IWS-074-23

WALK-THROUGH SURVEY REPORT
Contract #210-77-0096
Beech Aircraft Corporation
Salina, Kansas

DATE OF SURVEY
November 6, 1978

DATE OF REPORT
October 26, 1979

The Johns Hopkins University
Baltimore, Maryland

and

The National Institute for Occupational Safety and Health
Cincinnati, Ohio

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Contract #210-77-0096
Beech Aircraft Corporation
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PURPOSE

The purpose of the walk-through survey of this firm is to examine manufacturing processes, operations, and procedures and personnel records to determine whether this site would be suitable for inclusion in the in-depth survey of the aircraft industry segment of the investigation of health hazards to painters.

PERSONS CONDUCTING SURVEY

Genevieve M. Matanoski, M.D., Dr.P.H., Epidemiologist, The Johns Hopkins University
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PERSONS PREPARING REPORT

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PLANT CONTACTS

Mr. Roy Allen, Salina Division, General Manager
Mr. R. E. Samuelson, Chemical Engineer (Wichita)
Mr. Homer L. Lawrence, Safety Director (Wichita)
Mr. Dennis McMurray, Personnel Manager
Mr. R. K. Campbell, Safety Manager (Wichita)
Mr. Martin D. Bauer, Esq., Corporate Council (Wichita)
Mr. R. B. Hensley, Maintenance Foreman

DESCRIPTION OF PLANT

Beech aircraft Corporation is engaged in the manufacture and sale of light to medium propeller-driven aircraft for general aviation (commercial, business, and pleasure-uses). The firm has its principal manufacturing facilities in four divisions in three plants in Wichita, Kansas 67201, and in Liberal and Salina, Kansas and Boulder, Colorado and has 10,400 employees. Sales of the firm in 1978 were reported as $27.5 x 10^6 (net income $35.5 x 10^5) making it number 404 on the Fortune 500 largest industrials list (entering the list for the first time in 1977). The Salina plant started at the Salina Airport in 1956 and has grown to about 800 employees in 9 major buildings shown in Appendix 1, and summarized in Appendix 2. Total building area of the four divisions was stated to be over 2 x 10^6 square feet. Salina Division was estimated to be about 100,000 square feet.

PROCESS DESCRIPTION

Beech designs and manufactures a full range of piston-engine and turbine-engine propeller driven aircraft from commerical and commuter airline transports and medium-sized 2-engine executive turboprops (8-17 persons, up to 2,200 mile range, up to 333 mph, up to 30,000 foot service ceiling) with pressurized cabins, to luxury and conventional small sport single-engine propeller drive aircraft (2-6 persons, 1,000 mile range, 125-200 mph, service ceiling 12,000 feet). Major components of an aircraft consist of airframe, engine, and avionics and controls. Beech manufactures the airframe, and purchases and installs engines and avionics and controls. Principal airframe components manufactured are illustrated in Appendix 3 for their model 77-Skipper low cost (<$20,000) 2-place trainer. Salina Division manufactures (fabricates parts and assemblies) wings for several Beechcraft models, and builds two-engine pressurized cabin models Duke (model B50) and Baron (model B58P).
(Appendix 3). The general range of selling price for these units extends from <$20,000 for the model 77 to $75,000 for the famous Beechcraft Bonanza to $285,000 for the air-conditioned Baron, and up for the larger aircraft. Over 300 58P Barons and 500 Dukes have been produced . Production rate of these units was stated to be two per week at this site. The number of individual metal airframe parts (inclusive of fasteners) was estimated to be of the order of 300,000. Individual aluminum and other metal parts are formed by sawing, shearing, cutting, drilling, pressing, bending, etc., and prime coated with yellow-green strontium, and zinc chromates in small to medium parts paint spray booths in Buildings 703 or 713. Subassemblies are painted in Building 655. Aircraft major components (e.g. wings, fuselange, empennage, etc.) are assembled by hand or with small semiautomatic tools (power driven riveters, etc.) on appropriate jigs and fixtures. These subassemblies are combined into a full airframe and engines, control systems and avionics are installed. The completed aircraft is towed to Building 606 for final painting.

PAINTING OPERATIONS

Paints used and operations are outlined in Appendix 2. Small parts and subassemblies are painted in Building 703 in a small totally enclosed and ventilated paint spray booth by a single painter using a conventional hand-held air atomized spray gun. Parts are brought in on a transfer wagon and are lined-up for paint on a flat 30-inch high wheeled table containing a horizontal paper honeycomb-like (egg-crate) support by a painter's assistant. The 10 x 10 x 20L spray booth section has a water wash back wall and a ceiling supply grid at the opposite end. It is adjacent to a similarly sized drying oven with double doors normally closed. Paint is stored and mixed in a smaller room adjacent to and part of the spray booth. The painter mixes about 2 gallons at a time by pouring these together into a larger storage pot. Components observed being mixed included Component No. 1 - Pigmented Epoxy Resin Compound MIL23377 C (yellow Pb or Sr Chromate Primer) and Component No. 2 clear Polamode Converter (Catalyst) class 1 by ENMAR Manufacturing Co., Wichita, 52-129-300 COD5-L000544 8170 (requires Toluol and MIBK thinner?). Zinc chromate primer was also noted in the storeroom. This work was stated as being performed under subcontract to Bell Helicopter Division (Textron) in support of a military (US Army, Huey) helicopter contract.

Larger machined parts and certain subassemblies are painted in two large (10W x 20L x 20H) spray booths in machine shop Building 713. General layout of the booths is shown in Appendix 4. Air flow is downdraft from supply grilles in the ceiling to exhaust grids in the floor with water traps to collect overspray and final filters before the side exhaust fans. Materials containing isocyanates were in use during the observation period (U.S. Coatings-Alumagrip Universal Catalyst AA92-C-39). ZnCr Primer was also noted. This booth was built in 1970 for large sub-assemblies hung on the overhead track. Spray booth clean-up is performed by sandblasting about twice per year. Conventional half-mask respiratory protective devices containing 2 organic vapor cartridges with particulate prefilters were observed in the area, but their condition appeared somewhat deteriorated, thus affecting their integrity.

The fully assembled aircraft are finish painted in Building 606, a large hangar (approximately 200 x 200 x 50 feet) which contains on one side a full-plane paint spray booth. Aircraft are rolled in and masked with paper and tape and then surface blemishes (already primed during assembly) are sanded by means of hand-held air-powered orbital sanders (Sonix Tool-558) having integral high velocity, low volume extraction exhaust systems attached. A 3-M respirable dust mask (33-8710) is used during sanding. The aircraft is rolled into the spray booth (approximately 60 x 60 x 20H) and the finish coats are applied (with intermediate hot air drying and outside surface preparation, stripping, etc.) with hand-held conventional air-atomized guns. A full face-piece respirator (Willson R-C1 Canister) is used during painting (11 painters and 8 sanders are employed here and in the two other booths. The spray booth has tightly fitting doors, insulation, and full cross-floor ventilation as well as heating coils for hot air drying.

DESCRIPTION OF WORKFORCE AND PERSONNEL RECORDS

Nine thousand employees work for the Beech Aircraft Corporation in 6 plants in Kansas and Colorado. Painting and primary operations at the Salina Division only started in 1971, even though the plant has been in existence since 1966. The total workforce has doubled in the last 6 years and at present numbers about 800 employees. The workforce is stable with less than 1% turnover per month for most months of the year and approximately 10% for the year. The women make up 20 to 22% of the employees and minority groups including blacks, Asian, and Spanish-American constitute 16% of the force. All age groups within the range of 18 to 65 years are represented. Plant personnel had no break-down of employees by age distribution.

