of the significant findings, based on the 21,512 sampled GA aircraft for which avionics information was available, are listed below:

- While only about 19 percent of the GA fleet have the avionics equipment required to fly above 18,000 feet in positive controlled airspace, this proportion has grown approximately 162 percent in the past five years.
- Over 77 percent of the GA fleet can fly by Instrument Flight Rules (IFR).
- Over 51 percent of the GA fleet have some degree of instrument landing system (ILS) receiving capability.
- About 25 percent of the GA fleet can land at Group I Terminal Control Areas (TCA's).
- Over the past five years there has been a steady increase in the proportion of aircraft with avionics equipment enabling them both to land at Group I and II TCA's and to fly in positive controlled airspace.
- As the level of avionics in an aircraft increases,
  - primary uses change from mostly personal to mostly business and executive,
  - the aircraft usage (number of hours flown) increases, and
  - the age of the aircraft decreases.
- Over 83 percent of the GA fleet have two-way communication equipment.

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1. INTRODUCTION

1.1 DEFINITIONS

1.1.1 General Aviation (GA)

The term "general aviation" is defined for the purposes of this report as all aircraft in the U.S. civil air fleet except those operated under Federal Aviation Regulations (FAR) Parts 121 and 127. These two parts cover the operations of fixed wing aircraft and rotorcraft, respectively, that 1) have been issued a certificate of public convenience and necessity by the Civil Aeronautics Board authorizing the performance of scheduled air transportation over specified routes and a limited amount of non-scheduled operations, and 2) are used by large aircraft commercial operators. General aviation thus includes aircraft operated under FAR:

Part 91: General operating and flight rules.

Part 123: Certification and operations: air travel clubs using large airplanes.

Part 133: Rotorcraft external load operations.

Part 135: Air taxi operators and commercial operators of small aircraft.

Part 137: Agricultural aircraft operations.

General aviation offers such varied services as air taxi, air cargo, industrial, agricultural, business, personal, instructional, research, patrol, and sport flying. General aviation aircraft range in complexity from simple gliders and balloons to four engine turbojets.

1.1.2 Avionics

The term avionics, as used in this report, refers to the airborne electronic equipment used by aircraft to transmit and receive various forms of radio signals for purposes of navigation, communication, tracking, and landing the aircraft. Some examples are the VHF communications equipment which transmits and receives voice communications via very high frequency radio waves, and the radar altimeter which determines the aircraft's altitude above the terrain by bouncing radio waves off the ground below.

1.2 BACKGROUND

The General Aviation Avionics Statistics report series began with a report on the 1974 GA fleet. The report revealed the findings of a study designed first, to develop a framework for the GA fleet relating airborne avionics equipment to aircraft capability to perform in the National Airspace System (NAS), and second, within this framework to analyze the activity and other characteristics of the GA fleet. The subsequent reports are updates of the 1974 report and follow the 1974 format to facilitate year to year comparisons.

The usefulness of such reports is easily established when one considers GA's dominance of the civil air fleet, and the scarcity of reliable information on GA activities. In calendar year 1979 GA aircraft comprised almost 99 percent of the U.S. civil air fleet,[1] accounted for over 84 percent of civilian operations at FAA towered airports,[2] and logged over 85 percent of the total hours flown by the U.S. civil air fleet.[3] However, in contrast to the air carriers which account for the remaining civilian aircraft and operations, GA has no requirement for reporting activity and avionics information to the Federal government. Therefore one's knowledge of GA is confined to what can be extracted from the limited data available, acquired mostly through voluntary surveys. Analyses of the data and resulting inferences provide much needed insight into the nature of the GA fleet.

1.3 SOURCE OF DATA

The basic source of data for this report series is the owners of the GA fleet. For each of the years 1974 through 1976, the FAA collected GA activity and avionics data through a voluntary census of the owners of all GA aircraft using Part 2 of the annual Aircraft Registration Eligibility, Identification and Activity Report, AC Form 8050-73. For each of the 1977, 1978, and 1979 reports, FAA obtained GA activity and

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[1]Source: Census of U.S. Civil Aircraft, Calendar Year 1979, U.S. Department of Transportation, Federal Aviation Administration (Washington DC, 1980), p.4.

[2]This figure includes operations for both GA and air taxi. Source: FAA Air Traffic Activity, Calendar Year 1979, U.S. Department of Transportation, Federal Aviation Administration (Washington DC, 1979), p.2.

[3]Air Carrier: Census of U.S. Civil Aircraft, Calendar Year 1979, U.S. Department of Transportation, Federal Aviation Administration (Washington DC, 1980), p.21. General Aviation: Table 2-1.

avionics data by conducting a sample survey of around 14-15 percent of the registered GA fleet. This annual survey is known as the General Aviation Activity and Avionics Survey. Figure 1 shows the 1979 questionnaire. For a detailed description of the survey design, see Appendix A.

In this report, because of the survey method activity and avionics figures are in the form of statistical estimates rather than exact counts. These figures have standard errors because they are based on information obtained from only a portion of the GA fleet which is expanded to form an estimate for the whole fleet. Appendix A contains a thorough description of the standard errors, their interpretation, and use. Results of the survey were compiled into a computerized file known as the 1979 Sample File. A record layout appears in Appendix B.

1. CONTROL NUMBER

DEPARTMENT OF TRANSPORTATION – FEDERAL AVIATION ADMINISTRATION

GENERAL AVIATION ACTIVITY and AVIONICS SURVEY

(As of December 31, 1979)

Form Approved
OMB No. 04–R0185

This report is authorized by Section 311 of the Federal Aviation Act of 1958, as amended. While you are not required to respond, your cooperation is needed to make the results of this survey comprehensive, accurate and timely. Information collected in this survey will be used for statistical purposes only and not to disclose individual aircraft activity.

2 ☐ "X" here if you operate your aircraft principally as an air carrier (under FAR 121 or 127). If so, DO NOT complete remainder of form. However please return to address shown below.

3. AIRCRAFT CHARACTERISTICS

N –

INSTRUCTIONS: Please answer questions for the aircraft identified at right.
Mail the completed questionnaire in the enclosed postage paid envelope to

Federal Aviation Administration
P.O. Box 26045
Oklahoma City, Oklahoma 73126

	HOURS
4. What were the total lifetime airframe hours as of December 31, 1979?	

5. Was aircraft flown in Calendar Year 1979? *(Check one)*
1 ☐ Yes 2 ☐ No *(Skip to question 10)*

6. Did you own this aircraft for the entire year of 1979?
1 ☐ Yes 2 ☐ No
If "No," include previous owner's hours for 1979 in your estimates below.

7. HOURS FLOWN DURING CALENDAR YEAR 1979	HOURS
EXECUTIVE–Corporate flying with professional crew ..... a.	
BUSINESS–All non-executive flying for business reasons ..... b.	
PERSONAL–Individual flying for personal reasons ..... c.	
AERIAL APPLICATION–Agriculture, health, forestry ..... d.	
INSTRUCTIONAL– Flying with or under supervision of a flight instructor ..... e.	
AIR TAXI–All Part 135 passenger, cargo, and mail operations, including charter ..... f.	
INDUSTRIAL/SPECIAL–Patrol, survey, photo, hoist, etc.–Other than Part 135 ..... g.	
AIRCRAFT RENTAL BUSINESS–Commercial flying club, leased and rental aircraft activity ..... h.	
OTHER–R&D, government, air show, sales, parachuting, etc ..... i.	

	IFR HOURS
8. Was this aircraft flown on an Instrument Flight Plan in 1979? 1 ☐ Yes 2 ☐ No If "Yes," how many hours were flown on an Instrument Flight Plan?	

	GAL./HR.
9. Estimate of this aircraft's average rate of fuel consumption *(gal./hr.)* during 1979 *(Report whole gals. only)*	

	STATE
10. State *(Abbreviation)* or foreign country in which aircraft was based as of December 31, 1979	

11. AVIONICS EQUIPMENT CAPABILITY *("X" ALL boxes that reflect this aircraft's current capability. If none, check the last box in each group.)*

VHF COMMUNICATIONS EQUIPMENT	"X"
VHF Communications System:	
360 Channels or less ..... a.	☐
720 Channels or more ..... b.	☐
More than one comm. system ..... c.	☐
No VHF Communications Equipment ..... d.	☐

TRANSPONDER EQUIPMENT	
4096 Code ..... e.	☐
Altitude Encoding Equipment ..... f.	☐
No Transponder Equipment ..... g.	☐

NAVIGATION EQUIPMENT	
VOR Receiver:	
100 Channels ..... h.	☐
200 Channels ..... i.	☐
More than one VOR Receiver ..... j.	☐
Automatic Direction Finder (ADF) ..... k.	☐
Distance Measuring Equipment (DME) ..... l.	☐
Area Navigation Equipment (RNAV) ..... m.	☐
Long Range Nav. (Doppler, INS, Other) ..... n.	☐
Automatic Pilot ..... o.	☐
Radar Altimeter ..... p.	☐
Weather Radar ..... q.	☐
No Navigation Equipment ..... r.	☐

ILS RECEIVING EQUIPMENT	
Localizer ..... s.	☐
Marker Beacon ..... t.	☐
Glide Slope ..... u.	☐
Microwave Landing System ..... v.	☐
No ILS Receiving Equipment ..... w.	☐

THANK YOU
FOR YOUR COOPERATION

FAA Form 1800–54 (10-79) Supersedes previous edition

Figure 1. Survey Questionnaire

2. DEVELOPMENT AND METHODOLOGY

2.1 FLEET SIZE AND REPORT COVERAGE

The 1979 GA aircraft fleet contained 247,847 registered aircraft as of December 31, 1979. The avionics data in this report cover all GA aircraft, but are developed from the results of a 14.2 percent sample survey of the aircraft (see Appendix A). The survey sample size was 35,145 and achieved a response rate of 65 percent to the avionics questions (see Figure 2).

2.2 PROFILE OF GA AVIONICS

Table 1 summarizes the basic avionics data provided by the 1979 Sample File for the analysis of the 1979 GA fleet. It shows the estimates of the number of aircraft containing each piece of avionics equipment listed on the FAA 1800-54 forms. The usefulness of Table 1 is limited because it does not provide the means to determine the number of aircraft containing important groups of equipment, but deals solely with individual types of equipment. For example, one cannot determine the number of aircraft with all three components of an instrument landing system (ILS): localizer, glide slope, and marker beacon receivers. Thus the capability groups discussed below, were developed to make the study of groups of avionics equipment possible.

2.3 AVIONICS CAPABILITY GROUPS

2.3.1 Function of Capability Groups

Avionics capability groups (CG's) are the means through which significant groups of avionics equipment are associated with aircraft capability to perform in the NAS. The word "capability" takes on a number of meanings in conjunction with the NAS. It can refer to where an aircraft can fly, at what airports it can land, what type of flying it can do, or to what extent it can participate in the air route, landing, and communications systems. Avionics equipment is installed in an aircraft because of the capabilities gained from it; consequently, one should be able to identify an aircraft's general potential capabilities from knowledge of its avionics equipment configuration. Often several pieces of equipment are required to obtain a certain capability in the NAS; it thus becomes necessary to study groups of avionics, rather than individual pieces. The CG definitions are designed to

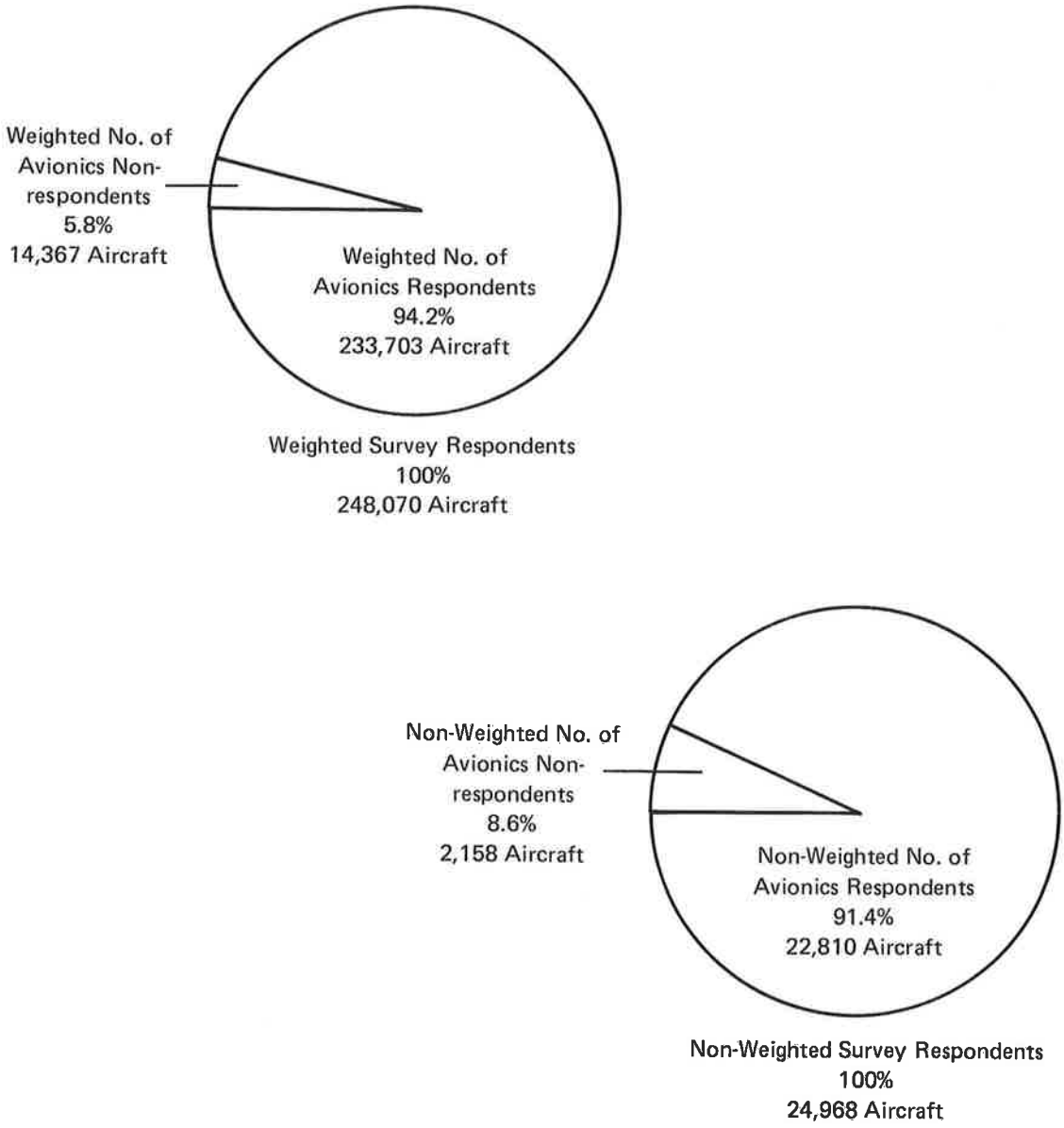

Figure 2. Survey Response to Avionics Questions

TABLE 1. BASIC AVIONICS DATA FOR 1979 GA FLEET*

VHF Communications Equipment	Estimates of Aircraft	% Standard Error
360 channels or less	127,117	A
720 channels or more	87,278	A
2 systems or more	114,095	A
None	41,670	A
Transponder Equipment		
4096 code	146,101	A
Altitude encoding	63,067	A
None	101,963	A
Navigation Equipment		
100 channels VOR receiver	89,219	A
200 channels VOR receiver	111,785	A
More than 1 VOR receiver	123,098	A
Automatic direction finder (ADF)	119,260	A
Distance measuring equipment (DME)	65,873	A
Area navigation equipment (RNAV)	18,647	A
Long range RNAV	2,852	A
Automatic pilot	73,019	A
Radar altimeter	14,505	A
Weather radar	16,219	A
None	51,397	A
Instrument Landing System		
Localizer	129,092	A
Marker beacon	114,312	A
Glide slope	95,845	A
Microwave landing system	792	C
None	113,603	A

*Based on the GA Activity and Avionics Survey for 1979.

STANDARD ERROR		CODE
Greater Than	Less Than or Equal To	
0 %	10 %	A
10 %	20 %	B
20 %	30 %	C
30 %		D

provide the link between groups of avionics equipment and capabilities. In addition, the CG's provide a framework within which other aspects of the GA fleet can be examined.

2.3.2 Assumptions

Several assumptions must be made in order to simplify the process of designing the groups and to minimize the number of groups needed. First, it is assumed that an aircraft's avionics equipment defines its capability to perform in the NAS. In actuality, an aircraft's engine size and power, pilot's certification, lack of cabin pressurization, or lack of other types of required equipment may prevent the aircraft from performing at its highest capability level according to its avionics configuration. Second, the capability groups are based on regulations and equipment requirements for the majority of general aviation aircraft. There may be exceptions to the avionics needed for certain capabilities depending on the use of the aircraft, the model of the aircraft, and the pilot's skill at maximizing the capabilities that his avionics equipment gives him. Third, it is assumed that area navigation (RNAV) equipment[1] on GA aircraft is comprised of VOR/DME-based course line computers rather than inertial or Doppler systems since as of January 1, 1975, fewer than 0.5 percent of GA aircraft contained the self-contained type of RNAV equipment.[2] Thus, RNAV equipment is considered to comply with FAA requirements for both VOR equipment and distance measuring equipment (DME).

2.3.3 Methodology

Two classifications of capability groups evolved: the first type consisted of avionics equipment meeting FAA requirements for use of the various aspects of the NAS; the second type was avionics equipment which gave an aircraft additional capability, but which was not required equipment according to FAA regulations. These two types of equipment necessitated the formation of two types of CG's.

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[1] See the Glossary for definitions of area navigation equipment and other technical terms.

[2] Avionics Installation Navigation and Communication Report, FAA/AEM.

To form the first type of CG, three sets of avionics requirements were obtained: one for flight in different segments of the airspace, another for different types of flying, and the third for landing at different airports. The three sets of requirements were combined into one set of avionics requirements dealing with the above three aspects of the NAS simultaneously. These combined requirements formed the basis for the first type of capability group. They were augmented by miscellaneous requirements for helicopters, air taxis, and gliders.

The formation of the second type of CG was a simpler task. It involved grouping component pieces of avionics equipment which together would form a complete avionics system for enabling an aircraft to make full use of a landing, communications, or navigation system in the NAS. However, except for the instrument landing system (ILS), it was found that an aircraft can gain full use of a system in the NAS by installing only one piece of airborne avionics equipment. Consequently, the second type of CG consists mainly of "groups" containing one piece of equipment each.

2.3.4 Definition of Capability Groups

Definitions of the two types of CG's mentioned above, known as hierarchical and non-hierarchical CG's, respectively, are given below in terms of the avionics equipment found in the FAA Survey Form 1800-54. A glossary at the end of this report explains the numerous terms relating to avionics equipment and the NAS found in the definitions below. Appendix D shows the various segments of the airspace and the flying regulations pertaining to the airspace, airports, and type of flying.

2.3.4.1 Hierarchical CG's

The FAA has established airborne avionics equipment requirements for aircraft use of the various segments of the NAS. In this regulatory sense, an aircraft's avionics equipment determines its capabilities to perform in areas of the NAS. FAA regulations deal with three basic capabilities: (1) to fly in different segments of the airspace, (2) to fly under visual flight rules (VFR) and instrument flight rules (IFR) type of flight, and (3) to land at different classes of airports. In the formation of CG's of avionics equipment which relate to these three capabilities, the groups take on a hierarchical nature, that is, there is an order to the groups. In general, the avionics equipment and the associated capabilities for one capability group are a subset of the avionics equipment and the associated capabilities for the next higher group.

These groups have the additional properties that they are mutually exclusive and exhaustive. When assigning individual aircraft to CG's, mutual exclusiveness means that an aircraft can be assigned to only one group. Exhaustiveness means that every aircraft will fall into a group.

Table 2 describes the hierarchical CG's in terms of avionics equipment and capabilities. The capabilities described represent the highest level at which an aircraft has avionics potential to participate in the NAS. Generally, an aircraft can also participate at all lower levels. Each group of equipment below is described in terms of (1) airspace capability, (2) type of flying capability, and (3) airport capability. Exceptions to airport and airspace capabilities are noted for helicopter and glider operations, respectively.

Figure 3 is a schematic diagram of the hierarchical capability groups, which summarizes the relationship of three types of aircraft capabilities to their required avionics equipment, namely type of flying, airspace, and airport capabilities. In the diagram, the capabilities increase from top to bottom. To determine the capability associated with a particular avionics box, simply position the box relative to the lines of the capability of interest.

2.3.4.2 Non-Hierarchical CG's

Many kinds of avionics equipment exist which give an aircraft additional capabilities to the three types discussed in the previous section. Whereas the latter capabilities are derived from regulatory considerations, those to be discussed in this section are based on engineering and safety considerations. The avionics CG's of this section have none of the properties of the previous groups. That is, they are not hierarchical in nature, nor are they mutually exclusive and exhaustive. The CG's are described in Table 3 in terms of the avionics equipment and associated capabilities.

2.4 DESCRIPTION OF AIRCRAFT CHARACTERISTICS

Eight aircraft characteristics were available on the 1979 Sample File for analysis in the framework of the CG's. They are listed below with appropriate comment.

a. Primary use of aircraft during 1979.

b. Hours flown during 1979: This variable was categorized into 50-hour intervals for easier reporting.

TABLE 2. HIERARCHICAL CAPABILITY GROUPS

AVIONICS	CAPABILITIES
Group 1 No regulatory avionics	1. Up to and including 12,500 feet mean sea level (MSL) Gliders...Up to and including 18,000 feet MSL ADF...Colored airways below 12,500 feet MSL VOR or RNAV...VOR airways below 12,500 feet MSL RNAV...Low altitude RNAV airways below 12,500 feet MSL 2. VFR flight, day and night 3. Uncontrolled airports
Group 2 Two-way communications	1. Up to and including 12,500 feet MSL Gliders...Up to and including 18,000 feet MSL 2. VFR flight, day and night 3. Non-TCA controlled airports Group III TCA's Helicopters with 4096 code transponders...Group III TCA's All helicopters...Group I and II TCA's below 1,000 feet above ground level (AGL) Note: Air taxis with navigation system and transponder: Group II TCA's Air taxis with navigation system, transponder and altitude reporting: Group I TCA's and non-positive controlled airspace Air taxis with navigation system, DME, transponder and altitude reporting: Group I TCA's and positive controlled airspace

TABLE 2. HIERARCHICAL CAPABILITY GROUPS (CONTINUED)

AVIONICS	CAPABILITIES
Group 3 Two-way communications Two systems---air taxis VOR or Automatic Direction Finder (ADF) or RNAV	1. Up to and including 12,500 feet MSL Gliders...Up to and including 18,000 feet MSL ADF...Colored airways below 12,500 feet MSL VOR or RNAV...VOR airways below 12,500 feet MSL RNAV...Low altitude RNAV airways below 12,500 feet MSL 2. IFR flight 3. Non-TCA controlled airways Group III TCA's Helicopters with 4096 code transponders...Group II TCA's All helicopters...Group I and II TCA's below 1,000 feet AGL
Group 4 Two-way communications Two systems---air taxis 4096 code transponder VOR or RNAV	1. Up to and including 12,500 feet MSL Gliders...Up to and including 18,000 feet MSL VOR airways below 12,500 feet MSL RNAV...Low altitude RNAV airways below 12,500 feet MSL 2. IFR flight 3. Non-TCA controlled airports Group II TCA's Helicopters...Group I TCA's below 1,000 feet AGL
Group 5 4096 code transponder Altitude encoding equipment	1. Non-positive controlled airspace 2. VFR flight, day and night 3. Uncontrolled airports Group III TCA's

TABLE 2. HIERARCHICAL CAPABILITY GROUPS (CONTINUED)

AVIONICS	CAPABILITIES
Group 6 Two-way communications 4096 code transponder Altitude encoding equipment	1. Non-positive controlled airspace 2. VFR flight, day and night 3. Non-TCA controlled airports Group III TCA's Helicopters...Group I TCA's
Group 7 Two-way communications Two systems---air taxis 4096 code transponder Altitude encoding equipment VOR	1. Non-positive controlled airspace VOR airways 2. IFR flight 3. Group I TCA's
Group 8 Two-way communications Two systems---air taxis 4096 code transponder Altitude encoding equipment VOR DME } or RNAV	1. Positive controlled airspace Jet routes RNAV...RNAV routes 2. IFR flight 3. Group I TCA's

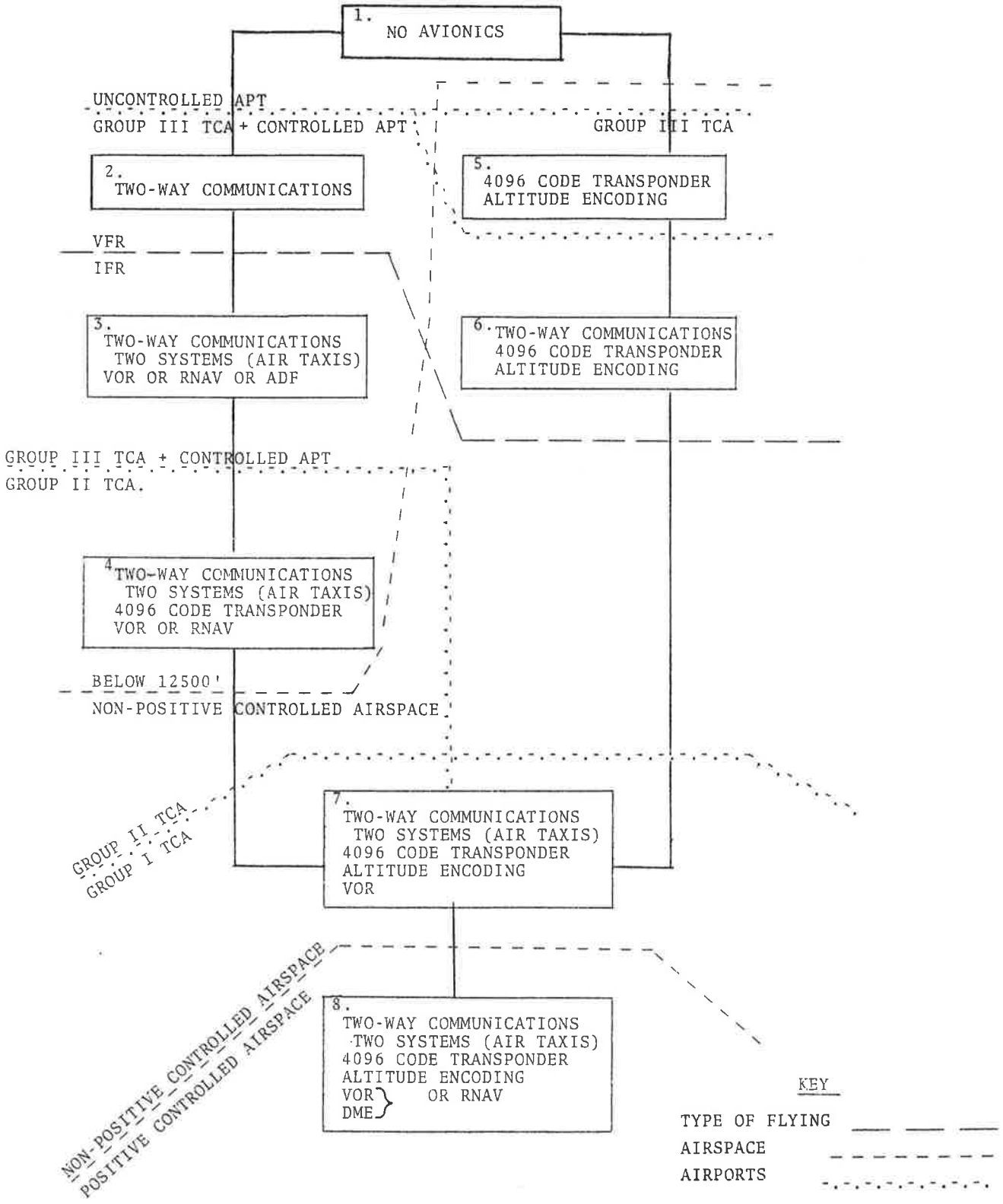

Figure 3. Hierarchical Capability Groups (CG's)

TABLE 3. NON-HIERARCHICAL CAPABILITY GROUPS

AVIONICS	CAPABILITIES
Group 1 Localizer	Partial use of airport ILS
Group 2 Localizer Marker Beacon	Partial use of airport ILS
Group 3 Localizer Marker Beacon Glide Slope	Full use of airport ILS
Group 4 ILS Radar Altimeter	Landing approach in Category III[1] weather conditions at airports with Category III equipment
Group 5 Long Range RNAV	Area navigation over long distances and large bodies of water
Group 6 Radar Altimeter	Determination of altitude above level of terrain
Group 7 Microwave Landing System (MLS)	More accurate and flexible landing approaches, especially at airports with mountains and large buildings nearby
Group 8 ILS MLS	Backup landing systems
Group 9 Long Range RNAV MLS	Sophisticated navigational and landing capabilities

[1]See Appendix D, "Weather Category Definitions."

c. Age of aircraft in 1979: This variable was categorized into 5-year intervals for easier reporting.

d. Computed aircraft type: The 13 computed aircraft types listed in Table 4 combine the four aircraft characteristics of engine type, number of engines, aircraft type (simple), and number of seats into meaningful combinations for the GA fleet.

e. Aircraft type (simple).

f. Engine type.

g. Number of engines.

h. Number of seats.

TABLE 4. COMPUTED AIRCRAFT TYPE

TYPE	DESCRIPTION
1.	Fixed wing single engine piston 1-3 seats
2.	Fixed wing single engine piston 4+ seats
3.	Fixed wing two engine piston 1-6 seats
4.	Fixed wing two engine piston 7+ seats
5.	Fixed wing piston other
6.	Fixed wing two engine turboprop 1-12 seats
7.	Fixed wing two engine turboprop 13+ seats
8.	Fixed wing turboprop other
9.	Fixed wing two engine turbojet
10.	Fixed wing turbojet other
11.	Rotorcraft piston
12.	Rotorcraft turbine
13.	Other aircraft

3. RESULTS

3.1 NON-HIERARCHICAL VERSUS HIERARCHICAL CAPABILITY GROUPS (CG's)

Table 5 presents the estimates of the number of GA aircraft found in the hierarchical and non-hierarchical CG's. Hierarchical CG's vary across the columns and non-hierarchical CG's vary across the rows, each beginning with the least sophisticated CG in the upper left hand corner of the table. Entries in the table are composed of four lines: aircraft estimate, standard error, percent of the row or non-hierarchical capability that estimate represents, and percent of the column or hierarchical capability that estimate represents.

