PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

for the

Beechcraft

Sundowner 180

C23

FAA APPROVED IN NORMAL AND UTILITY CATEGORY BASED ON CAR 3. THIS DOCUMENT MUST BE CARRIED IN THE AIRPLANE AT ALL TIMES AND BE KEPT WITHIN REACH OF THE PILOT DURING ALL FLIGHT OPERATIONS.

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY FAR PART 23.

Mfr's Serial No. _____

Registration No. _____

FAA Approved by: _____

THIS HANDBOOK SUPERSEDES ALL BEECH PUBLISHED OWNERS MANUALS AND CHECK LISTS ISSUED FOR THIS AIRPLANE WITH THE EXCEPTION OF FAA APPROVED AIRPLANE FLIGHT MANUALS.

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Beechcraft
A Raytheon Company

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Manufacturers Association

INTRODUCTION

This Pilot's Operating Handbook and FAA Approved Airplane Flight Manual is in the format and contains data recommended in the GAMA (General Aviation Manufacturers Association) Handbook Specification Number 1. Use of this specification by all manufacturers will provide the pilot the same type data in the same place in all of the handbooks.

In recent years BEECHCRAFT handbooks contained most of the data now provided, however, the new handbooks contain more detailed data and some entirely new data.

For example, attention is called to Section X SAFETY INFORMATION. While little of the information is new and every pilot has been exposed to the basic fundamentals, BEECHCRAFT feels it is highly important to have SAFETY INFORMATION in a condensed form in the hands of the pilots. The SAFETY INFORMATION should be read and studied. Periodic review will serve as a reminder of good piloting techniques.

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PILOT'S OPERATING HANDBOOK

and

FAA APPROVED AIRPLANE FLIGHT MANUAL

TABLE OF CONTENTS

A4 ..... January, 1982

LOG OF REVISIONS

Page	Description
Title Page	Added Revision Date
Logo Page	Added
Page A (A4)	Updated
5-1	Revised "Table of Contents"
5-3 thru 5-6	Revised "Introduction to Performance and Flight Planning"
5-18	Revised "Cruise Performance" chart
5-19	Shifted Material and Added "Notes"
5-20	Shifted Material
5-21	Added New Page and Shifted Material
5-22	Added New Page
7-1	Revised "Table of Contents"
7-3	Revised "Table of Contents"
7-5	Shifted Material
7-6	Shifted Material
7-11	Shifted Material and Revised "Flight Instruments"
7-25	Shifted Material and Revised "Alternator"
7-26 and 7-27	Shifted Material and Revised "External Power Receptacle"
7-28	Shifted Material and Revised "Interior Lighting"
7-30	Shifted Material
7-31	Shifted Material

98-38307

LOG OF REVISIONS

Page	Description
7-32	Shifted Material
8-1	Revised "Table of Contents"
8-10 and 8-11	Shifted Material and Revised "External Power Receptacle"

A4

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A3 ..... August,1980

LOG OF REVISIONS

Page	Description
Title Page	Added Revision Date
Page A (A3)	Updated
1-4 and 1-5	Revised "Use of Handbook"
1-6	Shifted Material
1-15	Revised "Engine Controls and Instruments"
2-5	Revised "Power Plant Limitations"
2-12	Revised "Electrical Power"
2-27	Revised "Fuel Selector Panel" Placard
2-28	Shifted Material
3-1	Revised "Table of Contents"
3-3	Revised "Emergency Airspeeds" and Added Note
3-7	Revised "Emergency Descent"
3-8 and 3-9	Added "Starter Engaged Warning Light Illuminated" and Revised "Alternator Out Procedure"
3-10 and 3-11	Shifted Material
4-1	Revised "Table of Contents"
4-5	Shifted Material
4-6	Revised "Before Starting"
4-7	Shifted Material
4-8	Revised "Starting"
4-9	Revised "Before Take-off"
4-10 thru 4-12	Shifted Material
6-5	Revised "Weighing Instructions"
6-11	Revised "Weight and Balance Responsibilities"
7-2	Revised "Table of Contents"
7-15	Revised "Shoulder Harnesses"
7-18 and 7-19	Shifted Material

LOG OF REVISIONS

Page	Description
7-20	Revised "Starter"
7-21 and 7-23	Revised "Fuel System"
8-15	Revised "Tires"
8-34 and 8-35	Revised "Consumable Materials"
8-41	Revised "Power Plant"

10-1 Thru 10-67
Revised Safety Section
Dated March 1981.

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LOG OF REVISIONS

A2 . . . . . October 1979

PAGE	DESCRIPTION
Title Page	Update
Page A (A2)	New
2-1	Update Table of Contents
2-5	Add "Fuel Additives"
2-6	Shift Material
2-7	Revise "Weight Limits" and "Center of Gravity Limits"
2-8	Revise "Maneuver Limits"
4-1	Update Table of Contents
4-8	Revise "After Starting and Before Taxi"
4-10	Shift Material
4-11	Revise "Descent"
4-15	Add "Noise Characteristics"
8-8	Revise "Jacking"
8-35	Revise "Consumable Materials"
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LOG OF REVISIONS

A1 ..... APRIL 1979

PAGES	DESCRIPTION
Title Page	Update
A1	New
1-9	Add NOTE
3-3	Revise material
3-4	Revise material
3-7	Revise switch designation
3-8	Revise switch designation
4-6	Revise switch designation
4-7	Add 28-volt system information
4-8 & 4-9	Shift material
4-12	Revise switch designation
7-2 & 7-3	Update Table of Contents
7-11	Revise "Switches"
7-24 & 7-25	Revise switch designation Revise "Battery"
7-25	Revise "Alternator"
7-26 & 7-27	Shift material and add revised "External Power Receptacle"
7-32	Revise switch designation
8-2	Update Table of Contents
8-11	Revise "External Power"
8-14 & 8-15	Revise "Battery"
8-34	Revise "Consumable Materials"
8-38	Revise "Bulb Replacement Guide"

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LOG OF REVISIONS

Original . . . . . February, 1979

PAGES	DESCRIPTION
Title Page	Original
"A" Page	Original
a and b	Original
1-1 thru 1-18	Original
2-1 thru 2-32	Original
3-1 thru 3-12	Original
4-1 thru 4-14	Original
5-1 thru 5-20	Original
6-1 thru 6-20	Original
7-1 thru 7-32	Original
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Section 9	See Log of Supplements
10-1 thru 10-30	Original

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SECTION I

GENERAL

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

THANK YOU . . . for displaying confidence in us by selecting a BEECHCRAFT airplane. Our design engineers, assemblers and inspectors have utilized their skills and years of experience to ensure that the BEECHCRAFT meets the high standards of quality and performance for which BEECHCRAFT airplanes have become famous throughout the world.

IMPORTANT NOTICE

This handbook must be read carefully by the owner and operator in order to become familiar with the operation of the airplane. Suggestions and recommendations have been made within it to aid in obtaining maximum performance without sacrificing economy. Be familiar with, and operate the airplane in accordance with the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, and/or placards which are located in the airplane.

As a further reminder, the owner and operator of this airplane should also be familiar with the Federal Aviation Regulations applicable to the operation and maintenance of the airplane and FAR Part 91 General Operating and Flight Rules. Further, the airplane must be operated and maintained in accordance with FAA Airworthiness Directives which may be issued against it.

The Federal Aviation Regulations place the responsibility for the maintenance of this airplane on the owner and the operator who should ensure that all maintenance is done by qualified mechanics in conformity with all airworthiness requirements established for this airplane.

All limits, procedures, safety practices, time limits, servicing, and maintenance requirements contained in

this handbook are considered mandatory for the continued airworthiness of this airplane, in a condition equal to that of its original manufacture.

Authorized BEECHCRAFT Aero or Aviation Centers and International Distributors or Dealers can provide recommended modification, service, and operating procedures issued by both FAA and Beech Aircraft Corporation, which are designed to get maximum utility and safety from this airplane.

USE OF THE HANDBOOK

The Pilot's Operating Handbook is designed so that necessary documents may be maintained for the safe and efficient operation of the airplane. The handbook has been prepared in loose leaf form for ease in maintenance and in a convenient size for storage. The handbook has been arranged with quick reference tabs imprinted with the title of each section and contains ten basic divisions:

Section I	General
Section II	Limitations
Section III	Emergency Procedures
Section IV	Normal Procedures
Section V	Performance
Section VI	Weight and Balance/Equipment List
Section VII	Systems Description
Section VIII	Handling, Servicing and Maintenance
Section IX	Supplements
Section X	Safety Information

NOTES

Except as noted, all airspeeds quoted in this handbook are Indicated Airspeeds (IAS) and assume zero instrument error.

Due to the large variety of airplane configurations available through optional equipment, it should be noted that in describing and illustrating the handbook, optional equipment may not be designated as such in every case. Through variations provided by custom designing, the illustrations in this handbook will not be typical of every airplane.

Neither Service Publications, Reissues, nor Revisions are automatically provided to the holder of this handbook. For information on how to obtain "Revision Service" applicable to this handbook, consult any BEECHCRAFT Aero or Aviation Center or International Distributor or Dealer or refer to the latest revision of BEECHCRAFT Service Instructions No. 0250-010.

Beech Aircraft Corporation expressly reserves the right to supersede, cancel and/or declare obsolete any part, part numbers, kits or publication that may be referenced in this handbook without prior notice.

The owner/operator should always refer to all supplements, whether STC Supplements or Beech Supplements, for possible placards, limitations, normal, emergency and other operational procedures for proper operation of the airplane with optional equipment installed.

REVISING THE HANDBOOK

Immediately following the title page is the "Log of Revisions" page(s). The Log of Revisions pages are used for maintaining a listing of all effective pages in the handbook (except the SUPPLEMENTS section), and as a record of revisions to these pages. In the lower right corner of the

outlined portion of the Log of Revisions is a box containing a capital letter which denotes the issue or reissue of the handbook. This letter may be suffixed by a number which indicates the numerical revision. When a revision to any information in the handbook is made, a new Log of Revisions will be issued. All Logs of Revisions must be retained in the handbook to provide a current record of material status until a reissue is made.

WARNING

When this handbook is used for airplane operational purpose it is the pilot's responsibility to maintain it in current status.

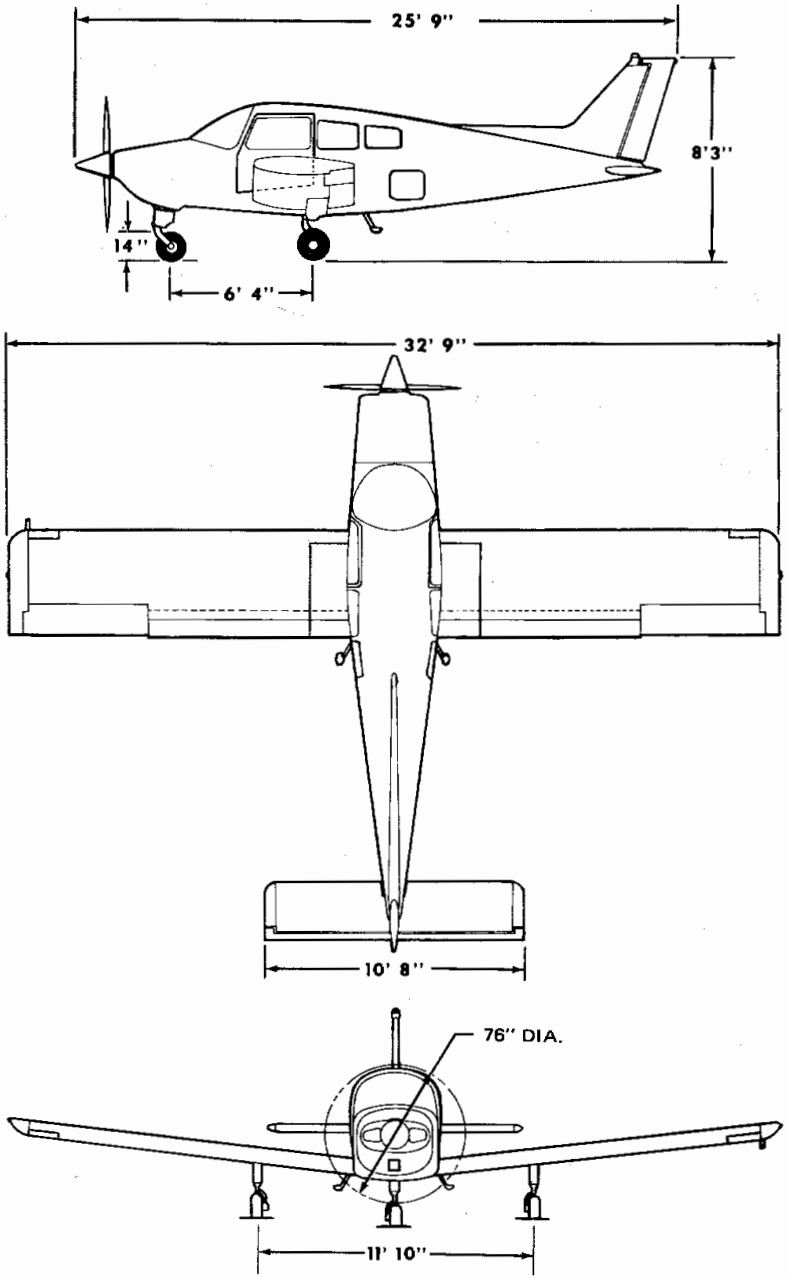
SUPPLEMENTS REVISION RECORD

Section IX contains supplements and a Log of Supplements page. On the "Log" page is a listing of the supplemental equipment available for installation on the BEECHCRAFT airplane.

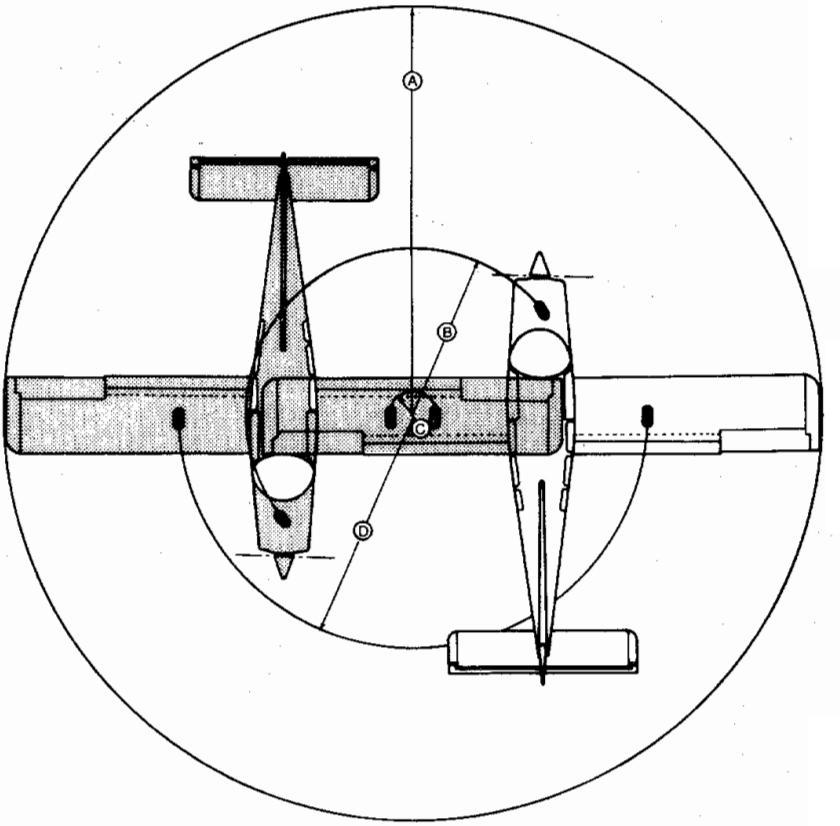
Upon receipt of a new or revised supplement, compare the "Log" page just received with the existing "Log" page in the manual. Retain the "Log" page with the latest date on the bottom of the page (this log will usually have the greater number of entries) and discard the other log.

VENDOR-ISSUED STC SUPPLEMENTS

When a new airplane is delivered from the factory, the handbook delivered with it contains either an STC (Supplemental Type Certificate) Supplement or a Beech Flight Manual Supplement for every installed item requiring a supplement. If a new handbook for operation of the airplane is obtained at a later date, it is the responsibility of the owner/operator to ensure that all required STC Supplements (as well as weight and balance and other pertinent data) are transferred into the new handbook.



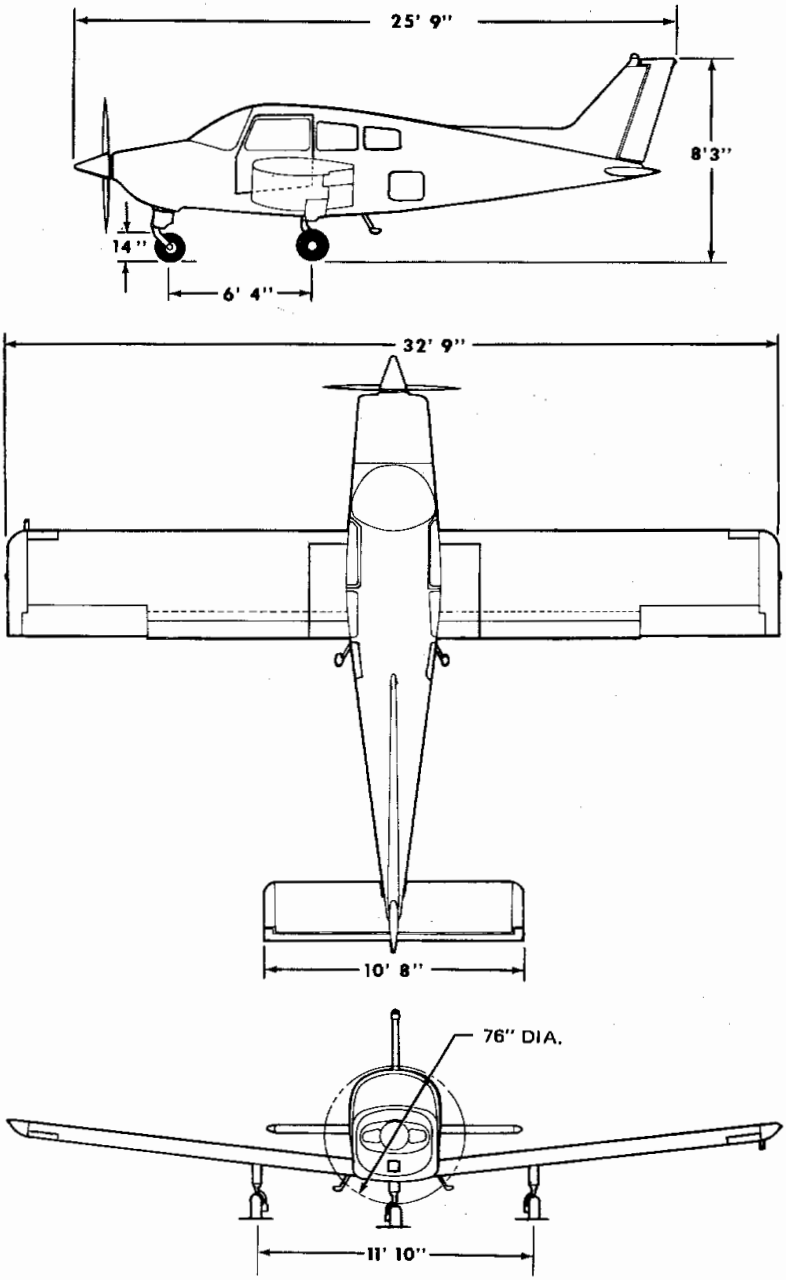
THREE VIEW



GROUND TURNING CLEARANCE

Ⓐ Radius for Wing Tip	23 ft. 11 in.
Ⓑ Radius for Nose Wheel	9 ft. 10 in.
Ⓒ Radius for Inside Gear	2 ft. 0 in.
Ⓓ Radius for Outside Gear	13 ft. 0 in.

TURNING RADII ARE CALCULATED USING FULL STEERING, ONE BRAKE AND PARTIAL POWER.



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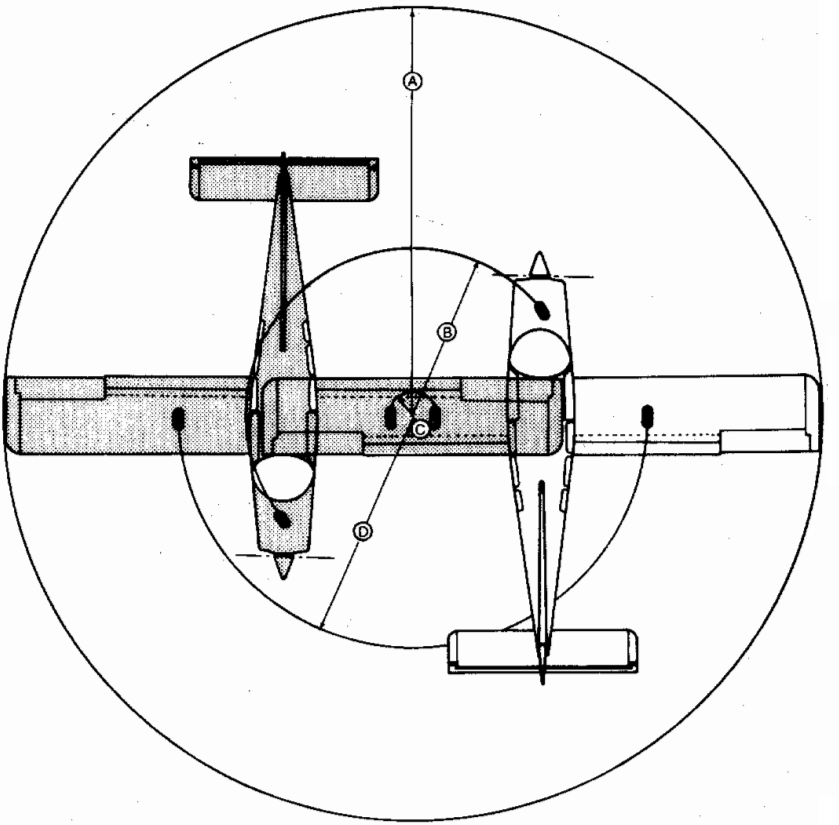
THREE VIEW



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TURNING RADII ARE CALCULATED USING FULL STEERING, ONE BRAKE AND PARTIAL POWER.

DESCRIPTIVE DATA

NOTE

M-1285 thru M-2178 are 14-volt systems. The battery switch is placarded BATTERY & ALT and the alternator switch is placarded ALT (or ALT FIELD). 28-volt systems, M-2179 and after, are placarded BATTERY for the battery switch and ALT FIELD for the alternator switch. All items throughout this handbook that refer to battery switch refer to either BATTERY & ALT switch or BATTERY switch depending upon configuration.

ENGINE

Airplane is equipped with an Avco Lycoming O-360-A2G, O-360-A4G, O-360-A4J or O-360-A4K engine rated at 180 horsepower.

Take-off and maximum continuous operation (sea level): 2700 rpm, full throttle.

Engine cooling has been demonstrated for a 100° F day.

PROPELLER

Sensenich M76EMMS-0-60 or 76EM8S5-0-60 fixed pitch, two blade propeller. Static rpm at maximum permissible throttle settings: Not over 2350 rpm and not under 2250 rpm. No additional tolerance permitted.

FUEL

Aviation Gasoline 91/96 (blue) minimum grade or 100 (green) or 100LL (blue).

M-1285 thru M-1516:

*59.8-gallon system

(29.9 gallons each tank) ..... *58 gallons usable

Each tank has provisions for partial filling to:

20 gallons each tank ..... 38.2 gallons usable

15 gallons each tank ..... 28.2 gallons usable

M-1517 thru M-1879 except M-1875 and prior airplanes after compliance with Service Instructions No. 0624-281:

*59.8-gallon system
(29.9 gallons each tank) ..... *52 gallons usable

Each tank has provisions for partial filling to:

20 gallons each tank ..... 32.2 gallons usable
15 gallons each tank ..... 22.2 gallons usable

M-1875, M-1880 and after:

*59.8-gallon system
(29.9 gallons each tank) ..... *57.2 gallons usable

Each tank has provisions for partial filling to:

20 gallons each tank ..... 37.4 gallons usable
15 gallons each tank ..... 27.4 gallons usable

*Value given is nominal. Tank capacity will vary with temperature and manufacturing tolerances.

OIL CAPACITY

The oil capacity is 8 quarts.

APPROVED OIL TYPES

Avco Lycoming Specification Number 301E approves for use lubricating oils which conform to both MIL-L-6082B straight mineral type and MIL-L-22851 ashless dispersant lubricants for airplane engines. Refer to the Approved Engine Oils table in the HANDLING, SERVICING AND MAINTENANCE section for a list of approved products.

MAXIMUM CERTIFICATED WEIGHTS

NORMAL CATEGORY

Maximum Ramp Weight	2455 lbs
Maximum Take-Off Weight	2450 lbs
Maximum Landing Weight	2450 lbs

UTILITY/ACROBATIC CATEGORY

Maximum Ramp Weight	2035 lbs
Maximum Take-Off Weight	2030 lbs
Maximum Landing Weight	2030 lbs

ALL CONFIGURATIONS

Maximum Zero Fuel Weight	No Structural Limit
Maximum Weight in Baggage Compartment	270 lbs.

CABIN AND ENTRY DIMENSIONS

Length (maximum)	7 ft 11 in.
Height (maximum)	4 ft 0 in.
Width (maximum)	3 ft 8 in.
Cabin Door	36 in. wide by 38 in. high

BAGGAGE SPACE AND ENTRY DIMENSIONS

Compartment Volume	19.5 cu ft
Door Width (Minimum)	23.6 in.
Door Height (Minimum)	18.5 in.

SPECIFIC LOADINGS (2450 lbs.)

Wing Loading	16.78 lbs/sq ft
Power Loading	13.61 lbs/hp

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

The following Abbreviations and Terminologies have been listed for convenience and ready interpretation where used within this handbook. Whenever possible, they have been categorized for ready reference.

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

CAS Calibrated Airspeed is the indicated speed of an airplane, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

GS Ground Speed is the speed of an airplane relative to the ground.

IAS Indicated Airspeed is the speed of an airplane as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.

KCAS Calibrated Airspeed expressed in "knots".

KIAS Indicated Airspeed expressed in "knots".

TAS True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature, and compressibility.

V_A	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{FE}	Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.
V_{NE}	Never Exceed Speed is the speed limit that may not be exceeded at any time.
V_{NO} or V_C	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
V_S	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V_{SO}	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
V_X	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V_Y	Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.
Cruise Climb	Recommended Climb Speed for enroute climb.

METEOROLOGICAL TERMINOLOGY

ISA	International Standard Atmosphere in which (1) The air is a dry perfect gas; (2) The temperature at sea level is 15° Celsius (59° Fahrenheit); (3) The pressure at sea level is 29.92 in Hg. (1013.2 millibars); (4) The temperature gradient from sea level to the altitude at which the temperature is -56.5° C (-69.7° F) is -0.00198° C (-0.003566° F) per foot and zero above that altitude.
OAT	Outside Air Temperature is the free air static temperature, obtained either from inflight temperature indications adjusted for instrument error and compressibility effects, or ground meteorological sources.
Indicated Pressure Altitude	The number actually read from an altimeter when the barometric subscale has been set to 29.92 in Hg. (1013.2 millibars).
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this Handbook, altimeter instrument errors are assumed to be zero. Position errors may be obtained from the Altimeter Correction Graph.

Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

POWER TERMINOLOGY

Take off and Maximum Continuous	Highest power rating not limited by time.

ENGINE CONTROLS AND INSTRUMENTS

Throttle Control	Used to control power by introducing fuel-air mixture into the intake passages of the engine.
Mixture Control	This control is used to set fuel flow in all modes of operation and cuts off fuel completely for engine shut down.
EGT (Exhaust Gas Temperature) Indicator	This indicator is used to identify the lean and best power fuel flow for various power settings during cruise.
Tachometer	Indicates the rpm of the engine/propeller.

AIRPLANE PERFORMANCE AND
FLIGHT PLANNING TERMINOLOGY

Climb Gradient	The ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during take-off and landing was actually demonstrated during certification tests.
MEA	Minimum enroute IFR altitude.
Route Segment	A part of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be established.
GPH	U.S. Gallons per hour.
PPH	Pounds per hour.

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.

Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)
Airplane Center of Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.
Basic Empty Weight	Standard empty weight plus optional equipment.

Payload	Weight of occupants, cargo and baggage.
Useful Load	Difference between take-off weight, or ramp weight if applicable, and basic empty weight.
Maximum Ramp Weight	Maximum weight approved for ground maneuvering. (It includes weight of start, taxi, and run-up fuel).
Maximum Take-off Weight	Maximum weight approved for the start of the take-off run.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Zero Fuel Weight	Weight exclusive of usable fuel.
Tare	The weight of chocks, blocks, stands, etc., used on the scales when weighing an airplane.
Leveling Points	Those points which are used during the weighing process to level the airplane.
Jack Points	Points on the airplane identified by the manufacturer as suitable for supporting the airplane for weighing or other purposes.

SECTION II

LIMITATIONS

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

The limitations included in this section have been approved by the Federal Aviation Administration.

The following limitations must be observed in the operation of this airplane.

AIRSPEED LIMITATIONS

SPEED	CAS		IAS		REMARKS
	KNOTS	MPH	KNOTS	MPH	
Never Exceed V_{NE}	152	175	152	175	Do not exceed this speed in any operation
Maximum Structural Cruising V_{NO} or V_C	136	156	136	156	Do not exceed this speed except in smooth air and then only with caution
Maneuvering V_A	118	136	118	136	Do not make full or abrupt control movements above this speed
Maximum Flap Extension/ Extended V_{FE}	96	110	96	110	Do not extend flaps or operate with flaps extended above this speed

*AIRSPEED INDICATOR MARKINGS

MARKING	CAS		IAS		SIGNIFICANCE
	KTS	MPH	KTS	MPH	
White Arc	①52-96	60-110	52-96	60-110	Full Flap Operating Range
	②51-96	59-110	51-96	59-110	
Green Arc	①63-136	72-156	62-136	71-156	Normal Operating Range
	②62-136	71-156	61-136	70-156	
Yellow Arc	136-152	156-175	136-152	156-175	Operate With Caution, Only in Smooth Air
Red Line	152	175	152	175	Maximum Speed For All Operations

* The limits of the arcs on the airspeed indicator are marked in CAS values.
① M-1285 thru M-1586
② M-1587 and after

POWER PLANT LIMITATIONS

ENGINE

One Avco Lycoming engine model O-360-A2G, O-360-A4G, O-360-A4J or O-360-A4K engine rated at 180 hp.

Take-off and Maximum Continuous
Power ..... Full Throttle at 2700 rpm

OPERATING LIMITATIONS

Engine Speed ..... 2700 rpm
Oil Temperature ..... 245°F
Oil Pressure
Minimum ..... 25 psi
Maximum ..... 100 psi
Fuel Pressure
Minimum ..... 0.5 psi
Maximum ..... 6.0 psi
Mixture - Set per leaning instructions on performance charts.

FUEL GRADES

Aviation Gasoline 91/96 (blue) minimum grade or 100 (green) or 100LL (blue).

FUEL ADDITIVES

Alcor TCP Concentrate, mixed according to the instructions provided by Alcor, Inc.

OIL SPECIFICATIONS

Avco Lycoming Specification Number 301E approves for use lubricating oils which conform to both MIL-L-6082B straight mineral type and MIL-L-22851 ashless dispersant lubricants for airplane engines. Refer to the Approved Engine Oils table in the HANDLING, SERVICING AND MAINTENANCE section for a list of approved products.

PROPELLER SPECIFICATIONS

Sensenich M76EMMS-0-60 or 76EM8S5-0-60 fixed

pitch, two blade propeller. Static rpm at maximum permissible throttle settings: Not over 2350 rpm and not under 2250 rpm. No additional tolerance permitted.

POWER PLANT INSTRUMENT MARKINGS

OIL TEMPERATURE
- Caution (Yellow Arc) ..... 60° to 120°F
- Operating Range (Green Arc) ..... 120° to 245°F
- Maximum (Red Line) ..... 245°F

OIL PRESSURE
- Minimum Pressure (Red Line) ..... 25 psi
- Minimum Pressure (Yellow Arc) ..... 25 to 60 psi
- Operating Range (Green Arc) ..... 60 to 90 psi
- Maximum Pressure (Red Line) ..... 100 psi

FUEL PRESSURE
- Operating Range (Green Arc) ..... 0.5 to 6.0 psi

TACHOMETER
- Engine Warm-up ..... 1000 to 1200 rpm
- Restricted Operation for O-360-A2G engine only (Red Arc) ..... 2150 to 2350 rpm
- Normal Operating Range all engines (Green Arc) ..... 1800 to 2700 rpm
- Maximum RPM (Red Radial) ..... 2700 rpm

MISCELLANEOUS INSTRUMENT MARKINGS

INSTRUMENT AIR
- Operating Range (Green Arc) ..... 4.3 to 5.9 in. Hg

FUEL QUANTITY

On M-1517 thru M-1879 except M-1875, or prior airplanes after compliance with S.I. No. 0624-281
Yellow Band ..... E to 3/8 full

On M-1875, M-1880 and after
Yellow Band ..... E to 1/3 full

WEIGHT LIMITS

NORMAL CATEGORY

Maximum Ramp Weight ..... 2455 lbs
Maximum Take-off
and Landing Weight ..... 2450 lbs
Zero Fuel Weight ..... No Structural Limitation
Maximum Baggage Compartment
Load ..... 270 lbs

UTILITY/ACROBATIC CATEGORY

Maximum Ramp Weight ..... 2035 lbs
Maximum Take-off
and Landing Weight ..... 2030 lbs
Zero Fuel Weight. ..... No Structural Limitation
Maximum Baggage Compartment
Load (Utility Category Only) ..... 270 lbs

CENTER OF GRAVITY LIMITS

NORMAL CATEGORY

Forward: 107.8 inches aft of datum to 1800 lbs with straight line variation to 114.5 inches at 2450 lbs.
Aft: 118.3 inches aft of datum at all weights.

UTILITY/ACROBATIC CATEGORY

Forward: 107.8 inches aft of datum to 1800 lbs with straight line variation to 110.2 inches aft of datum at 2030 lbs.

Aft: 114.0 inches aft of datum at all weights.

REFERENCE DATUM

Datum is 103 inches forward of wing leading edge. MAC length is 52.7 inches.

MANEUVER LIMITS

This airplane is approved for 4 place in the Normal Category and for 2 place in the Utility and Acrobatic Category. Maximum slip duration is 30 seconds.

NORMAL CATEGORY (2450 POUNDS)
No acrobatic maneuvers approved.

UTILITY CATEGORY (2030 POUNDS)
No acrobatic maneuvers are approved except those listed below.

MANEUVER	*ENTRY SPEED (CAS)*
Chandelle	116 kts/133 mph
Steep Turn	116 kts/133 mph
Lazy Eight	116 kts/133 mph
Stall (Except Whip)	Use slow deceleration

Intentional Spins M-1494 and after (only if certificated as Acrobatic) or prior airplanes modified by Kit No. 23-4007-1S per S.I. No. 0619-090 ..... Use slow deceleration

ACROBATIC CATEGORY (2030 POUNDS)
For additional approved acrobatic maneuvers, see FAA Approved Airplane Flight Manual Supplement.

FLIGHT LOAD FACTORS

NORMAL CATEGORY (2450 POUNDS)

Flight maneuvering load factor
Flaps Up ..... +3.8, -1.9
Flaps Down ..... +1.9

UTILITY CATEGORY (2030 POUNDS)

Flight maneuvering load factor
Flaps Up ..... +4.4, -2.2
Flaps Down ..... +2.2

ACROBATIC CATEGORY (2030 POUNDS)

Flight maneuvering load factor
Flaps Up ..... +6.0, -3.0
Flaps Down ..... +2.0

MINIMUM FLIGHT CREW

One (1) Pilot

KINDS OF OPERATION LIMITS

1. VFR day and night
2. IFR day and night

REQUIRED EQUIPMENT FOR VARIOUS CONDITIONS OF FLIGHT

Federal Aviation Regulations (91.3(a), 91.24, 91.25, 91.32, 91.33, 91.52, 91.90, 91.97, 91.170) specify the minimum numbers and types of airplane instruments and equipment which must be installed and operable for various kinds of flight conditions. This includes VFR day, VFR night, IFR day, and IFR night.

Regulations also require that all airplanes be certificated by the manufacturer for operations under various flight conditions. At certification, all required equipment must be in operating condition and should be maintained to assure continued airworthiness. If deviations from the installed equipment were not permitted, or if the operating rules did not provide for various flight conditions, the airplane could not be flown unless all equipment was operable. With appropriate limitations, the operation of every system or component installed in the airplane is not necessary, when the remaining operative instruments and equipment provide for continued safe operation. Operation in accordance with limitations established to maintain airworthiness, can permit continued or uninterrupted operation of the airplane temporarily.

For the sake of brevity, the Required Equipment Listing does not include obviously required items such as wings, rudders, flaps, engine, landing gear, etc. Also the list does not include items which do not affect the airworthiness of the airplane such as entertainment systems, passenger convenience items, etc. However, it is important to note that ALL ITEMS WHICH ARE RELATED TO THE AIRWORTHINESS OF THE AIRPLANE AND NOT INCLUDED ON THE LIST ARE AUTOMATICALLY REQUIRED TO BE OPERATIVE.

To enable the pilot to rapidly determine the FAA equipment requirements necessary for a flight into specific conditions, the following equipment requirements and exceptions are presented. It is the final responsibility of the pilot to determine whether the lack of, or inoperative status of a piece of equipment on his airplane, will limit the conditions under which he may operate the airplane.

WARNING

FLIGHT IN KNOWN ICING CONDITIONS PROHIBITED.

LEGEND

Numbers refer to quantities required to be operative for a specified condition.

(-) Indicates that the item may be inoperative for the specified condition.
(*) Refer to the REMARKS AND/OR EXCEPTIONS column for explicit information or reference.