The ten painters, of which one is a woman, are included in the job categories of sprayers and paint mixers. They paint aircraft assemblies and parts using hand-held spray guns. They also clean and maintain the paint equipment. One painter is involved in touch-up work only. In addition, there are 8 to 9 washers and sanders that work near the spray booths.

The personnel records are arranged alphabetically. Each folder contains: Application form with the name, social security number, date of birth, address, educational record, family status, and employment history for the previous five years with position and nature of duties. Sex and race information were included in the past but have been deleted since last year.

Extract from the Birth Certificate

Employee Performance Review which includes badge number (of which the first digit identifies the specific plant of the corporation), the job class and title, and the date employed in that job.

Assignment Record (form 69-31219, was 69-110) includes a name, address, social security number, badge number, starting date, department, classification, previous experience, age, sex, date and place of birth and family status.

Service Record (form 69-303A3, was 69-212) includes information on job changes and terminations with reasons and dates. A copy of this form is stored in the Corporation's headquarters in Wichita, Kansas.

The records are not computerized. They are kept for 3 years after termination. If a worker is re-hired after this period, he receives a new badge number and a new employment record is started. The file is transferred when an employee moves to another plant in the same corporation, but no insert card is left to indicate this.

The Employees' Group Insurance Program is carried by Bankers Life of Nebraska and is offered to those who complete 60 days of employment. The company pays 85% of the monthly premium. The Delta Dental Plan of Kansas, a separate carrier provides only dental care. Personnel entered the retirement system at age 55 previously and at age 70 beginning in January 1979. Early retirement at age 55 or disability retirement is also possible. At present there are only 8 to 10 retirees.

The forms described have had very few changes in the past years. It is uncertain whether all data are recorded on the cards or whether the folders contain all the forms, because on-site review of records was not possible. Payroll information is stored on computer in Wichita. It should be noted that copies of all records are sent to Wichita and may be available there. There are no death certificates retained locally even though the employees have life insurance.

MEDICAL PROGRAM AND RECORDS

Two registered nurses provide medical care for about 40 patients per day in the first aid facility which is a part of the safety department. Workers with serious illnesses or injuries are referred to local physicians for care.

A physician visits the plant each week for about 2 hours to perform pre-employment physical examinations required of all employees. Periodic examinations of those working with specified substances such as chromic acid are required. There are routine pulmonary function tests on everyone who uses a respirator. These are performed by the physician and additional medical work can be scheduled at his office as required.

Yearly audiometry testing is done on all workers by the nurses. There are no other routine medical programs. All painters do receive medical screening and annual medical monitoring.

The medical record file consists of information on employee's name, social security number, badge number, job title, birth date, marital status, previous medical history and physical examination. A dispensary log book is kept which describes symptoms and treatments. Workman's Compensation claims are recorded here, as well as sick leave records and medical release records. Any individual who is absent for five days must have an examination on return to work.

A brief look at the painters' records shows headaches, dermatitis, and stomach aches as frequent complaints. The nurses use a code system for complaints of a sensitive nature.

Reportable accidents are recorded in a log book. The records seem complete and indicate good medical coverage. All records are kept for 8 years after termination. A computerized system does not exist.

INDUSTRIAL HYGIENE AND SAFETY PROGRAM

The firm has a fully developed safety program under the direction of Mr. Lawrence and Mr. Campbell in the Industrial Relations Department. Safety procedures are reduced to policy and procedure orders (see Appendix 5) and communications. Each operating unit has a Safety Council composed of a principal safety professional (5 in the Division of Industrial Relations) and Department Superintendents and Foremen. The safety principal has responsibility for nursing, ambulance, and personal protective device programs. Worker Compensation insurance is carried by Northwestern National. Industrial hygiene services are provided by the state industrial hygiene program upon request (Peter Danning, John Erwin, U.S. Department of Health and Environment, Topeka, Kansas) or on a routine basis about twice per year. Reports were not available at this site. Material Safety Data Sheets were not available at this location.

DESCRIPTION OF ENGINEERING CONTROLS

703 Building - 10 x 10 x 20L closed booth with downflow - crossflow supply to water wash booth. Respirators required.

713 Building - Two 10W x 20 x 20 booths with downflow ventilation to water trap below floor grill and final filters. Respirators required.

606 Building - One large paint spray booth room approximately 60 x 60 x 20H with downflow inlets to crossflow exhaust to water wash wall and with heated air supply for drying and polymerizing coatings (110°F, 20,000 cfm). Total air volume during painting is 82,000 cfm.

REPRESENTATIVE COATING COMPONENTS

Characteristics reported for representative coatings are presented in Appendix 2. Estimated 1,000 gallons per year paint (350 gallons primer, 650 gallons finish) and 2,000 gallons per year solvents (MEK, toluene). The list of painting material is as follows:

U.S. Paint & Lacquer - St. Louis, Mo.

(1) Epoxy Corrosion Resistant Primer

Ameron, Industrial Finishes Division (Enmar)-Andover, Ks.

(2) Epoxy-Polamids Primer MIL-P-23373C

(3) Fuel Resistant Epoxy Primer Integral Fuel Container

(4) Satin Finish Acrylic Lacquer, Interior Decorative Finish

(5) Pre-treatment Wash Primer, Acid Etch Zinc Chromate

Kansas Paint & Color - Wichita, KS

(6) Urethane Lacquer, Modified Acrylic Interior Finish
Koppers, Briolite - Irving, TX

(7) Epoxy Primer Surfacer

Hughson Chemical, Lard Corp. - Erie, PA.

(8) Chemglaz, Urethane Rain Erosion Coating

Ameron and/or Koppers

(9) Zinc Chromate Primer MIL-P-8585A

Bordon, Inc. - Columbus, Ohio

(10) Krylon Acrylic Spray, Decal Protective Coating & Touch-up

Fifteen employees are assigned to paint operations in three paint facilities, day shift only.

Paint Facility	Assignment	Coatings Uses
Bldg. 655	2	items 2 and 9
Bldg. 605	9	items 1,2,3,4,5,6, and 10
Bldg. 713	4	items 1,2,7,8, and 10