Examination of Table 5 reveals the following observations on the GA fleet.

3.1.1 Hierarchical CG's

Changes in the hierarchical CG's include the following:

a. More than 19 percent of GA aircraft have the avionics equipment enabling them to fly above 18,000 feet in positive controlled airspace. Approximately 75 percent of the GA fleet cannot fly above 12,500 feet due to avionics limitations alone.

b. Over 77 percent of GA aircraft are equipped to fly IFR.

c. More than 16 percent of the GA fleet are limited to landing at uncontrolled airports. Approximately 26 percent can land at either uncontrolled airports or Group III TCA's. Approximately 32 percent can land at any type of airport except a Group I TCA. About 25 percent can land at Group I TCA's. This proportion has increased constantly over the past 5 years.

d. Hierarchical CG's 5 and 6 together contain only 0.5 percent of the GA fleet, showing little change from prior years.

TABLE 5. NON-HIERARCHICAL VS. HIERARCHICAL CAPABILITY GROUPS

1979

		1	2	3	4	5	6	7	8	TOTALS
L	ESTIMATE	58	418	6902	11458	0	31	900	312	20078
	% STD ERR	*	27.6	6.9	5.5	0.0	*	20.0	31.9	4.0
	ROW %	0.3	2.1	34.4	57.1	0.0	0.2	4.5	1.6	
	COLUMN %	0.1	3.2	13.8	14.3	0.0	3.1	6.6	0.6	8.1
L/MB	ESTIMATE	61	43	1864	11055	0	84	1259	846	15213
	% STD ERR	*	*	13.5	5.6	0.0	*	17.5	19.5	4.7
	ROW %	0.4	0.3	12.3	72.7	0.0	0.6	8.3	5.6	
	COLUMN %	0.1	0.3	3.7	13.8	0.0	8.3	9.2	1.8	6.1
L/MB/GS	ESTIMATE	203	167	1277	33541	169	616	10091	34525	80588
	% STD ERR	42.6	39.7	16.3	2.9	40.2	22.0	5.9	2.4	1.3
	ROW %	0.3	0.2	1.6	41.6	0.2	0.8	12.5	42.8	
	COLUMN %	0.5	1.3	2.6	41.7	66.0	60.9	73.9	71.7	32.5
L/MB/GS/RA	ESTIMATE	0	16	18	663	21	124	332	12038	13213
	% STD ERR	0.0	*	*	17.6	*	45.4	32.3	3.3	3.2
	ROW %	0.0	0.1	0.1	5.0	0.2	0.9	2.5	91.1	
	COLUMN %	0.0	0.1	0.0	0.8	8.2	12.3	2.4	25.0	5.3
LRN	ESTIMATE	14	173	97	664	11	95	11	1787	2852
	% STD ERR	39.6	33.0	34.1	21.0	*	48.7	*	8.6	7.7
	ROW %	0.5	6.1	3.4	23.3	0.4	3.3	0.4	62.7	
	COLUMN %	0.0	1.3	0.2	0.8	4.3	9.4	0.1	3.7	1.1
RA	ESTIMATE	14	31	118	1207	30	205	442	12458	14505
	% STD ERR	*	*	*	14.6	42.9	34.5	25.8	3.3	3.2
	ROW %	0.1	0.2	0.8	8.3	0.2	1.4	3.0	85.9	
	COLUMN %	0.0	0.2	0.2	1.5	11.7	20.3	3.2	25.9	5.8
ML	ESTIMATE	2	25	41	258	31	0	4	431	792
	% STD ERR	*	*	*	35.1	*	0.0	*	25.1	18.6
	ROW %	0.3	3.2	5.2	32.6	3.9	0.0	0.5	54.4	
	COLUMN %	0.0	0.2	0.1	0.3	12.1	0.0	0.0	0.9	0.3
L/MB/GS/ML	ESTIMATE	0	25	33	244	31	0	2	332	668
	% STD ERR	0.0	*	*	36.4	*	0.0	*	26.3	19.6
	ROW %	0.0	3.7	4.9	36.5	4.6	0.0	0.3	49.7	
	COLUMN %	0.0	0.2	0.1	0.3	12.1	0.0	0.0	0.7	0.3

TABLE 5. NON-HIERARCHICAL VS. HIERARCHICAL CAPABILITY GROUPS
(CONTINUED)
1979

TABLE 5. NON-HIERARCHICAL VS. HIERARCHICAL CAPABILITY GROUPS
(CONTINUED)

1979

		1	2	3	4	5	6	7	8	TOTALS
LRN/ML	ESTIMATE	0	0	36	33	6	0	2	223	300
	% STD ERR	0.0	0.0	49.1	47.3	*	0.0	*	37.1	28.8
	ROW %	0.0	0.0	12.0	11.0	2.0	0.0	0.7	74.3	
	COLUMN %	0.0	0.0	0.1	0.0	2.3	0.0	0.0	0.5	0.1
NO GROUP	ESTIMATE	41077	12348	39859	23514	57	155	974	273	118258
	% STD ERR	1.5	4.0	2.4	3.7	*	41.2	19.1	37.6	0.9
	ROW %	34.7	10.4	33.7	19.9	0.0	0.1	0.8	0.2	
	COLUMN %	99.2	93.8	79.7	29.3	22.3	15.3	7.1	0.6	47.7
ALL CRAFT	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 5. NON-HIERARCHICAL VS. HIERARCHICAL CAPABILITY GROUPS
(Continued)

KEY

Hierarchical Capability Groups

1. No regulatory avionics[1]
2. Two-way communications
3. Two-way communications
   Two systems - air taxis
   VOR or ADF or RNAV
4. Two-way communications
   Two systems - air taxis
   4096 code transponder
   VOR or RNAV
5. 4096 code transponder
   Altitude encoding equipment
6. Two-way communications
   4096 code transponder
   Altitude encoding equipment
7. Two-way communications
   Two systems - air taxis
   4096 code transponder
   Altitude encoding equipment
   VOR
8. Two-way communications
   Two systems - air taxis
   4096 code transponder
   Altitude encoding equipment
   VOR / DME or RNAV

Non-Hierarchical Capability Groups[2]

L: Localizer
MB: Marker Beacon
GS: Glide Slope
MLS: Microwave Landing System
RA: Radar Altimeter
LRN: Long Range RNAV
NO GROUP[3]: Non-grouped aircraft

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[1]Aircraft assigned to hierarchical CG 1 (No regulatory avionics) contain either no avionics equipment whatsoever or a combination of equipment which does not match or exceed the specified requirements for any other hierarchical CG.

[2]Since non-hierarchical groups are not all mutually exclusive (they overlap), the columns do not add to the counts at the bottom of the table. The first four groups (L through L, MB, GA, RA) are mutually exclusive among themselves. However, there is some overlap between the first four groups and the next five groups. The last group is mutually exclusive of the other nine.

[3]Non-grouped aircraft (NG) are those aircraft possessing none of the avionics covered by the other nine non-hierarchical CG's.

A comparison of hierarchical CG's for the past five year period reveals that significant changes occurred in two of the basic capabilities: airspace and airport. Growth occurred in the capability of flying above 18,000 feet (CG 8) in positive controlled airspace and the capability of landing at Group I TCA's (CG's 7 and 8). This indicates a general increase in avionics sophistication over the five year period. Figures 4, 5, 6, and 7 illustrate the changes which occurred in these two basic capabilities.

Figures 4 and 6 present the percentages of the fleet within the subdivisions of the airspace and airport capabilities, respectively. Those subdivisions requiring more sophisticated avionics increased while those requiring less sophistication decreased consistently over the past five years.

Figures 5 and 7 present normalized[1] growth of the capabilities from 1975 to 1979 relative to growth of the fleet as a whole. Normalization allows one to observe clearly changes in group sizes which are significant in relation to changes in the overall fleet. Figure 5 shows that the proportion of the fleet capable of flying above 18,000 feet grew much more rapidly than the fleet. In contrast, growth of planes flying below 12,500 feet (CG's 1-4) lagged behind growth of the fleet as a whole. Figure 7 shows that growth in the proportion of the fleet capable of landing at Group I TCA's was much larger than overall fleet growth.

In general, Table 5 indicates that those aircraft in the least sophisticated non-hierarchical CG's also comprise the bulk of the least sophisticated hierarchical CG's. Of the aircraft possessing none of the non-hierarchical CG equipment (i.e., NO GROUP) 78.8 percent fall into hierarchical CG's 1, 2, and 3. Similarly, those aircraft in the most sophisticated non-hierarchical CG's are also in the most sophisticated hierarchical CG's. For example, 91.1 percent of the aircraft possessing a complete ILS and a radar altimeter fall into hierarchical CG 8.

Figures 8 and 9 illustrate the changes which occurred to the hierarchical CG's from 1975 to 1979. Figure 8 provides a comparison of the major hierarchical CG percentages over the five year period and also enables one to gauge the group sizes relative to each other. It is evident that groups 3 and 4 comprise almost half the GA fleet, but that group 8 is gaining in importance. The constant decrease in group 3 (one of the groups that is limited in airport capability) along with the group 8 increases seems to substantiate that more owners are equipping their aircraft for the use of sophisticated airports.

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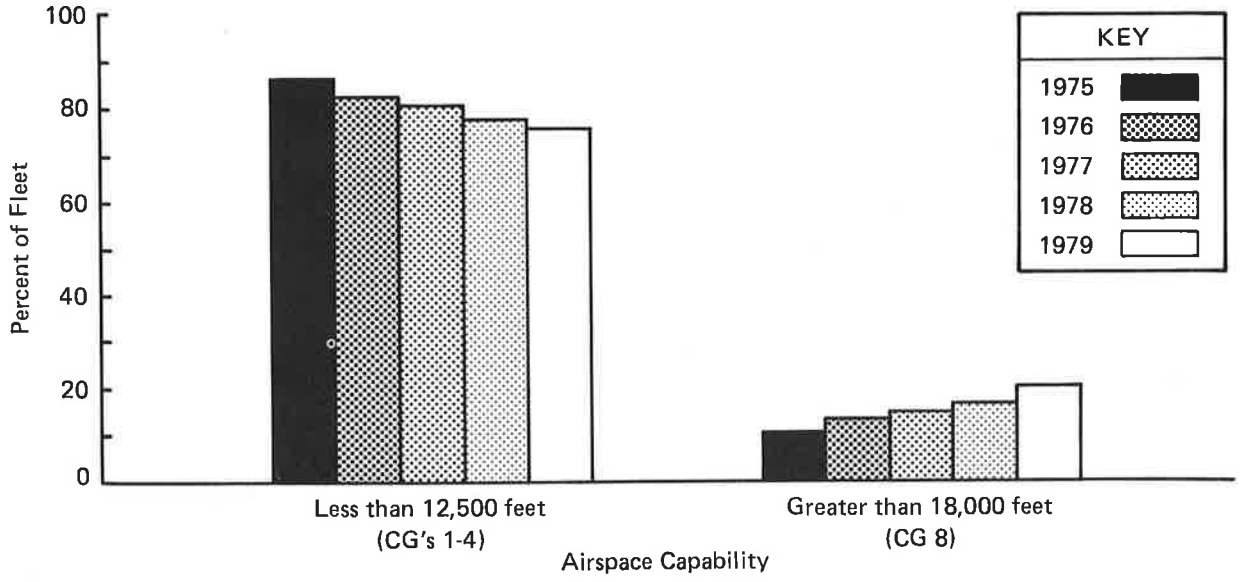
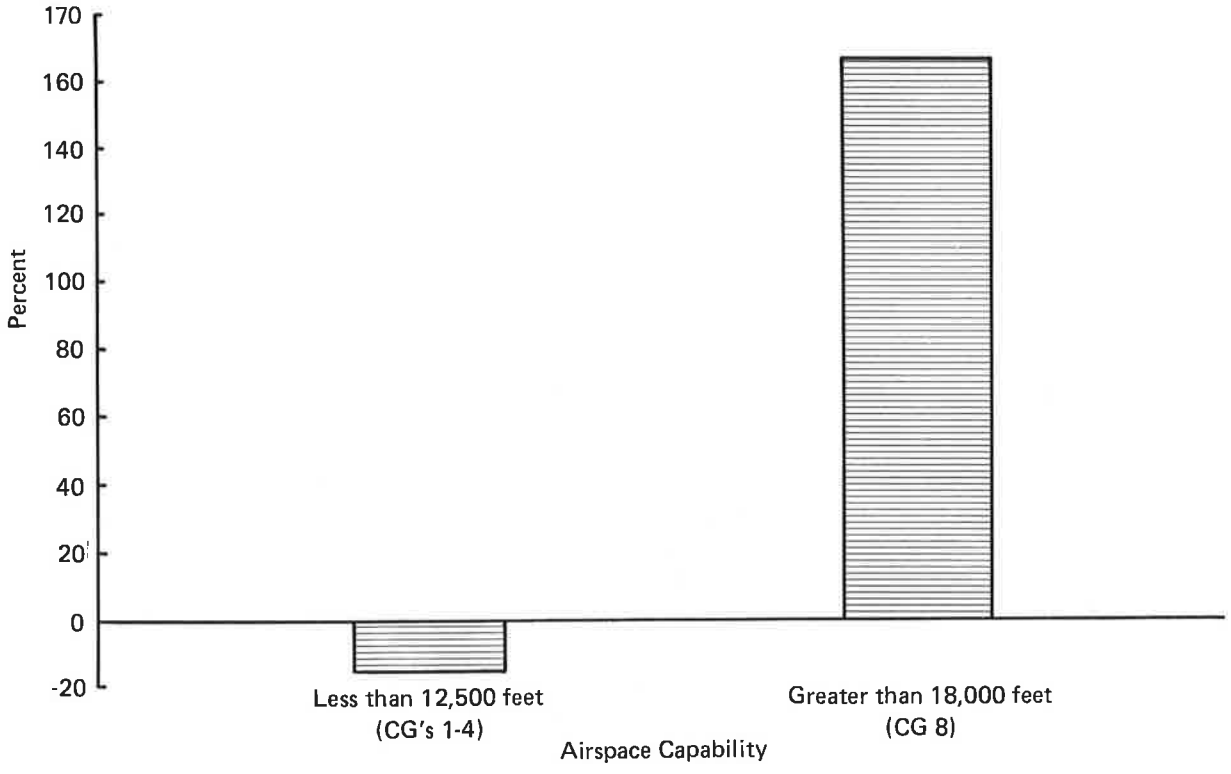
[1] Each group is normalized by the following formula: [(percent aircraft in 1979) - (percent aircraft in 1974)] ÷ (percent aircraft in 1974).



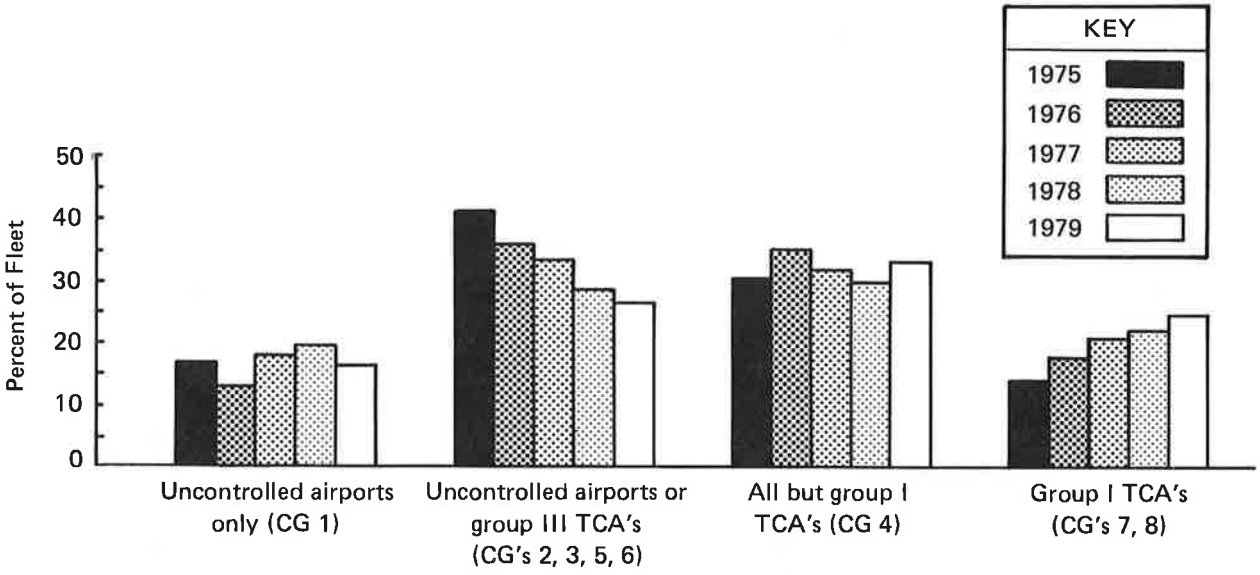
The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 4. A Five Year Comparison of Airspace Capabilities



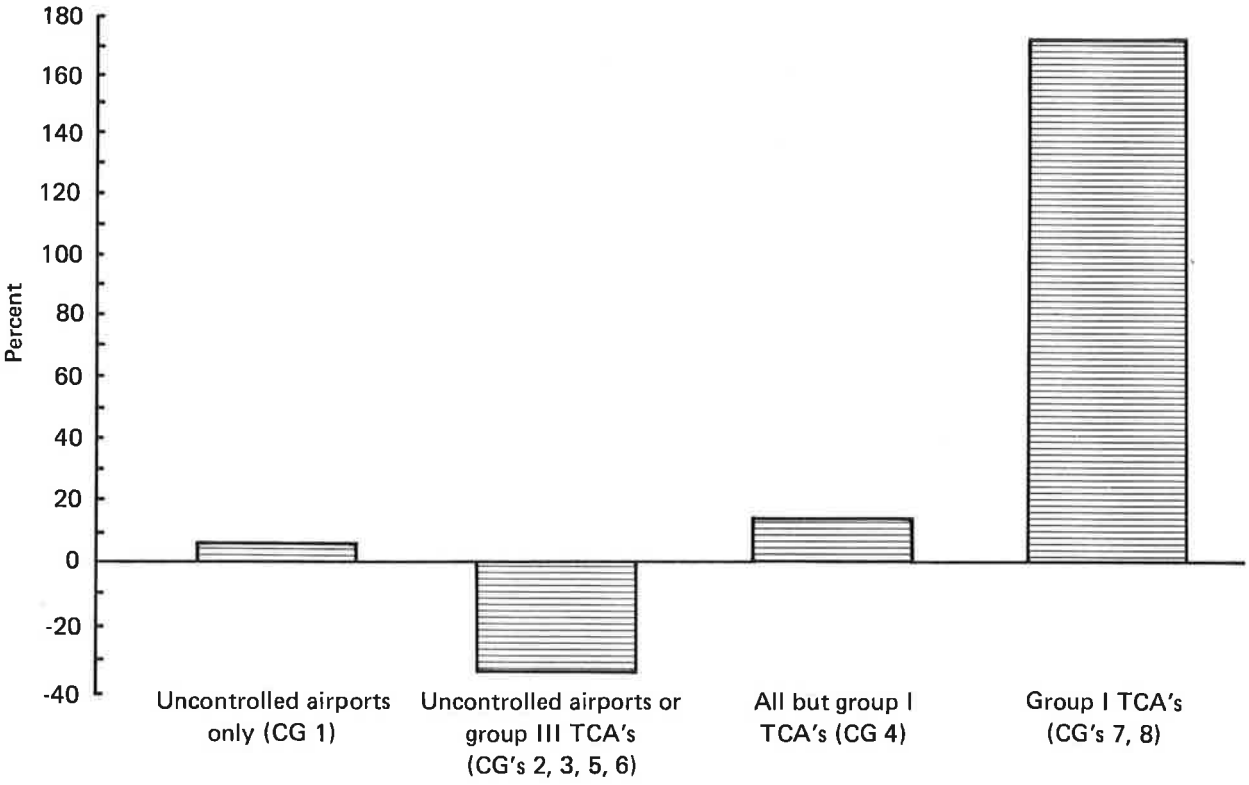
The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 5. Five Year Normalized Growth in Airspace Capabilities



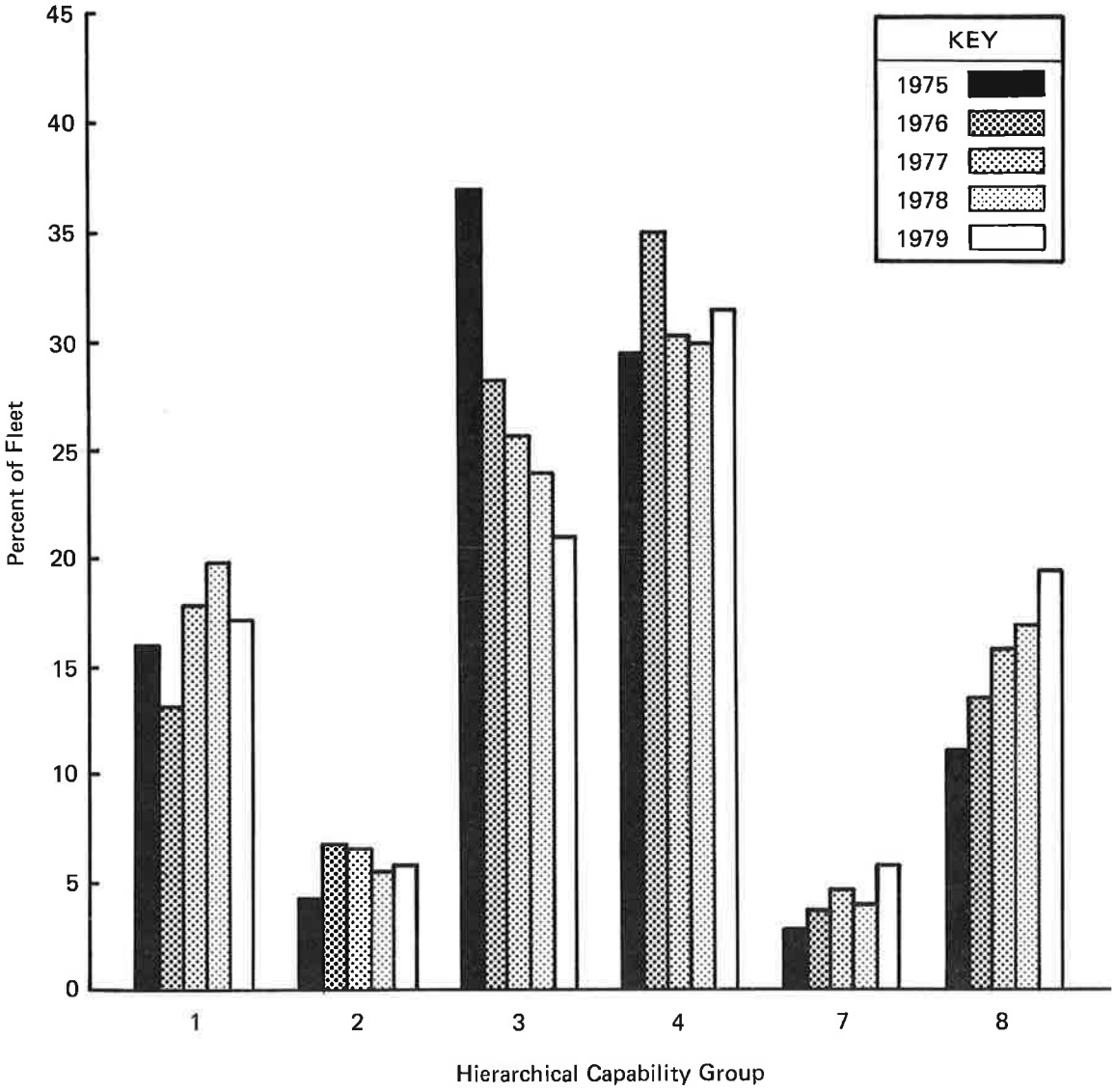
The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 6. A Five Year Comparison of Airport Capabilities



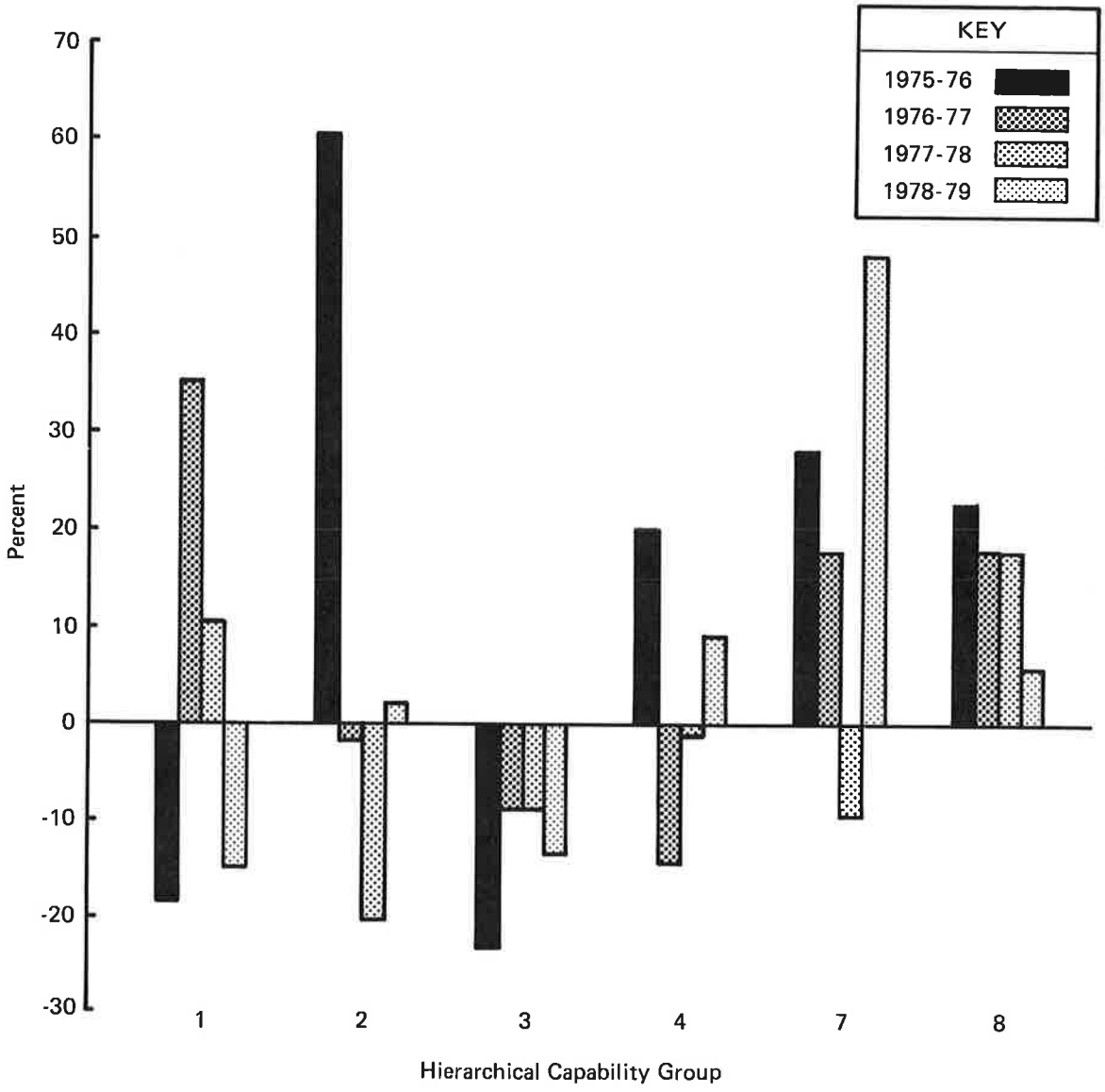
The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 7. Five Year Normalized Growth in Airport Capabilities



The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 8. A Five Year Comparison of Hierarchical CG's



The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 9. Normalized Growth in Hierarchical Group Size from 1975 to 1979

Figure 9 presents the normalized growth of the CG's relative to the growth of the fleet as a whole on a year by year basis. A study of Figure 9 reveals that CG's 4, 7, and 8 grew faster from 1978 to 1979 than the overall fleet. But, the growth in CG 8 has slowed this past year. Growth exhibited by CG 2 is only 1.9 percent and therefore relatively insignificant in the 1979 sample survey. Growth in CG's 4, 7 and 8 indicates a general trend toward greater sophistication in avionics and increased airport capability.

3.1.2 Non-Hierarchical CG's

Because the non-hierarchical capability groups were revised in 1976, comparison with previous years can be done only for the groups L; L, MB; and L, MB, GS. Figures 10 and 11 illustrate the changes from 1975 to 1979 in these three CG's. Figure 12 illustrates the change from 1976 to 1977, 1977 to 1978, and 1978 to 1979 in other non-hierarchical capability groups. A study of Figures 10 and 11 shows a decrease in partial ILS groups, and an increase in full ILS groups. This indicates the same trend toward sophistication in avionics noted in the hierarchical CG's and a willingness of GA aircraft owners to invest in sophisticated avionics equipment.