SYSTEM and/or COMPONENT	VFR Day	VFR Night	IFR Day	IFR Night	Remarks and/or Exceptions
GENERAL					
Overwater flight	*	*	*	*	- *Per FAR 91.33
COMMUNICATIONS					
VHF communications system	*	*	*	*	- *Per FAR 91.33
ELECTRICAL POWER					
Battery	1	1	1	1	
DC alternator	1	1	1	1	
Starter Engaged Warning Light (M-2278 and after)	1	1	1	1	- May be inoperative provided ammeter is operative and monitored

EQUIPMENT AND FURNISHING					
Seat belts and Shoulder harness	1	1	1	1	- Per Person or Per FAR 91.33
Emergency locator transmitter	1	1	1	1	- Per FAR 91.52
FIRE PROTECTION					
Portable fire extinguisher	*	*	*	*	-*Optional

SYSTEM and/or COMPONENT	*VFR Day*	*VFR Night*	*IFR Day*	*IFR Night*	*Remarks and/or Exceptions*
FLIGHT CONTROLS					
Stabilator trim tab indicator	1	1	1	1	- May be inoperative for ferry flight provided tabs are visually checked in the neutral position prior to take-off and checked for full range of operation.
Flap position indicator (On electric flap system)	1	1	1	1	- May be inoperative provided flap travel is visually inspected prior to take-off.
Stall warning	1	1	1	1	

FUEL EQUIPMENT					
Fuel boost pump	1	1	1	1	
Engine driven fuel pump	1	1	1	1	
Fuel quantity indicator	2	2	2	2	- One may be inoperative provided other side is operational and amount of fuel on board can be established to be adequate for the intended flight.
Fuel pressure indicator	1	1	1	1	
ICE AND RAIN PROTECTION					
Emergency static air source	*	*	*	*	-*Optional
Pitot heater	*	*	1	1	-*Optional

SYSTEM and/or COMPONENT	VFR Day	VFR Night	IFR Day	IFR Night	Remarks and/or Exceptions
LIGHTS					
Cockpit and instrument lights	-	*	-	*	-*Lights must be operative.
Taxi light	-	-	-	-	
Landing light	-	*	-	*	-*Per FAR 91.33
Rotating beacon	*	1	*	1	-*Optional
Position light	-	3	-	3	

NAVIGATION INSTRUMENTS					
Altimeter	1	1	1	1	
Airspeed indicator	1	1	1	1	
Vertical speed	-	-	-	-	
Magnetic compass	1	1	1	1	
Attitude indicator	-	-	1	1	
Turn coordinator	-	-	1	1	
Directional gyro	-	-	1	1	
Clock	-	-	1	1	
Transponder	*	*	*	*	-*Per FAR 91.24, 91.90, 91.97
Navigation equipment	-	-	*	*	-*Per FAR 91.33
VACUUM					
Vacuum system for instrument air	-	-	1	1	
Vacuum gage	-	-	1	1	

SYSTEM and/or COMPONENT	*VFR Day*	*VFR Night*	*IFR Day*	*IFR Night*	*Remarks and/or Exceptions*
ENGINE INDICATING INSTRUMENTS					
Engine tachometer indicator	1	1	1	1	
Exhaust gas temperature indicator	*	*	*	*	-*Optional
ENGINE OIL INSTRUMENTS					
Oil pressure indicator	1	1	1	1	
Oil temperature indicator	1	1	1	1	

FUEL

TOTAL FUEL with left and right wing fuel systems full:

M-1285 thru M-1516:

Two *29.9-gallon tanks in wings with a total of *58 gallons usable.

M-1517 thru M-1879 except M-1875 and prior airplanes after compliance with Service Instructions No. 0624-281:

Two *29.9-gallon tanks in wings with a total of *52 gallons usable.

M-1875, M-1880 and after:

Two *29.9-gallon tanks in wings with a total of *57.2 gallons usable.

*Value given is nominal. Tank capacity will vary with temperature and manufacturing tolerances.

FUEL MANAGEMENT

On M-1517 thru M-1879 except M-1875, and prior airplanes if service Instruction No. 0624-281 is accomplished:

Do not take off when the Fuel Quantity Gages indicate in the Yellow Band or with less than 11 gallons in each main tank.

Maximum slip duration: 30 seconds

On M-1875, M-1880 and after:

Do not take off when Fuel Quantity Gages indicate in Yellow Band on either gage.

Maximum slip duration: 30 seconds

PLACARDS

On Left Cabin Door or Left Side Panel:
(M-1285 thru M-1979 except M-1971) (CAS)

THIS AIRPLANE MUST BE OPERATED IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

NORMAL CATEGORY

MAXIMUM DESIGN WEIGHT		2450 LBS
REFER TO WEIGHT AND BALANCE DATA FOR LOADING INSTRUCTIONS		
FLIGHT MANEUVERING LOAD FACTOR	FLAPS UP	+3.8 −1.9
	DOWN	+1.9
MAXIMUM MANEUVERING SPEED		136 MPH

NO ACROBATIC MANEUVERS INCLUDING SPINS APPROVED

UTILITY CATEGORY

MAXIMUM DESIGN WEIGHT		2030 LBS
REFER TO WEIGHT AND BALANCE DATA FOR LOADING INSTRUCTIONS		
FLIGHT MANEUVERING LOAD FACTOR	FLAPS UP	+4.4 −2.2
	DOWN	+2.2

NO ACROBATIC MANEUVERS APPROVED EXCEPT THOSE LISTED BELOW:

MANEUVER	MAXIMUM ENTRY SPEED
CHANDELLES	133 MPH
LAZY EIGHTS	133 MPH
STEEP TURNS	133 MPH
STALLS (EXCEPT WHIP STALLS)	SLOW DECELERATION
NOTE: MAXIMUM ALTITUDE LOSS DURING STALL	300 FT

On Instrument Panel in Full View of Pilot (M-1285 through M-1493, unless modified by Kit No. 23-4007-1S and Service Instructions No. 0619-090):

"THIS AIRPLANE MUST BE OPERATED AS A NORMAL OR UTILITY CATEGORY AIRPLANE. INTENTIONAL SPINS ARE PROHIBITED. NO ACROBATIC MANEUVERS APPROVED EXCEPT: CHANDELLES, LAZY EIGHTS, STEEP TURNS, AND STALLS (EXCEPT WHIP STALLS)."

On Left Cabin Door or Left Side Panel (M-1971, M-1980 and after) (CAS)

THIS AIRPLANE MUST BE OPERATED IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

NORMAL CATEGORY

MAXIMUM DESIGN WEIGHT	2450 LBS
REFER TO WEIGHT AND BALANCE DATA FOR LOADING INSTRUCTIONS	
FLIGHT MANEUVERING LOAD FACTOR	FLAPS UP +3.8 −1.9 DOWN +1.9
MAXIMUM MANEUVERING SPEED	118 KTS/136 MPH

NO ACROBATIC MANEUVERS INCLUDING SPINS APPROVED

UTILITY CATEGORY

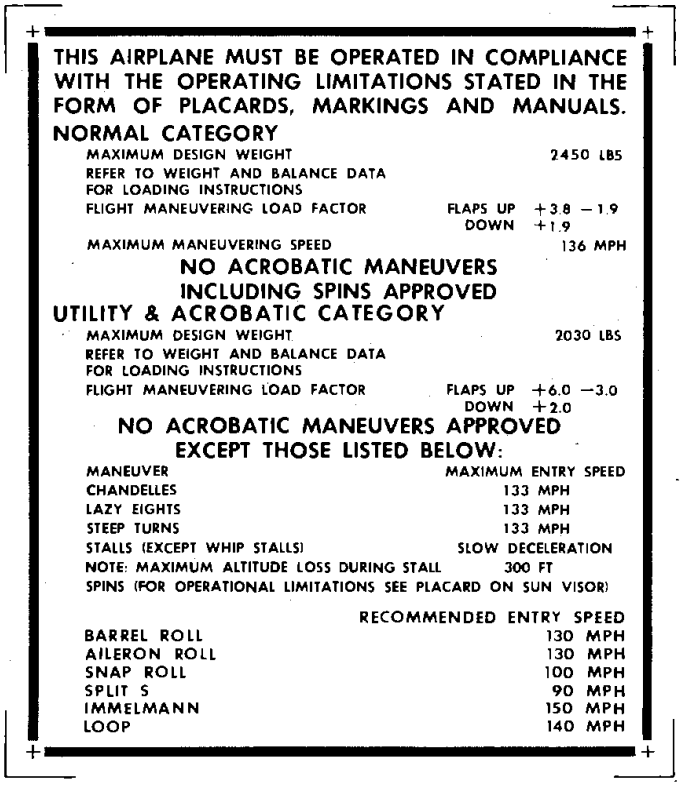
MAXIMUM DESIGN WEIGHT	2030 LBS
REFER TO WEIGHT AND BALANCE DATA FOR LOADING INSTRUCTIONS	
FLIGHT MANEUVERING LOAD FACTOR	FLAPS UP +4.4 −2.2 DOWN +2.2

NO ACROBATIC MANEUVERS APPROVED EXCEPT THOSE LISTED BELOW:

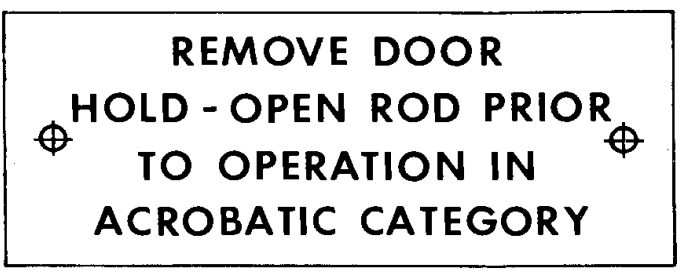
MANEUVER	MAXIMUM ENTRY SPEED
CHANDELLES	116 KTS/133 MPH
LAZY EIGHTS	116 KTS/133 MPH
STEEP TURNS	116 KTS/133 MPH
STALLS (EXCEPT WHIP STALLS)	SLOW DECELERATION
NOTE: MAXIMUM ALTITUDE LOSS DURING STALL	300 FT

PLACARDS

On Left Cabin Door or Left Side Panel (Acrobatic):
(M-1285 thru M-1979 except M-1971) (CAS)



On Right and Left Cabin Doors (Acrobatic):



On Left Door or Left Side Panel (Acrobatic): (M-1971, M-1980 and after) (CAS)

THIS AIRPLANE MUST BE OPERATED IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

NORMAL CATEGORY

MAXIMUM DESIGN WEIGHT	2450 LBS
REFER TO WEIGHT AND BALANCE DATA FOR LOADING INSTRUCTIONS	
FLIGHT MANEUVERING LOAD FACTOR	FLAPS UP +3.8 −1.9 DOWN +1.9
MAXIMUM MANEUVERING SPEED	118 KTS/136 MPH

NO ACROBATIC MANEUVERS INCLUDING SPINS APPROVED

UTILITY & ACROBATIC CATEGORY

MAXIMUM DESIGN WEIGHT	2030 LBS
REFER TO WEIGHT AND BALANCE DATA FOR LOADING INSTRUCTIONS	
FLIGHT MANEUVERING LOAD FACTOR	FLAPS UP +6.0 −3.0 DOWN +2.0

NO ACROBATIC MANEUVERS APPROVED EXCEPT THOSE LISTED BELOW:

MANEUVER	MAXIMUM ENTRY SPEED
CHANDELLES	116 KTS/133 MPH
LAZY EIGHTS	116 KTS/133 MPH
STEEP TURNS	116 KTS/133 MPH
STALLS (EXCEPT WHIP STALLS)	SLOW DECELERATION
NOTE: MAXIMUM ALTITUDE LOSS DURING STALL	300 FT
SPINS (FOR OPERATIONAL LIMITATIONS SEE PLACARD ON SUN VISOR)	

	RECOMMENDED ENTRY SPEED
BARREL ROLL	113 KTS/130 MPH
AILERON ROLL	113 KTS/130 MPH
SNAP ROLL	87 KTS/100 MPH
SPLIT S	79 KTS/90 MPH
IMMELMANN	130 KTS/150 MPH
LOOP	122 KTS/140 MPH

On Right Side of Instrument Panel (Acrobatic):

CAUTION

CONTINUOUS INVERTED FLIGHT WILL CAUSE LOSS OF OIL AND OIL PRESSURE. REAR CG LIMITED AND CARRYING OF BAGGAGE OR REAR SEAT PASSENGERS AND USE OF FLAPS PROHIBITED DURING ACROBATIC MANEUVERS.

PLACARDS

On Upper Right Instrument Panel:

RAISE FLAPS

TO INCREASE BRAKE EFFECTIVENESS

On Flap Extension Handle: (M-1285 thru M-1979 except M-1971) (CAS)

FLAPS PULL TO EXTEND, MAX SPEED 110 MPH

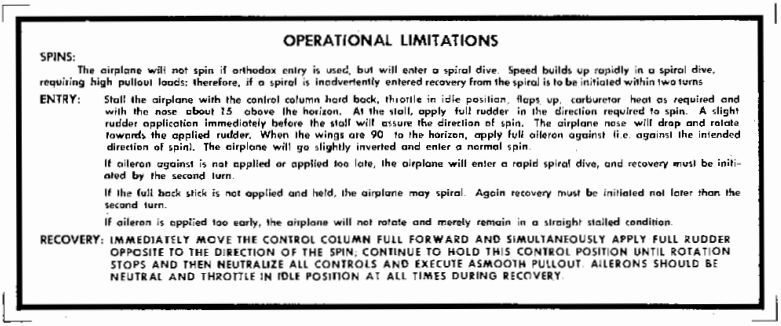
RETRACTED . . . . . 0°
FIRST NOTCH . . . . . 15°
SECOND NOTCH . . . . 25°
THIRD NOTCH . . . . . 35°

On Flap Extension Handle: (M-1971, M-1980 and after) (CAS)

FLAPS PULL TO EXTEND, MAX SPEED 96 KTS/110 MPH

RETRACTED . . . . . 0°
FIRST NOTCH . . . . . 15°
SECOND NOTCH . . . . 25°
THIRD NOTCH . . . . . 35°

On Sunvisor Above Pilot's Seat (Acrobatic):



OPERATIONAL LIMITATIONS

SPINS:
The airplane will not spin if orthodox entry is used, but will enter a spiral dive. Speed builds up rapidly in a spiral dive, requiring high pullout loads; therefore, if a spiral is inadvertently entered recovery from the spiral is to be initiated within two turns

ENTRY: Stall the airplane with the control column hard back, throttle in idle position, flaps up, carburetor heat as required and with the nose about 15 above the horizon. At the stall, apply full rudder in the direction required to spin. A slight rudder application immediately before the stall will assure the direction of spin. The airplane nose will drop and rotate towards the applied rudder. When the wings are 90 to the horizon, apply full aileron against (i.e. against the intended direction of spin). The airplane will go slightly inverted and enter a normal spin.

If aileron against is not applied or applied too late, the airplane will enter a rapid spiral dive, and recovery must be initiated by the second turn.

If the full back stick is not applied and held, the airplane may spiral. Again recovery must be initiated not later than the second turn.

If aileron is applied too early, the airplane will not rotate and merely remain in a straight stalled condition.

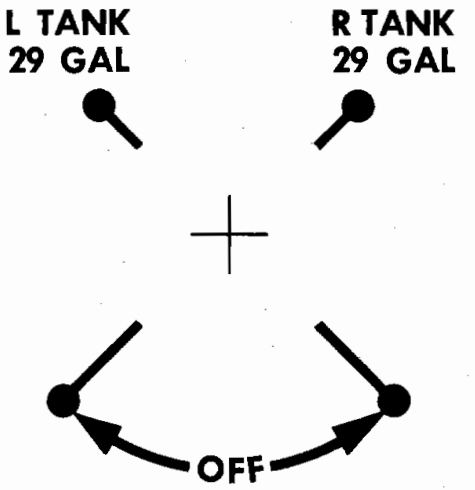
RECOVERY: IMMEDIATELY MOVE THE CONTROL COLUMN FULL FORWARD AND SIMULTANEOUSLY APPLY FULL RUDDER OPPOSITE TO THE DIRECTION OF THE SPIN; CONTINUE TO HOLD THIS CONTROL POSITION UNTIL ROTATION STOPS AND THEN NEUTRALIZE ALL CONTROLS AND EXECUTE A SMOOTH PULLOUT. AILERONS SHOULD BE NEUTRAL AND THROTTLE IN IDLE POSITION AT ALL TIMES DURING RECOVERY.

The above placard reads as follows:

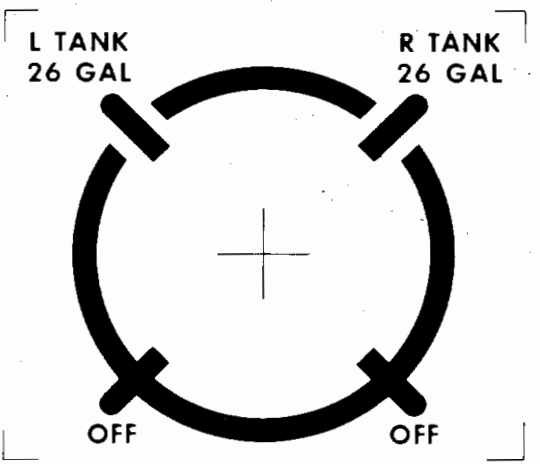
"OPERATIONAL LIMITATIONS SPINS: The airplane will not spin if orthodox entry is used, but will enter a spiral dive. Speed builds up rapidly in a spiral dive, requiring high pullout loads; therefore, if a spiral is inadvertently entered recovery from the spiral is to be initiated within two turns. ENTRY: Stall the airplane with the control column hard back, throttle in idle position, flaps up, carburetor heat as required and with the nose about 15° above the horizon. At the stall, apply full rudder in the direction required to spin. A slight rudder application immediately before the stall will assure the direction of spin. The airplane nose will drop and rotate towards applied rudder. When the wings are 90° to the horizon, apply full aileron against (i.e. against the intended direction of spin). The airplane will go slightly inverted and enter a normal spin. If aileron against is not applied or applied too late, the airplane will enter a spiral dive, and recovery must be initiated by the second turn. If the full back stick is not applied and held, the airplane may spiral. Again recovery must be initiated not later than the second turn. If the aileron is applied too early, the airplane will not rotate and merely remain in a straight stalled condition. RECOVERY: Immediately move the control column full forward and simultaneously apply full rudder opposite to the direction of the spin; continue to hold this control position until rotation stops and then neutralize all controls and execute a smooth pullout. Ailerons should be neutral and throttle in idle position at all times during recovery."

PLACARDS

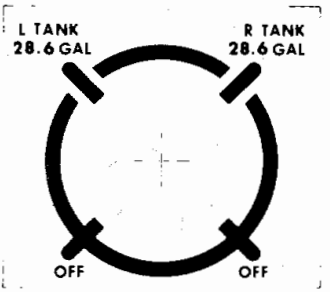
On Fuel Selector Panel (M-1285 through M-1516):



On Fuel Selector Panel (M-1517 through M-1879 except M-1875 or prior airplanes after compliance with Service Instructions No. 0624-281):

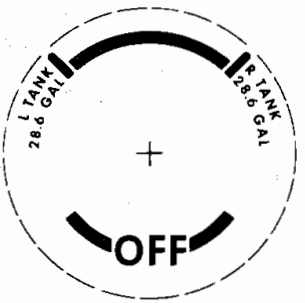


On Fuel Selector Panel (M-1875, M-1880 thru M-2224):



OR

On Fuel Selector Panel (Serials M-2225 and after, or earlier airplane serials which have complied with BEECHCRAFT Service Instructions No. 1095):



Adjacent to Engine Instrument Cluster (M-1517 through M-1879 except M-1875 or prior airplanes after compliance with Service Instructions No. 0624-281):

DO NOT TAKE OFF WHEN FUEL QUANTITY GAUGE INDICATES IN YELLOW OR WITH LESS THAN 11 GALLONS IN EACH MAIN TANK MAXIMUM SLIP DURATION IS 30 SECONDS

Adjacent to Engine Instrument Cluster (M-1875, M-1880 and after):

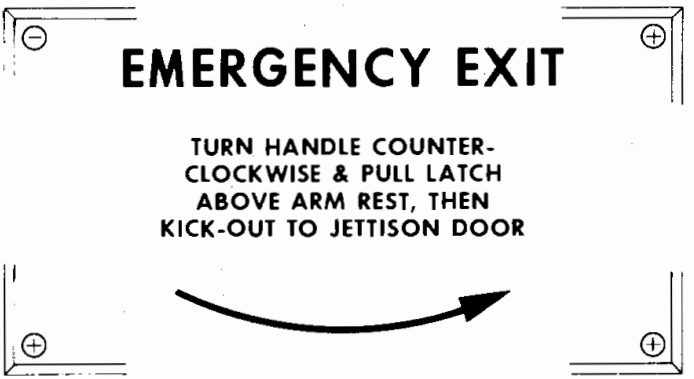
DO NOT TAKE OFF WHEN FUEL QUANTITY GAUGE INDICATES IN YELLOW ON EITHER GAUGE MAXIMUM SLIP DURATION 30 SEC.

PLACARDS

Above Right and Left Cabin Doors: (M-1285 thru M-1412 and M-1415, M-1419, M-1423, M-1439 and M-1447):

On Left Cabin Door (Acrobatic):

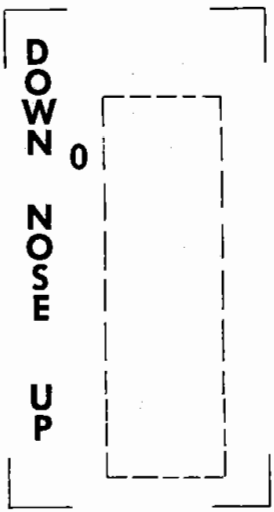
On Right Cabin Door (Acrobatic):



On Baggage Compartment Door:

TO LEVEL AIRCRAFT – LEVEL
BAGGAGE COMPARTMENT FLOOR

On Pedestal Between Front Seats:

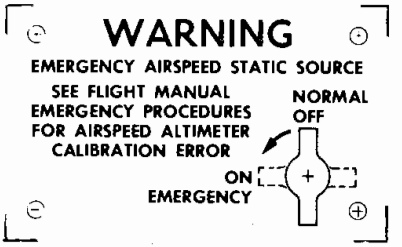


On Second Window Frame Right Side (M-1658 and after as required by weight and balance data):

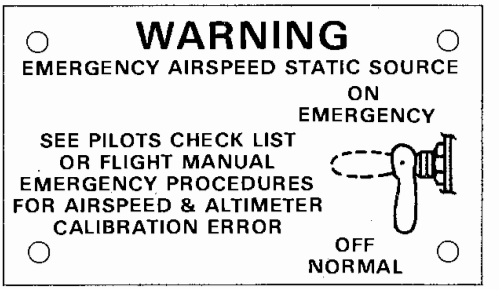
BAGGAGE, CARGO OR FAMILY SEATS
LOAD IN ACCORDANCE
WITH WEIGHT & BALANCE DATA
MAXIMUM SEAT CAPACITY _____ POUNDS

PLACARDS

On Lower Sidewall Adjacent to Pilot (when installed):



or;



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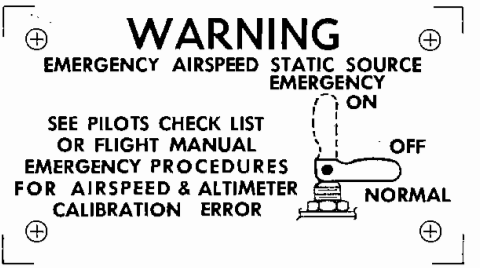

On Aft Cabin Bulkhead:

On Baggage Compartment Door:

BAGGAGE COMPARTMENT

270 POUNDS

MAXIMUM CAPACITY

On Upper Aft Corner of Each Cabin Door (when installed):

INSTRUCTIONS – SHOULDER STRAP

1. OCCUPANT SHORTER THAN 4FT 7IN **DO NOT** USE SHOULDER STRAP
2. NEVER USE SHOULDER STRAP WITH OUT LAP BELTS

or;

INSTRUCTION-SHOULDER STRAP

1. OCCUPANTS SHORTER THAN 4 FT. 7 IN. **DO NOT** USE SHOULDER STRAP.
2. PLACE SEAT BACK IN THE UPRIGHT POSITION DURING TAKEOFF AND LANDING.

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SECTION III

EMERGENCY PROCEDURES

TABLE OF CONTENTS

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All airspeeds quoted in this section are indicated airspeeds (IAS).

EMERGENCY AIRSPEEDS

Emergency Descent ..... 152 kts/175 mph
Glide ..... 78 kts/90 mph
Emergency Landing Approach..... 68 kts/78 mph

Stall warning horn is inoperative when the battery and alternator switches are turned off.

NOTE

On serials M-2225 and after, or on airplanes which have complied with BEECHCRAFT S.I. No. 1095, a fuel selector stop has been added to the selector valve guard. The fuel selector stop minimizes the possibility of inadvertently turning the fuel selector valve to the OFF detent position. The stop is a spring which must be depressed before the selector valve handle can be rotated to the OFF position.

The following information is presented to enable the pilot to form, in advance, a definite plan of action for coping with the most probable emergency situations which could occur in the operation of the airplane. Where practicable, the emergencies requiring immediate corrective action are treated in check list form for easy reference and familiarization. Other situations, in which more time is usually permitted to decide on and execute a plan of action, are discussed at some length.

ENGINE FAILURE

DURING TAKE-OFF GROUND ROLL

1. Throttle - CLOSED
2. Braking - MAXIMUM

NOTE

Conduct the following procedures immediately if it appears certain that the airplane will run off the runway. (Otherwise conduct these procedures at the pilot's discretion.)

3. Fuel Selector Valve - OFF
4. Battery Switch, Alternator Switch, and Fuel Boost Switch - OFF
5. Magneto/Start Switch - OFF

AFTER LIFTOFF AND IN FLIGHT

Landing straight ahead is usually advisable. If sufficient altitude is available for maneuvering, accomplish the following:

1. Mixture - FULL RICH, then LEAN as required
2. Fuel Boost Pump - ON
3. Fuel Selector Valve - SELECT OTHER TANK (Check to feel detent and check visually)
4. Magnetos - CHECK LEFT and RIGHT, then BOTH

NOTE

The most probable cause of engine failure would be loss of fuel flow or improper functioning of the ignition system.

IF NO RESTART:

1. Establish maximum glide
2. Throttle - CLOSE
3. Fuel Selector Valve - OFF
4. Mixture - IDLE CUT-OFF
5. Magneto/Start Switch - OFF
6. BATTERY & ALT, ALT, and FUEL BOOST switches - OFF (With electric flaps installed, it will be necessary to set desired flaps before securing battery.)

When certain of reaching the selected landing site:

7. Airspeed - 68 kts/78 mph
8. Flaps - AS REQUIRED

ENGINE DISCREPANCY CHECKS

CONDITION: ROUGH RUNNING ENGINE

1. Mixture - FULL RICH, then LEAN as required
2. Magneto/Start Switch - CHECK LEFT and RIGHT, then BOTH

CONDITION: LOSS OF ENGINE POWER

1. Fuel Pressure Gage - CHECK

If fuel flow is abnormally low:

a. Mixture - FULL RICH
b. Fuel Boost Pump - ON (Lean as required)
c. Fuel Boost Pump - OFF if performance does not improve in a few moments

2. Fuel Quantity Indicator - CHECK for fuel supply in tank being used

If tank being used is empty:

a. Fuel Tank Selector Valve - SELECT OTHER FUEL TANK (feel for detent and check visually)
b. Fuel Boost Pump - ON

AIR START PROCEDURE

1. Fuel Selector Valve - SELECT TANK MORE NEARLY FULL (check to feel detent and check visually)
2. Throttle - FULL FORWARD
3. Mixture - FULL RICH
4. Fuel Boost Pump - ON until power is regained, then OFF. (Leave on if engine driven fuel pump is inoperative.)
5. Throttle - ADJUST to desired power
6. Mixture - LEAN as required

ENGINE FIRE

IN FLIGHT

The red ventilation controls must be closed to shut off all heating system outlets so that smoke and fumes will not enter the cabin. The control labeled CABIN AIR must be pulled out to close. The control labeled DEFROST must be pushed in to close. In the event of an engine fire, shut down the engine as follows and make a landing:

1. Fuel Selector Valve - OFF
2. Mixture - IDLE CUT-OFF
3. Throttle - CLOSE
4. Cabin Air Control (Red Knob) - pull OFF

5. Defrost Valve (Red Knob) - push OFF
6. Battery Switch - OFF
7. Alternator Switch - OFF
8. Magneto/Start Switch - OFF
9. Do not attempt to restart engine

ON THE GROUND

1. Fuel Selector Valve - OFF
2. Throttle - CLOSED
3. Mixture - IDLE CUT-OFF
4. BATTERY & ALT and Magneto/Start Switches - OFF
5. Extinguish with Fire Extinguisher.

EMERGENCY DESCENT

1. Throttle - IDLE
2. Airspeed - ESTABLISH 152 kts/175 mph

MAXIMUM GLIDE CONFIGURATION

1. Flaps - UP
2. Airspeed - 78 kts/90 mph

Glide distance is approximately 1.7 nautical miles (2 statute miles) per 1000 feet of altitude above the terrain.

LANDING EMERGENCIES

LANDING WITHOUT POWER

When assured of reaching the landing site selected, and on final approach:

1. Airspeed - 68 kts/78 mph
2. Fuel Selector Valve - OFF
3. Mixture - IDLE CUT-OFF
4. Magneto/Start Switch - OFF
5. Flaps - AS REQUIRED

6. Battery Switch, Alternator Switch, and Fuel Boost Switch - OFF
7. Upper Cabin Door Latch - OPEN (if installed)

SYSTEMS EMERGENCIES

STARTER ENGAGED WARNING LIGHT ILLUMINATED (If Installed)

The STARTER ENGAGED warning light illuminates whenever the starter is engaged. If this light remains illuminated after Magneto/Start Switch is released from the START position, the starter relay is still energized. Consequently, electrical power is still being supplied to the starter, and it remains engaged. Continuing to supply power to the starter will eventually result in the complete loss of electrical system power, substantial starter damage, and possible damage to other electrical system components.

If light remains illuminated on the ground:

1. Battery Switch and Alternator Switch - OFF
2. Do Not Take Off.

If light remains illuminated in flight after air start:

1. Battery Switch and Alternator Switch - OFF
2. Land As Soon As Practical.

ALTERNATOR-OUT PROCEDURE

An inoperative alternator will place the entire electrical operation of the airplane on the battery. Alternator malfunction will be indicated by a fluctuation of the ammeter needle, or by a discharge indication. If this condition develops:

1. Alternator Switch - OFF MOMENTARILY, THEN ON (this resets overvoltage relay)

If alternator-out condition persists:

2. Alternator Switch - OFF
3. Nonessential Electrical Equipment - OFF to conserve battery power.

WARNING

Deactivation of the battery switch, alternator switch, or alternator circuit breaker during flight is prohibited, except as required by an actual emergency.

UNSCHEDULED ELECTRIC STABILATOR TRIM

1. Airplane Attitude - MAINTAIN using stabilator control.
2. Stabilator Trim Thumb Switch (On Control Wheel) - MOVE IN DIRECTION OPPOSITE UNSCHEDULED PITCH TRIM to open circuit breaker.
3. Stabilator Trim ON-OFF Switch (On Instrument Panel) - OFF
4. Manual Stabilator Trim Control Wheel - RETRIM AS DESIRED.

EMERGENCY STATIC AIR SOURCE SYSTEM

THE EMERGENCY STATIC AIR SOURCE SHOULD BE USED FOR CONDITIONS WHERE THE NORMAL STATIC SOURCE HAS BEEN OBSTRUCTED. When the airplane has been exposed to moisture and/or icing conditions (especially on the ground), the possibility of obstructed static ports should be considered. Partial obstructions will result in the rate of climb indication being sluggish during a climb or descent. Verification of suspected obstruction is possible by switching to the emergency system and noting

a sudden sustained change in rate of climb. This may be accompanied by abnormal indicated airspeed and altitude changes beyond normal calibration differences.

Whenever any obstruction exists in the Normal Static Air System or the Emergency Static Air System is desired for use:

1. Pilot's Emergency Static Air Source - Switch to ON EMERGENCY.
2. For Airspeed Calibration and Altimeter Correction, refer to PERFORMANCE section.

CAUTION

Be certain the emergency static air valve is in the NORMAL position when system is not needed.

UNLATCHED DOOR IN FLIGHT

If the cabin door is not locked it may come unlatched in flight. This may occur during or just after take-off. The door will trail in a position approximately 3 inches open. A buffet may be encountered with the door open in flight. Return to the field in a normal manner. If practicable, during the landing flare-out have a passenger hold the door to prevent it from swinging open.

SPINS

WARNING

Intentional spins are prohibited when operating in the Normal Category. Intentional spins are also prohibited in the Utility Category unless the airplane is approved for spins and equipped with a spin kit, or if the airplane is approved for operation in the Acrobatic Category. Refer to Service Instructions No. 0619-090.

The airplane will not spin if orthodox entry is used, but will enter a spiral dive. Speed builds rapidly in a spiral dive, requiring high pullout loads. Therefore, if a spiral is inadvertently entered recovery from the spiral is to be initiated within two turns.

ENTRY

Stall the airplane with the control column hard back,throttle in idle position, flaps up, carburetor heat as required and with the nose about 15° above the horizon. At the stall, apply full rudder in the direction required to spin. A slight rudder application immediately before the stall will assure the direction of spin. The airplane nose will drop and rotate towards the applied rudder. When the wings are 90° to the horizon, apply full aileron against the intended direction of spin. The airplane will go slightly inverted and enter a normal spin.

If aileron against the direction of spin is not applied or applied too late, the airplane will enter a rapid spiral dive, and recovery must be initiated by the second turn.

If the full back stick is not applied and held, the airplane may spiral. Again recovery must be initiated not later than the second turn.

If aileron is applied too early, the airplane will not rotate and merely remain in a straight stalled condition.

RECOVERY

If a spin is entered inadvertently:

Immediately move the control column full forward and simultaneously apply full rudder opposite to the direction of the spin; continue to hold this control position until rotation stops and then neutralize all controls and execute a smooth pullout. Ailerons should be neutral and throttle in idle position at all times during recovery.

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SECTION IV

NORMAL PROCEDURES

TABLE OF CONTENTS

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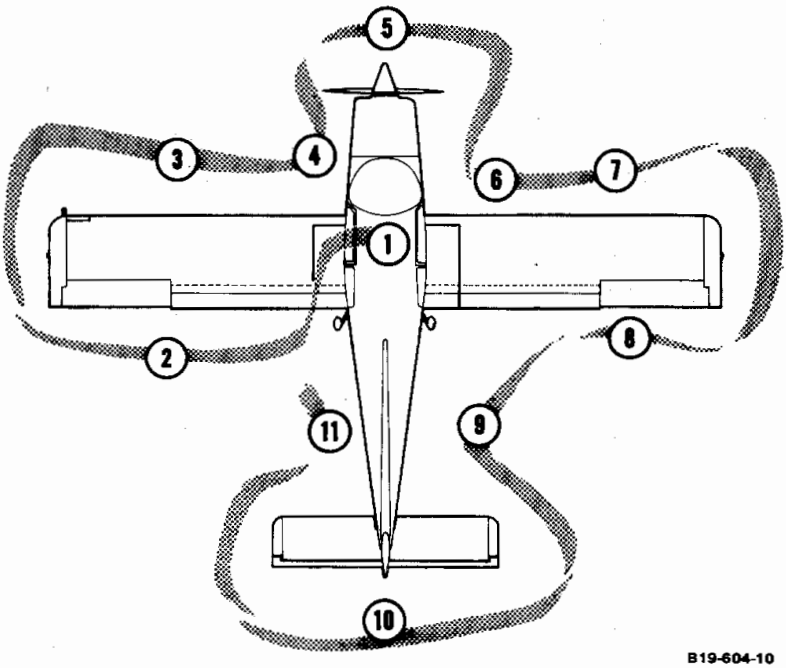
All airspeeds quoted in this section are indicated airspeeds (IAS)

SPEEDS FOR SAFE OPERATION

Take-off	
Lift-off	65 Knots/75 mph
50 Ft.	74 Knots/85 mph
Maximum Climb	
Best Rate (V_Y)	75 Knots/86 mph
Best Angle (V_X)	69 Knots/79 mph
Cruise Climb	82 Knots/95 mph
Maximum Turbulent Air Penetration	118 Knots/136 mph
Balked Landing	64 Knots/74 mph
Landing Approach	68 Knots/78 mph
Maximum Demonstrated Crosswind	17 Knots/20 mph



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PREFLIGHT INSPECTION

1. *CABIN:*
   a. Parking Brake - SET
   b. Control Lock - REMOVE
   c. All Switches - OFF
   d. Fuel Drain Tool (M-1971, M-1980 and after) - OBTAIN (See Section VIII for use) (See cabin door side pocket. This tool can be used for opening the oil and fuel filler caps.)

2. *LEFT WING TRAILING EDGE:*
   a. Flap - CHECK
   b. Fuel Vent Line - UNOBSTRUCTED
   c. Aileron - CHECK
   d. Wing Tip - CHECK
   e. Position Light - CHECK

3. *LEFT WING LEADING EDGE:*
   a. Pitot Tube - CHECK, (Remove Cover)
   b. Landing Light - CHECK
   c. Tie Down and Chocks - REMOVE
   d. Stall Warning - CHECK for movement of vane
   e. Fuel Tank - CHECK QUANTITY; Filler Cap - SECURE.

