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A STUDY OF THE COST-EFFECTIVE MARKETS FOR NEW TECHNOLOGY AGRICULTURAL AIRCRAFT

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ABSTRACT

This study provides an estimate of the regional and total U.S. cost-effective markets for a new technology agricultural aircraft as incorporating features which could result from NASA-sponsored aerial applications research. These estimates are conservative in that they do not include added savings due to market growth, "macroeconomic" effects and technology implementation other than aircraft sales. The study describes in detail the data base used in making these estimates.

The results show that the long-term market penetration of a new technology aircraft of the specific characteristics which could result from NASA-sponsored research would be near 3,000 aircraft. This market penetration would be attained in approximately 20 years. Annual sales would be about 200 aircraft after 5 to 6 years of introduction. The net present value of cost savings benefit which this aircraft would yield (measured on an infinite horizon basis) would be about $35 million counted at a 10 percent discount rate and $120 million at a 5 percent discount rate. At both discount rates the present value of cost savings exceeds the present value of research and development (R&D) costs estimated for the development of the technology base needed for the proposed aircraft. These results are quite conservative as they have been derived neglecting future growth in the agricultural aviation industry, which has been averaging about 12 percent per year over the past several years.

DISCLAIMER

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1. INTRODUCTION

Since November 1976, ECON, Inc. has been involved in the assessment of benefits attributable to a variety of potential technology improvements in agricultural aviation. A major portion of this effort was the development of a data base which would support the detailed modeling necessary to compute benefits. In developing the data base, ECON contacted about 900 individuals and organizations including individual ag-air operators, industry organizations, hardware manufacturers, various government agencies, a number of printed sources and a variety of foreign sources. From this data base, benefits were computed for a number of technology areas identified by NASA. These data were reported in "The Benefits of Improved Technologies in Agricultural Aviation."[*]

The current effort on the part of ECON makes use of the previously developed data base in order to create individual operator profiles for specific areas of the country. These profiles are then used in a decision model representing an individual operator's decision to purchase a new technology aircraft. From these results, ECON determined a cost-effective market for specific new technology agricultural aircraft.

1.1 Operator Profiles

The previously existing ECON data base was utilized in developing individual operator profiles. To do this, the ag-air industry was organized into 20 different geographic regions. Eight aircraft models were chosen as typical aircraft owned by the ag-operators. Within each region, specific parameters of the ag-operator's business were defined by a range of values for all sizes of operators. The profiles

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[*]NASA CR-156838, ECON, Inc., Princeton, NJ, February 1978.

include such information as total hours flown, number of aircraft in fleet, crops treated, materials used, application rates, field sizes, ferry distances, cost of materials, aircraft hourly costs, etc. The profiles are described in detail in Section 2.

1.2 Agricultural Aircraft Decision Model

A decision model was created representing the operator's decision to purchase a new technology agricultural aircraft. The model is based on the assumption that an operator would invest in a new aircraft only if it offers to decrease the costs of operating his present business mix (current acreage, field sizes, ferry distances, application rates, etc.). The model utilizes a Monte Carlo simulation to generate a number of operators within each region according to the parameters of the Operator Profiles. Each operator's costs are examined utilizing his current fleet and a fleet utilizing one or more new technology aircraft. The decision model is described in detail in Section 3.

1.3 New Technology Aircraft Market

From the results of the Agricultural Aircraft Decision Model analysis of new technology aircraft, a market penetration estimate was made for the new technology aircraft as a function of time. In addition, annual potential benefits were computed from the utilization of the new technology aircraft. The market penetration and annual benefit estimates are described in detail in Section 4.

2. OPERATOR PROFILES

2.1   Operator Profile Regions

The ECON ag-air data base was examined for similarity among operators according to the variety of crops treated. A number of preliminary groupings were identified. To further define a set of Operator Profile Regions, both the number of aircraft (Figure 2.1) and the number of ag-air operators that could be located (Figure 2.2) were plotted by postal zip codes. As a result, twenty regions were chosen and are labeled in Figure 2.3 with the major crops listed for each region. The ag-air data base was then reorganized into these regions. Operators that work in more than one region or that could not be located geographically were eliminated from the data base.   Regions 14 and 15 are both located in the Mississippi Valley area of Arkansas and Mississippi.   Region 14 includes operators that work primarily (more than 50 percent of their total hours) on cotton and Region 15 includes operators that work primarily on rice.

2.2   Operator Business Profiles

Within each of the 20 Operator Profile Regions, individual operator's businesses were examined and summarized by major crops. Some individual crops were grouped together into a larger crop group; for example, tomatoes, lettuce, onions, etc. are grouped together as vegetables; wheat, oats, barley, etc. are grouped together as grains. Specific crop groupings were then selected within each region as candidates for the Business Profiles. Noncandidates were crop groupings with less than 5 percent of the entire region's flight hours. These were classified as "other." Each operator's crop mix was then reclassified into the selected crop groupings. The resulting crop groupings with less than 5 percent of an operator's

TOTAL NUMBER OF AIRCRAFT = 12,102*

KEY

0-250	
251-300	
301-400	
401-450	
450+	

MILITARY
1

SAN JUAN
32

SOURCE: 1976 FAA DATA FILES
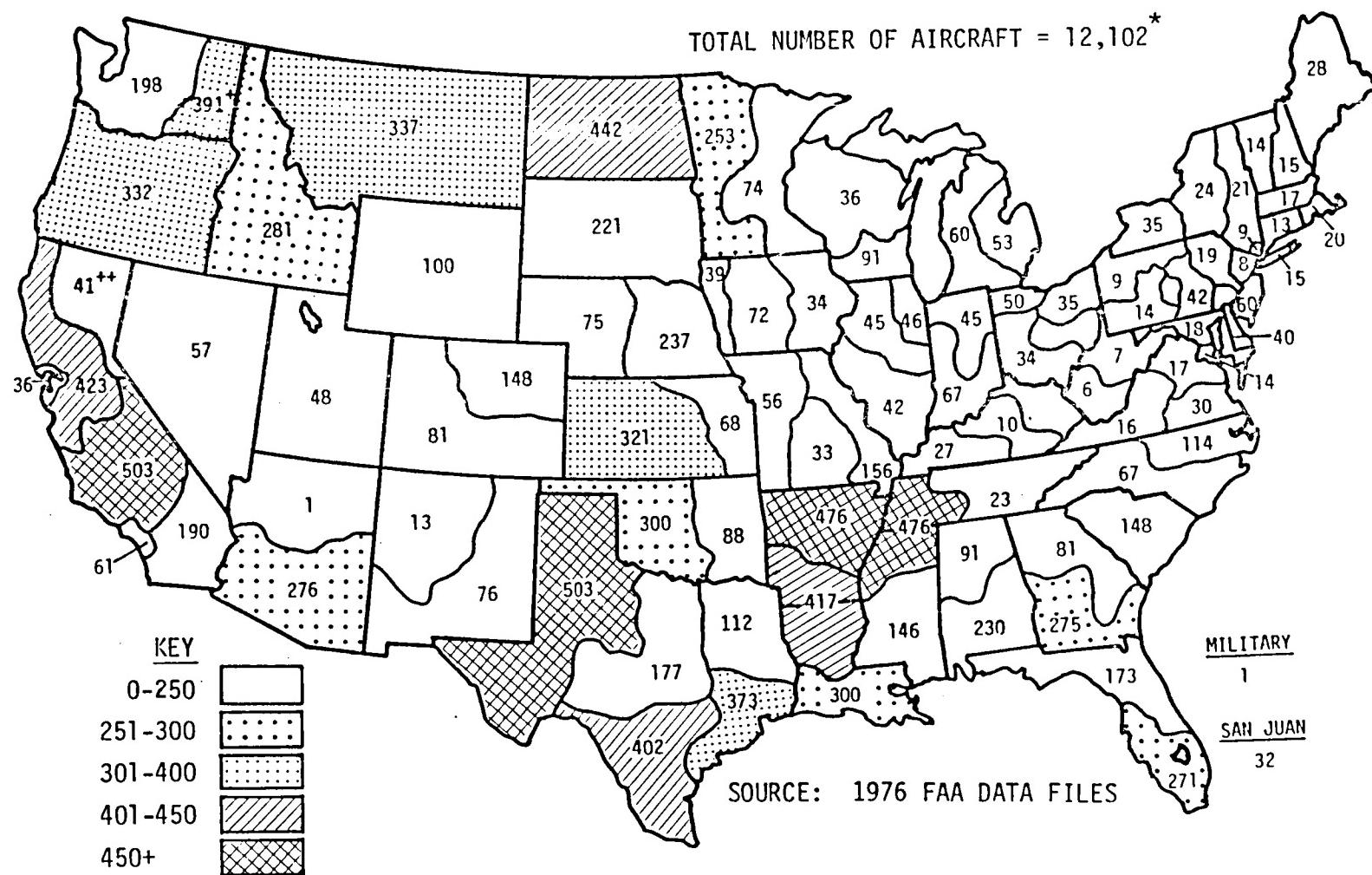
FIGURE 2.1   LOCATION OF AGRICULTURAL AND FORESTRY
AIRCRAFT--1976

*SEE APPENDIX G.

+INCLUDES ALASKA.

++INCLUDES HAWAII.

NUMBER OF OPERATORS LOCATED = 1458

NOTE: U.S. POSTAL ZIP
CODE REGIONS
EXCEPT IN
CALIFORNIA

*TOTAL STATE REGISTRATION.
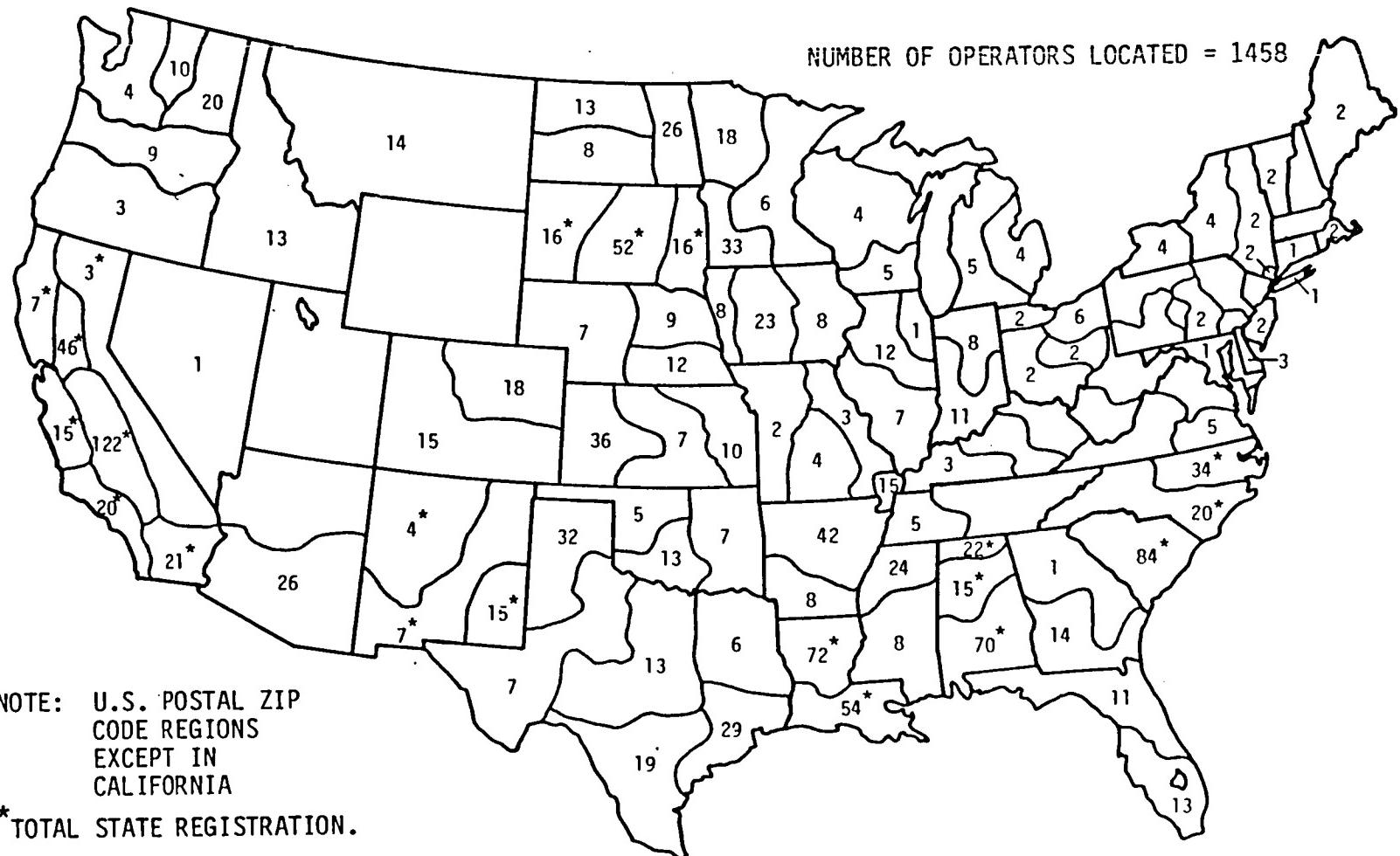
FIGURE 2.2   LOCATION OF AG-AIR OPERATORS (NATIONAL AGRICULTURAL AVIATION
ASSOCIATION [NAAA] MEMBERSHIP EXCEPT WHERE NOTED)

GRAINS
ORCHARDS
1

GRAINS
6

CORN
SOYBEANS
GRAINS
VEGETABLES

20

VEGETABLES
POTATOES
ORCHARDS

RICE
VEGETABLES
GRAINS
2

16

COTTON
SOYBEANS
RICE
GRAINS

RICE
COTTON
SOYBEANS

3

CORN
WHEAT
SORGHUM
RANGELAND

7

14-15

19

COTTON
SOYBEANS

COTTON
VEGETABLES
ALFALFA

COTTON

CORN
SORGHUM
GRAINS
COTTON

8

9

4

5

13

17

COTTON
VEGETABLES
ALFALFA

COTTON
RANGELAND
SORGHUM
GRAINS

12

COTTON
SOYBEANS
PEANUTS

11

RICE

RICE
SOYBEANS

COTTON
SOYBEANS

18

CITRUS
VEGETABLES

COTTON
VEGETABLES
GRAINS

10

FIGURE 2.3   MAJOR AG-AIR OPERATOR REGIONS

9

total flight hours were then eliminated from the operator's crop mix and those hours proportionately added to the other crop groupings. Figure 2.4 shows the methodology described above. There were insufficient data in the data base to generate meaningful profiles in Region 1.

Each variable of the Operator Business Profile (and also the Aircraft and Ground Vehicle Profiles) is described by three values: low, peak and high. The three values describe a triangular distribution as follows:

Low   Determines the lowest value of the variable under consideration that was observed for all operators in the data base for a particular region

Peak   Determines the most frequently observed value of the variable under consideration that was observed for all operators in the data base for a particular region (the peak number of operators)

High   Determines the highest value of the variable under consideration that was observed for all operators in the data base for a particular region.

Figure 2.5 illustrates an example. Of the 50 operators observed in the example, the most frequent value (peak) is 300 hours, the lowest value (low) is 50 hours and the highest value (high) is 450 hours. These values describe a triangular distribution used to determine the probability that an operator's business is made up of a certain number of hours flown. When the low, peak and high are equal, then the distribution is described as even, meaning that the probability of any value occurring is equally likely. Such a distribution would be plotted as a horizontal line.

In the Operator Business Profiles (Appendix A), the following outputs were generated:

1. Percent of operators in different crops: The number of different crops each operator works on was determined. Crop grouping "other" was not counted as a different crop; i.e., an operator whose crops are cotton, soybeans and other is considered to work on just two crops.

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                    ┌──────────────┐
                    │    ECON      │
                    │  DATA BASE   │
                    └──────────────┘
                           │
                           ▼
                    ┌──────────────┐
                    │  20 REGIONS  │
                    └──────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │         REGION X         │
              │  CROP          % OF       │
              │  GROUPING    REGION'S HOURS│
              │  CORN           22        │
              │  COTTON         38        │
              │  GRAINS         10        │
              │  ORCHARDS        3        │
              │  SOYBEANS       23        │
              │  VEGETABLES      4        │
              └──────────────────────────┘
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REGION X

CROP GROUPING	% OF REGION'S HOURS
CORN	22
COTTON	38
GRAINS	10
ORCHARDS	3
SOYBEANS	23
VEGETABLES	4

CANDIDATE CROPS REGION X

CORN
COTTON
GRAINS
SOYBEANS
OTHER

OPERATOR Y --ACTUAL--

CROP GROUPING	% OF HOURS
COTTON	60
GRAINS	25
SOYBEANS	12
VEGETABLES	3

OPERATOR Z --ACTUAL--

CROP GROUPING	% OF HOURS
CORN	10
COTTON	40
ORCHARDS	30
SOYBEANS	20

--RECLASSIFIED--

CROP GROUPING	% OF HOURS
COTTON	62
GRAINS	26
SOYBEANS	12

--RECLASSIFIED--

CROP GROUPING	% OF HOURS
CORN	10
COTTON	40
SOYBEANS	20
OTHER	30

OUTPUT REPORTS
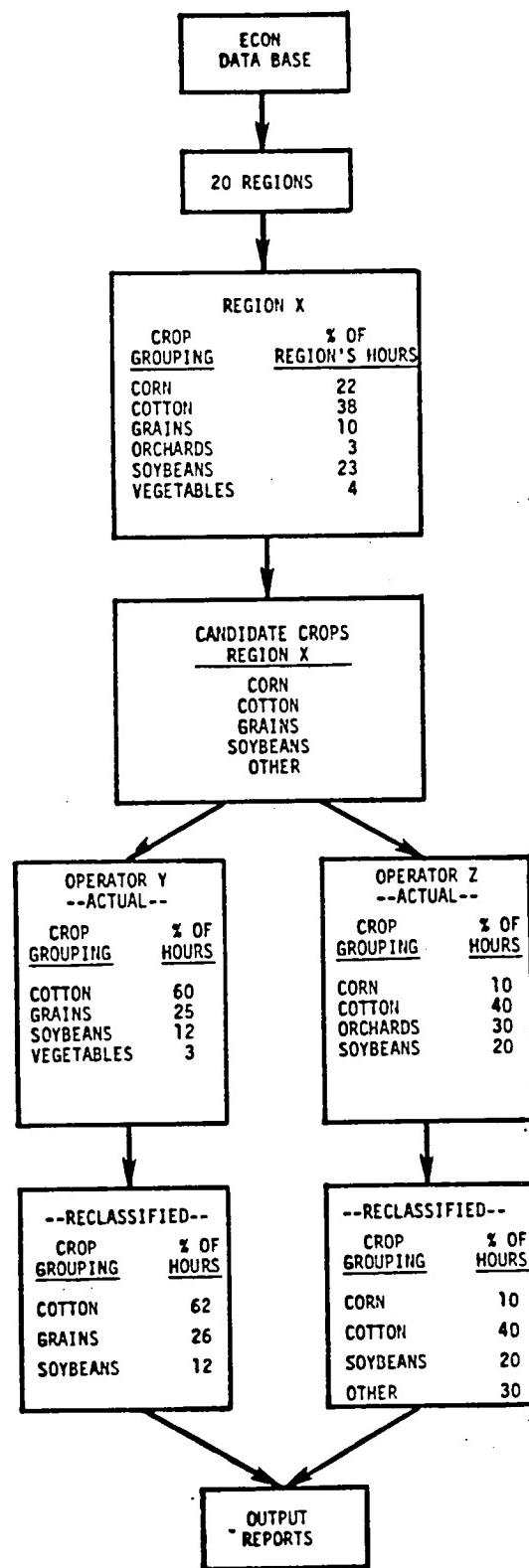
FIGURE 2.4   METHODOLOGY USED IN CREATING OPERATOR BUSINESS PROFILES
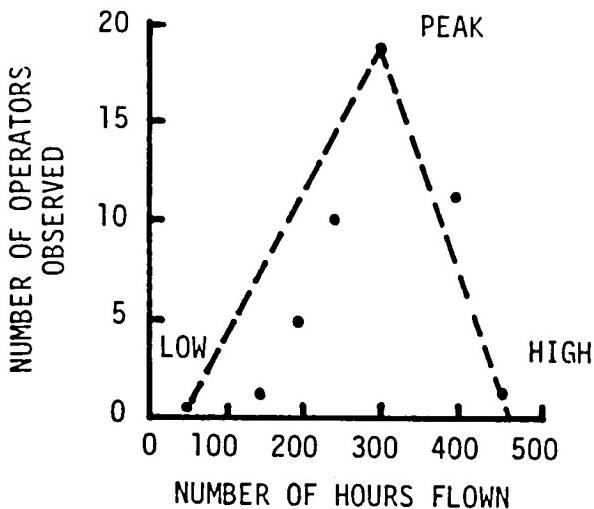
FIGURE 2.5   EXAMPLE OF A TRIANGULAR DISTRIBUTION

2.   Operator's crop mix by percent of hours: The percent of each
     operator's total flight hours for each crop grouping was determined.
     The value of the low, peak and high of the distribution by crop is given.
     The peak value is given to the nearest five percent.   The percent of
     operators in the region who work in each crop grouping is also given.

3.   Operator's crop mix by hours: The hours flown for each crop grouping
     was determined by operator.   The value of the low, peak and high of the
     distribution by crop is given.   The peak value is given to the nearest 50
     hours.   An estimate was made for hours flown per crop grouping for the
     entire region by applying the distribution of hours in the ECON data
     base to the total hours reported in the Federal Aviation Administration
     (FAA) data files for the region.

4.   Operator's crop mix by acres: The total number of acres an operator
     works on was estimated by crop.   The acreage would represent multiple
     acreage, not once-over acreage, because this estimate was determined
     by applying average productivities for each crop for the region to the
     operator's flight hours by crop.   The value of the low, peak and high of
     the distribution by crop is given.   The peak value is given to the nearest
     50 acres.   An estimate was made for the total number of acres treated
     in the region by applying the average productivities to the hours flown
     by crop.

5.   Operator's size: Each operator's total size was determined.   Items
     considered were (a) total flight hours, (b) total number of aircraft, (c)
     total acres treated, (d) the average number of hours flown per aircraft,
     i.e., a divided by b, (e) the average productivity for the operator, i.e., c

divided by a. The value of the low, peak and high of the distribution by item is given. The peak value of total hours is given to the nearest 100 hours; total acres to the nearest 10,000 acres; average hours per aircraft to the nearest 25 hours per aircraft; and average productivity to the nearest 10 acres per hour. Estimates were made for the entire region for each item based on both FAA data files and the ECON data base.

2.3 Operator Crop Profiles

The ECON data base was examined to determine typical values of specific items concerning the crops and fields an operator works on. In the Operator Crop Profiles (Appendix B), the following items are given:

1. Crop - the major crop groupings an operator works on as determined from the Operator Business Profiles.

2. Material applied - general type of material typically applied by ag-air operators.

3. Percent of acres - the regional distribution of acres by material for each crop grouping that ag-operators work on.

4. Application rate - a typical application rate of the total mix (base plus material) per acre. This would be the rate per pass because total acreage (multiple, not once-over) is used. Application rates can vary greatly from one operator to another. (G represents gallons and P represents pounds.)

5. Material cost - the cost per acre of the material applied.

6. Number in loading crew.

7. Number in flagging crew.

8. Long ferry - the ferry distance from home base to the loading area. A typical distribution of the percentage of fields that use a loading area at a given distance from home base is given. Loading at home base would be interpreted as a long ferry distance of zero miles.

9. Short ferry - the ferry distance from the loading area to the field. A typical distribution of the percentage of fields that are a given distance from the loading area is given.

10. Ground distance - the distance from home base to the field. A typical distribution of the percentage of fields that are a given distance from home base is given. This distribution is associated with the flagging crew. Where no flaggers are used, the ground distances would be interpreted as zero miles.

11. Field size - a typical distribution of the percentage of fields that are a given acreage.

12. Run length - a typical distribution of the percentage of fields that have a run length of the given length in miles. All fields are considered rectangular in shape.

The ECON data base was examined in order to determine which aircraft (see Section 2.5) are associated with each crop grouping. The results of this examination are presented in Tables B.1 through B.8 of Appendix B. In Table B.1, a count was added to each crop grouping an operator works on for each aircraft type the operator owns. All of the operator's crop groupings were considered. In Table B.2, the same procedure was used as above except only crop groupings that account for more than 25 percent of an operator's flight hours were considered, thereby restricting crop-aircraft associations to only the major crop groupings of each operator. A further analysis was done for selected crop groupings. Tables B.3 through B.8 show the results for crop groupings cotton, rice, grains, corn, soybeans and vegetables. In this analysis the percentage of each operator's flight hours was determined for the crop grouping being considered and a count was added to the percentage category for each aircraft type the operator owns.

These data show some interesting results. Certain aircraft are associated with specific crops. For example, referring to Table B.2, the Grumman Agcat (G164) is the primary aircraft used with rice, the Cessna Agtruck/Agwagon (C188) is the primary aircraft used with corn and the Piper Pawnee (PA25) is the primary aircraft used with grains. Referring to Table B.4, most operators that work over rice spend between 70 and 80 percent of their time working over rice. Very few rice operators spend less than 40 percent of their time over rice. Agcat owners tend to spend more of their time over rice than other aircraft owners who work over rice.

2.4 Operator Materials Profile

The ECON data base was examined to determine an average value of six variables associated with different aircraft (see Section 2.5) for each type of material applied to any crop grouping for all regions. Only average values of the variables associated with each type of material could be obtained for the new technology aircraft. Therefore, average values were also used for each aircraft used in the analysis. In the Operator Materials Profile (Appendix C), the following variables are given:

1. Aircraft type - the major aircraft types as determined from the Operator Aircraft Profiles (see Section 2.5 and Table 2.1).

2. Turn time - the average time required to reverse directions in a shuttle or back and forth application pattern (as opposed to a round robin pattern, less frequently used).

3. Swath width - a typical effective swath width such that the swath width divided by field width would equal the number of passes required to cover the field with the material being applied. A different swath width is used for dry and liquid materials.

4. Load carried - a typical load carried which allows for typical field practice and density of the material being applied.

Two additional variables are associated with the Operator Materials Profile:

1. Load time is calculated for liquid materials at a rate of 100 gallons per minute plus an additional 55 seconds for landing and hook-up time. For dry materials the load time is 80 seconds per load. In each case, only the required amount of material is carried.

2. Since there was no consistency among the operators in the data base on the question of leaving the engine running while loading, this variable was randomly determined.

2.5 Operator Aircraft Profiles

The FAA data files were examined in order to determine the major aircraft models used in ag-air. Seven fixed-wing models and one rotary-wing model were chosen as typical aircraft models owned by ag-air operators (see Table 2.1). Aircraft manufacturers' specifications and the ECON data base were then examined to determine typical values of several variables associated with each

TABLE 2.1 MAJOR AIRCRAFT MODELS USED IN AGRICULTURAL AVIATION FOR 1976		
AIRCRAFT ID#	AIRCRAFT MODEL	PERCENT OF FLEET
1	PIPER PAWNEE PA-25	15.8
2	CESSNA 188	14.7
3	BOEING STEARMAN (A75)	13.5
4	GRUMMAN AGCAT 164	12.0
5	PIPER CUB PA-18 AND J3	10.2
7	ROCKWELL THRUSH S2R	6.7
6	BELL 47G	3.5
8	PIPER BRAVE PA-36	2.7
	OTHER FIXED WING	16.5
	OTHER ROTARY WING	4.4
		100.0

aircraft type chosen. All but two variables in the profiles are represented by a distribution of values, either triangular in shape or as an even distribution (see Section 2.2 and Figure 2.5). These distributions typify the variability between operators and applications in the use of each aircraft type. The items described below are given for each of the eight current aircraft and the new technology aircraft in the Operator Aircraft Profiles (Appendix D).

1. Aircraft number - the aircraft I.D. # (see Table 2.1).

2. Year of manufacture - the actual distributions of the number of aircraft in the 1977 FAA files are represented in Figures D.1 through D.8 of Appendix D. A further discussion of this analysis can be found in Appendix G.

3. Useful hopper load - the typical maximum gallonage carried.

4. Year of purchase - operators typically trade planes every six years.

5. Expected lifetime - which can be interpreted as the period of depreciation.

6. Period of loan.

7. Interest rate of loan.

8. Ferry speed.

9. Application speed.

10. Fuel consumption during idle.

11. Fuel consumption during ferry.

12. Fuel consumption during application.

13. Oil use per hour.

14. Cost of oil.

15. Maintenance costs.

16. Hours between engine overhaul - TBO.

17. Overhaul costs.

18. Yearly inspection costs.

19. 100 hour inspection costs.

20. Taxes.

21. Direct hanger and tiedown costs.

Several other items associated with the Operator Aircraft Profiles are described below.

1. Purchase price - the purchase price for each aircraft type is determined from the year of purchase and the year of manufacture according to the curves in Figure D.9 through D.16 of Appendix D and adjusted by an aircraft inflation index found in Figure D.17 of Appendix D.

2. Salvage value - the salvage value is determined for each aircraft from the year of manufacture and purchase price according to the curve in Figure D.18 of Appendix D.

3. Amount of loan - the amount of loan against each aircraft is determined from the period of the loan and the purchase price according to the curve in Figure D.19 of Appendix D. Approximately one-third of the operators finance a newly purchased aircraft.

4. Cost of fuel - the cost of fuel is determined by region and aircraft type according to Table D.1 of Appendix D.

5. Hull insurance costs - the cost of hull insurance is determined from the purchase price according to the curve in Figure D.20 of Appendix D.

6. Fleet distribution - the number of each aircraft type is determined by region according to the distributions in Table D.2 of Appendix D. The location of each aircraft type is also given in Figure D.21 through D.28 of Appendix D.

7. Number of types owned by an operator - the number of different types of aircraft owned by an operator is determined by the number of aircraft owned according to the distributions in Table D.3 of Appendix D.

2.6 Operator Ground Vehicle Profile

The ECON data base was examined in order to determine typical values for nine variables associated with support equipment used by the flagging crew of an operator. It was assumed that support equipment used by the loading crew with the aircraft would be the same for both the current and new technology aircraft. Since the costs associated with the loading trucks would be basically constant, these costs were not included as part of the model. As with the Aircraft Profiles, several variables are represented by triangular and even distributions. The variables in the Operator Ground Vehicle Profile (Appendix E) are described below.

1. Year of purchase.

2. Purchase price.

3. Expected lifetime - which can be interpreted as the period of depreciation.

4. Salvage value.

5. Percent purchase price in loan - which is the amount of loan. Approximately one-half of the operators finance their ground vehicles.

6. Period of loan.

7. Interest rate of loan.

8. Fuel consumption.

9. Maintenance costs - which also include taxes and insurance.

One additional variable is associated with the Operator Ground Vehicle Profile. The cost of fuel is determined by region according to Table E.1 of Appendix E.

3. AGRICULTURAL AIRCRAFT DECISION MODEL

The Agricultural Aircraft Decision Model is a set of computer programs which utilizes the statistics of the ECON data base to simulate on a regional basis the activities of operators. The model is run for each of the 20 regions defined by the Operator Profiles and regional summary statistics are generated. The major question in the decision model is whether an aircraft, as defined by cost and operating characteristics, would be more economical than an aircraft of the existing fleet of a simulated operator. The cost comparison is a one-to-one decision, that is to say that the aircraft under consideration is compared doing the exact same tasks as one aircraft in the operator's fleet. The choice is whether the costs of operating a new aircraft in the first year are less than the costs of operating an existing aircraft. The Agricultural Aircraft Decision Model is outlined in Figure 3.1.