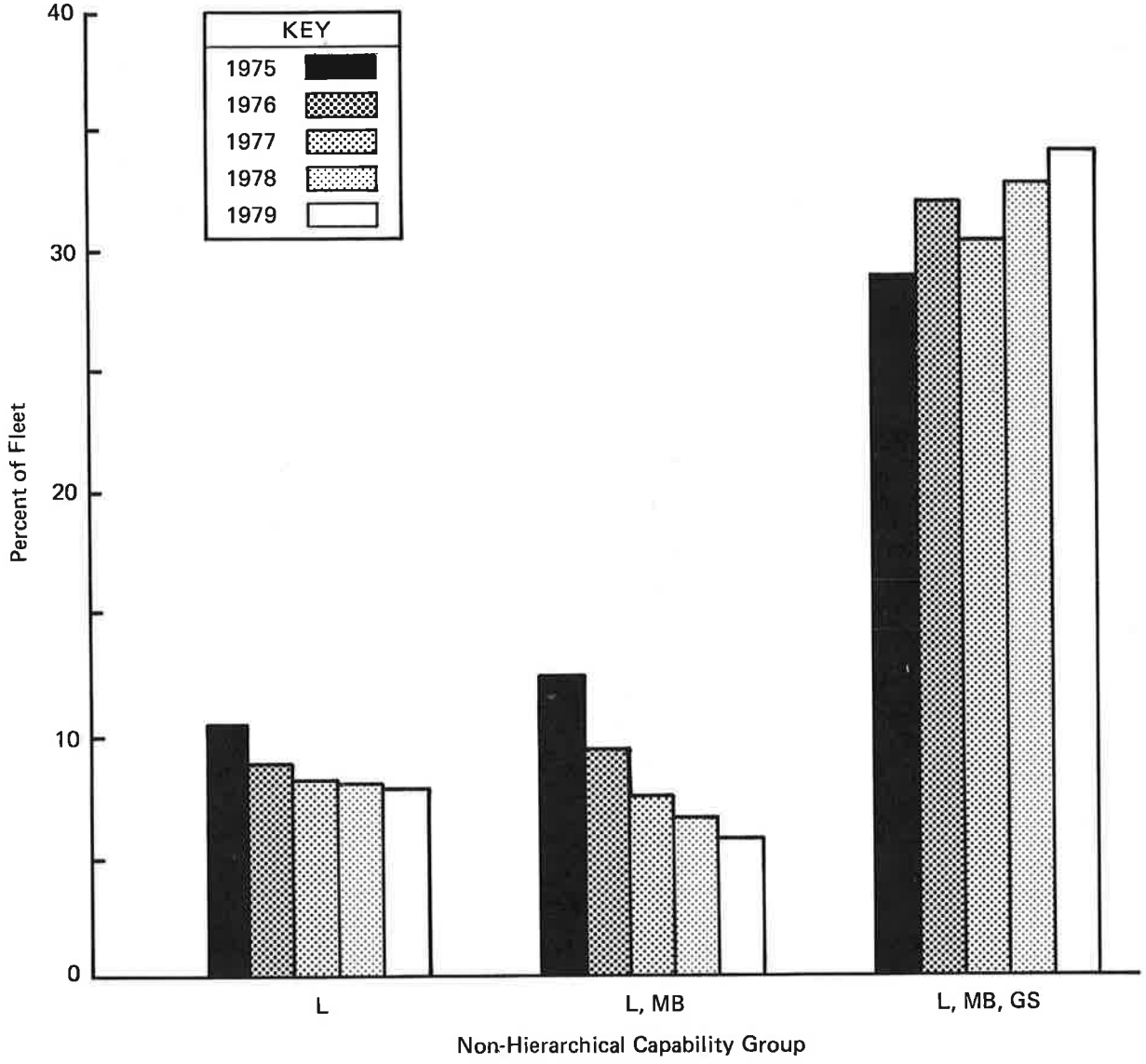
3.2 CHARACTERISTICS OF CAPABILITY GROUPS (CG's)

Tables 6 through 23 show four numbers in each cell. The first is the estimate of the number of aircraft falling into the particular capability group-category combination represented by the cell. The second is the percent standard error. The third number is the percent of the row or category that the number of aircraft represents. The fourth number is the percent of the column or capability group that the number of aircraft represents.

The key appearing at the bottom of each table gives the avionics associated with the CG's. Hierarchical group reports are additive across the columns as these groups are mutually exclusive. The numbers in the right-hand columns of the non-hierarchical group reports are the marginal distributions of the GA fleet across the categories, but are not row totals since non-hierarchical CG's are not mutually exclusive.

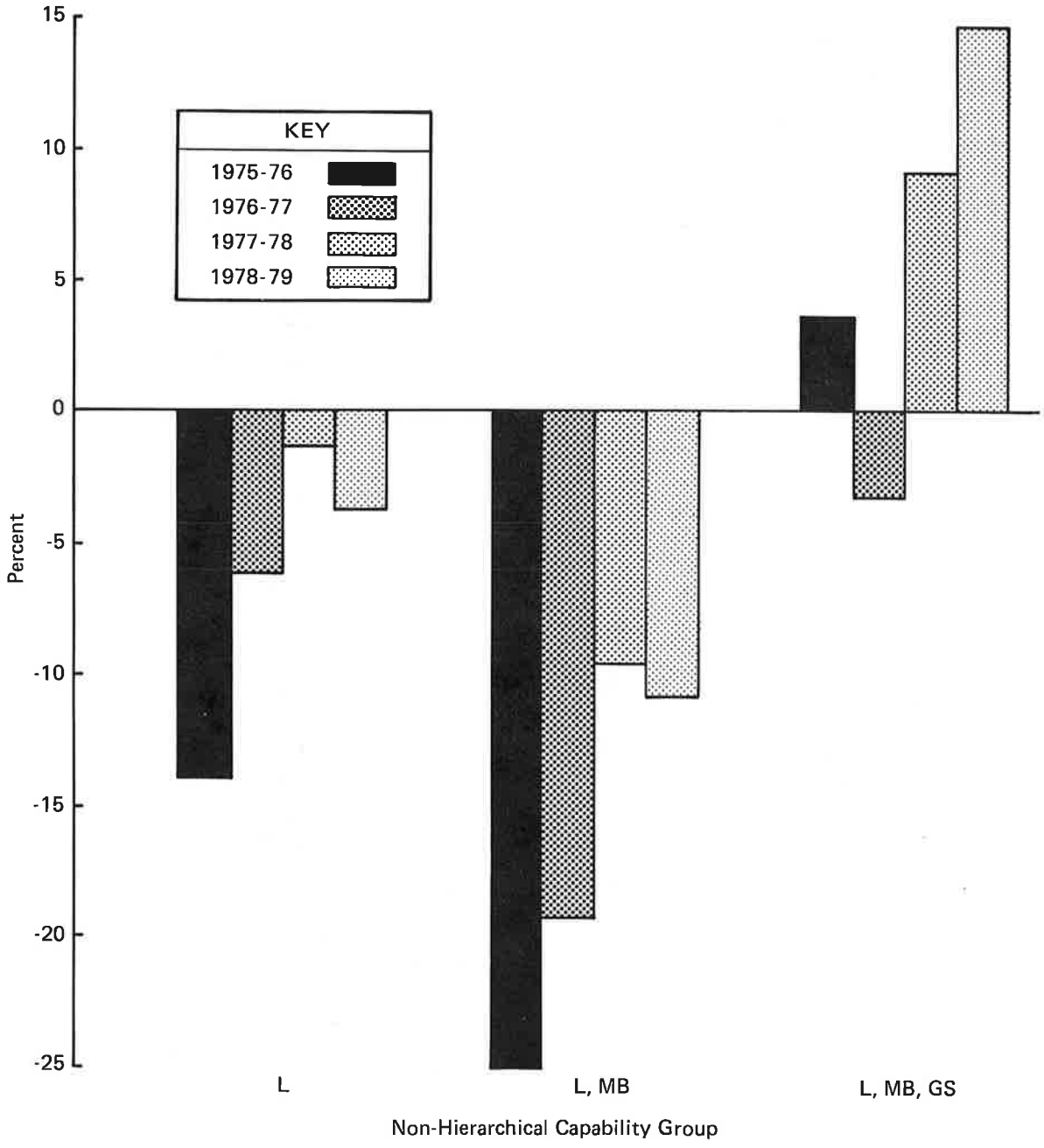
3.2.1 Characteristics of Hierarchical CG's

As mentioned in the discussion of Table 5, there was significant growth in hierarchical CG's 4, 7, and 8 from 1978 to 1979 attributable to both upgrading avionics systems in pre-1979 aircraft and installing complex avionics equipment in new aircraft. Tables 6 through 15 and Figures 13 through 17 show the kinds of aircraft exhibiting these changes and present other characteristics of the GA fleet.



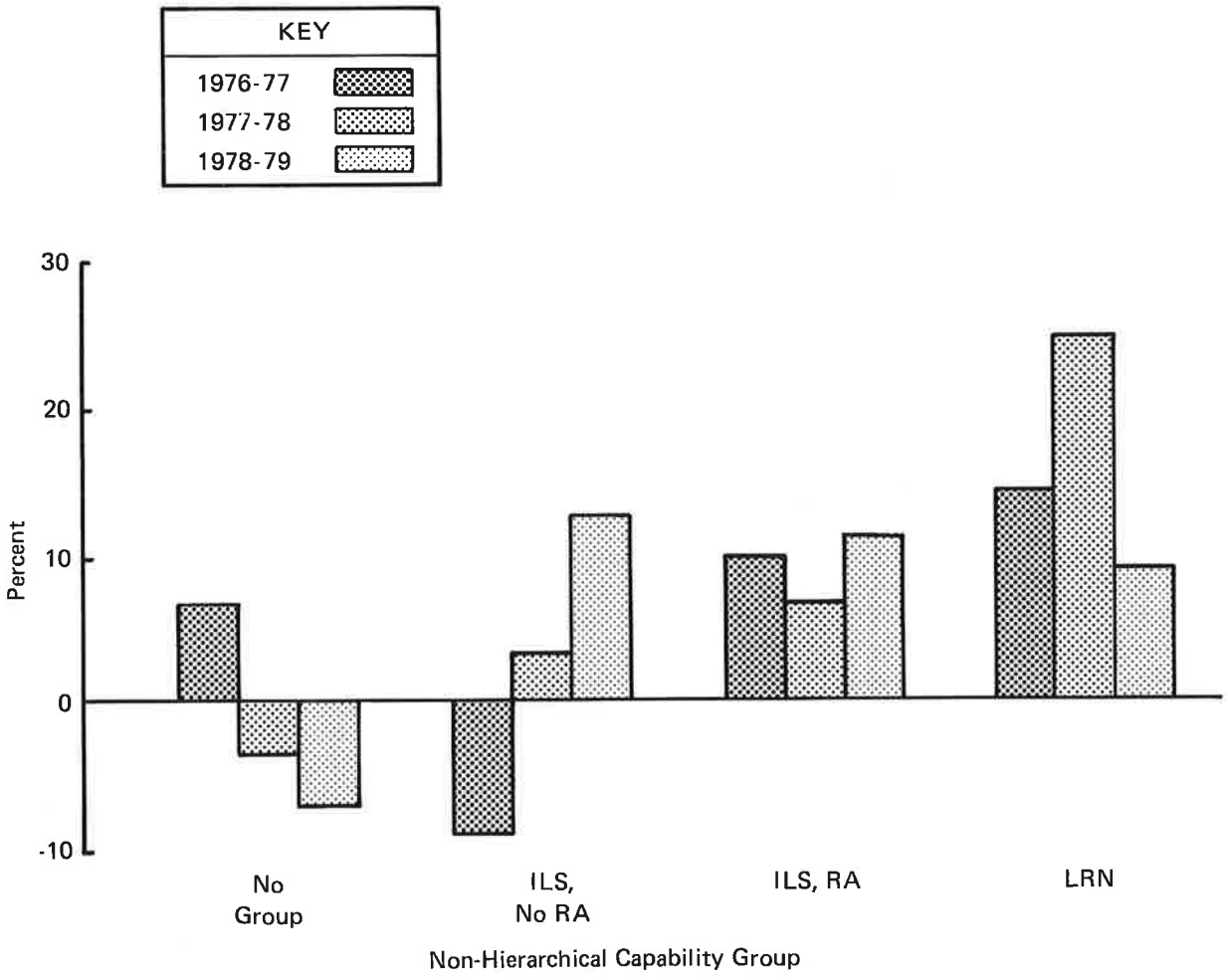
The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 10. A Five Year Comparison of Non-Hierarchical Groups



The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 11. Normalized Growth in Non-Hierarchical Groups from 1975 to 1979



The 1977-1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 12. Normalized Growth in Non-Hierarchical Groups from 1976 to 1977, 1977 to 1978, and 1978 to 1979

Generally, those aircraft in low order CG's have less sophisticated characteristics than those aircraft in high order CG's as follows:

a. As in prior years, as the hierarchical CG's increased in sophistication, the predominant uses also grew in sophistication from personal, to business and personal, to executive, business and personal (Table 6, Figure 13).

b. Aircraft containing more avionics equipment and capabilities are flown more hours than those with smaller investments in avionics equipment (Table 8, Figure 15).

c. Aircraft in the more sophisticated CG's contain newer aircraft on the average than less sophisticated CG's (Table 9, Figure 16).

d. As in a., above, the computed aircraft type, as well as the four individual characteristics which are combined to form computed aircraft type (simple aircraft type, engine type, number of engines, number of seats), become progressively more sophisticated moving from low to high order CG's (Tables 10 through 14, Figure 17).

A comparison of the 1979 tables with the 1978 tables reveals that the growth in hierarchical CG's 4, 7, and 8 was overall with no particular category showing a significant change.

3.2.2 Characteristics of Non-Hierarchical CG's

In the discussion of Table 5, it was noted that the non-hierarchical groups containing complete ILS changed substantially from 1978 to 1979. Tables 15 through 23 and Figures 18 through 22 help to identify which kinds of GA aircraft installed these avionics systems during 1979, and to characterize in general the kinds of GA aircraft equipped with these avionics.

Tables 15 through 23 show that sophisticated aircraft in terms of characteristics such as primary use, aircraft type, flying hours, etc., are more likely to possess advanced avionics systems than the simpler aircraft in the GA fleet as follows:

a. As non-hierarchical CG's increase in sophistication, the predominant primary uses of aircraft change from personal and business, to personal, business and executive, to business and executive. For

example, executive aircraft alone compose over 57 percent of the aircraft reporting both a microwave landing system and a long range RNAV and about 46 percent of the aircraft reporting a complete ILS and radar altimeter, yet executive aircraft compose only 5.6 percent of the fleet (Table 15 and Figure 18).

b. Aircraft containing more avionics equipment and capabilities fly more hours than aircraft with smaller investments in avionics equipment (Table 17 and Figure 20).

c. Aircraft falling into the non-grouped category are older than those falling into the other non-hierarchical CG's. Within the latter groups, age decreases as the level of avionics increases (Table 18 and Figure 21).

d. Computed aircraft type increases in sophistication as the level of avionics increases. This direct relationship also holds for the following four characteristics which are combined to form computed aircraft type: simple aircraft type, engine type, number of engines, and number of seats (Tables 19 through 23 and Figure 22).

No significant changes in aircraft non-hierarchical avionics occurred from 1978 to 1979.

TABLE 6. HIERARCHICAL GROUPS - PRIMARY USE VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
EXECUTIVE	ESTIMATE	640	216	475	1933	26	0	283	10435	14007
	% STD ERR	18.9	39.1	23.2	12.6	*	0.0	30.1	3.6	3.5
	ROW %	4.6	1.5	3.4	13.8	0.2	0.0	2.0	74.5	
	COLUMN %	1.5	1.6	0.9	2.4	10.2	0.0	2.1	21.7	5.6
BUSINESS	ESTIMATE	1475	689	4520	19627	71	67	4103	19961	50512
	% STD ERR	13.5	17.9	8.6	4.1	*	*	9.7	3.5	2.1
	ROW %	2.9	1.4	8.9	38.9	0.1	0.1	8.1	39.5	
	COLUMN %	3.6	5.2	9.0	24.4	27.7	6.6	30.0	41.5	20.4
PERSONAL	ESTIMATE	13705	5352	27504	37691	22	52	4798	8668	97791
	% STD ERR	3.4	6.4	3.0	2.7	*	*	8.8	6.2	1.3
	ROW %	14.0	5.5	28.1	38.5	0.0	0.1	4.9	8.9	
	COLUMN %	33.1	40.7	55.0	46.9	8.6	5.1	35.1	18.0	39.4
AERIAL AP.	ESTIMATE	6406	759	302	399	3	2	81	38	8000
	% STD ERR	3.9	19.4	28.8	23.4	*	*	*	*	3.4
	ROW %	80.1	9.6	3.8	5.0	0.0	0.0	1.0	0.5	
	COLUMN %	15.5	5.8	0.6	0.5	1.2	0.2	0.6	0.1	3.2
INSTRUCT.	ESTIMATE	687	667	4801	7228	0	0	1350	1114	15847
	% STD ERR	18.9	23.9	9.1	7.2	0.0	0.0	17.3	16.9	4.5
	ROW %	4.3	4.2	30.3	45.6	0.0	0.0	8.5	7.0	
	COLUMN %	1.7	5.1	9.6	9.0	0.0	0.0	9.9	2.3	6.4
AIR TAXI	ESTIMATE	20	2157	203	1361	0	716	493	3817	8767
	% STD ERR	*	9.9	34.2	15.1	0.0	19.9	24.6	7.6	5.0
	ROW %	0.2	24.6	2.3	15.5	0.0	8.2	5.6	43.5	
	COLUMN %	0.0	16.4	0.4	1.7	0.0	70.8	3.6	7.9	3.5
INDUSTR SP	ESTIMATE	100	497	877	937	0	85	168	395	3059
	% STD ERR	*	19.9	20.8	19.2	0.0	*	48.0	27.8	10.2
	ROW %	3.3	16.2	28.7	30.6	0.0	2.8	5.5	12.9	
	COLUMN %	0.2	3.8	1.8	1.2	0.0	8.4	1.2	0.8	1.2
RENTAL	ESTIMATE	432	233	1793	6600	75	3	1604	2280	13020
	% STD ERR	24.0	27.4	15.5	7.7	*	*	15.7	12.5	5.3
	ROW %	3.3	1.8	13.8	50.7	0.6	0.0	12.3	17.5	
	COLUMN %	1.0	1.8	3.6	8.2	29.3	0.3	11.7	4.7	5.2

TABLE 6. HIERARCHICAL GROUPS - PRIMARY USE VS. CAPABILITY GROUP
(CONTINUED)
1979

		1	2	3	4	5	6	7	8	TOTALS
OTHER	ESTIMATE	715	707	1143	1380	45	49	502	1003	5542
	% STD ERR	17.0	19.5	17.4	14.6	*	*	26.3	14.4	7.0
	ROW %	12.9	12.8	20.6	24.9	0.8	0.9	9.1	18.1	
	COLUMN %	1.7	5.4	2.3	1.7	17.6	4.8	3.7	2.1	2.2
INACTIVE	ESTIMATE	17258	1874	8526	3334	7	34	303	742	32078
	% STD ERR	3.1	10.8	5.5	9.8	*	*	31.8	16.4	2.4
	ROW %	53.8	5.8	26.6	10.4	0.0	0.1	0.9	2.3	
	COLUMN %	41.7	14.2	17.0	4.1	2.7	3.4	2.2	1.5	12.9
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

KEY

GROUP
1. NO REGULATORY AVIONICS
2. TWO-WAY COMMUNICATIONS
3. TWO-WAY COMMUNICATIONS
   TWO SYSTEMS - AIR TAXIS
   VOR OR ADF OR RNAV

GROUP
4. TWO-WAY COMMUNICATIONS
   TWO SYSTEMS - AIR TAXIS
   4096 CODE TRANSPONDER
   VOR OR RNAV
5. 4096 CODE TRANSPONDER
   ALTITUDE ENCODING EQUIPMENT
6. TWO-WAY COMMUNICATIONS
   4096 CODE TRANSPONDER
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GROUP
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NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 7. HIERARCHICAL GROUPS - BASE AIRPORT REGION VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
NEW ENGLND	ESTIMATE	4413	1373	5029	8296	1	93	1638	6559	27402
	% STD ERR	7.0	13.5	8.1	6.6	*	*	15.1	6.7	3.2
	ROW %	16.1	5.0	18.4	30.3	0.0	0.3	6.0	23.9	
	COLUMN %	10.7	10.4	10.0	10.3	0.4	9.2	12.0	13.6	11.0
EASTERN	ESTIMATE	6488	1932	6696	10128	92	157	2076	7939	35508
	% STD ERR	5.7	11.2	7.1	5.9	*	43.3	13.4	5.6	2.8
	ROW %	18.3	5.4	18.9	28.5	0.3	0.4	5.8	22.4	
	COLUMN %	15.7	14.7	13.4	12.6	35.9	15.5	15.2	16.5	14.3
SOUTHERN	ESTIMATE	3516	488	2989	6113	0	108	447	2799	16460
	% STD ERR	8.3	23.2	11.0	7.8	0.0	*	29.5	10.2	4.4
	ROW %	21.4	3.0	18.2	37.1	0.0	0.7	2.7	17.0	
	COLUMN %	8.5	3.7	6.0	7.6	0.0	10.7	3.3	5.8	6.6
GREAT LAKE	ESTIMATE	5234	2519	6762	13524	8	88	3846	8689	40669
	% STD ERR	5.8	9.3	6.7	5.0	25.4	*	9.9	5.8	2.6
	ROW %	12.9	6.2	16.6	33.3	0.0	0.2	9.5	21.4	
	COLUMN %	12.6	19.1	13.5	16.8	3.1	8.7	28.1	18.1	16.4
CENTRAL	ESTIMATE	1033	1315	3424	1128	2	26	109	167	7204
	% STD ERR	16.7	14.9	9.0	16.1	*	*	48.3	37.7	6.0
	ROW %	14.3	18.3	47.5	15.7	0.0	0.4	1.5	2.3	
	COLUMN %	2.5	10.0	6.8	1.4	0.8	2.6	0.8	0.3	2.9
ROCKY MTS	ESTIMATE	132	125	96	402	4	6	24	29	818
	% STD ERR	*	41.7	*	28.9	*	*	*	*	19.4
	ROW %	16.1	15.3	11.7	49.1	0.5	0.7	2.9	3.5	
	COLUMN %	0.3	0.9	0.2	0.5	1.6	0.6	0.2	0.1	0.3
NORTHWEST	ESTIMATE	5924	1615	6314	11982	66	146	1472	7647	35166
	% STD ERR	6.3	12.4	7.3	5.4	*	*	15.0	5.9	2.8
	ROW %	16.8	4.6	18.0	34.1	0.2	0.4	4.2	21.7	
	COLUMN %	14.3	12.3	12.6	14.9	25.8	14.4	10.8	15.9	14.2
WESTERN	ESTIMATE	22	15	115	97	0	0	9	191	449
	% STD ERR	*	*	47.0	*	0.0	0.0	*	28.1	22.1
	ROW %	4.9	3.3	25.6	21.6	0.0	0.0	2.0	42.5	
	COLUMN %	0.1	0.1	0.2	0.1	0.0	0.0	0.1	0.4	0.2

TABLE 7. HIERARCHICAL GROUPS - BASE AIRPORT REGION VS. CAPABILITY GROUP
(CONTINUED)
1979

		1	2	3	4	5	6	7	8	TOTALS
SOUTHWEST	ESTIMATE	7541	1492	9672	14885	56	250	1874	7776	43545
	% STD ERR	5.3	12.6	5.7	4.8	*	30.5	14.2	5.9	2.5
	ROW %	17.3	3.4	22.2	34.2	0.1	0.6	4.3	17.9	
	COLUMN %	18.2	11.3	19.3	18.5	21.9	24.7	13.7	16.2	17.6
PACIFIC	ESTIMATE	2537	1055	3194	4804	0	74	495	2293	14451
	% STD ERR	10.3	16.5	10.6	8.7	0.0	*	28.3	11.5	4.7
	ROW %	17.6	7.3	22.1	33.2	0.0	0.5	3.4	15.9	
	COLUMN %	6.1	8.0	6.4	6.0	0.0	7.3	3.6	4.8	5.8
ALASKAN	ESTIMATE	1544	280	2265	2215	0	20	804	1605	8732
	% STD ERR	12.4	27.3	12.6	12.8	0.0	*	21.5	13.9	6.0
	ROW %	17.7	3.2	25.9	25.4	0.0	0.2	9.2	18.4	
	COLUMN %	3.7	2.1	4.5	2.8	0.0	2.0	5.9	3.3	3.5
FOREIGN	ESTIMATE	3048	998	3462	6678	28	48	919	2480	17661
	% STD ERR	9.0	14.4	9.6	7.3	*	*	20.2	11.0	4.1
	ROW %	17.3	5.7	19.6	37.8	0.2	0.3	5.2	14.0	
	COLUMN %	7.4	7.6	6.9	8.3	10.9	4.7	6.7	5.2	7.1
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

KEY

GROUP
1. NO REGULATORY AVIONICS
2. TWO-WAY COMMUNICATIONS
3. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
VOR OR ADF OR RNAV
4. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
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* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 8. HIERARCHICAL GROUPS - HOURS FLOWN VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
1-49	ESTIMATE	10354	3486	14625	11883	5	49	1273	2537	44211
	% STD ERR	4.5	8.1	4.5	5.3	*	*	16.1	11.0	2.4
	ROW %	23.4	7.9	33.1	26.9	0.0	0.1	2.9	5.7	
	COLUMN %	25.0	26.5	29.2	14.8	2.0	4.8	9.3	5.3	17.8
50-99	ESTIMATE	4598	1981	10769	19399	10	54	2389	5778	44977
	% STD ERR	7.3	11.2	5.5	4.2	*	*	12.4	7.4	2.5
	ROW %	10.2	4.4	23.9	43.1	0.0	0.1	5.3	12.8	
	COLUMN %	11.1	15.1	21.5	24.1	3.9	5.3	17.5	12.0	18.1
100-149	ESTIMATE	2039	1342	5324	14604	70	83	2605	7541	33610
	% STD ERR	11.4	14.8	8.2	4.9	*	*	12.3	6.5	3.0
	ROW %	6.1	4.0	15.8	43.5	0.2	0.2	7.8	22.4	
	COLUMN %	4.9	10.2	10.6	18.2	27.3	8.2	19.1	15.7	13.5
150-199	ESTIMATE	1049	831	2766	7362	47	28	1438	6420	19941
	% STD ERR	15.9	20.2	11.9	7.2	*	*	16.2	6.9	4.1
	ROW %	5.3	4.2	13.9	36.9	0.2	0.1	7.2	32.2	
	COLUMN %	2.5	6.3	5.5	9.2	18.4	2.8	10.5	13.3	8.0
200-249	ESTIMATE	1122	455	1947	5985	69	79	1231	5864	16751
	% STD ERR	15.3	25.1	14.9	7.9	*	*	18.0	7.1	4.4
	ROW %	6.7	2.7	11.6	35.7	0.4	0.5	7.3	35.0	
	COLUMN %	2.7	3.5	3.9	7.4	27.0	7.8	9.0	12.2	6.8
250-299	ESTIMATE	602	236	690	2924	0	15	726	3861	9055
	% STD ERR	20.9	31.6	23.1	11.3	0.0	*	23.6	8.7	6.0
	ROW %	6.6	2.6	7.6	32.3	0.0	0.2	8.0	42.6	
	COLUMN %	1.5	1.8	1.4	3.6	0.0	1.5	5.3	8.0	3.7
300-349	ESTIMATE	1058	360	994	3618	0	21	521	3871	10442
	% STD ERR	16.4	27.1	21.6	10.3	0.0	*	28.1	8.4	5.6
	ROW %	10.1	3.4	9.5	34.6	0.0	0.2	5.0	37.1	
	COLUMN %	2.6	2.7	2.0	4.5	0.0	2.1	3.8	8.0	4.2
350-399	ESTIMATE	623	271	573	1319	11	42	420	1810	5068
	% STD ERR	21.9	31.8	27.8	17.6	*	*	29.0	11.8	8.0
	ROW %	12.3	5.3	11.3	26.0	0.2	0.8	8.3	35.7	
	COLUMN %	1.5	2.1	1.1	1.6	4.3	4.2	3.1	3.8	2.0

TABLE 8. HIERARCHICAL GROUPS - HOURS FLOWN VS. CAPABILITY GROUP
(CONTINUED)
1979

		1	2	3	4	5	6	7	8	TOTALS
400-449	ESTIMATE	544	288	775	1688	0	57	466	2287	6105
	% STD ERR	22.3	27.1	21.4	15.5	0.0	*	28.2	10.7	7.2
	ROW %	8.9	4.7	12.7	27.6	0.0	0.9	7.6	37.5	
	COLUMN %	1.3	2.2	1.5	2.1	0.0	5.6	3.4	4.8	2.5
450 UP	ESTIMATE	1996	1986	2972	8272	30	544	2298	7727	25826
	% STD ERR	10.5	10.2	12.0	6.7	*	22.9	13.1	5.1	3.3
	ROW %	7.7	7.7	11.5	32.0	0.1	2.1	8.9	29.9	
	COLUMN %	4.8	15.1	5.9	10.3	11.7	53.8	16.8	16.1	10.4
INACTIVE	ESTIMATE	17258	1874	8526	3334	7	34	303	742	32078
	% STD ERR	3.1	10.9	5.5	9.8	*	*	31.8	16.4	2.4
	ROW %	53.8	5.8	26.6	10.4	0.0	0.1	0.9	2.3	
	COLUMN %	41.7	14.2	17.0	4.1	2.7	3.4	2.2	1.5	12.9
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