4. *LEFT LANDING GEAR:*
   a. Tire and Brake - CHECK
   b. Fuel Sump - DRAIN

5. *NOSE SECTION:*
   a. Left Cowl - SECURE
   b. Induction Air Intake - CLEAR, Filter - CHECK for condition and security of attachment.
   c. Propeller - CHECK, General Condition, Nicks, etc.
   d. Tire and Nose Gear - CHECK
   e. Engine Oil - CHECK (See Servicing, Section 8) Cap and Dipstick - SECURE

f. Right Cowl - SECURE
g. Fuel Strainer - DRAIN
h. Chocks - REMOVE

6. *RIGHT LANDING GEAR:*
   a. Fuel Sump - DRAIN
   b. Tire and Brake - CHECK

7. *RIGHT WING LEADING EDGE:*
   a. Fuel Tank - CHECK QUANTITY; Filler Cap - SECURE
   b. Tie Down and Chocks - REMOVE
   c. Taxi Light - CHECK
   d. Wing Tip - CHECK
   e. Position Light - CHECK

8. *RIGHT WING TRAILING EDGE:*
   a. Aileron - CHECK
   b. Flap - CHECK
   c. Fuel Tank Vent Line - UNOBSTRUCTED

9. *RIGHT FUSELAGE:*
   a. Static Pressure Button - UNOBSTRUCTED
   b. Emergency Locator Transmitter - ARMED

10. *EMPENNAGE:*
    a. Control Surfaces - CHECK
    b. Tie Down - REMOVE
    c. Position Light - CHECK

11. *LEFT FUSELAGE:*
    a. Static Pressure Button - UNOBSTRUCTED
    b. All Antennas - CHECK
    c. Baggage Door - CHECK

BEFORE STARTING

1. Seats - POSITION AND LOCK; Seat Backs - UPRIGHT
2. Seat Belts and Shoulder Harnesses - FASTEN

3. Parking Brake - SET
4. All Avionics - OFF
5. Circuit Breakers - IN
6. Flaps - UP
7. Light Switches - AS REQUIRED
8. Electric Stabilator Trim Switch - OFF (if installed)
9. Battery Switch - ON
10. Alternator Switch - ON (If external power is used, turn Alternator Switch - OFF)
11. Fuel Boost Pump - ON (Check for operation, then OFF)
12. Fuel Selector Valve - ROTATE thru 360° and check for freedom of movement; set on tank more nearly full (feel for detent and check visually)

NOTE

On serials M-2225 and after, or on airplanes which have complied with BEECHCRAFT S.I. No. 1095, a fuel selector stop has been added to the selector valve guard. The fuel selector stop minimizes the possibility of inadvertently turning the fuel selector valve to the OFF detent position. The stop is a spring which must be depressed before the selector valve handle can be rotated to the OFF position.

WARNING

Do not take off if either fuel quantity gage indicates in yellow arc.

EXTERNAL POWER

The following precautions shall be observed while using external power:

1. The Battery Switch shall be ON and all avionics and electrical switches OFF. This protects the voltage regulators and associated electrical equipment from voltage transients (power fluctuations):

2. The airplane has a negative ground system. Connect the positive and negative leads of the external power unit to the corresponding positive and negative terminals of the airplane's external power receptacle.
3. In order to prevent arcing, no power shall be supplied while the connection is being made.

STARTING ENGINE USING AUXILIARY POWER UNIT

1. Alternator, Electrical, and Avionics Equipment - OFF
2. Auxiliary Power Unit - CONNECT
3. Auxiliary Power Unit - SET OUTPUT (*13.75 to 14.25 volts for 14-volt system and 27.75 to 28.25 volts for 28-volt system)
4. Auxiliary Power Unit - ON
5. Engine - START using normal procedures
6. Auxiliary Power Unit - OFF (after engine has been started)
7. Auxiliary Power Unit - DISCONNECT
8. Alternator Switch - ON

STARTING

CAUTION

Vernier-type engine controls should not be rotated clockwise after being advanced to the full forward position.

1. Mixture - FULL RICH
2. Throttle - FAST IDLE position
3. Fuel Boost Pump - ON (cold weather starts, use eight to ten strokes of engine prime, as required)
4. Magneto/Start Switch - START position (release to BOTH position when engine fires)

CAUTION

DO NOT PUMP THROTTLE TO START

*NOTE - M-1285 thru M-2178 are 14-volt systems. M-2179 and after are 28-volt systems.

Flooded Engine:

a. Mixture - IDLE CUT-OFF
b. Throttle - FULL OPEN
c. Starter - ENGAGE (retard throttle to fast idle when engine fires)
d. Mixture - ADVANCE TO FULL RICH

5. Starter Engaged Warning Light (if installed) EXTINGUISHED - CHECK; should be illuminated during start, and extinguished after start.

CAUTION

If the STARTER ENGAGED Warning Light is inoperative (or not installed), ensure that the ammeter indication is less than 25% of full charge at 1000 to 1200 rpm within two minutes with no additional electrical equipment on. If not, turn off the Battery Switch and Alternator Switch and do not take off.

6. External Power (if used) - OFF - DISCONNECT
7. ALT (alternator) switch - ON
8. Oil Pressure - ABOVE RED RADIAL WITHIN 30 SECONDS
9. Warm-up - 1000 to 1200 RPM
10. All Engine Indicators - CHECK
11. Fuel Boost Pump - OFF (for test of engine driven pump)
12. Parking Brakes - RELEASE

AFTER STARTING, AND BEFORE TAXI

1. Lights - AS REQUIRED
2. Avionics Equipment - ON, AS REQUIRED
3. Brakes - RELEASE AND CHECK

BEFORE TAKEOFF

1. Seat Belts and Shoulder Harnesses - CHECK

NOTE

All reclining seats must be in the upright position during take-off.

2. Parking Brake - SET
3. Avionics - CHECK
4. Engine Instruments - CHECK
5. Flight Instruments - CHECK AND SET
6. Starter Engaged Warning Light (if installed) - CHECK (should not be illuminated). If light is not installed or is inoperative, the ammeter indication should be less than 25% of full charge at 1000 to 1200 rpm and should show some decrease from the initial indication.
7. Throttle - 2200 RPM
8. Magnetos - CHECK at 2200 rpm, maximum drop of 125 rpm on each magneto, variance between individual magnetos should not exceed 50 rpm.
9. Carburetor Heat - CHECK (Set cold for takeoff)
10. Throttle - FAST IDLE
11. Stabilator Trim - TAKE-OFF RANGE (Green, White or Black Band)
12. Flaps - CHECK and SET
13. Controls - CHECK FREE and for proper direction of travel
14. Fuel Boost Pump - ON
15. Mixture - FULL RICH (or as required by field elevation) (tighten friction on push-pull type control)
16. Doors and Window - SECURE
17. Parking Brake - RELEASE
18. Instruments - CHECK (engine instruments in green range at the start of the takeoff run)

TAKEOFF

Takeoff ..... Full Throttle - 2700 RPM

1. Power - SET takeoff power and mixture before brake release.

2. Airspeed - ACCELERATE to and maintain takeoff speed.
3. Airspeed - ESTABLISH DESIRED CLIMB SPEED when clear of obstacles.

CLIMB

NOTE

Do not turn Fuel Boost Pump off during climb.

1. Throttle - FULL FORWARD
2. Temperature - MONITOR
3. Mixture - LEAN AS REQUIRED FOR SMOOTH OPERATION

CRUISE

1. Power - SET AS DESIRED (Use tables in PERFORMANCE Section)
2. Fuel Boost Pump - OFF
3. Mixture - LEAN AS REQUIRED (tighten friction on push-pull type control)

LEANING USING THE EXHAUST GAS TEMPERATURE INDICATOR (EGT)

For level flight at 75% power or less, the EGT unit should be used in the following manner:

1. Lean the mixture and note the point on the indicator that the temperature peaks and starts to fall.
   a. CRUISE (LEAN) MIXTURE - Enrich mixture until the EGT shows a drop of 25°F below peak on the rich side of peak.
   b. BEST POWER MIXTURE - Enrich mixture until the EGT shows a drop of 75°F below peak on the rich side of peak.

CAUTION

Do not continue to lean mixture beyond that necessary to establish peak temperature.

2. Continuous operation is recommended at 25°F or more below peak EGT only on the rich side of peak.
3. Changes in altitude and power settings require the peak EGT to be rechecked and the mixture reset.

DESCENT

1. Altimeter - SET
2. Carburetor Heat - FULL ON or FULL OFF, AS REQUIRED
3. Power - AS REQUIRED (avoid prolonged idle settings which may cause low cylinder head temperatures).
4. Mixture - ENRICH AS REQUIRED

BEFORE LANDING

1. Seat Belts and Shoulder Harnesses - SECURE.

NOTE

All reclining seats must be in the upright position during landing.

2. Fuel Selector Valve - SELECT TANK MORE NEARLY FULL (feel for detent and check visually).
3. Mixture - FULL RICH (or as required by field elevation) (tighten friction on push-pull type control)
4. Landing Light - AS REQUIRED
5. Flaps - DOWN (maximum extension speed, 96 kts/110 mph)

NOTE

The Flaps Up landing procedure will increase the Flaps Down landing distances (total over 50 foot obstacle) by 50%.

6. Airspeed - ESTABLISH LANDING APPROACH SPEED
   Flaps Down - 68 kts/78 mph
   Flaps Up - 80 kts/92 mph
7. Carburetor Heat - AS REQUIRED

NOTE

Carburetor heat should be in the full COLD (IN) position before full throttle application in the event of a go-around.

8. Fuel Boost Pump - ON

BALKED LANDING

1. Carburetor Heat - COLD
2. Power - FULL THROTTLE, 2700 RPM
3. Airspeed - 64 kts/74 mph until clear of obstacles, then trim to BEST RATE-OF-CLIMB
4. Flaps - UP

AFTER LANDING

1. Landing and Taxi Lights - AS REQUIRED
2. Flaps - UP
3. Trim Tab - SET TO 0°

SHUTDOWN

1. Brakes - SET
2. Fuel Boost Pump - OFF
3. Electrical and Avionics Equipment - OFF
4. Throttle - CLOSE
5. Mixture - IDLE CUT-OFF
6. Magneto/Start Switch - OFF, after engine stops
7. Battery Switch - OFF
8. Alternator Switch - OFF
9. Control Lock - INSTALL, if conditions warrant.
10. Install wheel chocks and release brakes if the airplane is to be left unattended.

ENVIRONMENTAL SYSTEMS

HEATING AND VENTILATION

Refer to the SYSTEMS DESCRIPTION Section for operation of heating and ventilation controls.

COLD WEATHER OPERATION

PREFLIGHT INSPECTION

All accumulations of ice, snow and frost must be removed from the wings, tail, control surfaces and hinges, propeller, windshield, pitot tube, static ports, antennas, fuel cell filler caps, crankcase vents, and fuel vents. If such accumulations are not removed completely, the airplane shall not be flown. The deposits will not blow off in flight. While an adverse weight factor is clearly involved in the case of heavy deposits, it is less obvious that even slight accumulations will disturb or completely destroy the designed aerodynamic properties of the airfoils.

The normal preflight procedures should then be completed, with particular attention given to check of flight controls for complete freedom of movement.

ENGINE

Use engine oil in accordance with Consumable Materials in the HANDLING, SERVICING AND MAINTENANCE Section.

WARNING

Ascertain that magneto switch and battery master switch are off before moving propeller by hand.

Always pull the propeller through by hand, opposite the direction of rotation, several times to clear the engine and "limber up" the cold, heavy oil before using the starter. This will also lessen the load on the battery if external power is not used.

During cold weather starts, use 8 to 10 strokes of engine primer, as required.

CAUTION

Do not pump throttle to start.

Under very cold conditions, it may be necessary to preheat the engine prior to a start. Particular attention should be given to the oil cooler and engine sump to ensure proper preheat. A start with congealed oil in the system may produce an indication of normal pressure immediately after the start, but then the oil pressure may decrease when residual oil in the engine is pumped back with the congealed oil in the sump. If an engine heater capable of heating both the engine sump and cooler is not available, the oil should be drained while the engine is hot and stored in a warm area until the next flight.

If there is no oil pressure within the first 30 seconds of running, or if oil pressure drops after a few minutes of ground operation, shut down and check for broken oil lines, oil cooler leaks or the possibility of congealed oil.

NOTE

It is advisable to use external power for starting in cold weather.

During warm-up, monitor engine temperatures closely, since it is quite possible to exceed the cylinder head temperature limit in trying to bring up the oil temperature.

During letdown and landing, give special attention to engine temperatures, since the engine will have a tendency toward overcooling.

ICING CONDITIONS

Flight in Known Icing Conditions Prohibited.

ENGINE BREAK-IN INFORMATION

See Systems Description section

NOISE CHARACTERISTICS

Approach to and departure from an airport should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas. Avoidance of noise-sensitive areas, if practical, is preferable to overflight at relatively low altitudes.

For VFR operations over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas, pilots should make every effort to fly not less than 2000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.

NOTE

The preceding recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgement, an altitude of less than 2000 feet is necessary to adequately exercise his duty to see and avoid other airplanes.

Flyover noise level established in compliance with FAR 36 is:

73.3 dB(A)

No determination has been made by the Federal Aviation Administration that the noise level of this airplane is or should be acceptable or unacceptable for operation at, into, or out of any airport.

SECTION V

PERFORMANCE

TABLE OF CONTENTS

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INTRODUCTION TO PERFORMANCE AND FLIGHT PLANNING

The graphs and tables in this section present performance information for flight planning at various parameters of weight, power, altitude and temperature. Examples have been presented on some performance charts. Calculations for flight time, block speed and fuel required for a sample VFR trip from Denver to Wichita are detailed below. All examples and calculations assume the following conditions:

CONDITIONS

At Stapleton International (DEN):

Outside Air Temperature ..... 15°C (59°F)
Field Elevation ..... 5330 ft
Altimeter Setting ..... 29.60 in. Hg
Wind ..... 270° at 10 kts
Runway 26L length ..... 10,000 ft

Route of Trip

*DEN-V4-GLD-V132-HUT-V73-ICT

For VFR Cruise at 9,500 feet

ROUTE SEGMENT	AVG MAG CRS/AVG MAG VAR	DIST NM	WIND 9500 FEET DIR/KTS	OAT 9500 FEET °C	ALT SETTING IN.HG
DEN-TXC	083°/12°E	80**	010/30	-5	29.60
TXC-GLD	093°/11°E	73	010/30	-5	29.60
GLD-HUT	105°/9°E	195	220/10	0	29.56
HUT-ICT	116°/8°E	33**	220/10	9	29.56

*REFERENCE: Enroute Low Altitude Chart L-6
**Includes distance between airport and VORTAC.

At Wichita Mid-Continent (ICT):

Outside Air Temperature	25°C (77°F)
Field Elevation	1332 ft
Altimeter Setting	29.56 in. Hg
Wind	180° at 10 kts
Runway 19L Length	7300 ft

To determine pressure altitude at origin and destination airports, add 100 feet to field elevation for each .1 in. Hg below 29.92, and subtract 100 feet from field elevation for each .1 in. Hg above 29.92.

Pressure Altitude at DEN:

29.92 - 29.60 = .32 in. Hg

The pressure altitude at DEN is 320 feet above the field elevation.

5330 + 320 = 5650 ft

Pressure Altitude at ICT:

29.92 - 29.56 = .36 in. Hg

The pressure altitude at ICT is 360 feet above the field elevation.

1332 + 360 = 1692 ft

NOTE

For flight planning, the difference between cruise altitude and cruise pressure altitude has been ignored.

Enter the CRUISE PERFORMANCE table for 73 percent maximum continuous power (or full throttle) at 9500 feet:

ALTITUDE FEET	THROTTLE SETTING RPM	FUEL FLOW GPH	TAS KNOTS
9500	2662	10.5	123

Time and fuel used were calculated as follows:

$$\text{Time} = \frac{\text{Distance}}{\text{Ground Speed}}$$

Fuel Used = (Time) (Fuel Flow)

Results are:

ROUTE SEGMENT	DISTANCE NM	EST GROUND SPEED KNOTS	TIME AT CRUISE ALTITUDE HRS: MIN	FUEL USED FOR CRUISE GAL
DEN-TXC	*65	117	:33	5.8
TXC-GLD	73	121	:36	6.3
GLD-HUT	195	125	1:34	16.4
HUT-ICT	33	124	:16	2.8

*Distance required to climb has been subtracted from segment distance.

TIME - FUEL - DISTANCE

ITEM	TIME HRS: MINS	FUEL GAL	DISTANCE NM
Start, Runup, Taxi and Take-off acceleration	0:00	1.3	0
Climb	0:11	2.0	15
Cruise	2:59	31.3	366
Total	3:10	34.6	381

Total Flight Time: 3 hours, 10 minutes

Block Speed: 381 NM ÷ 3 hours, 10 minutes = 120 knots

Reserve Fuel (45 minutes at 57% maximum continuous power)

Enter the CRUISE POWER SETTINGS table for 57% MCP at 2300 RPM. The fuel flow at 57% MCP is 7.8 gallons per hour.
Reserve fuel = (45 min) (7.8 GPH) = 5.9 gallons

Total Fuel = 34.6 + 5.9 = 40.5 gallons

The estimated landing weight is determined by subtracting the fuel required for the trip from the ramp weight:

Assumed ramp weight = 2450 lbs

Estimated fuel from DEN to ICT = (34.6 gal) (6 lbs/gal) = 208 lbs

Estimated landing weight = 2450 - 208 = 2242 lbs

COMMENTS PERTINENT TO THE USE OF PERFORMANCE GRAPHS

1. Indicated airspeeds (IAS) were obtained by using the AIRSPEED CALIBRATION NORMAL SYSTEM Graph.

2. The associated conditions define the specific conditions from which performance parameters have been determined. They are not intended to be used as instructions, however, performance values determined from charts can only be achieved if specified conditions exist.

3. The full amount of usable fuel is available for all approved flight conditions.

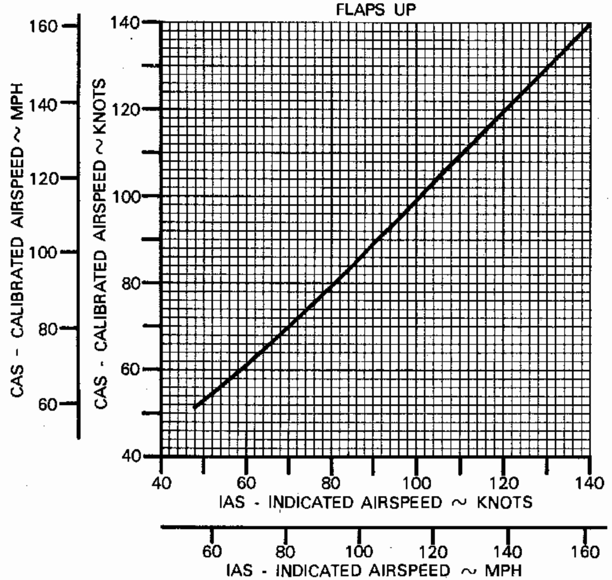
4. Engine and component cooling has been demonstrated for temperatures up to 100°F at sea level with a 3.57°F per 1000 ft lapse rate. (ISA + 41°F)

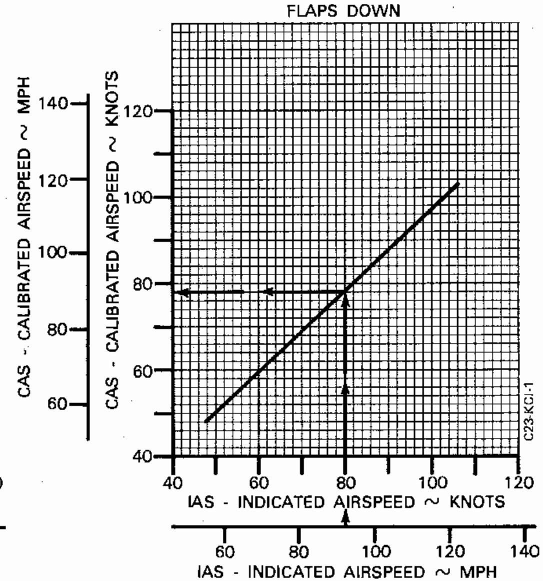
AIRSPEED CALIBRATION - NORMAL SYSTEM

NOTE: INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR

EXAMPLE:

FLAPS	DOWN
IAS	80 KTS
CAS	78 KTS





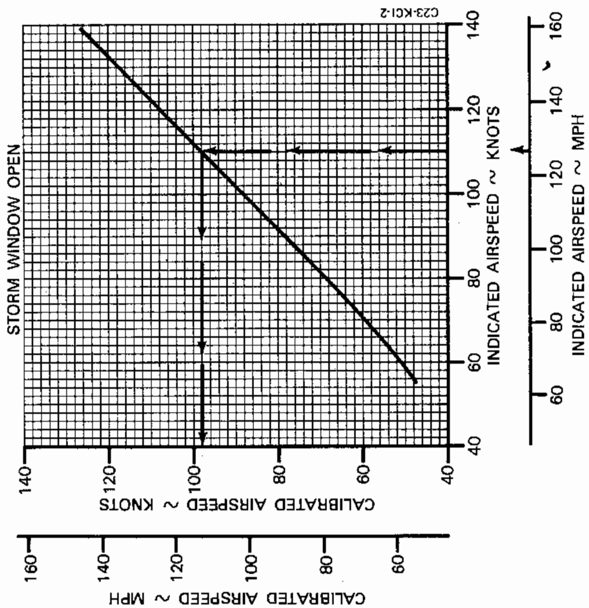
AIRSPEED CALIBRATION - ALTERNATE SYSTEM

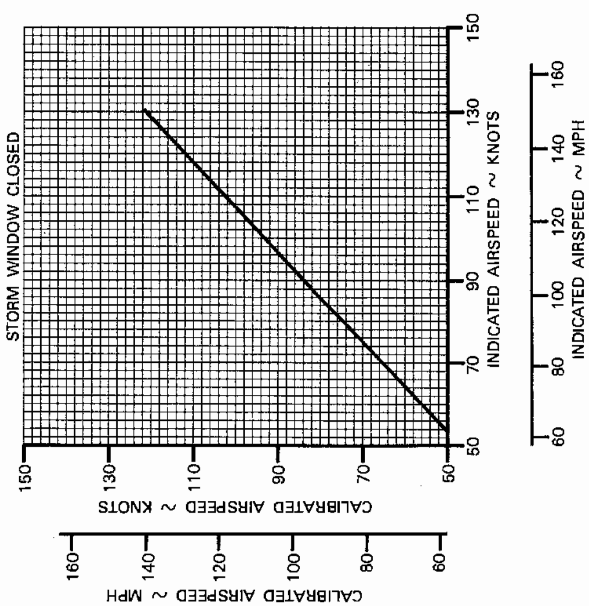
ALL FLAP POSITIONS

NOTE: INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR

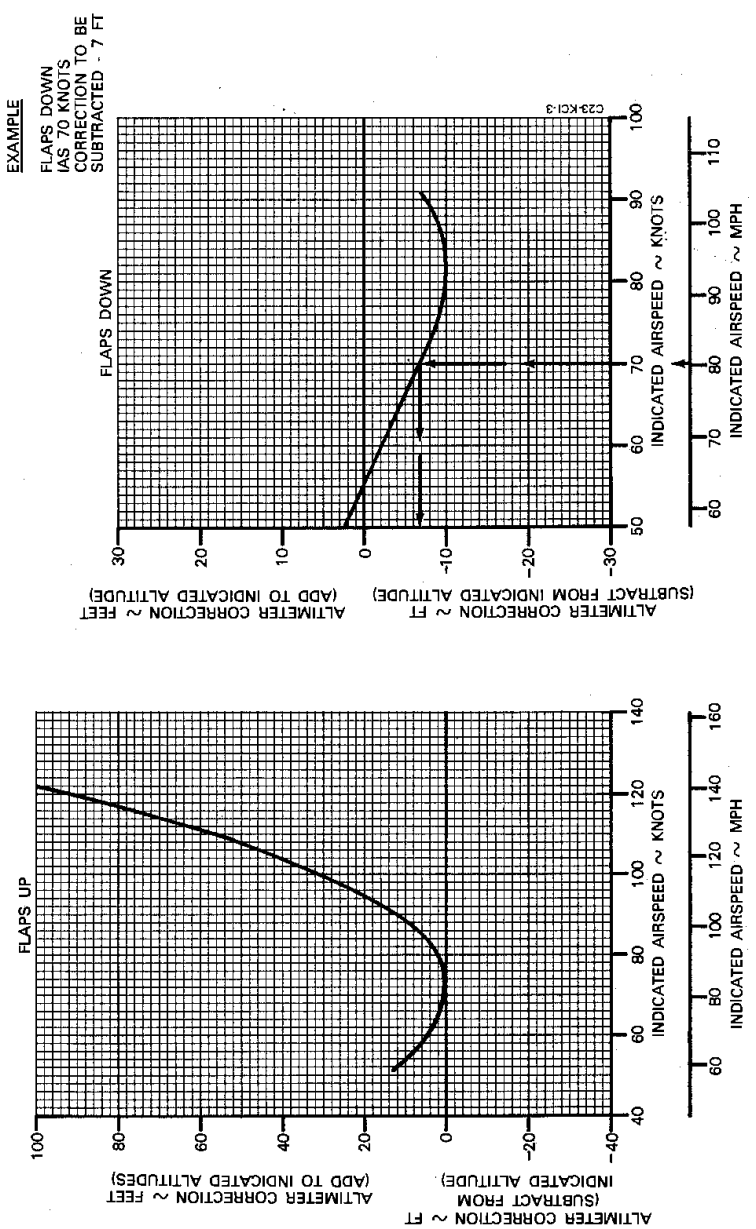
EXAMPLE:

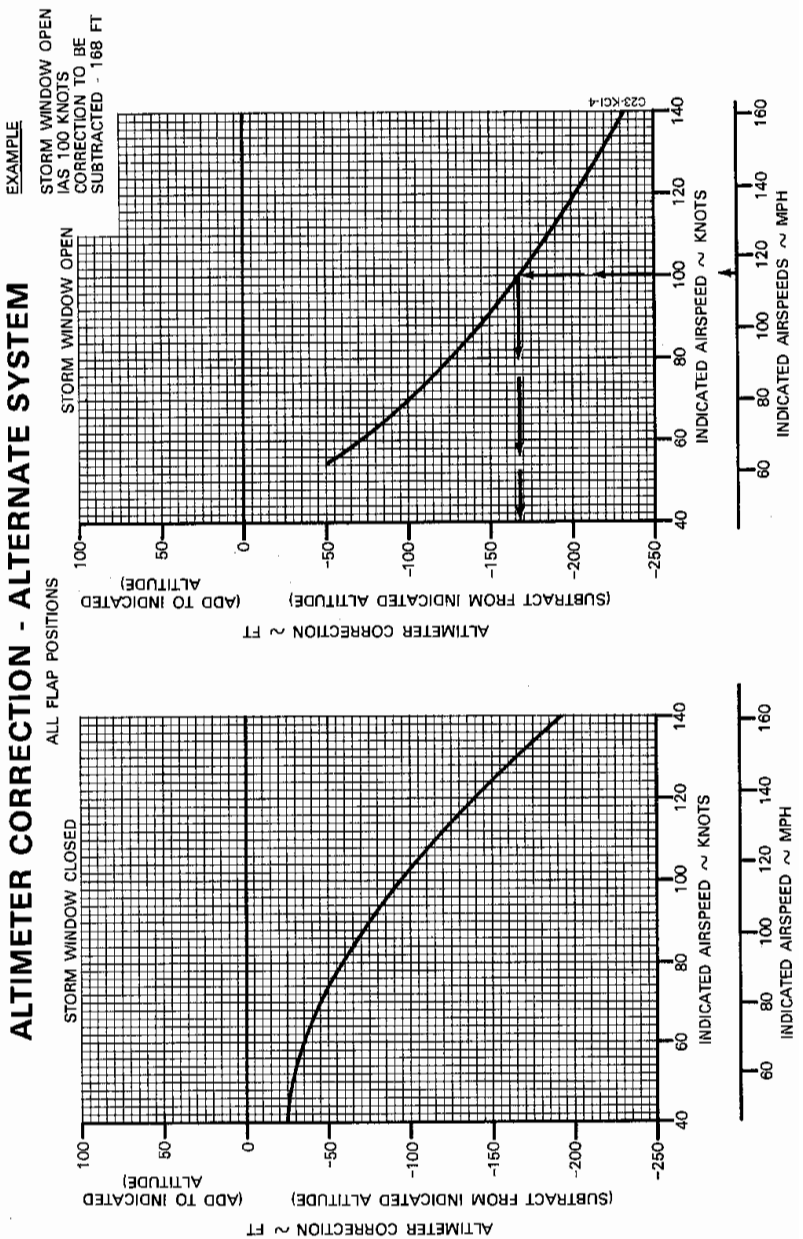
STORM WINDOW - OPEN
IAS - 110 KNOTS/126 MPH
CAS - 98 KNOTS/113 MPH





ALTIMETER CORRECTION - NORMAL SYSTEM




ALTIMETER CORRECTION - ALTERNATE SYSTEM
ALL FLAP POSITIONS
EXAMPLE
STORM WINDOW OPEN
IAS 100 KNOTS
CORRECTION TO BE
SUBTRACTED - 168 FT
STORM WINDOW OPEN
STORM WINDOW CLOSED
ALTIMETER CORRECTION ~ FT
(ADD TO INDICATED ALTITUDE)
(SUBTRACT FROM INDICATED ALTITUDE)
INDICATED AIRSPEED ~ KNOTS
INDICATED AIRSPEEDS ~ MPH
C23-KCI-4

POWER OFF STALL SPEEDS

(WEIGHT 2450 LBS)

Maximum altitude loss during a normal stall recovery is approximately 300 ft.

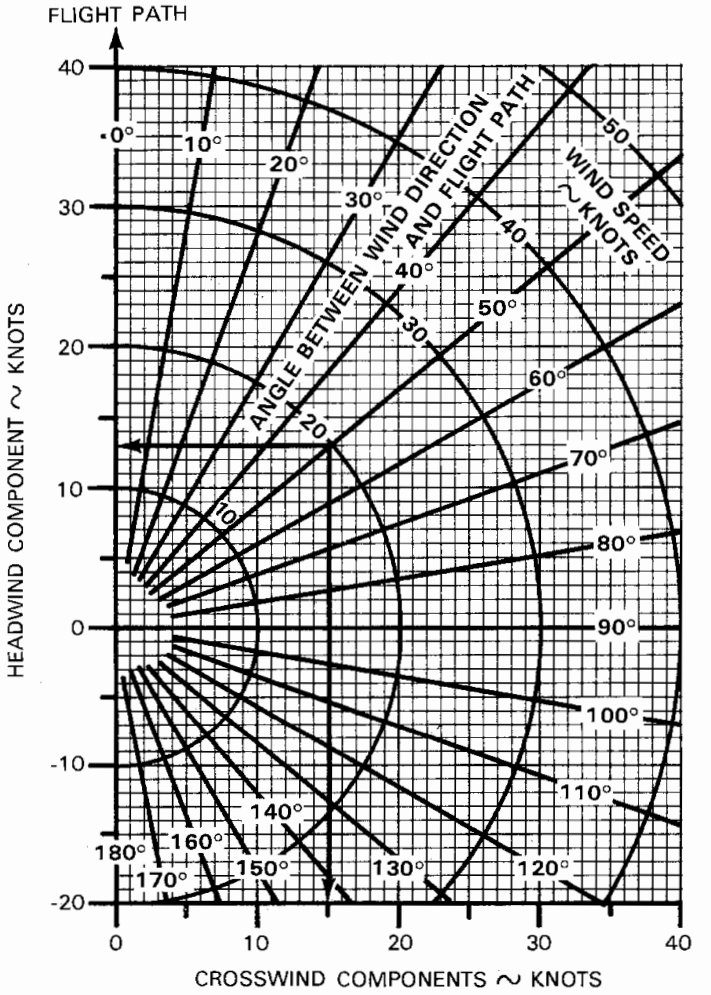
ANGLE OF BANK			
LEVEL	**30°**	**45°**	**60°**
FLAPS-UP			
72 mph 63 kts	77 mph 67 kts	85 mph 74 kts	101 mph 88 kts
FLAPS - DOWN (35°)			
59 mph 51 kts	63 mph 55 kts	70 mph 61 kts	83 mph 72 kts

WIND COMPONENTS

Demonstrated Crosswind Component is 17kts/20mph

EXAMPLE:

WIND SPEED	20 KTS
ANGLE BETWEEN WIND DIRECTION AND FLIGHT PATH	50°
HEADWIND COMPONENT	13 KTS
CROSSWIND COMPONENT	15 KTS



TAKE-OFF DISTANCE – HARD SURFACE

ASSOCIATED CONDITIONS:

POWER	FULL THROTTLE
MIXTURE	LEAN TO MAXIMUM RPM, THEN ENRICH SLIGHTLY
FLAPS	UP
RUNWAY	LEVEL, DRY, HARD SURFACE
WEIGHT	2450 LBS

TAKE-OFF SPEEDS:

LIFT OFF	65 KTS/75 MPH
AT 50 FT	74 KTS/85 MPH

WIND COMPONENT DOWN RUNWAY KNOTS	SEA LEVEL				2000 FT				4000 FT				6000 FT				8000 FT			
	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET
0	23	-5	917	1592	16	-9	1046	1805	9	-13	1195	2051	2	-17	1368	2334	-6	-21	1569	2662
	41	5	1020	1767	34	1	1165	2007	27	-3	1333	2284	20	-7	1528	2604	13	-11	1756	2975
	59	15	1130	1955	52	11	1293	2224	45	7	1481	2535	38	3	1701	2894	31	-1	1957	3311
	77	25	1248	2155	70	21	1429	2455	63	17	1640	2802	56	13	1856	3204	49	9	2173	3671
	95	35	1373	2369	88	31	1575	2701	81	27	1809	3087	74	23	2083	3535	67	19	2404	4055
15	23	-5	728	1454	16	-9	836	1653	9	-13	961	1883	2	-17	1108	2149	-6	-21	1279	2456
	41	5	813	1618	34	1	935	1842	27	-3	1077	2102	20	-7	1243	2402	13	-11	1438	2750
	59	15	904	1793	52	11	1042	2045	45	7	1202	2336	38	3	1389	2674	31	-1	1609	3067
	77	25	1003	1980	70	21	1156	2261	63	17	1336	2587	56	13	1546	2965	49	9	1793	3406
	95	35	1107	2180	88	31	1279	2492	81	27	1479	2855	74	23	1714	3277	67	19	1990	3768
30	23	-5	559	1337	16	-9	647	1523	9	-13	751	1739	2	-17	873	1988	-6	-21	1017	2278
	41	5	628	1490	34	1	728	1700	27	-3	847	1944	20	-7	985	2227	13	-11	1149	2555
	59	15	702	1654	52	11	816	1890	45	7	949	2164	38	3	1107	2483	31	-1	1292	2854
	77	25	782	1829	70	21	910	2094	63	17	1060	2401	56	13	1237	2758	49	9	1446	3174
	95	35	868	2017	88	31	1011	2311	81	27	1180	2653	74	23	1378	3052	67	19	1613	3518

TAKE-OFF DISTANCE - GRASS SURFACE

ASSOCIATED CONDITIONS:

POWER	FULL THROTTLE
MIXTURE	LEAN TO MAXIMUM RPM, THEN ENRICH SLIGHTLY
FLAPS	UP
RUNWAY	SHORT, DRY, LEVEL GRASS SURFACE
WEIGHT	2450 LBS

TAKE-OFF SPEEDS:

LIFT OFF	65 KTS/75 MPH
AT 50 FT	74 KTS/85 MPH

WIND COMPONENT DOWN RUNWAY KNOTS	SEA LEVEL				2000 FT				4000 FT				6000 FT				8000 FT			
	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET	OAT °F	OAT °C	GROUND ROLL FEET	TOTAL OVER 50 FT OBSTACLE FEET
0	23	-5	990	1665	16	-9	1129	1888	9	-13	1290	2146	2	-17	1477	2443	-6	-21	1693	2787
	41	5	1101	1848	34	1	1258	2100	27	-3	1439	2391	20	-7	1650	2726	13	-11	1896	3115
	59	15	1220	2045	52	11	1396	2327	45	7	1599	2653	38	3	1836	3030	31	-1	2113	3467
	77	25	1347	2255	70	21	1543	2569	63	17	1771	2933	56	13	2036	3354	49	9	2346	3844
	95	35	1482	2478	88	31	1700	2827	81	27	1954	3231	74	23	2249	3701	67	19	2595	4247
15	23	-5	786	1512	16	-9	902	1720	9	-13	1038	1960	2	-17	1196	2237	-6	-21	1381	2558
	41	5	878	1682	34	1	1009	1917	27	-3	1163	2187	20	-7	1342	2501	13	-11	1552	2865
	59	15	977	1865	52	11	1125	2128	45	7	1298	2432	38	3	1500	2785	31	-1	1737	3195
	77	25	1082	2060	70	21	1248	2353	63	17	1442	2693	56	13	1669	3088	49	9	1936	3548
	95	35	1196	2268	88	31	1381	2594	81	27	1597	2972	74	23	1851	3413	67	19	2149	3927
30	23	-5	603	1381	16	-9	699	1575	9	-13	811	1799	2	-17	943	2058	-6	-21	1098	2359
	41	5	678	1540	34	1	786	1758	27	-3	914	2011	20	-7	1064	2305	13	-11	1240	2647
	59	15	758	1710	52	11	881	1955	45	7	1025	2240	38	3	1195	2571	31	-1	1395	2957
	77	25	845	1892	70	21	983	2166	63	17	1145	2485	56	13	1336	2856	49	9	1562	3289
	95	35	938	2086	88	31	1092	2392	81	27	1273	2747	74	23	1488	3162	67	19	1741	3646

NORMAL CLIMB

ASSOCIATED CONDITIONS:

POWER FULL THROTTLE
MIXTURE LEAN TO MAXIMUM RPM AND THEN ENRICH SLIGHTLY
FLAPS UP

NOTE: HIGH HUMIDITY AND OR USE OF RICH MIXTURE HAS BEEN FOUND TO RESULT IN APPROXIMATELY 70 FPM LOSS IN RATE OF CLIMB FROM THAT SHOWN.

ANY AREA WITH LOW CLOUDS OR A DEWPOINT TEMPERATURE OF 60°F (16°C) OR HIGHER IS AN AREA OF HIGH HUMIDITY.