CONCLUSION

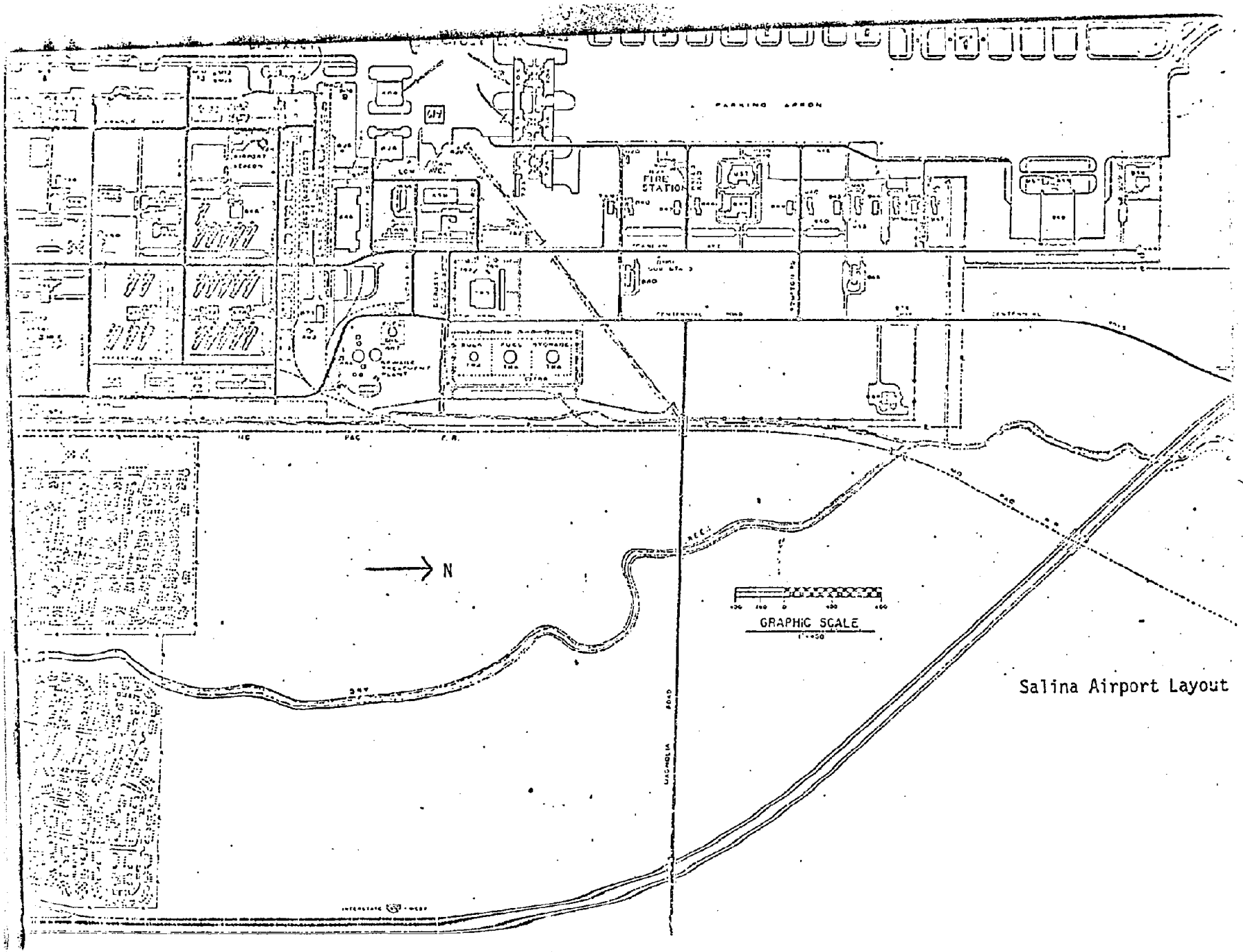
This would be a suitable plant for evaluation of painting exposures from an industrial hygiene standpoint.

This facility would not be ideal for epidemiological studies of possible health hazards from painting since that particular operation has only existed for about eight years and the number of painters is limited.

RECOMMENDATION

Include this plant for further consideration.

APPENDIX 1



Salina Airport Layout

APPENDIX 2

November 1, 1978

Reference: Dept. of HEW Letter to R. W. Allen dated October 19, 1978
Beech Salina Factory Survey

Subject: NIOSH, Beech Aircraft Opening Conference Response, Page 2 of Referenced Letter Questions 1 thru 6

Information Item:

1. We have 9 buildings of varying sizes being used for aircraft assembly and sub-assembly activity. Two buildings are used for parts fabrication, four buildings are used for sub-assembly of aircraft, one (building 606) is used for painting and the remaining buildings are used for tooling, maintenance and a paint booth.

2. Our paint operations are principally performed in 3 paint booths. One located in building 606 is the largest booth equipped to paint completed aircraft. Building 655 has a smaller booth for painting small parts and sub-assemblies. Building 713 contains a small filtered air type booth for painting small parts, etc. However, manufacturing and assembly are also performed in all of these buildings.

Painting and priming is accomplished using hand held pneumatic powered spray gun devices. Two booths are the water curtain type and one is a filtered air type booth. One small water curtain type booth (approx. 6' x 6') in building 703, is occasionally being used for painting nose cones.

The list of painting material is as follows:

U. S. Paint & Lacquer - St. Louis, Mo.
Alumigrip (Polyester-Urethane)
Corrosion Resistant Primer

Ameron, Industrial Finishes Division (Enmar) - Andover, Ks.
Epoxy-Polamids Primer MIL-P-23373C
Fuel Resistant Epoxy
Satin Finish Acrylic Lacquer
Wash Primer-Acid Etch Zinc Chromate

Kansas Paint & Color - Wichita, KS
Urethane Lacquer

Koppers, Briolite - Irving, Tx.
Epoxy Primer Surfacer

2. Continued

Hughson Chemical, Lord Corp. - Erie, Pa.
Chemglaze (Elastomeric Urethane)

Ameron and/or Koppers — MIL-P-8585A/TTA-1757
Zinc Chromate Primer

Borden, Inc. - Columbus, Ohio
Krylon Acrylic Spray Coating — Clear & Flat Black

3. Approximately eleven people, plant-wide, are assigned to paint aircraft assemblies and/or parts; this includes one female assignment. All employees are day shift employees with the exception of one employee on split shift for the purpose of touch up work only.

4. Our medical program includes a medical doctor to do the pre-employment physicals and periodic examination of employees working with specified substances. The doctor is present at our first aid facilities approximately two hours each week and the remaining medical work is scheduled at the doctor's office as required.

In addition, our medical staff consists of two full-time registered nurses manning a complete first aid facility. We also have sixteen employees strategically located and certified by Red Cross for first aid treatment, along with approximately twenty-five certified CPR attendants.

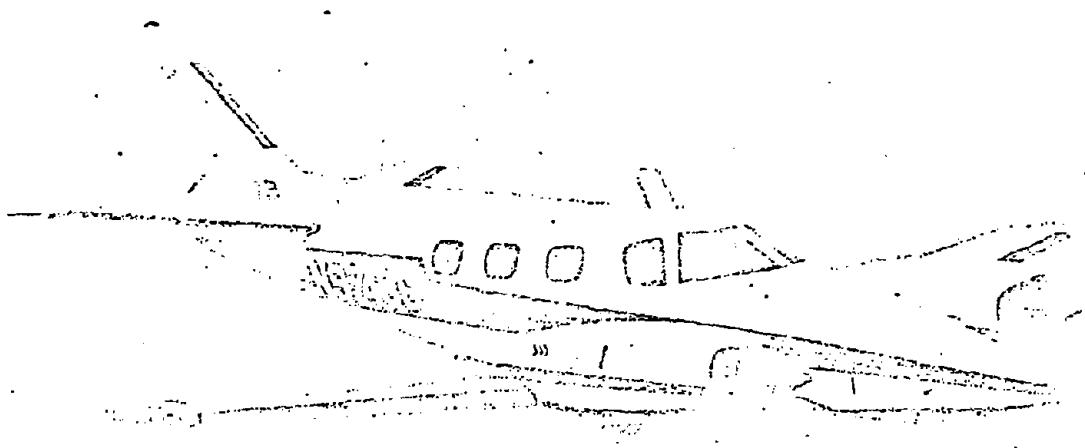
Our safety program consists of a Safety Director maintaining an on-going safety program which includes a safety council and a "Labor Management Safety Committee." Industrial hygiene programs include services of the State Department of Health and Environment, Wilson Laboratories of Salina and in-house exposure measurements by the Wichita Chemical Engineering Laboratory as required.

5. A verbal review of testing done by the State of Kansas and OSHA will be discussed at the opening conference.

6. One new paint booth has been installed, and one has been improved and updated. Improved comprehensive respiratory protective programs have been expanded and periodically updated.