KEY

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NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
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TABLE 9. HIERARCHICAL GROUPS - AGE OF AIRCRAFT VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
0-4 YRS	ESTIMATE	7456	2747	5712	19118	118	340	5766	21120	62375
	% STD ERR	5.3	8.9	8.0	4.2	*	30.9	8.3	3.3	1.9
	ROW %	12.0	4.4	9.2	30.7	0.2	0.5	9.2	33.9	
	COLUMN %	18.0	20.9	11.4	23.8	46.1	33.6	42.2	43.9	25.1
5-9 YRS	ESTIMATE	5501	2197	6250	15936	7	199	1916	8979	40985
	% STD ERR	6.5	10.8	7.5	4.7	*	41.3	14.4	5.4	2.6
	ROW %	13.4	5.4	15.2	38.9	0.0	0.5	4.7	21.9	
	COLUMN %	13.3	16.7	12.5	19.8	2.7	19.7	14.0	18.7	16.5
10-14 YRS	ESTIMATE	4137	2464	11077	21114	43	238	1803	10198	51073
	% STD ERR	8.2	11.2	5.7	3.9	44.9	31.4	14.3	4.9	2.2
	ROW %	8.1	4.8	21.7	41.3	0.1	0.5	3.5	20.0	
	COLUMN %	10.0	18.7	22.1	26.3	16.8	23.5	13.2	21.2	20.6
15-19 YRS	ESTIMATE	2239	1181	6428	10720	5	60	1727	4081	26441
	% STD ERR	11.7	14.5	7.6	5.7	36.5	*	14.6	8.4	3.3
	ROW %	8.5	4.5	24.3	40.5	0.0	0.2	6.5	15.4	
	COLUMN %	5.4	9.0	12.8	13.3	2.0	5.9	12.6	8.5	10.7
20-24 YRS	ESTIMATE	1607	1126	6132	8224	53	82	1458	2077	20760
	% STD ERR	13.9	17.2	6.9	6.1	*	43.3	15.3	11.8	3.4
	ROW %	7.7	5.4	29.5	39.6	0.3	0.4	7.0	10.0	
	COLUMN %	3.9	8.6	12.3	10.2	20.7	8.1	10.7	4.3	8.4
25-29 YRS	ESTIMATE	1204	494	3592	2925	0	42	530	393	9181
	% STD ERR	16.3	19.0	7.7	9.5	0.0	*	22.4	13.6	4.5
	ROW %	13.1	5.4	39.1	31.9	0.0	0.5	5.8	4.3	
	COLUMN %	2.9	3.8	7.2	3.6	0.0	4.2	3.9	0.8	3.7
30-34 YRS	ESTIMATE	11944	1824	9645	2813	4	23	189	141	26583
	% STD ERR	3.1	10.9	3.6	8.8	*	*	32.6	21.4	1.5
	ROW %	44.9	6.9	36.3	10.6	0.0	0.1	0.7	0.5	
	COLUMN %	28.8	13.9	19.3	3.5	1.6	2.3	1.4	0.3	10.7
35+ YRS	ESTIMATE	7215	1012	1212	585	0	12	167	463	10667
	% STD ERR	3.9	12.3	10.3	15.2	0.0	*	27.4	15.7	2.8
	ROW %	67.6	9.5	11.4	5.5	0.0	0.1	1.6	4.3	
	COLUMN %	17.4	7.7	2.4	0.7	0.0	1.2	1.2	1.0	4.3

TABLE 9. HIERARCHICAL GROUPS - AGE OF AIRCRAFT VS. CAPABILITY GROUP
(CONTINUED)
1979

		1	2	3	4	5	6	7	8	TOTALS
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

KEY

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* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 10. HIERARCHICAL GROUPS - COMPUTED AIRCRAFT TYPE VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
TYPE 1	ESTIMATE	31949	5370	29256	15746	48	38	1212	350	83969
	% STD ERR	1.7	7.4	2.6	4.0	*	*	17.5	27.5	0.0
	ROW %	38.0	6.4	34.8	18.8	0.1	0.0	1.4	0.4	
	COLUMN %	77.1	40.8	58.5	19.6	18.8	3.8	8.9	0.7	33.8
TYPE 2	ESTIMATE	2739	1779	19180	57734	138	292	11059	22586	115507
	% STD ERR	8.0	12.0	3.4	1.7	*	36.4	5.6	3.3	0.0
	ROW %	2.4	1.5	16.6	50.0	0.1	0.3	9.6	19.6	
	COLUMN %	6.6	13.5	38.3	71.8	53.9	28.9	80.9	46.9	46.6
TYPE 3	ESTIMATE	211	153	204	4089	41	331	734	12309	18071
	% STD ERR	25.6	37.0	27.9	7.2	49.4	30.3	18.9	2.6	0.0
	ROW %	1.2	0.8	1.1	22.6	0.2	1.8	4.1	68.1	
	COLUMN %	0.5	1.2	0.4	5.1	16.0	32.7	5.4	25.6	7.3
TYPE 4	ESTIMATE	240	208	233	1215	15	173	529	6658	9271
	% STD ERR	17.9	26.6	18.2	10.2	*	34.8	18.0	2.3	0.0
	ROW %	2.6	2.2	2.5	13.1	0.2	1.9	5.7	71.8	
	COLUMN %	0.6	1.6	0.5	1.5	5.9	17.1	3.9	13.8	3.7
TYPE 5	ESTIMATE	40	6	33	137	0	3	23	147	389
	% STD ERR	21.0	32.7	22.4	7.8	0.0	47.5	32.0	8.6	0.0
	ROW %	10.3	1.5	8.5	35.2	0.0	0.8	5.9	37.8	
	COLUMN %	0.1	0.0	0.1	0.2	0.0	0.3	0.2	0.3	0.2
TYPE 6	ESTIMATE	3	3	12	108	5	50	19	2787	2986
	% STD ERR	*	*	*	37.5	*	*	*	1.8	0.0
	ROW %	0.1	0.1	0.4	3.6	0.2	1.7	0.6	93.3	
	COLUMN %	0.0	0.0	0.0	0.1	2.0	4.9	0.1	5.8	1.2
TYPE 7	ESTIMATE	2	5	32	40	0	43	3	457	581
	% STD ERR	*	*	*	39.0	0.0	44.4	*	6.5	0.0
	ROW %	0.3	0.9	5.5	6.9	0.0	7.4	0.5	78.7	
	COLUMN %	0.0	0.0	0.1	0.0	0.0	4.3	0.0	0.9	0.2
TYPE 8	ESTIMATE	45	10	5	22	0	0	0	49	131
	% STD ERR	6.4	14.9	30.2	14.7	0.0	0.0	0.0	7.6	0.0
	ROW %	34.4	7.6	3.8	16.8	0.0	0.0	0.0	37.4	
	COLUMN %	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1

TABLE 10. HIERARCHICAL GROUPS - COMPUTED AIRCRAFT TYPE VS. CAPABILITY GROUP
(CONTINUED)
1979

		1	2	3	4	5	6	7	8	TOTALS
TYPE 9	ESTIMATE	6	7	8	123	0	22	0	2217	2383
	% STD ERR	*	*	*	24.7	0.0	49.7	0.0	1.6	0.0
	ROW %	0.3	0.3	0.3	5.2	0.0	0.9	0.0	93.0	
	COLUMN %	0.0	0.1	0.0	0.2	0.0	2.2	0.0	4.6	1.0
TYPE 10	ESTIMATE	99	8	6	102	8	0	6	322	551
	% STD ERR	10.3	40.8	*	15.8	25.1	0.0	29.5	4.9	0.0
	ROW %	18.0	1.5	1.1	18.5	1.5	0.0	1.1	58.4	
	COLUMN %	0.2	0.1	0.0	0.1	3.1	0.0	0.0	0.7	0.2
TYPE 11	ESTIMATE	2647	1889	585	184	0	26	13	2	5346
	% STD ERR	5.2	7.6	17.8	21.8	0.0	*	*	*	0.0
	ROW %	49.5	35.3	10.9	3.4	0.0	0.5	0.2	0.0	
	COLUMN %	6.4	14.4	1.2	0.2	0.0	2.6	0.1	0.0	2.2
TYPE 12	ESTIMATE	120	1302	423	836	0	28	66	249	3024
	% STD ERR	23.5	9.0	18.2	12.7	0.0	*	47.1	24.7	0.0
	ROW %	4.0	43.1	14.0	27.6	0.0	0.9	2.2	8.2	
	COLUMN %	0.3	9.9	0.8	1.0	0.0	2.8	0.5	0.5	1.2
TYPE 13	ESTIMATE	3316	2423	63	44	2	5	0	3	5856
	% STD ERR	4.2	5.8	*	*	*	*	0.0	*	0.0
	ROW %	56.6	41.4	1.1	0.8	0.0	0.1	0.0	0.1	
	COLUMN %	8.0	18.4	0.1	0.1	0.8	0.5	0.0	0.0	2.4
ALL CRAFT	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

KEY

GROUP
1. NO REGULATORY AVIONICS
2. TWO-WAY COMMUNICATIONS
3. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
VOR OR ADF OR RNAV

GROUP
4. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
VOR OR RNAV
5. 4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT
6. TWO-WAY COMMUNICATIONS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

GROUP
7. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT
8. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
ALTITUDE ENCODING EQUIPMENT
4096 CODE TRANSPONDER
VOR } OR RNAV
DME }

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 11. HIERARCHICAL GROUPS - AIRCRAFT TYPE VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
GLIDER	ESTIMATE	1630	2173	62	2	0	2	0	0	3870
	% STD ERR	7.8	6.0	*	*	0.0	*	0.0	0.0	1.8
	ROW %	42.1	56.1	1.6	0.1	0.0	0.1	0.0	0.0	
	COLUMN %	3.9	16.5	0.1	0.0	0.0	0.2	0.0	0.0	1.6
BALLOON	ESTIMATE	1684	250	1	42	2	3	0	3	1984
	% STD ERR	4.7	21.9	*	*	*	*	0.0	*	3.6
	ROW %	84.9	12.6	0.1	2.1	0.1	0.2	0.0	0.2	
	COLUMN %	4.1	1.9	0.0	0.1	0.8	0.3	0.0	0.0	0.8
BLIMP	ESTIMATE	2	0	0	0	0	0	0	0	2
	% STD ERR	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
	ROW %	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIXED WING ENG=1	ESTIMATE	34815	7168	48444	73518	193	331	12277	22986	199731
	% STD ERR	1.7	6.3	2.0	1.6	41.0	33.3	5.4	3.2	0.0
	ROW %	17.4	3.6	24.3	36.8	0.1	0.2	6.1	11.5	
	COLUMN %	84.1	54.5	96.8	91.5	75.4	32.7	89.9	47.8	80.5
FIXED WING ENG>1	ESTIMATE	517	381	524	5799	61	622	1307	24898	34108
	% STD ERR	13.6	21.0	14.2	5.6	36.8	19.6	12.9	1.4	0.0
	ROW %	1.5	1.1	1.5	17.0	0.2	1.8	3.8	73.0	
	COLUMN %	1.2	2.9	1.0	7.2	23.8	61.5	9.6	51.7	13.7
ROTORCRAFT	ESTIMATE	2767	3190	1008	1020	0	54	80	251	8370
	% STD ERR	5.0	5.8	12.9	11.2	0.0	*	41.2	24.5	0.0
	ROW %	33.1	38.1	12.0	12.2	0.0	0.6	1.0	3.0	
	COLUMN %	6.7	24.2	2.0	1.3	0.0	5.3	0.6	0.5	3.4
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

TABLE 11. HIERARCHICAL GROUPS - AIRCRAFT TYPE VS. CAPABILITY GROUP (CONTINUED)

KEY

GROUP
1. NO REGULATORY AVIONICS

2. TWO-WAY COMMUNICATIONS

3. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
VOR OR ADF OR RNAV

GROUP
4. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
VOR OR RNAV

5. 4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

6. TWO-WAY COMMUNICATIONS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

GROUP
7. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

8. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
ALTITUDE ENCODING EQUIPMENT
4096 CODE TRANSPONDER
VOR } OR RNAV
DME }

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 12. HIERARCHICAL GROUPS - ENGINE TYPE VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
RECIPROCAT	ESTIMATE	37898	9438	49518	79106	242	863	13570	42053	232688
	% STD ERR	1.6	5.1	2.0	1.5	33.9	18.9	5.0	2.0	0.0
	ROW %	16.3	4.1	21.3	34.0	0.1	0.4	5.8	18.1	
	COLUMN %	91.5	71.7	99.0	98.4	94.5	85.4	99.3	87.4	93.8
TURBOPROP	ESTIMATE	55	17	49	173	5	93	21	3293	3706
	% STD ERR	14.5	44.7	37.3	25.3	*	35.8	*	1.8	0.2
	ROW %	1.5	0.5	1.3	4.7	0.1	2.5	0.6	88.9	
	COLUMN %	0.1	0.1	0.1	0.2	2.0	9.2	0.2	6.8	1.5
TURBOSHAFT	ESTIMATE	112	1302	423	834	0	28	66	249	3014
	% STD ERR	24.4	9.0	18.2	12.8	0.0	*	47.1	24.7	0.3
	ROW %	3.7	43.2	14.0	27.7	0.0	0.9	2.2	8.3	
	COLUMN %	0.3	9.9	0.8	1.0	0.0	2.8	0.5	0.5	1.2
TURBOJET	ESTIMATE	107	15	14	225	8	22	6	2539	2936
	% STD ERR	13.7	*	*	15.3	25.1	49.7	29.5	1.5	0.1
	ROW %	3.6	0.5	0.5	7.7	0.3	0.7	0.2	86.5	
	COLUMN %	0.3	0.1	0.0	0.3	3.1	2.2	0.0	5.3	1.2
TUR AIR GEN	ESTIMATE	0	0	0	0	0	0	0	0	0
	% STD ERR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ROW %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAMJET	ESTIMATE	0	0	0	0	0	0	0	0	0
	% STD ERR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ROW %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO ENGINE	ESTIMATE	3241	2391	36	43	2	5	0	3	5721
	% STD ERR	4.3	5.8	*	*	*	*	0.0	*	0.9
	ROW %	56.7	41.8	0.6	0.8	0.0	0.1	0.0	0.1	
	COLUMN %	7.8	18.2	0.1	0.1	0.8	0.5	0.0	0.0	2.3
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

TABLE 12. HIERARCHICAL GROUPS - ENGINE TYPE VS. CAPABILITY GROUP
(CONTINUED)
1979

GROUP
1. NO REGULATORY AVIONICS

2. TWO-WAY COMMUNICATIONS

3. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
VOR OR ADF OR RNAV

GROUP
4. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
VOR OR RNAV

5. 4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

6. TWO-WAY COMMUNICATIONS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

GROUP
7. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

8. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
ALTITUDE ENCODING EQUIPMENT
4096 CODE TRANSPONDER
VOR } OR RNAV
DME }

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 13. HIERARCHICAL GROUPS - NUMBER OF ENGINES VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
ONE	ESTIMATE	37640	10269	49477	74452	193	383	12346	23168	207928
	% STD ERR	1.6	4.8	2.0	1.6	41.0	30.2	5.3	3.2	0.0
	ROW %	18.1	4.9	23.8	35.8	0.1	0.2	5.9	11.1	
	COLUMN %	90.9	78.0	98.9	92.6	75.4	37.9	90.4	48.1	83.8
TWO	ESTIMATE	478	497	491	5662	61	620	1295	24497	33601
	% STD ERR	14.8	17.1	15.1	5.7	36.8	19.7	13.0	1.5	0.1
	ROW %	1.4	1.5	1.5	16.9	0.2	1.8	3.9	72.9	
	COLUMN %	1.2	3.8	1.0	7.0	23.8	61.3	9.5	50.9	13.5
THREE	ESTIMATE	6	5	0	1	0	3	4	37	56
	% STD ERR	39.3	36.1	0.0	*	0.0	47.5	42.5	7.8	7.0
	ROW %	10.7	8.9	0.0	1.8	0.0	5.4	7.1	66.1	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0
FOUR	ESTIMATE	50	1	35	222	0	0	18	433	760
	% STD ERR	17.4	*	21.2	7.9	0.0	0.0	39.7	4.5	0.8
	ROW %	6.6	0.1	4.6	29.2	0.0	0.0	2.4	57.0	
	COLUMN %	0.1	0.0	0.1	0.3	0.0	0.0	0.1	0.9	0.3
MORE THAN FOUR	ESTIMATE	0	0	0	0	0	0	0	0	0
	% STD ERR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ROW %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NONE	ESTIMATE	3240	2390	36	43	2	5	0	3	5720
	% STD ERR	4.3	5.8	*	*	*	*	0.0	*	0.9
	ROW %	56.6	41.8	0.6	0.8	0.0	0.1	0.0	0.1	
	COLUMN %	7.8	18.2	0.1	0.1	0.8	0.5	0.0	0.0	2.3
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

TABLE 13. HIERARCHICAL GROUPS - NUMBER OF ENGINES VS. CAPABILITY GROUP (CONTINUED)

KEY

GROUP
1. NO REGULATORY AVIONICS

2. TWO-WAY COMMUNICATIONS

3. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
VOR OR ADF OR RNAV

GROUP
4. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
VOR OR RNAV.

5. 4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

6. TWO-WAY COMMUNICATIONS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

GROUP
7. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

8. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
ALTITUDE ENCODING EQUIPMENT
4096 CODE TRANSPONDER
VOR } OR RNAV
DME }

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 14. HIERARCHICAL GROUPS - NUMBER OF SEATS VS. CAPABILITY GROUP

1979

		1	2	3	4	5	6	7	8	TOTALS
1 SEAT	ESTIMATE	12804	3188	1302	367	12	4	27	40	17745
	% STD ERR	2.7	7.0	15.2	29.0	49.5	*	*	*	1.8
	ROW %	72.2	18.0	7.3	2.1	0.1	0.0	0.2	0.2	
	COLUMN %	30.9	24.2	2.6	0.5	4.7	0.4	0.2	0.1	7.2
2 SEATS	ESTIMATE	19574	4124	24126	15033	37	39	1186	351	64469
	% STD ERR	2.5	8.7	3.0	4.1	*	*	17.9	26.0	0.5
	ROW %	30.4	6.4	37.4	23.3	0.1	0.1	1.8	0.5	
	COLUMN %	47.3	31.3	48.2	18.7	14.5	3.9	8.7	0.7	26.0
3 SEATS	ESTIMATE	4946	1979	4434	632	8	27	36	46	12108
	% STD ERR	4.0	8.0	4.1	14.4	*	*	47.9	*	1.3
	ROW %	40.8	16.3	36.6	5.2	0.1	0.2	0.3	0.4	
	COLUMN %	11.9	15.0	8.9	0.8	3.1	2.7	0.3	0.1	4.9
4 SEATS	ESTIMATE	2880	1705	17428	51283	119	149	9366	13231	96161
	% STD ERR	7.6	11.6	3.6	1.8	*	48.5	6.2	4.7	0.4
	ROW %	3.0	1.8	18.1	53.3	0.1	0.2	9.7	13.8	
	COLUMN %	7.0	13.0	34.8	63.8	46.5	14.7	68.6	27.5	38.8
5 SEATS	ESTIMATE	400	921	1107	3504	1	25	835	2047	8840
	% STD ERR	15.7	12.6	10.3	8.3	*	*	17.9	11.4	4.0
	ROW %	4.5	10.4	12.5	39.6	0.0	0.3	9.4	23.2	
	COLUMN %	1.0	7.0	2.2	4.4	0.4	2.5	6.1	4.3	3.6
6 SEATS	ESTIMATE	233	441	1114	7533	58	476	1475	18772	30102
	% STD ERR	25.3	24.6	16.5	5.8	49.2	26.7	15.2	2.8	1.7
	ROW %	0.8	1.5	3.7	25.0	0.2	1.6	4.9	62.4	
	COLUMN %	0.6	3.4	2.2	9.4	22.7	47.1	10.8	39.0	12.1
7-11 SEATS	ESTIMATE	205	459	307	1467	20	242	633	11755	15088
	% STD ERR	20.6	16.5	18.5	10.5	48.6	27.5	18.7	2.1	1.4
	ROW %	1.4	3.0	2.0	9.7	0.1	1.6	4.2	77.9	
	COLUMN %	0.5	3.5	0.6	1.8	7.8	23.9	4.6	24.4	6.1
12-19 SEATS	ESTIMATE	174	308	92	177	0	9	9	739	1509
	% STD ERR	15.3	10.6	21.6	15.1	0.0	*	*	7.5	3.7
	ROW %	11.5	20.4	6.1	11.7	0.0	0.6	0.6	49.0	
	COLUMN %	0.4	2.3	0.2	0.2	0.0	0.9	0.1	1.5	0.6

TABLE 14. HIERARCHICAL GROUPS - NUMBER OF SEATS VS. CAPABILITY GROUP
(CONTINUED)
1979

		1	2	3	4	5	6	7	8	TOTALS
20-49 SEATS	ESTIMATE	57	73	114	172	0	39	81	653	1188
	% STD ERR	35.0	36.5	25.7	21.6	0.0	48.6	36.8	8.6	3.5
	ROW %	4.8	6.1	9.6	14.5	0.0	3.3	6.8	55.0	
	COLUMN %	0.1	0.6	0.2	0.2	0.0	3.9	0.6	1.4	0.5
50+ SEATS	ESTIMATE	71	0	18	214	0	0	17	503	823
	% STD ERR	18.2	0.0	36.0	8.0	0.0	0.0	41.9	5.8	2.9
	ROW %	8.6	0.0	2.2	26.0	0.0	0.0	2.1	61.1	
	COLUMN %	0.2	0.0	0.0	0.3	0.0	0.0	0.1	1.0	0.3
TOTALS	ESTIMATE	41415	13162	50040	80380	256	1011	13663	48137	248070
	% STD ERR	1.5	3.9	2.0	1.5	32.1	16.7	5.0	1.7	
	ROW %	16.7	5.3	20.2	32.4	0.1	0.4	5.5	19.4	

KEY

GROUP
1. NO REGULATORY AVIONICS
2. TWO-WAY COMMUNICATIONS
3. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
VOR OR ADF OR RNAV

GROUP
4. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
VOR OR RNAV
5. 4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT
6. TWO-WAY COMMUNICATIONS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT

GROUP
7. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
4096 CODE TRANSPONDER
ALTITUDE ENCODING EQUIPMENT
8. TWO-WAY COMMUNICATIONS
TWO SYSTEMS - AIR TAXIS
ALTITUDE ENCODING EQUIPMENT
4096 CODE TRANSPONDER
VOR } OR RNAV
DME }

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 15. NON-HIERARCHICAL GROUPS - PRIMARY USE VS. CAPABILITY GROUP

1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
EXECUTIVE	ESTIMATE	331	275	5540	6119	1303	6320	234	170	171	1639	14007
	% STD ERR	32.2	35.9	6.8	3.8	8.8	3.8	32.1	31.9	40.2	12.6	3.5
	ROW %	2.4	2.0	39.6	43.7	9.3	45.1	1.7	1.2	1.2	11.7	
	COLUMN %	1.6	1.8	6.9	46.3	45.7	43.6	29.5	25.4	57.0	1.4	5.6
BUSINESS	ESTIMATE	3390	4032	29058	3699	472	4032	203	169	31	10169	50512
	% STD ERR	10.4	9.6	3.0	8.4	25.0	8.1	40.1	42.5	*	5.7	2.1
	ROW %	6.7	8.0	57.5	7.3	0.9	8.0	0.4	0.3	0.1	20.1	
	COLUMN %	16.9	26.5	36.1	28.0	16.5	27.8	25.6	25.3	10.3	8.6	20.4
PERSONAL	ESTIMATE	8739	8298	24915	1056	170	1421	91	68	18	54585	97791
	% STD ERR	6.2	6.6	3.5	17.6	45.0	15.2	*	*	*	1.8	1.3
	ROW %	8.9	8.5	25.5	1.1	0.2	1.5	0.1	0.1	0.0	55.8	
	COLUMN %	43.5	54.5	30.9	8.0	6.0	9.8	11.5	10.2	6.0	46.2	39.4
AERIAL AP.	ESTIMATE	107	39	230	5	12	5	0	0	0	7619	8000
	% STD ERR	48.7	*	30.0	*	*	*	0.0	0.0	0.0	3.5	3.4
	ROW %	1.3	0.5	2.9	0.1	0.2	0.1	0.0	0.0	0.0	95.2	
	COLUMN %	0.5	0.3	0.3	0.0	0.4	0.0	0.0	0.0	0.0	6.4	3.2
INSTRUCT.	ESTIMATE	3369	395	4301	224	3	228	2	2	0	7554	15847
	% STD ERR	10.8	32.8	9.4	33.7	47.0	33.4	*	*	0.0	6.8	4.5
	ROW %	21.3	2.5	27.1	1.4	0.0	1.4	0.0	0.0	0.0	47.7	
	COLUMN %	16.8	2.6	5.3	1.7	0.1	1.6	0.3	0.3	0.0	6.4	6.4
AIR TAXI	ESTIMATE	338	327	4949	1147	221	1230	54	54	10	1809	8767
	% STD ERR	30.2	32.2	7.2	12.4	28.6	11.8	*	*	*	10.9	5.0
	ROW %	3.9	3.7	56.5	13.1	2.5	14.0	0.6	0.6	0.1	20.6	
	COLUMN %	1.7	2.1	6.1	8.7	7.7	8.5	6.8	8.1	3.3	1.5	3.5
INDUSTR SP	ESTIMATE	373	139	942	69	130	161	0	0	0	1527	3059
	% STD ERR	31.5	46.3	19.6	*	37.6	37.4	0.0	0.0	0.0	13.8	10.2
	ROW %	12.2	4.5	30.8	2.3	4.2	5.3	0.0	0.0	0.0	49.9	
	COLUMN %	1.9	0.9	1.2	0.5	4.6	1.1	0.0	0.0	0.0	1.3	1.2
RENTAL	ESTIMATE	1564	387	6853	287	27	288	103	103	0	3927	13020
	% STD ERR	16.1	31.4	7.4	32.5	15.8	32.5	*	*	0.0	9.9	5.3
	ROW %	12.0	3.0	52.6	2.2	0.2	2.2	0.8	0.8	0.0	30.2	
	COLUMN %	7.8	2.5	8.5	2.2	0.9	2.0	13.0	15.4	0.0	3.3	5.2

TABLE 15. NON-HIERARCHICAL GROUPS - PRIMARY USE VS. CAPABILITY GROUP
(CONTINUED)
1979

		L	L/MB	L/MB/GS	L/MB/GS/RA	LRN	RA	ML	L/MB/GS/ML	LRN/ML	NO GROUP	ALL CRAFT
OTHER	ESTIMATE	559	379	1630	453	228	465	43	43	1	2512	5542
	% STD ERR	23.5	32.4	13.6	18.0	24.4	17.6	*	*	*	10.2	7.0
	ROW %	10.1	6.8	29.4	8.2	4.1	8.4	0.8	0.8	0.0	45.3	
	COLUMN %	2.8	2.5	2.0	3.4	8.0	3.2	5.4	6.4	0.3	2.1	2.2
INACTIVE	ESTIMATE	1143	1020	2297	280	122	293	78	74	75	27332	32078
	% STD ERR	15.1	17.9	10.7	21.3	34.8	20.8	*	*	*	2.6	2.4
	ROW %	3.6	3.2	7.2	0.9	0.4	0.9	0.2	0.2	0.2	85.2	
	COLUMN %	5.7	6.7	2.9	2.1	4.3	2.0	9.8	11.1	25.0	23.1	12.9
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 16. NON-HIERARCHICAL GROUPS - BASE AIRPORT REGION VS. CAPABILITY GROUP

1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
NEW ENGLND	ESTIMATE	2160	1959	9702	1850	436	1908	164	158	80	11727	27402
	% STD ERR	12.3	13.9	6.0	10.5	18.9	10.3	39.4	39.6	49.4	4.9	3.2
	ROW %	7.9	7.1	35.4	6.8	1.6	7.0	0.6	0.6	0.3	42.8	
	COLUMN %	10.8	12.9	12.0	14.0	15.3	13.2	20.7	23.7	26.7	9.9	11.0
EASTERN	ESTIMATE	2721	1940	11694	2532	897	2819	126	126	58	16313	35508
	% STD ERR	11.8	13.8	5.2	8.3	14.6	8.1	*	*	*	4.1	2.8
	ROW %	7.7	5.5	32.9	7.1	2.5	7.9	0.4	0.4	0.2	45.9	
	COLUMN %	13.6	12.8	14.5	19.2	31.5	19.4	15.9	18.9	19.3	13.8	14.3
SOUTHERN	ESTIMATE	1378	968	5250	620	98	715	35	1	0	8204	16460
	% STD ERR	16.9	19.9	8.1	17.9	*	17.6	*	*	0.0	6.1	4.4
	ROW %	8.4	5.9	31.9	3.8	0.6	4.3	0.2	0.0	0.0	49.8	
	COLUMN %	6.9	6.4	6.5	4.7	3.4	4.9	4.4	0.1	0.0	6.9	6.6
GREAT LAKE	ESTIMATE	3327	2572	15207	1716	380	1913	194	128	70	17772	40669
	% STD ERR	10.3	11.6	4.6	11.0	25.2	10.7	38.4	42.3	*	3.8	2.6
	ROW %	8.2	6.3	37.4	4.2	0.9	4.7	0.5	0.3	0.2	43.7	
	COLUMN %	16.6	16.9	18.9	13.0	13.3	13.2	24.5	19.2	23.3	15.0	16.4
CENTRAL	ESTIMATE	582	86	1116	50	14	58	2	0	0	5369	7204
	% STD ERR	24.0	*	16.7	35.8	*	32.3	*	0.0	0.0	6.9	6.0
	ROW %	8.1	1.2	15.5	0.7	0.2	0.8	0.0	0.0	0.0	74.5	
	COLUMN %	2.9	0.6	1.4	0.4	0.5	0.4	0.3	0.0	0.0	4.5	2.9
ROCKY MTS	ESTIMATE	53	20	268	13	34	15	0	0	0	462	818
	% STD ERR	*	*	32.4	*	*	*	0.0	0.0	0.0	27.3	19.4
	ROW %	6.5	2.4	32.8	1.6	4.2	1.8	0.0	0.0	0.0	56.5	
	COLUMN %	0.3	0.1	0.3	0.1	1.2	0.1	0.0	0.0	0.0	0.4	0.3
NORTHWEST	ESTIMATE	2580	2019	12201	2143	316	2305	30	30	9	16162	35166
	% STD ERR	11.8	13.5	5.1	9.5	27.7	9.2	*	*	*	4.2	2.8
	ROW %	7.3	5.7	34.7	6.1	0.9	6.6	0.1	0.1	0.0	46.0	
	COLUMN %	12.8	13.3	15.1	16.2	11.1	15.9	3.8	4.5	3.0	13.7	14.2
WESTERN	ESTIMATE	10	64	161	94	61	94	0	0	0	120	449
	% STD ERR	*	*	34.3	33.9	40.9	33.9	0.0	0.0	0.0	48.2	22.1
	ROW %	2.2	14.3	35.9	20.9	13.6	20.9	0.0	0.0	0.0	26.7	
	COLUMN %	0.0	0.4	0.2	0.7	2.1	0.6	0.0	0.0	0.0	0.1	0.2