WEIGHT POUNDS	SEA LEVEL				4000 FEET				8000 FEET				12,000 FEET			
	OAT °F	OAT °C	R/C FT/MIN	IAS KTS/MPH	OAT °F	OAT °C	R/C FT/MIN	IAS KTS/MPH	OAT °F	OAT °C	R/C FT/MIN	IAS KTS/MPH	OAT °F	OAT °C	R/C FT/MIN	IAS KTS/MPH
2450	23	-5	841	78/90	9	-13	621	78/87	-6	-21	389	74/85	-20	-29	167	74/85
	41	5	816		27	-3	596		13	-11	362		-2	-19	141	
	59	15	792		45	7	572		31	-1	338		16	-9	117	
	77	25	769		63	17	549		49	9	315		34	1	94	
	95	55	747		81	27	527		67	19	293		52	11	72	
2200	23	-5	1047	76/88	9	-13	812	74/85	-6	-21	567	72/83	-20	-29	327	72/83
	41	5	1021		27	-3	787		13	-11	539		-2	-19	302	
	59	15	997		45	7	763		31	-1	515		16	-9	277	
	77	25	974		63	17	740		49	9	492		34	1	254	
	95	55	951		81	27	718		67	19	469		52	11	232	
2000	23	-5	1243	75/86	9	-13	994	72/83	-6	-21	735	70/81	-20	-29	478	70/81
	41	5	1217		27	-3	969		13	-11	707		-2	-19	453	
	59	15	1193		45	7	945		31	-1	682		16	-9	428	
	77	25	1169		63	17	922		49	9	659		34	1	405	
	95	55	1147		81	27	900		67	19	636		52	11	383	

TIME, FUEL, AND DISTANCE TO CLIMB

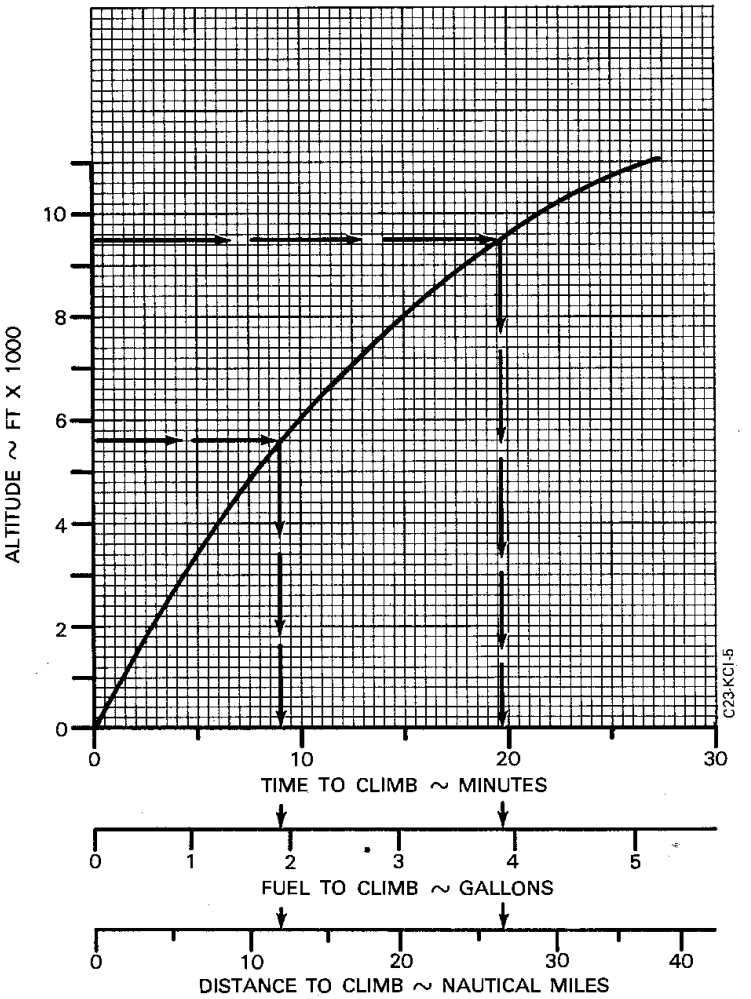
ASSOCIATED CONDITIONS

POWER	FULL THROTTLE
MIXTURE	LEAN TO MAXIMUM RPM THEN ENRICH SLIGHTLY
FLAPS	UP
WEIGHT	2450 LBS
STANDARD DAY	

EXAMPLE

AIRPORT PRESSURE ALTITUDE	5650 FT
CRUISE ALTITUDE	9500 FT
TIME TO CLIMB 20-9 =	11 MIN
FUEL TO CLIMB 3.9-1.9 =	2 GAL
DIST TO CLIMB 27.-12. =	15 NM

78 KTS/90 MPH



CRUISE PERFORMANCE
STANDARD DAY - 2350 LBS

POWER SETTINGS				TAS	RANGE N.M.	
ALTITUDE	THROTTLE SETTINGS	BHP	FUEL FLOW		INITIAL FUEL ONBOARD (USABLE)	
FEET	RPM	%	GAL/HR	KTS/MPH	37 GAL.	57 GAL.
2500	2700	88	13.2	128/147	287	482
	2500	73	10.4	118/136	336	564
	2300	60	8.2	108 /124	384	645
3500	2700	86	12.8	126/145	290	484
	2500	71	10.1	116/133	337	567
	2300	59	8.1	105/121	379	638
4500	2700	84	12.5	126/145	298	497
	2500	70	9.8	116/133	346	581
	2300	59	8.0	105/121	381	641
5500	2696	82	12.0	126/145	308	517
	2500	68	9.6	116/133	352	593
	2300	58	7.9	104/120	382	644
6500	2688	79	11.6	125/144	318	534
	2500	67	9.4	115/132	359	606
	2300	58	7.9	103/119	379	640
7500	2680	77	11.2	124/143	324	546
	2500	66	9.2	115/132	365	616
	2300	57	7.9	102/117	378	638
8500	2670	75	10.8	124/143	335	564
	2500	65	9.0	114/131	368	623
	2300	57	7.8	101/116	373	631
9500	2662	73	10.5	123/141	342	577
	2500	64	8.8	114/131	371	629
	2300	57	7.8	100/115	368	623
10.500	2654	71	10.2	122/140	347	587
	2500	63	8.7	113/130	372	632
	2300	57	7.9	99/114	362	613

NOTES:

1. Range allows for start, taxi, climb, and a 45 minute reserve at 57% MCP @ 2300 RPM.

2. Cruise performance is based on best power mixture. Lean to maximum RPM for a given throttle setting.

3. It is recommended that use of tanks be alternated and that a fuel log be maintained showing time remaining in each tank.

4. Determination of in-flight fuel flow: Enter the table at the altitude nearest to the computed density altitude, and read the fuel flow for the TAS value presented that is nearest to the actual true airspeed.

ASSOCIATED CONDITIONS:

Pressure Altitude	4500 FEET
OAT	53°F
Indicated Airspeed	111 KTS

EXAMPLE:

Density Altitude*	5200 FEET
Actual True Airspeed*	121 KTS
Nearest Altitude on Table	5500 FEET
Interpolating Factor (121 KTS is 50% of the difference between 116 and 126 KTS)	.50
Fuel Flow (12.0 - 9.6 = 2.4 x .50 = 1.2 + 9.6 = 10.8)	10.8 gal/hr

*Requires a Flight Computer.

LANDING DISTANCE – HARD SURFACE

ASSOCIATED CONDITIONS:

POWER IDLE
MIXTURE RICH
FLAPS 35°
RUNWAY LEVEL, DRY, HARD SURFACE
WEIGHT 2450 LBS

LANDING SPEEDS:

AT 50 FT 68 KTS/78 MPH
TOUCHDOWN 61 KTS/70 MPH

WIND COMPONENT DOWN RUNWAY	SEA LEVEL				2000 FT				4000 FT				6000 FT				8000 FT			
	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE
KNOTS	°F	°C	FEET	FEET	°F	°C	FEET	FEET	°F	°C	FEET	FEET	°F	°C	FEET	FEET	°F	°C	FEET	FEET
0	23	-5	654	1409	16	-9	693	1467	9	-13	735	1532	2	-17	780	1600	-6	-21	828	1672
	41	5	678	1446	34	1	719	1509	27	-3	763	1575	20	-7	810	1644	13	-11	861	1724
	59	15	703	1484	52	11	745	1548	45	7	791	1617	38	3	840	1691	31	-1	894	1776
	77	25	727	1521	70	21	771	1587	63	17	819	1658	56	13	871	1740	49	9	926	1827
	95	35	751	1558	88	31	798	1626	81	27	847	1703	74	23	901	1788	67	19	959	1882
15	23	-5	496	1190	16	-9	530	1243	9	-13	567	1302	2	-17	607	1365	-6	-21	650	1431
	41	5	518	1222	34	1	553	1280	27	-3	592	1342	20	-7	634	1407	13	-11	679	1476
	59	15	539	1257	52	11	576	1317	45	7	617	1381	38	3	661	1448	31	-1	708	1520
	77	25	560	1291	70	21	600	1354	63	17	642	1420	56	13	688	1489	49	9	737	1565
	95	35	582	1326	88	31	623	1390	81	27	667	1458	74	23	715	1530	67	19	766	1614
30	23	-5	361	1005	16	-9	390	1049	9	-13	421	1095	2	-17	456	1149	-6	-21	493	1211
	41	5	379	1032	34	1	409	1078	27	-3	443	1127	20	-7	479	1188	13	-11	518	1252
	59	15	397	1060	52	11	429	1107	45	7	464	1163	38	3	502	1226	31	-1	544	1293
	77	25	416	1088	70	21	449	1138	63	17	486	1200	56	13	526	1264	49	9	569	1334
	95	35	434	1114	88	31	469	1172	81	27	508	1235	74	23	550	1303	67	19	595	1375

LANDING DISTANCE - GRASS SURFACE

ASSOCIATED CONDITIONS:

POWER	IDLE
MIXTURE	RICH
FLAPS	35°
RUNWAY	SHORT, DRY, LEVEL GRASS SURFACE
WEIGHT	2450 LBS

LANDING SPEEDS:

AT 50 FT	68 KTS/78 MPH
TOUCHDOWN	61 KTS/70 MPH

WIND COMPONENT DOWN RUNWAY	SEA LEVEL				2000 FT				4000 FT				6000 FT				8000 FT			
	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE	OAT		GROUND ROLL	TOTAL OVER 50 FT OBSTACLE
KNOTS	°F	°C	FEET	FEET	°F	°C	FEET	FEET	°F	°C	FEET	FEET	°F	°C	FEET	FEET	°F	°C	FEET	FEET
0	23	-5	765	1520	16	-9	810	1586	9	-13	859	1657	2	-17	912	1732	-6	-21	969	1812
	41	5	793	1562	34	1	841	1631	27	-3	892	1704	20	-7	948	1782	13	-11	1007	1870
	59	15	822	1603	52	11	872	1675	45	7	925	1751	38	3	983	1834	31	-1	1046	1927
	77	25	851	1644	70	21	903	1719	63	17	959	1797	56	13	1019	1888	49	9	1084	1985
	95	35	879	1685	88	31	933	1762	81	27	992	1847	74	23	1054	1941	67	19	1122	2045
15	23	-5	581	1274	16	-9	621	1333	9	-13	663	1399	2	-17	710	1468	-6	-21	760	1542
	41	5	606	1310	34	1	647	1374	27	-3	693	1442	20	-7	741	1515	13	-11	794	1591
	59	15	631	1349	52	11	674	1415	45	7	722	1486	38	3	773	1561	31	-1	828	1640
	77	25	656	1387	70	21	701	1456	63	17	751	1529	56	13	804	1606	49	9	862	1691
	95	35	681	1425	88	31	729	1496	81	27	780	1571	74	23	836	1652	67	19	897	1744
30	23	-5	422	1066	16	-9	456	1115	9	-13	493	1167	2	-17	533	1226	-6	-21	576	1294
	41	5	443	1097	34	1	479	1147	27	-3	518	1202	20	-7	560	1269	13	-11	606	1340
	59	15	465	1127	52	11	502	1180	45	7	543	1242	38	3	588	1312	31	-1	636	1385
	77	25	486	1157	70	21	526	1214	63	17	568	1282	56	13	615	1354	49	9	666	1431
	95	35	508	1187	88	31	549	1252	81	27	594	1321	74	23	643	1396	67	19	696	1476

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SECTION VI

WEIGHT AND BALANCE/ EQUIPMENT LIST

TABLE OF CONTENTS

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INTRODUCTION TO WEIGHT AND BALANCE

The necessity for proper computation of the airplane's weight and balance cannot be overemphasized. In the basic design, it is planned that under normal loading the weight distribution of pilot, passengers, baggage, and fuel will balance the airplane for flight. Since these items are all variables, it is possible to concentrate weight in such a way as to make the airplane unsafe for flight. The factors which must be considered in the weight and balance of the airplane are the installation of equipment after the airplane has been weighed, trapped or unusable fuel, engine oil, usable fuel, pilot and passenger weights, and baggage or cargo.

In order to simplify the computation of the weight and balance, Beech Aircraft Corporation has devised a form called Basic Empty Weight and Balance. When the airplane is delivered from the factory it will first be weighed and the data recorded on this form. Provision has been made on the form for listing additions of items to be installed before the delivery or subtractions of items to be removed before delivery from the "as weighed" condition. This then represents the empty weight of the airplane.

When the airplane is first fueled, a certain amount of fuel is trapped in the fuel lines and cells which cannot be drained. Also, in some regimes of flight there are certain amounts of fuel that cannot be used. The combination of these fuel amounts is classified as unusable fuel. Also, it has been found that all operators bring the oil level near full before each flight. Thus, these items are computed along with the empty weight, giving a Basic Empty Weight as a starting point to the pilot for each flight computation.

Once the Basic Empty Weight for a given airplane has been established, the pilot is then only concerned with the

variable items which will comprise his useful load. These items which are of a changing nature are: Pilot and Passengers (computed on an individual weight and the seat occupied), Baggage and/or Cargo (computed on weight and location within the airplane), and Usable Fuel (the remaining fuel after subtracting the unusable fuel from the measured fuel on board).

WEIGHING INSTRUCTIONS

Periodic weighing of the airplane may be required to keep the Basic Empty Weight current. All changes to the airplane affecting weight and balance are the responsibility of the airplane's operator.

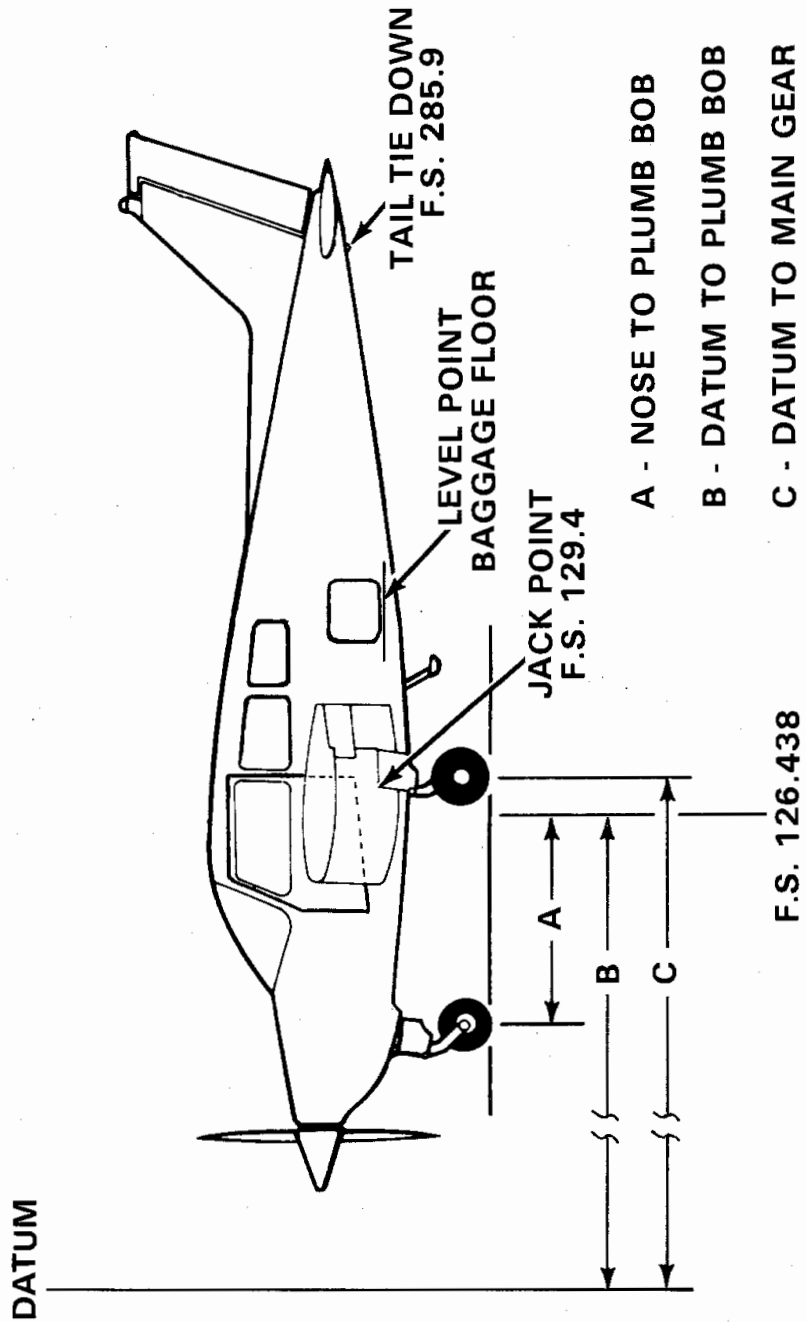
1. Provision for jack points are provided for weighing: two on the wing front spar at Fuselage Station 129.4 and one on the aft fuselage at Fuselage Station 285.9 (tail tie-down ring).
2. Fuel should be drained preparatory to weighing. Tanks are drained from the regular drain ports with the airplane in static ground attitude. The unusable fuel to be added to a Basic Empty Weight is: 6 lbs (M-1285 thru M-1516) at Fuselage Station 125.0. 45.6 lbs (M-1517 thru M-1879 except M-1875 or prior airplanes after compliance with Service Instructions No. 0624-281) at Fuselage Station 125.0. 15.6 lbs (M-1875, M-1880 & After) at Fuselage Station (125.0).
3. Engine oil must be at the full level or completely drained. Total engine oil when full is 15 pounds at Fuselage Station 48.
4. To determine airplane configuration at time of weighing, installed equipment is checked against the airplane equipment list or superseding forms. All installed equipment must be in its proper place during weighing.

5. At the time of weighing, the airplane must be level both longitudinally and laterally. Longitudinally and laterally level attitude is determined with a level on the baggage compartment floor.

6. Measurement of the reaction arms for a wheel weighing is made using a steel measuring tape. Measurements are taken, with the airplane level on the scales, from the reference (a plumb bob dropped from the centerline of airplane at F.S. 126.438, forward screw in spar access cover, approximately 8 to 10 inches forward of centerline drain hole) to the axle centerline of the main gear and then to the nose wheel axle centerline. The main wheel axle centerline is best located by stretching a string across from one main wheel to the other. All measurements are to be taken with the tape level with the hangar floor and parallel to the fuselage centerline. The locations of the wheel reactions will be approximately at Fuselage Station 134.0 for main wheels and Fuselage Station 58.5 for the nose wheel.

7. Jack point weighings are accomplished by placing scales at the jack points specified in step 1 above. Since the center of gravity of the airplane is forward of Fuselage Station 129.4, the tail reaction of the airplane will be in an up direction. This can be measured on regular scales by placing ballast of approximately 200 pounds on the scales to which the aft weighing point is attached by cable of adjustable length. The up reaction will then be total ballast weight minus the scale reading and is entered in the weighing form as a negative quantity.

8. Weighing should always be made in an enclosed area which is free from air currents. The scales used should be properly calibrated and certified.


TAIL TIE DOWN
F.S. 285.9
LEVEL POINT
BAGGAGE FLOOR
JACK POINT
F.S. 129.4
A - NOSE TO PLUMB BOB
B - DATUM TO PLUMB BOB
C - DATUM TO MAIN GEAR
F.S. 126.438
A
B
C
DATUM

BASIC EMPTY WEIGHT AND BALANCE

MODEL_____ SER. NO._____ REG. NO._____ DATE_____

JACK POINT LOCATION

FORWARD 129.4

AFT_____

PREPARED BY

Company_____

Signature_____

REACTION WHEEL - JACK POINTS	SCALE READING	TARE	NET WEIGHT	ARM	MOMENT
LEFT MAIN					
RIGHT MAIN					
NOSE OR TAIL					
TOTAL (AS WEIGHED)					
Space below provided for additions and subtractions to as weighed condition					
EMPTY WEIGHT (DRY)					
ENGINE OIL			15.0	48.0	720
UNUSABLE FUEL (M-1285 thru M-1516)			6.0	125.0	750
(M-1517 thru M-1879 except M-1875 or prior airplanes after compliance with S.I. No. 0624-281)			45.6	125.0	5700
(M-1875, M-1880 and after)			15.6	125.0	1950
BASIC EMPTY WEIGHT					

NOTE

Each new airplane is delivered with a completed sample loading, basic empty weight and center of gravity, and equipment list, all pertinent to that specific airplane. It is the owner's responsibility to ensure that changes in equipment are reflected in a new weight and balance and in an addendum to the equipment list. There are many ways of doing this; it is suggested that a running tally of equipment changes and their effect on basic empty weight and c.g. is a suitable means for meeting both requirements.

The current equipment list and empty weight and c.g. information must be retained with the airplane when it changes ownership. Beech Aircraft Corporation cannot maintain this information; the current status is known only to the owner. If these papers become lost, the FAA will require that the airplane be re-weighed to establish the empty weight and c.g. and that an inventory of installed equipment be conducted to create a new equipment list.

It is recommended that duplicate copies of the Basic Empty Weight and Balance sheet and the Equipment List be made and kept in an alternate location in the event the original handbook is misplaced.

WEIGHT AND BALANCE RECORD

SERIAL NO. _____ REGISTRATION NO. _____ PAGE NO. _____

DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR CHANGE	WEIGHT CHANGE ADDED (+) OR REMOVED (-)			RUNNING BASIC EMPTY WEIGHT	
	IN	OUT		WT (LBS)	ARM (IN.)	MOM / 100	WT (LBS)	MOM / 100

WEIGHT AND BALANCE RECORD

SERIAL NO. ______ REGISTRATION NO. ______ PAGE NO. ______

DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR CHANGE	WEIGHT CHANGE ADDED (+) OR REMOVED (-)			RUNNING BASIC EMPTY WEIGHT	
	IN	OUT		WT (LBS)	ARM (IN.)	MOM/100	WT (LBS)	MOM/100

WEIGHT AND BALANCE RESPONSIBILITIES

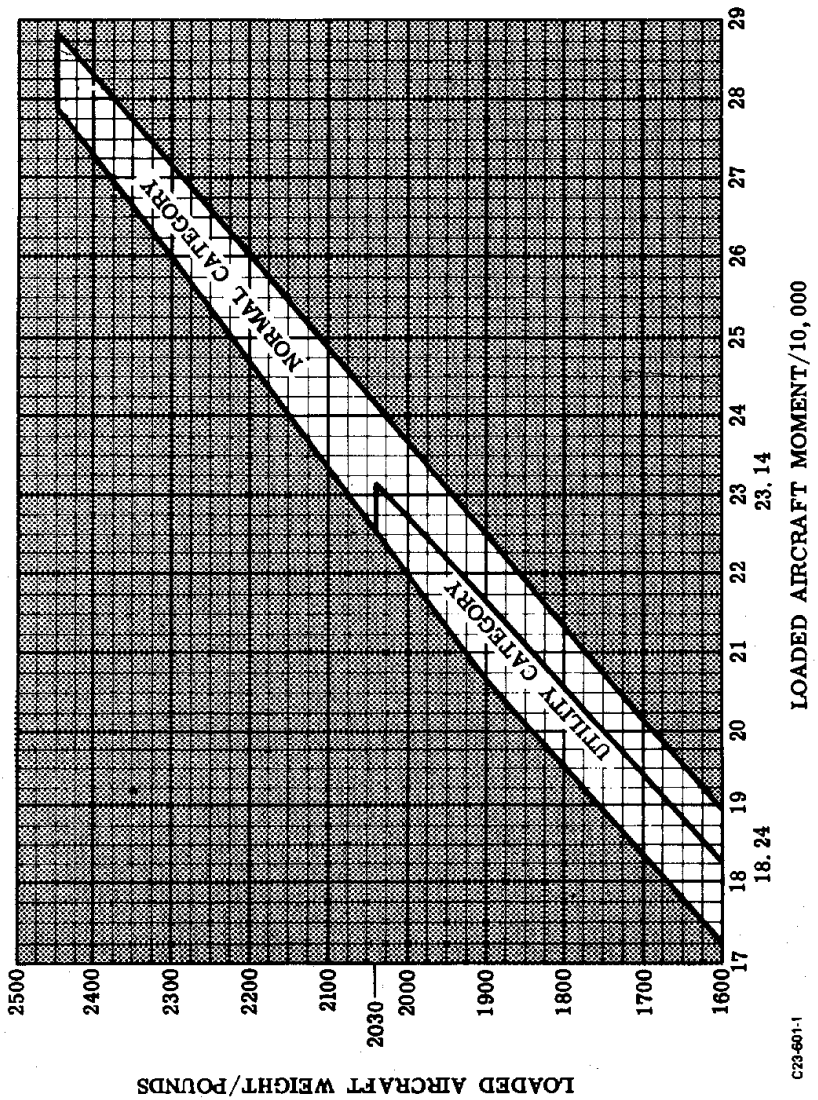
The Basic Empty Weight and Moment of the airplane at the time of delivery are shown on the airplane Basic Empty Weight and Balance form. Useful load items which may be loaded into the airplane are shown on the Useful Load Weights and Moments tables. The minimum and maximum moments are shown on the Moment Limits vs Weight table and can also be plotted on the Moment Limits vs Weight graph as visual indication that the limit is within the operational envelope. These moments correspond to the forward and aft center-of-gravity flight limits for a particular weight. The airplane must be loaded in such a manner to keep the center-of-gravity within these limits.

NOTE

THE FLOOR STRUCTURE LOAD LIMIT IS 100 POUNDS PER SQUARE FOOT.

ALL BAGGAGE/CARGO MUST BE SECURED.

GROSS WEIGHT MOMENT LIMITS GRAPH



GROSS WEIGHT MOMENT LIMITS

(NORMAL CATEGORY)

Gross Weight	Minimum Moment 100	Maximum Moment 100	Gross Weight	Minimum Moment 100	Maximum Moment 100	Gross Weight	Minimum Moment 100	Maximum Moment 100
1500	1617	1775	1900	2068	2248	2300	2599	2721
1510	1628	1786	1910	2081	2260	2310	2613	2733
1520	1639	1798	1920	2094	2271	2320	2626	2745
1530	1649	1810	1930	2107	2283	2330	2640	2756
1540	1660	1822	1940	2120	2295	2340	2654	2768
1550	1671	1834	1950	2133	2307	2350	2668	2780
1560	1682	1845	1960	2145	2319	2360	2681	2792
1570	1692	1857	1970	2158	2331	2370	2695	2804
1580	1703	1869	1980	2172	2342	2380	2708	2816
1590	1714	1881	1990	2185	2354	2390	2722	2827
1600	1725	1893	2000	2198	2366	2400	2736	2839
1610	1736	1905	2010	2211	2378	2410	2750	2851
1620	1746	1916	2020	2224	2390	2420	2764	2863
1630	1757	1928	2030	2237	2401	2430	2777	2875
1640	1768	1940	2040	2250	2413	2440	2791	2887
1650	1779	1952	2050	2263	2425	2450	2805	2898
1660	1789	1964	2060	2276	2437			
1670	1800	1976	2070	2290	2449			
1680	1811	1987	2080	2303	2461			
1690	1822	1999	2090	2316	2472			
1700	1833	2011	2100	2329	2484			
1710	1843	2023	2110	2343	2496			
1720	1854	2035	2120	2356	2508			
1730	1865	2047	2130	2369	2520			
1740	1876	2058	2140	2383	2532			
1750	1887	2070	2150	2396	2543			
1760	1897	2082	2160	2409	2555			
1770	1908	2094	2170	2423	2567			
1780	1919	2106	2180	2436	2579			
1790	1930	2118	2190	2450	2591			
1800	1940	2129	2200	2463	2603			
1810	1953	2141	2210	2477	2614			
1820	1966	2153	2220	2490	2626			
1830	1978	2165	2230	2504	2638			
1840	1991	2177	2240	2517	2650			
1850	2004	2189	2250	2531	2662			
1860	2017	2200	2260	2544	2674			
1870	2029	2212	2270	2558	2685			
1880	2042	2224	2280	2572	2697			
1890	2055	2236	2290	2585	2709			

The above weight and moment limits are based on the following weight and center of gravity limit data:

NORMAL CATEGORY

WEIGHT CONDITION	FWD CG LIMIT	AFT CG LIMIT
2450 lbs (max. take-off or landing)	114.5	118.3
1800 lbs or less	107.8	118.3

GROSS WEIGHT MOMENT LIMITS

(UTILITY CATEGORY &
ACROBATIC CATEGORY)

Gross Weight	Minimum Moment 100	Maximum Moment 100	Gross Weight	Minimum Moment 100	Maximum Moment 100
1500	1617	1710	1800	1940	2052
1510	1628	1721	1810	1953	2063
1520	1639	1733	1820	1966	2075
1530	1649	1744	1830	1978	2086
1540	1660	1756	1840	1991	2098
1550	1671	1767	1850	2004	2109
1560	1682	1778	1860	2017	2120
1570	1692	1790	1870	2029	2132
1580	1703	1801	1880	2042	2143
1590	1714	1813	1890	2055	2155
1600	1725	1824	1900	2068	2166
1610	1736	1835	1910	2081	2177
1620	1746	1847	1920	2094	2189
1630	1757	1858	1930	2107	2200
1640	1768	1870	1940	2120	2212
1650	1779	1881	1950	2133	2223
1660	1789	1892	1960	2145	2234
1670	1800	1904	1970	2158	2246
1680	1811	1915	1980	2172	2257
1690	1822	1927	1990	2185	2269
1700	1833	1938	2000	2198	2280
1710	1843	1949	2010	2211	2291
1720	1854	1961	2020	2224	2303
1730	1865	1972	2030	2237	2314
1740	1876	1984			
1750	1887	1995			
1760	1897	2006			
1770	1908	2018			
1780	1919	2029			
1790	1930	2041			

The above weight and moment limits are based on the following weight and center of gravity limit data:

UTILITY CATEGORY & ACROBATIC CATEGORY

WEIGHT CONDITION	FWD CG LIMIT	AFT CG LIMIT
2030 lbs (max. take-off or landing)	110.2	114.0
1800 lbs or less	107.8	114.0

COMPUTING PROCEDURE

1. Record the Basic Empty Weight and Moment from the Basic Empty Weight and Balance form (or from the latest superseding form) under the Basic Empty Condition block. The moment must be divided by 100 to correspond to Useful Load Weights and Moments tables.

2. Record the weight and corresponding moment from the appropriate table of each of the useful load items (except fuel) to be carried in the airplane.

3. Total the weight column and moment column. The SUB-TOTAL is the Zero Fuel Condition.

4. Determine the weight and corresponding moment for the fuel loading to be used. This fuel loading includes fuel for the flight, plus that required for start, taxi, and take-off. Add the Fuel to Zero Fuel Condition to obtain the SUB-TOTAL Ramp Condition.

5. Subtract the fuel to be used for start, taxi, and take-off to arrive at the SUB-TOTAL Take-off Condition.

6. Subtract the weight and moment of the fuel in the incremental sequence in which it is to be used from the take-off weight and moment. The Zero Fuel Condition, the Take-Off Condition, and the Landing Condition moment must be within the minimum and maximum moments shown on the Moment Limit vs Weight graph for that weight. If the total moment is less than the minimum moment allowed, useful load items must be shifted aft or forward load items reduced. If the total moment is greater than the maximum moment allowed, useful load items must be shifted forward or aft load items reduced. If the quantity or location of load items is changed, the calculations must be revised and the moments rechecked.

The following Sample Loading chart is presented to depict the sample method of computing a load. Weights used DO NOT reflect an actual airplane loading.

WEIGHT AND BALANCE LOADING FORM

MODEL C23 DATE _____

SERIAL NO. M-XXXX REG NO. NXXX

ITEM	WEIGHT	MOM/100
1. BASIC EMPTY CONDITION	1500	1650
2. FRONT SEAT OCCUPANTS	340	374
3. 3rd & 4th SEAT OCCUPANTS	340	482
4. BAGGAGE OR CARGO	40	67
5. **SUB TOTAL** ZERO FUEL CONDITION	2220	2573
6. FUEL LOADING (37 GAL)	222	259
7. **SUB TOTAL** RAMP CONDITION	2442	2832
8. *LESS FUEL F... TAXI, AND TAK...OFF	-5	-6
9. **SUB TOTAL** TAKE-OFF CONDITION	2437	2826
10. LESS FUEL TO DESTINATION (25 GAL)	-150	-176
11. **LANDING CONDITION**	2287	2650

SAMPLE

*Fuel for start, taxi and take-off is normally 5 lbs at an average mom/100 of 6.

WEIGHT AND BALANCE LOADING FORM

MODEL _____ **DATE** _____

SERIAL NO. _____ **REG NO.** NXXX

ITEM	WEIGHT	MOM/100
1. BASIC EMPTY CONDITION	1630	1750
2. FRONT SEAT OCCUPANTS	305	326
3. 3rd & 4th SEAT OCCUPANTS	305	450
4. BAGGAGE OR CARGO	30	50
5. **SUB TOTAL ZERO FUEL CONDITION**	2270	2576
6. FUEL LOADING (GAL)	210	246
7. **SUB TOTAL** RAMP CONDITION	2480	2822
8. *LESS FUEL FOR START, TAXI, AND TAKE-OFF	5	6
9. **SUB TOTAL** TAKE-OFF CONDITION	2475	2816
10. LESS FUEL TO DESTINATION (GAL)	150	176
11. **LANDING CONDITION**	2325	2640

*Fuel for start, taxi and take-off is normally 5 lbs at an average mom/100 of 6.

USEFUL LOAD WEIGHTS AND MOMENTS

OCCUPANTS

WEIGHT	FRONT SEATS			3RD AND 4TH SEATS	
	*FWD POS.		*AFT POS.	BENCH SEAT	SPLIT SEAT
	††ARM **104	†ARM **105	ARM **112	ARM **142	ARM **144
	MOM/100	MOM/100	MOM/100	MOM/100	MOM/100
120	125	126	134	170	173
130	135	137	146	185	187
140	146	147	157	199	202
150	156	158	168	213	216
160	166	168	179	227	230
170	177	179	190	241	245
180	187	189	202	256	259
190	198	200	213	270	274
200	208	210	224	284	288

†Effective M-1285 thru M-2006
††Effective M-2007 and after
*Reclining seat with back in full-up position
**Values computed from a C.G. criterion based on a 170 pound male. Differences in physical characteristics can cause variation in center of gravity location.

USEFUL LOAD WEIGHTS AND MOMENTS

OIL

(Included in Basic Empty Weight)

ARM 48		
QTS	WT	MOMENT/100
8	15	7

USABLE FUEL

ARM 117		
GALLONS	WEIGHT	MOMENT/100
5	30	35
10	60	70
15	90	105
20	120	140
22	132	154
25	150	176
27	162	189
30	180	211
32	192	225
35	210	246
37	222	259
40	240	281
45	270	316
50	300	351
52	312	365
55	330	386
57	342	400
58	348	407

USEFUL LOAD WEIGHTS AND MOMENTS

BAGGAGE

ARM 167	
WEIGHT	MOMENT 100
10	17
20	33
30	50
40	67
50	84
60	100
70	117
80	134
90	150
100	167
110	184
120	200
130	217
140	234

SECTION VII

SYSTEMS DESCRIPTION

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TABLE OF CONTENTS (Continued)

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AIRFRAME

The BEECHCRAFT Sundowner C23 is a four place, single-engine landplane with non-retractable landing gear and is powered by an Avco Lycoming four-cylinder, horizontally opposed engine with a fixed pitch propeller.

SEATING ARRANGEMENTS

In the standard configuration two adjustable seats and one fixed-bench seat are installed. Optional split 3rd and 4th seats are available. To adjust either of the front seats, pull the release knob below the left forward seat corner (pull to the right, then up) and slide the seat forward or aft as desired. Make certain the seat is locked securely in place after adjustment. The backs of all individual seats can be placed in any of three positions. Outboard armrests for the front seats are attached to the cabin doors.

FLIGHT CONTROLS

CONTROL SURFACES

The control surfaces are operated with conventional cable systems terminating in bellcranks.

CONTROL COLUMN

A single control column/wheel is installed as standard equipment on the left side. The optional control column/wheel may be installed on the right side. These are provided for stabilator and aileron control.

RUDDER PEDALS

The standard installation provides pedals for rudder control on the left side only. The optional installation provides a set of rudder pedals for both front seats.

STABILATOR TRIM SYSTEM

MANUAL TRIM

The manual stabilator trim is actuated by a handwheel located between the front seats. A stabilator tab position indicator is located adjacent to the trim control handwheel. Forward movement of the wheel trims the airplane's nose down, aft movement of the wheel trims the airplane's nose up.

ELECTRIC TRIM

The optional electric trim system is controlled by the ON-OFF switch located on the instrument panel, a thumb switch on the control wheel and a circuit breaker on the right subpanel. The ON-OFF switch must be on the ON position to operate the system. The thumb switch is moved forward for nose down, aft for nose up and when released, returns to the center OFF position. When the system is not being electrically actuated, the manual trim control wheel may be used.