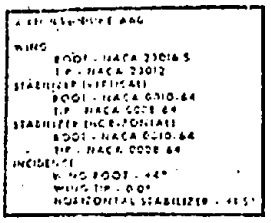
Beech Aircraft Corporation
Salina Division

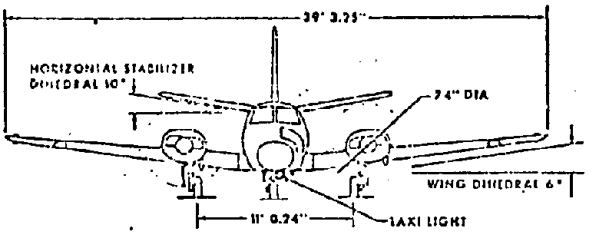
APPENDIX 3

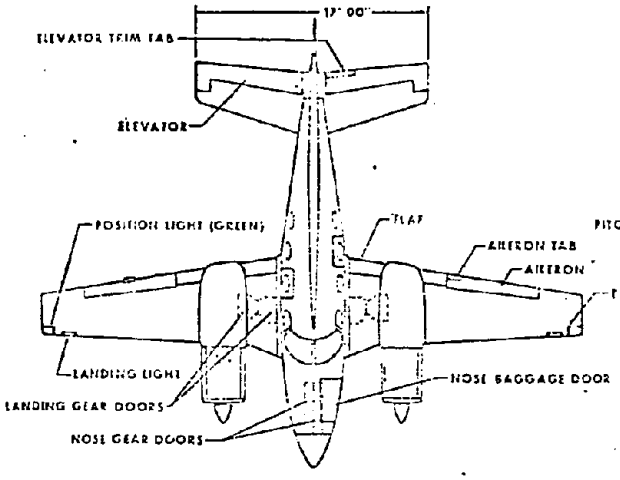


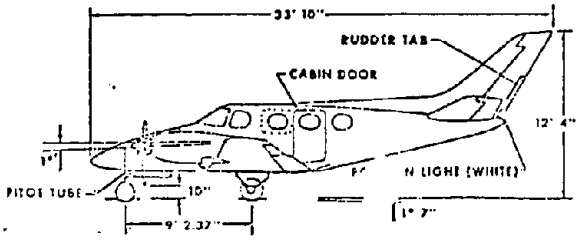
BEECHCRAFT DUKE B60

Pressurized, all-weather aircraft with advanced styling flown by many of its pilot-owners. With twin turbocharged 380-hp engines, the Duke B60 cruises up to 275 mph, flies up to 30,000 feet.

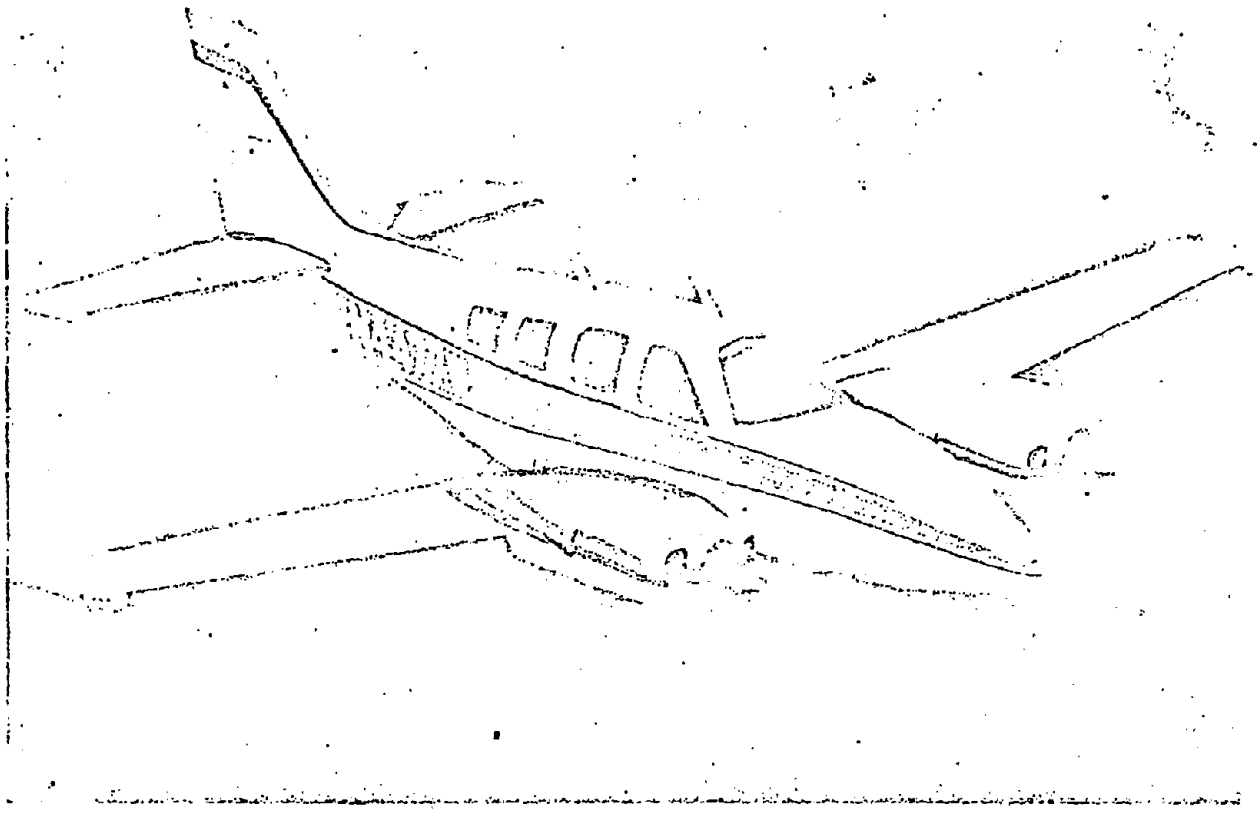








Beechcraft®
DUKE B60

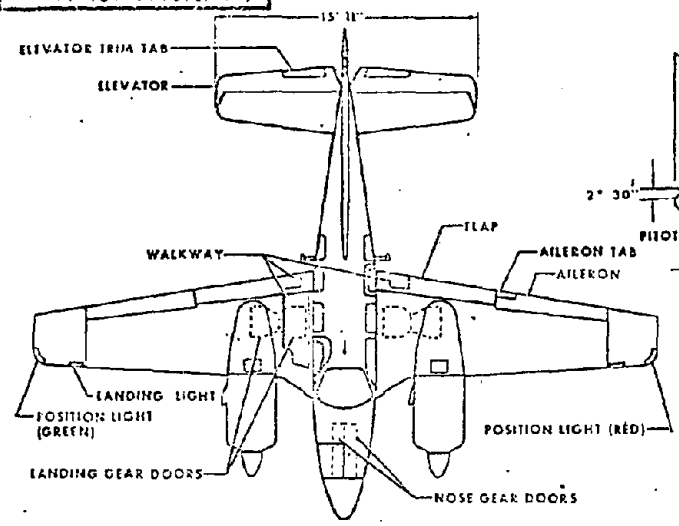


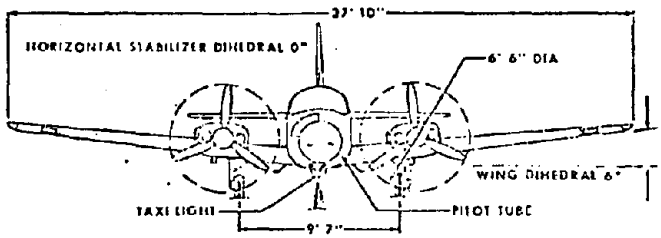
BEECHCRAFT BARON 58P

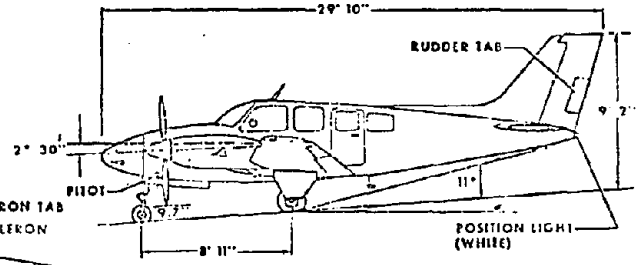
The Beechcraft Baron 58P is designed for efficient corporate transportation. . . .and it does its job well. Six people can travel in pressurized comfort at altitudes up to 25,000 feet and speeds up to 277 mph.