TABLE 16. NON-HIERARCHICAL GROUPS - BASE AIRPORT REGION VS. CAPABILITY GROUP
(CONTINUED)
1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
SOUTHWEST	ESTIMATE	3952	3177	13084	2608	375	2856	170	170	72	20671	43545
	% STD ERR	9.5	10.8	5.0	9.0	19.8	8.7	41.9	41.9	*	3.6	2.5
	ROW %	9.1	7.3	30.0	6.0	0.9	6.6	0.4	0.4	0.2	47.5	
	COLUMN %	19.7	20.9	16.2	19.7	13.1	19.7	21.5	25.4	24.0	17.5	17.6
PACIFIC	ESTIMATE	1147	585	3988	599	76	692	6	6	1	8065	14451
	% STD ERR	17.9	25.7	9.4	18.7	41.6	18.6	*	*	*	6.3	4.7
	ROW %	7.9	4.0	27.6	4.1	0.5	4.8	0.0	0.0	0.0	55.8	
	COLUMN %	5.7	3.8	4.9	4.5	2.7	4.8	0.8	0.9	0.3	6.8	5.8
ALASKAN	ESTIMATE	715	420	2718	386	63	438	16	16	4	4463	8732
	% STD ERR	22.5	29.2	11.3	25.2	42.6	23.6	*	*	*	8.3	6.0
	ROW %	8.2	4.8	31.1	4.4	0.7	5.0	0.2	0.2	0.0	51.1	
	COLUMN %	3.6	2.8	3.4	2.9	2.2	3.0	2.0	2.4	1.3	3.8	3.5
FOREIGN	ESTIMATE	1452	1415	5137	618	110	702	38	26	1	8966	17661
	% STD ERR	15.1	16.1	8.2	18.3	42.3	17.8	*	*	*	5.7	4.1
	ROW %	8.2	8.0	29.1	3.5	0.6	4.0	0.2	0.1	0.0	50.8	
	COLUMN %	7.2	9.3	6.4	4.7	3.9	4.8	4.8	3.9	0.3	7.6	7.1
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 17. NON-HIERARCHICAL GROUPS - HOURS FLOWN VS. CAPABILITY GROUP

1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
1-49	ESTIMATE	3678	2649	6222	605	181	739	11	7	8	30928	44211
	% STD ERR	9.3	11.5	7.2	20.3	39.4	17.9	*	*	*	2.8	2.4
	ROW %	8.3	6.0	14.1	1.4	0.4	1.7	0.0	0.0	0.0	70.0	
	COLUMN %	18.3	17.4	7.7	4.6	6.3	5.1	1.4	1.0	2.7	26.2	17.8
50-99	ESTIMATE	4484	4422	13687	1057	102	1126	118	65	9	21290	44977
	% STD ERR	9.1	9.2	4.9	16.6	49.5	16.1	*	*	*	3.7	2.5
	ROW %	10.0	9.8	30.4	2.4	0.2	2.5	0.3	0.1	0.0	47.3	
	COLUMN %	22.3	29.1	17.0	8.0	3.6	7.8	14.9	9.7	3.0	18.0	18.1
100-149	ESTIMATE	2731	3241	14353	1383	94	1473	84	84	38	11861	33610
	% STD ERR	11.9	10.9	4.8	14.1	*	13.7	*	*	*	5.3	3.0
	ROW %	8.1	9.6	42.7	4.1	0.3	4.4	0.2	0.2	0.1	35.3	
	COLUMN %	13.6	21.3	17.8	10.5	3.3	10.2	10.6	12.6	12.7	10.0	13.5
150-199	ESTIMATE	1673	1344	10245	987	71	1058	55	55	2	5653	19941
	% STD ERR	15.1	16.9	5.8	15.7	48.5	15.4	*	*	*	8.0	4.1
	ROW %	8.4	6.7	51.4	4.9	0.4	5.3	0.3	0.3	0.0	28.3	
	COLUMN %	8.3	8.8	12.7	7.5	2.5	7.3	6.9	8.2	0.7	4.8	8.0
200-249	ESTIMATE	970	828	8801	1337	163	1472	35	35	3	4728	16751
	% STD ERR	19.8	21.7	6.2	12.8	38.5	12.5	*	*	*	8.8	4.4
	ROW %	5.8	4.9	52.5	8.0	1.0	8.8	0.2	0.2	0.0	28.2	
	COLUMN %	4.8	5.4	10.9	10.1	5.7	10.1	4.4	5.2	1.0	4.0	6.8
250-299	ESTIMATE	645	398	4794	1089	92	1096	64	64	7	2127	9055
	% STD ERR	24.5	32.4	8.5	13.7	29.7	13.6	*	*	*	12.3	6.0
	ROW %	7.1	4.4	52.9	12.0	1.0	12.1	0.7	0.7	0.1	23.5	
	COLUMN %	3.2	2.6	5.9	8.2	3.2	7.6	8.1	9.6	2.3	1.8	3.7
300-349	ESTIMATE	820	439	4897	1282	95	1334	29	29	0	2990	10442
	% STD ERR	21.4	29.4	8.5	12.3	39.6	12.3	*	*	0.0	10.9	5.6
	ROW %	7.9	4.2	46.9	12.3	0.9	12.8	0.3	0.3	0.0	28.6	
	COLUMN %	4.1	2.9	6.1	9.7	3.3	9.2	3.7	4.3	0.0	2.5	4.2
350-399	ESTIMATE	268	75	2356	610	122	615	5	5	4	1721	5068
	% STD ERR	41.0	*	11.9	16.0	38.1	15.9	*	*	*	14.5	8.0
	ROW %	5.3	1.5	46.5	12.0	2.4	12.1	0.1	0.1	0.1	34.0	
	COLUMN %	1.3	0.5	2.9	4.6	4.3	4.2	0.6	0.7	1.3	1.5	2.0

TABLE 17. NON-HIERARCHICAL GROUPS - HOURS FLOWN VS. CAPABILITY GROUP
(CONTINUED)
1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
400-449	ESTIMATE	721	72	2663	881	199	991	29	29	0	1693	6105
	% STD ERR	24.3	*	11.2	13.8	21.7	13.6	*	*	0.0	13.9	7.2
	ROW %	11.8	1.2	43.6	14.4	3.3	16.2	0.5	0.5	0.0	27.7	
	COLUMN %	3.6	0.5	3.3	6.7	7.0	6.8	3.7	4.3	0.0	1.4	2.5
450 UP	ESTIMATE	2734	790	10348	3826	1446	4243	298	234	159	7906	25826
	% STD ERR	11.9	21.7	5.6	5.8	10.6	5.9	32.7	35.3	41.4	6.3	3.3
	ROW %	10.6	3.1	40.1	14.8	5.6	16.4	1.2	0.9	0.6	30.6	
	COLUMN %	13.6	5.2	12.8	29.0	50.7	29.3	37.6	35.0	53.0	6.7	10.4
INACTIVE	ESTIMATE	1143	1020	2297	280	122	293	78	74	75	27332	32078
	% STD ERR	15.1	17.9	10.7	21.3	34.8	20.8	*	*	*	2.6	2.4
	ROW %	3.6	3.2	7.2	0.9	0.4	0.9	0.2	0.2	0.2	85.2	
	COLUMN %	5.7	6.7	2.9	2.1	4.3	2.0	9.8	11.1	25.0	23.1	12.9
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 18. NON-HIERARCHICAL GROUPS - AGE OF AIRCRAFT VS. CAPABILITY GROUP

1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
0-4 YRS	ESTIMATE	5870	1152	28322	5983	1400	6517	340	271	149	20692	62375
	% STD ERR	8.0	18.8	3.2	5.5	12.0	5.4	33.2	36.5	*	3.6	1.9
	ROW %	9.4	1.8	45.4	9.6	2.2	10.4	0.5	0.4	0.2	33.2	
	COLUMN %	29.2	7.6	35.1	45.3	49.1	44.9	42.9	40.6	49.7	17.5	25.1
5-9 YRS	ESTIMATE	2979	2335	15685	3072	460	3320	160	160	15	16826	40985
	% STD ERR	11.4	13.2	4.6	7.8	22.0	7.7	45.4	45.4	*	4.1	2.6
	ROW %	7.3	5.7	38.3	7.5	1.1	8.1	0.4	0.4	0.0	41.1	
	COLUMN %	14.8	15.3	19.5	23.2	16.1	22.9	20.2	24.0	5.0	14.2	16.5
10-14 YRS	ESTIMATE	3700	5449	17474	2816	578	3083	136	130	64	21592	51073
	% STD ERR	10.5	8.3	4.2	7.9	15.9	7.6	35.9	35.4	37.5	3.8	2.2
	ROW %	7.2	10.7	34.2	5.5	1.1	6.0	0.3	0.3	0.1	42.3	
	COLUMN %	18.4	35.8	21.7	21.3	20.3	21.3	17.2	19.5	21.3	18.3	20.6
15-19 YRS	ESTIMATE	2107	2784	9824	691	243	751	88	76	31	11010	26441
	% STD ERR	13.6	12.0	5.6	19.1	27.5	18.3	39.4	38.4	*	5.5	3.3
	ROW %	8.0	10.5	37.2	2.6	0.9	2.8	0.3	0.3	0.1	41.6	
	COLUMN %	10.5	18.3	12.2	5.2	8.5	5.2	11.1	11.4	10.3	9.3	10.7
20-24 YRS	ESTIMATE	2104	2236	5783	442	145	534	19	15	13	10112	20760
	% STD ERR	12.8	12.5	7.1	23.9	38.6	21.8	*	*	*	5.3	3.4
	ROW %	10.1	10.8	27.9	2.1	0.7	2.6	0.1	0.1	0.1	48.7	
	COLUMN %	10.5	14.7	7.2	3.3	5.1	3.7	2.4	2.2	4.3	8.6	8.4
25-29 YRS	ESTIMATE	710	635	1631	86	33	133	4	4	1	6083	9181
	% STD ERR	19.1	21.3	11.1	25.4	33.4	39.2	46.3	46.3	*	6.0	4.5
	ROW %	7.7	6.9	17.8	0.9	0.4	1.4	0.0	0.0	0.0	66.3	
	COLUMN %	3.5	4.2	2.0	0.7	1.2	0.9	0.5	0.6	0.3	5.1	3.7
30-34 YRS	ESTIMATE	1957	791	968	102	33	111	8	3	5	22763	26583
	% STD ERR	9.9	16.7	15.8	38.3	*	36.8	*	*	*	1.7	1.5
	ROW %	7.4	3.0	3.6	0.4	0.1	0.4	0.0	0.0	0.0	85.6	
	COLUMN %	9.7	5.2	1.2	0.8	1.2	0.8	1.0	0.4	1.7	19.2	10.7
35+ YRS	ESTIMATE	379	112	612	138	59	228	51	51	43	9362	10667
	% STD ERR	19.0	34.6	10.4	37.2	*	27.6	*	*	*	3.1	2.8
	ROW %	3.6	1.0	5.7	1.3	0.6	2.1	0.5	0.5	0.4	87.8	
	COLUMN %	1.9	0.7	0.8	1.0	2.1	1.6	6.4	7.6	14.3	7.9	4.3

TABLE 18. NON-HIERARCHICAL GROUPS - AGE OF AIRCRAFT VS. CAPABILITY GROUP
(CONTINUED)
1979

		L	L/MB	L/MB/ GS	L/MB/ GS/RA	LRN	RA	ML	L/MB/ GS/ML	LRN/ML	NO GROUP	ALL CRAFT
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 19. NON-HIERARCHICAL GROUPS - COMPUTED AIRCRAFT TYPE VS. CAPABILITY GROUP

1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
TYPE 1	ESTIMATE	8448	2163	3656	44	97	160	55	49	49	69614	83969
	% STD ERR	6.2	13.1	10.0	*	*	47.0	*	*	*	0.9	0.0
	ROW %	10.1	2.6	4.4	0.1	0.1	0.2	0.1	0.1	0.1	82.9	
	COLUMN %	42.1	14.2	4.5	0.3	3.4	1.1	6.9	7.3	16.3	58.9	33.8
TYPE 2	ESTIMATE	10464	12019	56179	2229	496	2834	354	241	63	34356	115507
	% STD ERR	5.5	5.3	1.7	12.5	28.0	11.1	33.0	39.7	*	2.4	0.0
	ROW %	9.1	10.4	48.6	1.9	0.4	2.5	0.3	0.2	0.1	29.7	
	COLUMN %	52.1	79.0	69.7	16.9	17.4	19.5	44.7	36.1	21.0	29.1	46.6
TYPE 3	ESTIMATE	420	761	13192	3078	305	3266	71	69	38	574	18071
	% STD ERR	25.2	18.7	2.2	7.9	31.2	7.5	*	*	*	16.3	0.0
	ROW %	2.3	4.2	73.0	17.0	1.7	18.1	0.4	0.4	0.2	3.2	
	COLUMN %	2.1	5.0	16.4	23.3	10.7	22.5	9.0	10.3	12.7	0.5	7.3
TYPE 4	ESTIMATE	123	89	5803	2636	267	2792	110	106	36	529	9271
	% STD ERR	28.8	40.2	3.1	6.3	25.6	6.1	48.6	50.0	*	12.3	0.0
	ROW %	1.3	1.0	62.6	28.4	2.9	30.1	1.2	1.1	0.4	5.7	
	COLUMN %	0.6	0.6	7.2	20.0	9.4	19.2	13.9	15.9	12.0	0.4	3.7
TYPE 5	ESTIMATE	9	10	214	56	22	60	3	3	1	101	389
	% STD ERR	39.4	49.5	5.8	16.0	35.4	15.2	45.7	45.7	*	10.0	0.0
	ROW %	2.3	2.6	55.0	14.4	5.7	15.4	0.8	0.8	0.3	26.0	
	COLUMN %	0.0	0.1	0.3	0.4	0.8	0.4	0.4	0.4	0.3	0.1	0.2
TYPE 6	ESTIMATE	52	14	593	2315	231	2339	46	46	14	9	2986
	% STD ERR	*	*	14.2	3.8	23.8	3.7	*	*	*	48.9	0.0
	ROW %	1.7	0.5	19.9	77.5	7.7	78.3	1.5	1.5	0.5	0.3	
	COLUMN %	0.3	0.1	0.7	17.5	8.1	16.1	5.8	6.9	4.7	0.0	1.2
TYPE 7	ESTIMATE	3	40	310	220	68	228	69	69	30	8	581
	% STD ERR	*	38.2	11.5	15.3	32.0	14.7	36.7	36.7	*	*	0.0
	ROW %	0.5	6.9	53.4	37.9	11.7	39.2	11.9	11.9	5.2	1.4	
	COLUMN %	0.0	0.3	0.4	1.7	2.4	1.6	8.7	10.3	10.0	0.0	0.2
TYPE 8	ESTIMATE	11	2	28	33	15	41	0	0	0	55	131
	% STD ERR	17.8	*	12.0	11.2	19.6	9.1	0.0	0.0	0.0	5.7	0.0
	ROW %	8.4	1.5	21.4	25.2	11.5	31.3	0.0	0.0	0.0	42.0	
	COLUMN %	0.1	0.0	0.0	0.2	0.5	0.3	0.0	0.0	0.0	0.0	0.1

TABLE 19. NON-HIERARCHICAL GROUPS - COMPUTED AIRCRAFT TYPE VS. CAPABILITY GROUP (CONTINUED)
1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
TYPE 9	ESTIMATE	23	12	226	2110	787	2134	38	38	26	12	2383
	% STD ERR	*	*	20.2	2.4	7.5	2.2	45.5	45.5	*	*	0.0
	ROW %	1.0	0.5	9.5	88.5	33.0	89.6	1.6	1.6	1.1	0.5	
	COLUMN %	0.1	0.1	0.3	16.0	27.6	14.7	4.8	5.7	8.7	0.0	1.0
TYPE 10	ESTIMATE	36	3	124	282	244	286	10	10	9	102	551
	% STD ERR	23.8	*	10.3	3.6	5.6	3.6	43.3	43.3	38.1	10.0	0.0
	ROW %	6.5	0.5	22.5	51.2	44.3	51.9	1.8	1.8	1.6	18.5	
	COLUMN %	0.2	0.0	0.2	2.1	8.6	2.0	1.3	1.5	3.0	0.1	0.2
TYPE 11	ESTIMATE	79	0	6	34	38	44	33	33	33	5212	5346
	% STD ERR	40.1	0.0	*	46.2	44.3	46.3	47.3	47.3	47.3	0.7	0.0
	ROW %	1.5	0.0	0.1	0.6	0.7	0.8	0.6	0.6	0.6	97.5	
	COLUMN %	0.4	0.0	0.0	0.3	1.3	0.3	4.2	4.9	11.0	4.4	2.2
TYPE 12	ESTIMATE	383	97	256	176	272	296	2	2	0	1877	3024
	% STD ERR	20.9	42.2	27.1	28.5	25.6	23.2	*	*	0.0	6.0	0.0
	ROW %	12.7	3.2	8.5	5.8	9.0	9.8	0.1	0.1	0.0	62.1	
	COLUMN %	1.9	0.6	0.3	1.3	9.5	2.0	0.3	0.3	0.0	1.6	1.2
TYPE 13	ESTIMATE	27	4	0	3	10	24	3	3	3	5808	5856
	% STD ERR	*	*	0.0	*	40.4	47.5	*	*	*	0.4	0.0
	ROW %	0.5	0.1	0.0	0.1	0.2	0.4	0.1	0.1	0.1	99.2	
	COLUMN %	0.1	0.0	0.0	0.0	0.4	0.2	0.4	0.4	1.0	4.9	2.4
ALL CRAFT	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 20. NON-HIERARCHICAL GROUPS - AIRCRAFT TYPE VS. CAPABILITY GROUP

1979

		L	L/MB	L/MB/GS	L/MB/GS/RA	LRN	RA	ML	L/MB/GS/ML	LRN/ML	NO GROUP	ALL CRAFT
GLIDER	ESTIMATE	21	0	0	0	0	4	0	0	0	3844	3870
	% STD ERR	*	0.0	0.0	0.0	0.0	*	0.0	0.0	0.0	1.9	1.8
	ROW %	0.5	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	99.3	
	COLUMN %	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	1.6
BALLOON	ESTIMATE	6	4	0	3	10	19	3	3	3	1961	1984
	% STD ERR	39.0	*	0.0	*	40.4	*	*	*	*	3.7	3.6
	ROW %	0.3	0.2	0.0	0.2	0.5	1.0	0.2	0.2	0.2	98.8	
	COLUMN %	0.0	0.0	0.0	0.0	0.4	0.1	0.4	0.4	1.0	1.7	0.8
BLIMP	ESTIMATE	0	0	0	0	0	0	0	0	0	2	2
	% STD ERR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
	ROW %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIXED WING ENG=1	ESTIMATE	18959	14184	59893	2276	600	3008	410	292	112	104110	199731
	% STD ERR	4.1	4.9	1.7	12.4	24.9	10.8	30.0	35.2	*	1.0	0.0
	ROW %	9.5	7.1	30.0	1.1	0.3	1.5	0.2	0.1	0.1	52.1	
	COLUMN %	94.4	93.2	74.3	17.2	21.0	20.7	51.8	43.7	37.3	88.0	80.5
FIXED WING ENG>1	ESTIMATE	631	928	20433	10725	1933	11133	345	339	153	1252	34108
	% STD ERR	18.4	16.0	1.7	2.9	7.5	2.8	23.2	23.5	37.4	9.2	0.0
	ROW %	1.9	2.7	59.9	31.4	5.7	32.6	1.0	1.0	0.4	3.7	
	COLUMN %	3.1	6.1	25.4	81.2	67.8	76.8	43.6	50.7	51.0	1.1	13.7
ROTORCRAFT	ESTIMATE	462	97	262	209	310	340	34	34	33	7089	8370
	% STD ERR	18.6	42.2	26.6	25.1	23.1	21.0	47.1	47.1	47.3	1.7	0.0
	ROW %	5.5	1.2	3.1	2.5	3.7	4.1	0.4	0.4	0.4	84.7	
	COLUMN %	2.3	0.6	0.3	1.6	10.9	2.3	4.3	5.1	11.0	6.0	3.4
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 21. NON-HIERARCHICAL GROUPS - ENGINE TYPE VS. CAPABILITY GROUP

1979

		L	L/MB	L/MB/ GS	L/MB/ GS/RA	LRN	RA	ML	L/MB/ GS/ML	LRN/ML	NO GROUP	ALL CRAFT
RECIPROCAT	ESTIMATE	19563	15041	79050	8075	1226	9157	626	501	219	110502	232688
	% STD ERR	4.0	4.7	1.4	5.0	15.6	4.8	22.6	24.8	37.6	1.0	0.0
	ROW %	8.4	6.5	34.0	3.5	0.5	3.9	0.3	0.2	0.1	47.5	
	COLUMN %	97.4	98.9	98.1	61.1	43.0	63.1	79.0	75.0	73.0	93.4	93.8
TURBOPROP	ESTIMATE	69	56	932	2568	314	2608	115	115	44	79	3706
	% STD ERR	42.1	34.1	9.8	3.6	18.8	3.6	32.0	32.0	49.0	15.2	0.2
	ROW %	1.9	1.5	25.1	69.3	8.5	70.4	3.1	3.1	1.2	2.1	
	COLUMN %	0.3	0.4	1.2	19.4	11.0	18.0	14.5	17.2	14.7	0.1	1.5
TURBOSHAFT	ESTIMATE	381	97	256	176	272	296	2	2	0	1869	3014
	% STD ERR	20.9	42.2	27.1	28.5	25.6	23.2	*	*	0.0	6.1	0.3
	ROW %	12.6	3.2	8.5	5.8	9.0	9.8	0.1	0.1	0.0	62.0	
	COLUMN %	1.9	0.6	0.3	1.3	9.5	2.0	0.3	0.3	0.0	1.6	1.2
TURBOJET	ESTIMATE	59	15	350	2391	1031	2420	48	48	34	116	2936
	% STD ERR	27.3	*	13.5	2.1	5.9	2.0	37.1	37.1	43.0	14.3	0.1
	ROW %	2.0	0.5	11.9	81.4	35.1	82.4	1.6	1.6	1.2	4.0	
	COLUMN %	0.3	0.1	0.4	18.1	36.2	16.7	6.1	7.2	11.3	0.1	1.2
TUR AIR GEN	ESTIMATE	0	0	0	0	0	0	0	0	0	0	0
	% STD ERR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ROW %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAMJET	ESTIMATE	0	0	0	0	0	0	0	0	0	0	0
	% STD ERR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ROW %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO ENGINE	ESTIMATE	7	4	0	3	10	24	3	3	3	5693	5721
	% STD ERR	*	*	0.0	*	40.4	47.5	*	*	*	0.9	0.9
	ROW %	0.1	0.1	0.0	0.1	0.2	0.4	0.1	0.1	0.1	99.5	
	COLUMN %	0.0	0.0	0.0	0.0	0.4	0.2	0.4	0.4	1.0	4.8	2.3
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 22. NON-HIERARCHICAL GROUPS - NUMBER OF ENGINES VS. CAPABILITY GROUP

1979

		L	L/MB	L/MB/GS	L/MB/GS/RA	LRN	RA	ML	L/MB/GS/ML	LRN/ML	NO GROUP	ALL CRAFT
ONE	ESTIMATE	19356	14275	60154	2432	891	3265	443	324	144	111156	207928
	% STD ERR	4.1	4.9	1.7	11.8	18.5	10.1	28.0	32.0	44.9	0.9	0.0
	ROW %	9.3	6.9	28.9	1.2	0.4	1.6	0.2	0.2	0.1	53.5	
	COLUMN %	96.4	93.8	74.6	18.4	31.2	22.5	55.9	48.5	48.0	94.0	83.8
TWO	ESTIMATE	706	923	20126	10411	1675	10843	335	329	143	1292	33601
	% STD ERR	16.8	16.2	1.8	3.0	8.6	2.9	23.9	24.2	39.9	9.2	0.1
	ROW %	2.1	2.7	59.9	31.0	5.0	32.3	1.0	1.0	0.4	3.8	
	COLUMN %	3.5	6.1	25.0	78.8	58.7	74.8	42.3	49.3	47.7	1.1	13.5
THREE	ESTIMATE	3	1	4	33	21	33	5	5	5	15	56
	% STD ERR	46.4	*	*	10.8	19.0	10.8	*	*	*	21.6	7.0
	ROW %	5.4	1.8	7.1	58.9	37.5	58.9	8.9	8.9	8.9	26.8	
	COLUMN %	0.0	0.0	0.0	0.2	0.7	0.2	0.6	0.7	1.7	0.0	0.0
FOUR	ESTIMATE	6	10	304	334	254	340	7	7	5	104	760
	% STD ERR	*	*	5.1	4.1	6.1	4.0	38.0	38.0	47.9	10.1	0.8
	ROW %	0.8	1.3	40.0	43.9	33.4	44.7	0.9	0.9	0.7	13.7	
	COLUMN %	0.0	0.1	0.4	2.5	8.9	2.3	0.9	1.0	1.7	0.1	0.3
MORE THAN FOUR	ESTIMATE	0	0	0	0	0	0	0	0	0	0	0
	% STD ERR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ROW %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	COLUMN %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NONE	ESTIMATE	7	4	0	3	10	24	3	3	3	5691	5720
	% STD ERR	*	*	0.0	*	40.4	47.5	*	*	*	0.9	0.9
	ROW %	0.1	0.1	0.0	0.1	0.2	0.4	0.1	0.1	0.1	99.5	
	COLUMN %	0.0	0.0	0.0	0.0	0.4	0.2	0.4	0.4	1.0	4.8	2.3
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

TABLE 22. NON-HIERARCHICAL GROUPS - NUMBER OF ENGINES VS. CAPABILITY GROUP (CONTINUED)

KEY

GROUP		GROUP	
L:	LOCALIZER	RA:	RADAR ALTIMETER
MB:	MARKER BEACON	LRN:	LONG RANGE RNAV
GS:	GLIDE SLOPE	ML:	MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.