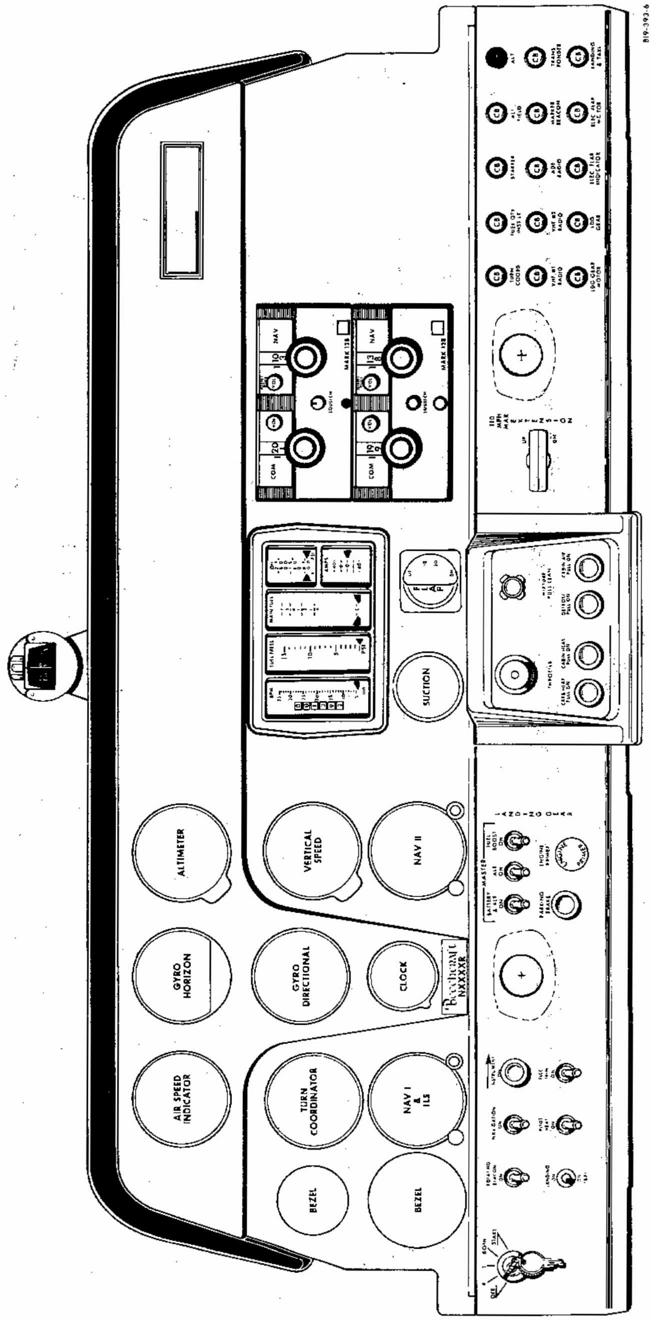
INSTRUMENT PANEL

The standard instrument panel consists of flight and navigation instruments on the left, and an avionics section on the right. The switching panel and the engine gages are located on the left subpanel and the circuit breaker grouping is on the right subpanel.

SWITCHES

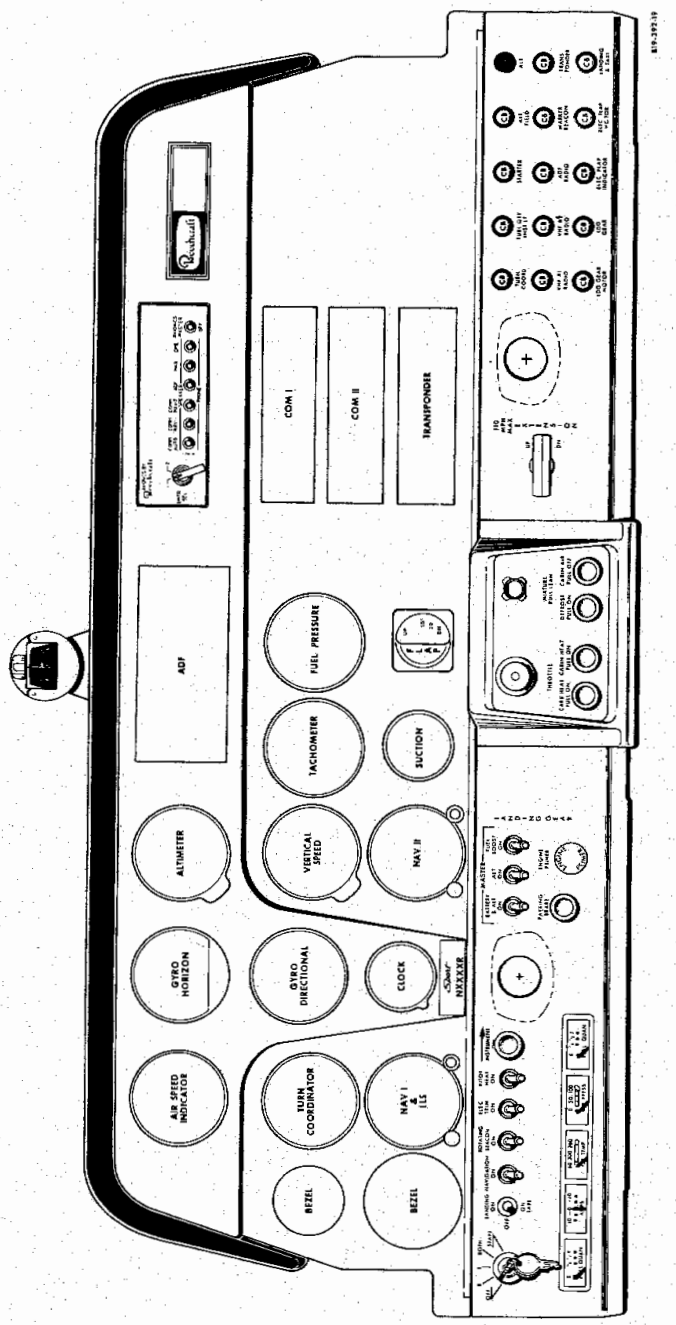
The Battery, Alternator, and Fuel Boost switches are grouped on the subpanel to the right of the pilot's control column under the marking MASTER. The Pitot Heat, Electric Trim, Magneto/Start, and light switches are to the left of the pilot's control column. (See page 1-9 for battery switch description.)

TYPICAL INSTRUMENT PANEL



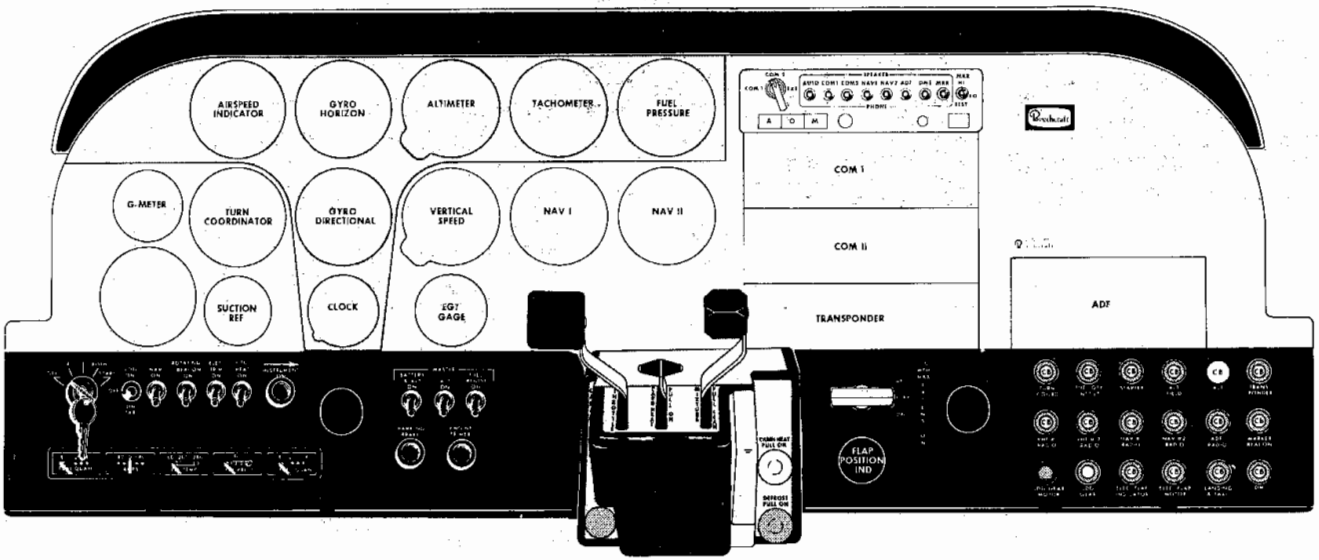
M-1285 thru M-1375

TYPICAL INSTRUMENT PANEL



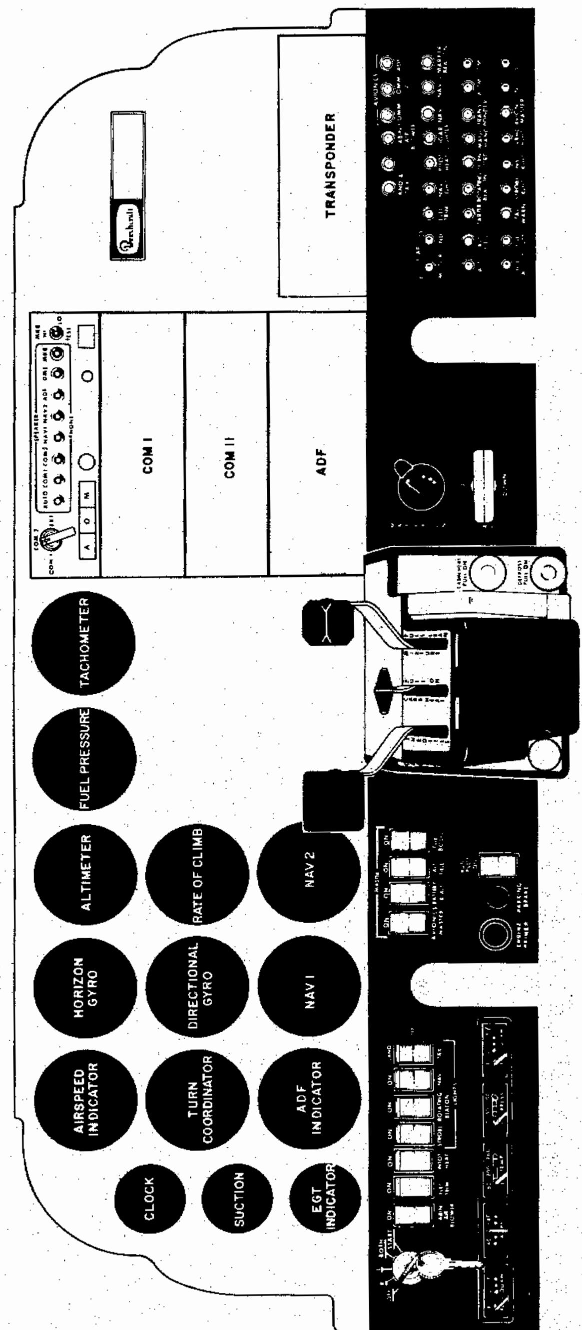
M-1376 thru M-1454

TYPICAL INSTRUMENT PANEL



M-1455 thru M-1979 except M-1971

TYPICAL INSTRUMENT PANEL



(M-1971, M-1980 and after)

CIRCUIT BREAKERS

The circuit breakers are located on the right subpanel.

FLIGHT INSTRUMENTS

The standard flight instruments are grouped in a "T" pattern on the main panel for the best presentation for the pilot. The magnetic compass is located above the instrument panel.

Ram air pressure for the airspeed indicator enters through the pitot tube under the left wing, static air pressure for the altimeter, vertical speed and airspeed indicator is supplied by a static port on each side of the fuselage, just aft of the cabin.

M-1285 through M-1979 except M-1971:

Instrument lights are turned on and dimmed by a rheostat switch located on the left subpanel, and a rheostat switch located below the power quadrant.

M-1971, M-1980 and after:

Instrument lights are turned on and dimmed by two rheostat switches located on the pedestal, below the power quadrant.

GROUND CONTROL

Steering is accomplished by the use of rudder pedals through a spring-loaded linkage connecting the nose gear to the rudder pedals. The nose gear maximum travel is 40° ± 2° right or left, and a hydraulic shimmy damper on the nose gear yoke compensates for any tendency to shimmy. Toe brakes may be used to aid in steering the airplane on the ground.

The minimum wing-tip turning radius, using full steering, one brake and partial power is 23 feet 11 inches.

WING FLAPS

MANUAL

The four position flaps are operated by a manual lever located between the front seats. In addition to the full flap down position of 35°, intermediate positions are provided. As the handle is raised to lower the flaps, a definite detent and click of the thumb release button will be felt at the 15° and 25° flap extended positions. Another detent will indicate the 35° position. To retract the flaps, depress the thumb button and lower the handle to the floor. The thumb button does not need to be depressed, nor should it be, to lower the flaps.

ELECTRIC

The electric wing flaps are controlled by a three-position switch UP, OFF and DOWN, located to the right of the power quadrant. The switch must be pulled out of detent before it can be repositioned. A dial type indicator has markings for UP, 10 DEGREES, 20 DEGREES and DOWN. The indicator is located adjacent to the power quadrant.

Limit switches automatically turn off the electrical motor when the flaps reach the extremes of travel. Intermediate flap positions can be obtained by placing the three-position switch in the OFF position during flap extension or retraction.

CAUTION

Establish recovery altitude, recovery power, and airspeed before retracting flaps during slow flight, particularly during recoveries from approach configuration.

LANDING GEAR

The fixed tricycle landing gear, fabricated from magnesium castings and aluminum forgings, uses rubber disks for shock absorption.

The gears are identical except for the pivoting and steering provisions on the nose gear and the brake attachment points on the main gear.

The nose wheel is steerable through a spring loaded linkage connected to the rudder pedals and has a maximum travel of 40° ± 2° in either direction. A hydraulic damper on the nose wheel strut compensates for any tendency to shimmy. Toe brakes will aid in steering the airplane on the ground.

BRAKES

The brakes on the main landing gear wheels are operated by applying toe pressure to the rudder pedals. The parking brake push-pull control is located on the right side of the lower left subpanel. To set the parking brakes, pull the control out and depress the pilot's toe pedals until firm. Push the control in to release the brakes.

NOTE

Wheel chocks should be installed and the parking brake left off if the airplane is to be left unattended. Changes in ambient temperature can cause the brakes to release or to exert excessive pressures.

BAGGAGE COMPARTMENT

A 19.5 cubic-foot baggage space is located behind the rear seat. In addition a hat shelf, near the top of the cabin enclosure provides an out-of-the-way space for light miscellaneous articles. Both the baggage compartment and hat shelf are accessible in flight.

WARNING

Do not carry hazardous material anywhere in the airplane.

Do not carry children in the baggage compartment.

SEATS, SEAT BELTS, AND SHOULDER HARNESSES

SEAT ADJUSTMENTS

To adjust either of the front seats pull up on the release bar below the left hand seat corner and slide the seat forward or aft, as desired. Make certain the seat is locked securely in place after adjustment. The backs of all individual seats can be placed in any of four positions. Outboard armrests for the front seats are attached to the cabin doors.

SEAT BELTS

All seats are provided with seat belts having a lever-action, quick-release, metal buckle. The seat belt length is adjustable. Holding the buckle at a right angle to the belt releases the binding action, allowing the belt to slip.

SHOULDER HARNESSES

The shoulder harness is a standard installation for all seats and should be used with the seats in the upright position. The spring loading at the inertia reel keeps the harness snug, but will allow normal movement during flight operations. The inertia reel is designed with a locking device that will secure the harness in the event of sudden forward movement or an impact action. The strap is worn over the shoulder and down across the body where it is fastened by a metal loop to the seat belt buckle. The inertia reels for the front and rear seats are attached to the lower cabin sidewall structure at the aft edge of the respective seat. The inertia reel is covered with an escutcheon, and the strap runs up from the reel to a looped fitting attached to the window frame just aft of the seat. For stowing these shoulder harness straps, stowage attach points are provided adjacent to the inertia reel on the cabin sidewall.

NOTE

The seat belt is independent of the shoulder harness. However, the shoulder harness may be used only when the seat belt is fastened.

WARNING

Occupants shorter than 4'7" are not to use shoulder harness.

DOORS AND EXITS

FORWARD CABIN DOORS

The airplane has a conventional cabin door on each side (standard on serials M-1362 and after) of the fuselage adjacent to the forward seats. The outside cabin door handle is spring-loaded to fit into a recess in the door. The door may be locked with a key. To open the door from the out-

side, lift the handle from its recess and pull until the door opens. To close the cabin door from the inside, grasp the armrest attached to the door and firmly pull the door closed. Opening the storm window will alleviate pressure inside the cabin as the door is being closed. On serials M-1285 thru M-1412 and M-1415, M-1419, M-1423, M-1439 and M-1447 a second door latch is installed on the upper aft door frame which must be rotated to the locked position. Press firmly outward at the aft edge of the door. If any movement of the door is detected, completely open the door and close again following the above instructions. To open the door from the inside, lift the door release handle and pull until the door latch releases.

AFT BAGGAGE DOOR

A baggage door, aft of the cabin door on either the left or right side of the fuselage, is provided for loading cargo into the aft cabin. To open the door on the right side from the outside, use the key provided to turn the cam lock. To open the door on the left side from the outside, grasp the flush handle and pull until the door opens. To open the right door from the inside, rotate handle counter clockwise until door opens. This right door lock can be locked with a key.

CONTROL LOCKS

A control lock is provided with the loose tools, to prevent movement of the control column and impairs access to the magneto/start switch.

To install the Control Lock:

1. Level the control wheel and move control column so the holes in the control column hanger and control column will align to accept the pin.

2. Push the control column lock pin through the hole provided in the control column hanger and into the hole in the underside of the control column tube assembly.
3. Ensure positive retention of the lock pin by positioning the hook over the control column.

WARNING

Before starting engine, remove the control lock by reversing the above procedure.

ENGINE

The BEECHCRAFT Sundowner C23 is powered by a Lycoming 0-360-A2G, 0-360-A4G, 0-360-A4J, or 0-360-A4K four-cylinder, horizontally opposed engine, rated at 180 horsepower at 2700 rpm.

Normal operating engine speed range is 1800 to 2700 rpm with a restricted operating range between 2150 and 2350 rpm, for the 0-360-A2G engine only.

ENGINE CONTROLS

The engine controls are centrally located for ease of operation from either the left or right seats. The throttle on the power quadrant incorporates both a locking button and a vernier arrangement for fine adjustments. The mixture control is locked with a clockwise turn of the friction nut located on the forward side of the knob.

When the engine controls are installed in the pedestal arrangement, the levers are grouped along the upper face of the pedestal. Their knobs are shaped to government standard configuration so they can be identified by touch. A single controllable friction lock on the right side of the console permits manual adjusting of the pressure on the levers.

ENGINE INSTRUMENTS

VERTICAL READOUT TYPE

The engine instruments are the vertical readout type. The instrument cluster is installed in the panel directly above the engine controls. The cluster includes a tachometer with hourmeter, fuel pressure indicator, a left and a right fuel quantity indicator, an oil temperature and oil pressure indicator and an ammeter.

DIAL TYPE

The engine instrument cluster is located on the lower left subpanel and includes the left fuel quantity indicator, an ammeter, oil temperature, oil pressure and the right fuel quantity indicator. The tachometer, and the fuel pressure indicator are located on the upper center of the instrument panel.

EXHAUST GAS TEMPERATURE INDICATOR (EGT)

This installation provides for sensitive and rapid indication of exhaust gas temperature to assist in adjusting the fuel/air mixture during cruise.

ENGINE BREAK-IN INFORMATION

New engines have been carefully run-in by the engine manufacturer. However, the engine should be operated on straight mineral oil for a minimum of 50 hours or until oil consumption stabilizes. After the first 25 hours of operation, drain and replace the mineral oil. A change to an approved engine oil should be made after the break-in period. Refer to Lycoming Engine Operator's Manual.

NOTE

In order to promote proper ring seating, cruise

power settings of 65% to 75% should be used until a total of 50 hours has accumulated or until oil consumption has stabilized. This recommendation is applicable to in-service engines following cylinder replacement or top-overhaul of one or more cylinders, as well as to new engines.

COWLING

The cowling is the split-type and is removable to expose the engine and mount assemblies.

LUBRICATION SYSTEM

The engine oil system is the wet-sump type and has an 8-quart capacity. Oil operating temperatures are controlled by an automatic thermostat bypass control. The bypass control will limit oil flow through the oil cooler when operating temperatures are below normal, and will permit the oil to bypass the cooler if it should become blocked.

CARBURETOR HEAT

There is a possibility of ice forming in the induction system under certain moist atmospheric conditions. Generally ice may form in the vicinity of the carburetor butterfly and may build up enough that a drop in power output could result. The induction installation is equipped with a system for preheating the incoming air to the carburetor. The air preheater is essentially a tube or jacket through which the exhaust pipe from one or more cylinders is passed, and the air flowing over these surfaces is heated. A push-pull control located on the power quadrant or the center lever on the pedestal, actuates a diverter gate which allows the hot air to mix with the cold air in the induction chamber before it enters the carburetor. For fur-

ther information concerning the use of carburetor heat consult engine manufacturer's operating manual.

STARTER

A magneto/start switch, located on the subpanel to the left of the pilot's control column, incorporates R(right), L(left) and BOTH magneto positions in addition to the normal OFF and START positions. After activation of the starter the spring-loaded switch returns to the BOTH position when released. Battery switch and alternator switch are grouped on the subpanel to the right of the pilot's control column.

The warning light placarded STARTER ENGAGED (M-2278 and after) illuminates whenever electrical power is being supplied to the starter. If the light remains illuminated after starting, the starter relay has remained engaged, and loss of electrical power and possible equipment damage will eventually result. Turn the Battery Switch and Alternator Switch OFF. If in flight, land as soon as practical. If the light does not illuminate during starting, the indicator system is inoperative and the ammeter must be monitored to ensure that the starter does not remain energized after releasing the magneto/start switch.

PROPELLER

Sensenich M76EMMS-0-60 or 76EM8S5-0-60 fixed pitch, two blade propeller. Static rpm at maximum permissible throttle settings: Not over 2350 rpm and not under 2250 rpm. No additional tolerance permitted.

FUEL SYSTEM

The airplane is designed for operation on 91/96 (Blue) grade aviation gasoline. In the event this grade is not

available, 100 (Green) or 100LL (Blue) grade aviation gasolines may be used.

CAUTION

See Avco Lycoming Service Letter No. L185A or later revision for operation on alternate fuels.

FUEL TANKS

Fuel tanks located in each wing leading edge have a nominal capacity of 29.9 gallons. In the filler neck of each tank is a visual measuring tab which permits partial filling of the fuel system. When the fuel touches the bottom of the tab it indicates 15 gallons of fuel, and when filled to the slot in the tab it indicates 20 gallons of fuel. The indicating system reads full at 20 gallons. The pilot must visually check the fuel level during preflight to ascertain desired level. Fuel is fed from the desired tank through a fuel selector valve in the center floorboard and then through a strainer to the engine-driven fuel pump.

FUEL DRAINS

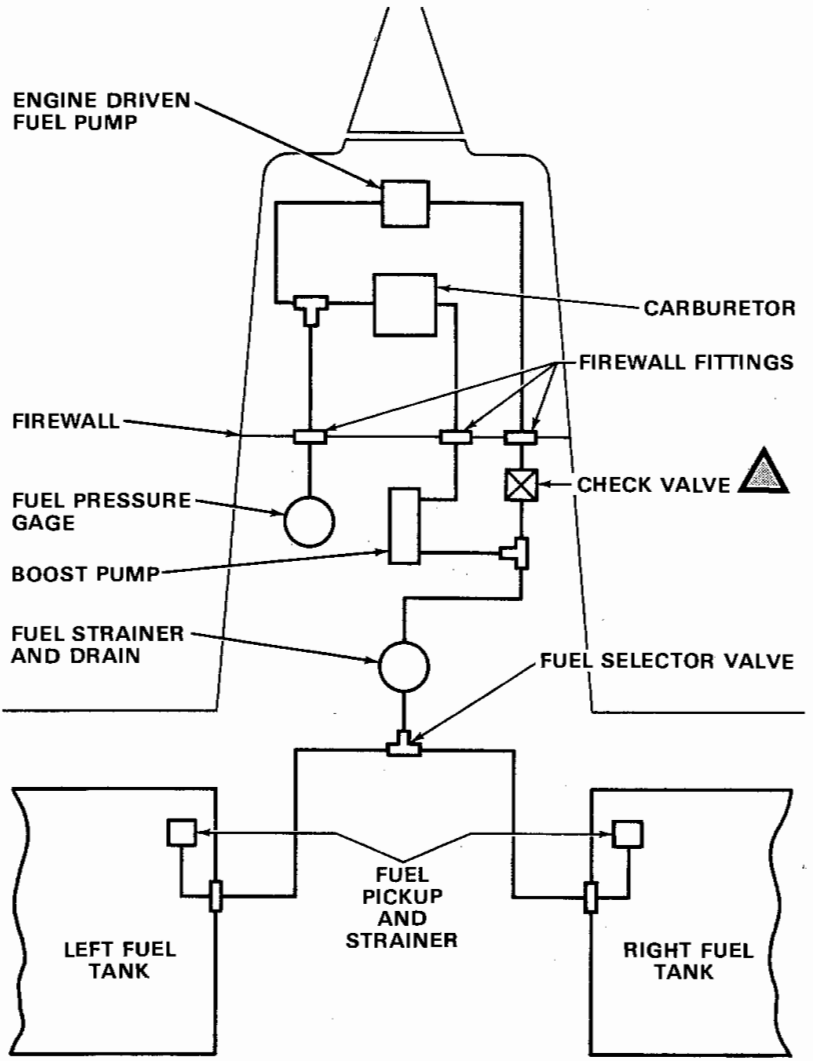
Two tank sump drains extend through the bottom of the wing skins, near the fuselage. M-1971, M-1980 and after have flush-type drain valves. The system low spot drain is incorporated in the fuel strainer on the lower right side of the fuselage aft of the nose wheel. Sump drains provide a means to visually inspect the fuel for water or contaminants.

Refer to HANDLING, SERVICING AND MAINTENANCE Section for procedures describing how and when to use fuel tank sump drains.

FUEL QUANTITY INDICATORS

Fuel quantity is measured by a float operated sensor, located in each wing tank system. These transmit electrical

FUEL SYSTEM SCHEMATIC



△ *EFFECTIVE M-1820, M-1837, M-1842, M-1845, M-1853, M-1854, M-1856, M-1860, M-1861, M-1862, M-1865, M-1866, M-1869, M-1871 AND AFTER.*

signals that indicate fuel remaining in each tank. The indicators indicate full when 20 or more gallons are in each wing tank.

FUEL BOOST PUMP

The electric fuel boost pump is controlled by an ON-OFF switch on the pilot's subpanel. It provides pressure for starting, taxiing, takeoff, climb, landing and emergency operation in cruise configuration. Immediately after starting the fuel boost pump should be turned off to test the engine driven fuel pump.

ENGINE PRIMER

The control for the engine primer is located directly below the master switches on the left subpanel. It is used to inject raw fuel into the induction system for cold starts. After use, secure the primer by turning it to lock it in the off position.

FUEL TANK SELECTION

The fuel selector valve handle is located on the floorboards between the pilot and copilot seats. Takeoffs and landings should be made using the tank that is more nearly full.

NOTE

On serials M-2225 and after, or on airplanes which have complied with BEECHCRAFT S.I. No. 1095, a fuel selector stop has been added to the selector valve guard. The fuel selector stop minimizes the possibility of inadvertently turning the fuel selector valve to the OFF detent position. The stop is a spring which must be depressed before the selector valve handle can be rotated to the OFF position.

If the engine stops because of insufficient fuel, refer to the EMERGENCY PROCEDURES Section for the Air Start procedures.

FUEL REQUIRED FOR FLIGHT

It is the pilot's responsibility to ascertain that the fuel quantity indicators are functioning and maintaining a reasonable degree of accuracy, and to be certain of ample fuel for a flight. Takeoff is prohibited if the fuel quantity indicators do not indicate above the yellow arc. The caps should be removed and fuel quantity checked to give the pilot an indication of fuel on board. The airplane must be approximately level for visual inspection of the tank. Fuel should be added so that the amount of fuel will be not less than is required for takeoff. Plan for an ample margin of fuel for any flight.

ELECTRICAL SYSTEM

The system circuitry is the single-wire, ground-return type, with the airplane structure used as the ground return. The battery, alternator, fuel boost, and magneto/start switches are located on the left subpanel. The circuit breaker panel, located on the right subpanel, contains the protective circuit-breakers for the various electrical systems. Some switch-type circuit breakers are located on the left subpanel.

In addition, on serials M-1285 thru M-1979, there is an in-line fuse in the rotating beacon wire and in the strobe light wire forward of the left subpanel, with spare fuses adjacent to the fuse holder. There is also a fuse on the left side of the quadrant pedestal for the electric clock (if installed), or an inline fuse near the battery box.

BATTERY

14-VOLT SYSTEM

A 12-volt battery is located in the aft fuselage. Battery servicing procedures are described in the HANDLING, SERVICING AND MAINTENANCE Section.

28-VOLT SYSTEM

One 24-volt battery, or two 12-volt batteries in series, are located in the aft fuselage. The two 12-volt batteries in series are of a shape and size such that both will fit in the same battery compartment which is provided for the 24-volt battery. Battery servicing procedures are described in the HANDLING, SERVICING AND MAINTENANCE Section.

ALTERNATOR

14-VOLT SYSTEM

The alternator maintains its full-rated 60-ampere output at cruise engine rpm, and uses a voltage regulator to adjust alternator output.

Since the alternator is not self-exciting, dual switches are required to activate the circuit. The switch placarded BATTERY & ALT, when placed in the ON position, will only activate the battery circuit. When this switch is on and the ALT (FIELD) switch is placed in the ON position, the alternator is excited by power from the airplane battery. When the BATTERY & ALT switch is in the OFF position, the alternator will be off regardless of the ALT (FIELD) switch position.

The alternator-field circuit breaker and alternator-output circuit breaker are located on the right subpanel (serials M-1285 through M-2130). On airplanes M-2131 through M-2178 (and M-1491 through M-2130 with installation of Beech Kit No. 23-3009-1 S) the alternator circuit is protected by an alternator-field circuit breaker on the right subpanel, and an alternator-output current limiter on the firewall.

28-VOLT SYSTEM

The 28-volt alternator is rated at 70 amps nominal output at cruise engine rpm. A self-exciting feature provides for activation of the alternator independent of battery power when the engine reaches a speed of 1200 to 1500 rpm. A switch on the pilot's subpanel placarded ALT FIELD controls the alternator circuit. Circuit breakers for the alternator are located on the right subpanel.

CAUTION

Do not pull alternator circuit breaker to turn off electrical system except in an emergency.

The alternator output is controlled by a regulator to keep the battery in a fully charged condition. Monitoring the ammeter for proper operation of the alternator is the same as for a generator installation. A zero reading, which is normal in cruising flight, indicates that the battery is fully charged and that the alternator output has been adjusted by the voltage regulator to balance the load of the electrical equipment in use.

Should an alternator or regulator become inoperative, indicated by a heavy discharging or widely fluctuating ammeter indication, turn the ALT switch to OFF, and minimize the electrical current consumption, since only battery power is available. Have the difficulty corrected before the next flight.

Refer to HANDLING, SERVICING AND MAINTENANCE Section for minor maintenance of the alternator.

EXTERNAL POWER RECEPTACLE

The external power receptacle is optional on this airplane.

If installed, it is located on the right side of the fuselage (M-1285 through M-2354) or on the left side of the fuselage (M-2355 and after) aft of the wing. Airplanes equipped with a 14-volt electrical system require a power unit set to 13.75 to 14.25 volts, while those equipped with a 28-volt electrical system require a setting of 27.75 to 28.25 volts.

CAUTION

On 14-volt airplanes, the power pin for external power is connected directly to the battery and continually energized. Turn off battery and alternator switches and all electrical and avionics switches when connecting the auxiliary power unit plug. Assure correct polarity (negative ground) before connecting auxiliary power unit. Turn on the battery switch before turning on the auxiliary power unit.

On 28-volt airplanes, a reverse polarity diode protection system is between the external power receptacle and the main bus. With external power applied, the bus is powered. Turn on the battery switch only, with all other switches including avionics switches off, when connecting the auxiliary power unit. Assure correct polarity before connecting external power.

LIGHTING SYSTEMS

INTERIOR LIGHTING

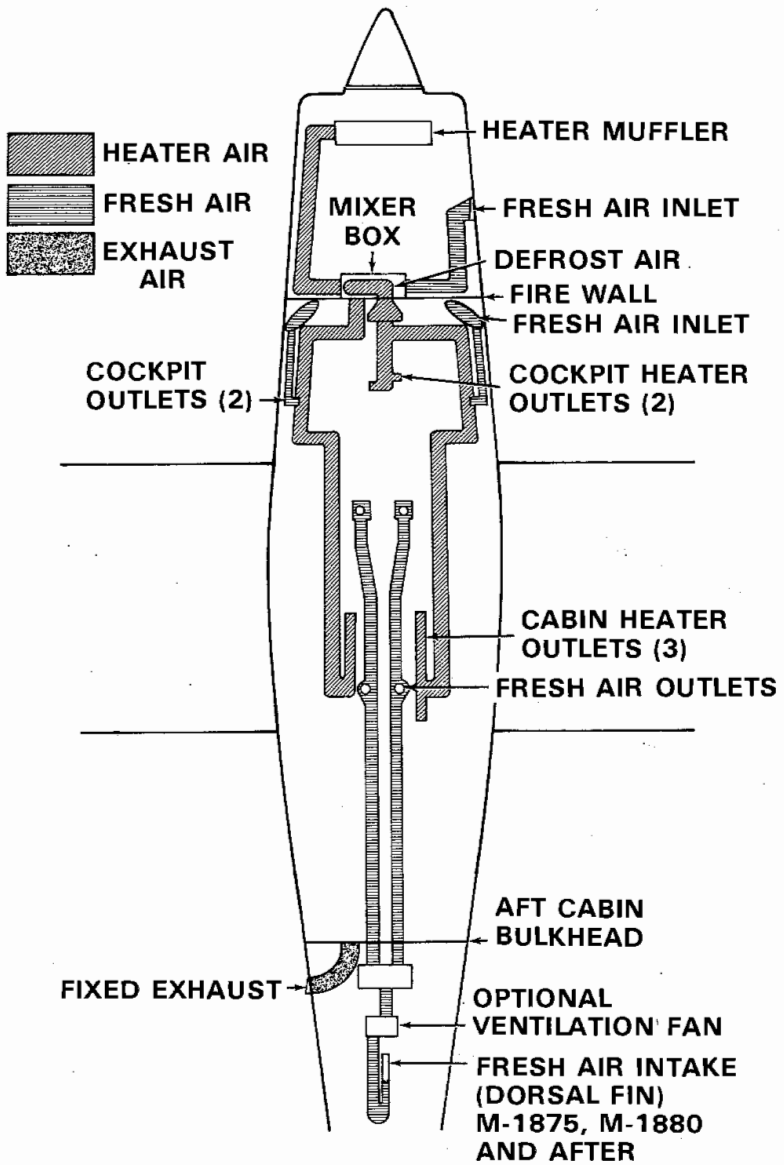
Lighting for the instrument panel is controlled by a rheostat switch located on the pilot's subpanel to the left of the control column (M-1285 through M-1979 except M-1971), or on the pedestal below the power quadrant (M-1971, M-1980 and after). The cabin dome light is operated by an ON-OFF switch adjacent to the light. The overhead instrument lighting and the map light (M-2224, M-2234 and after do not have a map light installed) are controlled by a rheostat switch located on the pedestal, below the power quadrant.

EXTERIOR LIGHTING

The switches for all of the exterior lights are located on the pilot's left subpanel. Each circuit is protected by a circuit breaker switch, circuit breaker, or fuse. The exterior lights consist of navigation lights on the wing tips and rudder, a landing light on the left outboard wing and taxi lights on both outboard wings. The landing light can be used for approach and taxiing. For longer battery and lamp life, use the landing light sparingly; avoid prolonged operation which could cause overheating during ground maneuvering.

NOTE

Particularly at night, reflections from rotating anti-collision lights or strobe lights on clouds, dense haze or dust can produce optical illusions and intense vertigo. Such lights, when installed, should be turned off before entering an overcast; their use may not be advisable under instrument or limited VFR conditions.



ENVIRONMENTAL SCHEMATIC

ENVIRONMENTAL SYSTEMS

CABIN HEATING

Air for warming the cabin and defrosting the windshield enters through an intake on the forward engine baffle, passes through the heater and into a mixer box where it is blended with cold air to obtain the desired cabin temperature. Hot or cold air may enter the cabin through the firewall outlets. The knob marked CABIN AIR regulates the quantity of air entering the cabin through this firewall outlet. With the CABIN AIR knob in, pull out the CABIN HEAT knob for heated air and push it in for fresh air. There are 4 outlets for cabin heat distribution. Pull out the DEFROST knob for maximum defrost. Under extremely cold conditions, heating in the back seats can be improved by partially pulling the defrost knob.

VENTILATION

M-1285 thru M-1879 except M-1875:

Fresh air for the cabin enters two grill type intakes immediately forward of the windshield. The air is ducted to four outlets, one on either side of the instrument panel and to two overhead outlets for rear seat passengers. The flow of air is controlled by the rotation of these outlets.

M-1875, M-1880 and after:

Fresh air for the cabin enters through two grill type intakes immediately forward of the windshield and through a scoop type intake on the dorsal fin. The grill type intakes supply fresh air to the outlets on each side of the instrument panel. The scoop type intake supplies fresh air to the four overhead outlets. Air flow through the outlets is regulated by rotating the outlet. An optional fan, controlled by a

switch, facilitates ventilation for ground operation. The switch is located on the pedestal (M-1875, M-1880 thru M-1979, except M-1971), or on the left instrument subpanel (M-1971, M-1980 and after). The fan should be off when the airplane is airborne.

EXHAUST VENT

A fixed exhaust vent is located in the aft cabin for flow-through ventilation.