3.1 Operator Simulation Model

Given the total acreage in a region for each crop, sufficient operators are simulated according to the distributions in Operator Business Profiles to cover the region. The number of crops that the operator covers is first simulated according to the distribution of percent of operators in different crops in the region. The number of acres for each crop is then simulated for each operator according to the acreage distributions as determined in the Operator Business Profiles. The distribution of ferry distances, field sizes and field lengths is determined from the Operator Crop Profiles. The number of materials per crop and application rates are determined by region based only upon the specific crops. Operators are

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┌──────────┐      ┌──────────┐                              ┌──────────┐      ┌──────────┐
│ CREATE   │      │ PICK     │         ┌────────────────────│COUNT NEW │      │SUMMARIZE │
│ OPERATOR │      │ SPECIFIC │◄────────┘                    │AIRCRAFT  │─────►│NEW AIRCRAFT│
│(SIMULA-  │─────►│ OPERATOR │                              │ADDED TO  │      │MARKET    │
│TION      │      │          │                              │FLEET     │      │          │
│MODEL)    │      │          │                              │          │      │          │
└──────────┘      └──────────┘                              └──────────┘      └──────────┘
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                  ┌──────────┐                              ┌──────────┐
                  │COMPUTE   │                              │COMPARE   │
                  │BASELINE  │                              │COSTS AND │
                  │TOTAL     │                              │SELECT    │
                  │OPERATING │─────────────────────────────►│LOWEST COST│
                  │COSTS     │                              │FLEET     │
                  │(COST     │                              │(DECISION │
                  │MODEL)    │                              │MODEL)    │
                  └──────────┘                              └──────────┘
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                  ┌──────────┐      ┌──────────┐
                  │MODIFY    │─────►│COMPUTE   │
                  │OPERATOR'S│      │OPERATOR'S│
                  │FLEET     │◄─────│COSTS WITH│
                  │          │      │MODIFIED  │
                  │          │      │FLEET (COST│
                  │          │      │MODEL)    │
                  └──────────┘      └──────────┘
```
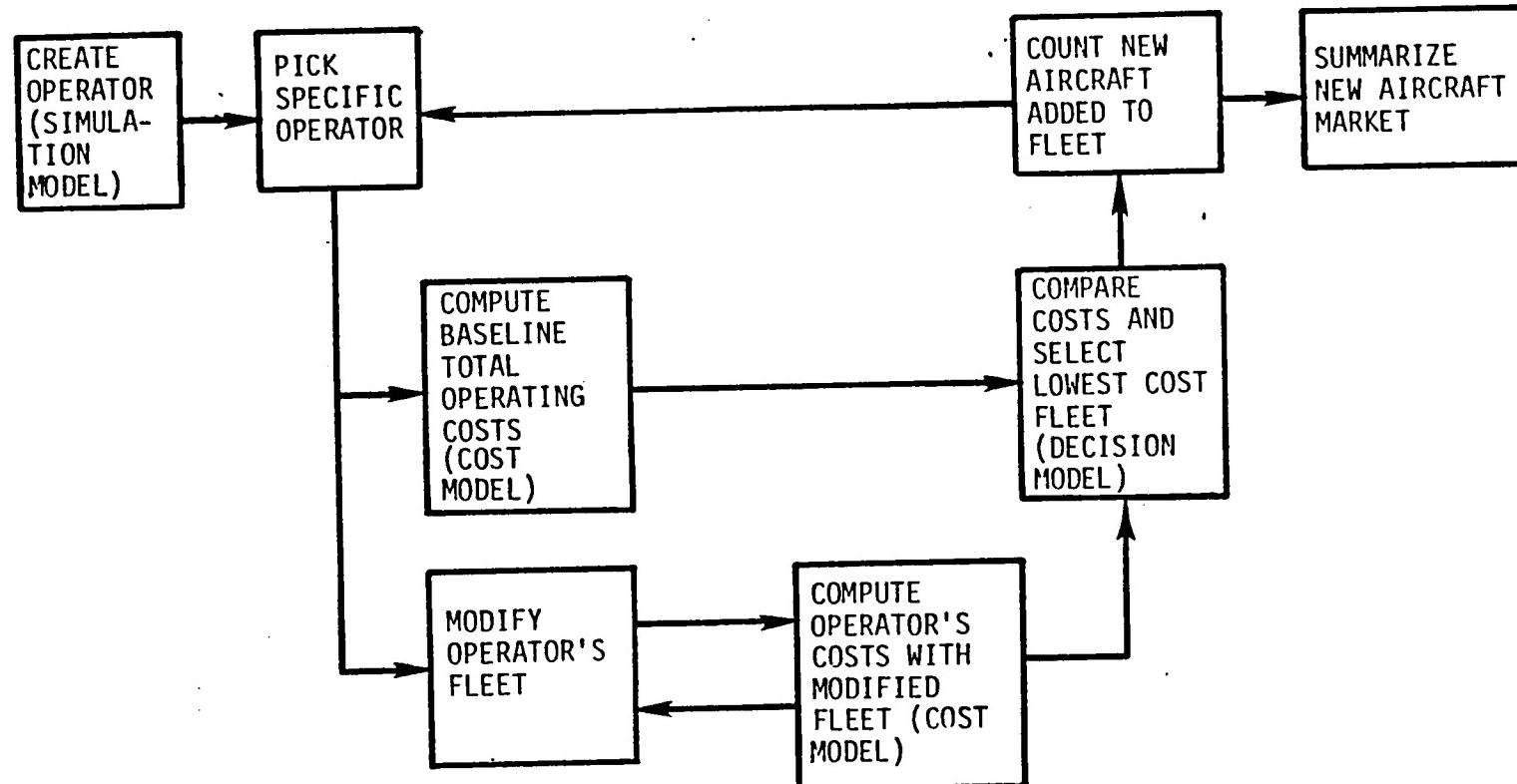
FIGURE 3.1   AGRICULTURAL AIRCRAFT DECISION MODEL

simulated in the above manner until the acreage for each crop in the region has been covered.

Given the size and crop distribution of the simulated operator, an aircraft fleet is generated. The number of aircraft is simulated from the Operator Business Profiles as a regional function of the size of the operator based on the hours per aircraft distribution and the average productivity (acres per hour per aircraft) in the region. The fleet mix recognizes the regional distribution of agricultural aircraft (Table D.2), the likelihood of each type of aircraft to be used on each crop in the region (Table B.2), and the fact that individual operators tend to restrict their aircraft to a few models (Table D.3). After the number of aircraft and the model types have been determined, the costs and operating characteristics are simulated for each aircraft from the Operator Aircraft Profiles. At the same time, an equal number of new technology aircraft are generated with costs and operating characteristics and matched one-to-one to each of the operator's aircraft. The matching includes the trade-in of the existing aircraft at book value for the new aircraft. In a similar manner to the aircraft, the ground vehicles for each operator are generated.

3.2 Cost Model

Once the operator has been defined in terms of number and types of crops and materials, field shapes and sizes and aircraft, the cost computation is straight-forward. Given a crop, material, application rate, field size, field length and aircraft characteristics, the cost computation involves computing the number of swaths, the number of payloads, the number of turns and other similar items and translating them into the respective times and costs of operation. Material and crew costs are included in the cost computation for each field.

In addition to the costs of treating each field, the total costs for each aircraft include annual costs such as insurance, interest, hangar, taxes and depreciation. The total costs for an operator include the costs of ground vehicles and other miscellaneous items. The major outputs of the cost calculations are the total costs for the operator and the costs for each aircraft.

3.3 Decision Model

The short-term market for the new aircraft is determined on a one-to-one basis. (This assumption does not always reflect the purchase decision and, hence, probably leads to an underestimation of the potential market.) The costs of covering the identical fields with identical materials is determined for an aircraft in the operator's fleet and for a new aircraft. These costs are then compared. Besides the obvious operating cost comparison, the annual fixed costs such as depreciation and interest are included. The short-term market assumes that the operators trade in one existing plane and apply the book value of the aircraft to the purchase of a new plane. The remainder of the purchase price of the new plane is financed at the prevailing regional interest rates. If the total annual costs for a new aircraft is lower under this scenario, then it would be profitable for the operator to purchase in the current year. (The business base, and hence revenues, has been held constant in this analysis. To allow growth in the business base of individual operators, with the large market penetration obtained by new technology aircraft, would require growth in the entire industry, which has been assumed zero in this analysis.)

The long-term market for the new aircraft looks only at the operating costs for each aircraft. If the respective operating costs are lower, then it is assumed that the new aircraft would be purchased. This comparison is achieved by setting the purchase price and all associated fixed annual costs of all aircraft to zero.

3.4   Model Implementation

The decision model as outlined above has been implemented on the Princeton University Computer Center IBM 360/91. The programming language used in the implementation was FORTRAN H Level 21.8 optimizing compiler. A typical execution of the program requires 110K bytes of main memory and 5 seconds of execution time. The regional statistics as well as the definition of aircraft and the selection of an aircraft to be substituted is accomplished through data input. For example, if it were desired to determine the short-term market penetration for any of the existing aircraft, then one data card would be changed and no programming changes would be necessary. The overall program design philosophy was to build maximum flexibility into the model through the use of data input which allows for analyses to be conducted which were not originally contemplated. The model structure flexibility will allow for future modifications and enhancements with minimal programming efforts.

4. NEW TECHNOLOGY AIRCRAFT MARKET

One new technology aircraft was profiled, a medium-sized single wing aircraft similar to the Agtruck and Pawnee. Results of modeling the decision to purchase a medium-sized new technology aircraft (I.D. #9 of this report) are presented below.

The Simulation Model was run for 19 regions. Region 1 had insufficient data to create appropriate Operator Profiles. There were 5,076 aircraft modeled which represents about 59 percent of the entire ag-air fleet. A breakdown by region is given in Table 4.1. (A further breakdown by aircraft type is given in Table F.1 of Appendix F.) In a few regions, more aircraft were modeled than were specified within that region by the Operator Profiles. This is due in part to the variability of the Simulation Model (which statistically simulates each major ag-air region), creating a greater proportion of smaller operators than might actually exist in a particular region and to the estimation of acreage treated within that region. The opposite situations will also explain the low percentage of the fleet being modeled in a few regions. These variations are taken into account in calculating other results.

The number of aircraft cost-effectively replaced by an aircraft incorporating technology which might result from NASA aerial applications research as determined by the Decision Model was 1,752 aircraft. (A breakdown by aircraft type and by region is given in Table F.2 of Appendix F.) By adjusting the number of aircraft substituted by the percent of fleet modeled, an estimation can be made of the long-term market penetration for the new technology aircraft. An ultimate penetration of nearly 3,000 aircraft was projected by the Decision Model. This

	TABLE 4.1 NUMBER OF AIRCRAFT IN AG-AIR FLEET AND MODELED BY SIMULATION MODEL		
REGION	NUMBER MODELED	NUMBER IN AG-AIR FLEET	% OF FLEET MODELED
2	164	262	63
3	295	298	99
4	87	101	86
5	220	197	112
6	474	896	53
7	478	558	86
8	248	355	70
9	208	217	96
10	203	287	71
11	190	267	71
12	231	214	108
13	607	402	151
14	415	405	102
15	330	405	81
16	306	335	91
17	241	361	67
18	207	256	81
19	121	235	51
20	51	149	34
OUTSIDE OF REGION	0	2449	0
TOTAL	5076	8649	AVERAGE 59

estimation is given in Figure 4.1 by region. The greatest numbers are located in the rice and cotton regions. Examination of which type of aircraft are replaced by a medium-sized new technology aircraft reveals that the smaller and least costly aircraft (Pawnee, Agtruck and Stearman) are the most competitive with the new technology aircraft. The larger and more costly aircraft (Agcat, Thrush and Brave) are the least competitive. The larger aircraft are located mostly in the cotton and rice regions (see Figure D.24 and D.27 of Appendix D) and the smaller aircraft in the midwest and northern plains (see Figures D.21 and D.22 of Appendix D). Although the Stearman is located in the rice regions, its low cost makes it competitive with a medium-sized new technology aircraft. Table F.3 of Appendix F gives the percent of aircraft type cost-effectively replaced by the new technology aircraft by region. A similar analysis was done in selected regions for the Cessna, Agcat and Thrush aircraft. Tables F.4 through F.12 of Appendix F give the results of this analyses.

An estimation of the long-term potential annual sales of the a medium-sized new technology aircraft can be made by creating an adjustment factor from the comparison of present aircraft sales of three current aircraft with that projected by the Decision Model. Table 4.2 gives the adjustment factors for the three current aircraft examined and the resulting potential annual sales for the new technology aircraft. The adjustment factor is determined by averaging the ratio of percent of aircraft replaced by a medium-sized new technology aircraft to a current aircraft across regions as projected by the Decision Model. The average time period in which a new aircraft reaches its peak sales is about six years (see Figures D.1, D.2, D.5, D.7 and D.8 of Appendix D). Therefore, in about six years after the introduction of a new technology aircraft, annual sales of about 200

TOTAL AIRCRAFT REPLACED OVER
ENTIRE COUNTRY = 2969

KEY

25-75	
76-125	
126-175	
176-225	
226+	

NOTE: 895 AIRCRAFT OUTSIDE
OF REGIONS MODELED.
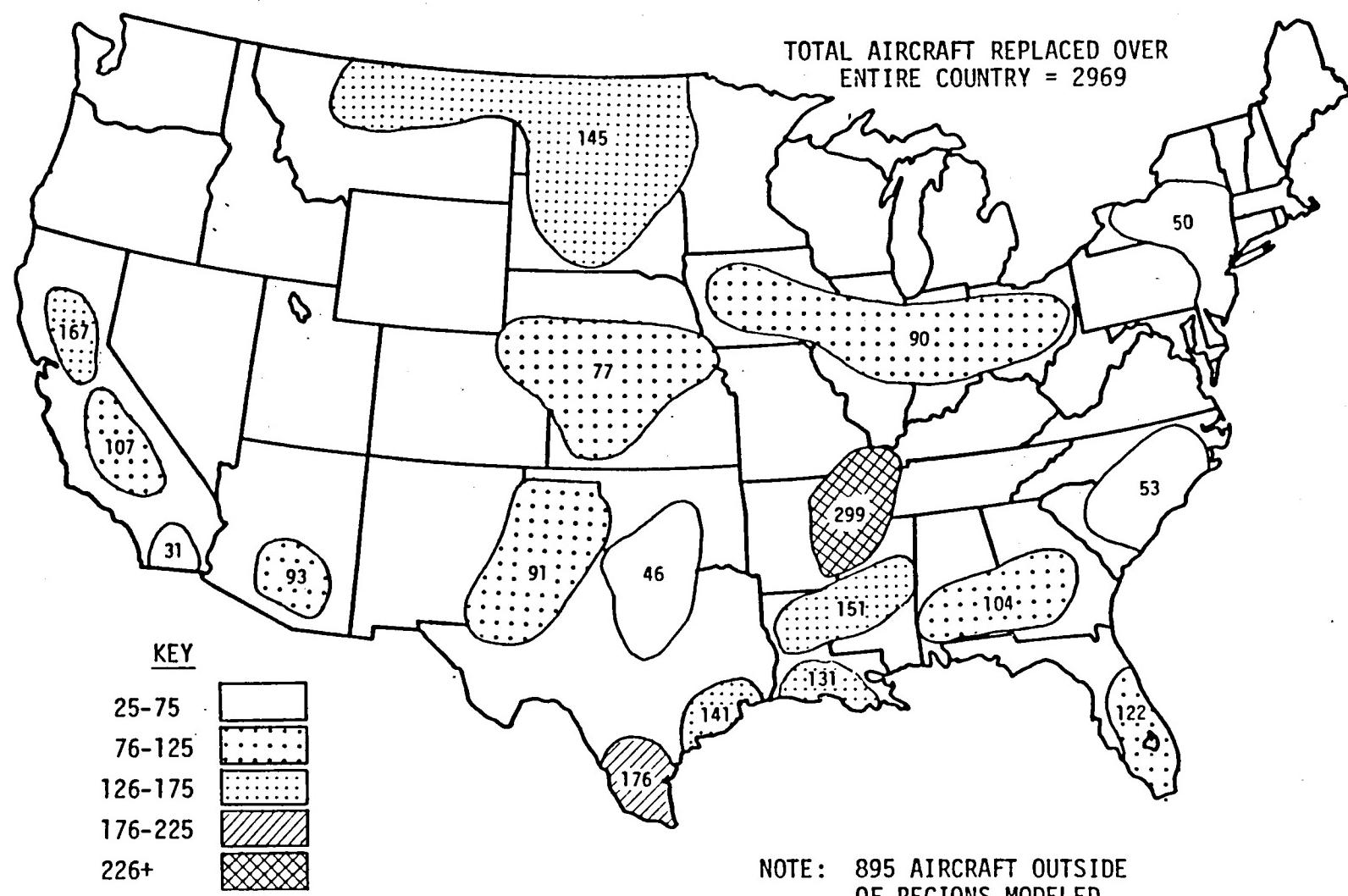
FIGURE 4.1   NUMBER OF AIRCRAFT COST-EFFECTIVELY REPLACED BY A MEDIUM-SIZED NEW TECHNOLOGY AGRICULTURAL
AIRCRAFT

TABLE 4.2 ESTIMATION OF POTENTIAL ANNUAL SALES FOR A NEW TECHNOLOGY AIRCRAFT			
AIRCRAFT TYPE	ANNUAL SALES	ADJUSTMENT FACTOR	ESTIMATED NEW TECHNOLOGY AIRCRAFT
CESSNA	300	1.87	160
AGCAT	200	.89	225
THRUSH	120	.50	240
AVERAGE	207	1.09	208

aircraft can be expected. Figure 4.2 shows the potential long-term market penetration and annual sales.

Cost savings benefits from the introduction of the proposed new technology aircraft are given in Figure 4.3 as a function of discount rate. This figure presents the conclusion that the expected net present value of the cost savings obtained exceeds the present value of the R&D costs necessary for the development of the technology base for the specified aircraft at discount rates up to at least 10 percent, based on an infinite horizon approach.[*] Furthermore, this conclusion is based upon a conservative estimation of the benefits. Specifically, the only benefits accounted for are due to cost savings in implementation of the entire aircraft proposed. Implementation of the component technologies as add-on devices to current fleet aircraft as well as other benefits have not been included. The other benefits include reduced environmental impacts, improved safety,

[*]The infinite horizon approach assumes that technology has an infinite life. That is to say, if new techologies are implemented, they should be credited with benefits over the technology which they replace for all future time. Clearly, the new technology will itself be superseded at some time. But then the superseding technology will also only be credited with its incremental benefits. In this way, each technology gets full credit for its development and "double counting" of benefits is prevented.
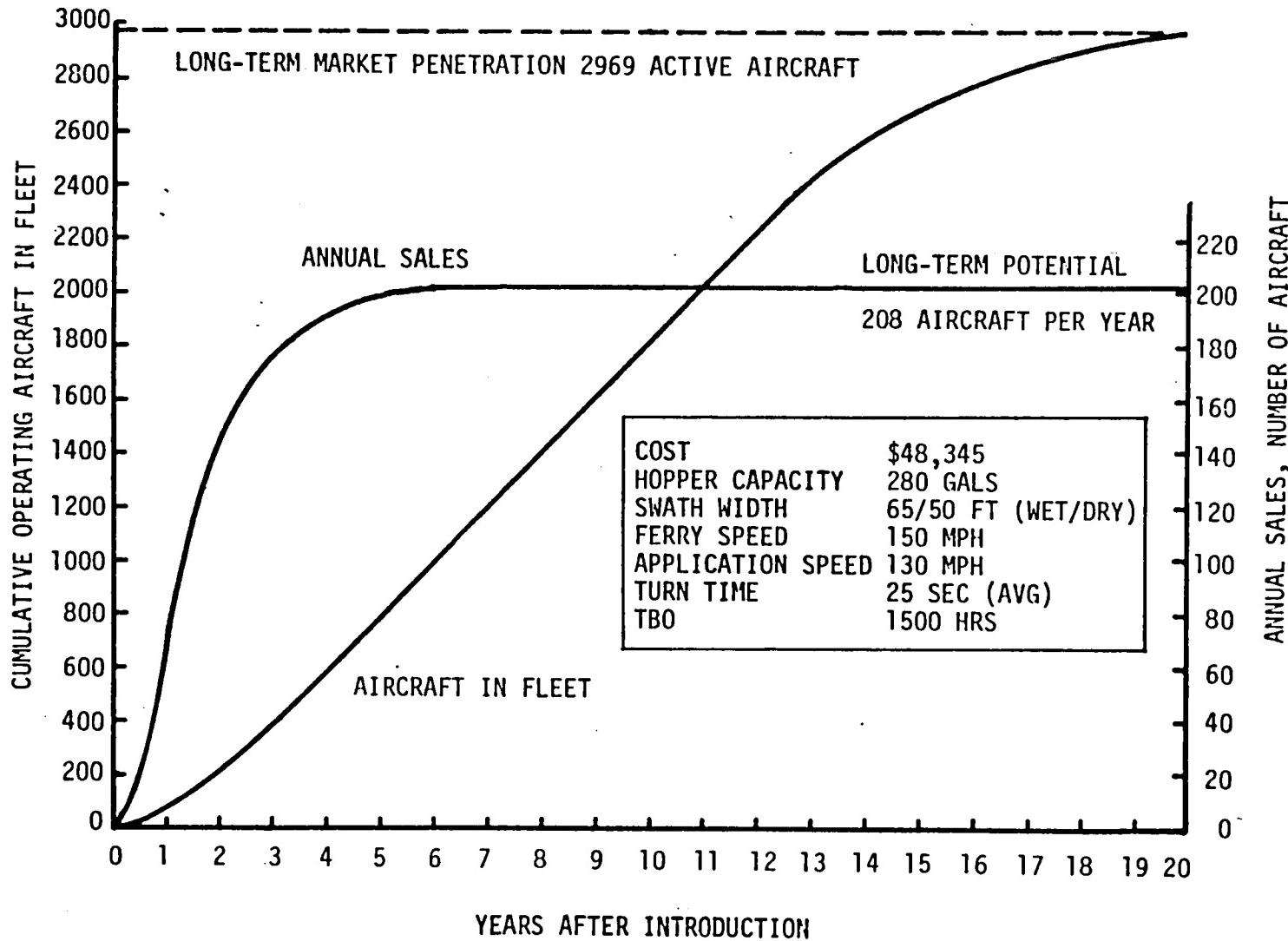
FIGURE 4.2   POTENTIAL MARKET FOR A MEDIUM-SIZED NEW TECHNOLOGY AG-AIRCRAFT
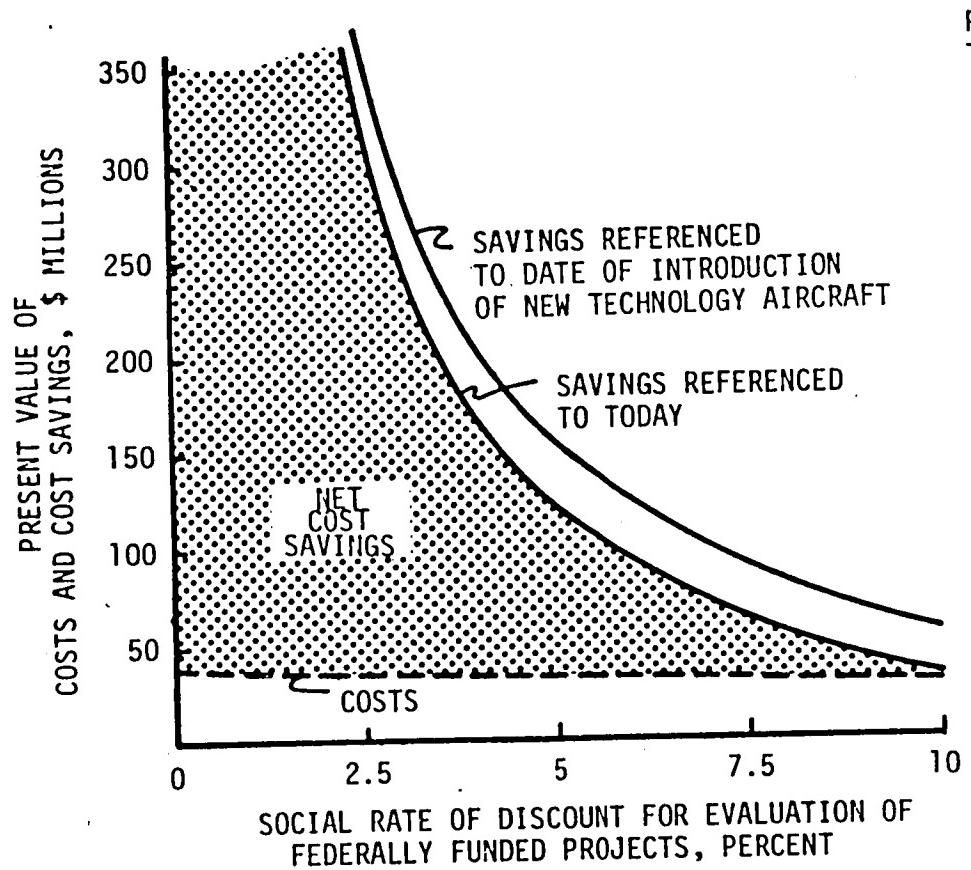
RESULTS SHOWN ARE CONSERVATIVE --
THEY DO NOT INCLUDE:

- ADDED SAVINGS DUE TO MARKET GROWTH
  EITHER WITH TIME OR DUE TO REDUCED
  COSTS

- ENVIRONMENTAL BENEFITS

- "MACROECONOMIC" EFFECTS

- TECHNOLOGY IMPLEMENTATION OTHER
  THAN AIRCRAFT SALES

FIGURE 4.3 POTENTIAL ECONOMIC BENEFITS FROM NASA-SPONSORED AERIAL
           APPLICATIONS RESEARCH

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increased aircraft sales both domestic and foreign (the latter impacting the balance of payments), and increased growth in the ag-air industry due to improved aircraft productivity. The benefit estimate is additionally conservative in that it is based on the present industry size and does not take expected industry growth into account. Thus, there is little doubt that the benefits shown in Figure 4.3 represent a lower bound--substantially higher total benefits could be expected and are projected in the "Study of Future World Markets for Agricultural Aircraft."[*]

APPENDIX A

OPERATOR BUSINESS PROFILES

Each variable of the Operator Business Profile is described by three values: low, peak and high. (See text for further explanation.) The three values describe a triangular distribution as follows:

Low Determines the lowest value of the variable under consideration that was observed for all operators in the data base for a particular region

Peak Determines the most frequently observed value of the variable under consideration that was observed for all operators in the data base for a particular region (the peak number of operators)

High Determines the highest value of the variable under consideration that was observed for all operators in the data base for a particular region.

In the Operator Business Profiles the following outputs were generated:

1. Percent of operators in different crops: The number of different crops each operator works on was determined. Crop grouping "other" was not counted as a different crop; i.e., an operator whose crops are cotton, soybeans and other is considered to work on just two crops.

2. Operator's crop mix by percent of hours: The percent of each operator's total flight hours for each crop grouping was determined. The value of the low, peak and high of the distribution by crop is given. The peak value is given to the nearest five percent. The percent of operators in the region who work in each crop grouping is also given.

3. Operator's crop mix by hours: The hours flown for each crop grouping was determined by operator. The value of the low, peak and high of the distribution by crop is given. The peak value is given to the nearest 50 hours. An estimate was made for hours flown per crop grouping for the entire region by applying the distribution of hours in the ECON data base to the total hours reported in the FAA data files for the region.

4. Operator's crop mix by acres: The total number of acres an operator works on was estimated by crop. The acreage would represent multiple acreage, not once-over acreage, because this estimate was determined by applying average productivities for each crop for the region to the operator's flight hours by crop. The value of the low, peak and high of the distribution by crop is given. The peak value is given to the nearest 50 acres. An estimate was made for the total number of acres treated in the region by applying the average productivities to the hours flown by crop.