TABLE 23. NON-HIERARCHICAL GROUPS - NUMBER OF SEATS VS. CAPABILITY GROUP

1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
1 SEAT	ESTIMATE	369	17	137	36	45	56	38	36	38	17169	17745
	% STD ERR	28.9	*	45.6	*	45.8	41.5	*	*	*	1.9	1.8
	ROW %	2.1	0.1	0.8	0.2	0.3	0.3	0.2	0.2	0.2	96.8	
	COLUMN %	1.8	0.1	0.2	0.3	1.6	0.4	4.8	5.4	12.7	14.5	7.2
2 SEATS	ESTIMATE	7497	2053	3598	5	47	124	8	5	3	51274	64469
	% STD ERR	6.7	13.7	10.1	*	*	*	*	*	*	1.3	0.5
	ROW %	11.6	3.2	5.6	0.0	0.1	0.2	0.0	0.0	0.0	79.5	
	COLUMN %	37.3	13.5	4.5	0.0	1.6	0.9	1.0	0.7	1.0	43.4	26.0
3 SEATS	ESTIMATE	705	102	39	36	52	52	43	41	41	11210	12108
	% STD ERR	13.8	31.8	43.3	*	*	*	*	*	*	1.6	1.3
	ROW %	5.8	0.8	0.3	0.3	0.4	0.4	0.4	0.3	0.3	92.6	
	COLUMN %	3.5	0.7	0.0	0.3	1.8	0.4	5.4	6.1	13.7	9.5	4.9
4 SEATS	ESTIMATE	9145	10267	42750	1235	392	1595	265	152	65	32555	96161
	% STD ERR	6.0	5.8	2.1	17.1	31.9	15.0	38.2	50.0	*	2.5	0.4
	ROW %	9.5	10.7	44.5	1.3	0.4	1.7	0.3	0.2	0.1	33.9	
	COLUMN %	45.5	67.5	53.0	9.3	13.7	11.0	33.5	22.8	21.7	27.5	38.8
5 SEATS	ESTIMATE	769	1014	4007	439	175	533	21	21	0	2472	8840
	% STD ERR	16.4	16.0	7.9	25.7	39.8	22.8	*	*	0.0	7.1	4.0
	ROW %	8.7	11.5	45.3	5.0	2.0	6.0	0.2	0.2	0.0	28.0	
	COLUMN %	3.8	6.7	5.0	3.3	6.1	3.7	2.7	3.1	0.0	2.1	3.6
6 SEATS	ESTIMATE	1258	1565	21341	3830	442	4247	147	145	38	2009	30102
	% STD ERR	15.3	14.7	2.6	7.5	24.3	7.1	47.4	47.9	*	11.5	1.7
	ROW %	4.2	5.2	70.9	12.7	1.5	14.1	0.5	0.5	0.1	6.7	
	COLUMN %	6.3	10.3	26.5	29.0	15.5	29.3	18.6	21.7	12.7	1.7	12.3
7-11 SEATS	ESTIMATE	262	129	7519	6345	1002	6512	157	153	55	734	15088
	% STD ERR	20.4	35.6	3.6	3.1	10.7	3.1	38.3	39.0	*	10.2	1.4
	ROW %	1.7	0.9	49.8	42.1	6.6	43.2	1.0	1.0	0.4	4.9	
	COLUMN %	1.3	0.8	9.3	48.0	35.1	44.9	19.8	22.9	18.3	0.6	6.1
12-19 SEATS	ESTIMATE	35	44	307	562	240	585	44	44	2	535	1509
	% STD ERR	49.0	37.7	10.3	9.3	16.2	9.2	45.5	45.5	*	7.0	3.7
	ROW %	2.3	2.9	20.3	37.2	15.9	38.8	2.9	2.9	0.1	35.5	
	COLUMN %	0.2	0.3	0.4	4.3	8.4	4.0	5.6	6.6	0.7	0.5	0.6

TABLE 23. NON-HIERARCHICAL GROUPS - NUMBER OF SEATS VS. CAPABILITY GROUP
(CONTINUED)
1979

		L	L,MB	L,MB, GS	L,MB, GS,RA	LRN	RA	ML	L,MB, GS,ML	LRN,ML	NO GROUP	ALL CRAFT
20-49 SEATS	ESTIMATE	33	12	523	399	282	467	48	48	42	156	1188
	% STD ERR	*	*	9.1	12.1	14.1	11.5	42.0	42.0	44.9	22.2	3.5
	ROW %	2.8	1.0	44.0	33.6	23.7	39.3	4.0	4.0	3.5	13.1	
	COLUMN %	0.2	0.1	0.6	3.0	9.9	3.2	6.1	7.2	14.0	0.1	0.5
50+ SEATS	ESTIMATE	6	10	367	326	174	332	23	23	16	111	823
	% STD ERR	*	*	7.0	6.6	7.1	6.5	29.0	29.0	35.8	13.6	2.9
	ROW %	0.7	1.2	44.6	39.6	21.1	40.3	2.8	2.8	1.9	13.5	
	COLUMN %	0.0	0.1	0.5	2.5	6.1	2.3	2.9	3.4	5.3	0.1	0.3
TOTALS	ESTIMATE	20078	15213	80588	13213	2852	14505	792	668	300	118258	248070
	% STD ERR	4.0	4.7	1.3	3.2	7.7	3.2	18.6	19.6	28.8	0.9	
	ROW %	8.1	6.1	32.5	5.3	1.1	5.8	0.3	0.3	0.1	47.7	

KEY

GROUP

L: LOCALIZER

MB: MARKER BEACON

GS: GLIDE SLOPE

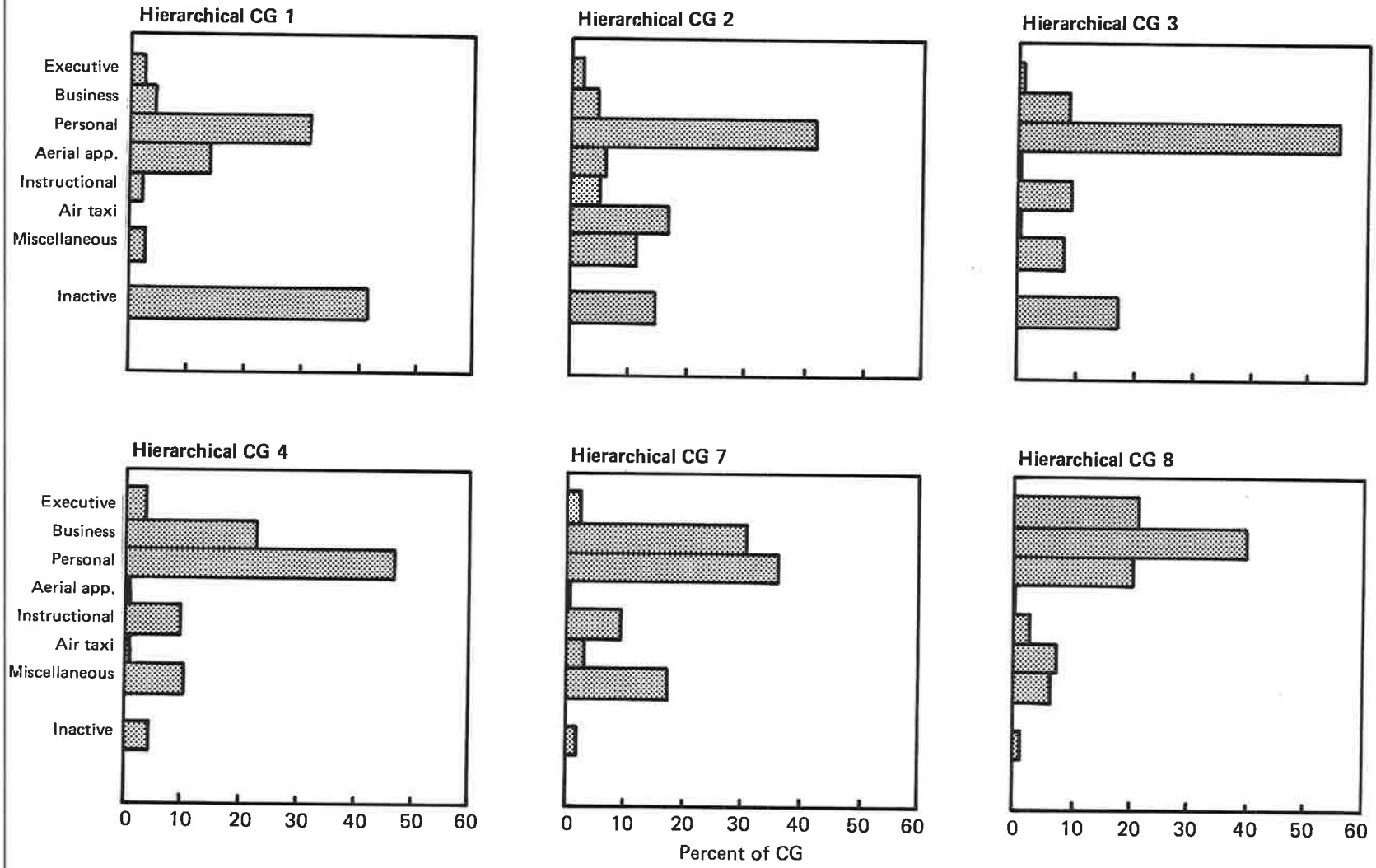
GROUP

RA: RADAR ALTIMETER

LRN: LONG RANGE RNAV

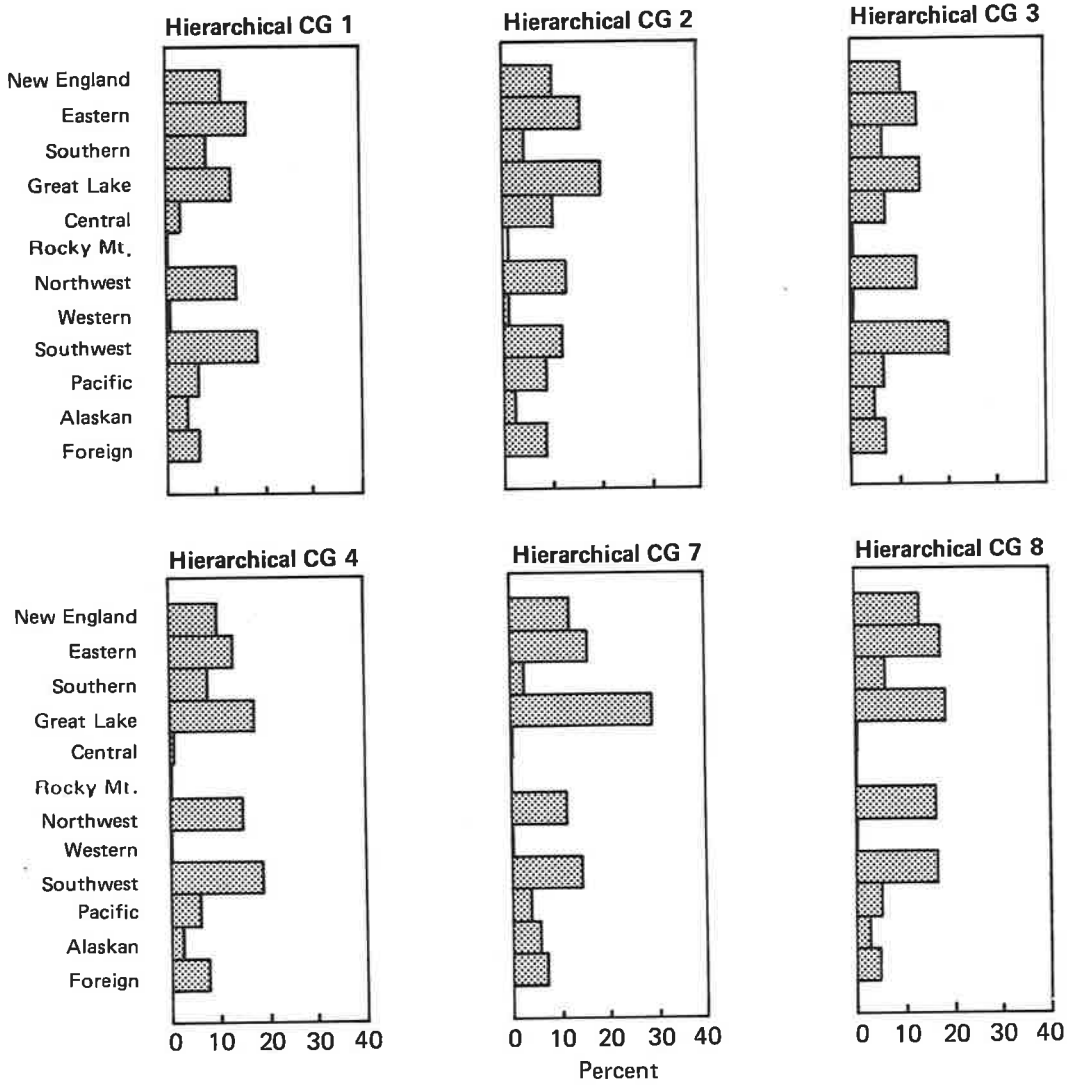
ML: MICROWAVE LANDING SYSTEM

NOTE : ROWS AND COLUMNS MAY NOT SUM TO PRINTED TOTALS DUE TO ESTIMATION PROCEDURES.
* STANDARD ERROR GREATER THAN 50 PERCENT.



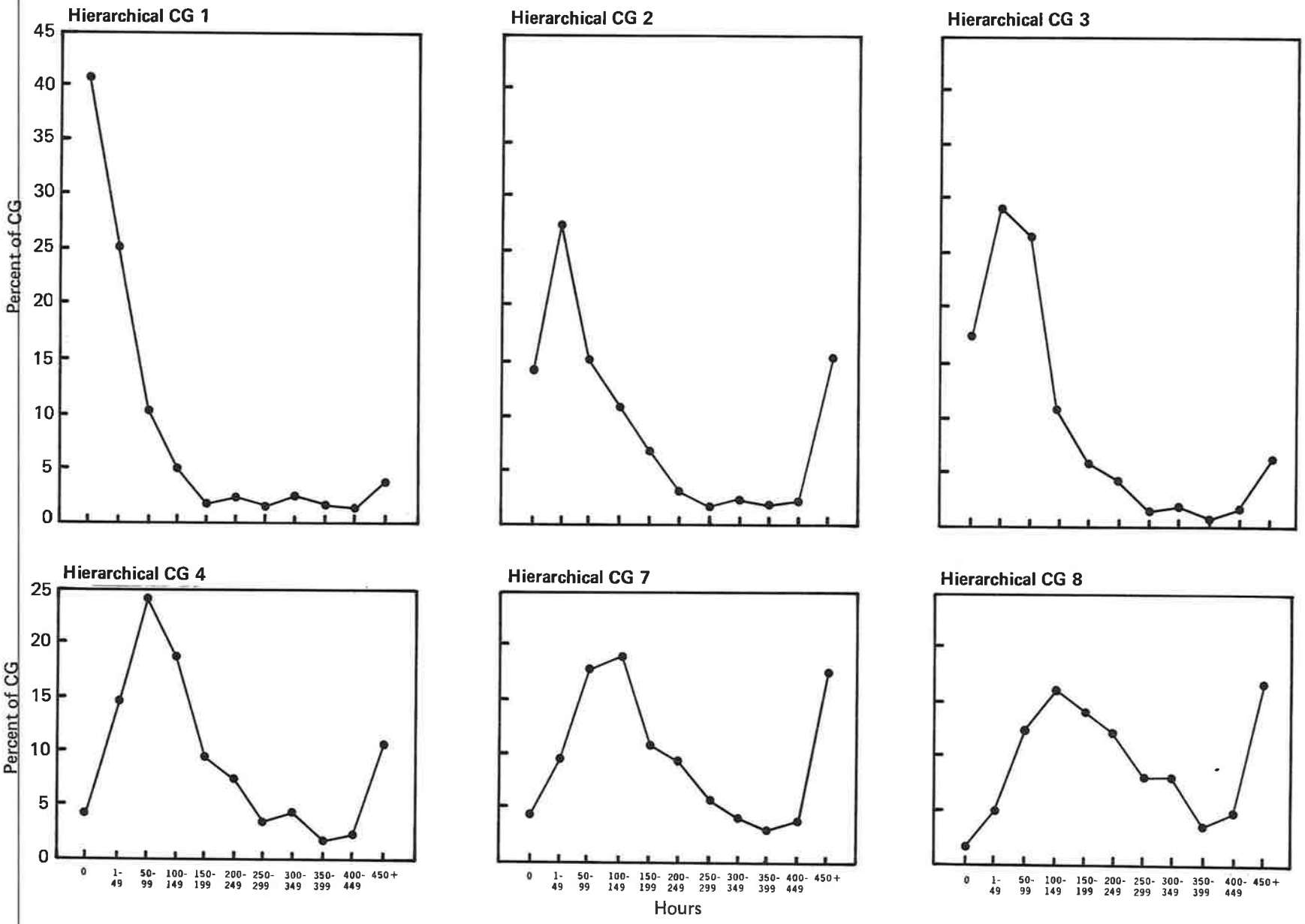
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 13. Percent Distribution of Hierarchical CG's by Primary Use



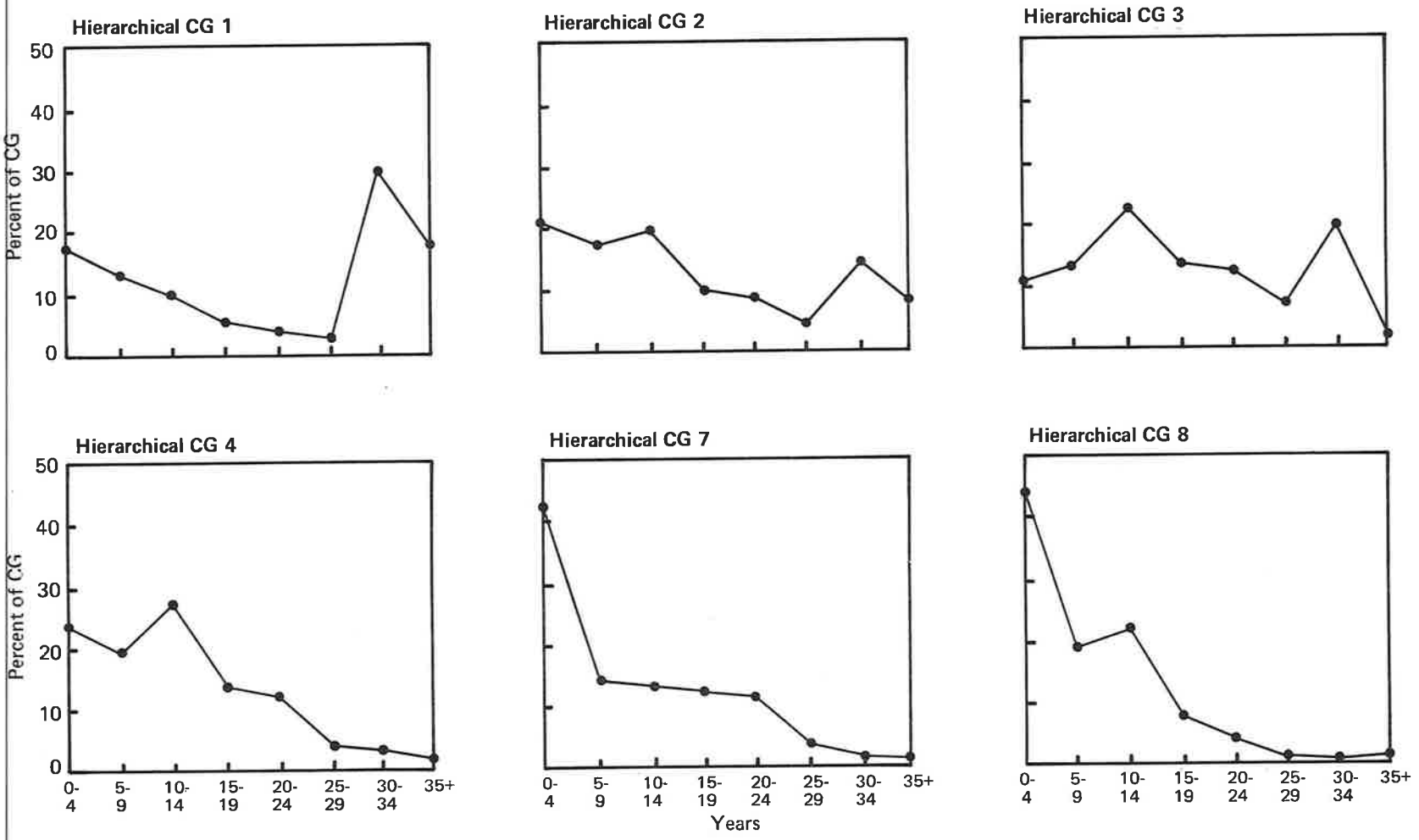
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 14. Percent Distribution of Hierarchical CG's by Base Airport Region



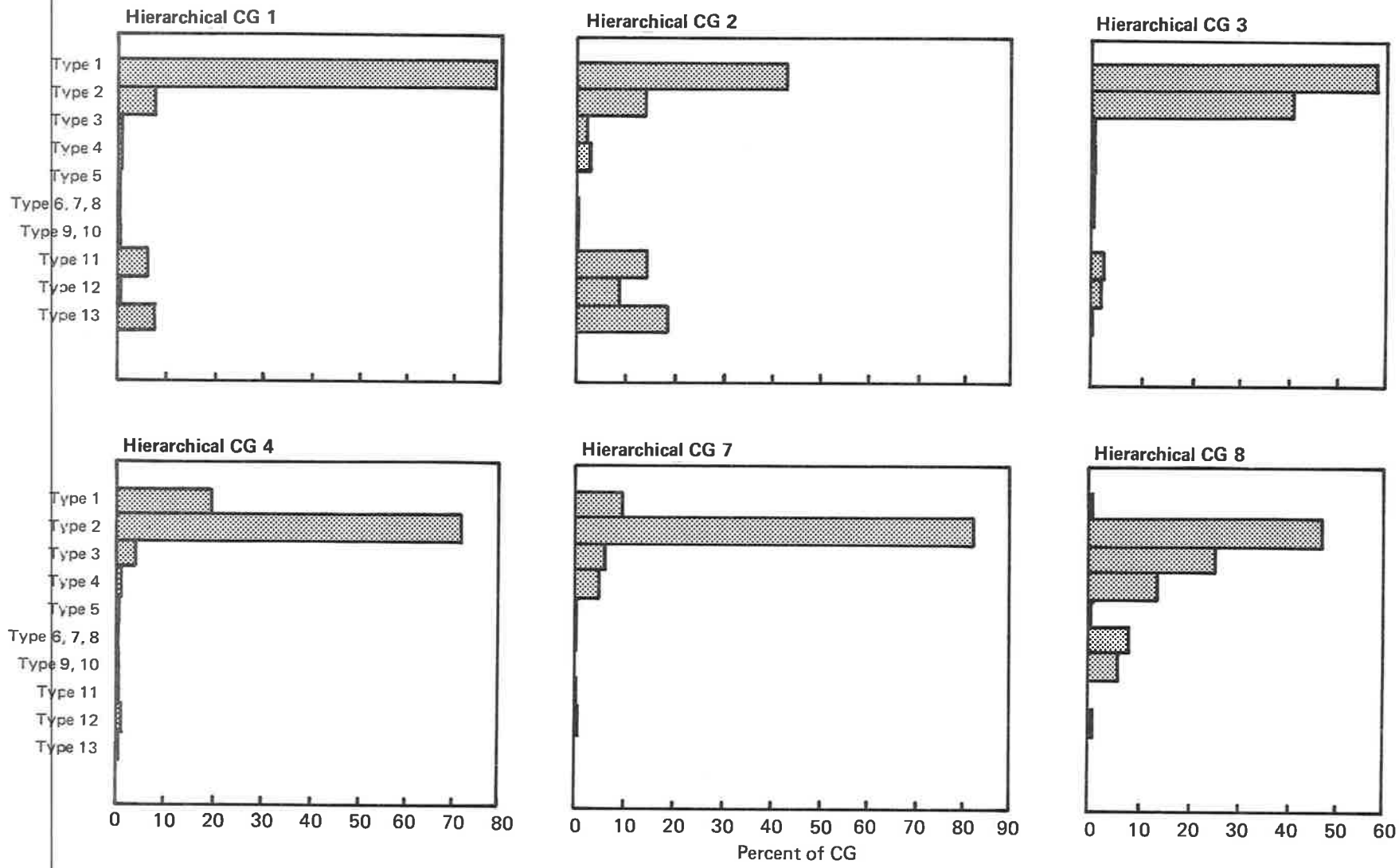
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 15. Percent Distribution of Hierarchical CG's by Annual Hours Flown



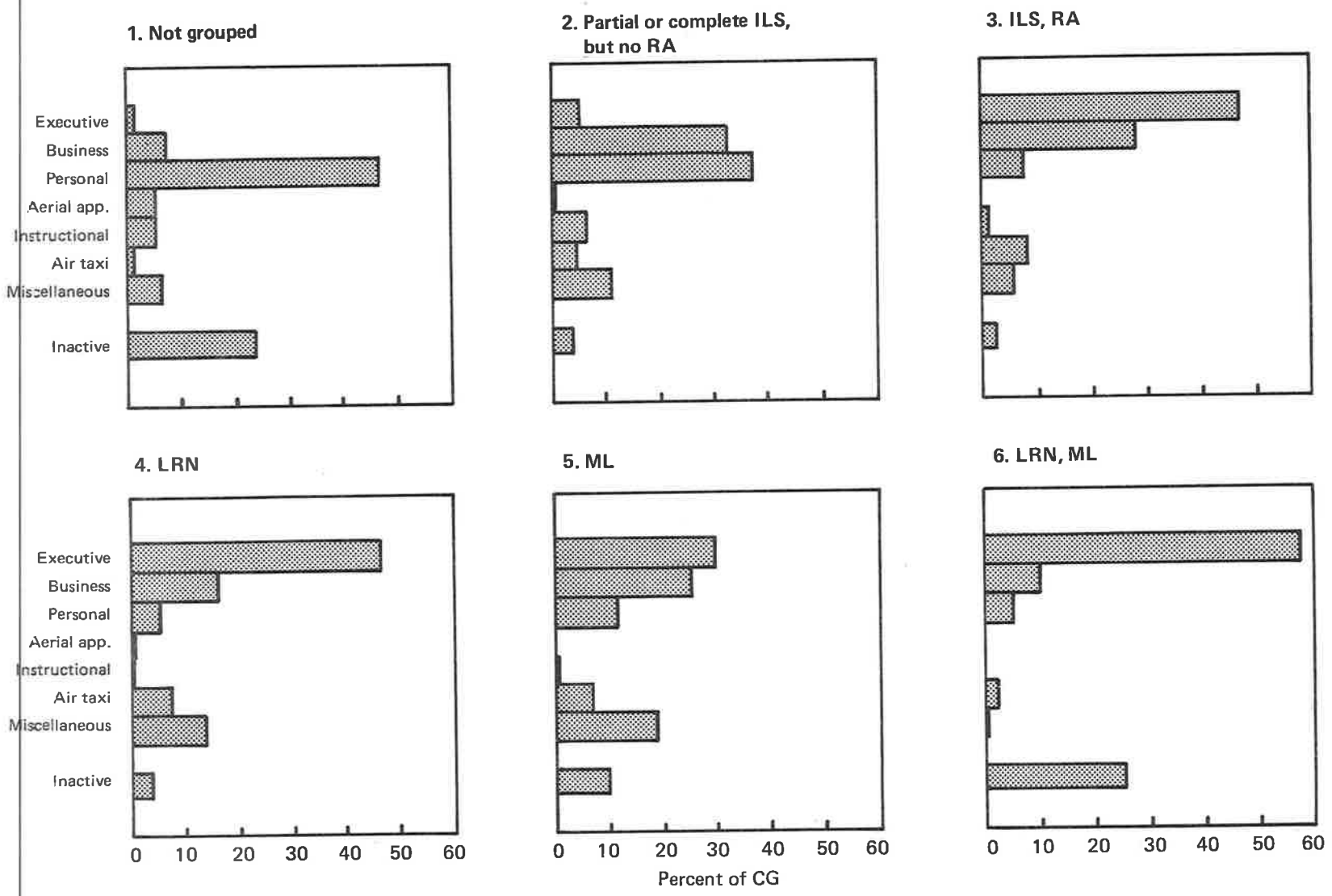
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 16. Percent Distribution of Hierarchical CG's by Age



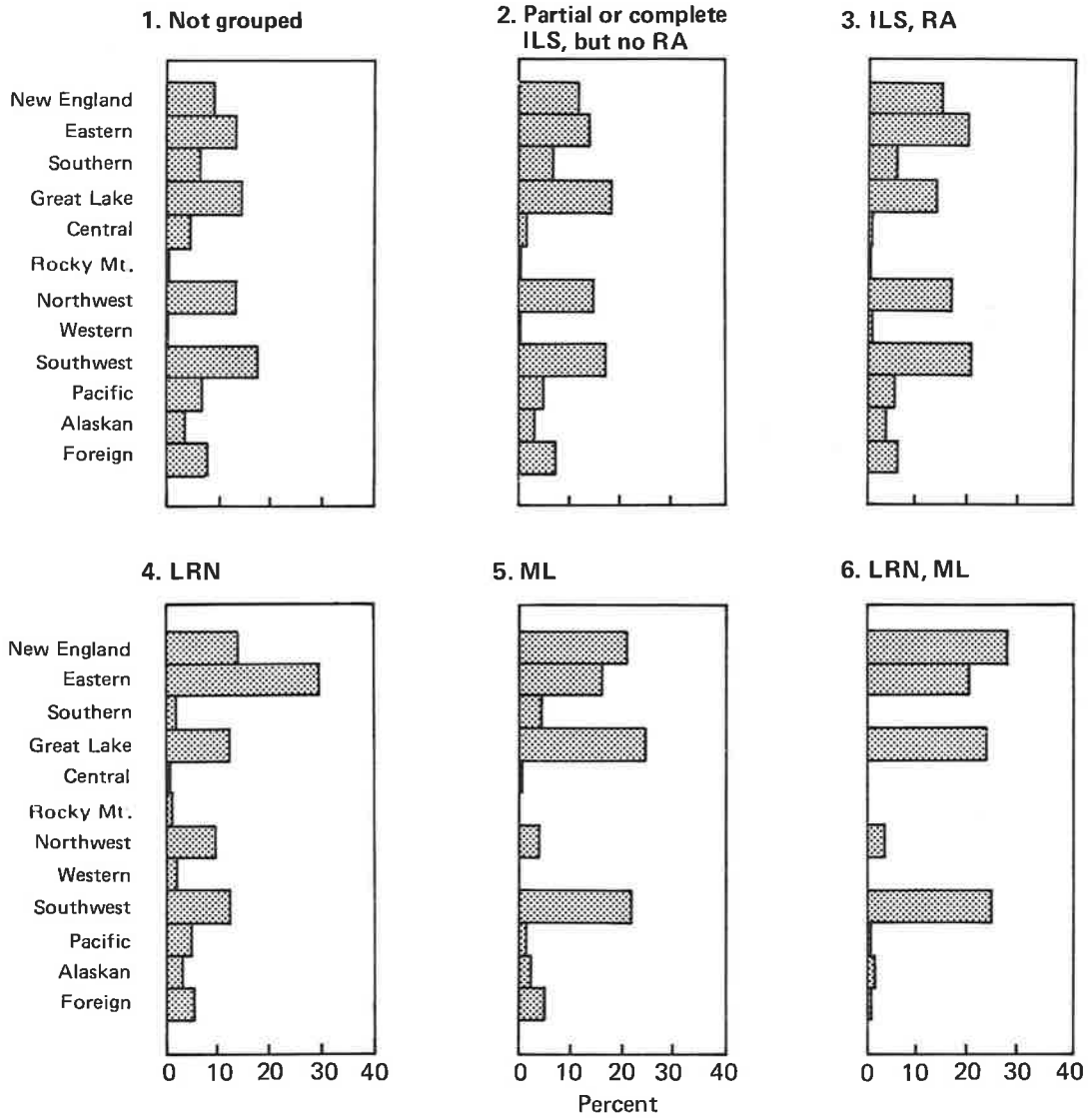
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 17. Percent Distribution of Hierarchical CG's by Computed Aircraft Type



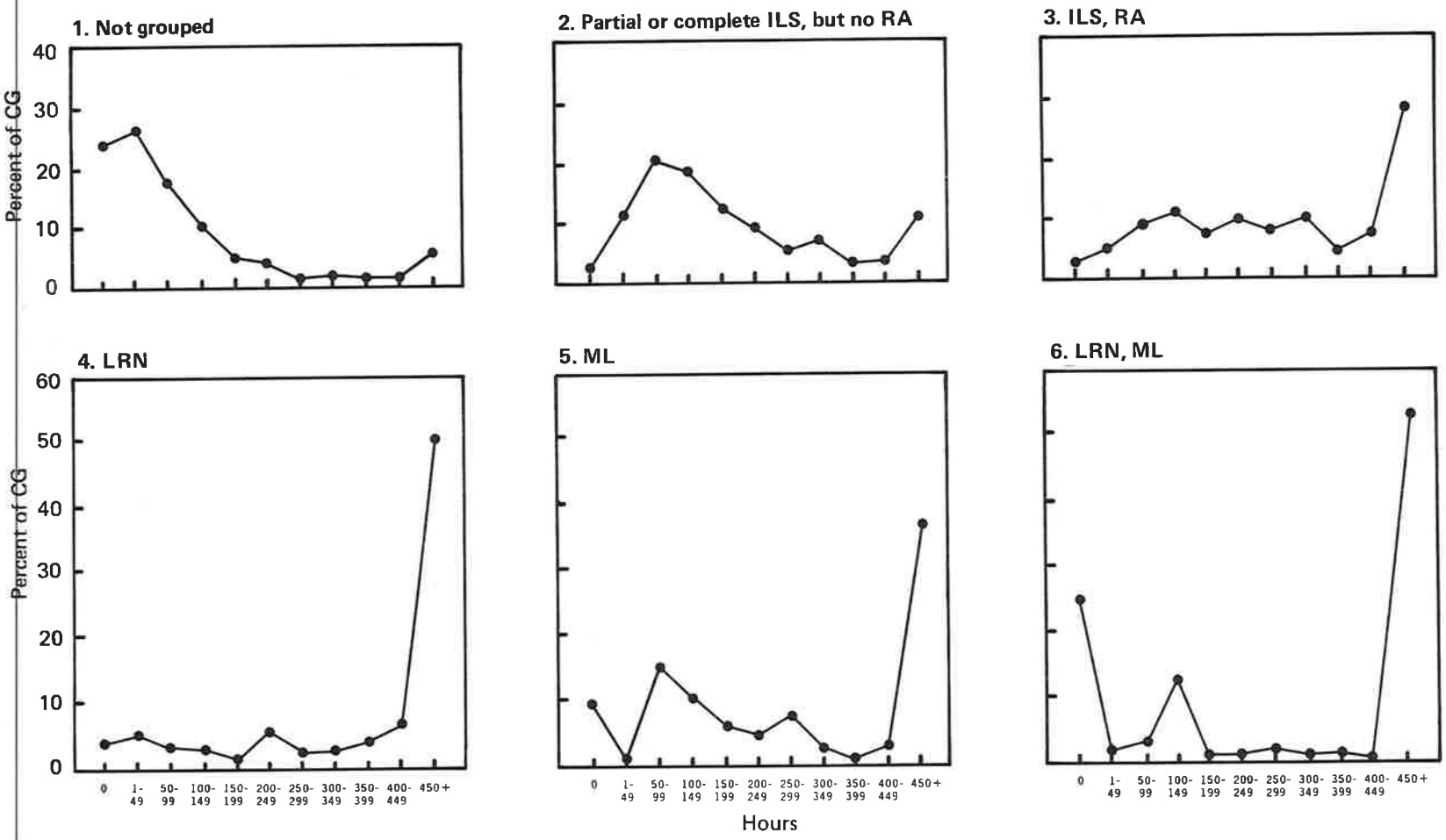
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 18. Percent Distribution of Non-Hierarchical CG's by Primary Use