PITOT AND STATIC SYSTEMS

PITOT SYSTEM

The pitot system provides a source of impact air for operation of the airspeed indicator. The pitot mast is located on the leading edge of the left wing.

PITOT HEAT

The pitot mast is provided with an electric heating element which is turned on and off with a switch on the instrument panel. The switch should be ON when flying in visible moisture. It is not advisable to operate the pitot heating element on the ground except for testing or for short intervals of time to remove ice or snow.

NORMAL STATIC AIR SYSTEM

The normal static air system provides a source of static air to the flight instruments through a flush static fitting on each side of the aft fuselage. A union located inside a cover plate on the belly of the airplane provides a drain point to remove moisture from the system.

EMERGENCY STATIC AIR SYSTEM

An emergency static air source may be installed to provide air for instrument operation should the static ports become blocked. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual Supplement for procedures describing how and when to use this system.

VACUUM SYSTEM

Vacuum for air-driven gyroscopic flight instruments and other air-driven equipment is supplied by an engine-driven vacuum pump. An adjustable relief valve controls suction by bleeding outside air into the vacuum pump.

A suction gage indicates system vacuum in inches of mercury. This instrument is located on the pilot's side of the instrument panel. The vacuum should be maintained within the green arc for proper operation of the air-driven instruments.

STALL WARNING SYSTEM

A stall warning horn located in the overhead speaker console sounds a warning 5 to 7 mph above a stall condition and continues steadily as the airplane approaches a complete stall. The stall warning horn, triggered by a sensing vane on the leading edge of the left wing, is equally affective in all flight configurations and at all weights.

NOTE

With the battery switch in the OFF position the stall warning horn is inoperative. Airplane certification requires the stall warning system to be on during flight except in emergency conditions as stated in Section III.

SECTION VIII

HANDLING, SERVICING AND MAINTENANCE

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

INTRODUCTION

The purpose of this section is to outline the requirements for maintaining the airplane in a condition equal to that of its original manufacture. This information sets the time frequency intervals at which the airplane should be taken to a BEECHCRAFT Aero or Aviation Center or International Distributor or Dealer for periodic servicing or preventive maintenance.

The Federal Aviation Regulations place the responsibility for the maintenance of this airplane on the owner and operator of the airplane who must ensure that all maintenance is done by qualified mechanics in conformity with all airworthiness requirements established for this airplane.

All limits, procedures, safety practices, time limits, servicing and maintenance requirements contained in this handbook are considered mandatory.

Authorized BEECHCRAFT Aero or Aviation Centers and International Distributors or Dealers will have recommended modification, service, and operating procedures issued by both FAA and Beech Aircraft Corporation, designed to get maximum utility and safety from the airplane.

If a question should arise concerning the care of the airplane, it should be directed to Beech Aircraft Corporation, Liberal Division, Box 300, Liberal, Kansas 67901. Correspondence should contain the airplane serial number, which may be found on the manufacturer's placard located on the fuselage at the inboard end of the right flap.

PUBLICATIONS

The following publications are available through BEECHCRAFT Aero or Aviation Centers and International Distributors and Dealers:

1. Shop Manual
2. Parts Catalog
3. Service Instructions
4. Various Inspection Forms

NOTE

Neither Service Publications, Reissues, nor Revisions are automatically provided to the holder of this manual. For information on how to obtain "Revision Service" applicable to this manual, consult any BEECHCRAFT Aero or Aviation Center or International Distributor or Dealer or refer to the latest revision of BEECHCRAFT Service Instructions No. 0250-010.

AIRPLANE INSPECTION PERIODS

1. FAA Required Annual Inspections.
2. BEECHCRAFT Recommended Inspection Guide.
3. Continuing Care Inspection Guide.
4. See "Recommended Servicing Schedule" and "Overhaul or Replacement Schedule" for further inspection schedules.

PREVENTATIVE MAINTENANCE THAT MAY BE ACCOMPLISHED BY A CERTIFICATED PILOT

1. A certificated pilot may perform limited maintenance. Refer to FAR Part 43 for the items which may be accomplished.

   To ensure proper procedures are followed, obtain a BEECHCRAFT Shop Manual for performing preventative maintenance.

2. All other maintenance must be performed by licensed personnel.

NOTE

Pilots operating airplanes of other than U.S. registry should refer to the regulations of the registering authority for information concerning preventative maintenance that may be performed by pilots.

ALTERATIONS OR REPAIRS TO AIRPLANE

The FAA should be contacted prior to any alterations on the airplane to ensure the airworthiness of the airplane is not violated.

NOTE

Alterations and repairs to the airplane must be made by properly licensed personnel.

GROUND HANDLING

The three-view drawing shows the minimum hangar clearances for a standard airplane. Allowances must be made for any special radio antennas and the possibility of an underinflated nose tire.

TOWING

CAUTION

Extreme care should be used when moving with power equipment. Should the nose gear be turned in excess of the red limit marks, there is a very good possibility the nose gear steering yoke and/or linkage may be damaged.

One person can move the airplane on a smooth and level surface, using the hand tow bar furnished with the loose equipment. Attach the tow bar to the tow lugs on the nose gear lower torque knee.

Where movement is restricted, two people can pivot the airplane on the main wheels. One person should push on the wing leading edge or hold the wing tip, while the other operates the tow bar.

CAUTION

Do not exert force on the propeller or control surfaces. Do not place weight on the stabilator to raise the nose wheel. Do not attempt to tow the airplane backward by the tail tie-down ring.

PARKING

The parking brake push-pull control is located on the left side of the lower subpanel. To set the parking brakes, pull control out and depress the pilot's toe pedals until firm. Push the control in to release the brakes.

CAUTION

The parking brake should be left off and wheel chocks installed if the airplane is to be left unattended. Changes in ambient temperature can cause the brakes to release or to exert excessive pressures.

CONTROL COLUMN LOCK PIN

1. Level the control wheel and move control column so the holes in the control column hanger and the control column will align to accept the pin.

2. Push the control column lock pin through the hole provided in the control column hanger and into the hole in the underside of the control column tube assembly.

3: Ensure positive retention of the lock pin by positioning the hook over the control column.

TIE-DOWN

It is advisable to nose the airplane into the wind. Three tie-down lugs are provided:one on the lower side of each wing and a third at the rear of the fuselage.

1. Install the control column lock pin.

2. Chock the main wheels, fore and aft.
3. Using nylon line or chain of sufficient strength, secure the airplane at the three points provided. DO NOT OVER TIGHTEN; if the line at the rear of the fuselage is excessively tight, the nose may rise and produce lift due to the angle of attack of the wings.
4. Release the parking brake.

If high winds are anticipated, a vertical tail post should be installed at the rear tie-down lug, and a tie-down line attached to the nose gear.

JACKING

Raise the individual gear for wheel and tire removal with a scissors jack under the axle. Refer to the BEECHCRAFT Shop Manual for proper procedures.

DO NOT enter the airplane while the airplane is on a wheel jack.

FLYABLE STORAGE - 7 TO 30 DAYS

MOORING

If the airplane cannot be placed in a hanger, tie down securely at the three points provided. Do not use hemp or manila rope. It is recommended a tail support be used to lightly compress the nose gear and reduce the angle of attack of the wings. Attach a line to the nose gear for additional tie-down.

FUEL CELLS

Fill to capacity to minimize fuel vapor.

FLIGHT CONTROL SURFACES

Lock with internal locks.

GROUNDING

Static ground airplane securely and effectively.

PITOT TUBE

Install cover.

WINDSHIELD AND WINDOWS

Close window vent.

DURING FLYABLE STORAGE

In a favorable atmospheric environment the engine of an aircraft that is flown intermittently can be adequately protected from corrosion by turning the engine over five revolutions by means of the propeller. This will dispel any beads of moisture that may have accummulated and spread the residual lubricating oil around the cylinder walls. Unless the aircraft is flown, repeat this procedure every five days.

WARNING

Be sure the ignition switch is "OFF", the throttle closed, and mixture control in the idle cut-off position before turning the propeller. Do not stand in the path of propeller blades. Also, ground running the engine for brief periods of time is not a substitute for turning the engine over by hand; in fact, the practice of ground running will tend to aggravate rather than minimize corrosion formation in the engine.

After 30 days, the aircraft should be flown for 30 minutes or a ground runup should be made long enough to produce an oil temperature within the lower green arc range. Excessive ground runup should be avoided.

PREPARATION FOR SERVICE

Remove all covers, clean the airplane, and give it a thorough inspection, particularly flaps and control openings.

Preflight the airplane.

PROLONGED OUT OF SERVICE CARE

The storage procedures listed are intended to protect the airplane from deterioration while it is not in use. The primary objectives of these measures are to prevent corrosion and damage from exposure to the elements.

If the airplane is to be stored longer than 30 days refer to the appropriate airplane shop manual and Avco Lycoming Service Letter L180.

EXTERNAL POWER RECEPTACLE

The external power receptacle is optional on this airplane. If installed, it is located on the right side of the fuselage (M-1285 through M-2354) or on the left side of the fuselage

(M-2355 and after) aft of the wing. Airplanes equipped with a 14-volt electrical system require a power unit set to 13.75 to 14.25 volts, while those equipped with a 28-volt electrical system require a setting of 27.75 to 28.25 volts.

CAUTION

On 14-volt airplanes, the power pin for external power is connected directly to the battery and continually energized. Turn off battery and alternator switches and all electrical and avionics switches when connecting the auxiliary power unit plug. Assure correct polarity (negative ground) before connecting auxiliary power unit. Turn on the battery switch before turning on the auxiliary power unit.

On 28-volt airplanes, a reverse polarity diode protection system is between the external power receptacle and the main bus. With external power applied, the bus is powered. Turn on the battery switch only, with all other switches including avionics switches off, when connecting the auxiliary power unit. Assure correct polarity before connecting external power.

CHECKING ELECTRICAL EQUIPMENT

Connect an auxiliary power unit as outlined above. Ensure that the current is stabilized prior to making any electrical equipment or avionics check.

CAUTION

If the auxiliary power unit has poor voltage regulation or produces voltage transients, the equipment connected to the unit may be damaged.

SERVICING

FUEL SYSTEM

FUEL CELLS

See Consumable Materials for recommended fuel grades.

CAUTION

See Avco Lycoming Service Letter No. L185A or later revision for operation on alternate fuels.

Two 29.9 gallon fuel tanks are located in the wings just outboard of the wing root. A visual measuring tab located below the tank filler neck facilitates a fuel load of 15 gallons when the fuel reaches the bottom of the tab, or 20 gallons when the fuel reaches the top of the slot. This partial filling of the fuel tanks allows an increase in the payload. The fuel indicators on the instrument panel will indicate full tanks even though each tank contains only 20 gallons of fuel.

CAUTION

Connect a grounding cable from the fuel service unit to the airframe, and connect grounding cables from both the fuel service unit and the airplane to ground during fueling operations. This procedure reduces fire hazard.

FUEL DRAINS

Open each of the fuel drain valves daily to remove any condensation from the system. The two tank sump drains extend through the bottom of the wing skins, near the landing gear. M-1971, M-1980 and after have flush-type drain valves. Flush-type valves are actuated by pushing up with the Flush Fuel Drain Tool and holding until the desired amount of fuel has drained. The valve will

automatically close when the Flush Fuel Drain Tool is removed. The fuel drain valves can be locked open by pushing up with the Flush Fuel Drain Tool and turning counterclockwise. To close the valve, turn the valve clockwise and remove the Flush Fuel Drain Tool.

The Flush Fuel Drain Tool is provided with the loose tools and accessories.

The system low spot drain is incorporated in the fuel strainer on the lower right side of the fuselage aft of the nose wheel.

Inspection and cleaning of the fuel strainers should be considered of the utmost importance as a regular part of preventive maintenance. The following inspection and cleaning intervals are recommendations only, since the frequency will depend upon service conditions and fuel handling cleanliness. When operating in localities where there is an excessive amount of sand or dirt, the strainers should be inspected at more frequent intervals.

The screen in the fuel strainer at the system low spot on the bottom of the fuselage should be removed and washed in fresh cleaning solvent at each 100-hour inspection of the airplane. Ordinarily, the finger strainers in the fuel tank outlets should not require cleaning unless there is a definite indication of solid foreign material in the tanks, or the airplane has been stored for an extended period.

After the fuel strainers have been reinstalled, the installations should be checked for leakage. Any fuel lines or fittings disconnected for maintenance purposes should be capped.

Frequently inspect the O-rings on the fuel filler caps for condition. Replace as required to prevent contamination of the fuel from precipitation.

OIL SYSTEM

CAUTION

During break-in periods on new engines, oil consumption tends to be higher, therefore, maximum range flights should be avoided and oil level brought to full after each flight during this period.

Check engine oil quantity before each flight. Under normal operating conditions, the oil should be changed after each 50 hours of engine operation. More frequent changes may be required under adverse operating conditions. Use engine oil as indicated in Consumable Materials in this section. The engine oil sump capacity is eight quarts. The normal operating range is six to eight quarts.

BATTERY

14-VOLT SYSTEM

A 12-volt, 25 amp-hour, lead-acid battery, located directly aft of the cabin area may be reached by removing the rear panel.

28-VOLT SYSTEM

One 24-volt, 15.5 amp hour, lead-acid battery, or two 12-volt 25 amp hour, lead-acid batteries connected in series, are located directly aft of the cabin area and may be reached by removing the rear panel.

Check the battery regularly for fluid level and add distilled water as required. Clean, tight connections should be maintained at all times. Battery vents on Serials M-1285 thru M-1979 except M-1971 should be checked periodically for obstructions and for proper protrusion (3 inches from top of chamfer to skin line). Serials M-1971, M-1980 and after have a flush vent system.

External power should be used for checking airplane electrical systems to prevent excess battery power loss, and for starting the engine during cold weather when more power is needed for cranking. Charging batteries in the airplane is discouraged. If the battery is low and needs charging and servicing, it should be removed from the airplane and serviced and charged in the manner prescribed in the shop manual.

WARNING

Always connect charging cables at the battery terminals first, then to the charging unit, to avoid sparks near the battery fumes since explosion could occur.

TIRES

The airplane is equipped with tube type tires. Inflate the 17.50 x 6.00 x 6 main or nose gear tires to 22 psi and the 15 x 6.00 x 6 main or nose gear tires to 40 psi. Maintaining proper tire inflation will minimize tread wear and aid in preventing tire failure caused from running over sharp stones. When inflating tires, visually inspect them for cracks and breaks.

CAUTION

Beech Aircraft Corporation cannot recommend the use of recapped tires. Recapped tires have a tendency to swell as a result of the increased temperature generated during takeoff. Increased tire size can jeopardize proper function of the landing gear with the possibility of damage to the landing gear.

SHIMMY DAMPER

A hydraulic shimmy damper is mounted on the nose wheel strut yoke. Whenever this component develops an external leak or a skip in the damping action, it should be replaced.

BRAKES

The brake hydraulic fluid reservoir is located on the firewall in the engine compartment. Refer to Consumable Materials in this section for hydraulic fluid specification.

Since the pistons move to compensate for lining wear, the brakes require no adjustment. Complete information on brake, wheel, and tire maintenance is contained in the appropriate manual included in the loose tools and accessories kit.

INDUCTION AIR FILTER

This filter should be inspected for foreign matter at least once during each 50-hour operating period. In adverse climatic conditions, or if the airplane is stored, preflight inspection is recommended.

To remove and clean the filter:

1. Remove the filter retaining screws.
2. Remove the filter.
3. Clean and service as described in the manufacturer's instructions on the filter.
4. Reinstall the filter.
5. Reinstall retaining screws. Tighten screws to assure that the filter is secure.

VACUUM SYSTEM

The foam rubber suction relief valve screen may be removed for cleaning by slipping it off the bottom of the valve. The screen may be cleaned with soap and water.

In addition, the airplane is equipped with a replaceable paper filter, mounted under the instrument panel on the upper left side of the firewall or mounted on the left instrument panel brace immediately under the glareshield.

PROPELLER BLADES

The daily preflight inspection should include a careful examination of the propeller blades for nicks and scratches.

Each blade leading edge should receive particular attention. It is very important that all nicks and scratches be smoothed out and polished. The BEECHCRAFT Aero or Aviation Center and International Distributors or Dealers will be glad to answer any questions concerning propeller blade repair.

WARNING

When servicing a propeller, always make certain the ignition switch is off and that the engine has cooled completely. WHEN MOVING A PROPELLER, STAND IN THE CLEAR; there is always some danger of a cylinder firing when a propeller is moved.

MINOR MAINTENANCE

RUBBER SEALS

To prevent sticking of the rubber seals around the doors, the seals should be coated with Oakite 6 compound or powdered soapstone or equivalent.

ALTERNATOR

Since the alternator and voltage regulator are designed for use on only one polarity system, the following precautionary measures must be observed when working on the charging circuit, or serious damage to the electrical equipment will result:

1. When installing a battery, make certain that the ground polarity of the battery and the ground polarity of the alternator are the same.

2. When connecting a booster battery, be sure to connect the negative battery terminals together and the positive battery terminals together.

3. When using a battery charger, connect the positive lead of the charger to the positive battery terminal and the negative lead of the charger to the negative battery terminal.

4. Do not operate an alternator on open circuit. Be sure all circuit connections are secure.

5. Do not short across or ground any of the terminals on the alterntor or voltage regulator.

6. Do not attempt to polarize an alternator.

MAGNETOS

Ordinarily, the magnetos will require only occasional adjustment, lubrication, and breaker point replacement. This work should be done by a BEECHCRAFT Aero or Aviation Center or International Distributor or Dealer.

WARNING

To be safe, treat the magnetos as hot whenever a switch lead is disconnected at any point; they do not have an internal automatic grounding device. The magnetos can be grounded by replacing the switch lead at the noise filter capacitor with a wire which is grounded to the engine case. Otherwise, all spark plug leads should be disconnected or the cable outlet plate on the rear of the magneto should be removed.

CLEANING

EXTERIOR PAINTED SURFACES

CAUTION

Do not apply wax or polish for a paint cure period of 90 days after delivery. Waxes and polishes seal the paint from the air and prevent curing. Wash uncured painted surfaces with cold or lukewarm water and a MILD NON-DETERGENT SOAP. Any rubbing of the surface should be done gently and held to a minimum to avoid cracking the paint film.

Prior to cleaning, cover the wheels, making certain the brake discs are covered. Attach the pitot cover securely, and plug or mask off all other openings. Be particularly careful to mask off both static air buttons before washing or waxing.

Flush loose dirt away with clean water, then wash with a mild soap and water. Avoid harsh, abrasive, or alkaline soaps or detergents which could cause corrosion or scratches. To remove stubborn oil and grease, use a cloth dampened with aliphatic naphtha (see Consumable Materials). After being cleaned with naphtha, the surface should be re-waxed and polished. To prevent scratches, use soft cleaning cloths or a chamois when cleaning and polishing. Any good grade of automotive wax or polish can be used on painted surfaces.

CAUTION

When washing the airplane with mild soap and water, use special care to avoid washing away grease from any lubricated area. After washing with solvent, lubricate all lubrication points. Premature wear of lubricated surfaces may result if the above precautions are not taken.

WINDSHIELD AND WINDOWS

The windshield and plastic windows should be kept clean and waxed at all times. To prevent scratches, wash the windows carefully with plenty of soap and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used, but only to carry water to the surface. Rinse thoroughly, then dry with a clean, moist chamois. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge which attracts dust particles in the air.

Remove oil and grease with a cloth moistened with isopropyl alcohol. Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, fire extinguisher fluid, anti-ice fluid, lacquer thinner or glass cleaner. These materials will soften the plastic and may cause it to craze.

After thoroughly cleaning, the surface should be waxed with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry, soft flannel cloth. Do not use a power buffer; the heat generated by the buffing pad may soften the plastic.

INTERIOR

To remove dust and loose dirt from the upholstery, headliner, and carpet, clean the interior regularly with a vacuum cleaner.

Blot up any spilled liquid promptly with cleansing tissue or rags. Do not pat the spot; press the blotting material firmly and hold it for several seconds. Continue blotting until no more liquid is taken up. Scrape off sticky materials with a dull knife, then spot-clean the area.

Oily spots may be cleaned with household spot removers, used sparingly. Before using any solvent, read the instructions on the container and test it on an obscure place on the fabric to be cleaned. Never saturate the fabric with a volatile solvent; it may damage the padding and backing materials.

Soiled upholstery and carpet may be cleaned with foam-type detergent used according to the manufacturer's instructions. To minimize wetting the fabric, keep the foam as dry as possible and remove it with a vacuum cleaner.

The plastic trim, instrument panel, and control knobs need only be wiped with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with isopropyl alcohol. Volatile solvents,

such gasoline, benzine, acetone, carbon tetrachloride, fire extinguisher fluid, anti-ice fluid, laquer thinner, or glass cleaner should not be used. These materials will soften the plastic and may cause it to craze.

ENGINE

Clean the engine with neutral solvent. Spray or brush the fluid over the engine, then wash off with water and allow to dry. Solutions which may attack rubber or plastic should not be used.

LUBRICATION

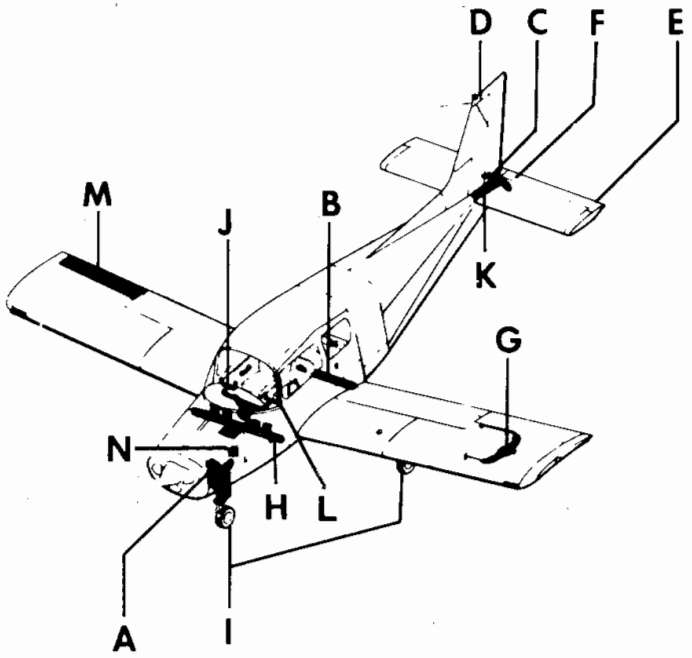
Proper lubrication is essential in keeping the airplane components in top condition. If this operation is performed thoroughly, general maintenance will be reduced and the service life of the airplane will be greatly increased.

The grease fittings or parts must be wiped clean to make sure that no dirt is carried into the part when lubricated. Apply lubricant sparingly, but with assurance that the bearing surfaces are adequately covered. Wipe off excess lubricant to prevent the accumulation of dust and foreign material.

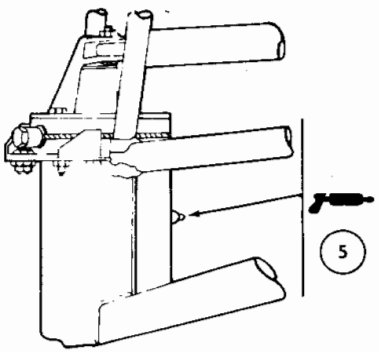
NOTE

Lubricate all pivotal points as shown on the Lubrication Diagram in the Shop Manual to ensure freedom of movement and proper functioning. More frequent lubrication may be required because of climate, or frequent usage of the airplane.

LUBRICATION POINTS

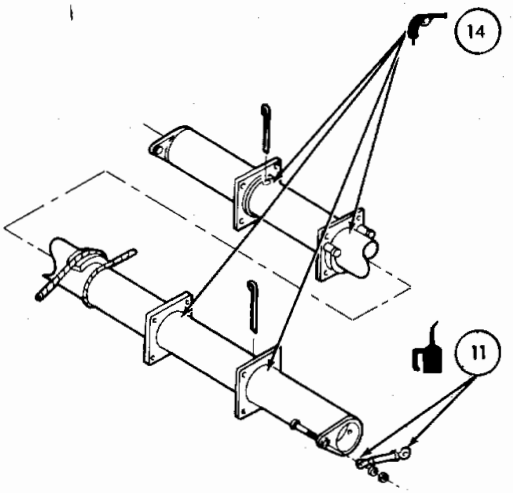


DETAIL A



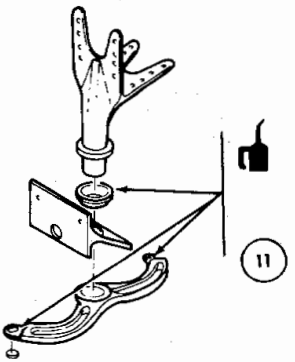
NOSE GEAR STEERING

DETAIL B



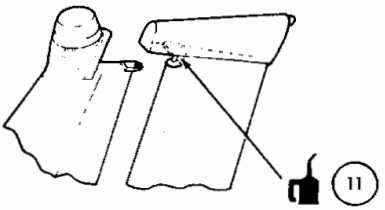
FLAP MECHANISM

DETAIL C



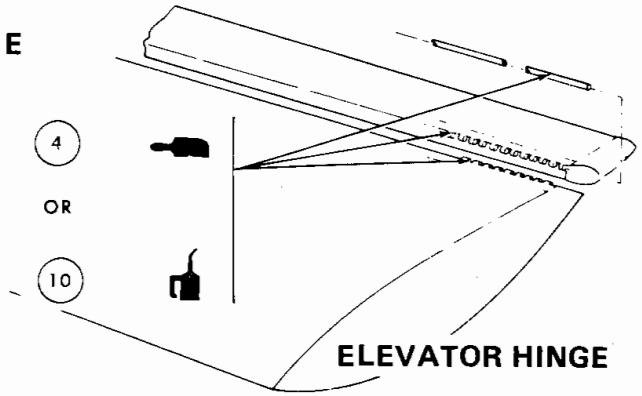
RUDDER BELLCRANK

DETAIL D

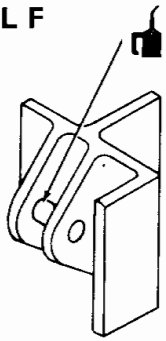


RUDDER HINGE

DETAIL E

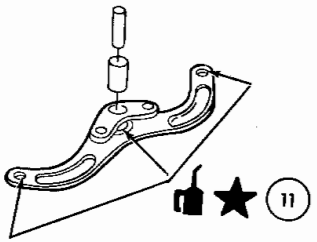


DETAIL F



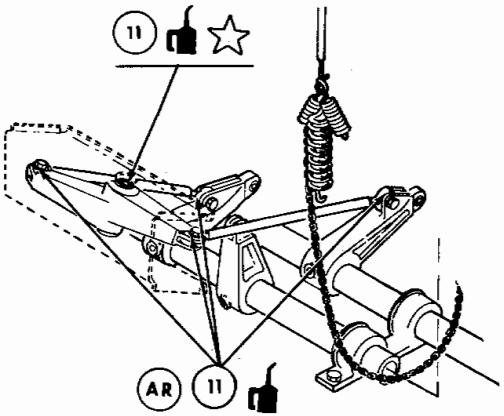
STABILATOR HINGE BRACKET

DETAIL G



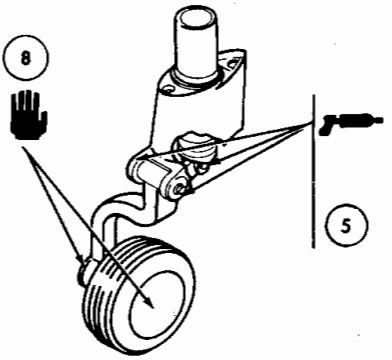
AILERON BELLCRANK

DETAIL H



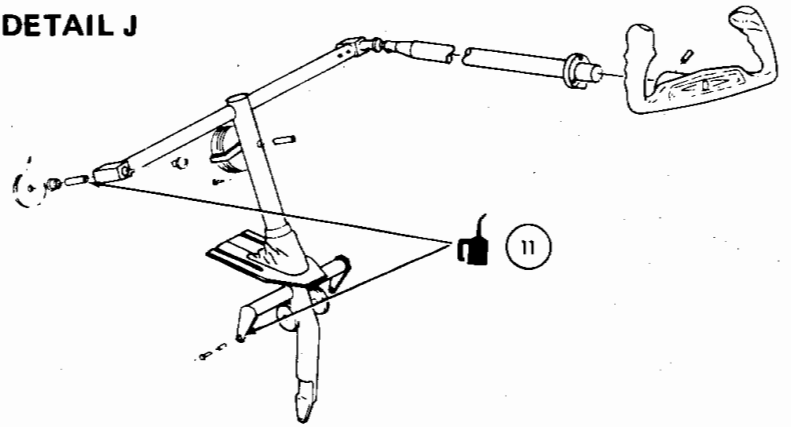
RUDDER PEDALS

DETAIL I



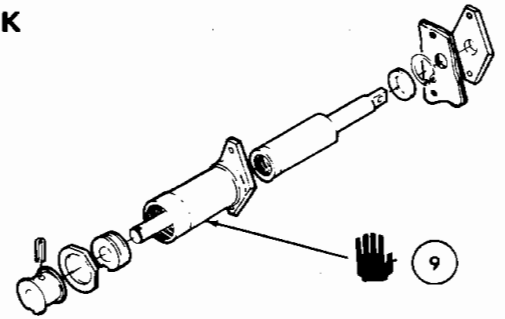
LANDING GEAR

DETAIL J



CONTROL COLUMN LINKAGE

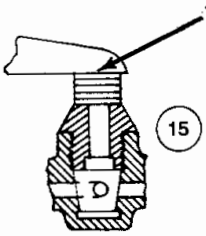
DETAIL K



TRIM TAB ACTUATOR

DETAIL L

(For Airplanes Prior to M-1486)



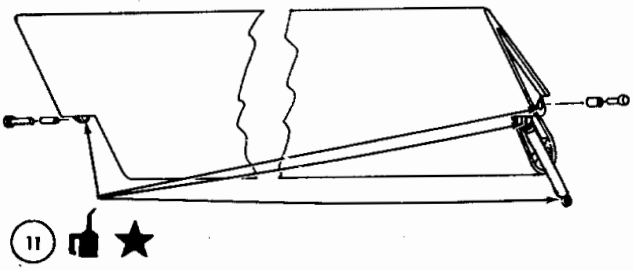
15 LOOSEN NUT, REMOVE VALVE CONE, AND LUBRICATE CONE WITH VERY THIN COATING OF LUBRICANT.

NOTE: DO NOT OVER LUBRICATE VALVE CONE APPLY MINIMUM AMOUNT OF LUBRICANT FOR COATING

FUEL SELECTOR VALVE

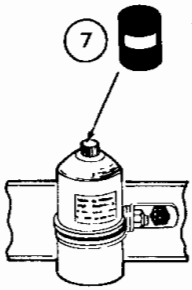
NOTE: FUEL SELECTOR VALVES ON M-1486 AND AFTER NEED NO LUBRICATION.

DETAIL M



AILERON HINGE AND ROD ENDS

DETAIL N



BRAKE FLUID RESERVOIR

SPRAY GREASE GUN HAND OR PACK

OIL CAN BRUSH HYDRAULIC FLUID

NOTE

Numbers refer to items in the consumable materials chart. Lubricate all plain bearing bushings as required or every 500 hours with SAE No. 30 oil. Apply SAE No. 20 oil to push-pull control housings as required. Lubricate flight control pully bushings with SAE No. 30 oil every 1000 hours.

SAE 10w/30 oil is an acceptable replacement for SAE 20 or SAE 30 oil.

RECOMMENDED SERVICING SCHEDULE

INTERVAL	ITEM	LOCATION (Letters refer to Lubrication Points Diagram)	LUBRICANT (Number refers to item on Consumable Materials)
Pre-flight	Check engine oil level	Upper right side of engine	1
	Drain fuel tank drains	Inboard bottom of wings	-
	Drain fuel system low spot	Bottom of fuselage	-
	Service fuel tanks	Top of wings	3
25 Hrs.	Check battery electrolyte	Behind aft cabin bulkhead	See Maintenance Manual
	Clean induction air filter	In lower forward cowl	-
	Lubricate landing gear knee pins	On landing gear (I)	5
50 Hrs.	Change engine oil	Lower side of engine	1
	Clean oil screens	Aft right side of accessory case and bottom of sump	2

RECOMMENDED SERVICING SCHEDULE

INTERVAL	ITEM	LOCATION (Letters refer to Lubrication Points Diagram)	LUBRICANT (Number refers to item on Consumable Materials)
100 Hrs.	Clean fuel system screens and strainers	Bottom of wings and fuselage	2
	Clean suction relief valve screen	Forward of firewall	-
	Lubricate wheel bearings	Landing gear (I)	8
	Lubricate nose gear rod end bearings	On top of nose gear (A)	11
	Lubricate nose gear swivel	On aft side of nose gear (A)	5
	Lubricate flap torque tubes	Under floorboards (B)	14
	Lubricate flap rod end bearings	Inboard end of flaps (B)	11
	Lubricate rudder bellcrank pivot points	Bottom of rudder (C)	11
	Lubricate rudder hinges	On rudder leading edge (D)	11
	Lubricate stabilator trim tab hinge and pin	On trailing edge of stabilator (E)	4, 10

	Lubricate stabilator hinge pivot point	In aft tail section (F)	11
	Lubricate aileron bellcrank	In wing forward of aileron (G)	11
	Lubricate aileron pivotal points and rod ends	Outboard trailing edge of wings (M)	11
300 Hrs.	Replace induction air filter	In front nose cowl	-
500 Hrs.	Lubricate rudder pedal bellcrank	Forward cabin floor (H)	11
	Lubricate rudder pedal rod ends	Forward cabin floor (H)	11
	Replace gyro instrument central filter	Behind instrument panel	-
1000 Hrs.	Lubricate control column pivot points	Behind instrument panel (J)	11
1200 Hrs.	Lubricate trim tab actuator	In aft tail section (K)	9

RECOMMENDED SERVICING SCHEDULE

INTERVAL	ITEM	LOCATION (Letters refer to Lubrication Points Diagram)	LUBRICANT (Number refers to item on Consumable Materials)
As Req.	Fuel selector valve Central brake reservoir Clean spark plugs	Center floorboard (L) On firewall (N) In engine compartment	15 7 -
Note 3	Replace Emergency Locator Transmitter Battery	Right side of aft fuselage	-

NOTES:

1. Anytime the control surfaces are altered, repaired, or repainted, they must be re-balanced per the Shop Manual.

2. Check the wing bolts for proper torque at the first 100-hour inspection and at the first 100-hour inspection after each reinstallation of the wing attach bolts.

3. Rechargeable Batteries: Recharge after one cumulative hour of use or after 50% of the useful charge life.

   Non-rechargeable Batteries: Replace after one cumulative hour or as noted on the battery.

CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATION
*1.	Engine Oil	SAE No. 30 (0° to 70°F) SAE No. 50 (Above 60°F) SAE No. 20 (Below 10°F)
2.	Solvent	PD680
**3.	Fuel, Engine	91/96 (blue), 100 (green) or 100LL (blue) Grade
***4.	Molybdenum Disulfide	MIL-M-7866
†5.	Grease (High & Low Temperature)	Aero Lubriplate
6.	Corrosion Preventive, Engine	MIL-C-6529
7.	Hydraulic Fluid	MIL-H-5606
††8.	Grease (General Purpose, Wide Temperature)	MIL-G-81322
††9.	Grease (High & Low Temperature)	MIL-G-23827
10.	Lubricating Oil (Low Temperature)	MIL-L-7870
11.	Lubricating Oil	SAE No. 20 or 10W/30
12.	Lubricating Oil	SAE No. 30 or 10W/30

ITEM	MATERIAL	SPECIFICATION
†††13.	Lubricant, Rubber Seal	Oakite 6 Compound
††††14.	Lubricant, Silicone Spray	Krylon No. 1329 (or equivalent)
15.	Lubricant, Fluorosilicone	Corning FS-1292
****16.	Engine Fuel Additive	ALCOR TCP Concentrate

* It is recommended that a straight mineral based (non-detergent) oil be used until the oil consumption has stabilized and then changed to an ashless dispersant oil for prolonged engine life.

Avco Lycoming Specification Number 301E approved for use lubricating oils which conform to both MIL-L-6082B straight mineral type and MIL-L-22851 ashless dispersant lubricants for airplane engines.

** If grade 91/96 (blue) fuel is not available, use 100 (green) or 100LL (blue).

*** Mix with naphtha into paste and apply with a brush.

**** Product of Alcor, Inc., San Antonio, Texas 78284

† Product of BRC Bearing Company, Wichita, Kansas

†† In extremely cold climates, MIL-G-23827 grease should be used in place of MIL-G81322 grease. Care should be exercised when using either MIL-G-81322 or MIL-G-23827 grease, as they contain a rust-preventing additive which is harmful to paint.

††† Product of Oakite Products, Inc., Berkley Heights, N.J.

†††† Product of Krylon Inc., Norristown, Pa.

APPROVED ENGINE OILS

COMPANY	BRAND NAME
Delta Petroleum Co., Inc.	*Global Concentrate A
Enjay Chemical Company	*Paranox 160 and 165
Mobil Oil Corporation	*RT-451, RM-173E, RM-180E
Shell Oil Company	*Shell Concentrate A - Code 60068 *Aeroshell W120 *Aeroshell W80
Texaco Incorporated	*TX-6309 *Aircraft Engine Oil Premium AD120 *Aircraft Engine Oil Premium AD80
American Oil and Supply Co.	*PQ Aviation Lubricant 753
Chevron Oil Company	*Chevron Aero Oil Grade 120
Humble Oil and Refining Co.	*Esso Aviation Oil E-120 *Enco Aviation Oil E-120 *Esso Aviation Oil A-100 *Enco Aviation Oil A-100 *Esso Aviation Oil E-80 *Enco Aviation Oil E-80
Standard Oil Company of California	*Chevron Aero Oil Grade 120

COMPANY	BRAND NAME
Castrol Oils, Canada Ltd.	**Castrolaero 113, Grade 1065 **Castrolaero 117, Grade 1100
Champlin Oil and Refining Co.	**Grade 1065 **Grade 1100
Chevron Oil Company	**Chevron Aviation Oil 65 **Grade 1100
Continental Oil Company	**Conoco Aero Oil 1065 **Conoco Aero Oil 1100
Mobil Oil Corporation	**Avrex 101/1065 **101/1100
Phillips Petroleum Co.	**Phillips 66 Aviation Engine Oil, Grade 1065 **Phillips 66 Aviation Engine Oil, Grade 1100
Shell Oil Company	**Aeroshell Oil 65 **Aeroshell Oil 100

* Ashless Dispersant Oils Complying with MIL-L-22851

NOTE

Ashless dispersant oil complying with MIL-L-22851 is recommended after the oil consumption has stabilized or after the first 50 hours of operation.