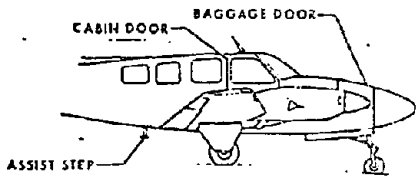
AIRFOILS - BARON 58P

WING
ROOT - NACA 23016.5
TIP - NACA 23010.5
STABILIZER (VERTICAL)
NACA 0008 MODIFIED
STABILIZER (HORIZONTAL)
NACA 0009 MODIFIED
INCIDENCE
WING ROOT - +4°
WING TIP - 0.0°
HORIZONTAL STABILIZER - +2°

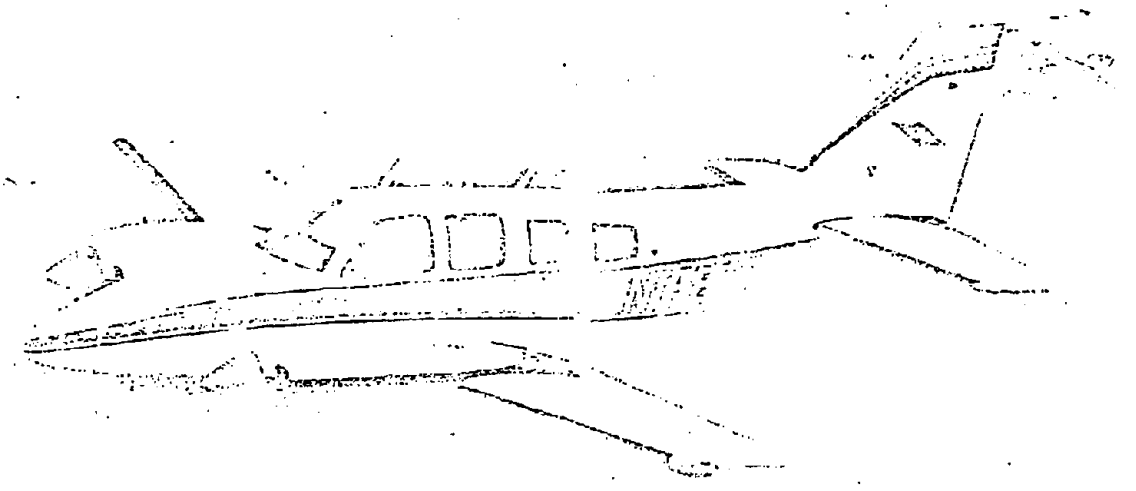








Beechcraft®
BARON 58P



BEECHCRAFT BARON 58TC

The Beechcraft Baron 58 is the most versatile Baron of them all. . .with optional club seating for roominess and comfort, and huge double doors for ease of entry and cargo loading. And now a turbocharged Beechcraft Baron 58TC that cruises at 267 mph is available.

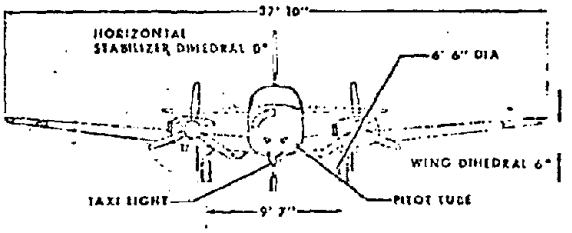
AIRFOILS - BARON 58TC

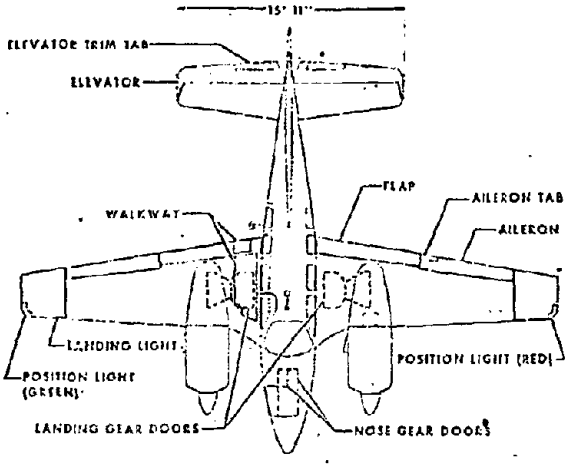
WING:
ROOT - NACA 23016.5
TIP - NACA 23010.5

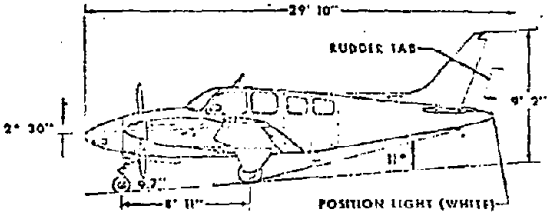
STABILIZER (VERTICAL):
NACA 0008 MODIFIED

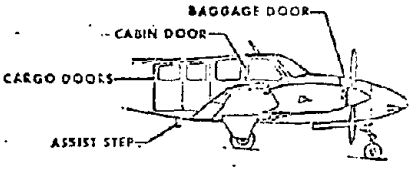
STABILIZER (HORIZONTAL):
NACA 0009 MODIFIED