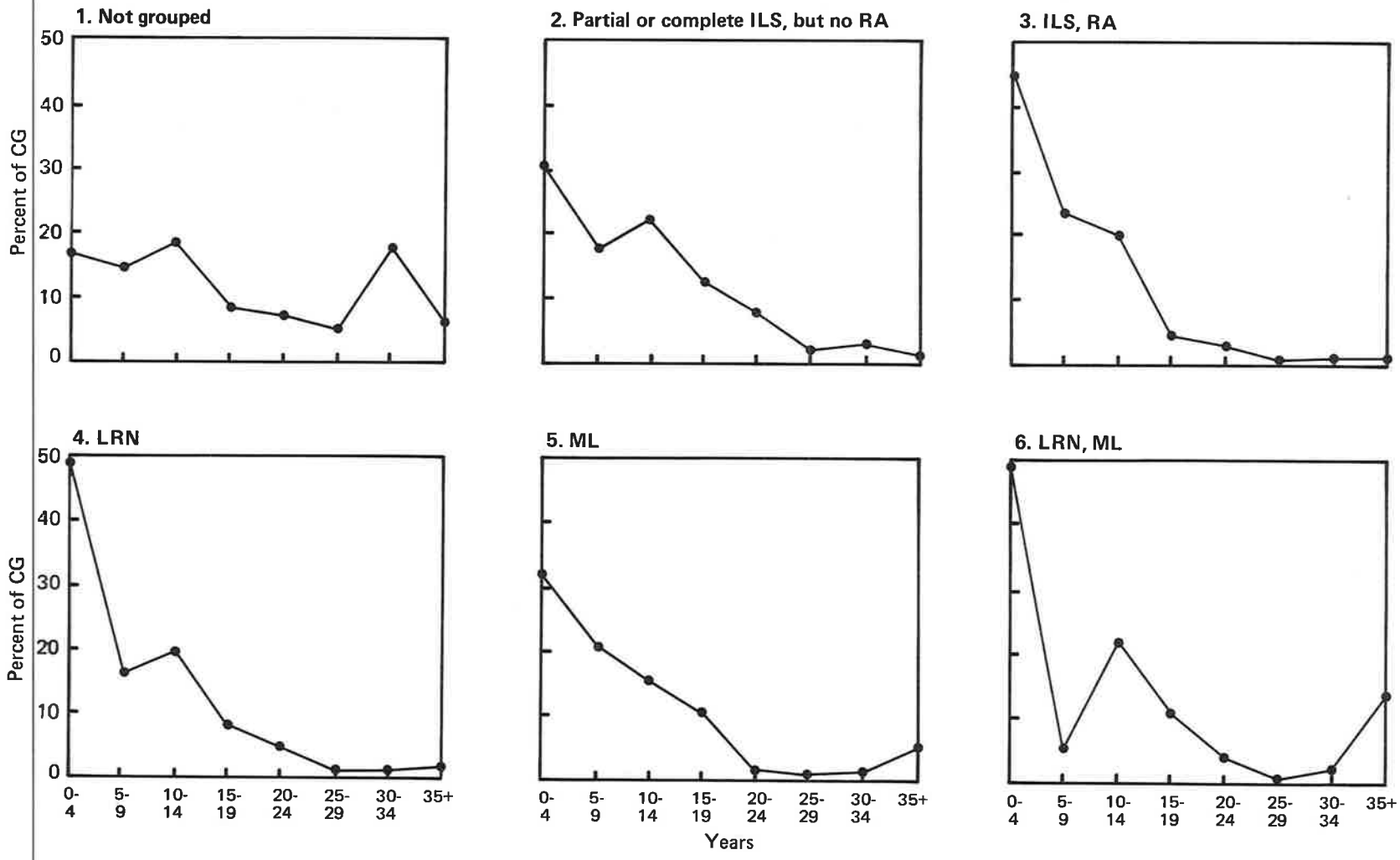
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 19. Percent Distribution of Non-Hierarchical CG's by Base Airport Region



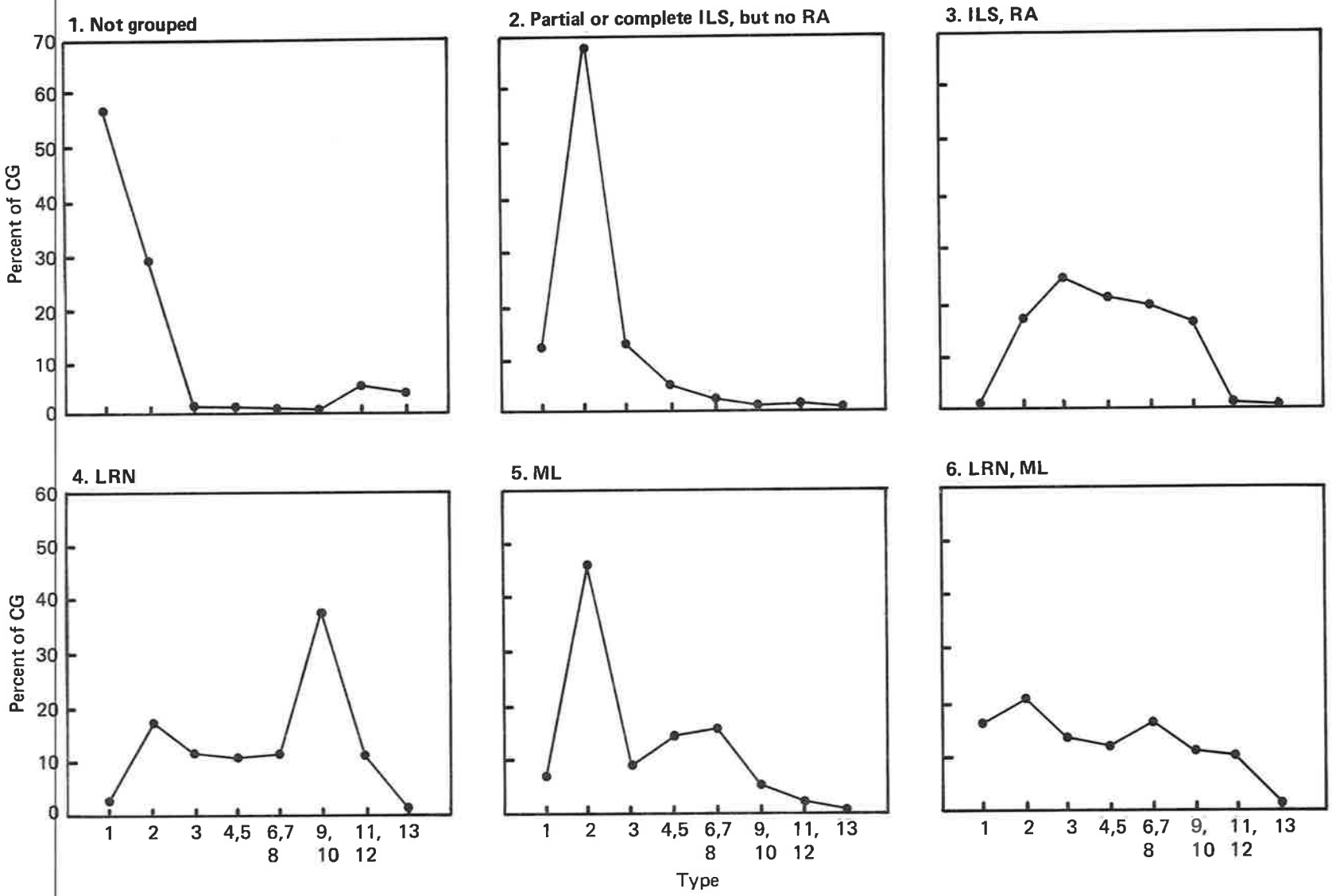
The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 20. Percent Distribution of Non-Hierarchical CG's by Annual Hours Flown



The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 21. Percent Distribution of Non-Hierarchical CG's by Age of Aircraft



The 1979 figures are based on a sample survey rather than a census and are subject to sampling error.

Figure 22. Percent Distribution of Non-Hierarchical CG's by Computed Aircraft Type

APPENDIX A
GENERAL AVIATION ACTIVITY AND AVIONICS SURVEY DESIGN

APPENDIX A[1]

DESIGN OF GENERAL AVIATION ACTIVITY AND AVIONICS SURVEY

A.1 BACKGROUND

Prior to the current survey method, the FAA used the Aircraft Registration Eligibility, Identification, and Activity Report, AC Form 8050-73 in its data collection program on general aviation activity and avionics. The form, sent annually to all owners of civil aircraft in the U.S., served two purposes: (1) Part 1 was the mandatory aircraft registration renewal form; (2) Part 2 was voluntary and applied to general aviation aircraft only, asking questions on the owner-discretionary characteristics of the aircraft such as flight hours, avionics equipment, base location, and use. In 1978, the FAA replaced AC form 8050-73 with a new system: Part 1 was replaced by a triennial registration program; Part 2 was replaced by the General Aviation Activity and Avionics Survey, FAA Form 1800-54 (see Figure 1). The survey was to be conducted annually based on a statistically selected sample of general aviation aircraft, requesting the same type of information as Part 2 of AC Form 8050-73. The first General Aviation Activity and Avionics Survey took place in 1978, collecting data on the 1977 general aviation aircraft fleet. The 1979 statistics in this report were derived from the third survey which took place in 1980. Benefits resulting from the new method of data collection included quicker processing of the results, improved data quality, and a considerable savings in time and money to both the public and the Federal Government.

A.2 SURVEY COVERAGE

A.2.1 Aircraft

The General Aviation Activity and Avionics Survey covers, through a stratified probability sample, all general aviation aircraft registered in the United States.

A.2.2 Geographic

The sample survey covers general aviation aircraft registered with the United States Aircraft Registry as of December 31, 1979. Over 99 percent of these aircraft are registered to owners living in the 50 states and Washington, D.C., with about 0.3 percent (675 aircraft) in Puerto Rico and

[1] Source: 1979 General Aviation Activity and Avionics Survey.

other U.S. Territories, and 0.5 percent (954 aircraft) registered to owners living in foreign countries.[1]

A.2.3 Content

Figure 1 is a copy of the survey questionnaire, FAA Form 1800-54. The questionnaire requests the owner to provide information on the sampled aircraft's characteristics and uses for various time periods:

(1) Hours by use, IFR hours, and fuel consumption for entire calendar year 1979,

(2) Airframe hour reading and location of aircraft base as of December 31, 1979, and,

(3) Avionics equipment currently on board.

A.3 SAMPLE DESIGN

A.3.1 Sample Frame and Size

The Aircraft Registration Master File, maintained by the FAA Mike Monroney Aeronautical Center in Oklahoma City, provided the sample frame, the list of aircraft from which the sample was selected, for the survey. This file is the official record of registered civil aircraft in the U.S., containing one record per aircraft.

Between the 1977 and 1978 survey cycles several changes occurred to this file which had an impact on the sample population and frame, and ultimately on the survey results. In January 1978, FAA implemented a new procedure for maintaining the file, known as triennial revalidation. Instead of requiring all owners to revalidate and update their aircraft registration annually, FAA required revalidation for only those owners who had not contacted the registry for three years. The less frequent updating affected the accuracy of the file and its representativeness. Two major consequences for the survey results are discussed below:

(1) The accuracy of owners' names and addresses deteriorated causing the number of questionnaires returned by the post office to double from 1977 to 1978 and again from 1978 to 1979. This partially accounted for lower survey response rates in 1978 and in 1979.

(2) The file contained a residue of aircraft which, under the old revalidation system, would have been deregistered and purged from

[1] Source: FAA Aircraft Registration Master File as of December 31, 1979.

the file, but remained under the new system. Consequently, the population counts were inflated resulting in artificially large increases in the estimates of the number of active general aircraft from 1977 to 1978, and from 1978 to 1979.

Also during this period, the entire Aircraft Registration System was installed on a new computer system. At the same time, FAA modified many of the updating and processing procedures. It is quite possible that these changes affected the registration file, although it is not known in what way.

Finally, new legislation required two categories of aircraft, formerly ineligible, to be registered with the U.S. Registry, namely:

(1) Aircraft owned by individual citizens of foreign countries who are permanent residents of the U.S., and

(2) Aircraft owned by non-U.S. corporations which are organized and doing business under U.S. law as long as the aircraft are based and used primarily in the U.S.

The definition of a registered general aviation aircraft changed from 1977 to 1978 to include the two new groups. It is estimated that these aircraft comprise less than one half percent of the general aviation fleet.

Thus these changes discussed above affected the contents of the Aircraft Registration Master File and, consequently, the survey results. While it is difficult to quantify the effects of the changes, FAA estimates that they caused the survey results to overestimate population and hours flown by not more than five percent.

All aircraft identified as general aviation in the file according to the definition in Section 1.1.1 comprise the sample frame with the following exceptions:

(1) Aircraft registered to dealers.

(2) Aircraft with "Sale Reported" or "Registration Pending" appearing in the records instead of the owner's name.

(3) Aircraft with a known inaccurate owner's address.

(4) Aircraft with missing state of registration, aircraft make-model-series code, or aircraft type information.

For calendar year 1979, the sample frame consisted of 248,070 general aviation aircraft records from which 35,145 records were sampled, yielding a 14.2 percent sample. Table A-1 shows the distribution of the sample compared to that of the population by aircraft type. Table A-2 shows similar distributions by FAA region. (See Appendix C for the FAA regional map.) These displays clearly demonstrate the disproportionality of the sample to the population, an intended result of the sample design to gain efficiency and to control errors.

A.3.2 Description of Sample Design

The sample design employed was a stratified, systematic design from a random start. The sample was selected from a two-way stratified frame matrix. The two stratification criteria were:

(1) State or territory of aircraft registration.

(2) A variable called make-model index constructed from the thirteen aircraft types and the 300+ aircraft manufacturer/model groups of 20 or more general aviation aircraft.

The 54 levels of the state criterion and the 330 levels of the make-model index yielded a matrix of 54 by 330, or 17,820 cells (strata) among which the frame was divided for sampling.

The FAA's primary requirement was for estimates of mean annual flight hours per aircraft, necessitating optimal determination of sample sizes based on flight hour variation by state and make-model, and not on population. Hence, the sample was not proportional to cell size, and a sampling fraction was determined for each cell with a non-zero population. Sampling was then performed systematically from a random start within individual cells.

Initially, each aircraft in the sample was given a weight which was the inverse of its cell's sampling fraction, and which corresponded to the number of aircraft in the sample frame represented by that aircraft. When all responses to the survey were tallied, each weight was adjusted according to the response rate for the aircraft's cell, counting an aircraft for which no survey questions were answered as a

TABLE A-1. SAMPLE AND POPULATION DISTRIBUTIONS BY AIRCRAFT TYPE

TYPE	POPULATION	SAMPLE SIZE	SAMPLE AS % OF POPULATION
Fixed Wing			
Piston			
1 engine, 1-3 seats	83,970	13,321	15.9
1 engine, 4+ seats	115,507	10,892	9.4
2 engines, 1-6 seats	18,071	2,454	13.6
2 engines, 7+ seats	9,271	2,502	27.0
Other Piston	389	338	86.9
Turboprop			
2 engines, 1-12 seats	2,986	584	19.6
2 engines, 13+ seats	584	191	32.7
Other Turboprop	132	131	99.2
Turbojet			
2 engines	2,383	541	22.7
Other Turbojet	551	376	68.2
Rotorcraft			
Piston	5,346	1,558	29.1
Turbine	3,024	625	20.7
Other	5,856	1,632	27.9
TOTAL	248,070	35,145	14.2

TABLE A-2. SAMPLE AND POPULATION DISTRIBUTIONS BY REGION OF REGISTERED AIRCRAFT

REGION	APPROXIMATE POPULATION	SAMPLE SIZE	SAMPLE AS % OF POPULATION
Alaskan	6,898	1,704	24.7
Central	16,670	2,132	12.8
Eastern	27,355	5,193	19.0
European (Foreign)	388	226	58.2
Great Lakes	43,624	4,316	9.9
New England	8,614	2,961	34.4
Northwestern	17,648	1,997	11.3
Pacific	825	480	58.2
Rocky Mountain	13,343	3,239	24.3
Southern	35,662	5,191	14.6
Southwestern	35,311	3,113	8.8
Western	40,584	4,827	11.9
TOTAL	248,070	35,145	14.2

non-respondent and an aircraft for which at least one question was answered as a respondent. The weight adjustment is described below:

(1) Non-respondents' weights were changed to zero.

(2) The weights of all responding aircraft in cells where there were fewer than four telephone follow-up contacts were adjusted uniformly by dividing the initial weights by the response rate.

(3) In cells where there were four or more telephone follow-up contacts, the weights of the mail respondents remained unchanged, and the weights of the telephone respondents were increased by dividing their initial weights by the proportion of non-respondents contacted by telephone.

This method of weight adjustment has several attributes. It actually incorporates the response rates into the final weights and simplifies estimation procedures. In addition, (3) above removes non-response bias from the affected make-model indices and states of registration by weighting the telephone sample of mail non-respondents to adjust for the remaining non-respondents.

A.3.3 Error

Errors associated with estimates derived from sample survey results fall into two categories: sampling and non-sampling errors.[1] Sampling errors occur because the estimates are based on a sample - not the entire population. Non-sampling errors arise from a number of sources such as non-response, inability or unwillingness of respondents to provide correct information, differences in interpretation of questions, mistakes in recording or coding the data obtained, and others. The following sections discuss the two types of errors.

A.3.3.1 Sampling Error

In a designed survey, the sampling error associated with an estimate is generally unknown, but a measurable quantity

[1] Standards for Discussion and Presentation of Errors in Data, Department of Commerce, Bureau of the Census, (Washington, D.C., 1974), pp. 11-14.

known as the standard error is often used as a guide to the magnitude of sampling error. The standard error measures the variation which would occur among the estimates from all possible samples of the same design from the same population. It thus measures the precision with which an estimate approximates the average result of all possible samples or the result of a survey in which all elements of the population were sampled.

Through sample design techniques, the statistican can control the sizes of standard errors on a few key variables, known as design variables, in the survey. In the General Aviation Activity and Avionics Survey, the design variables were the mean annual hours flown per aircraft by aircraft type, by aircraft manufacturer/model group, and by state of aircraft registration. The sample was designed to produce standard errors on these variables at levels specified by the FAA. No controls were placed on the standard errors of the non-design variables.

Thus every estimate resulting from a sample survey, whether it be for a design or non-design variable, has sampling error associated with it. The user of survey results must consider this error along with the point estimate itself when making inferences or drawing conclusions about the sample population. A large standard error relative to an estimate indicates lack of precision and, inversely, a small standard error indicates precision. To facilitate the comparison of estimates and their errors, the tables in Section 3 of this publication display the percent standard errors for all estimated quantities. In some cases, the tables contain the percent standard error, which is the standard error divided by the corresponding estimate. The paragraphs below explain the proper interpretation and use of the errors.

An estimate and its standard error make it possible to construct an interval estimate with prescribed confidence that the interval will include the average value of the estimate from all possible samples of the population. Table A-3 below shows selected interval widths and their corresponding confidence.

TABLE A-3. CONFIDENCE OF INTERVAL ESTIMATES

WIDTH OF INTERVAL	APPROXIMATE CONFIDENCE THAT INTERVAL INCLUDES AVERAGE VALUE
1 Standard error	68%
2 Standard errors	95%
3 Standard errors	99%

As an example, from Table 9 a 95 percent confidence interval for the estimated number of aircraft in the 0-4 years age category would be 62375 $\pm$ 2(.019)(62375) or 62375 $\pm$ 2370 or (60005, 64745). One would say that the number of aircraft in the 0-4 years age category lies somewhere between 60005 and 64745 with 95 percent confidence.

A.3.3.2 Non-Sampling Error

Non-sampling error can be reduced through survey design although the amount of reduction is difficult, if not impossible, to quantify in any given design. Nevertheless, through controlled experiments, various techniques have been identified which limit non-sampling error. Several of these techniques were incorporated into the design of the general aviation survey and are itemized below:

- The second mailing and telephone survey of a sample of non-respondents were conducted in addition to the original mailing to improve the response rate, since a low response rate is a major cause of non-sampling error. Seventy-one percent of those aircraft sampled responded to at least one question of the survey. While acceptable, this rate nevertheless represents a decrease in response from 1977 when the survey achieved an 80 percent response rate and 1978 when the response rate was 74 percent. Possible causes of the decrease include:

  (1) The deterioration of aircraft owners' names and addresses in the Aircraft Registration Master File, the sample frame. This increased the number of questionnaires returned undelivered by the postmaster from around 500 in 1977 to over 1000 in 1978 to almost 2,000 in 1979, hence decreasing the response rate.

  (2) Repeated sampling of aircraft in two and possibly three consecutive years. Due to the design of the sample to achieve specified precision in estimates for states and manufacturer/model groups of aircraft, it is impossible to avoid sampling some of the same aircraft in consecutive years. Owners of such aircraft may have been less willing to respond in 1979 than in 1978 and 1977.

Tables A-4 and A-5 show the response rates broken down by FAA region and aircraft type, respectively. The lowest response rate for any region was 21 percent for the European (Foreign) Region due to mail delivery and telephone contact difficulties. The Pacific and Alaskan Regions rates were low at 57 and 58 percent, respectively, for similar reasons. These three regions together, however, represented only 3 percent of the active U.S. general aviation fleet. Twin engine fixed wing piston aircraft with 7 or more seats had the lowest response rate at 59 percent of any of the aircraft types, but these aircraft represented less than 4 percent of the fleet.

- The telephone sample of mail non-respondents helped to minimize bias in results caused by differences in attributes between respondents and non-respondents.

- The survey questionnaire was designed and tested to minimize misinterpretation of questions by the aircraft owners.

- To assure the owners of the confidentiality of their responses, the questionnaire cover letter informed them that the intended use of the responses was "only to produce summary statistics and not to disclose individual operations nor to make changes to your aircraft records."

- Comprehensive editing procedures insured the accuracy of the data transcription to machine readable form and the internal consistency of responses.

- The official and most accurate source of information available on the general aviation fleet, the FAA Aircraft Registration Master File, was used as the sampling frame.

TABLE A-4. RESPONSE RATES BY REGION

REGION	RESPONSE RATE (%)	REGION	RESPONSE RATE (%)
Alaskan	58	Pacific	57
Central	75	Rocky Mountain	72
Eastern	73	Southern	69
European (Foreign)	21	Southwestern	72
Great Lakes	76	Western	72
New England	73		
Northwestern	69	TOTAL	71

TABLE A-5. RESPONSE RATES BY AIRCRAFT TYPE

AIRCRAFT TYPE	RESPONSE RATE (%)	AIRCRAFT TYPE	RESPONSE RATE (%)
Fixed Wing			
Piston		Turbojet	
1 engine, 1-3 seats	72	2 engines	85
1 engine, 4+ seats	71	Other	75
2 engines, 1-6 seats	70		
2 engines, 7+ seats	59		
Other	60		
Turboprop		Rotorcraft	
2 engines, 1-12 seats	80	Piston	69
2 engines, 13+ seats	84	Turbine	78
Other	75		
		Other	75
		TOTAL	71

A.4 SURVEY METHOD

The main method of collecting data for this survey was the mail questionnaire, sent to the owners of the sampled aircraft in two mailings. The first mailing on February 29, 1980, covered all 35,145 aircraft in the sample and had a response rate of 55 percent as shown in Table A-6 below. This was about 78 percent of the total responses to the survey. The second mailing conducted on March 31, 1980, included only those aircraft in the sample that had not yet responded. The second mailing had a response rate of 30 percent which accounted for 19 percent of the total responses to the survey. The combined response rate for the two mailings was 69 percent of the sample.

A telephone follow-up survey was conducted during June and early July using the same questions appearing in the mail survey. A sample of the mail non-respondents was selected for the telephone survey weighing most heavily those states and make-model groups in the sampling strata that had the lowest mail response rates. Of a total telephone sample of 3611 aircraft, only 850, or 24 percent, responses could be obtained due to difficulty in obtaining telephone numbers, finding owners at home, and obtaining cooperation of owners over the telephone. Nevertheless, the 850 telephone responses contributed the remaining three percent of the responses and increased the overall response rate of the survey to 71 percent.

TABLE A-6. SUMMARY OF RESPONSE INFORMATION BY SURVEY PHASE

SURVEY PHASE	SAMPLE SIZE (S)	NUMBER OF RESPONSES (R)	RESPONSE RATE (R/S X 100%)	PORTION OF TOTAL RESPONSE [(R/TOTAL R) X 100%]
FIRST MAILING	35,145	19,361	55%	78%
SECOND MAIILNG	15,784	4,757	30%	19%
COMBINED MAILINGS	35,145	24,118	69%	97%
TELEPHONE SURVEY	3,611	850	24%	3%
TOTAL	35,145	24,968	71%	100%

APPENDIX B

SAMPLE FILE AIRCRAFT RECORD LAYOUT

FIELD	NAME	FIELD DESCRIPTION/LENGTH	POSITION	COMMENTS
1.	Blank	A/N7	1-7	Unique for each sampled aircraft. Data verification purposes only.
2.	Control Number	N6	8-13	
3.	Blank	A/N20	14-33	
4.	Aircraft manufacturer/model/series code	N7	34-40	Standard FAA numeric code.
5.	Aircraft category code	N1	41	1 - Land 2 - Sea 3 - Amphibian
6.	Aircraft type	N1	42	1 - Glider 2 - Balloon 3 - Blimp/Dirigible 4 - Fixed Wing Single Engine 5 - Fixed Wing Multi-Engine 6 - Rotorcraft
7.	Engine type code	N1	43	1 - Reciprocating 2 - Turbopropeller 3 - Turboshaft 4 - Turbojet 5 - Turbine Air Generator 6 - Ram Jet 9 - Unknown 0 - No Engine
8.	Engine manufacturer/model code	N5	44-48	Standard FAA numeric code.

FIELD NAME	FIELD DESCRIPTION/LENGTH	POSITION	COMMENTS
9. Number of engines	N2	49-50	
10. Engine horsepower	N5	51-55	Per engine
11. Year of manufacture	N2	56-57	00 if unknown
12. Registrant type	N1	58	1 - Individual 2 - Partnership 3 - Corporation 4 - Co-ownership 5 - Government
13. Number of co-owners	N2	59-60	Does not include principal owner.
14. Aircraft base state numeric code	N2	61-62	
15. Aircraft base region code	A/N1	63	
16. Engine SDR group name	A/N12	64-75	Standard FAA numeric code.
17. Final weight-state	N6	76-81	Weight used when compiling state or regional statistics XXXX.X
18. Blanks	A/N48	82-129	
19. Registrant city	A/N18	130-147	
20. Registrant zip code	A/N5	148-152	
21. Registrant region	A/N1	153	
22. Registrant state code	N2	154-155	

FIELD NAME	FIELD DESCRIPTION/LENGTH	POSITION	COMMENTS
23. Registrant county/ country code	A/N3	156-158	
24. Airworthiness class	N1	159	1 - Standard 2 - Limited 3 - Restricted 4 - Experimental 5 - Provisional 6 - Multiple 8 - Special Flight Permit
25. Certificate issue date	N6	160-165	
26. State abbreviation	A/N2	166-167	Standard FAA name.
27. Aircraft manufacturer name	A/N30	168-197	Standard FAA name.
28. Aircraft model name	A/N20	198-217	
29. Number of seats	N3	218-220	
30. Respondent type	N1	221	1 - Respondent to First Mailout 2 - Respondent to Second Mailout 3 - Respondent to Telephone Survey 5 - Address Unknown 6 - Non-respondent
31. GA/air carrier indicator	N1	222	0 for GA 1 for Air Carrier

FIELD NAME	FIELD DESCRIPTION/LENGTH	POSITION	COMMENTS
32. Lifetime airframe hours	N5	223-227	
33. Active/inactive	N1	228	0, if not reported; 1, if active; 2, if inactive.
34. Owned part of year	N1	229	0, if owned full year; 1, if owned part of year.
35. Executive use hours	N4	230-233	
36. Business use hours	N4	234-237	
37. Personal use hours	N4	238-241	
38. Aerial application hours	N4	242-245	These hours contain both current and previous owners' hours.
39. Instructional use hours	N4	246-249	
40. Air taxi hours	N4	250-253	
41. Industrial/special use hours	N4	254-257	
42. Rental use hours	N4	258-261	
43. Other use hours	N4	262-265	
44. Annual hours flown	N4	266-269	Sum of Fields 35 through 43 inclusive.