5. Operator's size: Each operator's total size was determined. Items considered were (a) total flight hours, (b) total number of aircraft, (c) total acres treated, (d) the average number of hours flown per aircraft, i.e., a divided by b, (e) the average productivity for the operator, i.e., c divided by a. The value of the low, peak and high of the distribution by item is given. The peak value of total hours is given to the nearest 100 hours; total acres to the nearest 10,000 acres; average hours per aircraft to the nearest 25 hours per aircraft; and average productivity to the nearest 10 acres per hour. Estimates were made for the entire region for each item based on both FAA data files and the ECON data base.

OPERATOR BUSINESS PROFILE
REGION 2: CA--SACRAMENTO VALLEY

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

3	75
4	25

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
PICE	35	75	90	88
GRAINS	5	10	30	100
ORCHARDS	5	5	15	50
VEGETABLES	5	20	60	88
OTHER	5	5	5	25

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
RICE	665	1100	3823	52583	57.3
GRAINS	133	200	765	12906	14.1
ORCHARDS	80	400	626	5168	5.6
VEGETABLES	80	700	1738	20297	22.1
OTHER	80	100	125	836	0.9

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
RICE	32585	53900	187327	2576916	48.3
GRAINS	9177	13800	52785	890642	16.7
ORCHARDS	4720	23600	36934	304962	5.7
VEGETABLES	6160	53900	133826	1563107	29.3

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 2
TOTAL HOURS	1325	2500	6950	91791
TOTAL # AC	1	4	9	262
TOTAL ACRES	71358	130000	410872	5335627
AVE HOURS/AC	400	625	2000	350
AVE PRODUCTIVITY	50	60	72	58

OPERATOR BUSINESS PROFILE
REGION 3: CA--SAN JOAQUIN VALLEY

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

3	43
4	57

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
ALFALFA	14	25	50	100
COTTON	10	25	50	100
ORCHARDS	5	30	40	57
VEGETABLES	5	20	71	100
OTHER	5	10	10	43

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
ALFALFA	150	550	1140	31605	24.9
COTTON	30	700	2063	47721	37.7
ORCHARDS	90	350	720	9637	7.6
VEGETABLES	30	650	1181	32426	25.6
OTHER	126	200	413	5330	4.2

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
ALFALFA	11100	40700	84360	2338915	28.3
COTTON	1800	42000	123780	2863439	34.6
ORCHARDS	5310	20650	42480	568604	6.9
VEGETABLES	2310	50050	90937	2496965	30.2

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 3
TOTAL HOURS	300	2500	4125	126719
TOTAL # AC	3	5	6	298
TOTAL ACRES	20520	190000	275300	8267924
AVE HOURS/AC	100	600	825	425
AVE PRODUCTIVITY	65	70	74	65

OPERATOR BUSINESS PROFILE
REGION 4: CA--IMPERIAL VALLEY

OPERATORS IN DIFFERENT CROPS

# OF CROPS	% OF OPERATORS
2	25
3	50
4	25

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
ALFALFA	10	20	35	55
COTTON	30	70	100	100
GRAINS	5	10	10	40
VEGETABLES	5	20	40	60

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
ALFALFA	50	300	800	5027	16.0
COTTON	150	850	5000	14137	45.0
GRAINS	50	100	200	5655	18.0
VEGETABLES	25	250	800	6597	21.0

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
ALFALFA	3700	22200	59200	371965	17.6
COTTON	9000	51000	300000	848232	40.0
GRAINS	3450	6900	13800	390187	18.4
VEGETABLES	1925	19250	61600	507997	24.0

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 4
TOTAL HOURS	350	500	6200	31416
TOTAL # AC	1	1	17	101
TOTAL ACRES	25000	100000	580000	2118381
AVE HOURS/AC	200	450	850	311
AVE PRODUCTIVITY	70	90	90	67

OPERATOR BUSINESS PROFILE
REGION 5: AZ--SOUTH

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

1	17
2	50
3	17
4	17

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
ALFALFA	5	5	15	58
COTTON	53	85	100	100
GRAINS	5	10	20	42
VEGETABLES	5	20	42	33
OTHER	5	5	20	42

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
ALFALFA	20	100	600	5376	5.8
COTTON	209	1000	4920	76398	82.6
GRAINS	63	100	480	4421	4.8
VEGETABLES	19	150	540	4665	5.0
OTHER	28	50	110	1591	1.7

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
ALFALFA	1840	9200	55200	494585	5.5
COTTON	21736	104000	511680	7945787	88.2
GRAINS	4536	7200	34560	318318	3.5
VEGETABLES	1007	7950	28620	247233	2.7

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 5
TOTAL HOURS	380	600	6000	92450
TOTAL # AC	1	2	8	197
TOTAL ACRES	35234	110000	601440	9005923
AVE HOURS/AC	280	400	900	469
AVE PRODUCTIVITY	81	110	104	97

OPERATOR BUSINESS PROFILE
REGION 6: NORTHERN PLAINS

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

1	52
2	34
3	11
4	3

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
GRAINS	25	100	100	100
FIELD CROPS	5	10	42	39
VEGETABLES	5	15	30	17
POTATOES	6	30	55	9
OTHER	5	10	56	47

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
GRAINS	68	250	1550	113740	75.6
FIELD CROPS	13	50	250	9652	6.4
VEGETABLES	20	150	250	7093	4.7
POTATOES	15	100	675	8980	6.0
OTHER	13	50	250	10967	7.3

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
GRAINS	6188	22750	141050	10349601	88.1
FIELD CROPS	884	3400	17000	656266	5.6
VEGETABLES	940	7050	11750	333344	2.8
POTATOES	675	4500	30375	404087	3.4

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 6
TOTAL HOURS	70	300	1550	150432
TOTAL # AC	1	1	6	896
TOTAL ACRES	6370	30000	141050	11743297
AVE HOURS/AC	70	200	500	168
AVE PRODUCTIVITY	61	100	91	78

OPERATOR BUSINESS PROFILE
REGION 7: MID WEST

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

2	13
3	75
4	13

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
CORN	10	35	58	88
SORGHUM	15	50	62	63
GRAINS	15	25	80	75
RANG & BSH	14	25	36	50
VEGETABLES	20	20	21	25

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
CORN	20	50	551	41120	33.9
SORGHUM	45	100	225	23502	19.4
GRAINS	26	50	400	32888	27.2
RANG & BSH	42	100	162	14675	12.1
VEGETABLES	40	50	200	8939	7.4

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
CORN	1880	4700	51794	3867652	32.7
SORGHUM	4680	10400	23400	2445756	20.6
GRAINS	2496	4800	38400	3159238	26.7
RANG & BSH	5250	12500	20250	1835510	15.5
VEGETABLES	2400	3000	12000	536677	4.5

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 7
TOTAL HOURS	150	300	950	121125
TOTAL # AC	1	1	3	558
TOTAL ACRES	14996	50000	82994	11844832
AVE HOURS/AC	150	200	450	217
AVE PRODUCTIVITY	87	110	110	98

OPERATOR BUSINESS PROFILE
REGION 8: TX--PANHANDLE

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

2	28
3	47
4	21
5	2

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
CORN	5	30	80	77
SORGHUM	10	30	80	79
COTTON	5	20	80	45
GRAINS	5	25	61	68
VEGETABLES	5	5	60	23
OTHER	5	10	100	38

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
CORN	38	100	742	22803	27.5
SORGHUM	50	150	690	22047	26.6
COTTON	30	200	840	11622	14.0
GRAINS	20	100	658	15456	18.6
VEGETABLES	13	50	900	5121	6.2
OTHER	20	50	921	5851	7.1

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
CORN	4218	11100	82362	2530451	31.7
SORGHUM	5700	17100	78660	2512741	31.5
COTTON	2790	18600	78120	1080600	13.6
GRAINS	2040	10200	67116	1576128	19.8
VEGETABLES	689	2650	47700	271356	3.4

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 8
TOTAL HOURS	200	500	1675	82900
TOTAL # AC	1	2	5	355
TOTAL ACRES	0	50000	177541	7971276
AVE HOURS/AC	175	300	700	234
AVE PRODUCTIVITY	0	110	113	96

OPERATOR BUSINESS PROFILE
REGION 9: TX--NORTHCENTRAL

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

# OF CROPS	% OF OPERATORS
1	6
2	22
3	33
4	39

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SORGHUM	9	20	40	83
PEANUTS	10	35	51	22
COTTON	5	40	85	83
GRAINS	5	25	50	50
RANG & BSH	5	25	95	67
OTHER	5	10	30	44

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SORGHUM	30	150	480	9261	16.1
PEANUTS	95	250	385	3926	6.8
COTTON	50	200	765	20292	35.2
GRAINS	55	100	400	5968	10.4
RANG & BSH	15	100	1140	15269	26.5
OTHER	28	50	267	2893	5.0

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SORGHUM	3510	17550	56160	1085137	17.4
PEANUTS	11210	29500	45430	463956	7.5
COTTON	5150	20600	78795	2093068	33.6
GRAINS	6160	11200	44800	669425	10.8
RANG & BSH	1875	12500	142500	1911415	30.7

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 9
TOTAL HOURS	300	1200	1200	57610
TOTAL # AC	1	1	5	217
TOTAL ACRES	32286	100000	149220	6223002
AVE HOURS/AC	183	400	1200	265
AVE PRODUCTIVITY	103	110	124	108

OPERATOR BUSINESS PROFILE
REGION 10: TX--SOUTH

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

# OF CROPS	% OF OPERATORS
2	33
3	67

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
COTTON	30	70	88	100
GRAINS	5	25	30	78
VEGETABLES	5	25	40	89

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
COTTON	288	800	2400	66473	55.9
GRAINS	50	100	2100	21939	18.4
VEGETABLES	20	400	2800	30604	25.7

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
COTTON	30816	85600	256800	7112619	61.7
GRAINS	5250	10500	220500	2303575	20.0
VEGETABLES	1380	27600	193200	2111684	18.3

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 10
TOTAL HOURS	400	1600	7000	119016
TOTAL # AC	1	4	5	287
TOTAL ACRES	41856	250000	638400	11527878
AVE HOURS/AC	400	625	1400	415
AVE PRODUCTIVITY	91	100	107	97

OPERATOR BUSINESS PROFILE
REGION 11: TX--COASTAL

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

1	56
2	40
3	4

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SOYBEANS	5	10	30	28
RICE	44	100	100	100
COTTON	6	10	42	20
OTHER	5	5	56	56

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SOYBEANS	60	100	1200	6044	6.7
RICE	350	500	9120	73195	80.7
COTTON	30	100	1320	4567	5.0
OTHER	25	50	840	6935	7.6

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SOYBEANS	5640	9400	112800	568126	10.0
RICE	22050	31500	574560	4611505	81.5
COTTON	3150	10500	138600	479569	8.5

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 11
TOTAL HOURS	.500	500	12000	90740
TOTAL # AC	1	1	24	267
TOTAL ACRES	31500	40000	839613	5659200
AVE HOURS/AC	167	500	900	340
AVE PRODUCTIVITY	63	70	82	62

OPERATOR BUSINESS PROFILE
REGION 12: LA--SOUTH

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

# OF CROPS	% OF OPERATORS
1	35
2	65

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SOYBEANS	5	25	55	65
RICE	50	70	100	70
SUGARCANE	35	95	100	30
OTHER	5	10	30	30

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SOYBEANS	10	250	1015	14837	14.6
RICE	300	400	5873	72378	71.1
SUGARCANE	175	200	945	9427	9.3
OTHER	50	150	540	5209	5.1

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SOYBEANS	1000	25000	101500	1483837	22.6
RICE	16800	22400	328888	4053468	61.7
SUGARCANE	19075	21800	103005	1027607	15.7

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 12
TOTAL HOURS	200	600	7250	101851
TOTAL # AC	1	1	11	214
TOTAL ACRES	21710	30000	453073	6564912
AVE HOURS/AC	200	500	659	476
AVE PRODUCTIVITY	56	60	109	64

OPERATOR BUSINESS PROFILE
REGION 13: MS LA--NORTH

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

1	38
2	54

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SOYBEANS	5	20	89	46
COTTON	11	100	100	77
TIMBER	31	100	100	23
OTHER	8	10	21	15

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SOYBEANS	30	100	623	32636	19.3
COTTON	77	400	1800	119728	70.8
TIMBER	80	200	400	12331	7.3
OTHER	116	150	120	4470	2.6

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SOYBEANS	3390	11300	70399	3688271	17.8
COTTON	10164	52800	237600	15805883	76.3
TIMBER	8000	20000	40000	1233219	5.9

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 13
TOTAL HOURS	80	600	1800	169165
TOTAL # AC	1	1	5	402
TOTAL ACRES	8000	60000	237600	20727373
AVE HOURS/AC	80	450	650	421
AVE PRODUCTIVITY	100	140	132	123

OPERATOR BUSINESS PROFILE
REGION 14: MISSISSIPPI VALLEY - COTTON

OPERATORS IN DIFFERENT CROPS.

# OF CROPS	% OF OPERATORS
1	5
2	48
3	38
4	10

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SOYBEANS	7	30	60	71
RICE	5	15	52	29
COTTON	11	50	87	86
GRAINS	6	20	45	67
OTHER	5	5	48	48

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SOYBEANS	65	200	560	26006	20.0
RICE	65	200	1080	17456	13.4
COTTON	70	200	1320	58237	44.9
GRAINS	32	100	325	16138	12.4
OTHER	16	50	480	11973	9.2

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SOYBEANS	5915	18200	50960	2366005	21.3
RICE	3575	11000	59400	959859	8.6
COTTON	7770	22200	146520	6462839	58.2
GRAINS	2624	8200	26650	1323035	11.9

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 14
TOTAL HOURS	320	400	2400	129811
TOTAL # AC	1	1	4	405
TOTAL ACRES	28658	50000	205920	11111738
AVE HOURS/AC	175	400	600	321
AVE PRODUCTIVITY	82	100	112	86

OPERATOR BUSINESS PROFILE
REGION 15: MISSISSIPPI VALEY - RICE

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

        1   6
        2   29
        3   47
        4   18

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SOYBEANS	8	15	75	59
SORGHUM	10	15	40	24
RICE	9	65	90	100
COTTON	5	20	83	71
GRAINS	8	15	39	24
OTHER	10	10	20	12

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SOYBEANS	60	100	450	15310	11.8
SORGHUM	72	100	560	6670	5.1
RICE	78	450	1440	72707	56.0
COTTON	48	100	1079	26634	20.5
GRAINS	78	150	429	6159	4.7
OTHER	30	50	280	2331	1.8

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SOYBEANS	5220	8700	39150	1332967	14.1
SORGHUM	8280	11500	64400	767616	8.1
RICE	4290	24750	79200	4001904	42.3
COTTON	5328	11100	119769	2958652	31.3
GRAINS	5070	9750	27885	400608	4.2

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 15
TOTAL HOURS	300	600	2400	129811
TOTAL # AC	1	1	6	405
TOTAL ACRES	16500	40000	171168	9461747
AVE HOURS/AC	300	500	1550	321
AVE PRODUCTIVITY	55	70	104	73

OPERATOR BUSINESS PROFILE
REGION 16: CORN BELT

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

1	8
2	24
3	60
4	8

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
CORN	14	50	100	92
SOYBEANS	15	50	100	92
GRAINS	5	20	39	56
VEGETABLES	13	30	44	28
OTHER	5	10	19	16

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
CORN	60	100	1040	34814	40.3
SOYBEANS	29	200	546	28560	33.0
GRAINS	33	100	360	10617	12.3
VEGETABLES	52	100	540	9416	10.9
OTHER	23	50	342	3050	3.5

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
CORN	6180	10300	107120	3583811	48.7
SOYBEANS	2407	16600	45318	2369090	32.2
GRAINS	2244	6800	24480	721561	9.8
VEGETABLES	3796	7300	39420	686985	9.3

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 16
TOTAL HOURS	150	300	1800	86457
TOTAL # AC	1	1	5	335
TOTAL ACRES	13433	30000	152400	7361447
AVE HOURS/AC	90	300	650	258
AVE PRODUCTIVITY	77	90	103	85

OPERATOR BUSINESS PROFILE
REGION 17: AL GA--SOUTH

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

# OF CROPS	% OF OPERATORS
1	8
2	69
3	15

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SOYBEANS	5	10	60	77
PEANUTS	10	25	95	31
COTTON	5	95	95	85
OTHER	7	10	100	38

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SOYBEANS	20	50	420	17511	15.3
PEANUTS	210	300	600	13790	12.0
COTTON	18	350	1932	78235	68.2
OTHER	28	50	288	5126	4.5

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SOYBEANS	1020	2550	21420	893237	16.6
PEANUTS	7770	11100	22200	510323	9.5
COTTON	918	17850	98532	3990650	74.0

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 17
TOTAL HOURS	80	400	2400	114663
TOTAL # AC	1	1	7	361
TOTAL ACRES	0	20000	112855	5394211
AVE HOURS/AC	80	350	800	318
AVE PRODUCTIVITY	0	60	51	47

OPERATOR BUSINESS PROFILE
REGION 18: FL--SOUTH

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

1	58
2	33
3	8

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
CITRUS	11	100	100	75
VEGETABLES	8	10	73	42
RIGHT-OF-WAY	5	5	80	17
MOSQ CONTRL	28	30	100	17
OTHER	6	15	20	25

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
CITRUS	275	300	2817	33687	47.9
VEGETABLES	70	100	1825	21669	30.8
RIGHT-OF-WAY	125	150	560	4033	5.7
MOSQ CONTRL	538	550	700	7290	10.4
OTHER	140	200	275	3604	5.1

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
CITRUS	27500	30000	281700	3368943	57.2
VEGETABLES	4410	6300	114975	1365243	23.2
RIGHT-OF-WAY	7500	9000	33600	242027	4.1
MOSQ CONTRL	67250	68750	87500	911281	15.5

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 18
TOTAL HOURS	300	300	3275	70282
TOTAL # AC	1	1	8	256
TOTAL ACRES	30000	30000	317292	5887494
AVE HOURS/AC	140	300	500	275
AVE PRODUCTIVITY	60	100	125	84

OPERATOR BUSINESS PROFILE
REGION 19: NC SC

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

#	%
1	16
2	78
3	6

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
SOYBEANS	5	10	88	90
PEANUTS	5	10	80	14
COTTON	6	90	100	86
OTHER	5	5	45	55

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
SOYBEANS	25	100	880	15197	27.0
PEANUTS	18	50	600	2573	4.6
COTTON	30	250	1925	32771	58.3
OTHER	10	50	483	5709	10.1

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
SOYBEANS	1300	5200	45760	790459	30.9
PEANUTS	666	1850	22200	95237	3.7
COTTON	1530	12750	98175	1671724	65.4

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 19
TOTAL HOURS	150	700	2500	56250
TOTAL # AC	1	1	7	235
TOTAL ACRES	7650	30000	127861	2557420
AVE HOURS/AC	150	350	2000	239
AVE PRODUCTIVITY	37	60	52	45

OPERATOR BUSINESS PROFILE
REGION 20: NORTHEAST

OPERATORS IN DIFFERENT CROPS

OF CROPS   % OF OPERATORS

# OF CROPS	% OF OPERATORS
1	16
2	16
3	42
4	16
5	5.

BY PERCENT	LOW	PEAK	HIGH	% IN CROP
CORN	5	10	50	47
GRAINS	5	10	43	53
ORCHARDS	20	30	59	26
VEGETABLES	5	60	100	79
POTATOES	10	20	95	58
OTHER	5	5	100	37

BY HOURS	LOW	PEAK	HIGH	EST HRS IN AREA	%
CORN	27	50	233	1194	4.9
GRAINS	25	100	400	1904	7.7
ORCHARDS	155	250	510	2227	9.0
VEGETABLES	85	150	2010	8049	32.7
POTATOES	54	100	1995	7802	31.7
OTHER	78	200	1340	3433	14.0

BY ACRES	LOW	PEAK	HIGH	EST ACRES IN AREA	%
CORN	2052	3800	17708	90667	6.9
GRAINS	1750	7000	28000	133192	10.2
ORCHARDS	11625	18750	38250	166902	12.8