INCIDENCE:
WING ROOT - 4.4°
WING TIP - 0.0°
HORIZONTAL STABILIZER - 4.2°

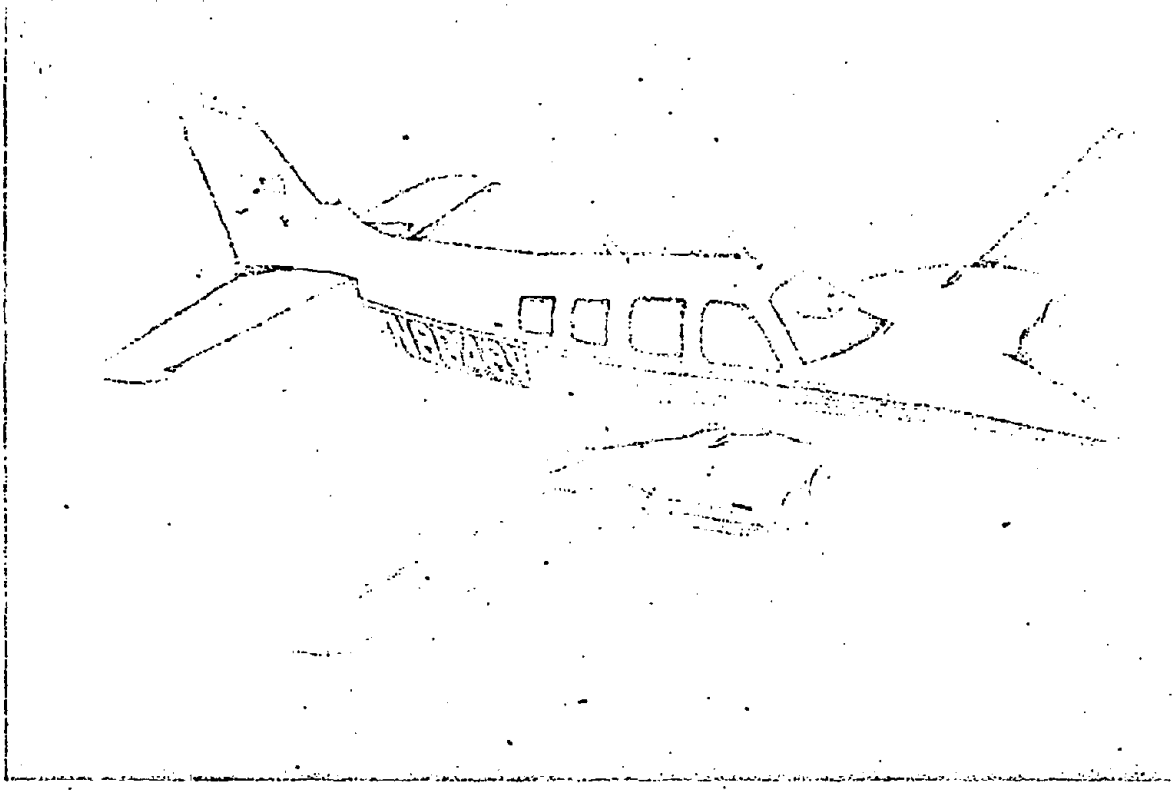






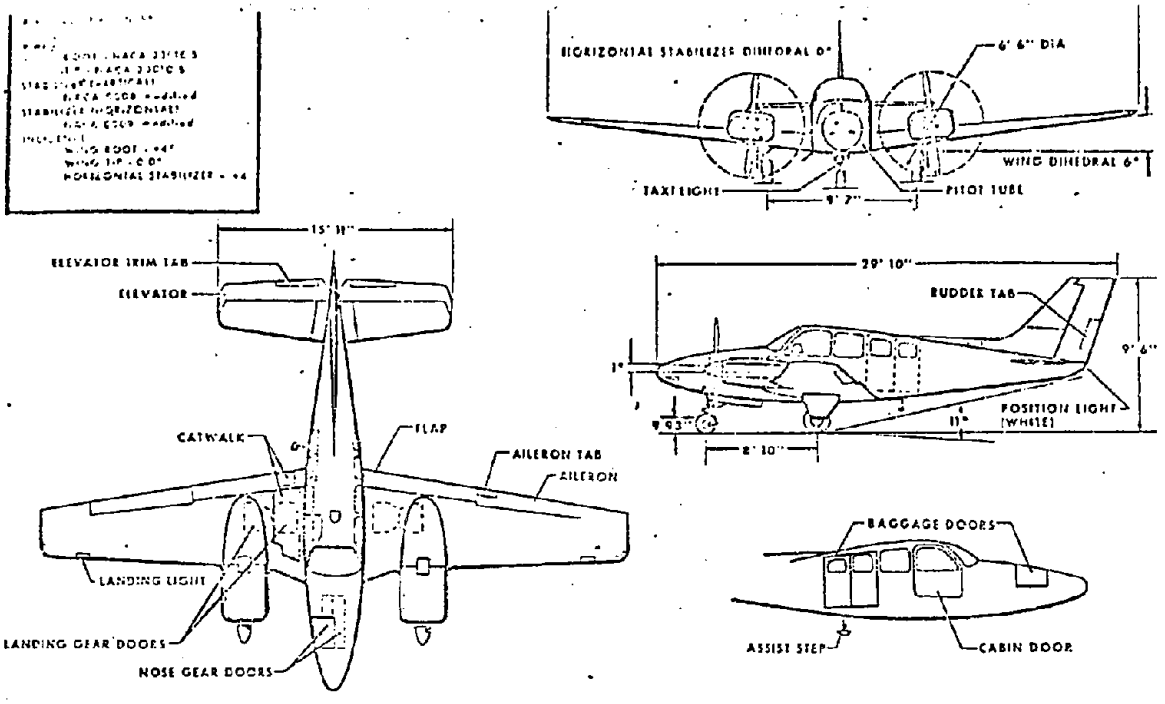


Beechcraft
BARON 58TC

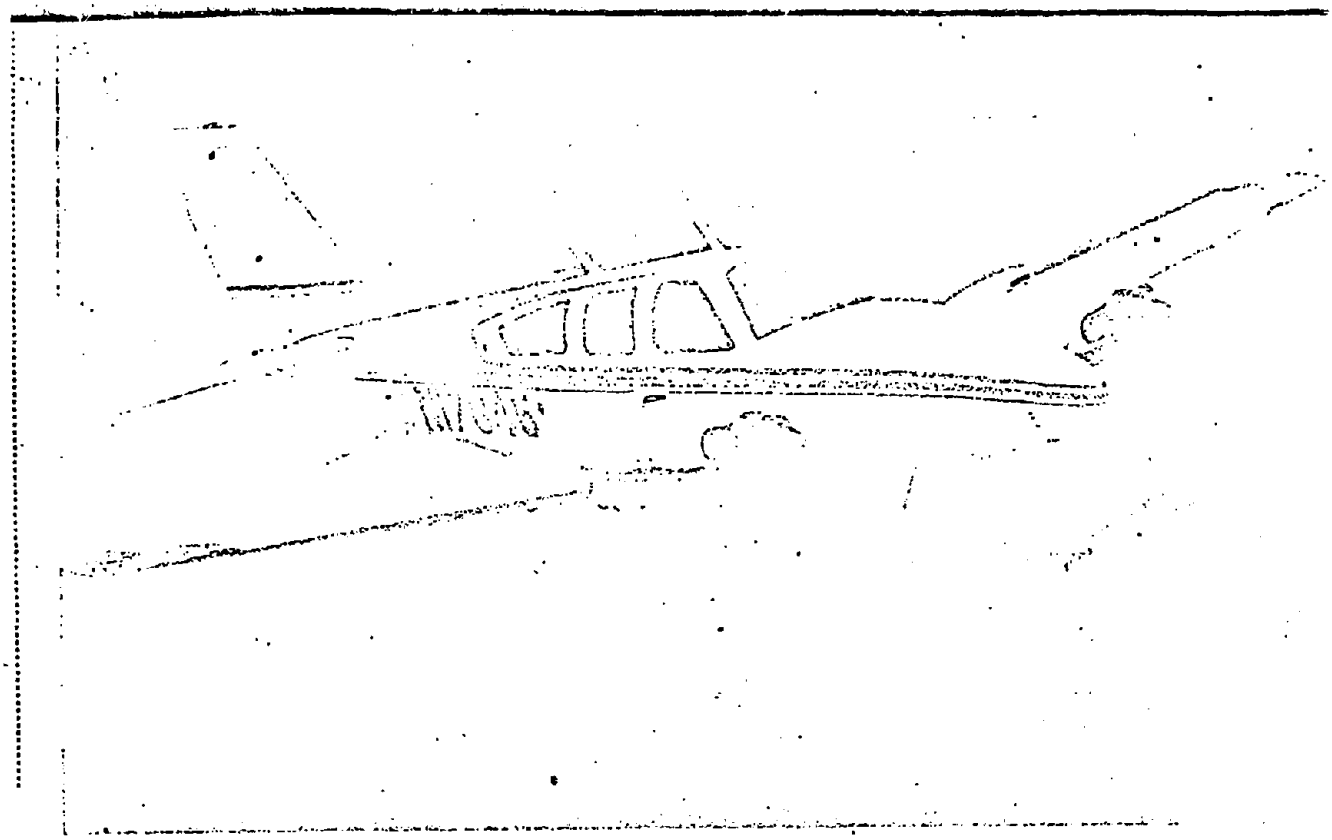


BEECHCRAFT BARON 58

- *Largest cabin in the light twin-engine field. Oxygen installation is available for high flying, has rear double door. Strong landing gear retracts in just 4½ seconds. Cruises at 230 mph and up to 18,600 foot altitude.*