** Straight Mineral Oils Complying with MIL-L-6082

NOTE

A straight mineral oil conforming to MIL-L-6082 may be used until the oil consumption has stabilized, not to exceed 50 hours of operation. Oil of seasonal viscosity, added to maintain the proper oil level during this break-in period, must comply with MIL-L-6082.

Vendors listed as meeting Federal and Military Specifications are provided as reference only and are not specifically recommended by Beech Aircraft Corporation. Any product conforming to the specification may be used.

BULB REPLACEMENT GUIDE

LOCATION	NUMBER	
	14-VOLT	28-VOLT
Compass light	330	327
Dome light, cabin	89	303
Instrument flood light, overhead	89	303
Landing light, wing	4313	4596
Navigation light, tail cone	1777	1683
Navigation light, wing	1512	1524
Rotating beacon	WRM-44KA or WRM-1940	WRM-1939
Taxi light	4595	4594

OVERHAUL OR REPLACEMENT SCHEDULE

The first overhaul or replacement should be performed not later than the required period. The condition of the item at the end of the first period can be used as a criterion for determining subsequent periods applicable to the individual airplane or fleet operation, providing the operator has an approved monitoring system.

The time periods for inspection noted in this handbook are based on average usage and average environmental conditions.

SPECIAL CONDITIONS CAUTIONARY NOTICE

Airplanes operated for Air Taxi or other than normal operation and airplanes operated in humid tropics or cold and damp climates, etc., may need more frequent inspections for wear, corrosion and/or lack of lubrication. In these areas periodic inspections should be performed until the operator can set his own inspection periods based on experience.

NOTE

The required periods do not constitute a guarantee that the item will reach the period without malfunction, as the aforementioned factors cannot be controlled by the manufacturer.

COMPONENT	OVERHAUL OR REPLACE
LANDING GEAR	
Brake Assembly	On Condition
Brake Lining	On Condition
Master Cylinder	On Condition
Parking Brake Valve	On Condition
All Hose	On Condition
Shimmy Damper	On Condition
Wheels and Tires	On Condition

POWER PLANT

NOTE

When an engine has been overhauled, or a new engine installed, it is recommended that low power settings NOT be used until oil consumption has stabilized. The average time for piston ring seating is approximately 50 hours. Refer to Lycoming Engine Operator's Manual.

Engine	
0-360-A2G	2000 hours
0-360-A4G	2000 hours
0-360-A4J	2000 hours
0-360-A4K	2000 hours
Engine Controls	On Condition
Engine Vibration Isolator Mounts	Engine Change

COMPONENT	OVERHAUL OR REPLACE
Exhaust System	800 hours or on condition
Magnetos	At engine overhaul (Bendix) 800 hours (Slick)
Starter	Inspect at engine overhaul; overhaul or replace on condition
Alternator	On Condition
Oil Cooler	On Condition (replace when contaminated)
Propeller	On Condition or 1000 hours
Engine Driven Fuel Pump	At Engine Overhaul
Exhaust Muffler & Shroud	Inspect every 100 hours
All Hose carrying flammable liquid	At engine overhaul or every 5 years. All other hoses on condition.
Vacuum System Filter	Every 300 Hours
Vacuum Regulator Valve	On Condition
Vacuum Pump	At engine overhaul or on condition.

FUEL SYSTEM

Fuel Boost Pump	On condition
All Hose carrying flammable liquid	At engine overhaul or every 5 years
All Hose not carrying flammable liquid	On Condition
Fuel Selector Valve	Inspect every 100 hours; overhaul on condition
Fuel System Check Valves	On Condition
Fuel Cell Drain Valve	On Condition
Wing Fuel Quantity Transmitters	On Condition

COMPONENT	OVERHAUL OR REPLACE
INSTRUMENTS	
Turn Coordinator	On Condition
Altimeter	Every 24 months per FAA Directive (Inspect and calibrate)
Directional Gyro	On Condition
Instrument Air	On Condition
Engine Indicator Units	On Condition
Airspeed Indicator	On Condition
Rate-of-Climb Indicator	On Condition
Fuel Quantity Indicator	On Condition
Fuel Pressure Indicator	On Condition
Tachometer	On Condition
Free Air Temperature Indicator	On Condition
Flap Position Indicator	On Condition
ELECTRICAL SYSTEM	
Battery Master Relay	On Condition
All other Relays	On Condition
Voltage Regulator	On Condition
Starter Relay	On Condition
FLAPS AND FLIGHT CONTROLS	
Flight Controls	On Condition
Stabilator Tab Actuator	On Condition
Flap Motor and Actuator Drive Assembly	On Condition
Flap Motor Brushes	On Condition

COMPONENT	OVERHAUL OR REPLACE
MISCELLANEOUS	
Seat Belts and Shoulder Harness	Inspect every 12 months, replace on condition
Hand Fire Extinguisher	Inspect every 12 months, recharge as necessary
Cabin Heating and Ventilating Ducts	On Condition, Inspect every 12 months
Transponder	Test and inspect every 24 months

INSPECTIONS

The FAA requires that an airplane used for hire be inspected at each 100 hours of operation by qualified personnel. Airplanes which are not used for hire are required to have an inspection by qualified personnel on an annual basis.

Good operating practice requires that the airplane be preflighted prior to takeoff. Items found during preflight and engine run-up should be corrected on the basis of their importance to the safe operation of the airplane; however, in any event, early correction of items found is good preventative maintenance.

Although it is not a requirement that FAA qualified personnel change the oil and inspect the airplane, except at the 100-hour/annual inspection, as noted above, it is recommended the airplane be given an inspection at the recommended oil change period. Any unsatisfactory items should be corrected, either at that time or as soon as practical, depending on the nature of the item.

The inspection at the recommended oil change interval should include the following:

Operational Inspection

1. Alternator/voltage regulator functioning
2. Engine instruments
3. Flight instruments
4. Idle rpm and mixture
5. Engine controls operation
6. All lights
7. Radio operation
8. Magneto check
9. Brake operation
10. Tank selector operation
11. Heat and vent system operation
12. Starter operation
13. Electrical switches and circuit breakers
14. Power check 2250 to 2350 rpm static

Power Plant

1. Oil screens cleaned.
2. Induction air filter cleaned.
3. Check engine controls, wiring harness, and plumbing for clearance and security.
4. Check propeller for rock damage, and spinner and spinner bulkheads for cracks and security; engine for oil leaks.
5. Check engine baffles and cowling for cracks and security.
6. Check exhaust system and air ducts for condition and security.
7. Check for indications of oil leaks, condition and security of engine accessories.
8. Check brake system reservoir.

Cabin and Aft Fuselage

1. Flight control operation through full travel and proper direction of travel.
2. Storm window and door operation.
3. Check interior furnishings and seat belts.
4. Check battery water level.

Exterior

1. Check flight control surfaces for condition and security.
2. Check tires, brake pucks and discs.
3. Check static ports, pitot mast and fuel vent lines for obstructions.
4. Check general condition of fuselage and wings.

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SECTION IX

SUPPLEMENTS

NOTE

The supplemental data contained in this section is for equipment that was delivered on the airplane including standard optional equipment that was available, whether it was installed or not. Supplements for equipment for which the vendor obtained a Supplemental Type Certificate were included as loose equipment with the airplane at the time of delivery. These and other Supplements for other equipment that was installed after the airplane was delivered new from the factory should be placed in this SUPPLEMENTS Section of this Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

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PILOT'S OPERATING HANDBOOK

and

FAA APPROVED AIRPLANE FLIGHT MANUAL

LOG OF SUPPLEMENTS

FAA Supplements must be in the airplane for flight operation when subject equipment is installed:

Supp. No.	Part Number	Subject	Rev. No.	Date
1	169-590008-9	Acrobatic		2/79
2	169-590008-19	Single Door		2/79
3	MCO-C32644-11	Static Air		6/78

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PILOT'S OPERATING HANDBOOK AND
FAA APPROVED AIRPLANE FLIGHT MANUAL
SUPPLEMENT
for the C23

when approved for ACROBATIC MANEUVERS

The airplane must conform to Drawing Number 169-002001

The following maneuvers are approved ONLY when the above modification has been completed and when the airplane is operated in the UTILITY CATEGORY at 2030 lbs or less. The pilot and copilot must be wearing approved parachutes before performing these maneuvers.

WARNING

The aircraft cabin area should be clean and free of any loose equipment before attempting these maneuvers.

LOOP

The maneuver is entered at 140 MPH/122 KTS IAS at 2700 RPM. A 3.0 to 3.5 G pull-up is recommended. The airspeed at the top of the loop will be 50 to 60 MPH/43 to 52 KTS IAS which is fast enough to retain positive acceleration and prevent a stall. Completion of the loop is accomplished by keeping the G level just below that where a buffet occurs. The altitude loss is 50 to 100 feet.

IMMELMANN

The maneuver is entered at 150 MPH/130 KTS IAS at 2700 RPM. A 3.5 G pull-up is recommended. The roll to the left should be initiated either just before or just as the airplane inverts. Adverse yaw during the roll will be encountered. A roll to the right will result in the airplane turning sideways and usually stalling.

SNAP ROLL

The maneuver is entered at 100 MPH/87 KTS IAS for a single roll or 105 to 110 MPH/91 to 96 KTS IAS for double rolls. Ailerons are kept neutral until initiation of recovery.

BARREL AND AILERON ROLL

Both maneuvers are entered at 130 MPH/113 KTS IAS in a shallow dive.

SPLIT-S

The maneuver is entered at 90 MPH/79 KTS IAS. The airplane is rolled either way to invert. The maximum speed is 140 MPH/122 KTS IAS, with acceleration at 3.5 G's. The altitude loss will be 800 feet. The throttle is to be retarded as the nose drops past the horizon in the inverted position.

WARNING

Do not use abrupt or full control travel at speeds greater than the maximum design maneuvering speed.

Spins are approved. Spins have not been demonstrated in excess of 6 turns. For spin entry and recovery see pages 3-10 and 3-11 of this Pilot's Operating Handbook and FAA Approved Flight Manual.

Continuous inverted flight is prohibited.

Acrobatic maneuvers are prohibited with door hold-open installed.

Approved:

for Donald H Peters

W. H. Schultz
Beech Aircraft Corporation
DOA CE-2

FAA Approved
Revised: February 1979
P/N 169-590008-9

BEECHCRAFT LANDPLANE

PILOT'S OPERATING HANDBOOK AND
FAA APPROVED AIRPLANE FLIGHT MANUAL
SUPPLEMENT

for the

WALK-AROUND INSPECTION

of the

SINGLE DOOR C23

GENERAL

This document is to be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the airplane is modified with a single entrance door which has been installed in accordance with BEECHCRAFT FAA approved data.

This document supersedes or adds to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only where covered in the items contained herein.

LIMITATIONS - No change

EMERGENCY PROCEDURES - No change

NORMAL PROCEDURES

PREFLIGHT INSPECTION

1. *CABIN:*
   a. Parking Brake - SET
   b. Control Lock - REMOVE
   c. All Switches - OFF

FAA Approved
Revised: February 1979
P/N 169-590008-19

2. *RIGHT FUSELAGE:*
   a. Static Pressure Button - UNOBSTRUCTED
   b. Emergency Locator Transmitter - ARMED

3. *EMPENNAGE:*
   a. Control Surfaces - CHECK
   b. Tie Down - REMOVE
   c. Position Light - CHECK

4. *LEFT FUSELAGE:*
   a. Static Pressure Button - UNOBSTRUCTED
   b. All Antennas - CHECK
   c. Baggage Door - CHECK

5. *LEFT WING TRAILING EDGE:*
   a. Flap - CHECK
   b. Fuel Vent Line - UNOBSTRUCTED
   c. Aileron - CHECK
   d. Wing Tip - CHECK
   e. Position Light - CHECK

6. *LEFT WING LEADING EDGE:*
   a. Pitot Tube - CHECK, (Remove Cover)
   b. Landing Light - CHECK
   c. Tie Down and Chocks - REMOVE
   d. Stall Warning - CHECK for movement of vane
   e. Fuel Tank - CHECK QUANTITY; Filler Cap SECURE.

7. *LEFT LANDING GEAR:*
   a. Tire and Nose Gear - CHECK
   b. Fuel Sump - DRAIN

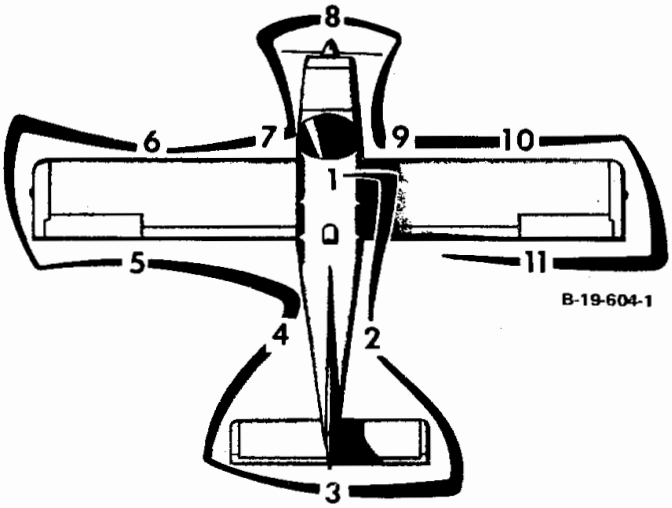
8. *NOSE SECTION:*
   a. Left Cowl - SECURE
   b. Induction Air Intake - CLEAR
   c. Propeller - CHECK, General Condition, Nicks, etc.
   d. Tire and Nose Gear - CHECK

e. Engine Oil - CHECK (See Servicing, Section 8) Cap and Dipstick - SECURE
f. Right Cowl - SECURE
g. Fuel Strainer - DRAIN
h. Chocks - REMOVE

9. *RIGHT LANDING GEAR:*
   a. Fuel Sump - DRAIN
   b. Tire and Brake - CHECK

10. *RIGHT WING LEADING EDGE:*
   a. Fuel Tank - CHECK QUANTITY; Filler Cap - SECURE
   b. Tie Down and Chocks - REMOVE
   c. Wing Tip - CHECK
   d. Position Light - CHECK

11. *RIGHT WING TRAILING EDGE:*
   a. Aileron - CHECK
   b. Flap - CHECK
   c. Fuel Tank Vent Line - UNOBSTRUCTED



PERFORMANCE - No change

Approved:

Donald H Peters

for W. H. Schultz
Beech Aircraft Corporation
DOA CE-2

FAA Approved
Revised: February 1979
P/N 169-590008-19

BEECHCRAFT B19, C23, A24 LANDPLANE

PILOT'S OPERATING HANDBOOK AND
FAA APPROVED AIRPLANE FLIGHT MANUAL
SUPPLEMENT

for the

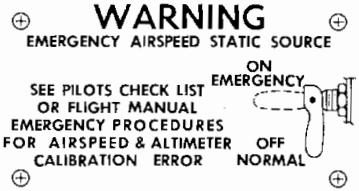
EMERGENCY STATIC AIR SOURCE

GENERAL

The information in this document is FAA Approved material which, together with the appropriate placards, is applicable and must be carried in the airplane when modified by the installation of the Beechcraft Emergency Static Air Source.

LIMITATIONS

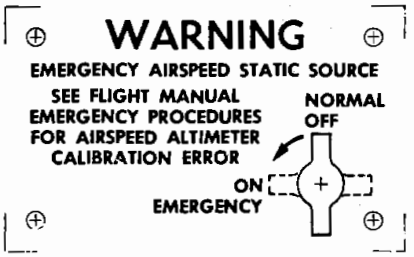
PLACARDS:



or;

FAA Approved
Date: June 2, 1978
P/N MCO C32644-11

or;



EMERGENCY PROCEDURES

Whenever any obstruction exists in the Normal Static Air System, or the Emergency Static Air System is desired for use:

1. Pilot's Emergency Static Air Source - Switch to ON EMERGENCY (lower sidewall adjacent to pilot)

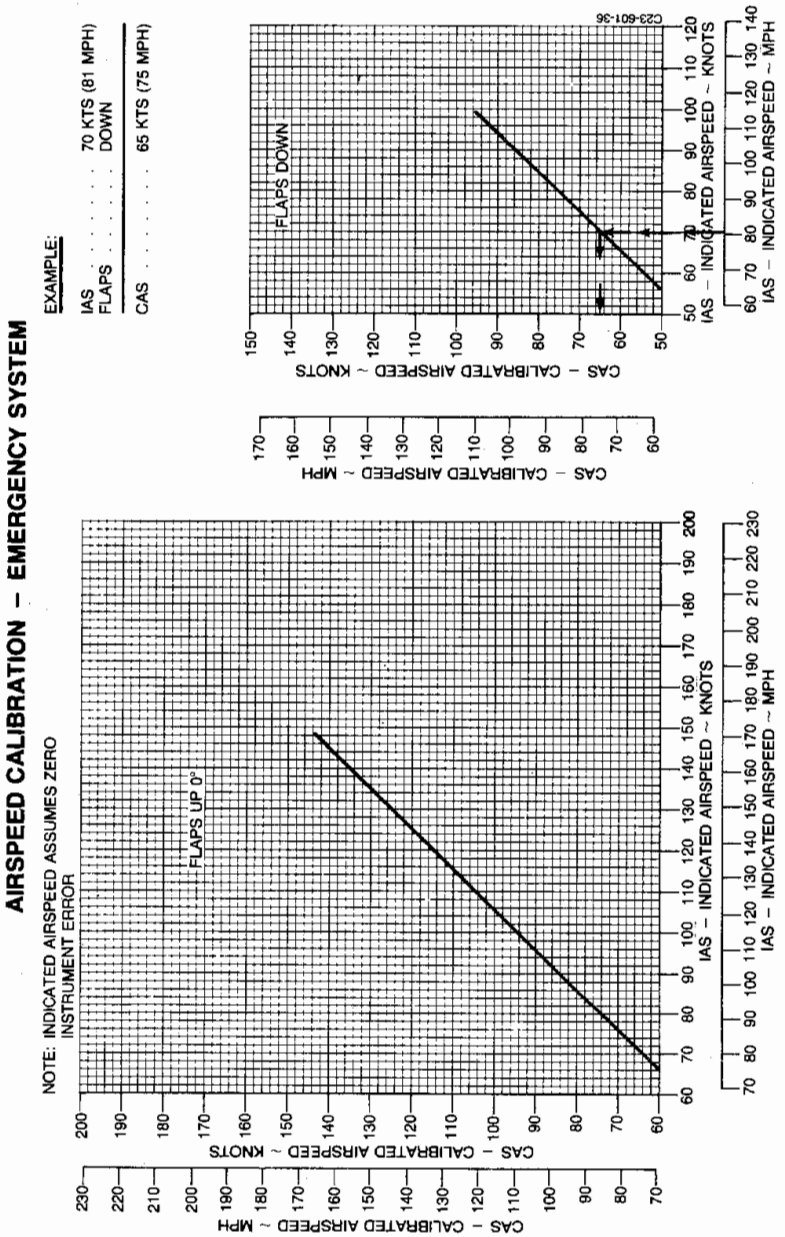
2. For airspeed calibration and altimeter correction, refer to AIRSPEED CALIBRATION-EMERGENCY SYSTEM and ALTIMETER CORRECTION-EMERGENCY SYSTEM graphs in the PERFORMANCE section.

CAUTION

Be certain the emergency static air valve is in the OFF NORMAL position when system is not needed.

NORMAL PROCEDURES - No change.

EMERGENCY STATIC AIR SOURCE



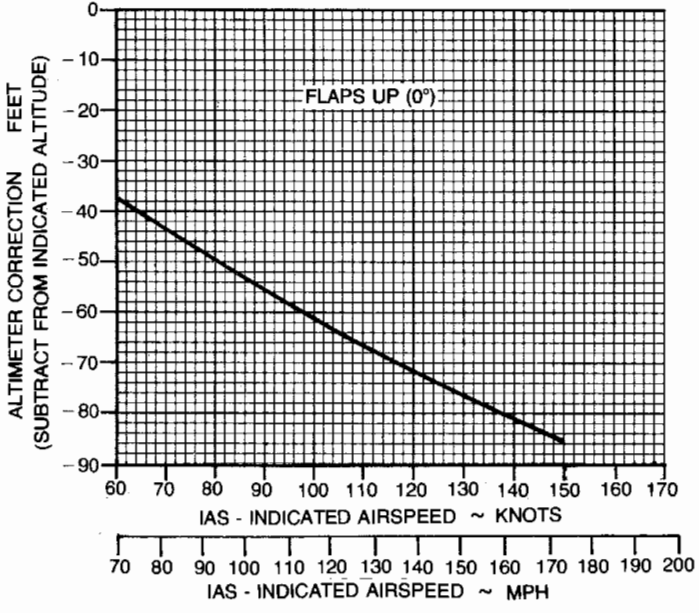
ALTIMETER CORRECTION - EMERGENCY SYSTEM

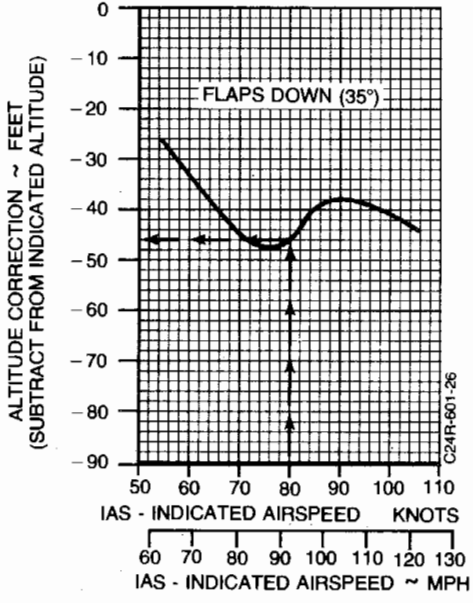
NOTE:

INDICATED AIRSPEED AND INDICATED ALTITUDE ASSUME ZERO INSTRUMENT ERROR.

EXAMPLE:

IAS	80 KTS (92 MPH)
FLAPS	DOWN (35°)
INDICATED ALTITUDE	6256 FT
ALTIMETER CORRECTION	-46 FT
CORRECTED ALTITUDE	6210 FT





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SYSTEMS DESCRIPTION

EMERGENCY STATIC AIR SOURCE

THE EMERGENCY STATIC AIR SOURCE SHOULD BE USED FOR CONDITIONS WHERE THE NORMAL STATIC SOURCE HAS BEEN OBSTRUCTED. When the airplane has been exposed to moisture and/or icing conditions (ground obstructions not properly corrected may cause inflight obstruction), the possibility of obstructed static ports should be considered. Partial obstruction will result in the rate-of-climb indication being sluggish during a climb or descent. Verification of suspected obstruction is possible by switching to the emergency system and noting a sudden sustained change in rate of climb. This may be accompanied by abnormal indicated airspeed and altitude changes beyond normal calibration differences.

HANDLING, SERVICING, AND MAINTENANCE

EMERGENCY STATIC AIR SOURCE

The system should be drained every 100 hours.

Remove cover plate from the lower middle fuselage under the spar and unscrew knurled nut to disconnect static air lines and drain moisture. Reconnect static air lines.

Approved:

for Donald H Retz

Chester A. Rembleske
Beech Aircraft Corporation
DOA CE-2

FAA Approved
Date: June 2, 1978
P/N MCO C32644-11

SECTION X

SAFETY INFORMATION

TABLE OF CONTENTS

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INTRODUCTION

The best engineering and manufacturing craftsmanship have gone into the design and building of all BEECHCRAFTS. Like any other high performance airplane, they operate efficiently and safely only in the hands of a skilled pilot.

You must be thoroughly familiar with the contents of your operating manuals, placards, and check lists to insure safe utilization of your airplane. When the airplane was manufactured, it was equipped with one or more of the following: placards, Owners Manual, FAA Flight Manual, Pilots Operating Handbook and FAA Approved Flight Manual. For simplicity and convenience we will refer to all official manuals in various models as the "Information Manual". If the airplane has changed ownership, the Information Manual may have been misplaced or may not be current. If missing or out of date, replacement Information Manuals must be obtained from any BEECHCRAFT Aviation Center as soon as possible.

For your added protection and safety, we have developed this special publication of safety information to refresh owners' and pilots' knowledge of a number of safety subjects. These subjects must

be reviewed periodically and kept with the airplane, along with the Information Manual and other documents required for operation of the airplane.

Topics in this publication are dealt with in more detail in FAA Documents and other articles pertaining to the subject of safe flying. The safe pilot is familiar with this literature.

BEECHCRAFT airplanes are designed and built to provide owners and pilots with many years of safe and efficient transportation. By maintaining it properly and flying it prudently, you will realize its full potential.

WARNING

Because your aircraft is a high performance, high speed transportation vehicle, designed for operation in a three-dimensional environment, special safety precautions must be observed to reduce the risk of fatal or serious injuries to the pilot(s) and occupant(s).

It is mandatory that you fully understand the contents of this manual and the other operating and maintenance manuals which accompany the aircraft;

that FAA requirements for ratings, certifications and review be scrupulously complied with; and that you allow only persons who are properly licensed and rated, and thoroughly familiar with the contents of the Information Manual, to operate the aircraft. IMPROPER OPERATION OR MAINTENANCE OF AN AIRCRAFT, NO MATTER HOW WELL BUILT INITIALLY, CAN RESULT IN CONSIDERABLE DAMAGE OR TOTAL DESTRUCTION OF THE AIRCRAFT ALONG WITH SERIOUS OR FATAL INJURIES TO ALL OCCUPANTS.

. . . . .BEECH AIRCRAFT CORPORATION

GENERAL

As a pilot, you are responsible to yourself and to those who fly with you, to other pilots and their passengers, and to people on the ground, to fly wisely and safely.

The following material in this Safety Section covers several subjects in limited detail. Here are some condensed Do's and Don'ts.

DO'S

Be thoroughly familiar with your airplane, know its limitations and your own.

Be current in your airplane, or fly with a qualified instructor until you are current/proficient.

Pre-plan all aspects of your flight - including weather and adequate fuel reserves.

Use services available - Weather briefing, in-flight weather and Flight Service Station.

Carefully pre-flight your airplane.

Use the approved check list.

Have more than enough fuel for takeoff, plus the trip, and an adequate reserve.

Be sure your weight loading and C.G. are within limits.

Pilot(s) and passengers must use seat belts and shoulder harnesses at all times.

Be sure all loose articles and baggage are secured.

Check freedom of all controls during pre-flight inspection and before takeoff.

Maintain the prescribed airspeeds in takeoff, climb, descent and landing.

Avoid big airplane wake turbulence.

Preplan fuel and fuel tank management before the actual flight. Utilize auxiliary tanks only in level cruise flight. Take off and land on the fullest main tank.

Practice emergency procedures at safe altitudes and airspeeds, preferably with a qualified instructor pilot, until the required action is instinctive.

Keep your airplane in good mechanical condition.

Stay informed and alert; fly in a sensible manner.

DON'TS

Don't take off with frost, ice or snow on the airplane.

Don't take off with less than minimum recommended fuel, plus adequate reserves, and don't run the tank dry before switching.

Don't fly in a reckless, show-off, careless manner.

Don't fly into thunderstorms or severe weather.

Don't fly in possible icing conditions unless the airplane is approved and properly equipped.

Don't fly close to mountainous terrain.

Don't apply controls abruptly or with high forces that could exceed design loads of the airplane.

Don't fly into weather conditions that are beyond your ratings or current proficiency.

Don't attempt any take off or landing without using the check list.

Don't fly when physically or mentally exhausted or below par.

Don't trust to luck.

GENERAL SOURCES OF INFORMATION

There is a wealth of information available to the pilot created for the sole purpose of making your flying safer, easier and faster. Take advantage of this knowledge and be prepared for an emergency in the remote event that one should occur.

You, as a pilot, have responsibilities under government regulations. These are designed for your protection and the protection of your passengers. Compliance is mandatory.

RULES AND REGULATIONS

F.A.R. Part 91, General Operating and Flight Rules, is a document of law governing operation of aircraft and the owner's and pilot's responsibilities. This document covers such subjects as:

Responsibilities and authority of the pilot-in-command

Certificates required
Liquor and drugs
Flight plans
Pre-flight action
Fuel requirements
Flight rules
Maintenance, preventative maintenance, alterations, inspection, and maintenance records

These are only some of the topics covered. It is the owner's and pilot's responsibility to be thoroughly familiar with all items in F.A.R. Part 91 and to follow them.

AIRWORTHINESS DIRECTIVES

F.A.R. Part 39 specifies that no person may operate a product to which an airworthiness directive issued by the FAA applies, except in accordance with the requirements of that airworthiness directive.

AIRMAN INFORMATION, ADVISORIES, AND NOTICES - FAA AIRMAN'S INFORMATION MANUAL

AIRMAN'S INFORMATION MANUAL

The Airman's Information Manual (AIM) is designed

to provide airmen with basic flight information and ATC procedures for use in the national airspace system of the United States. It also contains items of interest to pilots concerning health and medical facts, factors affecting flight safety, a pilot/controller glossary of terms used in the Air Traffic Control System, information on safety, and accident and hazard reporting. It is revised at six-month intervals and can be purchased locally or from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

This document contains a wealth of pilot information. Among the subjects are:

Controlled Air Space
Services Available to Pilots
Radio Phraseology and Technique
Airport Operations
Clearances and Separations
Pre-flight
Departures - IFR
Enroute - IFR
Arrival - IFR
Emergency Procedures
Weather and Icing
Mountain Flying
Wake Turbulence - Vortices

Medical Facts for Pilots
Bird Hazards
Good Operating Practices
Airport Location Directory

All pilots must be thoroughly familiar with and use the information in the AIM.

ADVISORY INFORMATION

NOTAMS (Notices to Airmen) are documents that have information of a time-critical nature that would affect a pilot's decision to make a flight; for example, an airport closed, terminal radar out of service, enroute navigational aids out of service, etc.

Airmen can subscribe to services to obtain FAA NOTAMS and Airman Advisories, and these are also available at FAA Flight Service Stations.

FAA ADVISORY CIRCULARS

The FAA issues advisory circulars to inform the aviation public in a systematic way of non-regulatory material of interest. Advisory Circulars contain a wealth of information with which the prudent pilot should be familiar. A complete list of current FAA advisory circulars is published in Advisory Circular

AC00-2, which lists advisory circulars that are for sale, as well as those distributed free of charge by the FAA, and provides ordering information. Many advisory circulars which are for sale can be purchased locally in aviation bookstores or at FBO's. Some of the advisory circulars of interest to pilots are:

*	00-6A	Aviation Weather
	00-24	Thunderstorms
	00-30	Rules of Thumb for Avoiding or Minimizing Encounters with Clear Air Turbulence
*	00-45A	Aviation Weather Services
	00-46A	Aviation Safety Reporting Program
	00-50	Low Level Wind Shear
	20-5D	Plane Sense
	20-93	Flutter Due to Ice or Foreign Substance on or in Aircraft Control Surfaces
	20-105	Engine Power-Loss Accident Prevention
	39-7	Airworthiness Directives for General Aviation Aircraft
	43-12	Preventive Maintenance
	60-4	Pilot's Spatial Disorientation

	60-6A	Airplane Flight Manuals (AFM), Approved Manual Materials, Markings and Placards - Airplanes
	60-9	Induction Icing - Pilot Precautions and Procedures
	60-12	Availability of Industry-Developed Guidelines for the Conduct of the Biennial Flight Review
	60-13	The Accident Prevention Counselor Program
*	61-8D	Instrument Rating Written Test Guide
	61-9B	Pilot Transition Courses for Complex Single-Engine and Light, Twin Engine Airplanes
*	61-10A	Private and Commercial Pilots Refresher Courses
	61-12J	Student Pilot Guide
	61-19	Safety Hazard Associated with Simulated Instrument Flights
*	61-21	Flight Training Handbook
*	61-23A	Pilot's Handbook of Aeronautical Knowledge
*	61-27B	Instrument Flying Handbook
*	61-32B	Private Pilot - Airplane - Written Test Guide
*	61-34B	Federal Aviation Regulations Written Test Guide for Private, Commercial and Military Pilots

	61-47	Use of Approach Slope Indicators for Pilot Training
*	61-54A	Private Pilot Airplane - Flight Test Guide
*	61-55A	Commercial Pilot Airplane . . . Flight Test Guide
*	61-56A	Flight Test Guide - Instrument Pilot Airplane
*	61-58	Flight Instructor Practical Test Guide
	61-65	Part 61 (Revised) Certification Pilot and Flight Instructors
	61-67	Hazards Associated with Spins in Airplanes Prohibited from Intentional Spinning
*	61-70	Flight Instructor Instrument - Airplane - Written Test Guide
*	61-71A	Commercial Pilot Airplane Written Test Guide
*	61-72A	Flight Instructor - Airplane Written Test Guide
	61-84	Role of Preflight Preparation
*	67-2	Medical Handbook for Pilots
	90-23D	Wake Turbulence
	90-34	Accidents resulting from Wheelbarrowing in Tricycle Gear Equipped Aircraft

	90-42A	Traffic Advisory Practices at Non-tower airports
	90-43D	Operations Reservation for High-Density Traffic Airports
	90-48	Pilots' role in Collision Avoidance
	90-64	Automated Radar Terminal System (ARTS) III
	90-66	Recommended Standard Traffic Patterns for Airplane Operations at Uncontrolled Airports
	91-6A	Water, Slush and Snow on runway
	91-8A	Use of Oxygen by General Aviation Pilots/Passengers
	91-11B	Annual Inspection Reminder
	91-13C	Cold Weather Operation of Aircraft
	91-17	The use of View Limiting Devices on Aircraft
*	91-23A	Pilot's Weight and Balance Handbook
	91-24	Aircraft Hydroplaning or Aquaplaning on Wet Runways
	91-25A	Loss of Visual Cues During Low Visibility Landings
	91-28	Unexpected Opening of Cabin Doors

91-33	Use of Alternate Grades of Aviation Gasoline for Grade 80/87
91-35	Noise, Hearing Damage, and Fatigue in General Aviation Pilots
91-43	Unreliable Airspeed Indications
91-46	Gyroscopic Instruments - Good Operating Practices
91-51	Airplanes Deice and Anti-Ice Systems
103-4	Hazard Associated with Sublimation of Solid Carbon Dioxide (Dry Ice) Aboard Aircraft
150/ 5200-3A	Bird Hazards to Aircraft
210-1A	National Notice to Airmen System
210-5	Military Flying Activities

* Advisory Circulars that are for sale.

FAA GENERAL AVIATION NEWS

FAA General Aviation News is published by the FAA in the interest of flight safety. The magazine is designed to promote safety in the air by calling the attention of general aviation airmen to current technical, regulatory and procedural matters affecting the safe operation of aircraft. FAA General Aviation News is sold on subscription by the

Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

FAA ACCIDENT PREVENTION PROGRAM

The FAA assigns accident prevention specialists to each Flight Standards and General Aviation District Office to organize accident prevention program activities. In addition, there are over 3,000 volunteer airmen serving as accident prevention counselors, sharing their technical expertise and professional knowledge with the general aviation community. The FAA conducts seminars and workshops, and distributes invaluable safety information under this program.

Usually the airport manager, the FAA Flight Service Stations (FSS), or Fixed Base Operator (F.B.O.), will have a list of accident prevention counselors and their phone numbers available. All Flight Standards and General Aviation District Offices have a list of the counselors serving the district.

Before flying over unfamiliar territory, such as mountainous terrain or desert areas, it is advisable for transient pilots to consult with local counselors. They will be familiar with the more desirable routes, the wind and weather conditions, and the service and emergency landing areas that are available along

the way. They can also offer advice on the type of emergency equipment you should be carrying.

GENERAL INFORMATION ON SPECIFIC TOPICS

FLIGHT PLANNING

F.A.R. Part 91 requires that each pilot in command, before beginning a flight, familiarize himself with all available information concerning that flight.

Obtain a current and complete pre-flight briefing. This should consist of local, enroute and destination weather and enroute navaid information. Enroute terrain and obstructions, alternate airports, airport runways active, length of runways, and take-off and landing distances for the airplane for conditions expected should be known.

The prudent pilot will review his planned enroute track and stations and make a list for quick reference. It is strongly recommended a flight plan be filed with Flight Service Stations, even though the flight may be VFR. Also, advise Flight Service Stations of changes or delays of one hour or more and remember to close the flight plan at destination.

The pilot must be completely familiar with the performance of the airplane and performance data in the Information Manual. The resultant effect of temperature and pressure altitude must be taken into account in determining performance if not accounted for on the charts. An applicable FAA Approved Flight Manual, if one is provided, must be aboard the airplane at all times including the weight and balance forms and equipment list.

PASSENGER INFORMATION CARDS

Beech has available, for most current production airplanes, passenger information cards which contain important information on the proper use of restraint systems, oxygen masks, emergency exits and emergency bracing procedures. Passenger information cards may be obtained at any Beechcraft Aviation or Aero Center. A pilot should not only be familiar with the information contained in the cards himself, but should, prior to flight, always inform passengers of the information contained in the information cards. If a passenger information card is not available for your model of airplane, the pilot should orally brief the passengers on the proper use of restraint systems, doors and emergency exits, and other emergency procedures, as required by Part 91 of the FAR's.