VEGETABLES	4335	7650	102510	410214	31.4
POTATOES	3510	6500	129675	506760	38.8

OPERATOR SIZE	LOW	PEAK	HIGH	TOTAL FOR AREA 20
TOTAL HOURS	150	600	3350	24608
TOTAL # AC	1	1	10	149
TOTAL ACRES	0	40000	170850	1307736
AVE HOURS/AC	150	400	700	165
AVE PRODUCTIVITY	0	70	72	53

APPENDIX B

OPERATOR CROP PROFILES

In the Operator Crop Profiles the following items are given:

1. Crop - the major crop groupings an operator works on as determined from the Operator Business Profiles.

2. Material applied - general type of material typically applied by ag-air operators.

3. Percent of acres - the regional distribution of acres by material for each crop grouping that ag-operators work on.

4. Application rate - a typical application rate of the total mix (base plus material) per acre. This would be the rate per pass because total acreage (multiple, not once-over) is used. Application rates can vary greatly from one operator to another. (G represents gallons and P represents pounds.)

5. Material cost - the cost per acre of the material applied.

6. Number in loading crew.

7. Number in flagging crew.

8. Long ferry - the ferry distance from home base to the loading area. A typical distribution of the percentage of fields that use a loading area at a given distance from home base is given. Loading at home base would be interpreted as a long ferry distance of zero miles.

9. Short ferry - the ferry distance from the loading area to the field. A typical distribution of the percentage of fields that are a given distance from the loading area is given.

10. Ground distance - the distance from home base to the field. A typical distribution of the percentage of fields that are a given distance from home base is given. This distribution is associated with the flagging crew. Where no flaggers are used, the ground distances would be interpreted as zero miles.

11. Field size - a typical distribution of the percentage of fields that are a given acreage.

12. Run length - a typical distribution of the percentage of fields that have a run length of the given length in miles. All fields are considered rectangular in shape.

Tables B.1 through B.8 show the use of aircraft by crop.

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
RICE	SEED	15	175.0 P	$ 14.79	2	2	0	20%	0%	15%	20	5%	0.2	10%
							2	0%	80%	20%	40	20%	0.3	20%
							5	20%	20%	35%	80	50%	0.4	30%
							10	40%	0%	20%	120	15%	0.5	25%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	FERTILIZER	43	175.0 P	$ 12.98	2	2	0	20%	0%	15%	20	5%	0.2	10%
							2	0%	80%	20%	40	20%	0.3	20%
							5	20%	20%	35%	80	50%	0.4	30%
							10	40%	0%	20%	120	15%	0.5	25%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	HERBICIDE	12	30.0 P	$ 11.40	2	2	0	20%	0%	15%	20	5%	0.2	10%
							2	0%	80%	20%	40	20%	0.3	20%
							5	20%	20%	35%	80	50%	0.4	30%
							10	40%	0%	20%	120	15%	0.5	25%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	HERBICIDE	13	10.0 G	$ 1.10	1	2	0	20%	0%	15%	20	5%	0.2	10%
							2	0%	80%	20%	40	20%	0.3	20%
							5	20%	20%	35%	80	50%	0.4	30%
							10	40%	0%	20%	120	15%	0.5	25%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	INSECTICIDE	5	10.0 P	$ 4.50	2	2	0	20%	0%	15%	20	5%	0.2	10%
							2	0%	80%	20%	40	20%	0.3	20%
							5	20%	20%	35%	80	50%	0.4	30%
							10	40%	0%	20%	120	15%	0.5	25%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	INSECTICIDE	12	2.0 G	$ 0.24	1	1	0	20%	0%	15%	20	5%	0.2	10%
							2	0%	80%	20%	40	20%	0.3	20%
							5	20%	20%	35%	80	50%	0.4	30%
							10	40%	0%	20%	120	15%	0.5	25%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	HERBICIDE	38	3.0 G	$ 2.62	1	2	0	60%	0%	0%	20	5%	0.2	5%
							2	0%	60%	15%	40	25%	0.3	15%
							5	0%	30%	20%	80	55%	0.4	35%
							10	20%	10%	35%	120	10%	0.5	35%
							18	20%	0%	20%	160	5%	0.6	10%
							25	0%	0%	10%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	38	1.0 G	$ 1.81	1	0	0	60%	0%	100%	20	5%	0.2	5%
							2	0%	60%	0%	40	25%	0.3	15%
							5	0%	30%	0%	80	55%	0.4	35%
							10	20%	10%	0%	120	10%	0.5	35%
							18	20%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
GRAINS	FERTILIZER	24	150.0 P	$ 12.30	2	2	0	20%	0%	15%	20	5%	0.2	5%
							2	0%	80%	20%	40	25%	0.3	15%
							5	20%	20%	35%	80	55%	0.4	35%
							10	40%	0%	20%	120	10%	0.5	35%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
ORCHARDS	INSECTICIDE	100	15.0 G	$ 4.00	1	0	0	30%	0%	100%	20	15%	0.2	5%
							2	0%	60%	0%	40	50%	0.3	50%
							5	0%	30%	0%	80	35%	0.4	30%
							10	70%	10%	0%	120	0%	0.5	10%
							18	0%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	100	10.0 G	$ 3.20	1	0	0	60%	0%	100%	20	10%	0.2	5%
							2	0%	60%	0%	40	30%	0.3	25%
							5	0%	30%	0%	80	50%	0.4	40%
							10	20%	10%	0%	120	10%	0.5	25%
							18	20%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
ALFALFA	INSECTICIDE	94	10.0 G	$ 3.80	1	0	0	30%	0%	100%	20	10%	0.2	15%
							2	0%	60%	0%	40	15%	0.3	20%
							5	0%	30%	0%	80	55%	0.4	20%
							10	70%	10%	0%	120	10%	0.5	30%
							18	0%	0%	0%	160	10%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
ALFALFA	FERTILIZER	6	100.0 P	$ 8.07	2	2	0	30%	0%	0%	20	10%	0.2	15%
							2	0%	60%	10%	40	15%	0.3	20%
							5	0%	30%	20%	80	55%	0.4	20%
							10	70%	10%	50%	120	10%	0.5	30%
							18	0%	0%	15%	160	10%	0.6	10%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	27	10.0 G	$ 3.63	1	0	0	30%	0%	100%	20	0%	0.2	5%
							2	0%	60%	0%	40	10%	0.3	10%
							5	0%	30%	0%	80	40%	0.4	25%
							10	70%	10%	0%	120	40%	0.5	35%
							18	0%	0%	0%	160	10%	0.6	20%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	68	10.0 G	$ 2.90	1	2	0	30%	0%	0%	20	0%	0.2	5%
							2	0%	60%	10%	40	10%	0.3	10%
							5	0%	30%	20%	80	40%	0.4	25%
							10	70%	10%	50%	120	40%	0.5	35%
							18	0%	0%	15%	160	10%	0.6	20%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	6	3.0 G	$ 2.17	1	2	0	30%	0%	0%	20	0%	0.2	5%
							2	0%	60%	10%	40	10%	0.3	10%
							5	0%	30%	20%	80	40%	0.4	25%
							10	70%	10%	50%	120	40%	0.5	35%
							18	0%	0%	15%	160	10%	0.6	20%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
ORCHARDS	INSECTICIDE	100	15.0 G	$ 4.00	1	0	0	30%	0%	100%	20	15%	0.2	5%
							2	0%	60%	0%	40	50%	0.3	50%
							5	0%	30%	0%	80	35%	0.4	30%
							10	70%	10%	0%	120	0%	0.5	10%
							18	0%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	100	10.0 G	$ 3.20	1	0	0	30%	0%	100%	20	10%	0.2	5%
							2	0%	60%	0%	40	30%	0.3	25%
							5	0%	30%	0%	80	50%	0.4	40%
							10	70%	10%	0%	120	10%	0.5	25%
							18	0%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 4

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
ALFALFA	INSECTICIDE	94	10.0 G	$ 3.80	1	0	0	30%	0%	100%	20	10%	0.2	15%
							2	0%	60%	0%	40	15%	0.3	20%
							5	0%	30%	0%	80	55%	0.4	20%
							10	70%	10%	0%	120	10%	0.5	30%
							18	0%	0%	0%	160	10%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
ALFALFA	FERTILIZER	6	100.0 P	$ 8.07	2	2	0	30%	0%	0%	20	10%	0.2	15%
							2	0%	60%	10%	40	15%	0.3	20%
							5	0%	30%	20%	80	55%	0.4	20%
							10	70%	10%	50%	120	10%	0.5	30%
							18	0%	0%	15%	160	10%	0.6	10%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	27	10.0 G	$ 3.63	1	0	0	30%	0%	100%	20	0%	0.2	5%
							2	0%	60%	0%	40	10%	0.3	10%
							5	0%	30%	0%	80	40%	0.4	25%
							10	70%	10%	0%	120	40%	0.5	15%
							18	0%	0%	0%	160	10%	0.6	20%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	68	10.0 G	$ 2.90	1	2	0	30%	0%	0%	20	0%	0.2	5%
							2	0%	60%	10%	40	10%	0.3	10%
							5	0%	30%	20%	80	40%	0.4	25%
							10	70%	10%	50%	120	40%	0.5	35%
							18	0%	0%	15%	160	10%	0.6	20%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	6	3.0 G	$ 2.17	1	2	0	30%	0%	0%	20	0%	0.2	5%
							2	0%	60%	10%	40	10%	0.3	10%
							5	0%	30%	20%	80	40%	0.4	25%
							10	70%	10%	50%	120	40%	0.5	35%
							18	0%	0%	15%	160	10%	0.6	20%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	HERBICIDE	38	3.0 G	$ 2.62	1	2	0	60%	0%	0%	20	5%	0.2	5%
							2	0%	60%	15%	40	25%	0.3	15%
							5	0%	30%	20%	80	55%	0.4	35%
							10	20%	10%	35%	120	10%	0.5	35%
							18	20%	0%	20%	160	5%	0.6	10%
							25	0%	0%	10%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	38	1.0 G	$ 1.81	1	0	0	60%	0%	100%	20	5%	0.2	5%
							2	0%	60%	0%	40	25%	0.3	15%
							5	0%	30%	0%	80	55%	0.4	15%
							10	20%	10%	0%	120	10%	0.5	35%
							18	20%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	FERTILIZER	24	150.0 P	$ 12.30	2	2	0	20%	0%	15%	20	5%	0.2	5%
							2	0%	80%	20%	40	25%	0.3	15%
							5	20%	20%	35%	80	55%	0.4	35%
							10	40%	0%	20%	120	10%	0.5	35%
							18	20%	0%	10%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 4 (CONTINUED)

CROP	MATERIAL	% OR ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	ROW LENGTH
VEGETABLES	INSECTICIDE	100	10.1 G	$ 3.20	1	0	0	10%	3%	101%	2?	10%	0.2	5?
							2	0%	63%	3%	40	10%	0.1	25%
							5	0%	30%	3%	90	50%	0.4	40%
							10	70%	10%	0%	120	10%	0.5	25%
							18	0%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 5

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
ALFALFA	INSECTICIDE	100	4.0 G	$ 5.05	1	0	0	30%	0%	100%	20	0%	0.2	0%
							2	0%	30%	0%	40	5%	0.3	10%
							5	0%	50%	0%	80	20%	0.4	20%
							10	70%	20%	0%	120	50%	0.5	40%
							18	0%	0%	0%	160	20%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	10%
COTTON	INSECTICIDE	84	3.5 G	$ 3.14	1	0	0	30%	0%	100%	20	0%	0.2	0%
							2	0%	30%	0%	40	5%	0.3	10%
							5	0%	50%	0%	80	20%	0.4	20%
							10	70%	20%	0%	120	50%	0.5	40%
							18	0%	0%	0%	160	20%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	10%
COTTON	DEFOLIANT	12	7.5 G	$ 2.60	1	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	30%	10%	40	5%	0.3	10%
							5	0%	50%	30%	80	20%	0.4	20%
							10	70%	20%	40%	120	50%	0.5	40%
							18	0%	0%	20%	160	20%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	10%
COTTON	HERBICIDE	4	7.0 G	$ 1.54	1	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	30%	10%	40	5%	0.3	10%
							5	0%	50%	30%	80	20%	0.4	20%
							10	70%	20%	40%	120	50%	0.5	40%
							18	0%	0%	20%	160	20%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	10%
GRAINS	INSECTICIDE	49	4.0 G	$ 5.66	1	0	0	30%	0%	100%	20	0%	0.2	0%
							2	0%	30%	0%	40	5%	0.3	10%
							5	0%	50%	0%	80	20%	0.4	20%
							10	70%	20%	0%	120	50%	0.5	40%
							18	0%	0%	0%	160	20%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	10%
GRAINS	FERTILIZER	36	175.0 P	$ 12.95	2	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	30%	10%	40	5%	0.3	10%
							5	0%	50%	30%	80	20%	0.4	20%
							10	70%	20%	40%	120	50%	0.5	40%
							18	0%	0%	20%	160	20%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	10%
GRAINS	HERBICIDE	15	8.0 G	$ 2.62	1	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	30%	10%	40	5%	0.3	10%
							5	0%	50%	30%	80	20%	0.4	20%
							10	70%	20%	40%	120	50%	0.5	40%
							18	0%	0%	20%	160	20%	0.6	10%
							25	0%	0%	0%	200	5%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	10%
VEGETABLES	INSECTICIDE	100	7.0 G	$ 2.80	1	0	0	30%	0%	100%	20	0%	0.2	5%
							2	0%	30%	0%	40	10%	0.3	10%
							5	0%	50%	0%	80	40%	0.4	20%
							10	70%	20%	0%	120	30%	0.5	25%
							18	0%	0%	0%	160	20%	0.6	30%
							25	0%	0%	0%	200	0%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	0%

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OPERATOR CROP PROFILE--REGION 6

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
GRAINS	HERBICIDE	92	2.0 G	$ 2.24	1	1	0	40%	0%	0%	20	0%	0.2	0%
							2	0%	20%	20%	40	10%	0.3	5%
							5	0%	30%	20%	80	10%	0.4	10%
							10	0%	50%	40%	120	50%	0.5	15%
							18	60%	0%	10%	160	20%	0.6	20%
							25	0%	0%	10%	200	10%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%
GRAINS	INSECTICIDE	8	2.0 G	$ 1.11	1	0	0	40%	0%	100%	20	0%	0.2	0%
							2	0%	20%	0%	40	10%	0.3	5%
							5	0%	30%	0%	80	10%	0.4	10%
							10	0%	50%	0%	120	50%	0.5	15%
							18	60%	0%	0%	160	20%	0.6	20%
							25	0%	0%	0%	200	10%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%
FIELD CROPS	INSECTICIDE	69	3.0 G	$ 1.25	1	0	0	40%	0%	100%	20	0%	0.2	0%
							2	0%	20%	0%	40	20%	0.3	10%
							5	0%	30%	0%	80	60%	0.4	30%
							10	0%	50%	0%	120	20%	0.5	20%
							18	60%	0%	0%	160	0%	0.6	30%
							25	0%	0%	0%	200	0%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	0%
FIELD CROPS	HERBICIDE	21	4.0 G	$ 2.24	1	1	0	40%	0%	0%	20	0%	0.2	0%
							2	0%	20%	20%	40	20%	0.3	10%
							5	0%	30%	20%	80	60%	0.4	30%
							10	0%	50%	40%	120	20%	0.5	20%
							18	60%	0%	10%	160	0%	0.6	30%
							25	0%	0%	10%	200	0%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	0%
FIELD CROPS	DEFOLIANT	11	5.0 G	$ 2.70	1	1	0	40%	0%	0%	20	0%	0.2	0%
							2	0%	20%	20%	40	20%	0.3	10%
							5	0%	30%	20%	80	60%	0.4	30%
							10	0%	50%	40%	120	20%	0.5	20%
							18	60%	0%	10%	160	0%	0.6	30%
							25	0%	0%	10%	200	0%	0.7	10%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	14	5.0 G	$ 2.80	1	0	0	75%	0%	100%	20	20%	0.2	25%
							2	0%	15%	0%	40	60%	0.3	25%
							5	0%	35%	0%	80	20%	0.4	40%
							10	0%	50%	0%	120	0%	0.5	5%
							18	25%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	HERBICIDE	34	5.0 G	$ 2.20	1	1	0	75%	0%	0%	20	20%	0.2	25%
							2	0%	15%	15%	40	60%	0.3	25%
							5	0%	35%	25%	80	20%	0.4	40%
							10	0%	50%	35%	120	0%	0.5	5%
							18	25%	0%	25%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	FUNGICIDE	52	5.0 G	$ 1.35	1	2	0	75%	0%	0%	20	20%	0.2	25%
							2	0%	15%	15%	40	60%	0.3	25%
							5	0%	35%	25%	80	20%	0.4	40%
							10	0%	50%	35%	120	0%	0.5	5%
							18	25%	0%	25%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
POTATOES	FUNGICIDE	33	5.0 G	$ 1.30	1	1	0	75%	0%	0%	20	20%	0.2	25%
							2	0%	15%	15%	40	60%	0.3	25%
							5	0%	35%	25%	80	20%	0.4	40%
							10	0%	50%	35%	120	0%	0.5	5%
							18	25%	0%	25%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
POTATOES	INSECTICIDE	53	4.0 G	$ 1.10	1	0	0	75%	0%	100%	20	20%	0.2	25%
							2	0%	15%	0%	40	60%	0.3	25%
							5	0%	35%	0%	80	20%	0.4	40%
							10	0%	50%	0%	120	0%	0.5	5%
							18	25%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
POTATOES	DEFOLIANT	15	5.0 G	$ 3.16	1	1	0	75%	0%	0%	20	20%	0.2	25%
							2	0%	15%	15%	40	60%	0.3	25%
							5	0%	35%	25%	80	20%	0.4	40%
							10	0%	50%	35%	120	0%	0.5	5%
							18	25%	0%	25%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 7

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
CORN	INSECTICIDE	75	2.0 G	$ 2.48	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	20%	0.3	10%
							5	0%	20%	0%	80	60%	0.4	30%
							10	0%	50%	0%	120	20%	0.5	20%
							18	10%	25%	0%	160	0%	0.6	35%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
CORN	HERBICIDE	25	2.0 G	$ 4.05	1	1	0	90%	5%	0%	20	0%	0.2	0%
							2	0%	20%	5%	40	20%	0.3	10%
							5	0%	50%	15%	80	60%	0.4	30%
							10	0%	25%	45%	120	20%	0.5	20%
							18	10%	0%	30%	160	0%	0.6	35%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
SORGHUM	INSECTICIDE	72	1.0 G	$ 1.16	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	20%	0.3	10%
							5	0%	20%	0%	80	60%	0.4	30%
							10	0%	50%	0%	120	20%	0.5	20%
							18	10%	25%	0%	160	0%	0.6	35%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
SORGHUM	HERBICIDE	28	2.0 G	$ 4.28	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	20%	0.3	10%
							5	0%	20%	15%	80	60%	0.4	30%
							10	0%	50%	45%	120	20%	0.5	20%
							18	10%	25%	30%	160	0%	0.6	35%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	HERBICIDE	66	1.5 G	$ 2.36	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	0%	0.3	0%
							5	0%	20%	15%	80	10%	0.4	5%
							10	0%	50%	45%	120	40%	0.5	30%
							18	10%	25%	30%	160	40%	0.6	45%
							25	0%	0%	5%	200	10%	0.7	15%
							35	0%	0%	0%	240	0%	0.8	5%
GRAINS	INSECTICIDE	34	1.0 G	$ 1.12	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	0%	0.3	0%
							5	0%	20%	0%	80	10%	0.4	5%
							10	0%	50%	0%	120	40%	0.5	30%
							18	10%	25%	0%	160	40%	0.6	45%
							25	0%	0%	0%	200	10%	0.7	15%
							35	0%	0%	0%	240	0%	0.8	5%
RANGELAND	HERBICIDE	100	1.5 G	$ 2.36	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	0%	0.3	0%
							5	0%	20%	15%	80	0%	0.4	0%
							10	0%	50%	45%	120	20%	0.5	0%
							18	10%	25%	30%	160	20%	0.6	10%
							25	0%	0%	5%	200	40%	0.7	20%
							35	0%	0%	0%	240	20%	0.8	70%
VEGETABLES	FUNGICIDE	100	3.0 G	$ 1.25	1	2	0	90%	0%	0%	20	10%	0.2	5%
							2	0%	5%	5%	40	40%	0.3	30%
							5	0%	20%	15%	80	0%	0.4	40%
							10	0%	50%	45%	120	10%	0.5	20%
							18	10%	25%	30%	160	0%	0.6	5%
							25	0%	0%	5%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
CORN	INSECTICIDE	84	2.5 G	$ 2.22	1	0	0	90%	0%	100%	20	0%	0.2	5%
							2	0%	5%	0%	40	40%	0.3	25%
							5	0%	20%	0%	80	40%	0.4	40%
							10	0%	50%	0%	120	20%	0.5	20%
							18	10%	25%	0%	160	0%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
CORN	HERBICIDE	16	2.5 G	$ 5.60	1	1	0	90%	0%	0%	20	0%	0.2	5%
							2	0%	5%	5%	40	40%	0.3	25%
							5	0%	20%	15%	80	40%	0.4	40%
							10	0%	50%	45%	120	20%	0.5	20%
							18	10%	25%	30%	160	0%	0.6	10%
							25	0%	0%	5%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SORGHUM	INSECTICIDE	79	1.0 G	$ 1.16	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	0%	0.3	0%
							5	0%	20%	0%	80	20%	0.4	10%
							10	0%	50%	0%	120	40%	0.5	20%
							18	10%	25%	0%	160	40%	0.6	20%
							25	0%	0%	0%	200	0%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%
SORGHUM	HERBICIDE	21	2.0 G	$ 4.50	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	0%	0.3	0%
							5	0%	20%	15%	80	20%	0.4	10%
							10	0%	50%	45%	120	40%	0.5	20%