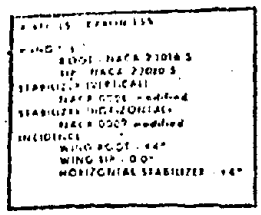


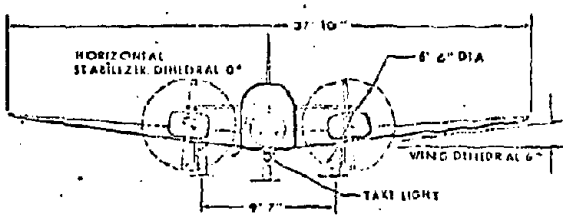
Beechcraft®
BARON 58

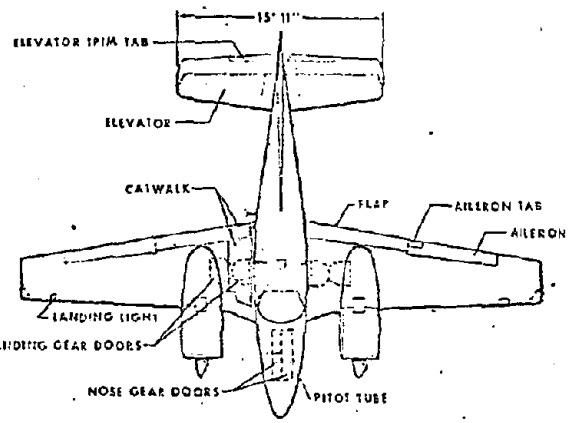


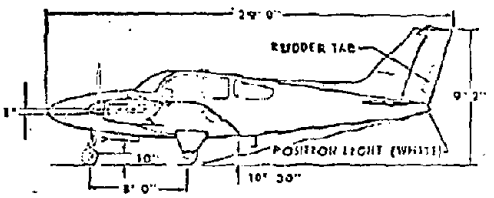
BEECHCRAFT BARON E55

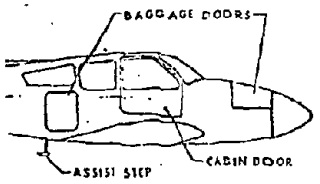
Powerful twin with seats for six people. Fuel-injection, 285-hp engines. Short-field takeoff and landing capability permits operation from unimproved landing strips.



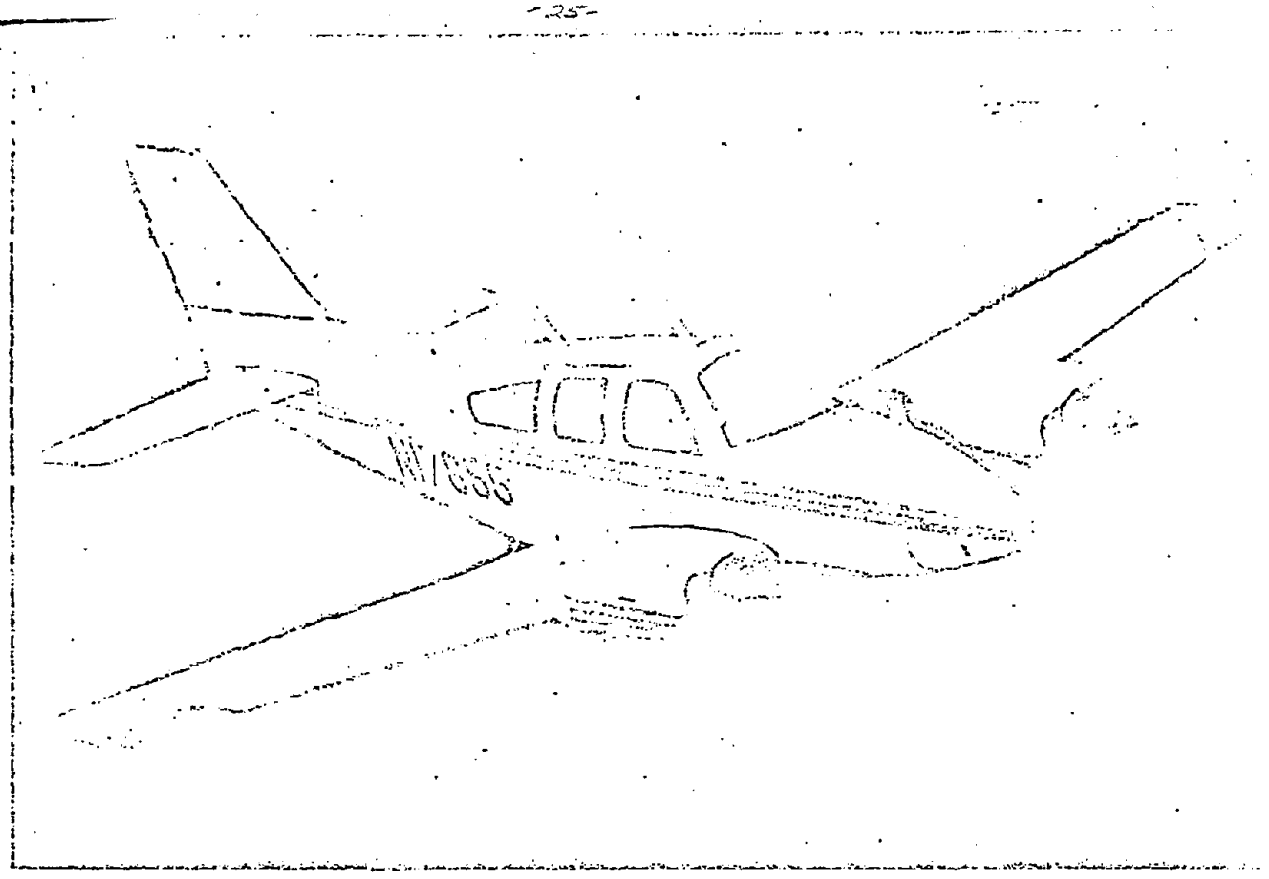






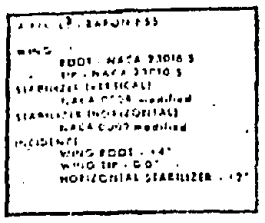


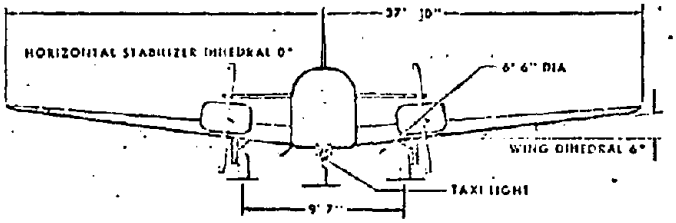
Beechcraft
BARON E55

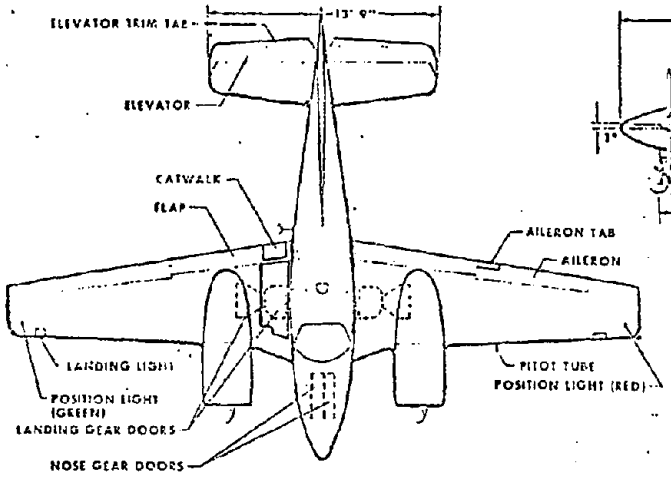


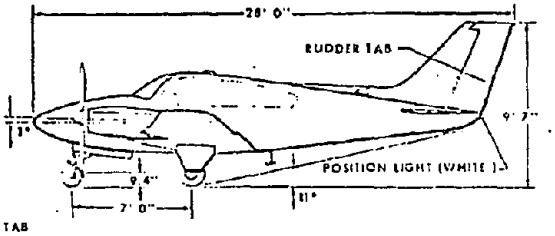
BEECHCRAFT BARON B55

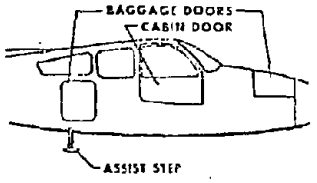
With six seats and cargo door, the Baron B55 is in a distinctive class of versatile aircraft. Pilots like the combination of its 216 mph cruise speed with economical twin 260-hp engines.