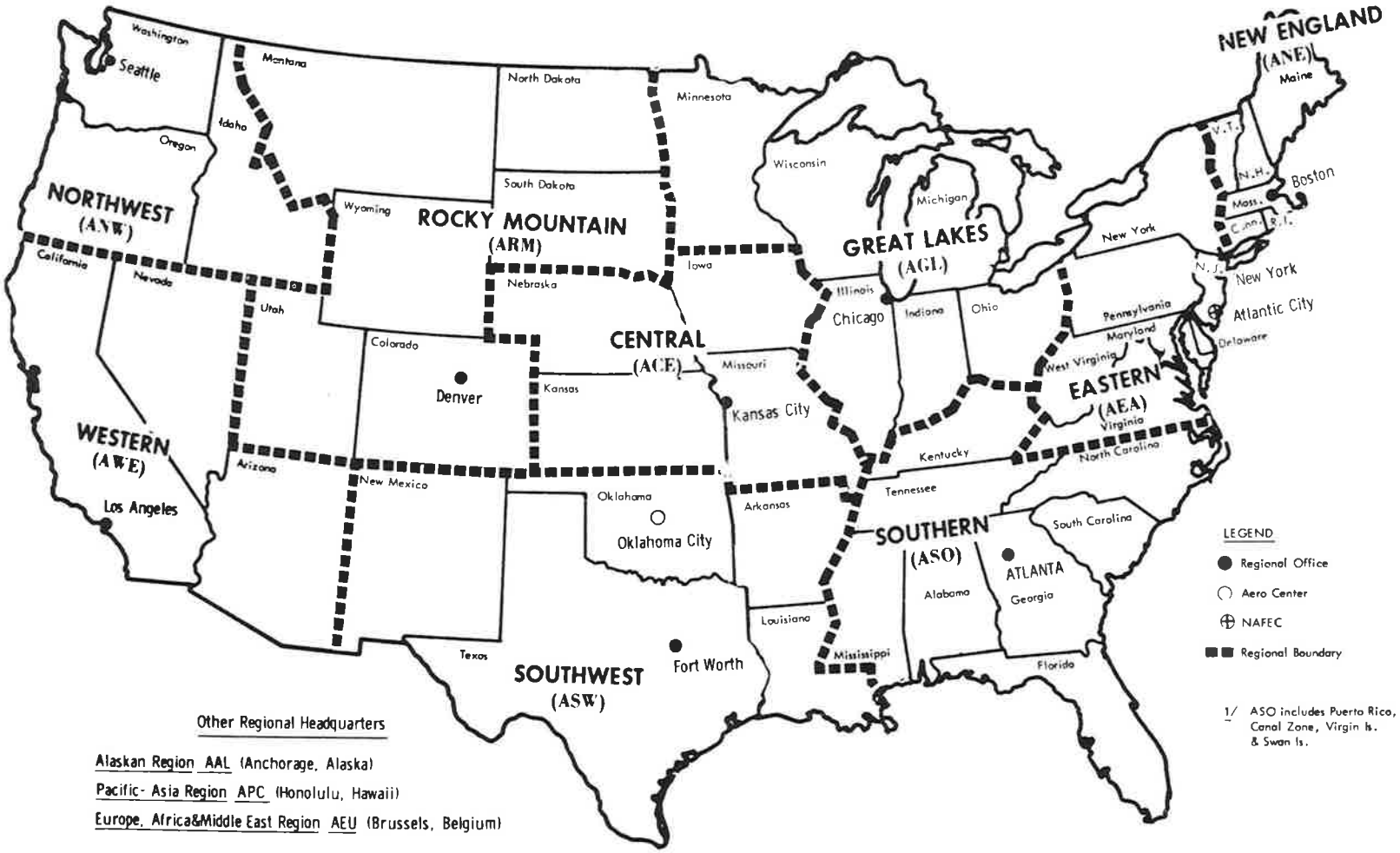
FIELD NAME	FIELD DESCRIPTION/LENGTH	POSITION	COMMENTS
45. Primary use	N1	270	0 - Unknown or inactive 1 - Executive 2 - Business 3 - Personal 4 - Aerial application 5 - Instruction 6 - Air taxi 7 - Industrial/special 8 - Aircraft rental business 9 - Other
46. IFR flight	N1	271	0, if not reported; 1, if flown IFR; 2, if not flown IFR.
47. IFR hours	N4	272-275	
48. Fuel consumption	N4	276-279	Gallons per hour for the aircraft.
49. Aircraft base state or foreign country	A/N2	280-281	Standard Postal Abbreviation
50. Base foreign country code	A/N1	282	Blank, if aircraft base is a state. F, if aircraft base is a foreign country or U.S. territory.

FIELD NAME	FIELD DESCRIPTION/LENGTH	POSITION	COMMENTS
51. VHF; 360 channels or less	N1	283	0, if not checked; 1, if checked.
52. VHF; 720 channels or more	N1	284	
53. VHF; more than one	N1	285	
54. No VHF	N1	286	
55. 4096 code transponder	N1	287	
56. Altitude encoding equipment	N1	288	
57. No transponder equipment	N1	289	
58. VOR; 100 channels	N1	290	
59. VOR; 200 channels	N1	291	
60. VOR; more than one receiver	N1	292	
61. ADF	N1	293	
62. DME	N1	294	
63. RNAV	N1	295	
64. Long range RNAV	N1	296	
65. Auto Pilot	N1	297	
66. Radar altimeter	N1	298	
67. Weather radar	N1	299	

FIELD NAME	FIELD DESCRIPTION/LENGTH	POSITION	COMMENTS
68. No navigation equipment	N1	300	0, if not checked; 1, if checked.
69. Localizer	N1	301	
70. Marker beacon	N1	302	
71. Glide slope	N1	303	
72. MLS	N1	304	
73. No ILS equipment	N1	305	
74. Computed aircraft type	N2	306-307	See Table 4.
75. Final weight make-model	N6	308-313	XXXX.X
76. Manufacturer/model/ type index	N3	314-316	A unique number for each make-model index level of stratification criterion 2. (M-M).
77. Aircraft SDR group name	A/N12	317-328	Standard FAA name.

APPENDIX C

FEDERAL AVIATION ADMINISTRATION REGIONAL MAP

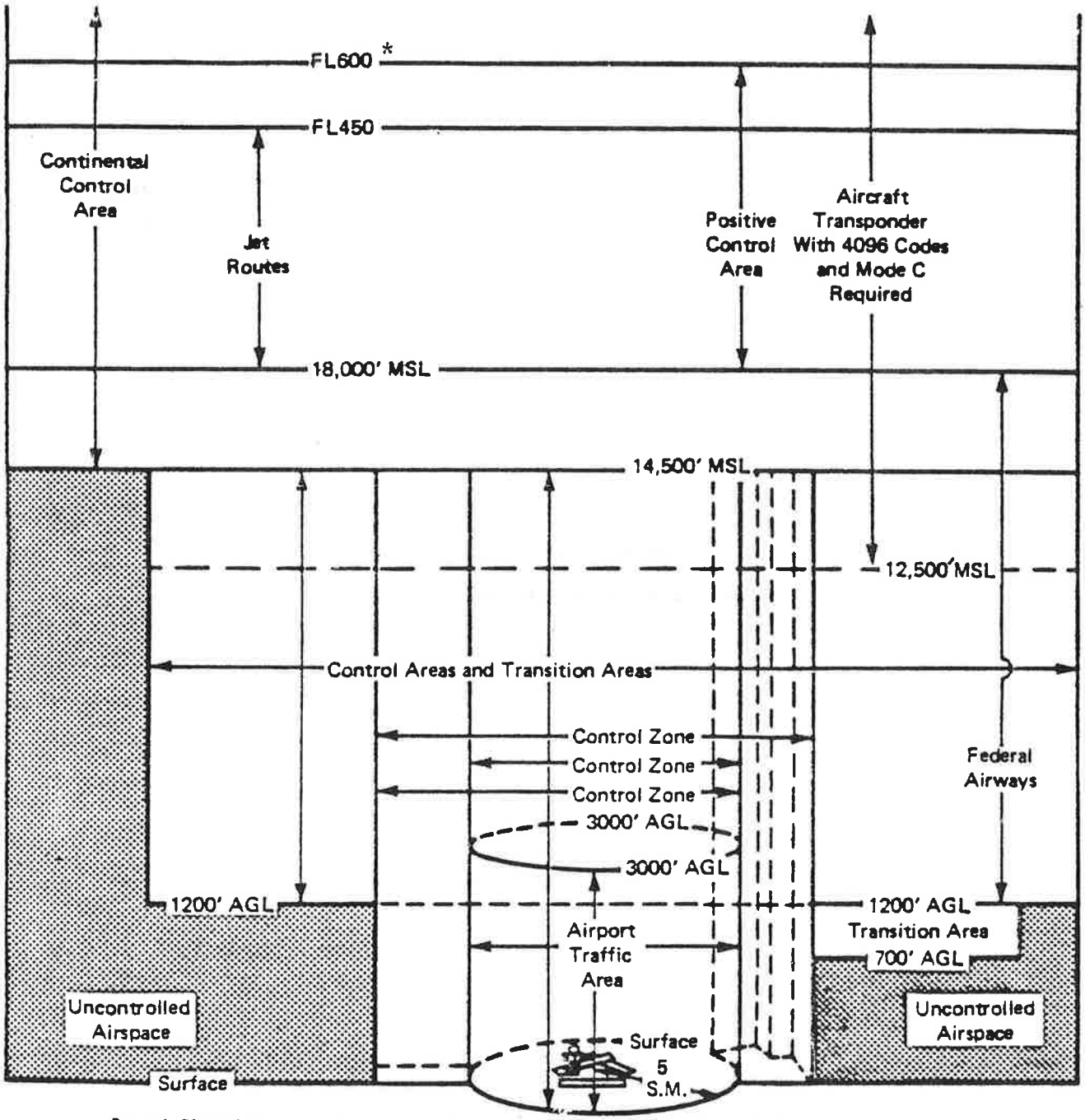


Census of U.S. Civil Aircraft Calendar Year 1978, (1979),p. vii.

APPENDIX D

AIRSPACE STRUCTURE

APPENDIX D. AIRSPACE STRUCTURE



General Dimensions of Control Zones, Airport Traffic Areas, and the Vertical Extent of Airspace Segments.

*FL600 means "Flight Level 60,000 feet MSL"

Airman's Information Manual, Basic Flight Manual and ATC Procedures, Part 1, (May, 1976), p. 1-23.

WEATHER CATEGORY DEFINITIONS[1]

Category	Definition (Ceiling in ft., Visibility in mi.)
VFR	$\geq$ 1500 ft.[2] and 3 mi.
IFR 0	< 1500 ft. and/or 3 mi., but $\geq$ 400 ft. and 1 mi.
IFR I	< 400 ft. and/or 1 mi., but $\geq$ 200 ft. and 1/2 mi.
IFR II	< 200 ft. and/or 1/2 mi., but $\geq$ 100 ft. and 1/4 mi.
IFR III	< 100 ft. and/or 1/4 mi.

[1] Ceiling-Visibility Climatological Study and Systems Enhancement Factors (Washington, 1975), p. 15.

[2] This altitude may vary depending on the minimum approach altitude for the airport.

APPENDIX D. (CONTINUED)

Summary of Major Airspace Designated Areas

Designation	Measure	Present system 1975	Future system	
			In plan 1976–85	Total 1985
En route:				
Jet routes	Number	216	−66	150
Jet area navigation routes	Number	163	+47	200
Low altitude routes:				
Low frequency	Number	24	−24	0
VHF/UHF	Number	462	−214	248
Area navigation VHF	Number	8	+192	200
Area positive control	Altitude (FL)			
Conterminous U.S.		180–600	—	180–600
Alaska		240–600	—	240–600
Parallel	Number	0	+500	500
Three dimensional	Number	0	+1000	1000
Terminal:				
Control zones	Number	806	+287	1093
Transition areas	Number	1,495	−9	1486
Control area extension	Number	1	—	1
Terminal control areas (Group I & II)	Number	18	3	21
STARs/SIDs	Number	414	−239	175
RNAV STARs/SIDs	Number	2	+448	450
Special use:				
Prohibited areas	Number	7	+2	9
	Square Miles	1,626	—	—
Restricted areas	Square Miles	77,639	—	—
Joint use	Number	163	+6	169
Nonjoint use	Number	29	−18	11
Warning areas	Number	68	−33	35
	Square Miles	408,970	—	—
Alert areas	Number	35	−5	30
Jet training areas	Number	35	−5	30
	Square Miles	87,183	—	—

The National Aviation System Plan Fiscal Years 1976-1985, (March, 1975), p. 6-3.

Airborne Equipment Requirements

Types of Airspace	Flight condition	Equipment Requirements 1975		1985
Uncontrolled	VFR (day)	1. Airspeed indicator 2. Altimeter 3. Compass 4. Tachometer 5. Oil temperature 6. Emergency locator transmitter [1]	7. Manifold pressure 8. Fuel gage 9. Landing gear 10. Belts 11. Special equipment for over water flights (FAR 91.33)	Same as 1975
Uncontrolled	VFR (night)	All above plus: 1. Position lights 2. Anti-collision light	3. Landing light (if for hire) 4. Electrical source	Same as 1975
Uncontrolled	IFR	Same as VFR plus: 1. Two-way radio 2. Navigation system 3. Gyro turn/bank 4. Sensitive altimeter adjustable for barometric pressure 5. Clock with sweep second hand	6. Artificial horizon 7. Directional gyro or equivalent 8. Generator	Same as 1975
Controlled (non-positive)	VFR	Same as uncontrolled VFR plus transponder [2]		Same as 1975
	IFR	Same as uncontrolled IFR plus transponder [2]		Same as 1975
Positive control	VFR	Requires prior ATC approval		Same as 1975
	IFR	Same as uncontrolled IFR plus: 1. DME (if VOR/TACAN equipment carried) 2. Transponder [2] 3. VOR (In TCA's) 4. ADF (Air Carrier only) 5. ILS (Air Carrier only)		Same as 1975

[1] Does not apply to turbojet aircraft, scheduled air carriers (except charter), or certain training and agricultural flights.

[2] 4096 code, Mode 3A transponder with Mode C automatic altitude reporting capability will be required at Group I and II TCA Locations and in APC, and in controlled airspace of the 48 States above 12,500 feet. All non-participating aircraft operating within Group III TCA's will be transponder equipped with Mode C capability.

The National Aviation System Plan Fiscal Years 1976-1985, (March, 1975), p. 13-5.

APPENDIX D. (CONTINUED)

National Terminal Radar Programs

Location	Terminal airspace designation	Equipment Requirements		Services provided
		Present	Under Consideration	
Top 9 Large Hub locations.	Group I TCA	(Effective Jan 1. 1975) 4096 Code Transponder and Mode C Automatic Altitude Reporting Capability; Two-way Radio; VOR or TACAN Receiver.	Relaxation of Transponder Requirements During Periods of Low Activity.	TCA Procedures
Next 12 Large Hub locations	Group II TCA	(Effective July 1, 1975) 4096 Code Transponder and Mode C Automatic Altitude Reporting Capability; Two-way Radio; VOR or TACAN Receiver.	Deletion of Altitude Encoding Requirement. (Has been deleted)	TCA Procedures
Remaining 42 ARTS–III locations.	Group III TCA	(Effective July 1, 1975) 4096 Code Transponder and Mode C Automatic Altitude Reporting Capability *or* Two-way Radio Communications.		TCA Procedures
All other radar facilities	TRSA where Stage III service is provided	----------		Stage II or III service

The National Aviation System Plan Fiscal Years 1976-1985, (March, 1975), p. 6-4.

APPENDIX D. (CONCLUDED)

Designated Terminal Airspace (All ARTS-III Locations); Terminal Control Areas

GROUP I	Date designated or planned	GROUP II	Date designated or planned
1. Atlanta	June 1970	1. St. Louis	Jan. 1974
2. Chicago	Aug. 1970	2. Seattle	Jan. 1974
3. Washington National	Feb. 1971	3. Minneapolis	Feb. 1974
4. New York (LGA, JFK, EWR)	Sept. 1971	4. Denver	Mar. 1974
5. Los Angeles	Sept. 1971	5. Houston	Mar. 1974
6. San Francisco	Dec. 1972	6. Cleveland	May 1974
7. Boston	Feb. 1973	7. Detroit	May 1974
8. Miami	Apr. 1973	8. Pittsburgh	May 1974
9. Dallas	Jan. 1974	9. Las Vegas	Nov. 1974
		10. Philadelphia	Mar. 1975
		11. Kansas City	Mar. 1975
		12. New Orleans	Jul. 1975

Group III Terminal Areas (42 locations)

Albany	El Paso	Omaho	San Diego
Albuquerque	Hartford	Orlando	San Juan
Baltimore	Honolulu	Portland, Oreg.	Santa Ana/Long Beach
Birmingham	Indianapolis	Phoenix	Shreveport
Buffalo	Jacksonville	Providence	Syracuse
Burbank	Louisville	Raleigh–Durham	Tampa
Charlotte	Memphis	Ontario, California	Tucson
Cincinnati	Milwaukee	Rochester, N.Y.	Tulsa
Columbus, Ohio	Nashville	Sacramento	Washington-Dulles
Dayton	Norfolk	Salt Lake City	
Des Moines	Oklahoma City	San Antonio	

The National Aviation System Plan Fiscal Years 1976-1985, (March, 1975), p. 6-5.

GLOSSARY

GLOSSARY*

Aerial Application - Aerial application in agriculture consists of those activities that involve the discharge of materials from aircraft in flight and a miscellaneous collection of minor activities that do not require the distribution of any materials.

Air Carrier - The term "Air Carrier," as used in this report, refers to aircraft operators certified by the Federal Aviation Administration for the transportation by air of persons, property, and mail.

Air Carrier Operations - Aircraft operations under certificates of public convenience and necessity, issued by the Civil Aeronautics Board authorizing the performance of scheduled air transportation over specified routes and a limited amount of non-scheduled operations.

Airport Advisory Area - The area within five statute miles of an airport not served by a control tower, i.e., there is no tower or the tower is not in operation, on which is located a Flight Service Station.

Airport Traffic Area - Unless otherwise specifically designated in FAR Part 93, that airspace within a horizontal radius of 5 statute miles from the geographical center of any airport at which a control tower is operating, extending from the surface up to, but not including, an altitude of 3,000 feet above the elevation of the airport. Unless otherwise authorized or required by ATC, no person may operate an aircraft within an airport traffic area except for the purpose of landing at, or taking off from, an airport within that area. ATC authorization may be given as individual approval of specific operations or may be contained in written agreements between airport users and the town concerned. (Refer to FAR Parts 1 and 91.)

Airport Traffic Control Tower - A central operations facility in the terminal air traffic control system, consisting of tower cab structure, including an associated common IFR room if radar equipped, using air/ground communications and/or radar, visual signalling and other devices, to provide safe and expeditious movement of terminal air traffic.

Air Taxi Operations - Air Taxi operations (takeoffs and landings) carry passengers, mail, or cargo for revenue in accordance with FAR Part 135.

*These definitions have been taken from the following three sources: Airman's Information Manual, Part 1, Census of U.S. Civil Aircraft, and FAA Air Traffic Activity.

Airway/Federal Airway - A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids. (Refer to FAR Part 7.)

Altitude - The height of the level, point, or object measured in feet Above Ground Level (AGL) or from Mean Sea Level (MSL).

1. MSL Altitude - Altitude, expressed in feet measured from mean sea level

2. AGL Altitude - Altitude, expressed in feet measured above ground level

3. Indicated Altitude - The altitude as shown by an altimeter. On a pressure or barometric altimeter it is altitude as shown uncorrected for instrument error and uncompensated for variation from standard atmospheric conditions.

Area Navigation/RNAV - A method of navigation that permits aircraft operations on any desired course within the coverage of station-referenced navigation signals or within the limits of self-contained system capability. (Refer to FAR Part 71.)

a. Area Navigation Low Route - An area navigation route within the airspace extending upward from 1,200 feet above the surface of the earth to, but not including, 18,000 feet MSL.

b. Area Navigation High Route - An area navigation route within the airspace extending upward from and including 18,000 feet MSL to flight level 450.

c. Random Area Navigation Routes/Random RNAV Routes - Direct routes, based on area navigation capability, between waypoints, defined in terms of degree/distance fixes or offset from published or established routes/airways at specified distance and direction.

d. RNAV Waypoint/W/P - A predetermined geographical position used for route or instrument approach definition or progress reporting purposes that is defined to a VORTAC station position.

Automatic Altitude Reporting - That function of a transponder which responds to Mode C interrogations by transmitting the aircraft's altitude in 100-foot increments.

Automatic Direction Finder/ADF - An aircraft radio navigation system which senses and indicates the direction to an L/MF nondirectional radio beacon (NDB) ground transmitter. Direction is indicated to the pilot as a magnetic bearing or as a relative bearing to the longitudinal axis of the aircraft depending on the type of indicator installed in the aircraft. In certain applications, such as military, ADF operations may be based on airborne and ground transmitters in the VHF/UHF frequency spectrum.

Balloon - A lighter-than-air aircraft that is not engine driven.

Business Transportation - Any use of an aircraft not for compensation or hire by an individual for the purpose of transportation required by a business in which he/she is engaged.

Certified Pilot - A person who holds a certificate issued by FAA, which qualifies him/her to operate aircraft within the limitations prescribed on the certificate.

Colored (L/MF) Airway - Low altitude airway over the state of Alaska predicated on L/MF navigation aids. It is depicted on aeronautical charts by color and number.

Continental United States - The 49 states located on the continent of North America and the District of Columbia.

Conterminous U.S. - The forty-eight adjoining states and the District of Columbia.

Controlled Airport - An airport at which a control tower is in operation.

Controlled Airspace - Airspace, designated as a continental control area, control area, control zone, terminal control area, or transition area, within which some or all aircraft may be subject to air traffic control. (Refer to FAR Part 71).

Types of U.S. Controlled Airspace:

a. Continental Control Area - The airspace of the 48 contiguous states, the District of Columbia and Alaska, excluding the Alaska peninsula west of Long. 160 00'00"W at and above 14,500 MSL, but does not include:

   1. The airspace less than 1,500 feet above the surface of the earth or,

   2. Prohibited and restricted areas, other than the restricted areas listed in FAR Part 71.

b. Control Area - Airspace designated as Colored Federal Airways, VOR Federal Airways, Terminal Control Areas, Additional Control Areas, and Control Area Extensions, but not including the Continental Control Area. Unless otherwise designated, control areas also include the airspace between a segment of a main VOR airway and its associated alternate segments. The vertical extents of the various categories of airspace contained in control areas are defined in FAR Part 71.

c. Control Zone - Controlled airspace which extends upward from the surface and terminates at the base of the continental control area. Control zones that do not underlie the continental area have no upper limit. A control zone may include one or more airports and is normally a circular area within a radius of 5 statute miles and any extensions necessary to include instrument approach and departure paths.

d. Terminal Control Area/TCA - Controlled airspace extending upward from the surface or higher to specified altitudes within which all aircraft are subject to operating rules and pilot and equipment requirements specified in FAR Part 91. TCA's are depicted on Sectional, Word Aeronautical, En Route Low Altitude and TCA charts. (Refer to FAR Part 91.)

e. Transition Area - Controlled airspace extending upward from 700 feet or more above the surface of the earth when designated in conjunction with an airport for which an approved instrument approach procedure has been prescribed, or from 1,200 feet or more above the surface of the earth when designated in conjunction with airway route structures or segments. Unless otherwise limited, transition areas terminate at the base of the overlying controlled airspace. Transition areas are designed to contain IFR operations in controlled airspace during portions of the terminal operations and while transiting between the terminal and en route environment.

Dirigible - A lighter-than-air aircraft, engine propelled, with an inward metal frame which maintains its shape.

Distance Measuring Equipment/DME - Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigation aid.

En Route - The route of flight from point of departure to point of destination, including intermediate stops (excludes local operations).

Executive Transportation - Any use of an aircraft by a corporation, company or other organization for the purposes of transporting its employees and/or property not for compensation or hire and employing professional pilots for the operation of the aircraft.

FAA - Federal Aviation Administration.

Fixed Wing Aircraft - Aircraft having wings fixed to the airplane fuselage and outspread in flight, i.e., nonrotating wings.

Flight Service Station/FSS - Air Traffic Service facilities within the National Airspace System (NAS) which provide preflight pilot briefing and en route communications with VFR flights, assist lost IFR/VFR aircraft, assist aircraft having emergencies, relay ATC clearances, originate, classify, and disseminate Notices to Airmen, broadcast aviation weather and NAS information, receive and rescue units of missing VFR aircraft, and operate the national weather teletypewriter systems. In addition, at selected locations FSS's take weather observations, issue airport advisories, administer airman written examinations, advise Customs and Immigrations of transborder flights.

General Aviation/GA - That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of public convenience and necessity from the Civil Aeronautics Board, and large aircraft commercial operators.

General Aviation Aircraft - All civil aircraft except those classified as air carrier.

Group I Terminal Control Area - A TCA representing one of the nine busiest locations in the U.S. in terms of aircraft operations and passengers carried within which it is necessary for safety reasons to have strict requirements for operation.

Group II Terminal Control Area - A TCA representing one of the twelve less busy locations than a Group I TCA and requiring less stringent pilot and equipment requirements.

Group III Terminal Control Area - One of the 43 least busy TCA's where an ARTS-III system exists.

IFR Conditions - Weather conditions below the minimum for flight under visual rules.

Industrial/Special - Any use of an aircraft for specialized work allied with industrial activity; excluding transportation and aerial application. (Examples: pipeline patrol; survey advertising; photography; helicopter hoist; etc.)

Instructional Flying - Any use of an aircraft for the purposes of formal instruction with the flight instructor aboard, or with the maneuvers on the particular flight(s) specified by the flight instructor.

Instrument Flight Rules/IFR - Rules governing the procedures for conducting instrument flight. Also, a term used by pilots and controllers to indicate type of flight plan. (See Visual Flight Rules.)

Instrument Landing System/ILS - A precision instrument approach system consisting of the following electronic components and visual aids:

a. Localizer
b. Glide Slope
c. Outer Marker
d. Middle Marker
e. Approach Lights

(Refer to FAR Part 91.)

Jet Route - A route designed to serve aircraft operations from 18,000 feet MSL up to and including flight level 450. The routes are referred to as "J" routes with numbering to identify the designated route, e.g., J 105. (Refer to FAR Part 71.)

Low Altitude Airway Structure/Federal Airways - The network of airways serving aircraft operations up to but not including 18,000 feet MSL. (See Airway.)

Microwave Landing System/MLS - An instrument landing system operating in the microwave spectrum which provides lateral and vertical guidance to aircraft having compatible avionics equipment. (See Instrument Landing System.)

Non-Positive Controlled Airspace - Controlled airspace below 18,000 feet MSL.

Personal and Pleasure Flying - Any use of an aircraft for personal purposes not associated with business or profession, and not for hire. This includes maintenance of pilot proficiency.

Pilot Briefing - Information furnished a pilot to assist in flight planning. Principal items are weather conditions, Notices to Airmen, routes, and preparation and handling of the flight plan.

Piston-Powered Aircraft - An aircraft operated by engines in which pistons moving back and forth work upon a crank shaft or other device to create rotational movement.

Positive Controlled Area/PCA - Airspace designated in FAR Part 71 wherein aircraft are required to be operated under Instrument Flight Rules (IFR). Vertical extent of PCA is from 18,000 feet to and including flight level 600 throughout most of the conterminous United States and from flight level 240 to and including flight level 600 in designated portions of Alaska.

Radio Altimeter/Radar Altimeter - Aircraft equipment which makes use of the reflection of radio waves from the ground to determine the height of the aircraft above the surface.

Region (FAA) - A principal subdivision of the Federal Aviation Administration organized to carry out FAA programs under the executive direction of a regional director within the specific geographic boundaries.

Registered Aircraft - Aircraft registered with FAA.

Rotorcraft - A heavier-than-air aircraft that derives lift from one or more revolving "wings" or blades, engine-driven above an approximately vertical axis. A rotorcraft does not have conventional fixed wings, nor in any but some earlier models is provided with a conventional propeller, forward thrust and lift being furnished by the rotor. The powered rotor blades also enable the machine to hover, and to land and take off vertically.

Transponder - The airborne radar beacon receiver/transmitter portion of the Air Traffic Control Radar Beacon System (ATCRBS), which automatically receives signals from interrogations being received on the mode to which it is set to respond.

Turbine-Powered Aircraft - Include aircraft with either turbojet, turbofan, turboprop, or turboshaft engines.

Turbojet - Aircraft operated by jet engines incorporating a turbine-driven air compressor to take in and compress the air for the combustion of fuel, the gases of combustion (or the heated air) being used both to rotate the turbine and to create a thrust-producing engine.

Turboprop - Aircraft in which the main propulsive force is supplied by a gas turbine-driven conventional propeller. Additional propulsive force may be supplied form the discharge turbine engine gas.

Uncontrolled Airport - Also known as a non-tower airport, an airport at which no control tower is in operation. It may have an FSS, UNICOM operator, or no facility at all.

Uncontrolled Airspace - That portion of the airspace that has not been designated as continental control area, control area, control zone, terminal control area, or transition area. (See Controlled Airspace.)

UNICOM - A non-government air/ground radio communication facility, which may provide airport advisory service at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

U.S. Civil Aircraft Fleet - All aircraft under U.S. registry exclusive of Military.

Visual Flight Rules/VFR - Rules that govern the procedures for conducting flight under visual conditions. It is used by pilots and controllers to indicate the type of Flight Plan. (See Instrument Flight Rules.) (Refer to FAR Part 91.)

VOR Airway - Low altitude airway designated from 1,200 feet AGL to 18,000 feet MSL predicated on VOR/VORTAC navigation aids. Also known as a "Victor" airway, it is indicated by a "V" on aeronautical charts and is numbered similarly to the U.S. highway system.

VOR/Very High Frequency Omnidirectional Range Station - A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature. Voice features may be used by ATC or FSS for transmitting instructions/information to pilots.

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