							18	10%	25%	30%	160	40%	0.6	20%
							25	0%	0%	5%	200	0%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%
COTTON	INSECTICIDE	68	1.0 G	$ 2.76	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	0%	0.3	5%
							5	0%	20%	0%	80	45%	0.4	10%
							10	0%	50%	0%	120	45%	0.5	25%
							18	10%	25%	0%	160	5%	0.6	35%
							25	0%	0%	0%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	26	2.0 G	$ 2.72	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	5%	0.3	5%
							5	0%	20%	15%	80	45%	0.4	10%
							10	0%	50%	45%	120	45%	0.5	25%
							18	10%	25%	30%	160	5%	0.6	35%
							25	0%	0%	5%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	6	3.0 G	$ 0.52	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	5%	0.3	5%
							5	0%	20%	15%	80	45%	0.4	10%
							10	0%	50%	45%	120	45%	0.5	25%
							18	10%	25%	30%	160	5%	0.6	35%
							25	0%	0%	5%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	63	1.0 G	$ 1.17	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	10%	0.3	5%
							5	0%	20%	0%	80	40%	0.4	15%
							10	0%	50%	0%	120	40%	0.5	20%
							18	10%	25%	0%	160	10%	0.6	30%
							25	0%	0%	0%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	5%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
GRAINS	HERBICIDE	34	1.5 G	$ 2.40	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	10%	0.3	5%
							5	0%	20%	15%	80	40%	0.4	15%
							10	0%	50%	45%	120	40%	0.5	20%
							18	10%	25%	30%	160	10%	0.6	30%
							25	0%	0%	5%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	5%
GRAINS	FERTILIZER	2	100.0 P	$ 6.80	2	2	0	90%	0%	0%	20	0%	0.2	5%
							2	0%	5%	5%	40	10%	0.3	15%
							5	0%	20%	15%	80	40%	0.4	20%
							10	0%	50%	45%	120	40%	0.5	30%
							18	10%	25%	30%	160	10%	0.6	25%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	42	3.5 G	$ 2.30	1	0	0	90%	0%	100%	20	10%	0.2	15%
							2	0%	5%	0%	40	55%	0.3	35%
							5	0%	20%	0%	80	25%	0.4	30%
							10	0%	50%	0%	120	10%	0.5	15%
							18	10%	25%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	FUNGICIDE	58	8.0 G	$ 1.25	1	1	0	90%	0%	0%	20	10%	0.2	15%
							2	0%	5%	5%	40	55%	0.3	35%
							5	0%	20%	15%	80	25%	0.4	30%
							10	0%	50%	45%	120	10%	0.5	15%
							18	10%	25%	30%	160	0%	0.6	5%
							25	0%	0%	5%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 9

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SORGHUM	INSECTICIDE	90	1.0 G	$ 1.16	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	0%	0.3	0%
							5	0%	20%	0%	80	20%	0.4	10%
							10	0%	50%	0%	120	40%	0.5	20%
							18	10%	25%	0%	160	40%	0.6	20%
							25	0%	0%	0%	200	0%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%
SORGHUM	HERBICIDE	10	3.0 G	$ 4.50	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	0%	0.3	0%
							5	0%	20%	15%	80	20%	0.4	10%
							10	0%	50%	45%	120	40%	0.5	20%
							18	10%	25%	30%	160	40%	0.6	20%
							25	0%	0%	5%	200	0%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%
PEANUTS	INSECTICIDE	33	2.5 G	$ 4.16	1	0	0	90%	0%	100%	20	10%	0.2	15%
							2	0%	5%	0%	40	45%	0.3	30%
							5	0%	20%	0%	80	40%	0.4	40%
							10	0%	50%	0%	120	5%	0.5	15%
							18	10%	25%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
PEANUTS	FUNGICIDE	67	4.0 G	$ 4.25	1	1	0	90%	0%	0%	20	10%	0.2	15%
							2	0%	5%	5%	40	45%	0.3	30%
							5	0%	20%	15%	80	40%	0.4	40%
							10	0%	50%	45%	120	5%	0.5	15%
							18	10%	25%	30%	160	0%	0.6	0%
							25	0%	0%	5%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	88	1.0 G	$ 3.25	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	5%	0.3	5%
							5	0%	20%	0%	80	45%	0.4	10%
							10	0%	50%	0%	120	45%	0.5	25%
							18	10%	25%	0%	160	5%	0.6	35%
							25	0%	0%	0%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	10	3.0 G	$ 1.10	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	5%	0.3	5%
							5	0%	20%	15%	80	45%	0.4	10%
							10	0%	50%	45%	120	45%	0.5	25%
							18	10%	25%	30%	160	5%	0.6	35%
							25	0%	0%	5%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	2	3.0 G	$ 5.26	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	5%	0.3	5%
							5	0%	20%	15%	80	45%	0.4	10%
							10	0%	50%	45%	120	45%	0.5	25%
							18	10%	25%	30%	160	5%	0.6	35%
							25	0%	0%	5%	200	0%	0.7	25%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	93	1.0 G	$ 1.17	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	0%	0.3	0%
							5	0%	20%	0%	80	20%	0.4	10%
							10	0%	50%	0%	120	40%	0.5	20%
							18	10%	25%	0%	160	40%	0.6	20%
							25	0%	0%	0%	200	0%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%

OPERATOR CROP PROFILE--REGION 9 (CONTINUED)

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
GRAINS	HERBICIDE	7	1.0 G	$ 2.40	1	1	0	90%	0%	0%	20	0%	0.2	0%
							2	0%	5%	5%	40	0%	0.3	0%
							5	0%	20%	15%	80	20%	0.4	10%
							10	0%	50%	45%	120	40%	0.5	20%
							18	10%	25%	30%	160	40%	0.6	20%
							25	0%	0%	5%	200	0%	0.7	30%
							35	0%	0%	0%	240	0%	0.8	20%
RANGELAND	HERBICIDE	100	3.0 G	$ 2.40	1	0	0	90%	0%	100%	20	0%	0.2	0%
							2	0%	5%	0%	40	0%	0.3	0%
							5	0%	20%	0%	80	0%	0.4	0%
							10	0%	50%	0%	120	20%	0.5	10%
							18	10%	25%	0%	160	20%	0.6	20%
							25	0%	0%	0%	200	40%	0.7	30%
							35	0%	0%	0%	240	20%	0.8	40%

OPERATOR CROP PROFILE--REGION 10

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
COTTON	INSECTICIDE	97	1.5 G	$ 3.75	1	0	0	40%	0%	100%	20	0%	0.2	5%
							2	0%	60%	0%	40	10%	0.3	15%
							5	0%	20%	0%	80	40%	0.4	40%
							10	40%	20%	0%	120	40%	0.5	20%
							18	20%	0%	0%	160	10%	0.6	15%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	3	4.5 G	$ 3.75	1	2	0	40%	0%	0%	20	0%	0.2	5%
							2	0%	60%	20%	40	10%	0.3	15%
							5	0%	20%	25%	80	40%	0.4	40%
							10	40%	20%	35%	120	40%	0.5	20%
							18	20%	0%	15%	160	10%	0.6	15%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	100	2.0 G	$ 1.17	1	0	0	40%	0%	100%	20	0%	0.2	5%
							2	0%	60%	0%	40	45%	0.3	25%
							5	0%	20%	0%	80	40%	0.4	45%
							10	40%	20%	0%	120	15%	0.5	15%
							18	20%	0%	0%	160	0%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	96	4.0 G	$ 2.30	1	0	0	40%	0%	100%	20	15%	0.2	15%
							2	0%	60%	0%	40	30%	0.3	5%
							5	0%	20%	0%	80	50%	0.4	55%
							10	40%	20%	0%	120	5%	0.5	15%
							18	20%	0%	0%	160	0%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	FUNGICIDE	4	7.5 G	$ 1.25	1	2	0	40%	0%	0%	20	15%	0.2	15%
							2	0%	60%	20%	40	30%	0.3	5%
							5	0%	20%	25%	80	50%	0.4	55%
							10	40%	20%	35%	120	5%	0.5	15%
							18	20%	0%	15%	160	0%	0.6	10%
							25	0%	0%	5%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SOYBEANS	INSECTICIDE	53	2.0 G	$ 2.50	1	0	0	40%	0%	100%	20	0%	0.2	0%
							2	0%	65%	0%	40	20%	0.3	10%
							5	0%	25%	0%	80	40%	0.4	30%
							10	25%	10%	0%	120	40%	0.5	40%
							18	35%	0%	0%	160	0%	0.6	20%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	HERBICIDE	12	5.0 G	$ 1.31	1	2	0	40%	0%	0%	20	0%	0.2	0%
							2	0%	65%	10%	40	20%	0.3	10%
							5	0%	25%	30%	80	40%	0.4	30%
							10	25%	10%	40%	120	40%	0.5	40%
							18	35%	0%	10%	160	0%	0.6	20%
							25	0%	0%	10%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	FUNGICIDE	36	5.0 G	$ 3.50	1	2	0	40%	0%	0%	20	0%	0.2	0%
							2	0%	65%	10%	40	20%	0.3	10%
							5	0%	25%	30%	80	40%	0.4	30%
							10	25%	10%	40%	120	40%	0.5	40%
							18	35%	0%	10%	160	0%	0.6	20%
							25	0%	0%	10%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	SEED	12	120.0 P	$ 18.00	2	2	0	20%	0%	0%	20	0%	0.2	0%
							2	0%	75%	10%	40	5%	0.3	10%
							5	0%	20%	30%	80	10%	0.4	10%
							10	40%	5%	40%	120	35%	0.5	25%
							18	40%	0%	10%	160	35%	0.6	25%
							25	0%	0%	10%	200	10%	0.7	20%
							35	0%	0%	0%	240	5%	0.8	10%
RICE	FERTILIZER	40	150.0 P	$ 12.75	2	2	0	20%	0%	0%	20	0%	0.2	0%
							2	0%	75%	10%	40	5%	0.3	10%
							5	0%	20%	30%	80	10%	0.4	10%
							10	40%	5%	40%	120	35%	0.5	25%
							18	40%	0%	10%	160	35%	0.6	25%
							25	0%	0%	10%	200	10%	0.7	20%
							35	0%	0%	0%	240	5%	0.8	10%
RICE	HERBICIDE	8	30.0 P	$ 10.80	2	2	0	20%	0%	0%	20	0%	0.2	0%
							2	0%	75%	10%	40	5%	0.3	10%
							5	0%	20%	30%	80	10%	0.4	10%
							10	40%	5%	40%	120	35%	0.5	25%
							18	40%	0%	10%	160	35%	0.6	25%
							25	0%	0%	10%	200	10%	0.7	20%
							35	0%	0%	0%	240	5%	0.8	10%
RICE	HERBICIDE	20	10.0 G	$ 10.71	1	2	0	20%	0%	0%	20	0%	0.2	0%
							2	0%	75%	10%	40	5%	0.3	10%
							5	0%	20%	30%	80	10%	0.4	10%
							10	40%	5%	40%	120	35%	0.5	25%
							18	40%	0%	10%	160	35%	0.6	25%
							25	0%	0%	10%	200	10%	0.7	20%
							35	0%	0%	0%	240	5%	0.8	10%
RICE	INSECTICIDE	13	17.0 P	$ 5.10	2	2	0	20%	0%	0%	20	0%	0.2	0%
							2	0%	75%	10%	40	5%	0.3	10%
							5	0%	20%	30%	80	10%	0.4	10%
							10	40%	5%	40%	120	35%	0.5	25%
							18	40%	0%	10%	160	35%	0.6	25%
							25	0%	0%	10%	200	10%	0.7	20%
							35	0%	0%	0%	240	5%	0.8	10%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
RICE	INSECTICIDE	8	3.0 G	$ 1.53	1	2	0	20%	0%	0%	20	0%	0.2	0%
							2	0%	75%	10%	40	5%	0.3	10%
							5	0%	20%	30%	80	10%	0.4	10%
							10	40%	5%	40%	120	35%	0.5	25%
							18	40%	0%	10%	160	35%	0.6	25%
							25	0%	0%	10%	200	10%	0.7	20%
							35	0%	0%	0%	240	5%	0.8	10%
COTTON	INSECTICIDE	92	1.5 G	$ 2.67	1	0	0	40%	0%	100%	20	0%	0.2	0%
							2	0%	65%	0%	40	0%	0.3	5%
							5	0%	25%	0%	80	15%	0.4	20%
							10	25%	10%	0%	120	35%	0.5	30%
							18	35%	0%	0%	160	35%	0.6	25%
							25	0%	0%	0%	200	20%	0.7	15%
							35	0%	0%	0%	240	5%	0.8	5%
COTTON	DEFOLIANT	6	5.0 G	$ 1.92	1	2	0	40%	0%	0%	20	0%	0.2	0%
							2	0%	65%	10%	40	0%	0.3	5%
							5	0%	25%	30%	80	15%	0.4	20%
							10	25%	10%	40%	120	30%	0.5	30%
							18	35%	0%	10%	160	30%	0.6	25%
							25	0%	0%	10%	200	20%	0.7	15%
							35	0%	0%	0%	240	5%	0.8	5%
COTTON	HERBICIDE	2	7.5 G	$ 0.52	1	2	0	40%	0%	0%	20	0%	0.2	0%
							2	0%	65%	10%	40	0%	0.3	5%
							5	0%	25%	30%	80	15%	0.4	20%
							10	25%	10%	40%	120	30%	0.5	30%
							18	35%	0%	10%	160	30%	0.6	25%
							25	0%	0%	10%	200	20%	0.7	15%
							35	0%	0%	0%	240	5%	0.8	5%

OPERATOR CROP PROFILE--REGION 12

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SOYBEANS	INSECTICIDE	51	2.0 G	$ 3.20	1	0	0	50%	0%	100%	20	0%	0.2	0%
							2	0%	60%	0%	40	5%	0.3	10%
							5	0%	20%	0%	80	20%	0.4	25%
							10	40%	20%	0%	120	40%	0.5	40%
							18	10%	0%	0%	160	30%	0.6	20%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	HERBICIDE	30	6.0 G	$ 1.35	1	2	0	50%	0%	0%	20	0%	0.2	0%
							2	0%	60%	10%	40	5%	0.3	10%
							5	0%	20%	20%	80	20%	0.4	25%
							10	40%	20%	30%	120	40%	0.5	40%
							18	10%	0%	35%	160	30%	0.6	20%
							25	0%	0%	5%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	FUNGICIDE	19	5.0 G	$ 3.55	1	2	0	50%	0%	0%	20	0%	0.2	0%
							2	0%	60%	10%	40	5%	0.3	10%
							5	0%	20%	20%	80	20%	0.4	25%
							10	40%	20%	30%	120	40%	0.5	40%
							18	10%	0%	35%	160	30%	0.6	20%
							25	0%	0%	5%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	SEED	13	140.0 P	$ 21.43	2	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	80%	10%	40	5%	0.3	10%
							5	0%	15%	20%	80	20%	0.4	25%
							10	60%	5%	30%	120	40%	0.5	40%
							18	10%	0%	35%	160	30%	0.6	20%
							25	0%	0%	5%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	FERTILIZER	44	175.0 P	$ 12.25	2	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	80%	10%	40	5%	0.3	10%
							5	0%	15%	20%	80	20%	0.4	25%
							10	60%	5%	30%	120	40%	0.5	40%
							18	10%	0%	35%	160	30%	0.6	20%
							25	0%	0%	5%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	HERBICIDE	20	10.0 G	$ 8.75	1	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	80%	10%	40	5%	0.3	10%
							5	0%	15%	20%	80	20%	0.4	25%
							10	60%	5%	30%	120	40%	0.5	40%
							18	10%	0%	35%	160	30%	0.6	20%
							25	0%	0%	5%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	HERBICIDE	6	30.0 P	$ 10.50	2	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	80%	10%	40	5%	0.3	10%
							5	0%	15%	20%	80	20%	0.4	25%
							10	60%	5%	30%	120	40%	0.5	40%
							18	10%	0%	35%	160	30%	0.6	20%
							25	0%	0%	5%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	INSECTICIDE	11	17.0 P	$ 5.44	2	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	80%	10%	40	5%	0.3	10%
							5	0%	15%	20%	80	20%	0.4	25%
							10	60%	5%	30%	120	40%	0.5	40%
							18	10%	0%	35%	160	30%	0.6	20%
							25	0%	0%	5%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
RICE	INSECTICIDE	6	3.0 G	$ 0.99	1	0	0	30%	0%	100%	20	0%	0.2	0%
							2	0%	80%	0%	40	5%	0.3	10%
							5	0%	15%	0%	80	20%	0.4	25%
							10	60%	5%	0%	120	40%	0.5	40%
							18	10%	0%	0%	160	30%	0.6	20%
							25	0%	0%	0%	200	5%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
SUGARCANE	INSECTICIDE	75	2.0 G	$ 1.55	1	0	0	30%	0%	100%	20	0%	0.2	0%
							2	0%	80%	0%	40	20%	0.3	10%
							5	0%	15%	0%	80	50%	0.4	30%
							10	60%	5%	0%	120	30%	0.5	45%
							18	10%	0%	0%	160	0%	0.6	15%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SUGARCANE	HERBICIDE	25	5.0 G	$ 1.50	1	2	0	30%	0%	0%	20	0%	0.2	0%
							2	0%	80%	10%	40	20%	0.3	10%
							5	0%	15%	20%	80	50%	0.4	30%
							10	60%	5%	30%	120	30%	0.5	45%
							18	10%	0%	35%	160	0%	0.6	15%
							25	0%	0%	5%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SOYBEANS	FUNGICIDE	24	5.0 G	$ 3.27	1	2	0	40%	0%	0%	20	0%	0.2	5%
							2	0%	80%	15%	40	20%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	45%
							10	50%	0%	35%	120	20%	0.5	15%
							18	10%	0%	15%	160	10%	0.6	5%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	INSECTICIDE	76	2.0 G	$ 2.34	1	0	0	40%	0%	100%	20	0%	0.2	5%
							2	0%	80%	0%	40	20%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	45%
							10	50%	0%	0%	120	20%	0.5	15%
							18	10%	0%	0%	160	10%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	94	2.0 G	$ 2.92	1	0	0	40%	0%	100%	20	0%	0.2	5%
							2	0%	80%	0%	40	20%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	45%
							10	50%	0%	0%	120	20%	0.5	15%
							18	10%	0%	0%	160	10%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	5%
COTTON	HERBICIDE	3	5.0 G	$ 2.07	1	2	0	40%	0%	0%	20	0%	0.2	5%
							2	0%	80%	15%	40	20%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	45%
							10	50%	0%	35%	120	20%	0.5	15%
							18	10%	0%	15%	160	10%	0.6	5%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	3	5.0 G	$ 2.57	1	2	0	40%	0%	0%	20	0%	0.2	5%
							2	0%	80%	15%	40	20%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	45%
							10	50%	0%	35%	120	20%	0.5	15%
							18	10%	0%	15%	160	10%	0.6	5%
							25	0%	0%	5%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%
TIMBER	INSECTICIDE	100	5.0 G	$ 2.50	1	0	0	60%	0%	100%	20	0%	0.2	5%
							2	0%	30%	0%	40	20%	0.3	25%
							5	0%	50%	0%	80	50%	0.4	45%
							10	30%	20%	0%	120	20%	0.5	15%
							18	10%	0%	0%	160	10%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	5%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 14

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SOYBEANS	INSECTICIDE	31	2.5 G	$ 2.99	1	0	0	40%	0%	100%	20	10%	0.2	15%
							2	0%	70%	0%	40	25%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	35%
							10	60%	10%	0%	120	10%	0.5	15%
							18	0%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	FUNGICIDE	14	5.0 G	$ 3.22	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	HERBICIDE	55	6.0 G	$ 1.20	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	SEED	11	140.0 P	$ 20.35	2	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	FERTILIZER	52	90.0 P	$ 8.90	2	2	0	40%	70%	0%	20	10%	0.2	15%
							2	0%	20%	25%	40	25%	0.3	25%
							5	0%	10%	30%	80	50%	0.4	35%
							10	60%	0%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	HERBICIDE	7	30.0 P	$ 10.36	2	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	HERBICIDE	23	10.0 G	$ 8.10	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	INSECTICIDE	2	17.0 P	$ 5.51	2	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

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CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
RICE	INSECTICIDE	6	5.0 G	$ 1.06	1	0	0	40%	0%	100%	20	10%	0.2	15%
							2	0%	70%	0%	40	25%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	35%
							10	60%	10%	0%	120	10%	0.5	15%
							18	0%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	64	2.0 G	$ 2.15	1	0	0	40%	0%	100%	20	10%	0.2	15%
							2	0%	70%	0%	40	25%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	35%
							10	60%	10%	0%	120	10%	0.5	15%
							18	0%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	25	5.0 G	$ 2.36	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	35%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	11	5.0 G	$ 1.68	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	SEED	21	100.0 P	$ 9.10	2	2	0	40%	0%	0%	20	20%	0.2	25%
							2	0%	70%	25%	40	40%	0.3	40%
							5	0%	20%	30%	80	30%	0.4	20%
							10	60%	10%	40%	120	10%	0.5	10%
							18	0%	0%	5%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	FERTILIZER	23	125.0 P	$ 8.62	2	2	0	40%	0%	0%	20	20%	0.2	25%
							2	0%	70%	25%	40	40%	0.3	40%
							5	0%	20%	30%	80	30%	0.4	20%
							10	60%	10%	40%	120	10%	0.5	10%
							18	0%	0%	5%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	56	1.0 G	$ 1.12	1	0	0	40%	0%	100%	20	20%	0.2	25%
							2	0%	70%	0%	40	40%	0.3	40%
							5	0%	20%	0%	80	30%	0.4	20%
							10	60%	10%	0%	120	10%	0.5	10%
							18	0%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 15

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SOYBEANS	INSECTICIDE	21	2.5 G	$ 2.99	1	0	0	40%	0%	100%	20	10%	0.2	15%
							2	0%	70%	0%	40	25%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	35%