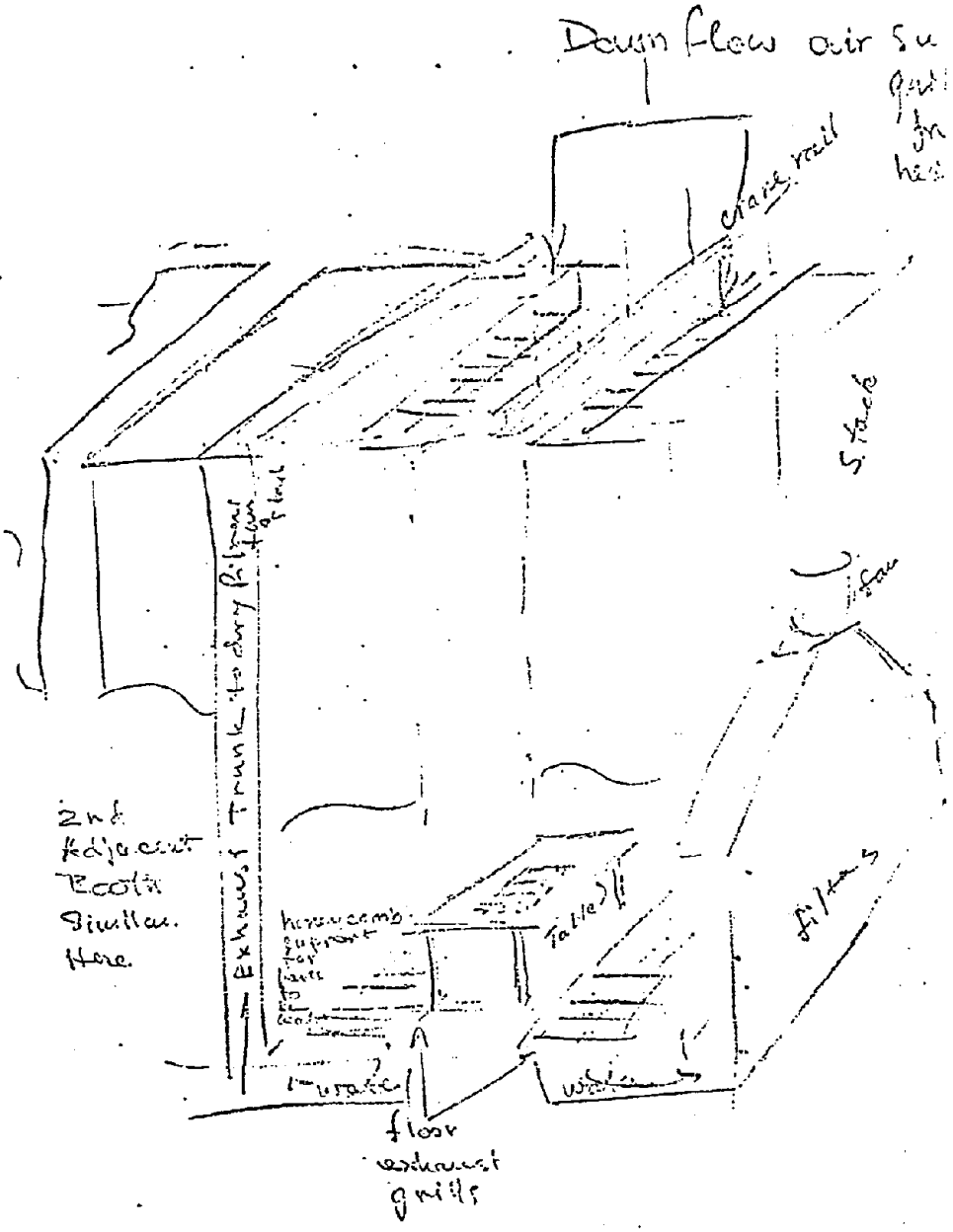






Beechcraft®
BARON B55

APPENDIX 4



BLDG 713 MACH SHOP PAINT SPRA
BOOTH SCHEMATIC

APPENDIX 5

8/14/7

NOTICE TO PROCESSING DEPARTMENT EMPLOYEES

SAFETY PROCEDURE

EMPLOYEE PROTECTIVE EQUIPMENT - RESPIRATORS

RESPIRATOR ASSIGNMENT & MAINTENANCE

1. Respirators will be issued to each person as required or they may be checked out on their personal tool card at Crib #1, Wichita. Supervisors at all facilities will insure availability and use of this equipment.

2. Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly.

3. Replacement parts as required may be obtained from the using department's or from the tool cribs. The entire unit must be replaced immediately upon determination of nonrepairable malfunction. Defective units requiring new parts may not be used until repaired.

4. Following assignment changes that no longer require the use of the respirator the assignees will return the respirators to the place of issue and clear their tool card.

RESPIRATOR SANITARY REQUIREMENTS

1. Respirators will be used only by those to whom the respirator is issued; when not in use they must be placed in protective containers and stored in designated places.

2. All respirators returned will be repaired, functionally tested, repackaged and sanitized before reissue.

RESPIRATOR CARTRIDGE REPLACEMENT REQUIREMENTS

1. The time to replace cartridges is when you find it becomes difficult to breathe normally.

2. Use only the cartridge number listed on the attached guide for your specific requirements.

3. Paint respirators must be equipped with pre-filters in conjunction with the cartridg These pre-filters extend the life of the cartridges at a fraction of the cartridge cos and should be replaced frequently to assure ease of breathing through the cartridge

SAFETY DEPARTMENT
8/14/78

Attachment
cad

RESPIRATOR GUIDE CHART

AGENT	ITEM	PART NO.	MATERIAL CODE
Paint, primer mist, lacquer, Enamel and organic vapor	Cartridge Filter Filter Cover	7500-01 7500-10 7500-14	12-10-0450 12-10-0500 12-10-0550
Acid gases, and mists	Cartridge Filter Filter Cover	7500-03 7500-06 7500-14	12-10-1000 12-10-1050 12-10-0550
Alkaline gases and mists - Amonia	Cartridge Filter Filter Cover	7500-04 7500-06 7500-14	12-10-1005 12-10-1050 12-10-0550
Primer dust, metal fume and Smoke	Cartridge Filter Filter Cover	7500-08 None None	12-10-1040
Insecticides	Cartridge Filter Filter Cover	7500-21 7500-23 7500-14	12-10-0900 12-10-0950 12-10-0550
Heavy dust generated by sanding Or construction and maintenance Work	Filter Male Holder Filter Holder	7500-06 7500-13 7500-14	12-10-1050 12-10-1080 12-10-0550
Respirator (Large)	Face Piece	7500-30	12-10-1015
Respirator (Medium)	Face Piece	7500-30M	12-10-1045

RESPIRATOR
(Spare Parts)

Part Name	Part No.	Material Code
Inhalation Valve	7500-17	12-10-0650
Exhalation Valve	7500-18	12-10-0750
Head Band	7500-12	12-10-0850

(SPARE PARTS LIST)