							10	60%	10%	0%	120	10%	0.5	15%
							18	0%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	FUNGICIDE	13	5.0 G	$ 3.22	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	HERBICIDE	67	6.0 G	$ 1.20	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SORGHUM	HERBICIDE	27	2.0 G	$ 4.53	1	2	0	40%	0%	0%	20	15%	0.2	20%
							2	0%	70%	25%	40	30%	0.3	30%
							5	0%	20%	30%	80	40%	0.4	30%
							10	60%	10%	40%	120	10%	0.5	10%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SORGHUM	INSECTICIDE	73	1.5 G	$ 0.99	1	0	0	40%	0%	100%	20	15%	0.2	20%
							2	0%	70%	0%	40	30%	0.3	30%
							5	0%	20%	0%	80	40%	0.4	30%
							10	60%	10%	0%	120	10%	0.5	10%
							18	0%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	SEED	10	140.0 P	$ 20.35	2	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	FERTILIZER	49	90.0 P	$ 8.90	2	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	HERBICIDE	7	30.0 P	$ 10.36	2	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
RICE	HERBICIDE	26	10.0 G	$ 8.10	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	INSECTICIDE	2	17.0 P	$ 5.51	2	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RICE	INSECTICIDE	6	5.0 G	$ 1.06	1	0	0	40%	0%	100%	20	10%	0.2	15%
							2	0%	70%	0%	40	25%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	35%
							10	60%	10%	0%	120	10%	0.5	15%
							18	0%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	63	2.0 G	$ 2.15	1	0	0	40%	0%	100%	20	10%	0.2	15%
							2	0%	70%	0%	40	25%	0.3	25%
							5	0%	20%	0%	80	50%	0.4	35%
							10	60%	10%	0%	120	10%	0.5	15%
							18	0%	0%	0%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	23	5.0 G	$ 2.36	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	14	5.0 G	$ 1.68	1	2	0	40%	0%	0%	20	10%	0.2	15%
							2	0%	70%	25%	40	25%	0.3	25%
							5	0%	20%	30%	80	50%	0.4	35%
							10	60%	10%	40%	120	10%	0.5	15%
							18	0%	0%	5%	160	5%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	FERTILIZER	37	125.0 P	$ 8.62	2	2	0	40%	0%	0%	20	20%	0.2	25%
							2	0%	70%	25%	40	40%	0.3	40%
							5	0%	20%	30%	80	30%	0.4	20%
							10	60%	10%	40%	120	10%	0.5	10%
							18	0%	0%	5%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	SEED	30	100.0 P	$ 9.10	2	2	0	40%	0%	0%	20	20%	0.2	25%
							2	0%	70%	25%	40	40%	0.3	40%
							5	0%	20%	30%	80	30%	0.4	20%
							10	60%	10%	40%	120	10%	0.5	10%
							18	0%	0%	5%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
GRAINS	INSECTICIDE	17	1.0 G	$ 1.12	1	0	0	40%	0%	100%	20	20%	0.2	25%
							2	0%	70%	0%	40	40%	0.3	40%
							5	0%	20%	0%	80	30%	0.4	20%
							10	60%	10%	0%	120	10%	0.5	10%
							18	0%	0%	0%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	HERBICIDE	17	4.0 G	$ 2.40	1	2	0	40%	0%	0%	20	20%	0.2	25%
							2	0%	70%	25%	40	40%	0.3	40%
							5	0%	20%	30%	80	30%	0.4	20%
							10	60%	10%	40%	120	10%	0.5	10%
							18	0%	0%	5%	160	0%	0.6	5%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 16

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
CORN	HERBICIDE	33	3.0 G	$ 8.24	1	2	0	90%	0%	0%	20	10%	0.2	15%
							2	0%	35%	30%	40	40%	0.3	45%
							5	0%	60%	40%	80	40%	0.4	35%
							10	10%	5%	25%	120	10%	0.5	5%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
CORN	INSECTICIDE	67	2.0 G	$ 2.76	1	0	0	90%	0%	100%	20	10%	0.2	15%
							2	0%	35%	0%	40	40%	0.3	45%
							5	0%	60%	0%	80	40%	0.4	35%
							10	10%	5%	0%	120	10%	0.5	5%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	HERBICIDE	50	4.0 G	$ 1.57	1	2	0	90%	0%	0%	20	10%	0.2	15%
							2	0%	35%	30%	40	40%	0.3	45%
							5	0%	60%	40%	80	40%	0.4	35%
							10	10%	5%	25%	120	10%	0.5	5%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	FUNGICIDE	7	5.0 G	$ 4.21	1	2	0	90%	0%	0%	20	10%	0.2	15%
							2	0%	35%	30%	40	40%	0.3	45%
							5	0%	60%	40%	80	40%	0.4	35%
							10	10%	5%	25%	120	10%	0.5	5%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	INSECTICIDE	43	2.5 G	$ 3.01	1	0	0	90%	0%	100%	20	10%	0.2	15%
							2	0%	35%	0%	40	40%	0.3	45%
							5	0%	60%	0%	80	40%	0.4	35%
							10	10%	5%	0%	120	10%	0.5	5%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	FERTILIZER	32	125.0 P	$ 8.50	2	2	0	90%	0%	0%	20	25%	0.2	30%
							2	0%	35%	30%	40	50%	0.3	50%
							5	0%	60%	40%	80	25%	0.4	20%
							10	10%	5%	25%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	58	2.0 G	$ 1.42	1	2	0	90%	0%	0%	20	25%	0.2	30%
							2	0%	35%	30%	40	50%	0.3	50%
							5	0%	60%	40%	80	25%	0.4	20%
							10	10%	5%	25%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	HERBICIDE	10	3.0 G	$ 2.75	1	2	0	90%	0%	0%	20	25%	0.2	30%
							2	0%	35%	30%	40	50%	0.3	50%
							5	0%	60%	40%	80	25%	0.4	20%
							10	10%	5%	25%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 16 (CONTINUED)

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
VEGETABLES	FUNGICIDE	40	5.0 G	$ 1.30	1	2	0	90%	0%	0%	20	30%	0.2	40%
							2	0%	35%	30%	40	70%	0.3	50%
							5	0%	60%	40%	80	0%	0.4	10%
							10	10%	5%	25%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	60	4.0 G	$ 2.85	1	0	0	90%	0%	100%	20	30%	0.2	40%
							2	0%	35%	0%	40	70%	0.3	50%
							5	0%	60%	0%	80	0%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 17

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SOYBEANS	HERBICIDE	9	4.0 G	$ 1.29	1	0	0	90%	0%	100%	20	20%	0.2	30%
							2	0%	35%	0%	40	70%	0.3	60%
							5	0%	60%	0%	80	10%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	FUNGICIDE	9	5.0 G	$ 3.42	1	0	0	90%	0%	100%	20	20%	0.2	30%
							2	0%	35%	0%	40	70%	0.3	60%
							5	0%	60%	0%	80	10%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	INSECTICIDE	82	1.5 G	$ 2.45	1	0	0	90%	0%	100%	20	20%	0.2	30%
							2	0%	35%	0%	40	70%	0.3	60%
							5	0%	60%	0%	80	10%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
PEANUTS	FUNGICIDE	100	5.0 G	$ 3.75	1	0	0	90%	0%	100%	20	20%	0.2	30%
							2	0%	35%	0%	40	70%	0.3	60%
							5	0%	60%	0%	80	10%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	1	5.0 G	$ 0.46	1	0	0	90%	0%	100%	20	20%	0.2	30%
							2	0%	35%	0%	40	70%	0.3	60%
							5	0%	60%	0%	80	10%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	90	1.0 G	$ 2.62	1	0	0	90%	0%	100%	20	20%	0.2	30%
							2	0%	35%	0%	40	70%	0.3	60%
							5	0%	60%	0%	80	10%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	9	5.0 G	$ 2.81	1	0	0	90%	0%	100%	20	20%	0.2	30%
							2	0%	35%	0%	40	70%	0.3	60%
							5	0%	60%	0%	80	10%	0.4	10%
							10	10%	5%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 18

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
CITRUS	INSECTICIDE	100	5.0 G	$ 13.33	1	0	0	60%	0%	100%	20	20%	0.2	25%
							2	0%	10%	0%	40	30%	0.3	25%
							5	0%	30%	0%	80	30%	0.4	20%
							10	0%	40%	0%	120	20%	0.5	20%
							18	40%	20%	0%	160	0%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	100	4.0 G	$ 2.37	1	0	0	60%	0%	100%	20	20%	0.2	25%
							2	0%	10%	0%	40	30%	0.3	25%
							5	0%	30%	0%	80	30%	0.4	20%
							10	0%	40%	0%	120	20%	0.5	20%
							18	40%	20%	0%	160	0%	0.6	10%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
RIGHT OF WAY	HERBICIDE	100	10.0 G	$ 2.32	1	0	0	60%	0%	100%	20	0%	0.2	0%
							2	0%	10%	0%	40	100%	0.3	0%
							5	0%	30%	0%	80	0%	0.4	0%
							10	0%	40%	0%	120	0%	0.5	0%
							18	40%	20%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	100%
MOSQ CONTROL	INSECTICIDE	100	0.1 G	$ 0.22	1	0	0	60%	0%	100%	20	0%	0.2	0%
							2	0%	10%	0%	40	0%	0.3	0%
							5	0%	30%	0%	80	8%	0.4	0%
							10	0%	40%	0%	120	60%	0.5	0%
							18	40%	20%	0%	160	20%	0.6	0%
							25	0%	0%	0%	200	20%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	100%

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
SOYBEANS	HERBICIDE	2	5.0 G	$ 1.35	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	FUNGICIDE	6	4.0 G	$ 3.55	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
SOYBEANS	INSECTICIDE	92	1.5 G	$ 2.56	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
PEANUTS	FUNGICIDE	100	5.0 G	$ 3.65	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	HERBICIDE	3	4.0 G	$ 0.69	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	INSECTICIDE	89	1.0 G	$ 2.41	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
COTTON	DEFOLIANT	7	4.0 G	$ 2.81	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

OPERATOR CROP PROFILE--REGION 20

CROP	MATERIAL	% OF ACRES	APPLICATION RATE	MATERIAL COST/ACRE	LOAD CREW	FLAG CREW	MILES	LONG FERRY	SHORT FERRY	GROUND DISTANCE	ACRES	FIELD SIZE	MILES	RUN LENGTH
CORN	HERBICIDE	54	5.0 G	$ 5.70	1	1	0	90%	0%	0%	20	45%	0.2	55%
							2	0%	20%	25%	40	50%	0.3	41%
							5	0%	70%	65%	80	5%	0.4	5%
							10	10%	10%	10%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
CORN	INSECTICIDE	46	4.0 G	$ 3.38	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	FERTILIZER	25	100.0 P	$ 8.40	2	1	0	90%	0%	0%	20	45%	0.2	55%
							2	0%	20%	25%	40	50%	0.3	43%
							5	0%	70%	65%	80	5%	0.4	5%
							10	10%	10%	10%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	INSECTICIDE	58	3.0 G	$ 1.25	1	1	0	90%	0%	0%	20	45%	0.2	55%
							2	0%	20%	25%	40	50%	0.3	43%
							5	0%	70%	65%	80	5%	0.4	5%
							10	10%	10%	10%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
GRAINS	HERBICIDE	17	5.0 G	$ 2.75	1	1	0	90%	0%	0%	20	45%	0.2	55%
							2	0%	20%	25%	40	50%	0.3	41%
							5	0%	70%	65%	80	5%	0.4	5%
							10	10%	10%	10%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
ORCHARDS	INSECTICIDE	100	5.0 G	$ 2.15	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	40%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
VEGETABLES	INSECTICIDE	100	4.0 G	$ 2.42	1	0	0	90%	0%	100%	20	45%	0.2	55%
							2	0%	20%	0%	40	50%	0.3	41%
							5	0%	70%	0%	80	5%	0.4	5%
							10	10%	10%	0%	120	0%	0.5	0%
							18	0%	0%	0%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%
POTATOES	INSECTICIDE	100	5.0 G	$ 2.60	1	1	0	90%	0%	0%	20	45%	0.2	55%
							2	0%	20%	25%	40	50%	0.3	41%
							5	0%	70%	65%	80	5%	0.4	5%
							10	10%	10%	10%	120	0%	0.5	0%
							18	0%	0%	5%	160	0%	0.6	0%
							25	0%	0%	0%	200	0%	0.7	0%
							35	0%	0%	0%	240	0%	0.8	0%

TABLE B.1 PERCENT OF EACH AIRCRAFT TYPE WORKING OVER A CROP

CROP	PA25	C188	A75	G164	PA18	47G	S2R	PA36	FW	RW	TOTAL
CORN	21	34	7	13	2	4	6	3	7	4	100
SOYBEANS	13	24	9	28	1	4	6	2	9	4	100
ALFALFA	18	17	18	29	2	2	4	1	5	3	100
SORGHUM	23	27	6	15	2	0	11	4	10	2	100
RICE	5	7	14	55	0	0	5	1	12	0	100
TOBACCO	11	51	0	3	11	0	3	6	14	0	100
PEANUTS	36	23	0	18	2	0	5	5	11	0	100
COTTON	17	24	10	21	2	2	8	3	13	1	100
GRAINS	20	23	6	21	4	3	8	3	11	1	100
RANG & BSH	25	33	15	11	1	1	6	2	6	0	100
GRASS	25	19	1	26	3	4	9	3	8	3	100
FIELD CROPS	43	12	6	10	3	3	5	6	12	0	100
ORCHARDS	10	15	13	42	2	2	7	3	5	2	100
FRUITS	3	18	12	50	0	9	0	0	9	0	100
CITRUS	23	17	2	4	0	21	13	11	2	6	100
VEGETABLES	16	17	11	21	1	5	12	3	10	5	100
SUGARCANE	27	0	10	30	0	0	20	3	10	0	100
BEANS AND PEAS	19	26	18	20	0	3	6	0	1	6	100
POTATOES	12	21	18	15	1	13	5	2	12	0	100
NUTS	15	7	19	44	0	4	4	7	0	0	100
TIMBER	0	0	0	56	0	36	0	0	8	0	100
RIGHT-OF-WAY	36	0	0	7	0	43	0	14	0	0	100
MOSQ CONTRL	0	29	0	17	0	8	4	0	33	8	100
OTHER	11	13	12	31	1	4	3	3	15	8	100
TOTAL	18	22	9	23	2	4	7	3	10	2	100

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE B.2   PERCENT OF EACH AIRCRAFT TYPE WORKING OVER A CROP THAT ACCOUNTS
FOR MORE THAN 25 PERCENT OF AN OPERATOR'S FLIGHT HOURS

CROP	PA25	C188	A75	G164	PA18	47G	S2R	PA36	FW	RW	TOTAL
CORN	23	36	1	9	1	7	5	2	11	4	100
SOYBEANS	15	24	1	29	2	3	7	2	10	7	100
ALFALFA	11	0	47	32	0	0	0	0	5	5	100
SORGHUM	28	31	0	3	4	0	12	6	17	0	100
RICE	5	6	12	60	0	0	5	1	11	0	100
TOBACCO	25	0	0	13	50	0	0	13	0	0	100
PEANUTS	37	23	0	20	3	0	0	0	17	0	100
COTTON	14	23	9	22	1	2	10	3	15	1	100
GRAINS	31	17	6	5	8	2	12	5	13	2	100
RANG & BSH	38	41	0	3	3	0	7	3	3	0	100
GRASS	21	21	0	7	21	7	0	7	14	0	100
FIELD CROPS	27	13	0	40	0	7	0	7	7	0	100
ORCHARDS	10	20	0	50	10	0	10	0	0	0	100
FRUITS	33	0	0	67	0	0	0	0	0	0	100
CITRUS	17	21	0	0	0	33	21	4	0	4	100
VEGETABLES	19	9	10	18	0	7	13	5	10	10	100
SUGARCANE	46	0	15	38	0	0	0	0	0	0	100
BEANS AND PEAS	7	37	22	17	0	2	0	0	0	15	100
POTATOES	10	14	21	7	2	24	2	2	17	0	100
TIMBER	0	0	0	83	0	17	0	0	0	0	100
RIGHT-OF-WAY	0	0	0	0	0	100	0	0	0	0	100
MOSQ CONTRL	0	0	0	8	0	0	8	0	67	17	100
OTHER	0	0	0	73	9	0	0	0	18	0	100
TOTAL	19	20	7	22	3	4	8	3	12	3	100

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE B.3 PERCENT OF EACH AIRCRAFT TYPE WORKING OVER COTTON

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	63	7	7	4	2	6	3	3	2	3	1	100
C188	49	9	7	4	5	2	7	5	4	6	1	100
A75	35	26	0	1	5	8	0	1	5	13	6	100
G164	59	6	7	4	2	7	3	2	5	3	1	100
PA18	83	0	7	3	0	0	0	0	10	2	0	100
47G	83	0	5	0	0	0	0	0	7	0	1	100
S2R	54	4	2	7	2	6	7	7	7	0	10	100
PA36	62	0	7	10	3	7	0	0	0	0	10	100
OTHER FW	54	4	0	2	2	6	4	9	15	2	1	100
OTHER RW	81	5	0	0	0	14	0	0	0	0	0	100
TOTAL	57	7	5	4	3	5	4	4	6	4	2	100

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	20	19	25	21	10	20	13	13	7	13	11	18
C188	17	24	27	21	34	9	39	26	14	33	16	20
A75	5	27	0	3	14	11	0	3	7	25	26	8
G164	24	19	33	23	21	29	18	15	22	20	16	23
PA18	4	0	4	3	0	0	0	0	0	3	5	3
47G	6	0	4	0	0	0	0	0	7	3	0	4
S2R	7	4	4	15	7	9	16	15	10	0	5	8
PA36	3	0	4	8	3	4	0	0	0	0	16	3
OTHER FW	11	7	0	8	10	13	13	28	33	5	5	12
OTHER RW	3	1	0	0	0	5	0	0	0	0	0	2
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE B.4 PERCENT OF EACH AIRCRAFT TYPE WORKING OVER RICE

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	94	1	1	0	1	2	0	1	0	1	0	100
C188	94	0	0	0	1	0	0	3	1	0	0	100
A75	68	0	0	4	1	1	1	21	0	1	0	100
G164	48	0	0	0	2	5	7	14	10	1	3	100
PA18	97	0	0	0	0	0	3	14	10	10	4	100
47G	98	0	0	0	0	0	3	0	0	0	0	100
S2R	86	0	0	0	0	0	0	0	0	2	0	100
PA36	93	0	0	0	0	1	1	4	4	4	0	100
OTHER FW	78	3	0	0	7	1	0	2	4	3	0	100
OTHER RW	100	0	0	0	0	0	0	0	0	0	0	100
TOTAL	79	0	0	0	2	2	2	6	3	3	1	100

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	22	20	67	0	11	19	0	2	0	3	0	18
C188	23	0	0	0	11	5	5	10	8	0	0	18
A75	6	0	0	100	6	5	5	10	8	0	0	20
G164	14	0	33	0	28	52	82	26	0	3	14	8
PA18	3	0	0	0	28	52	82	54	69	71	64	23
47G	5	0	0	0	0	0	5	0	0	0	0	3
S2R	9	0	0	0	0	5	5	5	8	3	0	4
PA36	3	0	0	0	0	10	0	0	8	9	0	8
OTHER FW	12	80	0	0	44	5	0	0	0	0	0	3
OTHER RW	3	0	0	0	0	5	0	3	14	11	21	12
TOTAL	100	100	100	100	100	100	100	100	100	100	100	2

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE B.5   PERCENT OF EACH AIRCRAFT TYPE WORKING OVER GRAINS

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	52	5	9	5	3	3	1	6	6	6	4	100
C188	63	10	10	7	2	2	0	2	1	1	0	100
A75	67	14	1	12	5	1	0	0	0	0	0	100
G164	77	15	5	1	0	0	1	0	0	0	0	100
PA18	34	3	0	10	0	3	3	0	3	10	31	100
47G	78	10	7	0	.5	0	0	0	0	0	0	100
S2R	57	4	10	12	2	4	1	0	5	4	1	100
PA36	55	0	10	14	0	0	3	3	3	7	3	100
OTHER FW	61	7	8	6	7	2	1	1	2	3	3	100
OTHER RW	76	0	10	14	0	0	0	0	0	0	0	100
TOTAL	64	9	7	6	3	2	1	2	2	3	2	100

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	15	11	23	15	18	29	22	61	52	44	33	18
C188	19	22	27	23	18	29	0	22	13	11	4	20
A75	8	12	1	15	14	6	0	0	0	0	0	8
G164	28	39	15	5	4	0	33	6	0	0	0	23
PA18	2	1	0	5	0	6	11	0	4	11	38	3
47G	5	4	4	0	7	0	0	0	0	0	0	4
S2R	7	3	11	16	7	18	11	0	17	11	4	8
PA36	2	0	4	6	0	0	11	6	4	7	4	3
OTHER FW	11	9	13	11	32	12	11	6	9	15	17	12
OTHER RW	2	0	3	5	0	0	0	0	0	0	0	2
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE B.6 PERCENT OF EACH AIRCRAFT TYPE WORKING OVER CORN

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	74	6	5	5	2	5	1	2	1	0	1	100
C188	63	10	4	9	5	6	1	0	0	0	0	100
A75	97	0	0	0	1	1	0	0	0	0	0	100
G164	92	2	2	2	1	1	1	0	0	0	0	100
PA18	90	3	3	0	0	3	0	0	0	0	0	100
47G	71	5	2	12	5	5	0	0	0	0	0	100
S2R	81	2	7	2	0	4	0	0	0	0	0	100
PA36	72	10	7	7	3	0	1	1	0	0	0	100
OTHER FW	85	3	0	7	4	2	0	0	0	0	0	100
OTHER RW	43	24	14	0	0	0	19	0	0	0	0	100
TOTAL	79	5	3	5	2	3	1	1	0	0	0	100

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	17	21	26	18	16	27	9	67	50	0	100	
C188	16	40	24	39	40	39	27	0	50	0	100	18
A75	9	0	0	0	4	3	0	0	50	0	0	20
G164	27	8	12	8	8	6	18	17	0	0	0	8
PA18	3	2	3	0	0	3	0	0	0	0	0	23
47G	4	4	3	10	8	6	0	0	0	0	0	3
S2R	8	4	18	4	0	9	9	17	0	0	0	4
PA36	3	6	6	4	4	0	0	0	0	0	0	8
OTHER FW	13	8	0	16	20	6	0	0	0	0	0	3
OTHER RW	1	9	9	0	0	0	36	0	0	0	0	12
TOTAL	100	100	100	100	100	100	100	100	100	100	100	2

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE B.7 PERCENT OF EACH AIRCRAFT TYPE WORKING OVER SOYBEANS

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	80	10	2	2	1	3	1	3	0	0	0	100
C188	69	12	4	5	1	1	1	2	2	0	0	100
A75	85	6	8	0	1	0	0	0	0	0	0	100
G164	68	12	10	8	1	0	0	0	0	0	0	100
PA18	86	3	0	3	0	0	7	0	0	0	0	100
47G	71	20	7	0	0	0	2	0	0	0	0	100
S2R	83	4	2	2	0	4	1	2	0	1	0	100
PA36	79	14	3	0	3	0	0	0	0	0	0	100
OTHER FW	78	9	3	8	1	0	1	0	0	0	0	100
OTHER RW	29	24	14	33	0	0	0	0	0	0	0	100
TOTAL	74	11	5	5	1	1	1	1	0	0	0	100

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	20	18	5	6	22	42	11	38	0	0	0	18
C188	18	22	16	19	22	25	22	38	100	50	100	20
A75	9	4	11	0	11	0	0	0	0	0	0	8
G164	21	27	44	37	22	8	11	8	0	0	0	23
PA18	3	1	0	2	0	0	22	0	0	0	0	3
47G	4	7	5	0	0	0	11	0	0	0	0	4
S2R	9	3	4	4	0	25	11	15	0	50	0	8
PA36	3	4	2	0	11	0	0	0	0	0	0	3
OTHER FW	12	10	7	19	11	0	11	0	0	0	0	12
OTHER RW	1	4	5	13	0	0	0	0	0	0	0	2
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE B.8 PERCENT OF EACH AIRCRAFT TYPE WORKING OVER VEGETABLES

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	82	4	5	3	0	1	2	2	0	1	1	100
C188	84	6	5	4	0	1	0	0	0	0	0	100
A75	63	19	9	8	1	0	0	0	0	0	0	100
G164	79	4	8	3	4	0	1	0	0	0	0	100
PA18	97	3	0	0	0	0	0	0	0	0	0	100
47G	73	7	5	10	0	0	0	5	0	0	0	100
S2R	74	4	10	1	7	0	4	0	0	0	0	100
PA36	83	0	3	0	0	0	7	7	0	0	0	100
OTHER FW	80	7	4	0	2	2	5	0	0	0	0	100
OTHER RW	38	5	5	52	0	0	0	0	0	0	0	100
TOTAL	79	6	6	4	2	1	2	1	0	0	0	100

AC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	TOTAL
PA25	19	13	15	14	0	33	19	43	0	100	50	18
C188	21	19	17	19	0	33	0	0	0	0	0	20
A75	6	24	11	14	5	0	0	0	0	0	0	20
G164	24	16	31	16	53	0	13	0	0	0	50	23
PA18	3	2	0	0	0	0	0	0	0	0	0	3
47G	4	5	3	9	0	0	0	29	0	0	0	4
S2R	7	5	12	2	32	0	19	0	0	0	0	8
PA36	3	0	2	0	0	0	13	29	0	0	0	3
OTHER FW	12	15	8	0	11	33	38	0	0	0	0	12
OTHER RW	1	2	2	26	0	0	0	0	0	0	0	2
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

APPENDIX C

OPERATOR MATERIALS PROFILE

In the Operator Materials Profile the following variables are given:

1. Aircraft type - the major aircraft types as determined from the Operator Aircraft Profiles (see Section 2.5 and Table 2.1).

2. Turn time - the average time required to reverse directions in a shuttle or back and forth application pattern (as opposed to a round robin pattern, less frequently used).

3. Swath width - a typical effective swath width such that the swath width divided by field width would equal the number of passes required to cover the field with the material being applied. A different swath width is used for dry and liquid materials.

4. Load carried - a typical load carried which allows for typical field practice and density of the material being applied.

AIRCRAFT ID#	AVERAGE TURN TIME (IN SECONDS)	SWATH WIDTH (IN FEET)		MAXIMUM LOAD CARRIED				
				DRY MATERIALS (IN POUNDS)				LIQUID MATERIALS (IN GALLONS)
		DRY	WET	SEED	FERTILIZER	HERBICIDE	INSECTICIDE	
1	30	35	55	1125	1000	1050	1175	150
2	30	40	60	1600	1600	1600	1600	200
3	35	30	45	1625	1400	1500	1675	220
4	35	40	65	2150	1875	2000	2250	280
5	35	35	50	900	900	900	900	110
6	15	30	80	750	650	700	780	100
7	35	45	65	2850	2500	2650	2975	375
8	35	40	60	1800	1775	1800	1800	220
9	25	50	65	2150	1875	2000	2250	280

OPERATOR MATERIALS PROFILE

APPENDIX D

OPERATOR AIRCRAFT PROFILES

Each variable of the Operator Aircraft Profile is described by three values: low, peak and high. (See text for further explanation.) The three values describe a triangular distribution as follows:

Low   Determines the lowest value of the variable under consideration that was observed for all operators in the data base for a particular region

Peak   Determines the most frequently observed value of the variable under consideration that was observed for all operators in the data base for a particular region (the peak number of operators)

High   Determines the highest value of the variable under consideration that was observed for all operators in the data base for a particular region.

Most variables in the Operator Aircraft Profiles are self-explanatory. The actual distributions of the number of aircraft in the 1977 FAA data files by year of manufacture are represented in Figures D.1 through D.8. A further discussion of this analysis can be found in Appendix G. Operators typically trade planes every six years. The expected lifetime is interpreted as the period of depreciation. Asking prices of aircraft, by year of manufacture, are given in Figures D.9 through D.16. Figure D.17 shows the rate of inflation in the price of several new agricultural aircraft and compares this against the gross national product (GNP) implicit price deflation index. Clearly, over the last several years, the price of agricultural aircraft has been inflating well above the average inflation rate. Figures D.18, D.19 and D.20 provide financial and insurance data and Figures D.21 through D.28 give the location of agricultural aircraft by two-digit zip codes. Table D.1 gives the cost of aviation gasoline, Table D.2 gives the distribution of aircraft by type and region and Table D.3 gives data on operator fleet mixes.

Several other items associated with the Operator Aircraft Profiles are determined from the data in Figures D.1 through D.28 and Tables D.1 through D.3 as described below.

1. Purchase price - the purchase price for each aircraft type is determined from the year of purchase and the year of manufacture according to the curves in Figure D.9 through D.16 and adjusted by an aircraft inflation index found in Figure D.17.

2. Salvage value - the salvage value is determined for each aircraft from the year of manufacture and purchase price according to the curve in Figure D.18.

3. Amount of loan - the amount of loan against each aircraft is determined from the period of the loan and the purchase price according to the curve in Figure D.19. Approximately one-third of the operators finance a newly purchased aircraft.

4. Cost of fuel - the cost of fuel is determined by region and aircraft type according to Table D.1.

5. Hull insurance costs - the cost of hull insurance is determined from the purchase price according to the curve in Figure D.20.

6. Fleet distribution - the number of each aircraft type is determined by region according to the distributions in Table D.2. The location of each aircraft type is also given in Figure D.21 through D.28.

7. Number of types owned by an operator - the number of different types of aircraft owned by an operator is determined by the number of aircraft owned according to the distributions in Table D.3.

OPERATOR AIRCRAFT PROFILE--PIPER PAWNEE (ID #1)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	1	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	59	65	77
USEFUL HOPPER LOAD	GALLONS	--	---	150	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	90	0	110
APPLICATION SPEED	MPH	EVEN	80	0	110
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	3	0	10
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	13	0	16
FUEL CONSUMPTION APPLN	GALS/HP	EVEN	14	0	16
OIL USE PER HOUR	QTS/HR	EVEN	0.10	0.00	0.50
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	1.50	3.00	4.50
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1200	1200
OVERHAUL COSTS	DOLLARS	EVEN	3800	0	6000
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

OPERATOR AIRCRAFT PROFILE--CESSNA 188 (ID #2)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION		
			LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	2	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	66	75	77
USEFUL HOPPER LOAD	GALLONS	--	---	200	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	110	0	120
APPLICATION SPEED	MPH	EVEN	100	0	120
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	3	0	8
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	14	0	18
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	14	0	20
OIL USE PER HOUR	QTS/HR	EVEN	0.05	0.00	0.50
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	1.50	3.00	4.50
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1200	1200
OVERHAUL COSTS	DOLLARS	EVEN	3500	0	7800
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

OPERATOR AIRCRAFT PROFILE--STEARMAN (ID #3)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION		
			LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	3	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	39	41	45
USEFUL HOPPER LOAD	GALLONS	--	---	220	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	95	0	125
APPLICATION SPEED	MPH	EVEN	90	0	120
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	5	0	10
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	15	0	35
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	20	0	40
OIL USE PER HOUR	QTS/HR	EVEN	0.50	0.00	0.70
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	2.00	3.50	7.50
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1000	1100
OVERHAUL COSTS	DOLLARS	EVEN	6000	0	7800
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

OPERATOR AIRCRAFT PROFILE--AGCAT (ID #4)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	4	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	59	76	77
USEFUL HOPPER LOAD	GALLONS	--	---	280	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	90	0	115
APPLICATION SPEED	MPH	EVEN	90	0	110
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	5	0	10
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	15	0	35
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	20	0	40
OIL USE PER HOUR	QTS/HR	EVEN	0.10	0.00	0.50
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	2.00	3.50	7.50
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1000	1100
OVERHAUL COSTS	DOLLARS	EVEN	6000	0	7800
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

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OPERATOR AIRCRAFT PROFILE--PIPER CUB (ID #5)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION		
			LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	5	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	40	46	77
USEFUL HOPPER LOAD	GALLONS	--	---	110	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	95	0	115
APPLICATION SPEED	MPH	EVEN	90	0	105
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	2	0	4
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	9	0	12
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	10	0	14
OIL USE PER HOUR	QTS/HR	EVEN	0.10	0.00	0.50
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	1.50	3.00	4.50
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1200	1200
OVERHAUL COSTS	DOLLARS	EVEN	3500	0	5500
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

OPERATOR AIRCRAFT PROFILE--BELL HELICOPTER (ID #6)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION		
			LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	6	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	53	66	73
USEFUL HOPPER LOAD	GALLONS	--	---	100	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	55	0	65
APPLICATION SPEED	MPH	EVEN	55	0	65
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	7	0	9
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	15	0	17
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	15	0	17
OIL USE PER HOUR	QTS/HR	EVEN	0.25	0.00	3.00
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	5.00	7.00	10.00
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1000	1100
OVERHAUL COSTS	DOLLARS	EVEN	4000	0	6000
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

OPERATOR AIRCRAFT PROFILE--THRUSH (ID #7)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	7	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	59	74	77
USEFUL HOPPER LOAD	GALLONS	--	---	375	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	110	0	125
APPLICATION SPEED	MPH	EVEN	100	0	125
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	5	0	10
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	25	0	35
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	30	0	35
OIL USE PER HOUR	QTS/HR	EVEN	0.50	0.00	1.00
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	2.50	4.00	8.50
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1000	1100
OVERHAUL COSTS	DOLLARS	EVEN	6000	0	7800
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

OPERATOR AIRCRAFT PROFILE--PIPER BRAVE (ID #8)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION		
			LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	8	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	73	75	77
USEFUL HOPPER LOAD	GALLONS	--	---	220	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	5	7	10
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	110	0	120
APPLICATION SPEED	MPH	EVEN	100	0	110
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	3	0	8
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	16	0	23
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	18	0	25
OIL USE PER HOUR	QTS/HR	EVEN	0.05	0.00	0.10
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	1.50	3.00	4.50
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	900	1200	1200
OVERHAUL COSTS	DOLLARS	EVEN	4500	0	7500
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500

OPERATOR AIRCRAFT PROFILE--MEDIUM-SIZED NEW TECHNOLOGY AIRCRAFT (ID #9)

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION LOW	PEAK	HIGH
AIRCRAFT NUMBER	NUMBER	--	---	9	---
YEAR OF MANUFACTURE	YEAR	TRIANGULAR	77	77	77
USEFUL HOPPER LOAD	GALLONS	--	---	280	---
YEAR OF PURCHASE	YEAR	TRIANGULAR	77	77	77
EXPECTED LIFETIME	YEARS	TRIANGULAR	6	9	13
PERIOD OF LOAN	YEARS	TRIANGULAR	1	5	7
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FERRY SPEED	MPH	EVEN	140	0	150
APPLICATION SPEED	MPH	EVEN	120	0	130
FUEL CONSUMPTION IDLE	GALS/HR	EVEN	3	0	6
FUEL CONSUMPTION FERRY	GALS/HR	EVEN	11	0	14
FUEL CONSUMPTION APPLN	GALS/HR	EVEN	11	0	16
OIL USE PER HOUR	QTS/HR	EVEN	0.05	0.00	0.10
COST OF OIL	$/QT	TRIANGULAR	0.50	0.75	1.25
MAINTENANCE COSTS	$/HR	TRIANGULAR	1.25	2.50	4.00
HOURS BETWEEN OVERHAUL	HOURS	TRIANGULAR	1200	1500	1800
OVERHAUL COSTS	DOLLARS	EVEN	7250	0	7250
YEARLY INSPECTION COSTS	DOLLARS	TRIANGULAR	0	0	3000
100 HR INSPECTION COSTS	DOLLARS	TRIANGULAR	0	25	100
TAXES	$/YR	TRIANGULAR	10	10	400
HANGER & TIEDOWN COSTS	$/YR	EVEN	0	0	1500
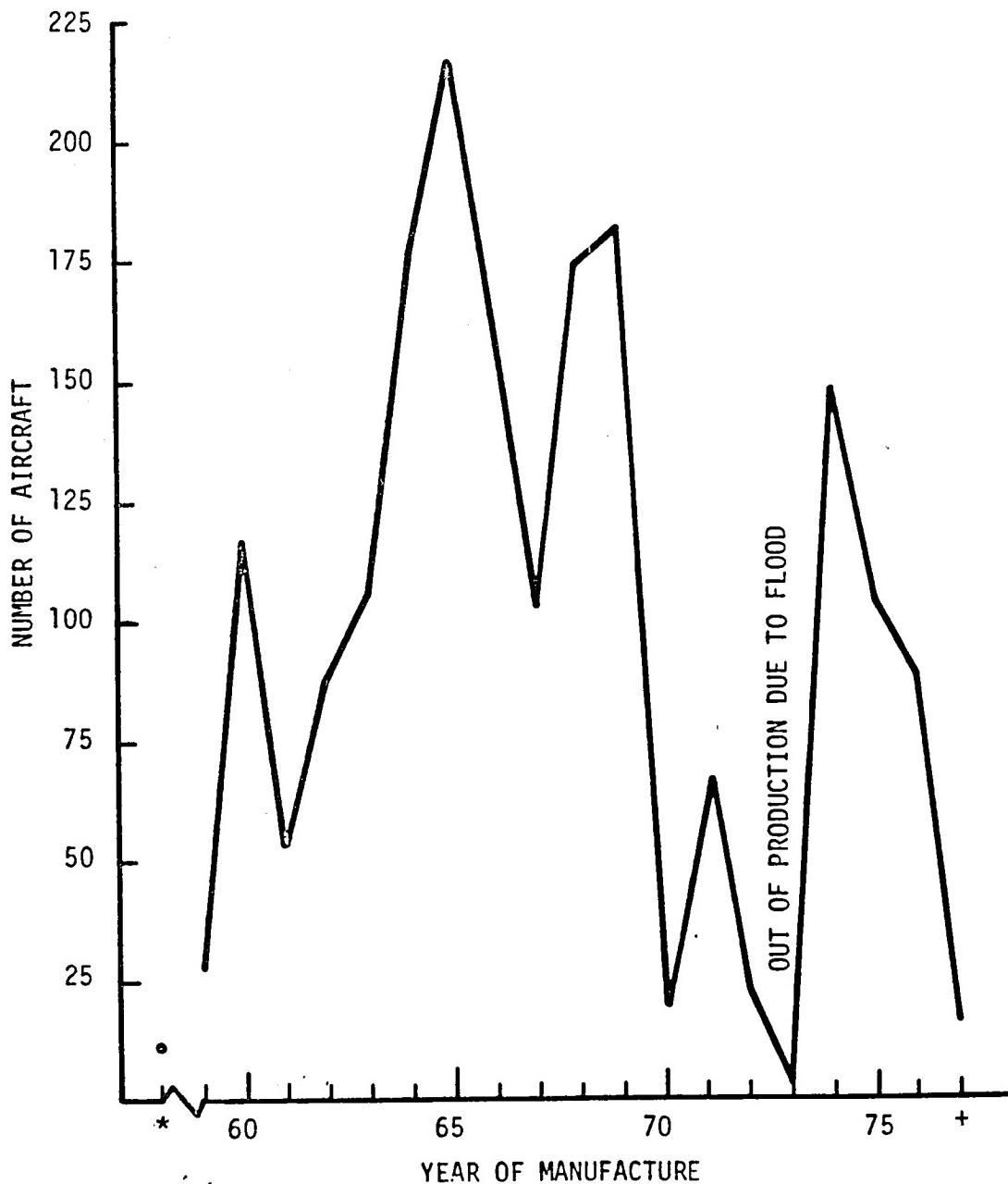
FIGURE D.1   AGE DISTRIBUTION OF THE PIPER PAWNEE IN
            THE AG-AIR FLEET

*YEAR OF MANUFACTURE UNKNOWN.
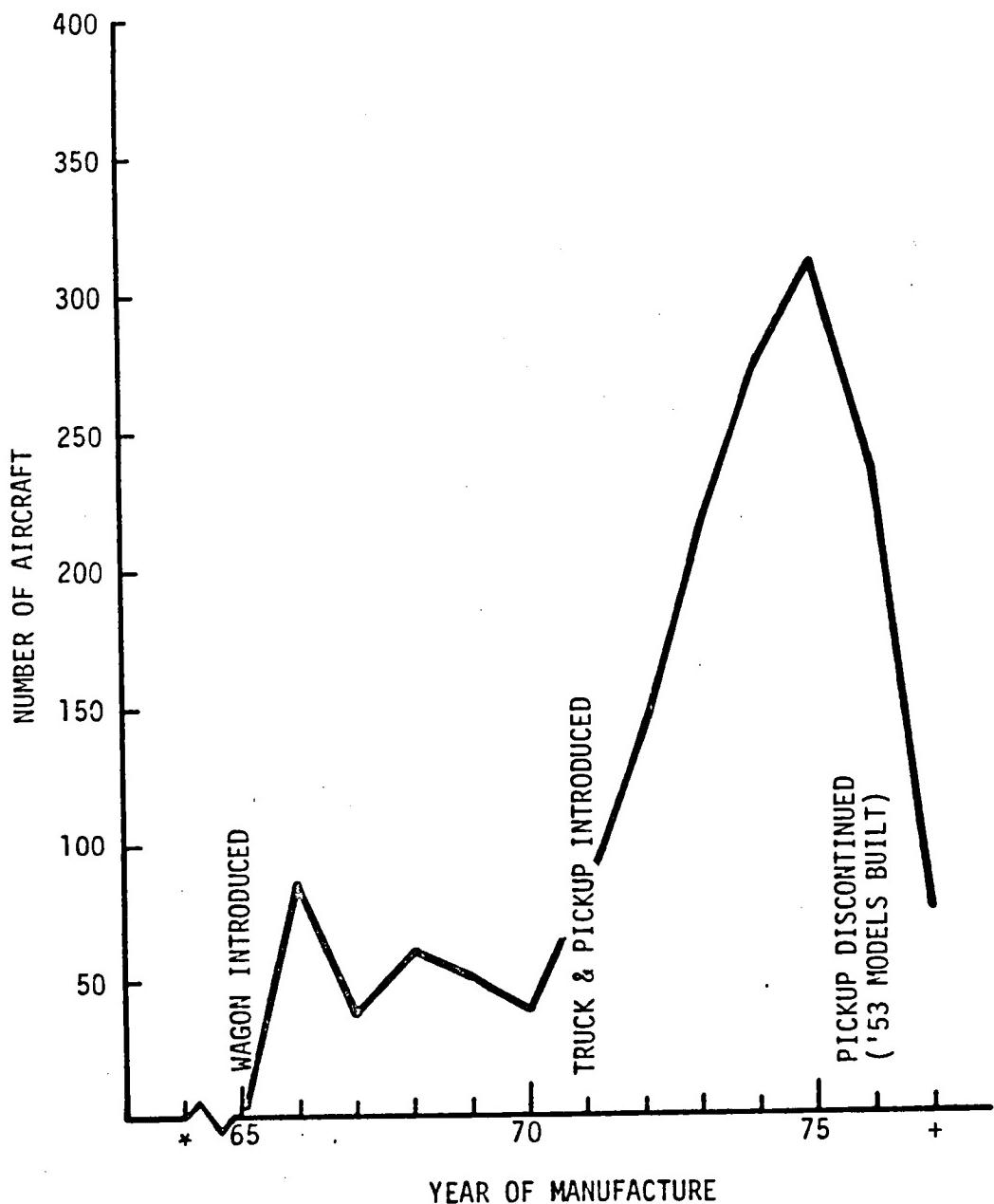
+PARTIAL DATA.

FIGURE D.2   AGE DISTRIBUTION OF THE CESSNA 188 IN
            THE AG-AIR FLEET

*YEAR OF MANUFACTURE UNKNOWN.
+PARTIAL DATA.
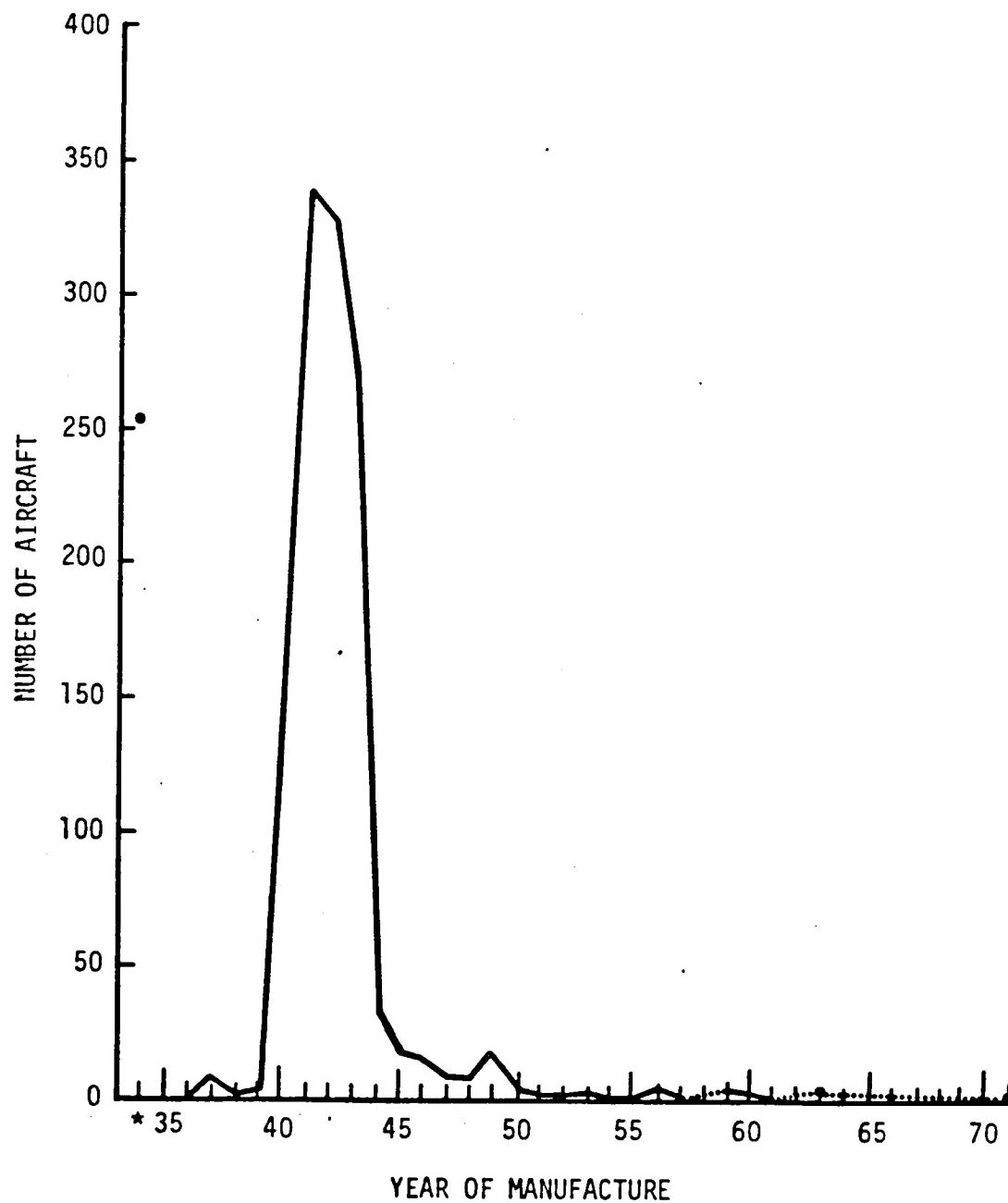
FIGURE D.3   AGE DISTRIBUTION OF THE STEARMAN IN THE
   AG-AIR FLEET

* YEAR OF MANUFACTURE UNKNOWN

NOTE: REGISTERED AIRCRAFT WITH YEAR OF MANUFACTURE AFTER
        1945 PROBABLY REFER TO YEAR OF REBUILDING.
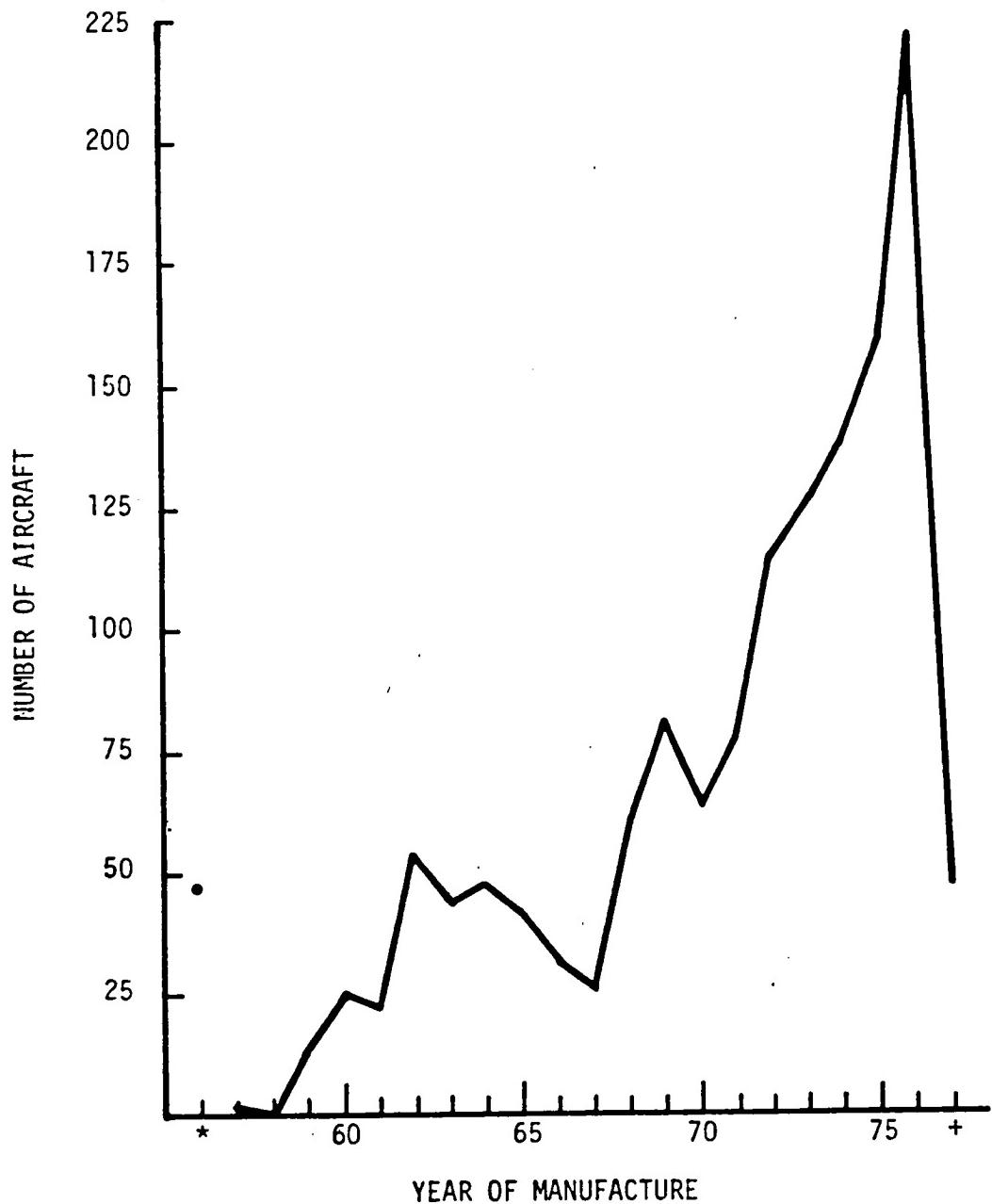
FIGURE D.4 AGE DISTRIBUTION OF THE GRUMMAN AGCAT
IN THE AG-AIR FLEET

*YEAR OF MANUFACTURE UNKNOWN.

+PARTIAL DATA.
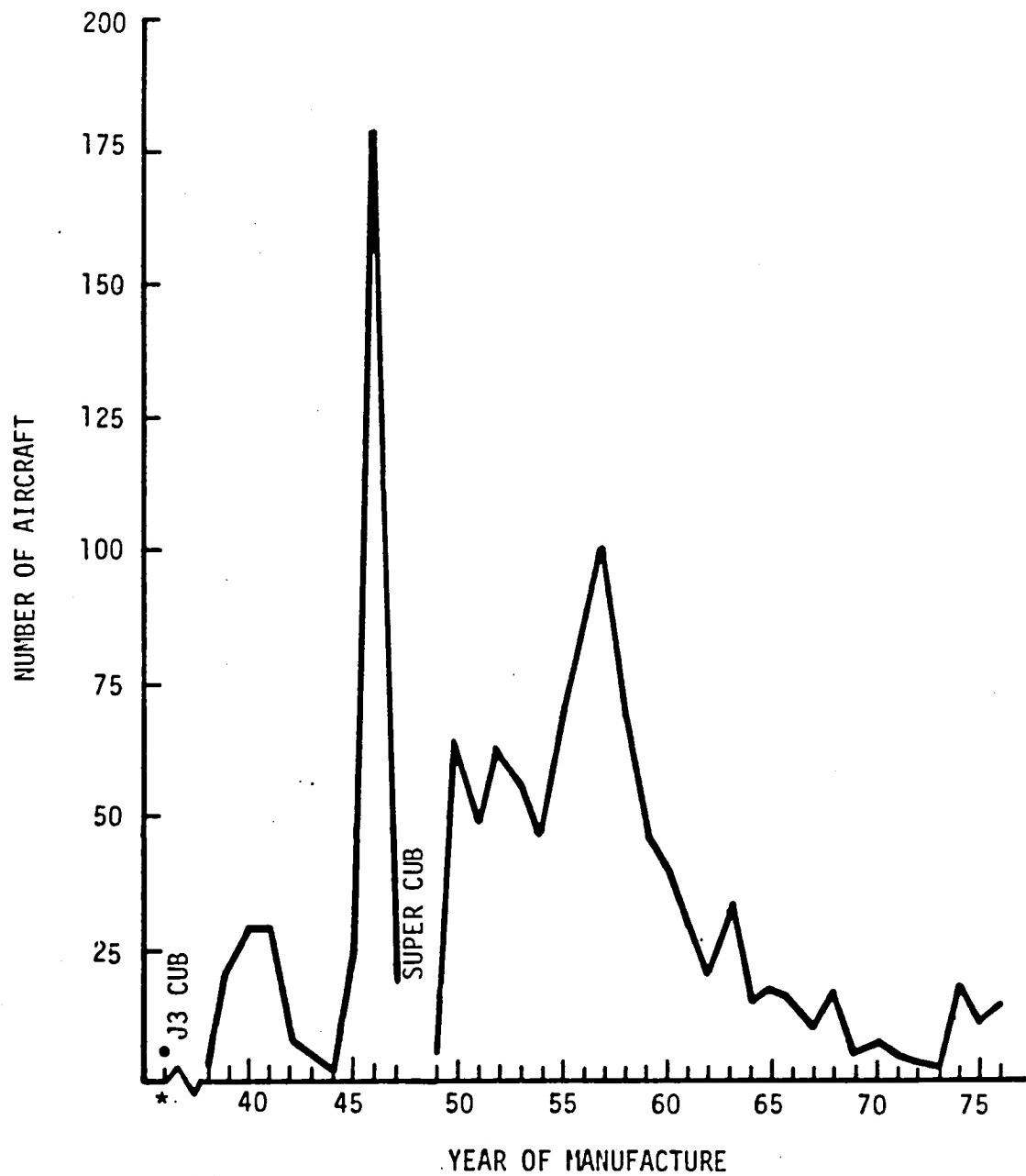
FIGURE D.5 AGE DISTRIBUTION OF THE PIPER CUB IN THE AG-AIR FLEET

* YEAR OF MANUFACTURE UNKNOWN
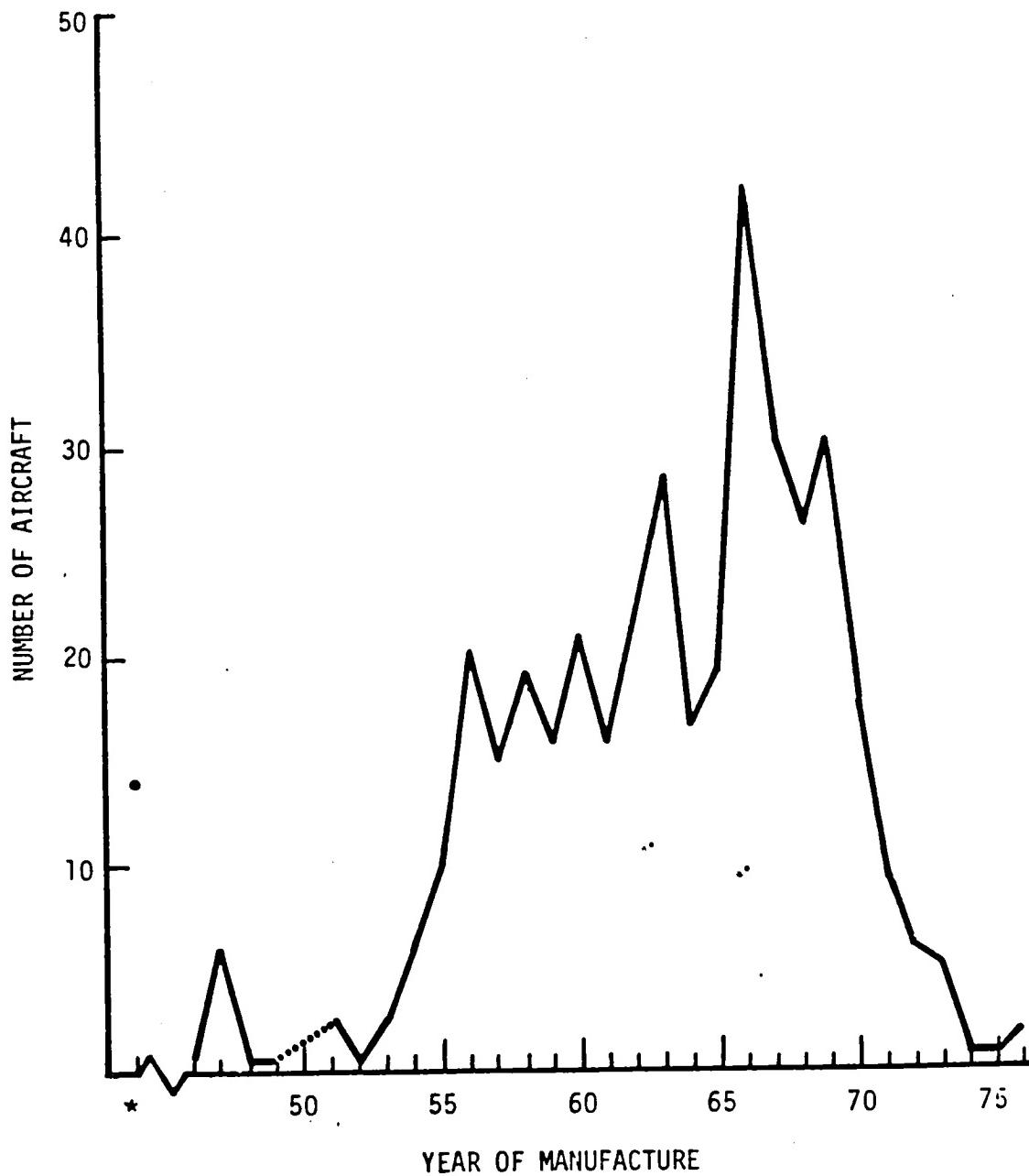
FIGURE D.6 AGE DISTRIBUTION OF THE BELL 47G IN THE AG-AIR
            FLEET

* YEAR OF MANUFACTURE UNKNOWN
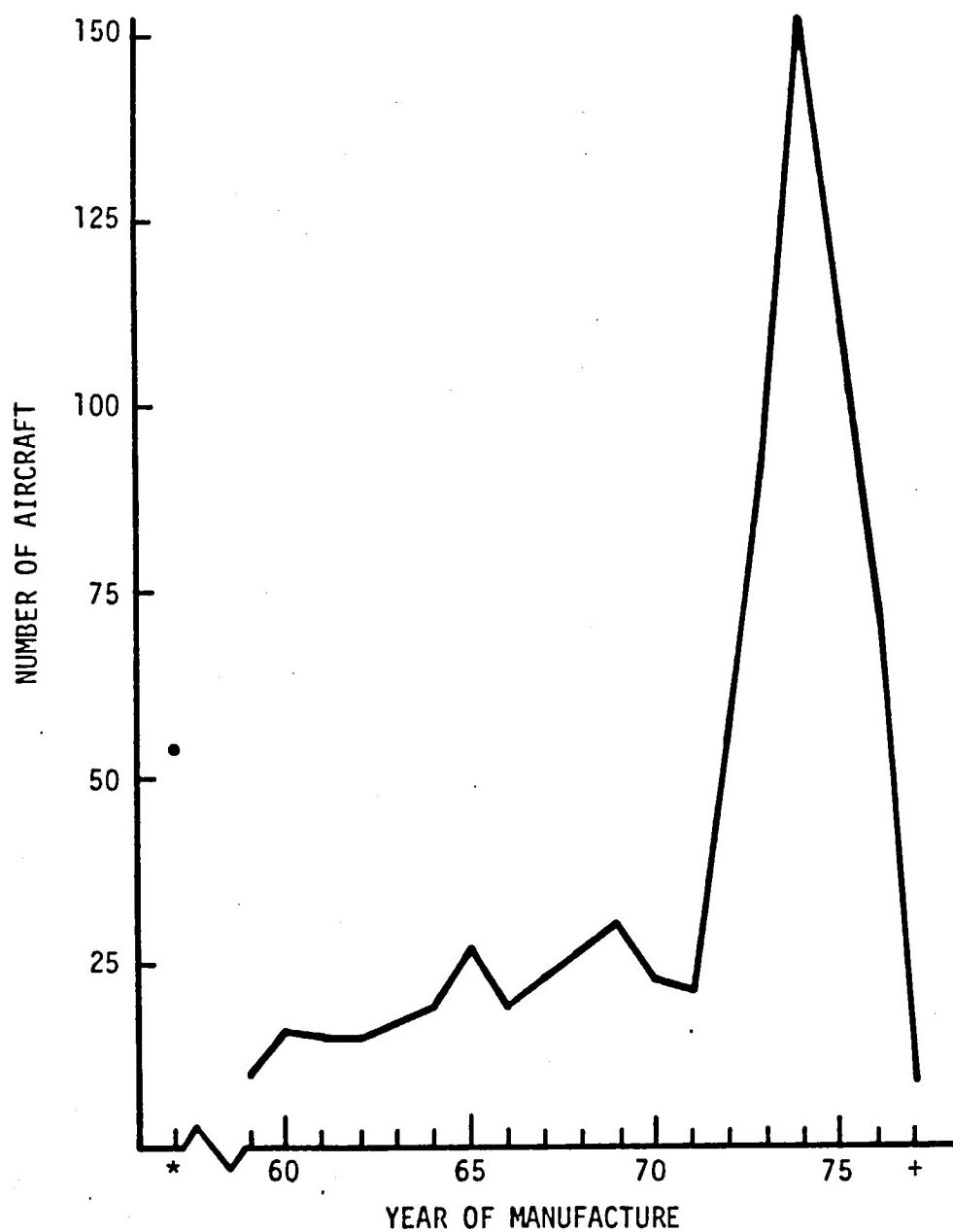
.FIGURE D.7   AGE DISTRIBUTION OF THE THRUSH/AERO
              COMMANDER IN THE AG-AIR FLEET

*YEAR OF MANUFACTURE UNKNOWN.
+PARTIAL DATA.
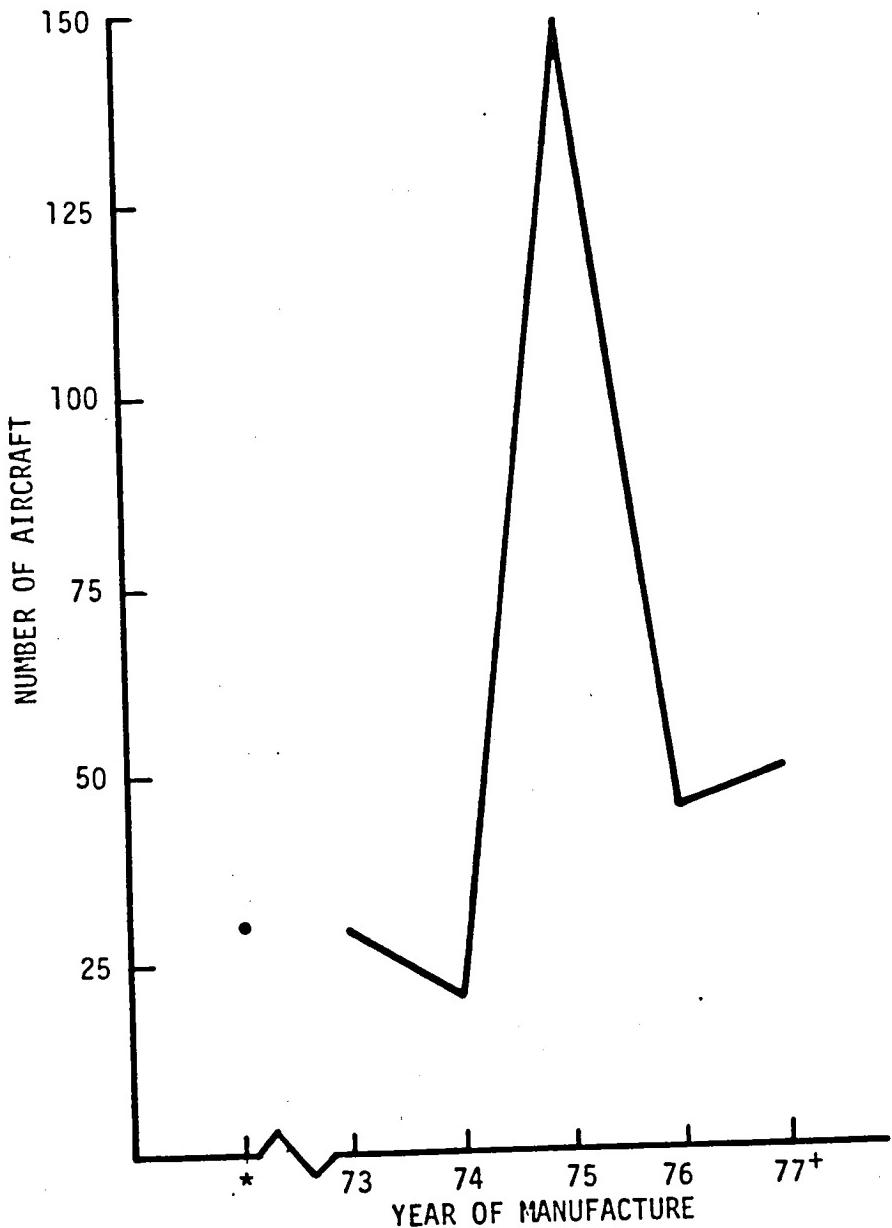
FIGURE D.8 AGE DISTRIBUTION OF THE PIPER
BRAVE IN THE AG-AIR FLEET

*YEAR OF MANUFACTURE UNKNOWN.

+PARTIAL DATA.
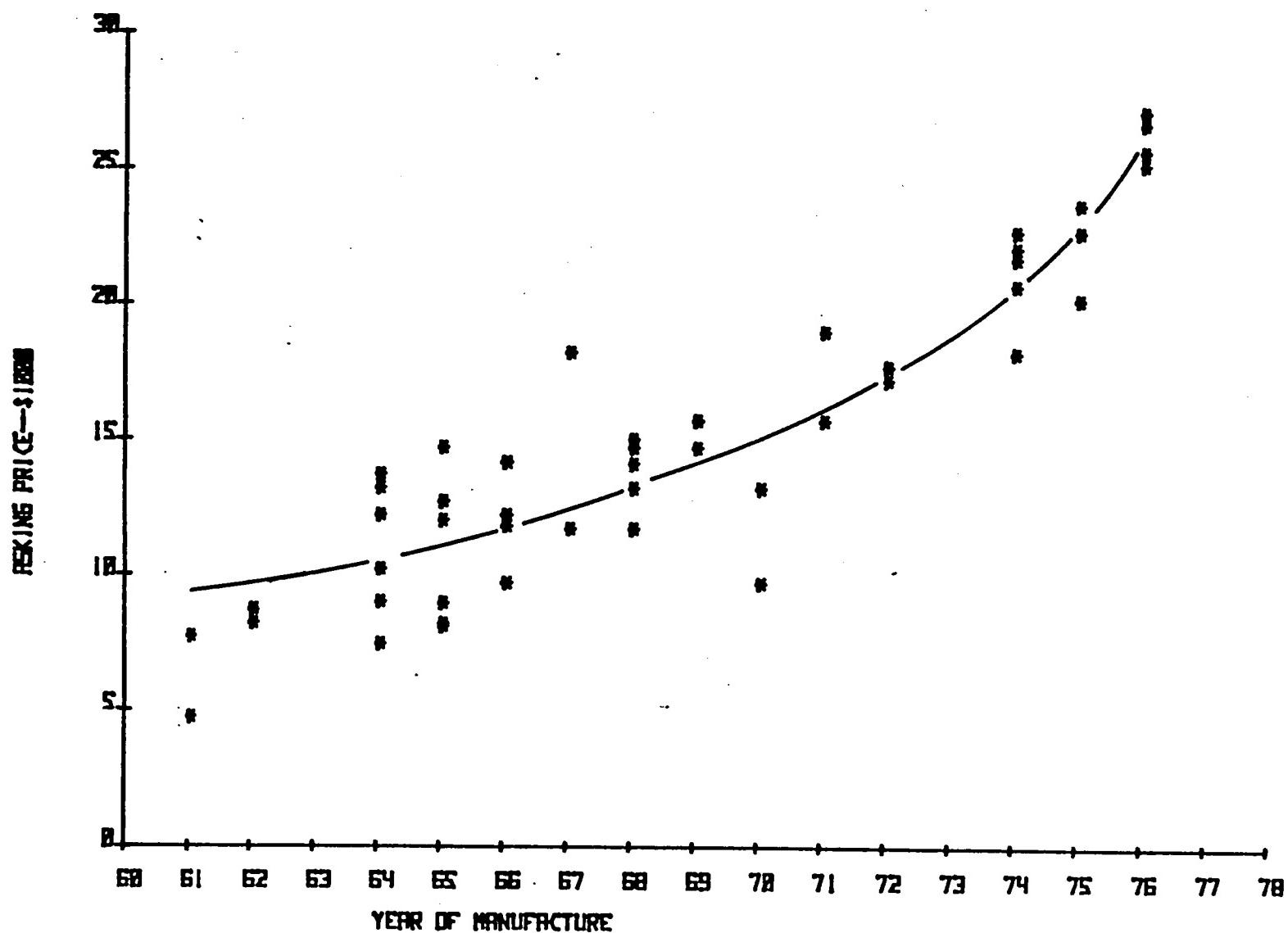
FIGURE D.9   THE 1978 ASKING PRICE--PIPER PAWNEE
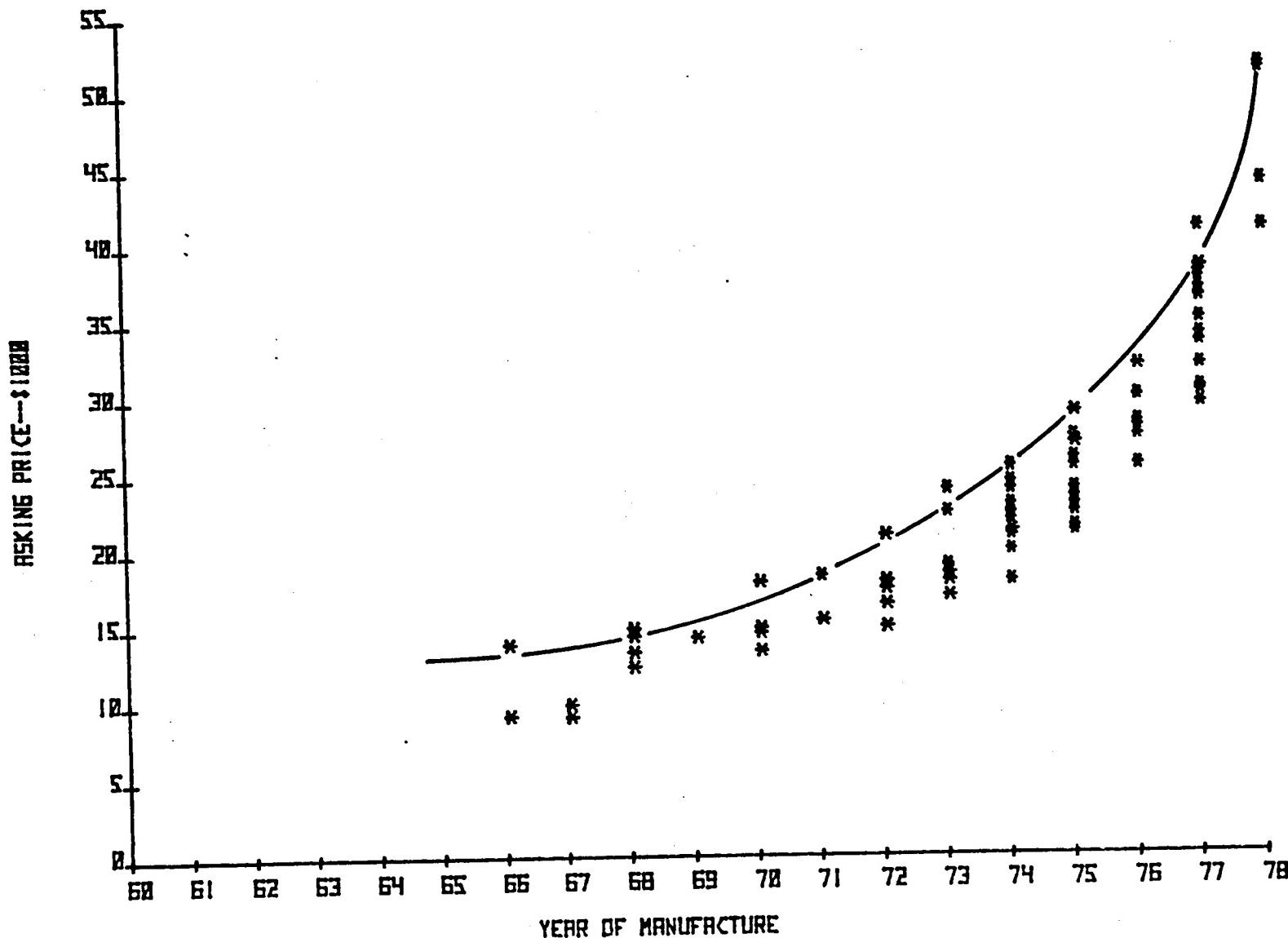
FIGURE D.10 THE 1978 ASKING PRICE--CESSNA 188
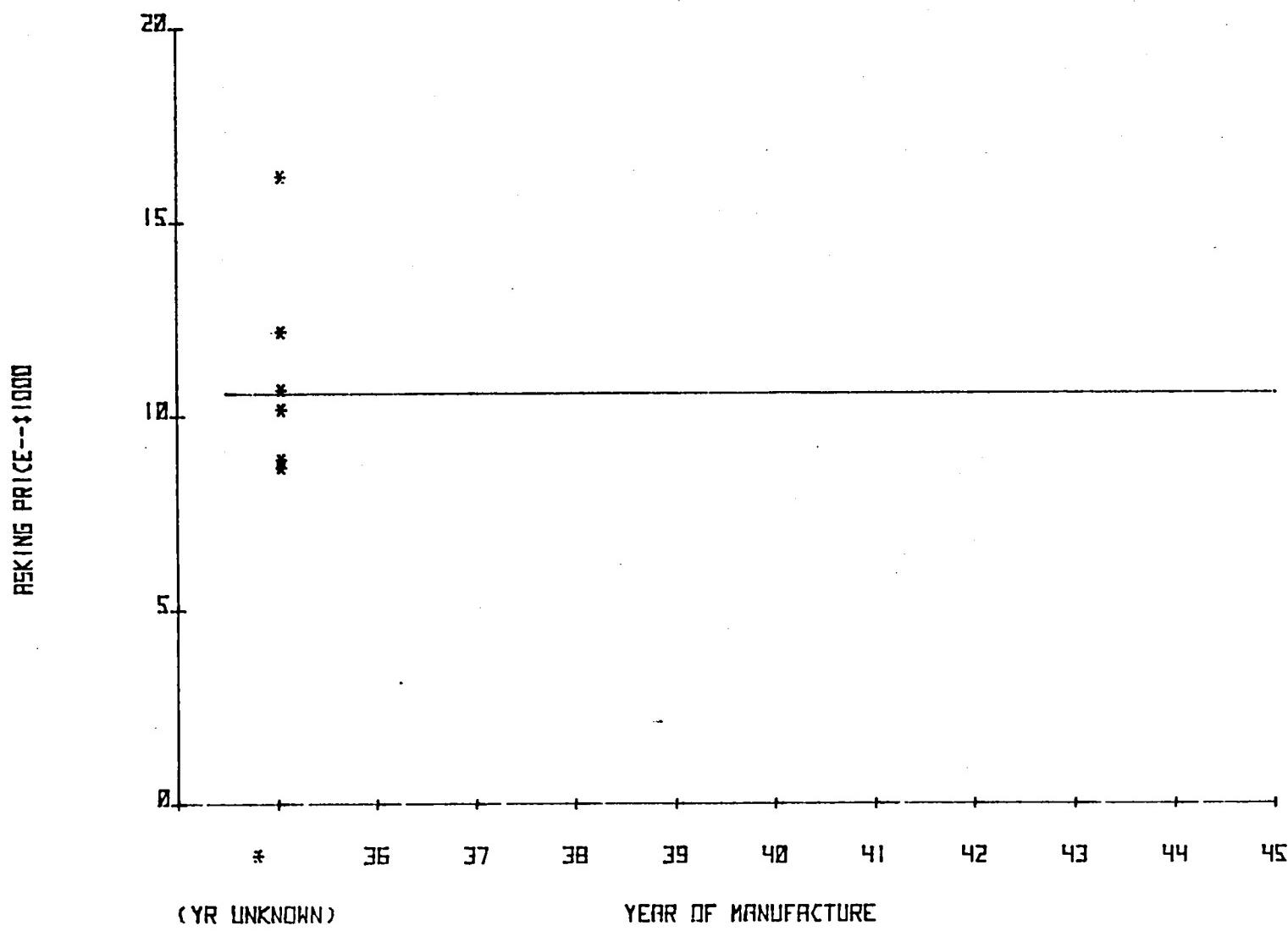
FIGURE D.11   THE 1978 ASKING PRICE--STEARMAN 450
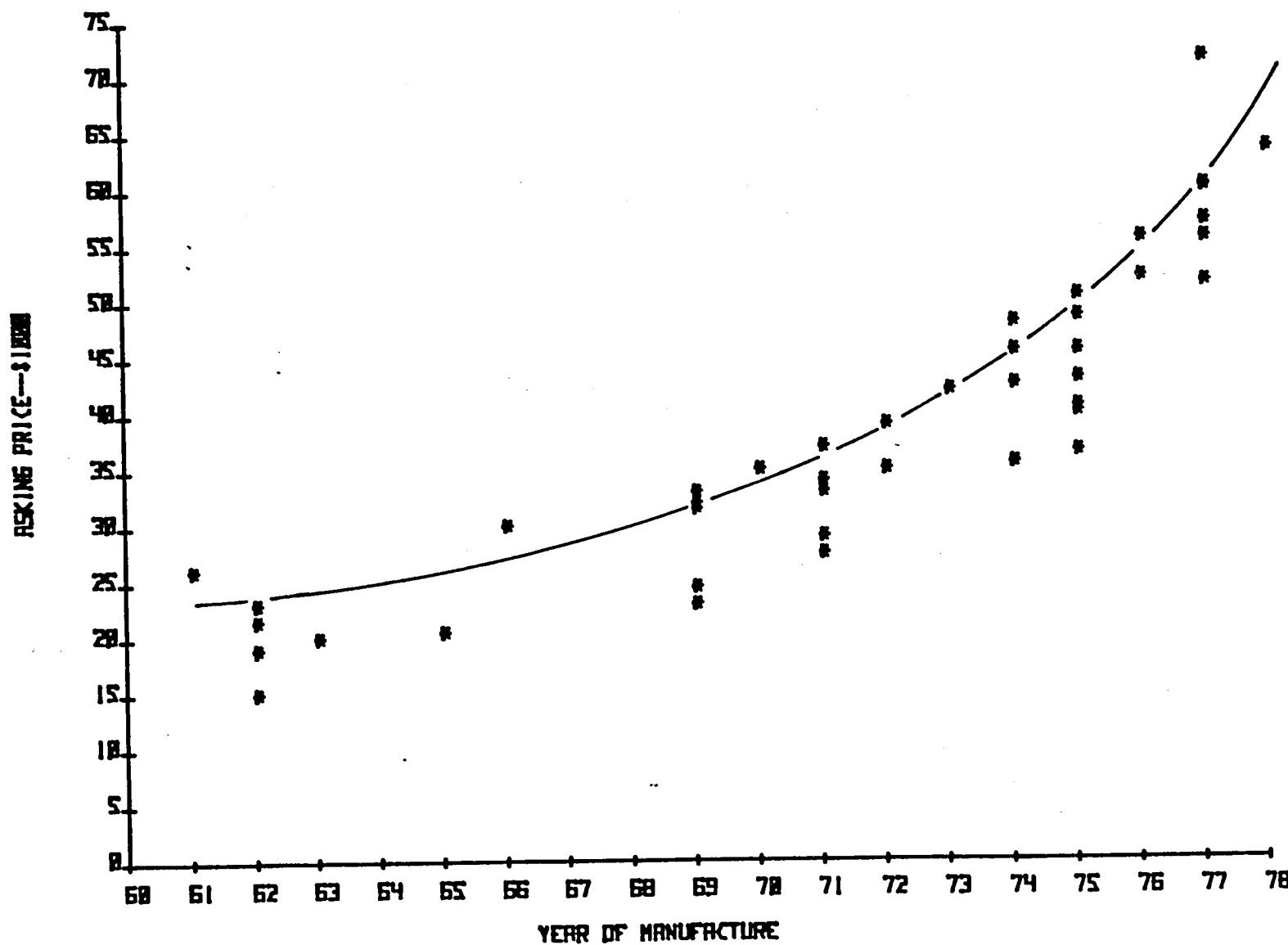
FIGURE D.12 THE 1978 ASKING PRICE--AGCAT 164
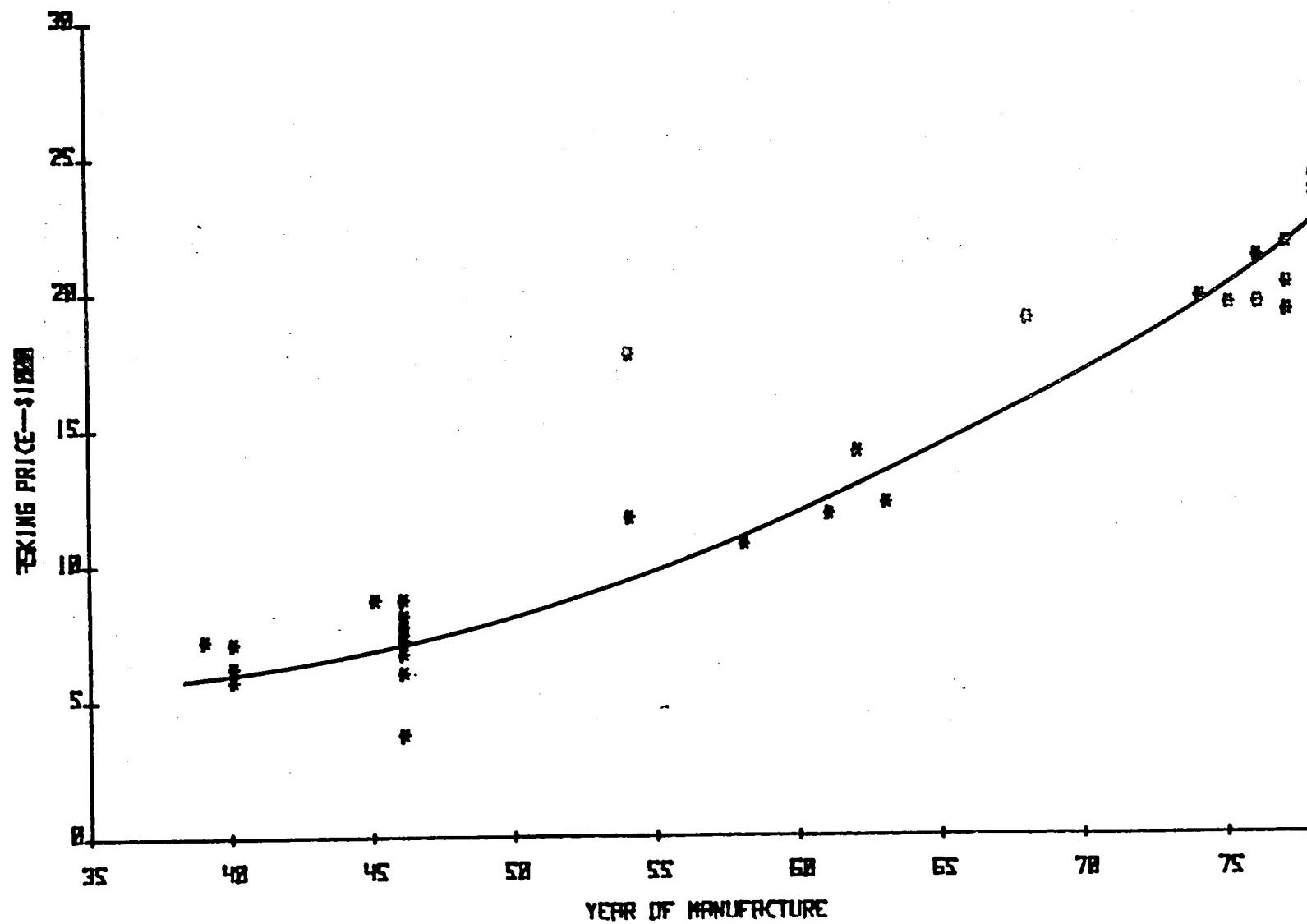
FIGURE D.13   THE 1978 ASKING PRICE--PIPER CUB
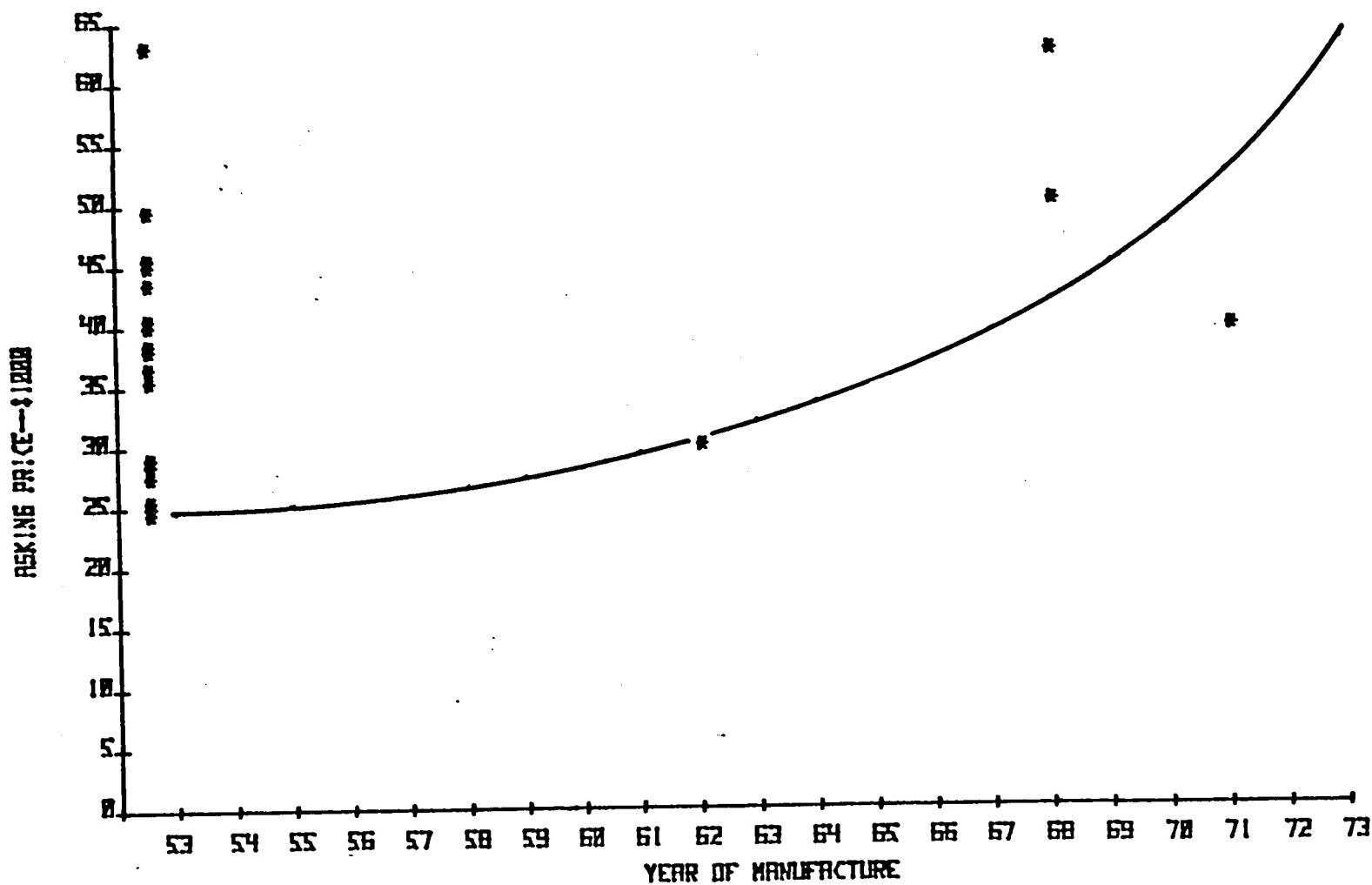
FIGURE D.14   THE 1978 ASKING PRICE--BELL 47G
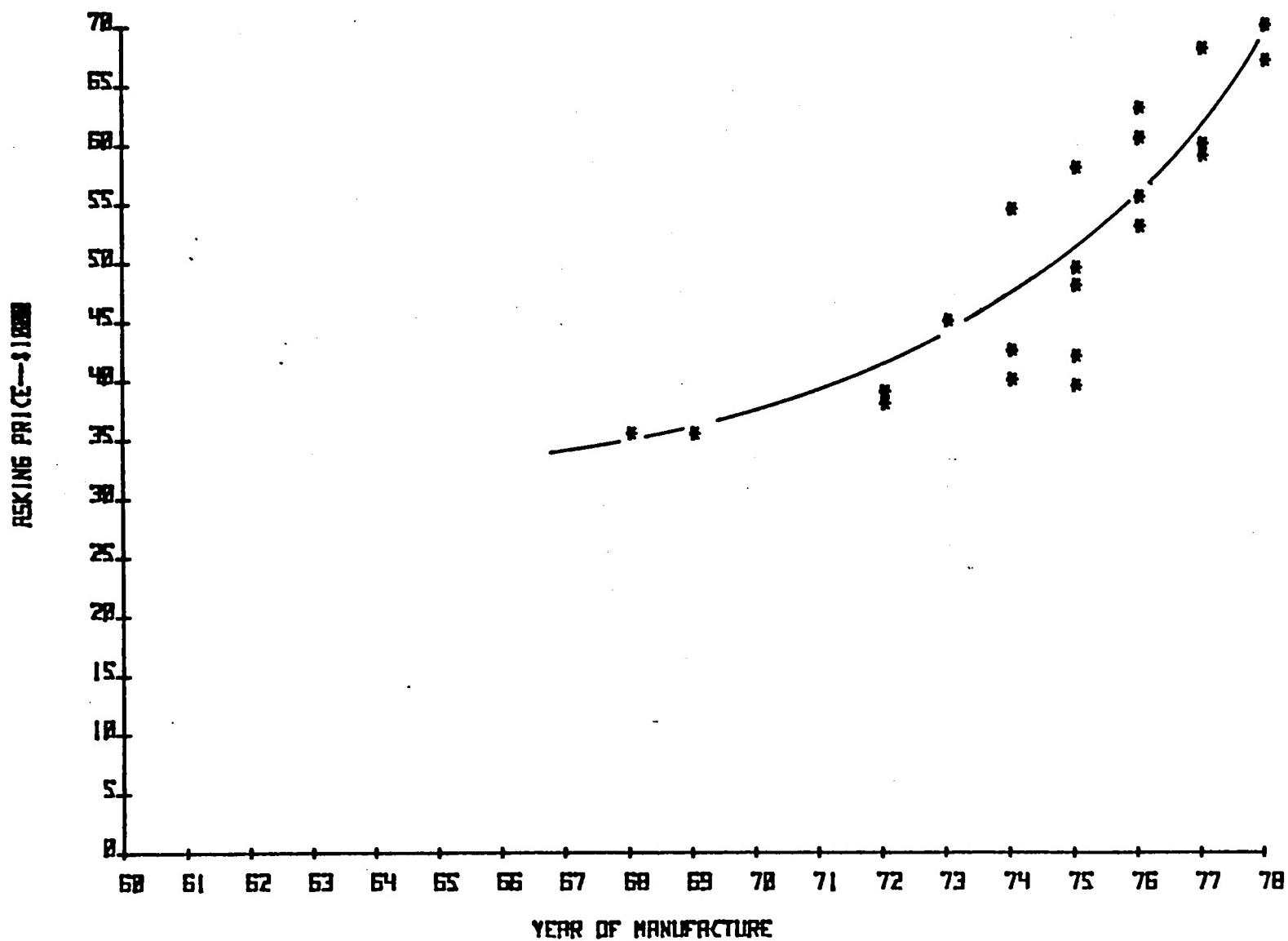
FIGURE D.15   THE 1978 ASKING PRICE--ROCKWELL S2R
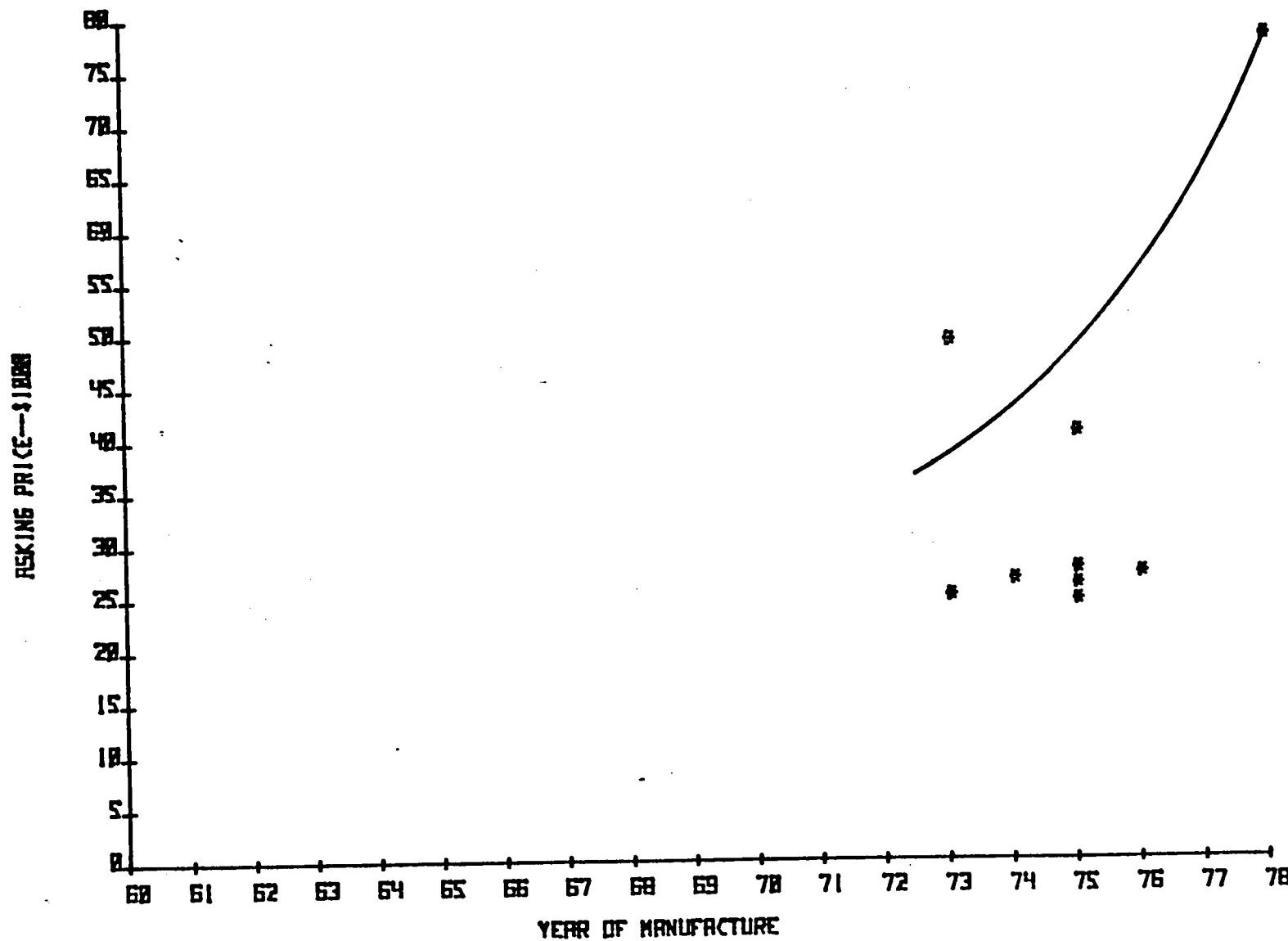
FIGURE D.16   THE 1978 ASKING PRICE--PA-36
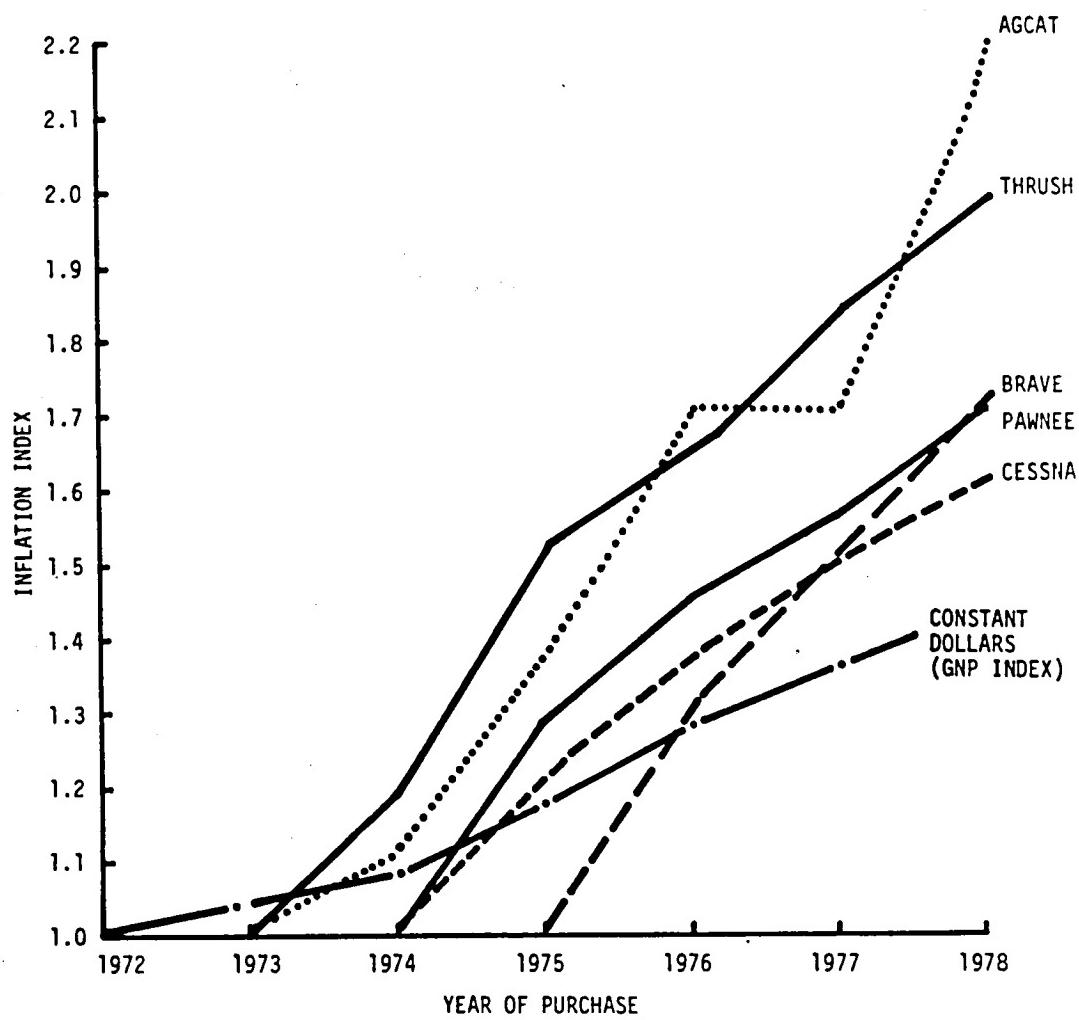
FIGURE D.17 AIRCRAFT INFLATION INDEX
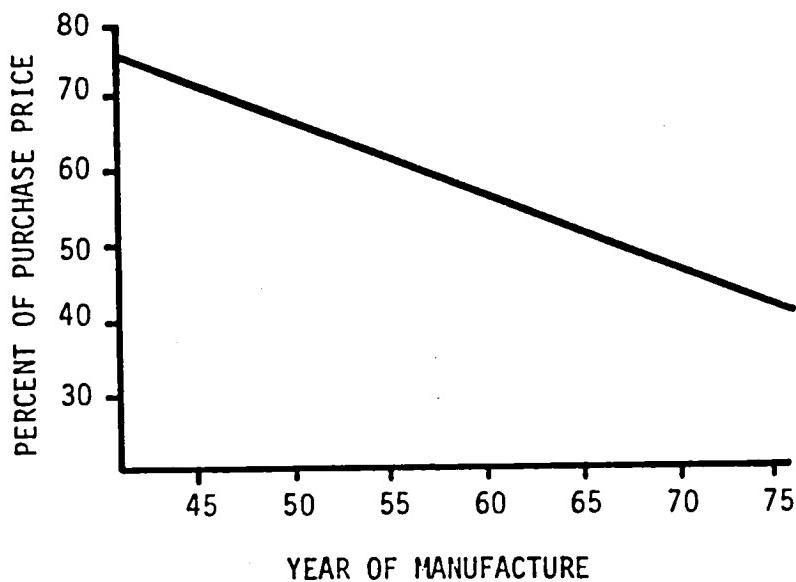
FIGURE D.18   SALVAGE VALUE FUNCTION
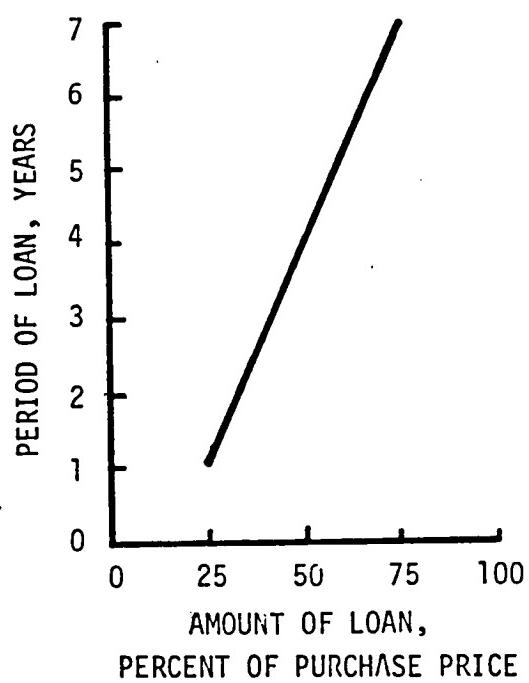
FIGURE D.19   AMOUNT VERSUS PERIOD OF LOAN
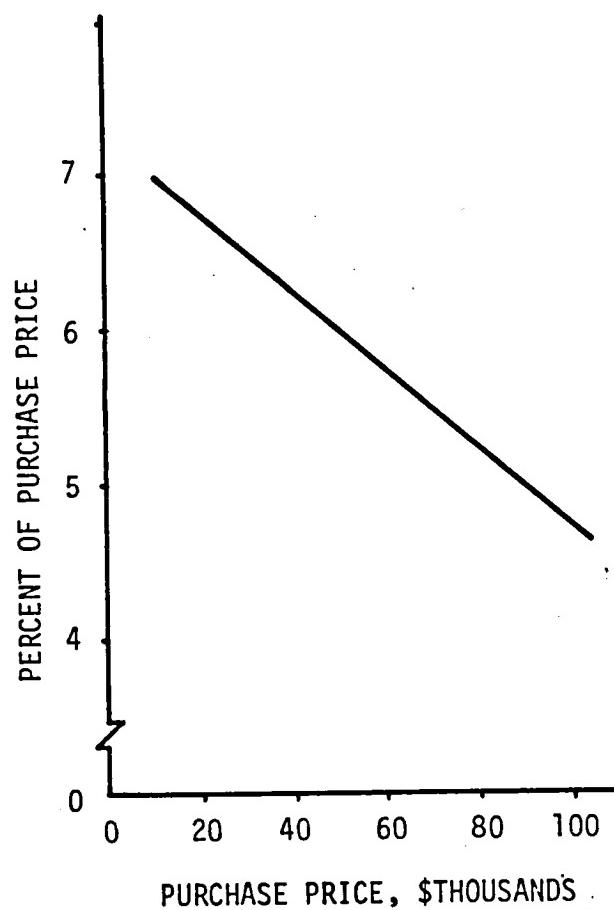
FIGURE D.20   HULL INSURANCE FUNCTION

TOTAL NUMBER OF AIRCRAFT = 1886*

KEY

0-30	
31-40	
41-60	
61-100	
101+	

SOURCE: 1976 DATA FILES

FIGURE D.21   LOCATION OF PIPER MODEL PA-25 AIRCRAFT
(FAA #71025)--1976
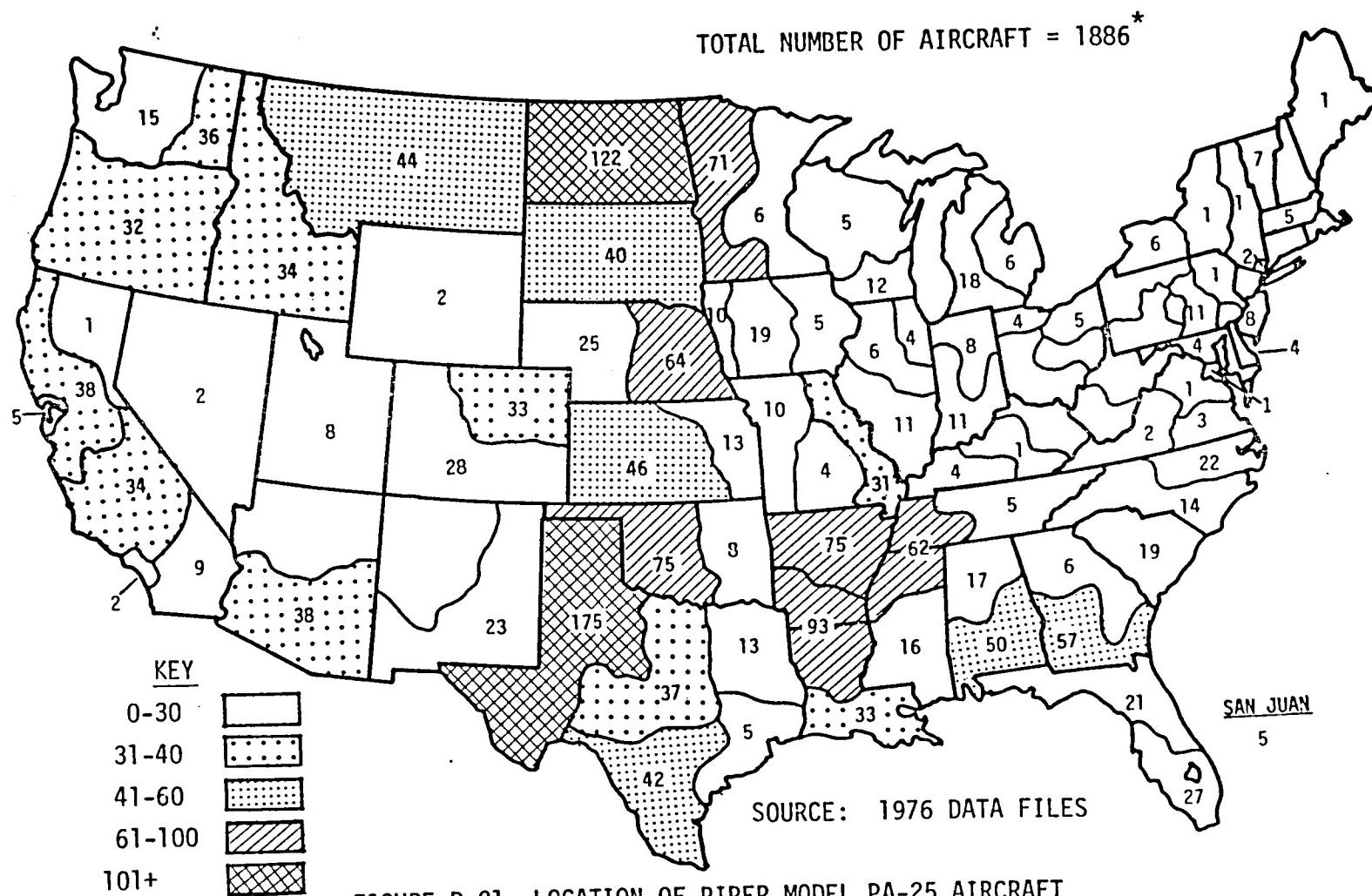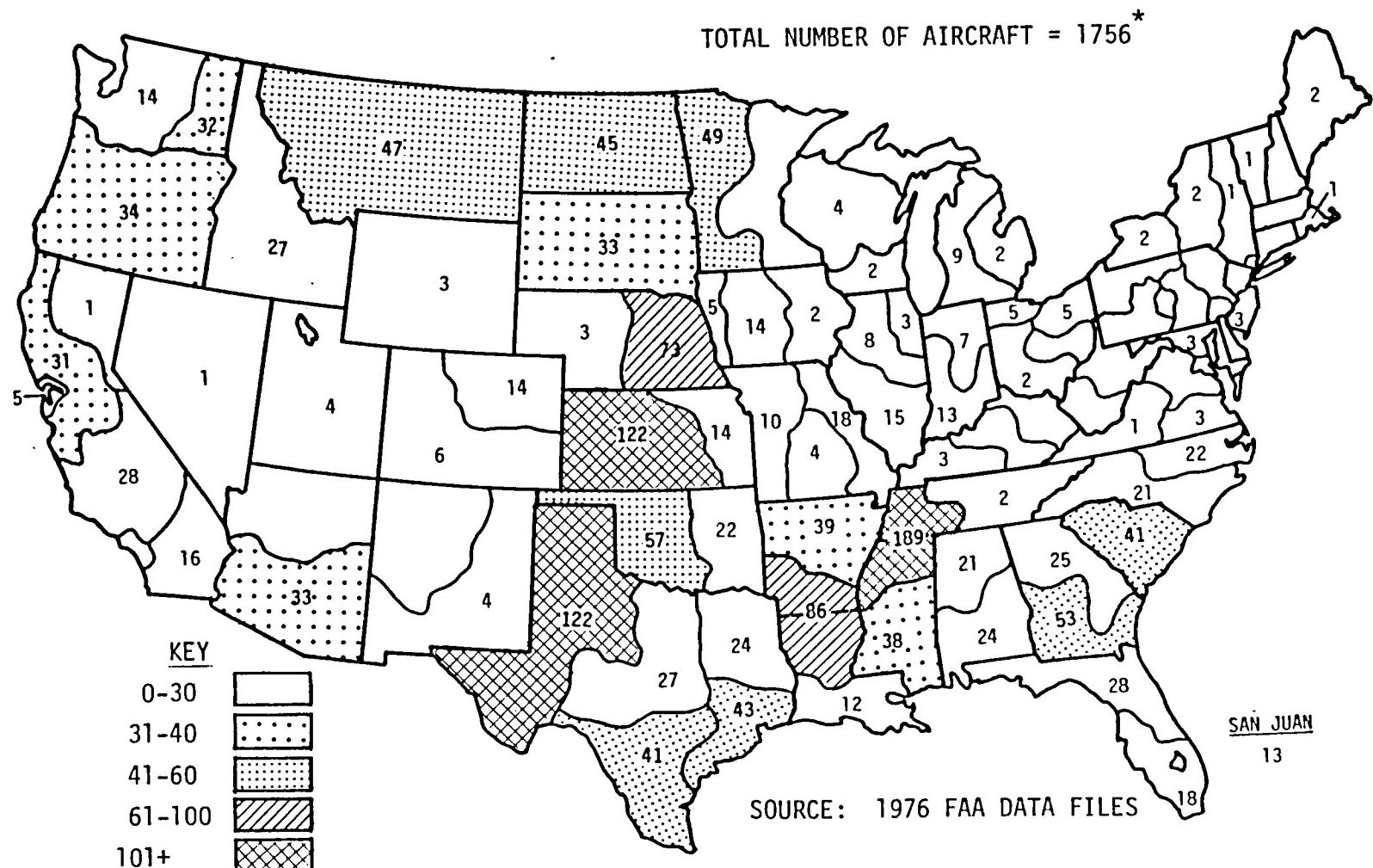
* SEE APENDIX G

FIGURE D.22   LOCATION OF CESSNA MODEL 188 AIRCRAFT
(FAA #20730)--1976

TOTAL NUMBER OF AIRCRAFT = 1756*

KEY
0-30
31-40
41-60
61-100
101+

SOURCE: 1976 FAA DATA FILES

SAN JUAN
13

* SEE APPENDIX G

TOTAL NUMBER OF AIRCRAFT = 1608[*]

26 8 12 26 8 3
51 5 8 2 5 1 2 1
49 23 5 12 2 3 4
12 1 3 6 13 7 2 1 1 5 19
108 2 6 2 9 1 3
3 11 15 6 13 1 2 2
196 4 19 5 3 1 2 3
64 4 3 19 6
4 52 5 56 10 72 29 3 22
35 57 7 11
132 26 20 17 12 25
33 23 50 58

KEY
0-30
31-40
41-60
61-110
110+

SOURCE: 1976 FAA DATA FILES
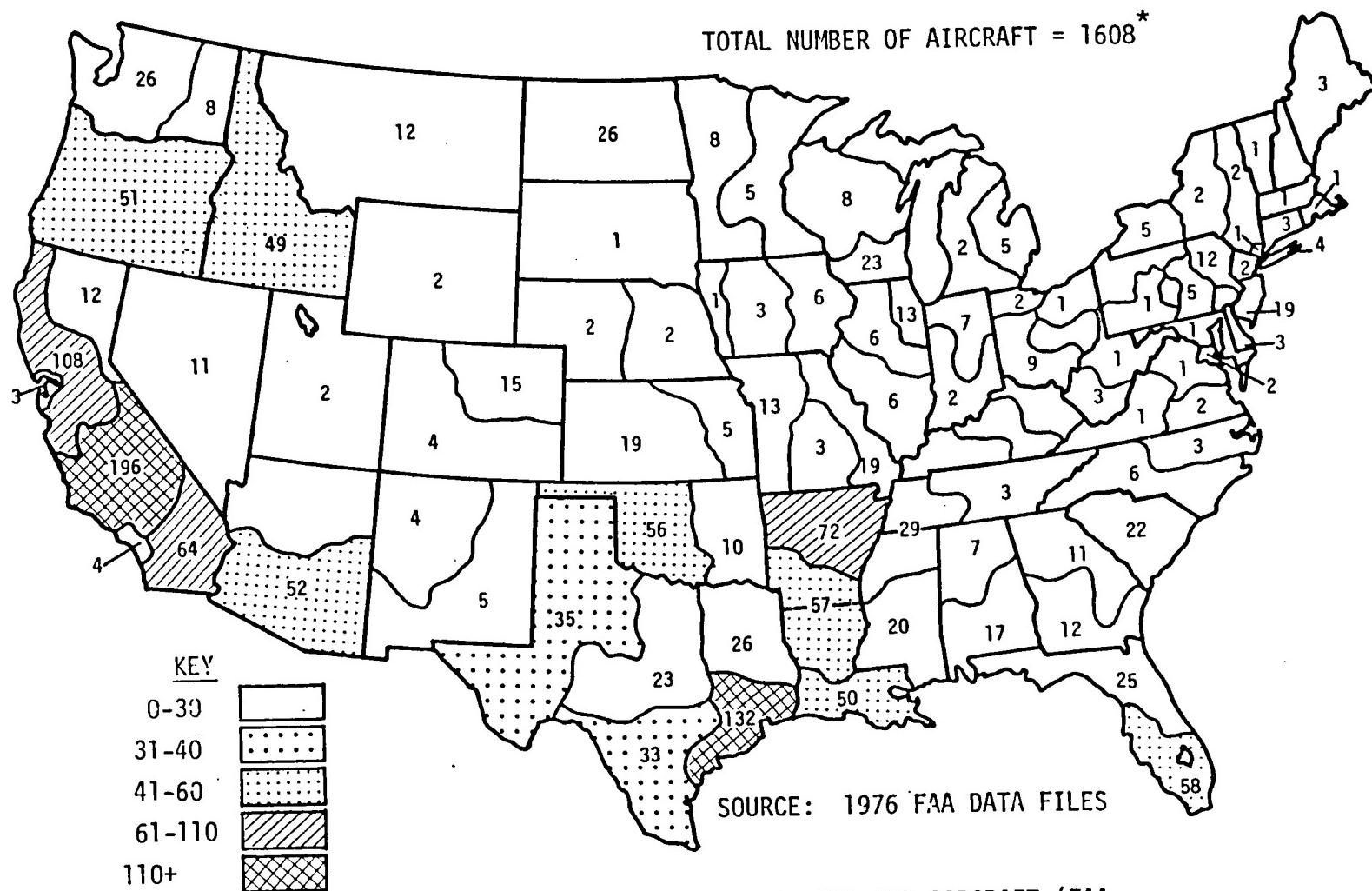
FIGURE D.23   LOCATION OF STEARMAN AND N3N AIRCRAFT (FAA
#13801, 61202)--1976

* SEE APPENDIX G

TOTAL NUMBER OF AIRCRAFT = 1434[*]

SOURCE: 1976 FAA DATA FILE

SAN JUAN
3

KEY
0-30
31-40
41-60
61-100
100+
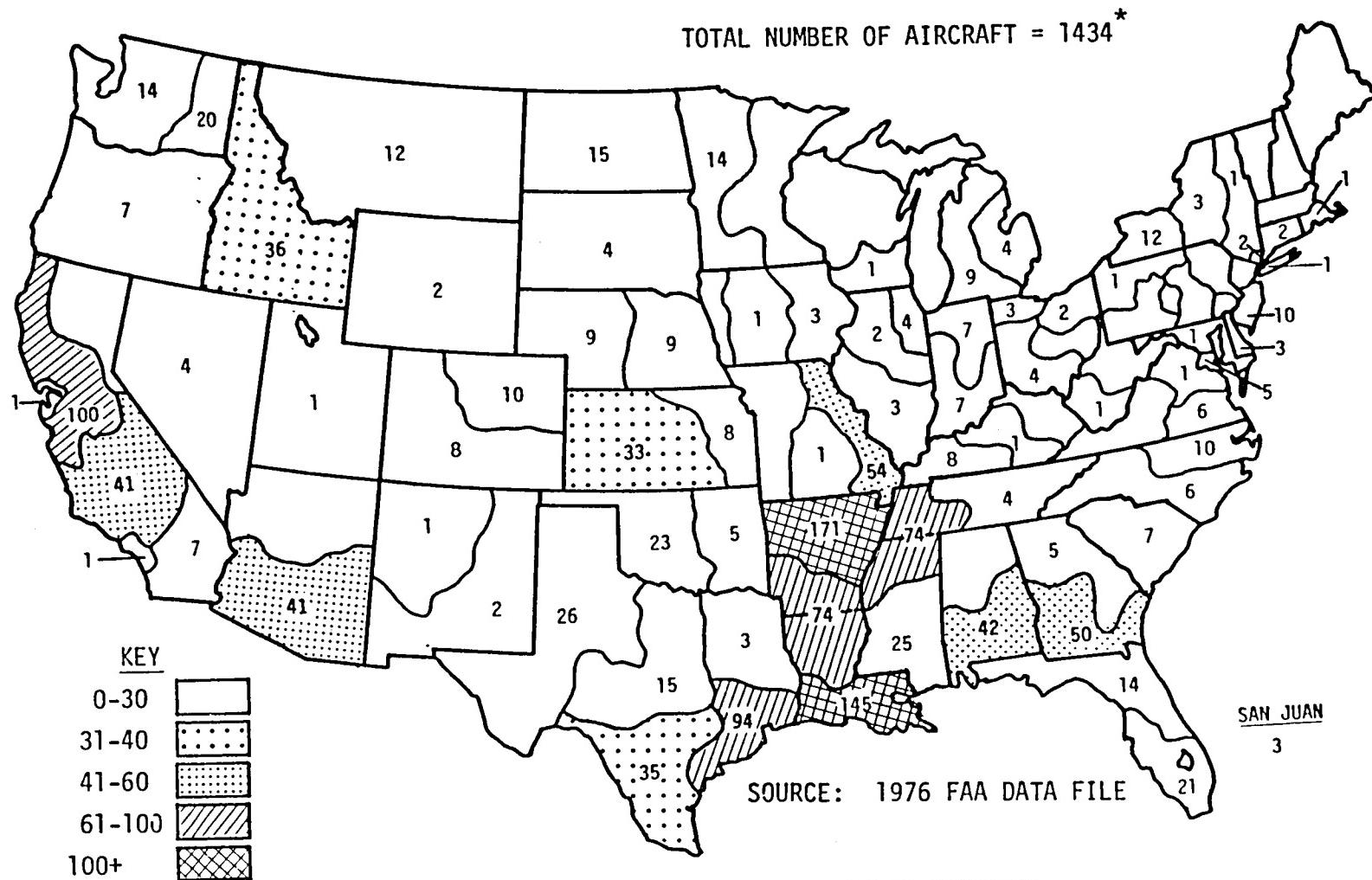
FIGURE D.24   LOCATION OF GRUMMAN MODEL 164 AIRCRAFT
(FAA #39527, 39528, 39602)--1976

* SEE APPENDIX G

TOTAL NUMBER OF AIRCRAFT = 1225*

KEY

0-30	
31-40	
41-60	
61-110	
110+	

SOURCE: 1976 FAA DATA FILES

MILITARY
1
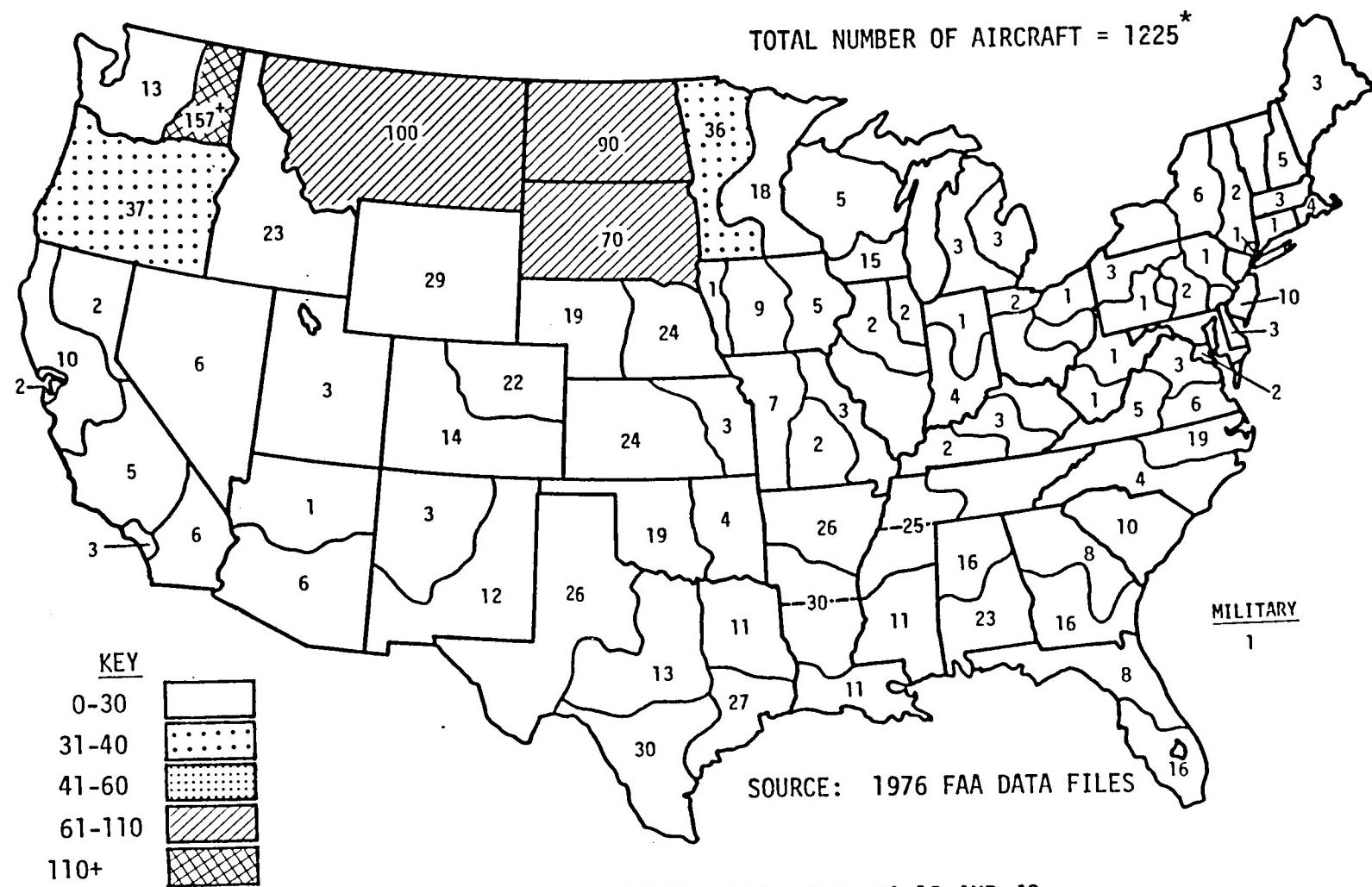
FIGURE D.25   LOCATION OF PIPER MODEL PA-18 AND J3
AIRCRAFT (FAA #71005, 71018)--1976

* SEE APPENDIX G
+ REGION ALSO INCLUDES ALASKA

TOTAL NUMBER OF AIRCRAFT = 420*

KEY

0-5	
6-7	
8-9	
10-20	
21+	

SAN JUAN
1

SOURCE: 1976 FAA DATA FILES
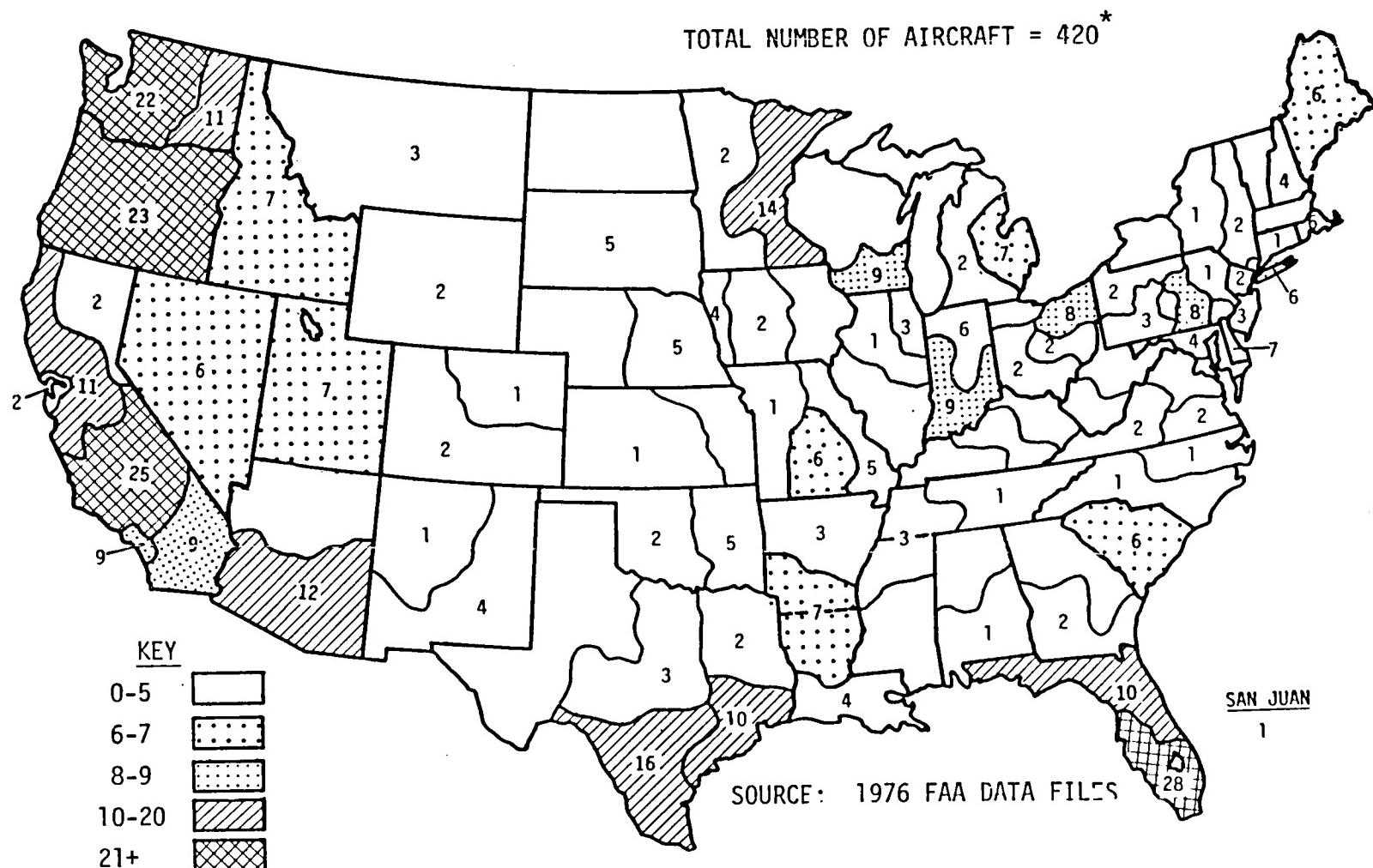
FIGURE D.26   LOCATION OF BELL MODEL 47G AIRCRAFT
(FAA #11810)--1976

* SEE APPENDIX G

TOTAL NUMBER OF AIRCRAFT = 805*

KEY

0-20	
21-30	
31-40	
41-60	
61+	
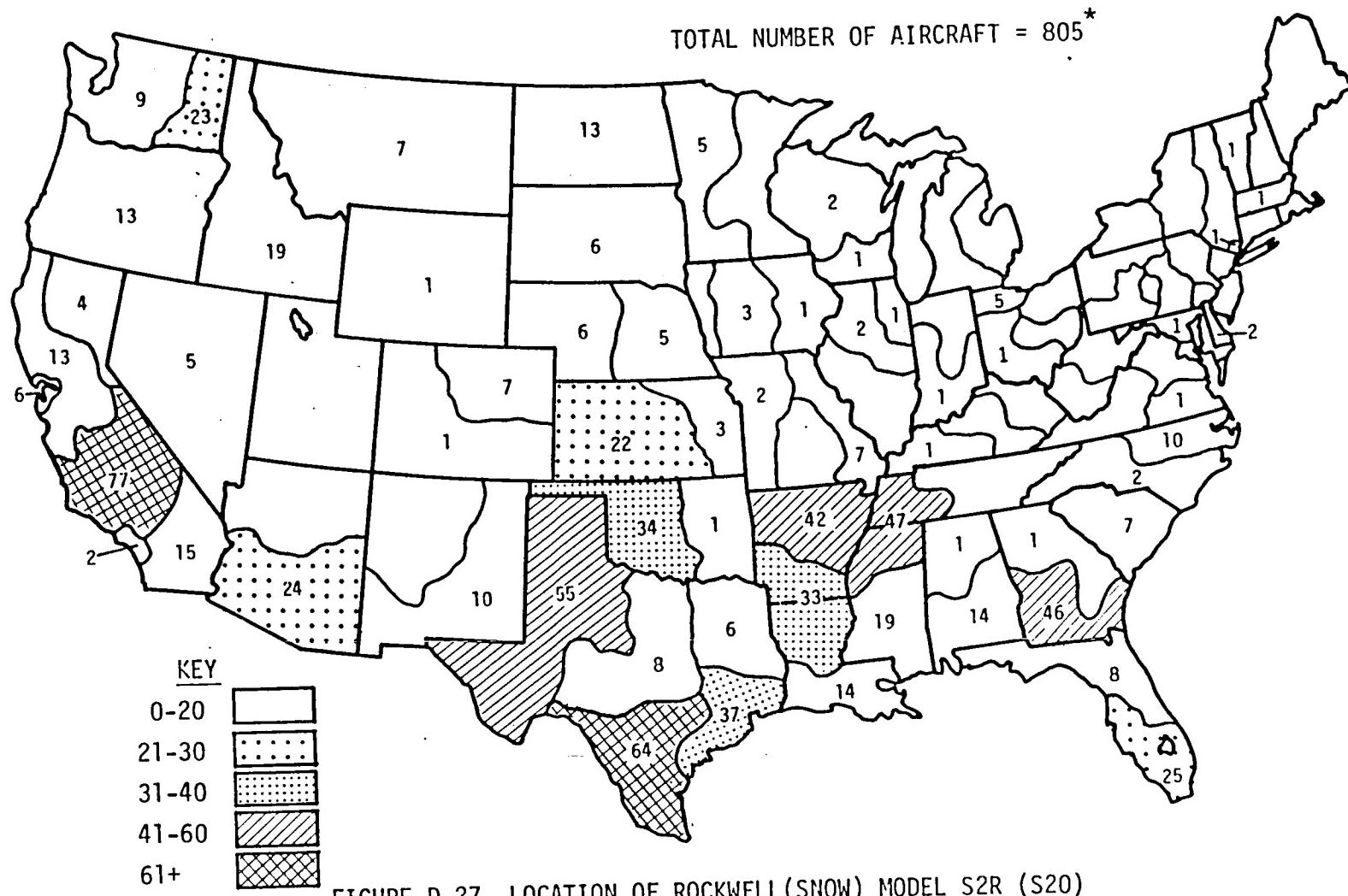
FIGURE D.27   LOCATION OF ROCKWELL(SNOW) MODEL S2R (S20)
AIRCRAFT (FAA #1430, 76302, 83802, 83803)--
1976

* SEE APPENDIX G

TOTAL NUMBER OF AIRCRAFT = 324*

KEY

0-10

11-20

21+

SOURCE: 1976 FAA DATA FILES
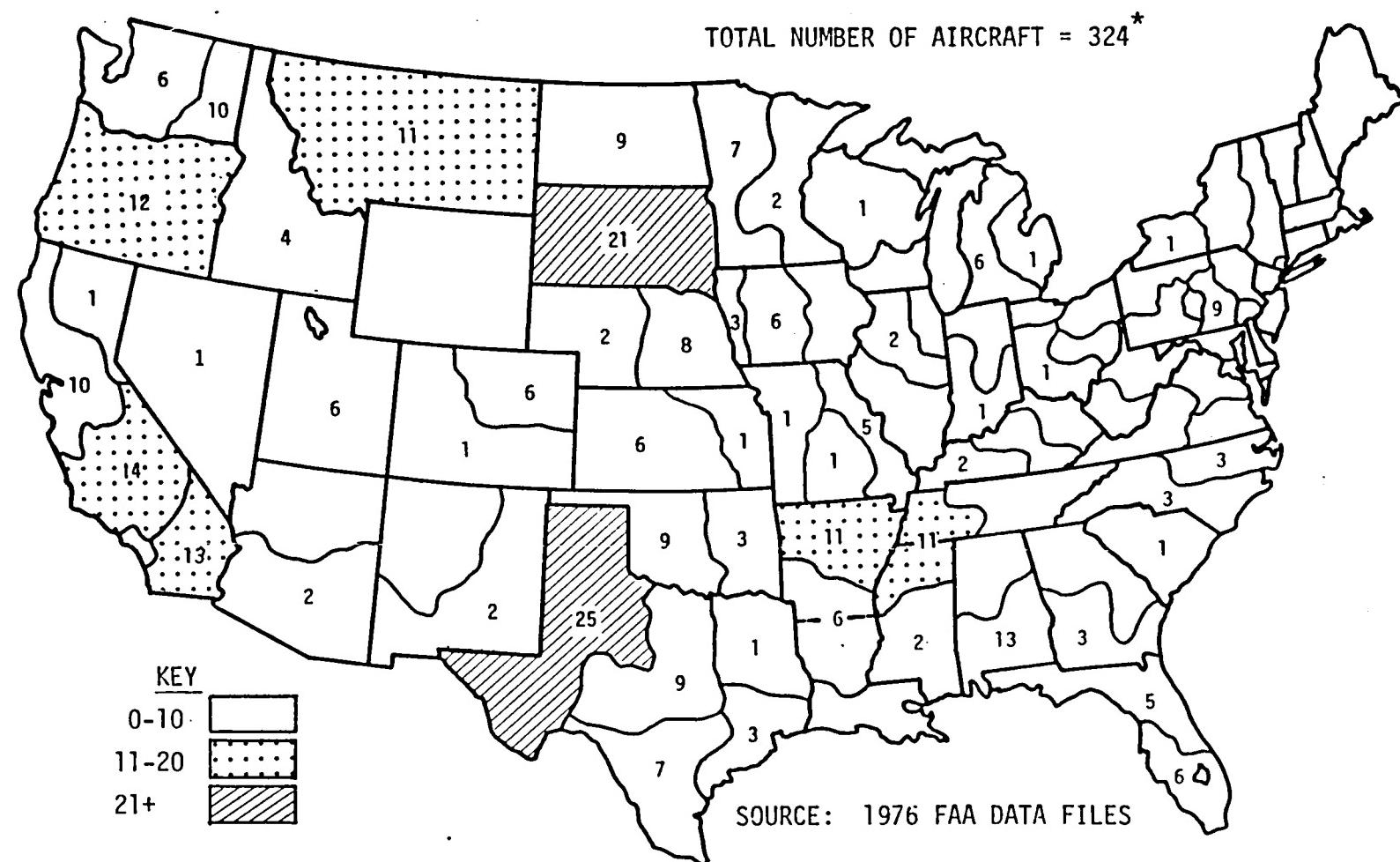
FIGURE D.28   LOCATION OF PIPER MODEL PA-36 (FAA
#71036)--1976

* SEE APPENDIX G

| TABLE D.1 COST OF AC FUEL BY REGION, JULY 1977 (¢/GAL) | | | | | |
| 80 OCTANE* | | | 100 OCTANE** | | |
REGION	LOW	MEDIAN	HIGH	LOW	MEDIAN	HIGH
1	75	77	79	78	80	84
2	73	78	82	79	85	95
3	73	78	82	79	85	95
4	73	78	82	79	85	95
5	73	78	82	79	85	95
6	76	81	83	78	82	83
7	79	80	86	81	82	86
8	75	78	81	66	77	83
9	75	78	81	66	77	83
10	75	78	81	66	77	83
11	75	78	81	66	77	83
12	70	78	81	72	77	82
13	70	78	81	72	77	82
14	70	78	81	72	77	82
15	70	78	81	72	77	82
16	79	82	89	80	81	87
17	70	78	81	72	77	82
18	70	78	81	72	77	82
19	70	78	81	72	77	82
20	75	80	88	81	84	91

*AIRCRAFT ID# 1, 3, 4, 5, 6 and 8.
**AIRCRAFT ID# 2, 7 and 9.

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36
TABLE D.2 PERCENT OF EACH AIRCRAFT TYPE BY REGION								
1	14	12	21	10	13	19	7	4
2	12	9	33	30	3	6	4	3
3	8	7	45	10	1	8	18	3
4	6	11	46	5	4	8	11	9
5	18	15	25	19	3	8	11	1
6	29	19	4	5	32	2	3	6
7	26	33	6	9	14	2	6	3
8	36	24	9	6	7	1	12	5
9	27	21	20	8	7	2	11	4
10	16	15	12	13	11	7	24	2
11	2	12	37	26	8	4	10	1
12	12	4	18	51	4	3	5	3
13	21	24	15	19	8	1	10	2
14	16	25	11	29	5	2	9	3
15	16	25	11	29	5	2	9	3
16	22	20	15	10	7	19	4	3
17	25	18	7	21	9	2	14	4
18	13	11	25	10	7	21	10	3
19	21	31	12	9	12	5	7	3
20	13	7	29	18	14	17	1	1

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

NUMBER OF A/C TYPES OWNED	NUMBER OF A/C OWNED BY AN OPERATOR									
	1	2	3	4	5	6	7	8	9	10
1	100	45	36	38	40		33	67		
2		55	41	41	24	50	50			67
3			23	21	20	50		33	100	33
4					8		17			
5					8					

TABLE D.3 PERCENT OF OPERATORS OWNING DIFFERENT TYPES OF AIRCRAFT

APPENDIX E

OPERATOR GROUND VEHICLE PROFILE

Each variable of the Operator Ground Vehicle Profile is described by three values: low, peak and high. (See text for further explanation.) The three values describe a triangular distribution as follows:

Low   Determines the lowest value of the variable under consideration that was observed for all operators in the data base for a particular region

Peak   Determines the most frequently observed value of the variable under consideration that was observed for all operators in the data base for a particular region (the peak number of operators)

High   Determines the highest value of the variable under consideration that was observed for all operators in the data base for a particular region.

Most variables in the Operator Ground Vehicle Profile are self-explanatory. The expected lifetime is interpreted as the period of depreciation. The percent of purchase price in loan is the amount of the loan. Approximately one-half of the operators finance their ground vehicles. Maintenance costs include taxes and insurance.

Table E.1 provides the cost of gasoline for ground vehicles, by region, used in the simulation runs.

OPERATOR GROUND VEHICLE PROFILE

VARIABLE	UNITS	TYPE OF DISTRIBUTION	VALUES IN DISTRIBUTION		
			LOW	PEAK	HIGH
YEAR OF PURCHASE	YEAR	TRIANGULAR	72	77	77
PURCHASE PRICE	DOLLARS	EVEN	4500	0	7800
EXPECTED LIFETIME	YEARS	EVEN	2	0	10
SALVAGE VALUE	DOLLARS	TRIANGULAR	0	0	1000
% PURCHASE PRICE IN LOAN	PERCENT	EVEN	0	0	100
PERIOD OF LOAN	YEARS	EVEN	1	0	4
INTEREST RATE OF LOAN	PERCENT	TRIANGULAR	8.5	9.0	12.0
FUEL CONSUMPTION	MPG	TRIANGULAR	10	10	15
MAINTENANCE COSTS	$/YR	TRIANGULAR	400	400	1000

TABLE E.1 COST OF AUTOMOTIVE GASOLINE BY REGION, MAY 30, 1978 (¢/GAL)		
REGION	LOW	HIGH
1	64.0	70.2
2	66.5	70.3
3	66.5	70.3
4	66.5	70.3
5	66.4	68.2
6	64.3	67.6
7	62.9	68.1
8	58.3	66.2
9	58.3	64.4
10	58.3	61.9
11	58.3	61.9
12	62.7	66.6
13	62.7	69.1
14	61.9	69.1
15	61.9	69.1
16	61.5	70.9
17	62.0	66.9
18	60.5	65.1
19	61.6	67.1
20	59.5	68.2

APPENDIX F

DATA FROM OPERATOR DECISION MODEL SIMULATION RUNS

Tables F.1 through F.12 present data resulting from the operator decision model simulation runs.

TABLE F.1   NUMBER OF EACH AIRCRAFT TYPE MODELED IN EACH REGION DURING ANALYSIS
WITH A MEDIUM-SIZED NEW TECHNOLOGY AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	13	12	72	48	1	2	10	6	164
3	28	16	153	35	2	15	38	8	295
4	6	7	44	6	2	7	6	9	87
5	31	23	77	39	6	21	22	1	220
6	148	82	32	19	122	9	22	40	474
7	119	166	37	42	60	8	31	15	478
8	86	68	24	12	14	3	31	10	248
9	52	60	44	15	10	3	17	7	208
10	33	24	22	31	12	13	60	8	203
11	8	30	86	40	2	0	21	3	190
12	26	5	30	126	4	6	21	13	231
13	88	117	69	208	26	38	46	15	607
14	48	105	57	137	7	2	46	13	415
15	69	72	34	115	0	0	31	9	330
16	74	51	50	29	19	66	2	15	306
17	48	44	23	45	21	3	50	7	241
18	29	29	51	37	7	44	10	0	207
19	18	45	14	9	15	5	13	2	121
20	8	6	14	9	8	5	1	0	51
TOTAL	932	962	933	1002	338	250	478	181	5076

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.2   NUMBER OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY
REPLACED BY TYPE, BY A MEDIUM-SIZED NEW TECHNOLOGY AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	2	4	41	40	0	2	10	6	105
3	1	2	26	20	0	15	34	8	106
4	0	0	4	3	0	7	4	9	27
5	1	7	31	24	0	21	19	1	104
6	1	9	2	8	0	8	11	38	77
7	3	14	2	9	0	2	22	14	66
8	2	12	4	8	0	1	27	10	64
9	2	11	0	6	0	3	15	7	44
10	2	4	15	26	0	13	57	8	125
11	4	6	51	23	0	0	13	3	100
12	6	2	13	86	0	5	18	11	141
13	0	19	19	112	0	24	39	15	228
14	0	10	10	69	0	1	31	13	134
15	5	17	10	68	0	0	27	9	136
16	2	6	6	15	0	37	2	14	82
17	0	5	5	17	0	0	37	6	70
18	3	3	15	27	0	42	9	0	99
19	0	8	2	2	0	2	11	2	27
20	0	0	5	6	0	5	1	0	17
TOTAL	34	139	261	569	0	188	387	174	1752

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.3   PERCENT OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY
            REPLACED BY TYPE, BY A MEDIUM-SIZED NEW TECHNOLOGY AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	15	33	57	83	0	100	100	100	64
3	4	13	17	57	0	100	89	100	36
4	0	0	9	50	0	100	67	100	31
5	3	30	40	62	0	100	86	100	47
6	1	11	6	42	0	89	50	95	16
7	3	8	5	21	0	25	71	93	14
8	2	18	17	67	0	33	87	100	26
9	4	18	0	40	0	100	88	100	21
10	6	17	68	84	0	100	95	100	62
11	50	20	59	58	0	0	62	100	53
12	23	40	43	68	0	83	86	85	61
13	0	16	28	54	0	63	85	100	38
14	0	10	18	50	0	50	67	100	32
15	7	24	29	59	0	0	87	100	41
16	3	12	12	52	0	56	100	93	27
17	0	11	22	38	0	0	74	86	29
18	10	10	29	73	0	95	90	0	48
19	0	18	14	22	0	40	85	100	22
20	0	0	36	67	0	100	100	0	33
TOTAL	4	14	28	57	0	75	81	96	35

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.4 NUMBER OF EACH AIRCRAFT TYPE MODELED IN EACH REGION DURING ANALYSIS WITH A NEW CESSNA 188 AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	18	19	129	51	1	25	59	3	305
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	120	98	25	25	126	11	16	29	450
7	0	0	0	0	0	0	0	0	0
8	95	67	20	7	20	5	27	15	256
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	17	24	73	54	0	0	19	0	187
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	91	111	50	108	13	1	31	17	422
15	0	0	0	0	0	0	0	0	0
16	62	72	42	19	22	60	12	9	298
17	51	50	8	44	30	7	39	14	243
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	454	441	347	308	212	109	203	87	2161

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.5 NUMBER OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY REPLACED BY TYPE, BY A NEW CESSNA 188 AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	3	12	69	40	1	25	55	3	208
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	24	51	13	17	10	11	12	29	167
7	0	0	0	0	0	0	0	0	0
8	22	38	5	7	0	5	24	15	116
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	5	17	63	54	0	0	16	0	155
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	15	52	27	90	1	1	28	17	231
15	0	0	0	0	0	0	0	0	0
16	12	26	32	14	0	54	12	9	159
17	8	27	7	38	1	3	38	14	136
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	89	223	216	260	13	99	185	87	1172

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.6	PERCENT OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY REPLACED BY TYPE, BY A NEW CESSNA 188 AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	17	63	53	78	100	100	93	100	68
	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
	0	52	52	68	8	100	75	100	37
	0	0	0	0	0	0	0	0	0
8	23	57	25	100	0	100	89	100	45
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	29	71	86	100	0	0	84	0	83
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	16	47	54	83	8	100	90	100	55
15	0	0	0	0	0	0	0	0	0
16	19	36	76	74	0	90	100	100	53
17	16	54	88	86	3	43	97	100	56
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	20	51	62	84	6	91	91	100	54

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.7 NUMBER OF EACH AIRCRAFT TYPE MODELED IN EACH REGION DURING
ANALYSIS WITH A NEW AGCAT AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	19	24	158	30	0	10	50	4	295
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	149	101	25	24	131	9	10	30	479
7	0	0	0	0	0	0	0	0	0
8	68	67	32	25	19	2	14	13	240
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	10	34	58	61	0	0	37	3	203
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	68	111	41	136	16	3	43	18	436
15	0	0	0	0	0	0	0	0	0
16	71	41	51	27	22	33	20	8	273
17	42	34	12	78	18	3	40	8	235
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	427	412	377	381	206	60	214	84	2161

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.8	NUMBER OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY REPLACED BY TYPE, BY A NEW AGCAT AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	0	4	24	17	0	9	36	3	93
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	4	18	1	14	0	8	5	26	76
7	0	0	0	0	0	0	0	0	0
8	0	11	5	13	0	2	6	11	48
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	3	4	34	0	0	16	2	59
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	14	5	69	0	3	29	16	136
15	0	0	0	0	0	0	0	0	0
16	0	3	10	13	0	19	14	6	65
17	0	4	0	39	0	1	28	6	78
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	4	57	49	199	0	42	134	70	555

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.9   PERCENT OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY REPLACED BY TYPE, BY A NEW AGCAT AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	0	17	15	57	0	90	72	75	32
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	3	18	4	58	0	89	50	87	16
7	0	0	0	0	0	0	0	0	0
8	0	16	16	52	0	100	43	85	20
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	9	7	56	0	0	43	67	29
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	13	12	51	0	100	67	89	31
15	0	0	0	0	0	0	0	0	0
16	0	7	20	48	0	58	70	75	24
17	0	12	0	50	0	33	70	75	33
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	1	14	13	52	0	70	63	83	26

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

	TABLE F.10		NUMBER OF EACH AIRCRAFT TYPE MODELED IN EACH REGION DURING ANALYSIS WITH A NEW THRUSH AIRCRAFT						

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	25	28	142	27	0	17	60	7	306
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	129	91	21	30	126	7	18	40	462
7	0	0	0	0	0	0	0	0	0
8	78	65	28	22	13	1	31	18	256
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	28	73	57	1	0	28	1	188
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	66	116	55	107	7	10	48	14	423
15	0	0	0	0	0	0	0	0	0
16	57	74	33	39	27	69	9	6	314
17	71	43	10	57	19	5	26	14	245
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	426	445	362	339	193	109	220	100	2194

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.11 NUMBER OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY REPLACED BY TYPE, BY A NEW THRUSH AIRCRAFT

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	0	2	1	3	0	13	38	5	62
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	8	1	5	0	4	7	29	54
7	0	0	0	0	0	0	0	0	0
8	0	4	0	3	0	0	19	11	37
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	11	26	0	0	17	1	55
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	5	0	20	0	6	20	6	57
15	0	0	0	0	0	0	0	0	0
16	0	2	0	9	0	7	3	2	23
17	0	2	0	7	0	0	14	10	33
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	0	23	13	73	0	30	118	64	321

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT,
PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH,
PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

TABLE F.12	PERCENT OF AIRCRAFT THAT WILL ULTIMATELY BE COST-EFFECTIVELY REPLACED BY TYPE, BY A NEW THRUSH AIRCRAFT							

REGION	PA25	C188	A75	G164	PA18	47G	S2R	PA36	TOTAL
2	0	0	0	0	0	0	0	0	0
3	0	7	1	11	0	76	63	71	20
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	9	5	17	0	57	39	73	12
7	0	0	0	0	0	0	0	0	0
8	0	6	0	14	0	0	61	61	14
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	15	46	0	0	61	100	29
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	4	0	19	0	60	42	43	13
15	0	0	0	0	0	0	0	0	0
16	0	3	0	23	0	10	33	33	7
17	0	5	0	12	0	0	54	71	13
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
TOTAL	0	5	4	22	0	28	54	64	15

PA25 = PIPER PAWNEE, C188 = CESSNA 188, A75 = STEARMAN, G164 = AGCAT, PA18 = PIPER CUB (& SUPER), 47G = BELL HELICOPTER, S2R = THRUSH, PA36 = PIPER BRAVE, FW = OTHER FIXED WING, RW = OTHER ROTARY WING.

APPENDIX G

METHODOLOGY USED TO DETERMINE AG-AIR FLEET
FROM THE FAA DATA FILES

It is desired to obain a listing of all aircraft for which their primary use is aerial application in either agriculture or forestry. The source for this listing is the Federal Aviation Administration's Aircraft Registration Master File for 1975 and 1976.

The procedure used to produce the listings was to select any records of the FAA tapes which were likely candidates for aerial application in agriculture and forestry. Three criteria were used in this selection:

1. Aircraft Model

2. Aircraft Airworthiness Classification and Approved Operation

3. Aircraft Primary Use.

Under Criterion 1, any aircraft model which is designed primarily for agricultural application was included in the selection. (See Table G.1 for the listing of aircraft models included under Criterion 1.) Under Criterion 2, any aircraft that was classified as Restricted or Multiple with an approved operation of Agriculture and Pest Control or Forest was included in the selection. Under Criterion 3, any aircraft that reported a primary use of aerial application was included in the selection. The only aircraft deleted from the listing that meet these three criteria were gliders, balloons, blimps and dirigibles (of which there were 18 in the 1976 fleet). The number and percent of aircraft that are in the various subsets of the selection criteria are shown in Figures G.1 and G.2.

TABLE G.1 AG-MODEL AIRCRAFT	
MODEL NUMBER	MODEL NAME
01430	ROCKWELL AERO COMMANDER S2 SERIES
01442	ROCKWELL AERO COMMANDER A9 SERIES
01443	ROCKWELL AERO COMMANDER B1 SERIES
03901	AIR TRACTOR
20730	CESSNA 188 SERIES
32801	EMROTH EMAIR MA1 SERIES
39527	GRUMMAN AGCAT G164 SERIES
39528	GRUMMAN/SCHWEIZER AGCAT G164 SERIES
39602	GRUMMAN AMERICAN AGCAT G164 SERIES
60701	MURRAYAIR MA SERIES
71025	PIPER PA-25 PAWNEE D SERIES
71036	PIPER PA-36 PAWNEE BRAVE SERIES
76302	ROCKWELL INT. S2 SERIES .
83801	SNOW S1 SERIES
83802	SNOW S2 SERIES
83803	SNOW 600S2 SERIES
96304	WEATHERLY 201 SERIES

1976
TOTAL NUMBER OF AIRCRAFT = 12,120
(NUMBER IN CATEGORIES)
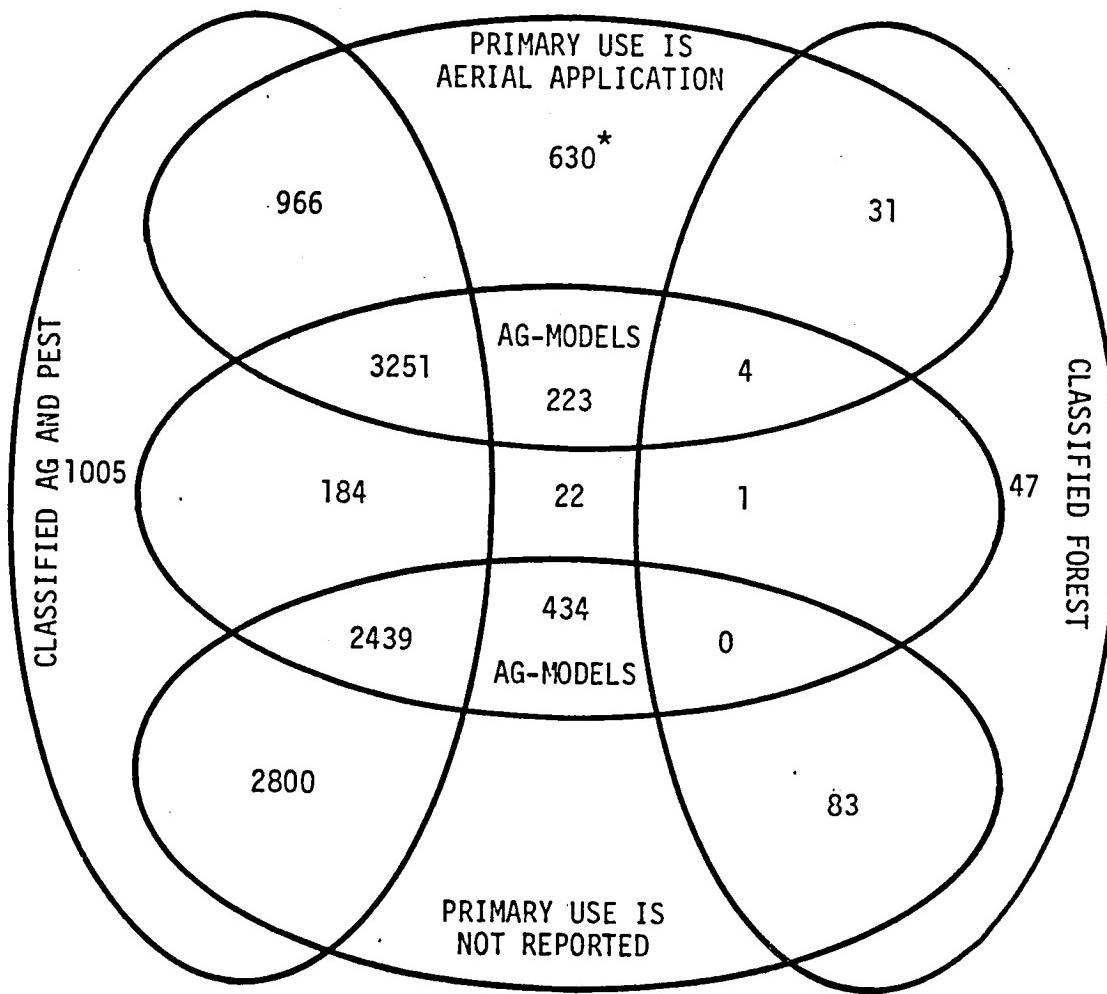
FIGURE G.1   NUMBER OF AIRCRAFT THAT FIT
SELECTION CRITERIA

* INCLUDES 18 AIRCRAFT (GLIDERS, ETC.) DELETED FROM LISTING

1976
TOTAL NUMBER OF AIRCRAFT = 12,120
(PERCENT IN CATEGORIES)
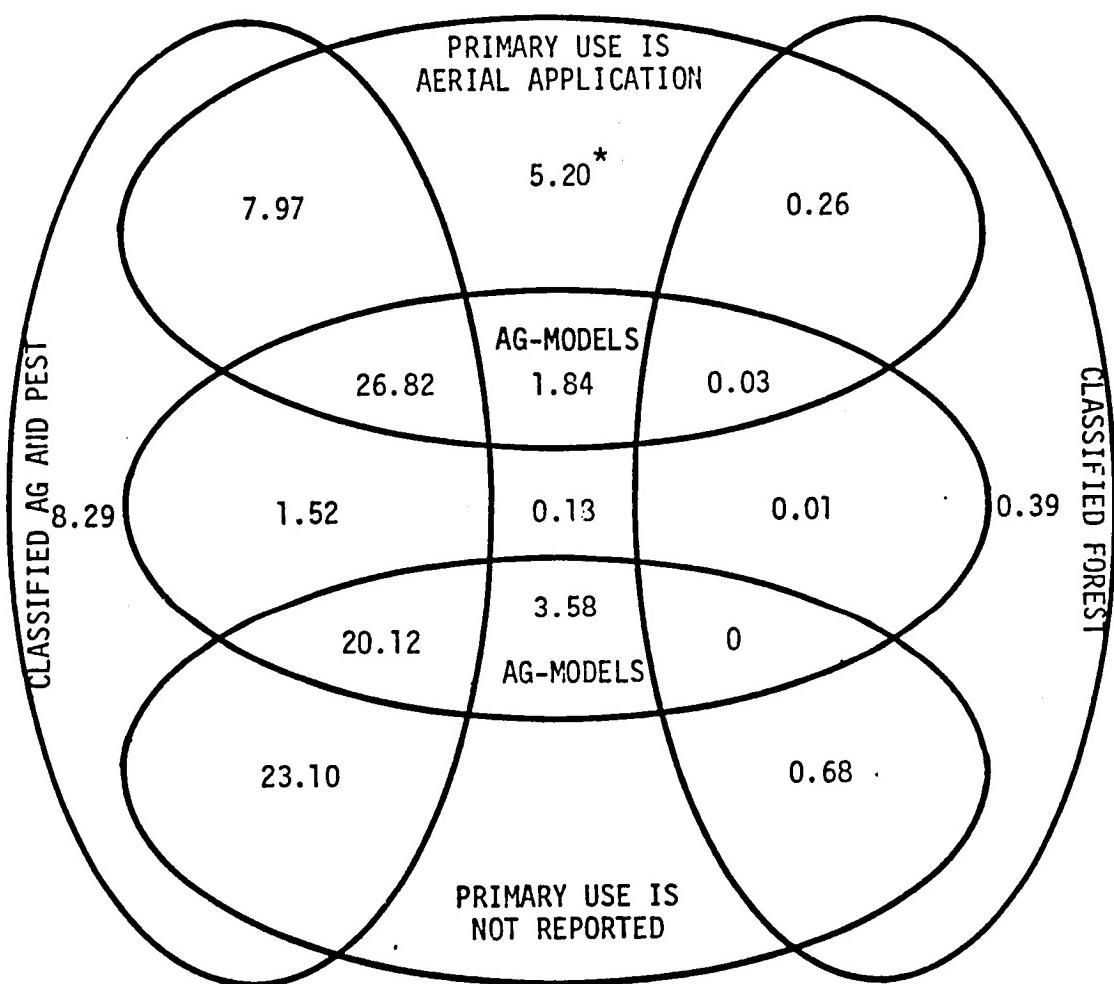
FIGURE G.2   PERCENT OF AIRCRAFT THAT FIT
SELECTION CRITERIA

* INCLUDES 18 AIRCRAFT (GLIDERS, ETC.) DELETED FROM LISTING

1. Report No. NASA CR-159090	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle A Study of the Cost-Effective Markets for New Technology Agricultural Aircraft		5. Report Date September 1979
		6. Performing Organization Code
7. Author(s) George A. Hazelrigg, Jr., and Fred Clyne		8. Performing Organization Report No.
9. Performing Organization Name and Address ECON, Inc. 900 State Road Princeton, NJ 08540		10. Work Unit No.
		11. Contract or Grant No. NASW-2781
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15. Supplementary Notes

16. Abstract

This study provides an estimate of the regional and total U.S. cost-effective markets for a new technology agricultural aircraft as incorporating features which could result from NASA-sponsored aerial applications research. These estimates are conservative in that they do not include added savings due to market growth, "macroeconomic" effects, and technology implementation other than aircraft sales. The study describes in detail the data base used in making these estimates.

The results show that the long-term market penetration of a new technology aircraft of the specific characteristics which could result from NASA-sponsored research would be near 3,000 aircraft. This market penetration would be attained in approximately 20 years. Annual sales would be about 200 aircraft after 5 to 6 years of introduction. The net present value of cost savings benefit which this aircraft would yield (measured on an infinite horizon basis) would be about $35 million counted at a 10-percent discount rate and $120 million at a 5-percent discount rate. At both discount rates, the present value of cost savings exceeds the present value of research and development (R&D) costs estimated for the development of the technology base needed for the proposed aircraft. These results are quite conservative as they have been derived neglecting future growth in the agricultural aviation industry, which has been averaging about 12 percent per year over the past several years.

17. Key Words (Suggested by Author(s)) Aerial applications, agricultural aircraft, cost/benefit, mission profiles.		18. Distribution Statement Unclassified - Unlimited	
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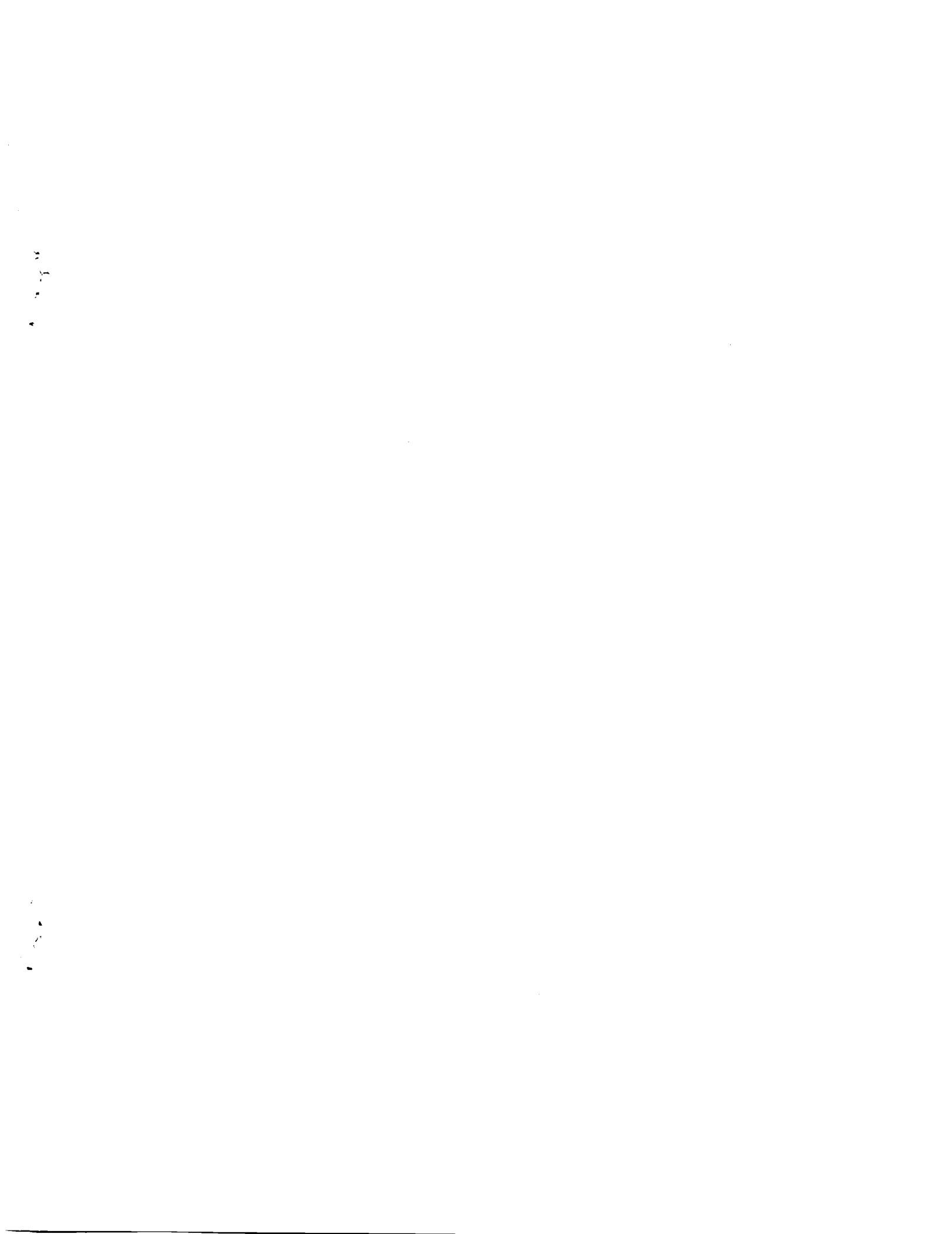
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