INSPECTIONS - MAINTENANCE

In addition to maintenance inspections and pre-flight information required by F.A.R. Part 91, a complete pre-flight inspection is imperative. It is the responsibility of the owner and the operator to assure that the airplane is maintained in an airworthy condition and that proper maintenance records are kept.

Each airplane has a checklist for the pre-flight inspection which must be followed. USE THE CHECKLIST!

FLIGHT OPERATIONS

GENERAL

The pilot must be thoroughly familiar with all information published by the manufacturer concerning the airplane, and is required by law to operate the airplane in accordance with the FAA Approved Airplane Flight Manual and/or placards installed.

TURBULENT WEATHER

A complete and current weather briefing is a requirement for a safe trip.

Updating of weather information enroute is also essential. The wise pilot knows that weather conditions can change quickly, and treats weather forecasting as professional advice, rather than an absolute fact. He obtains all the advice he can, but stays alert to any sign or report of changing conditions.

Plan the flight to avoid areas of severe turbulence and thunderstorms. It is not always possible to detect individual storm areas or find the in-between clear areas.

Thunderstorms, squall lines and violent turbulence should be regarded as extremely dangerous and must be avoided. Hail and tornadic wind velocities can be encountered in thunderstorms that can destroy any airplane, just as tornadoes destroy nearly everything in their path on the ground.

Turboprop Engines - Thunderstorms also pose the possibility of a lightning strike on an aircraft. Any structure or equipment which shows evidence of a lightning strike, or of being subjected to a high current flow due to a strike, or is a suspected part of a lightning strike path through the aircraft, should be thoroughly inspected and any damage repaired prior to additional flight. The Pratt & Whitney or

AiResearch Engine Maintenance Manual and Hartzell Service Letter No. 104 include inspection and maintenance requirements for engines and propellers involved in lightning strike incidents.

A roll cloud ahead of a squall line or thunderstorm is visible evidence of violent turbulence; however, the absence of a roll cloud should not be interpreted as denoting that severe turbulence is not present.

Even though flight in severe turbulence must be avoided, flight in turbulent air may be encountered unexpectedly under certain conditions.

The following recommendations should be observed for airplane operation in turbulent air:

Flying through turbulent air presents two basic problems, the answer to both of which is proper airspeed. On one hand, if you maintain an excessive airspeed, you run the risk of structural damage or failure; on the other hand, if your airspeed is too low, you may stall.

If turbulence is encountered, reduce speed to the turbulent air penetration speed, if given, or to the maneuvering speed, which is listed in the Limitations Section of the Information Manual. These speeds give the best assurance of avoiding

excessive stress loads, and at the same time providing the proper margin against inadvertent stalls due to gusts.

Beware of overcontrolling in attempting to correct for changes in attitude; applying control pressure abruptly will build up G-forces rapidly and could cause structural damage or even failure. You should watch particularly your angle of bank, making turns as wide and shallow as possible. Be equally cautious in applying forward or back pressure to keep the nose level. Maintain straight and level attitude in either up or down drafts. Use trim sparingly to avoid being grossly out of trim as the vertical air columns change velocity and direction. If necessary to avoid excessive airspeeds, lower the landing gear.

FLIGHT IN ICING CONDITIONS

Every pilot of Beech airplanes (for that matter the pilot of any airplane) should be intimately acquainted with the FAA Approved National Weather Service definitions for ice intensity and accumulation which we have reprinted below:

INTENSITY	ICE ACCUMULATION
Trace	Ice becomes perceptible. Rate of accumulation slightly greater than rate

INTENSITY	ICE ACCUMULATION (Cont'd)
Trace (Cont'd)	of sublimation. It is not hazardous even though deicing/anti-icing equipment is not utilized, unless encountered for an extended period of time (over 1 hour).
Light	The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.
Moderate	The rate of accumulation is such that even short encounters become potentially hazardous and use of deicing/anti-icing equipment or diversion is necessary.
Severe	The rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary.

It is no longer unusual to find deicing and anti-icing equipment on a wide range of airplane sizes and

types. Since the capability of this equipment varies, it becomes the pilot's primary responsibility to understand limitations which restrict the use of his airplane in icing conditions and the conditions which may exceed the systems capacity.

Pilots and airplane owners must carefully review the Information Manual in order to ascertain the required operable equipment needed for flight in icing conditions. In addition, they must ascertain from the same sources the limits of approval or certification of their airplane for flight in icing conditions, and plan the flight accordingly, if icing conditions are known or forecast along the route.

Every owner and pilot of an airplane should understand that it is not uncommon to find aircraft equipped with less than the full complement of available systems and equipment. For example, props and pitot tube may be protected, but the aircraft might not have wing boots or tail boots. The reverse might be true. Windshield, pitot and airfoil surfaces might be protected, but the props might not be. Before undertaking any flight into areas where icing conditions might be suspected, inspect the aircraft and review the Information Manual to be certain that you are supported by the full complement of required IFR and deicing/anti-icing equipment.

Remember that regardless of its combination of deicing/anti-icing equipment, any aircraft not fully equipped and functional for IFR flight is not properly equipped for flight in icing conditions.

An airplane which is not approved or certificated for flight in icing conditions, not fully equipped, or which does not have all critical areas protected in the required manner by fully operational equipment must not be exposed to icing encounters of any intensity. When icing is detected, the pilot of such an aircraft must make an immediate diversion by flying out of the area of visible moisture or going to an altitude where icing is not encountered.

Some models of Beech airplanes were approved for flight in certain limited icing conditions under the FAA's Bureau of Flight Standards Release No. 434. Under this release, properly equipped airplanes are approved for flight in light to moderate icing conditions only. These aircraft are not approved for extended flight in moderate icing conditions or flights in any severe icing conditions. Flight in these conditions must be avoided.

Even airplanes fully equipped and certified for flight in the icing conditions described in Appendix C to FAR Part 25 must avoid flights into those conditions defined by the National Weather Service as

"Severe". The National Weather Service definition of "severe icing" describes that condition as: "the rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard." No airplane equipped with any combination of deicing/anti-icing equipment can be expected to cope with such conditions. As competent pilots know, there appear to be no predictable limits for the severest weather conditions. For essentially the same reasons that airplanes, however designed or equipped for IFR flight, cannot be flown safely into conditions such as thunderstorms, tornados, hurricanes or other phenomena likely to produce severe turbulence, airplanes equipped for flight in icing conditions cannot be expected to cope with "severe" icing conditions as defined by the National Weather Service. The prudent pilot must remain alert to the possiblity that icing conditions may become "severe", and that his equipment will not cope with them. At the first indication that such condition may have been encountered or may lie ahead, he should immediately react by selecting the most expeditious and safe course for diversion.

Every pilot of a properly and fully-equipped Beech airplane who ventures into icing conditions must maintain the minimum speed (KIAS) for operation in icing conditions, which is set forth in the Normal Procedures Section of his Information Manual. If a

minimum speed for flight in icing conditions is not specified in the manual, the following indicated airspeeds must be maintained:

All Baron and Travel Air Models - 130 KIAS

All other Beechcraft twin-engine models - 140 KIAS

The pilot must remain aware of the fact that if he allows his airspeed to deteriorate below this minimum speed, he will increase the angle of attack of his airplane to the point where ice may build up on the under side of the wings aft of the area protected by the boots.

The fact or extent of ice build-up in unprotected areas will not be directly observable from the cockpit. Due to distortion of the wing airfoil, increased drag and reduced lift, stalling speeds will increase as ice accumulates on the airplane. For the same reasons, stall warning devices are not accurate and cannot be relied upon in icing conditions.

Even though the pilot maintains the prescribed minimum speed for operating in icing conditions, ice is still likely to build up on other unprotected areas (the fuselage and the unprotected wing leading edge inboard of the engine nacelle). Under some atmospheric conditions, it may even build up aft of

the boots despite the maintenance of the prescribed minimum speed. The effect of ice accumulation on any unprotected surface is aggravated by the length of exposure to the icing conditions. Ice buildup on unprotected surfaces will increase drag, add weight, reduce lift, and generally, adversely affect the aerodynamic characteristics and performance of the airplane. It can progress to the point where the airplane is no longer capable of flying. Therefore, the pilot operating even a fully-equipped airplane in sustained icing conditions must remain sensitive to any indication, such as observed ice accumulation, loss of airspeed, the need for increased power, reduced rate of climb, or sluggish response, that ice is accumulating on unprotected surfaces and that continued flight in these conditions is extremely hazardous, regardless of the performance of the deicing/anti-icing equipment.

Rapid cycling of the deice boots or cycling before at least one-quarter inch (1/4") of ice has accumulated (measured in the chordwise direction or forward from the leading edge), may cause the ice to grow outside the contour of the inflated boots and prevent ice removal.

For any owner or pilot whose use pattern for an aircraft exposes it to icing encounters, the following references are required reading for safe flying:

The aircraft's Information Manual, expecially the sections on Normal Procedures, Emergency Procedures, Systems, and Safety Information.

FAA Advisory Circular 91-51 - Airplane Deice and Anti-ice Systems.

Weather Flying, by Robert N. Buck.

Finally, the most important ingredients to safe flight in icing conditions - regardless of the aircraft or the combination of deicing/anti-icing equipment - are a complete and current weather briefing, sound pilot judgment, close attention to the rate and type of ice accumulations, and the knowledge that "severe icing" as defined by the National Weather Service is beyond the capability of modern aircraft and immediate diversion must be made. It is the inexperienced or uneducated pilot who presses on "regardless", hoping that steadily worsening conditions will improve, only to find himself flying an airplane which has become so loaded with ice

that he can no longer maintain altitude. At this point he has lost most, if not all, of his safety options, including perhaps a 180 degree turn to retreat along the course already traveled. The responsible and well-informed pilot recognizes the limitations of weather conditions, his airplane and its systems and reacts promptly; he lives to fly again.

MOUNTAIN FLYING

Pilots flying in mountainous areas should inform themselves of all aspects of mountain flying, including the effects of topographic features on weather conditions. Many good articles have been published, and a synopsis of mountain flying operations is included in the FAA Airman's Information Manual, Part 1.

Avoid flight at low altitudes over mountainous terrain, particularly near the lee slopes. If the wind velocity near the level of the ridge is in excess of 25 knots and approximately perpendicular to the ridge, mountain wave conditions are likely over and near the lee slopes. If the wind velocity at the level of the ridge exceeds 50 knots, a strong mountain wave is probable with extreme up and down drafts and severe turbulence. The worst turbulence will be encountered in and below the rotor zone, which is

usually 8 to 10 miles downwind from the ridge. This zone is sometimes characterized by the presence of "roll clouds" if sufficient moisture is present; altocumulus standing lenticular clouds are also visible signs that a mountain wave exists, but their presence is likewise dependent on moisture. Mountain wave turbulence can, of course, occur in dry air and the absence of such clouds should not be taken as any assurance that mountain wave turbulence will not be encountered. A mountain wave downdraft may exceed the climb capability of your airplane. Avoid mountain wave downdrafts.

VFR - LOW CEILINGS

If you are not instrument rated, do not attempt "VFR on Top" or "Special VFR" flight or clearances. Being caught above a solid cloud layer when an emergency descent is required (or at destination) is an extremely hazardous position for the VFR pilot. Accepting a clearance out of certain airport control zones with no minimum ceiling and one-mile visibility as permitted with "Special VFR" is a foolish practice for the VFR pilot.

Avoid areas of low ceilings and restricted visibility unless you are instrument rated and proficient and have an instrument equipped airplane. Then proceed with caution and with planned alternates.

VFR AT NIGHT

When flying VFR at night, in addition to the altitude appropriate for the direction of flight, pilots should maintain a safe minimum altitude as dictated by terrain, obstacles such as TV towers, or communities in the area flown. This is especially true in mountainous terrain, where there is usually very little ground reference. Minimum clearance is 2,000 feet above the highest obstacle enroute. Do not depend on your ability to see obstacles in time to miss them. Flight on dark nights over sparsely populated country can be the same as IFR, and must be avoided by inexperienced or non-IFR rated pilots.

VERTIGO - DISORIENTATION

Disorientation can occur in a variety of ways. During flight, inner ear balancing mechanisms are subjected to varied forces not normally experienced on the ground. This, combined with loss of outside visual reference, can cause vertigo. False interpretations (illusions) result, and may confuse the pilot's conception of the altitude and position of his airplane.

Under VFR conditions, the visual sense, using the horizon as a reference, can override the illusions. Under low visibility conditions (night, fog, clouds,

haze, etc.) the illusions predominate. Only through awareness of these illusions, and proficiency in instrument flight procedures, can an airplane be operated safety in a low visibility environment.

Flying in fog, dense haze or dust, cloud banks, or very low visibility, with strobe lights or rotating beacons turned on can contribute to vertigo. They should be turned off in these conditions, particularly at night.

All pilots should check the weather and use good judgment in planning flights. The VFR pilot should use extra caution in avoiding low visibility conditions.

Motion sickness often precedes or accompanies disorientation and may further jeopardize the flight.

Disorientation in low visibility conditions is not limited to VFR pilots. Although IFR pilots are trained to look at their instruments to gain an artificial visual reference as a replacement for the loss of a visual horizon, they do not always do so. This can happen when the pilot's physical condition will not permit him to concentrate on his instruments; when the pilot is not proficient in flying instrument conditions in the airplane he is flying; or, when the pilot's work load of flying by reference to

his instruments is augmented by such factors as turbulence. Even an instrument rated pilot encountering instrument conditions, intentional or unintentional, should ask himself whether or not he is sufficiently alert and proficient in the airplane he is flying, to fly under low visibility conditions and the turbulence anticipated or encountered. If any doubt exists, the flight should not be made or it should be discontinued as soon as possible.

The result of vertigo is loss of control of the airplane. If the loss of control is sustained it will result in an excessive speed accident. Excessive speed accidents occur in one of two manners, either as an inflight airframe separation or as a high speed ground impact; and they are fatal accidents in either case. All airplanes are subject to this form of accident.

For years, Beech Information Manuals have contained instructions that the landing gear should be extended in any circumstance in which the pilot encounters IFR conditions which approach the limits of his capability or his ratings. Lowering the gear in IFR conditions or flight into heavy or severe turbulence, tends to stabilize the aircraft, assists in maintaining proper airspeed, and will substantially reduce the possibility of reaching excessive

airspeeds with catastrophic consequences, even where loss of control is experienced.

Excessive speed accidents occur at airspeeds greatly in excess of two operating limitations which are specified in the manuals: Maximum maneuvering speed and the "red line" or "never exceed" speed. Such speed limits are set to protect the structure of an airplane. For example, control surfaces are designed to be used to their fullest extent only below a certain speed - maximum maneuvering speed. As a result, the control surfaces should never be suddenly or fully deflected above maximum maneuvering speed. Turbulence penetration should not be performed above that speed. The accidents we are discussing here occur at airspeeds greatly in excess of these limitations. No airplane should ever be flown beyond its FAA approved operating limitations.

FLIGHT OF MULTI-ENGINE AIRPLANES WITH ONE ENGINE INOPERATIVE.

The major difference between flying a twin-engine and single-engine airplane is knowing how to manage the flight if one engine loses power for any reason. Safe flight with one engine out requires an

understanding of the basic aerodynamics involved - as well as proficiency in engine out procedures.

Loss of power from one engine affects both climb performance and controllability of any light twin. Climb performance depends on an excess of power over that required for level flight. Loss of power from one engine obviously represents a 50% loss of horsepower but, in virtually all light twins, climb performance is reduced by at least 80%. A study of the charts in your Information Manual will confirm this fact.

Single engine climb performance depends on four factors:

Airspeed	too little, or too much, will decrease climb performance.
Drag	gear, flaps, cowl flaps, prop, and speed.
Power	amount available in excess of that needed for level flight.
Weight	passengers, baggage, and fuel load greatly affect climb performance.

Loss of power on one engine creates yaw due to

asymmetrical thrust. Yaw forces must be balanced with the rudder. Loss of power on one engine also reduces prop wash over the wing. In addition, yaw affects the lift distribution over the wing causing a roll toward the "dead" engine. These roll forces may be balanced by banking slightly (up to 5°) into the operating engine.

Airspeed is the key to safe single engine operations. For most light twins there is an:

	Symbol
- airspeed below which directional control cannot be maintained	Vmca
- airspeed below which an intentional engine cut should never be made	Vsse
- airspeed that will give the best single engine rate-of-climb (or the slowest loss of altitude)	Vyse
- airspeed that will give the steepest angle-of-climb with one engine-out	Vxse

MINIMUM CONTROL SPEED AIRBORNE (Vmca)

Vmca is designated by the red radial on the airspeed indicator and indicates the minimum control speed, airborne at sea level. Vmca is determined by FAA regulations as the minimum airspeed at which it is possible to recover directional control of the airplane within 20 degrees heading change, and thereafter maintain straight flight, with not more than 5 degrees of bank if one engine fails suddenly with:

- Take-off power on both engines,
- Rearmost allowable center of gravity,
- Flaps in takeoff position,
- Landing gear retracted,
- Propeller windmilling in takeoff pitch configuration (or feathered if automatically featherable).

However, sudden engine failures rarely occur with all of the factors listed above, and therefore, the actual Vmca under any particular situation may be a little slower than the red radial on the airspeed

indicator. Most airplanes will not maintain level flight at speeds at or near Vmca. Consequently, it is not advisable to fly at speeds approaching Vmca, except in training situations or during flight tests. Adhering to the practice of never flying at or below the published Vmc speed for your aircraft will virtually eliminate loss of directional control as a problem in the event of engine failure.

INTENTIONAL ONE-ENGINE INOPERATIVE SPEED (Vsse)

Vsse is specified by the airplane manufacturer and is the minimum speed at which to perform intentional engine cuts. Use of Vsse is intended to reduce the accident potential from loss of control after engine cuts at or near minimum control speed. Vmca demonstrations are necessary in training, but should only be made at a safe altitude above the terrain and with the power reduction on one engine made at or above Vsse.

BEST SINGLE ENGINE RATE-OF-CLIMB SPEED (Vyse)

Vyse is designated by the blue radial on the airspeed indicator. Vyse delivers the greatest gain in altitude

in the shortest possible time, and is based on the following criteria:

- critical engine inoperative, and its propeller in the minimum drag position.
- operating engine set at not more than maximum continuous power.
- landing gear retracted.
- wing flaps in the most favorable (i.e., best lift/drag ratio position).
- cowl flaps as required for engine cooling.
- aircraft flown at recommended bank angle.

Drag caused by a windmilling propeller, extending landing gear, or flaps in the landing position, will severely degrade or destroy single engine climb performance. Since engine climb performance varies widely with type of airplane, weight, temperature, altitude, and airplane configuration, the climb gradient (altitude gain or loss per mile) may be marginal - or even negative - under some conditions. Study the Information Manual for your specific airplane and know what performance to expect with one-engine out.

BEST SINGLE ENGINE ANGLE-OF-CLIMB AIRSPEED (Vxse)

Vxse is used only to clear obstructions during initial

climb-out as it gives the greatest altitude gain per unit of horizontal distance. It provides less engine cooling and requires more rudder control than Vyse.

SINGLE ENGINE SERVICING CEILING

The single engine service ceiling is the maximum altitude at which an airplane will climb, at a rate of at least 50 feet per minute in smooth air, with one engine feathered.

The single engine service ceiling chart should be used during flight planning to determine whether the airplane, as loaded, can maintain the Minimum Enroute Altitude (MEA) if IFR, or terrain clearance if VFR, following an engine failure.

BASIC SINGLE ENGINE PROCEDURES

Know and follow, to the letter, the single-engine emergency procedures specified in your Information Manual for your specific make and model airplane. However, the basic fundamentals of all the procedures are as follows:

- Maintain aircraft control and airspeed at all times. This is cardinal rule No. 1.
- Usually, apply maximum power to the operating engine. However, if the engine failure occurs at

a speed below Vmca, or during cruise or in a steep turn, you may elect to use only enough power to maintain a safe speed and altitude. If the failure occurs on final approach, use power only as necessary to complete the landing.

- Reduce drag to an absolute minimum.
- Secure the failed engine and related sub-systems.

The first three steps should be done promptly and from memory. The check list should then be consulted to be sure that the inoperative engine is secured properly and that the appropriate switches are placed in the correct position. The airplane must be banked about 5° into the live engine, with the "slip/skid" ball out of center toward the live engine, to achieve rated performance.

Another note of caution: Be sure to identify the dead engine, positively, before feathering it. Remember: First, identify the suspected engine (i.e., "Dead foot means dead engine"), second, verify with cautious throttle movement, then feather.

ENGINE FAILURE ON TAKE-OFF

If an engine fails before attaining lift-off speed, or below Vmca, the only proper action is to discontinue

the take-off. If the engine fails after lift-off with the landing gear still down, the take-off should still be discontinued if touch-down and roll-out on the remaining runway is still possible.

If you do find yourself in a position of not being able to climb, it is much better to pull the power on the good engine and land straight ahead than try to force a climb and lose control.

Your Information Manual contains charts that are used in calculating the runway length required to stop if the engine fails before reaching lift-off speed and also has charts showing single engine performance after lift-off.

Study your charts carefully. No airplane is capable of climbing out on one engine under all weight, pressure altitude, and temperature conditions. Know, before you take the actual runway, whether you can maintain control and climb-out if you lose an engine while the gear is still down. It may be necessary to off-load some weight, or wait for more favorable temperature or wind conditions.

WHEN TO FLY Vx, Vy, Vxse and Vyse

During normal two-engine operations, always fly Vy (Vx if necessary for obstacle clearance) on initial

climb-out. Then, accelerate to your cruise climb airspeed, which may be Vy plus 10 to 15 knots after you have obtained a safe altitude. Use of cruise climb airspeed will give you better engine cooling, increased inflight visibility and better fuel economy. However, at the first indication of an engine failure during climb-out, or while on approach, establish Vyse or Vxse, whichever is appropriate. (Consult your Information Manual for specifics).

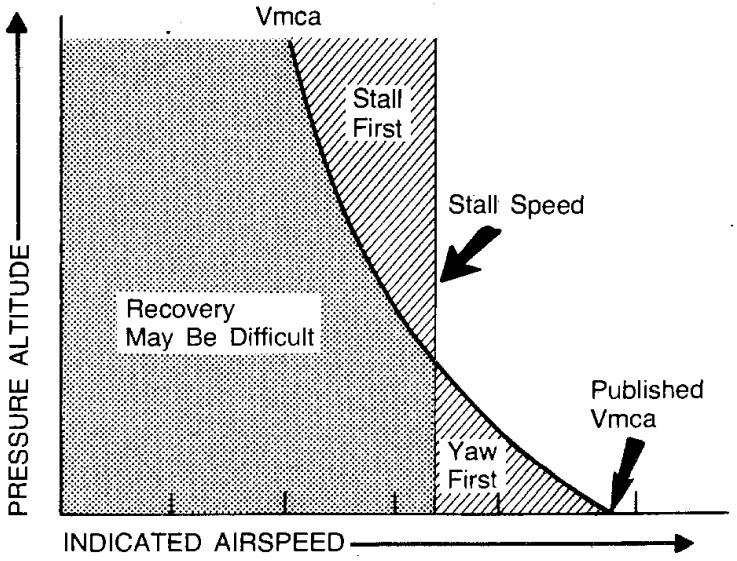
STALLS, SLOW FLIGHT AND TRAINING

The stall warning system must be kept operational at all times and must not be deactivated by interruption of circuits, circuit breakers, or fuses. Compliance with this requirement is especially important in all high performance single and multi-engine airplanes during engine-out practice, or stall demonstrations, because the stall speed is critical in all low speed operations of high-performance airplanes.

Training should be accomplished under the supervision of a qualified instructor-pilot; with careful reference to the applicable sections of the FAA Flight Test Guide and FAA Pilot Transition Courses for Complex Single Engine and Light Twin Engine Airplanes (AC61-9B). In particular, observe carefully the warnings in the flight test guides.

The single engine stall speed of a twin engine aircraft is generally slightly below the power off (engines idle) stall speed, for a given weight condition. Single engine stalls in multi-engine airplanes are not recommended. Single engine stalls have never been required by the FAA regulations for multi-engine flight tests, and should not be practiced in high performance airplanes by other than qualified engineering test pilots.

Engine out minimum control speed demonstrations in multi-engine airplanes should be conducted in



Relationship Between Stall Speed And Vmca For Aircraft With Normally Aspirated Engines.

STD-601-38

strict accordance with the warning of the FAA Flight Test Guide. Engine out minimum control speed generally decreases with altitude, while the single engine stall speed remains approximately constant, for normally aspirated engines. No such demonstration should be attempted when the density altitude and temperature are such that the engine out minimum control speed is known, or discovered to be, close to the stalling speed. Loss of directional or lateral control, just as a stall occurs, is potentially hazardous.

Vsse, the airspeed below which an engine should not be intentionally rendered inoperative for practice purposes, was established because of the apparent practice of some pilots, instructors, and examiners, of intentionally rendering an engine inoperative at a time when the airplane is being operated at a speed close to, or below the power idle stall speed. Unless the pilot takes immediate and proper corrective action under such circumstances, it is possible to enter an inadvertent spin.

It is recognized that flight below Vsse with one engine inoperative, or simulated inoperative, may be required for conditions such as practice demonstration of Vmca for multi-engine pilot certification. Refer to the procedure set forth in the Information Manual for your aircraft. This

procedure calls for simulating one engine inoperative by reducing the power lever (throttle) on one engine to idle while operating at an airspeed above Vsse. Power on the other engine is set at maximum, then airspeed is reduced at approximately one knot per second until either Vmca or stall warning is obtained. During this transition, rudder should be used to maintain directional control, and ailerons should be used to maintain a 5° bank toward the operative engine. At the first sign of either Vmca or stall warning (which may be evidenced by inability to maintain longitudinal, lateral or directional control, aerodynamic stall buffet, or stall warning horn sound), recovery must be initiated immediately by reducing power to idle on operative engine and lowering the nose to regain Vsse. Resume normal flight. This entire procedure should be used at a safe altitude of at least 5,000 feet above the ground in clear air only.

If stall warning is detected prior to the first sign of Vmca, an engine-out minimum control speed demonstration cannot be accomplished under the existing density altitude and gross weight conditions and should not be attempted.

SPINS

A major cause of fatal accidents in general aviation

aircraft is a stall and spin. Stall demonstrations and practice are a means for a pilot to acquire the skills to recognize when a stall is about to occur and to recover as soon as the first signs of a stall are evident. If a stall does not occur - A spin cannot occur. It is important to remember however, that a stall can occur in any flight attitude, at any airspeed, if controls are misused.

Unless your aircraft has been specifically certificated in the aerobatic category and specifically tested for spin recovery characteristics, it is placarded against intentional spins. The pilot of an airplane placarded against intentional spins should assume that the airplane may become uncontrollable in a spin, since its performance characteristics beyond certain limits specified in the FAA regulations may not have been tested and are unknown. This is why aircraft are placarded against intentional spins, and this is why stall avoidance is your protection against an inadvertent spin.

Pilots are taught that intentional spins are entered by deliberately inducing a yawing movement with the controls as the aircraft is stalled. Inadvertent spins result from the same combination - stall plus yaw. That is why it is important to use coordinated controls and to recover at the first indication of a stall when practicing stalls.

In any twin engine airplane, fundamental aerodynamics dictate that if the airplane is allowed to become fully stalled while one engine is providing lift-producing thrust the yawing movement which can induce a spin will be present. Consequently, it is important to immediately reduce power on the operating engine, lower the nose to reduce the angle of attack, and increase the airspeed to recover from the stall. In any twin engine aircraft, if application of stall recovery controls is delayed a rapid rolling and yawing motion may develop, even against full aileron and rudder, resulting in the airplane becoming inverted during the onset of a spinning motion. Once the airplane has been permitted to progress beyond the stall and is allowed to reach the rapid rolling and yawing condition, the pilot must then immediately initiate the generally accepted spin recovery procedure for multi-engine airplanes, which is as follows:

> Immediately move the control column full forward, apply full rudder opposite to the direction of the spin and reduce power on both engines to idle. These three actions should be done as near simultaneously as possible; then continue to hold this control position until rotation stops and then neutralize all controls and execute a

smooth pullout. Ailerons should be neutral during recovery. THE LONGER THE PILOT DELAYS BEFORE TAKING PROPER CORRECTIVE ACTION, THE MORE DIFFICULT RECOVERY WILL BECOME.

Always remember that extra alertness and pilot techniques are required for slow flight maneuvers, including the practice or demonstration of stalls or Vmca. In addition to the foregoing mandatory procedures, always:

1. Be certain that the center of gravity of the airplane is as far forward as possible. Forward C.G. aids stall recovery, spin avoidance and spin recovery. An aft C.G. can create a tendency for a spin to flatten out, which delays recovery.
2. Whenever a student pilot will be required to practice slow flight or single-engine maneuvers, be certain that the qualified instructor pilot has a full set of operable controls in front of him. FAA regulations prohibit flight instruction without full dual controls.
3. Conduct any maneuvers which could possibly result in a spin at altitudes in excess of five thousand (5,000) feet above ground level in clear air only.

4. Remember that an airplane, at or near traffic pattern and approach altitudes, cannot recover from a spin, or perhaps even a stall, before impact with the ground. For twin engine aircraft, when descending to traffic altitude and during pattern entry and all other flight operations, maintain speed no lower than Vsse. On final approach maintain at least the airspeed shown in the flight manual. Should a go-around be required, do not apply more power than necessary until the airplane has accelerated to Vsse. Recognize that under some conditions of weight, density altitude, and aircraft configuration, a twin engine aircraft cannot climb or accelerate on a single engine. Hence a single engine go-around is impossible and the aircraft is committed to a landing. Plan your approach accordingly.
5. Remember that if an airplane flown under instrument conditions is permitted to stall or enter a spin, the pilot, without reference to the horizon, is certain to become disoriented. He may be unable to recognize a stall, spin entry, or the spin condition and he may be unable to determine even the direction of the rotation.
6. Finally, never forget that stall avoidance is your best protection against an inadvertent spin. MAINTAIN YOUR AIRSPEED.

DESCENT

In piston-powered airplanes, whether single or twin engines, supercharged or normally aspirated, it is necessary to avoid prolonged descents with low power, as this produces two problems: (1) Excessively cool cylinder head temperatures which cause premature engine wear, and (2) excessively rich mixtures due to idle enrichment (and altitude) which causes soot and lead deposits on the spark plugs (fouling). The second of these is the more serious consideration; the engine may not respond to the throttle when it is desired to discontinue the descent.

Both problems are amenable to one solution: maintain adequate power to keep cylinder head temperatures in the "green" range during descent, and lean to best power mixture (that is, progressively enrich the mixture from cruise only slightly as altitude decreases). This procedure will lengthen the descent, of course, and requires some advance planning.

If it is necessary to make a prolonged descent at or near idle, as in practicing forced landings, at least avoid the problem of fouled spark plugs by frequently advancing the throttle until the engine runs smoothly, and maintain an appropriate mixture

setting with altitude. (Refer to pre-landing check list.)

VORTICES - WAKE TURBULENCE

Every airplane generates wakes of turbulence while in flight. Part of this is from the propeller or jet engine, and part from the wing tip vortices. The larger and heavier the airplane, the more pronounced and turbulent the wakes will be. Wing tip vortices from large, heavy airplanes are very severe at close range, degenerating with time, wind, and space. These are rolling in nature, from each wing tip. In tests, vortex velocities of 133 knots have been recorded.

Encountering the rolling effect of wing tip vortices within two minutes after passage of large airplanes is most hazardous to light airplanes. This roll effect can exceed the maximum counter roll obtainable in a light airplane.

The turbulent areas may remain for as long as three minutes or more, depending on wind conditions, and may extend several miles beyond the airplane. Plan to fly slightly above and to the windward side of the other airplanes. Because of the wide variety of conditions that can be encountered, there is no set rule to follow to avoid wake turbulence in all

situations. However, the Airman's Information Manual, and to a greater extent Advisory Circular 90-23, Aircraft Wake Turbulence, provides a thorough discussion of the factors you should be aware of when wake turbulence may be encountered.

TAKEOFF AND LANDING CONDITIONS

When taking off on runways covered with water or freezing slush, the landing gear should remain extended for approximately ten seconds longer than normal, allowing the wheels to spin and dissipate the freezing moisture. The landing gear should then be cycled up, then down, wait approximately five seconds and then retract again.

Caution must be exercised to insure that the entire operation is performed below Maximum Landing Gear Operating Airspeed.

Use caution when landing on runways that are covered by water or slush which cause hydroplaning (aquaplaning), a phenomenon that renders braking and steering ineffective because of the lack of sufficient surface friction. Snow and ice covered runways are also hazardous. The pilot should also be alert to the possibility of the brakes freezing.

Use caution when taking off or landing during gusty wind conditions. Also be aware of the special wind conditions caused by buildings or other obstructions located near the runway in a crosswind pattern.

MEDICAL FACTS FOR PILOTS

GENERAL

When the pilot enters the airplane, he becomes an integral part of the man-machine system. He is just as essential to a successful flight as the control surfaces. To ignore the pilot in pre-flight planning would be as senseless as failing to inspect the integrity of the control surfaces or any other vital part of the machine. The pilot himself has the responsibility for determining his reliability prior to entering the airplane for flight. When piloting an airplane, an individual should be free of conditions which are harmful to alertness, ability to make correct decisions, and rapid reaction time.

FATIGUE

Fatigue generally slows reaction times and causes errors due to inattention. In addition to the most common cause of fatigue; insufficient rest and loss of sleep, the pressures of business, financial

worries, and family problems can be important contributing factors. If you are tired, don't fly.

HYPOXIA

Hypoxia, in simple terms, is a lack of sufficient oxygen to keep the brain and other body tissues functioning properly. There is a wide individual variation in susceptibility to hypoxia. In addition to progressively insufficient oxygen at higher altitudes, anything interfering with the blood's ability to carry oxygen can contribute to hypoxia (anemias, carbon monoxide, and certain drugs). Also, alcohol and various drugs decrease the brain's tolerance to hypoxia.

Your body has no built-in alarm system to let you know when you are not getting enough oxygen. It is impossible to predict when or where hypoxia will occur during a given flight, or how it will manifest itself. Some of the common symptoms of hypoxia are increased breathing rate, a light-headed or dizzy sensation, tingling or warm sensation, sweating, reduced visual field, sleepiness, blue coloring of skin, fingernails, and lips, and behavior changes. A particularly dangerous feature of hypoxia is an increased sense of well-being, called euphoria. It obscures a person's ability and desire to be critical of himself, slows reaction time, and impairs thinking

ability. Consequently, an hypoxic individual commonly believes things are getting progressively better while he nears total collapse.

The symptoms are slow but progressive, insidious in onset, and are most marked at altitudes starting above ten thousand feet. Night vision, however, can be impaired starting at an altitude of 5,000 feet. Persons who have recently overindulged in alcohol, who are moderate to heavy smokers, or who take certain drugs, may be more susceptible to hypoxia. Susceptibility may also vary in the same individual from day to day or even morning to evening. Use oxygen on flights above 10,000 feet and at any time when symptoms appear.

Depending upon altitude, an hypoxic individual has a limited time to make decisions and perform useful acts, even though he may remain conscious for a longer period. If pressurization equipment fails at certain altitudes the pilot and passengers have only a certain amount of time to get an oxygen mask on before they exceed their time of useful consciousness. The time of useful consciousness is approximately 3-5 minutes at 25,000 feet of altitude in the average individual and diminishes markedly as altitude increases. At 30,000 feet altitude, for

example, the time of useful consciousness is approximately 1 to 2 minutes. Therefore, in the event of depressurization, oxygen masks should be obtained and used immediately.

Should symptoms occur that cannot definitely be identified as either hypoxia or hyperventilation, try three or four deep breaths of oxygen. The symptoms should improve markedly if the condition was hypoxia (recovery from hypoxia is rapid).

HYPERVENTILATION

Hyperventilation, or overbreathing, is a disturbance of respiration that may occur in individuals as a result of emotional tension or anxiety. Under conditions of emotional stress, fright, or pain, breathing rate may increase, causing increased lung ventilation, although the carbon dioxide output of the body cells does not increase. As a result, carbon dioxide is "washed out" of the blood. The most common symptoms of hyperventilation are: dizziness; hot and cold sensations; tingling of the hands, legs and feet; tetany; nausea; sleepiness; and finally, unconsciousness. If the symptoms persist, discontinue use of oxygen and consciously slow your breathing rate until symptoms clear, and then resume normal breathing rate. Normal breathing can be aided by talking aloud.

ALCOHOL

Common sense and scientific evidence dictate that you must not fly as a crew member while under the influence of alcohol. Alcohol, even in small amounts, produces, among other things, a dulling of critical judgment; a decreased sense of responsibility; diminished skill reactions and coordination; decreased speed and strength of muscular reflexes (even after one ounce of alcohol); decreases in efficiency of eye movements during reading (after one ounce of alcohol); increased frequency of errors (after one ounce of alcohol); constriction of visual fields; decreased ability to see under dim illuminations; loss of efficiency of sense of touch; decrease of memory and reasoning ability; increased susceptibility to fatigue and decreased attention span; decreased relevance of response; increased self confidence with decreased insight into immediate capabilities.

Tests have shown that pilots commit major errors of judgment and procedure at blood alcohol levels substantially less than the minimum legal levels of intoxication for most states. These tests further show a continuation of impairment from alcohol up to as many as 14 hours after consumption, with no appreciable diminution of impairment. The body metabolizes ingested alcohol at a rate of about one-

third of an ounce per hour. Even after the body completely destroys a moderate amount of alcohol, a pilot can still be severely impaired for many hours by hangover.

The effects of alcohol on the body are magnified at altitudes, as 2 oz. of alcohol at 18,000 feet produce the same adverse effects as 6 oz. at sea level. In other words, "the higher you get, the higher you get".

Because of the slow destruction of alcohol by the body, a pilot may still be under influence eight hours after drinking a moderate amount of alcohol. Therefore, an excellent rule is to allow at least 12 to 24 hours between "bottle and throttle", depending on the amount of alcoholic beverage consumed.

DRUGS

Self-medication or taking medicine in any form when you are flying can be extremely hazardous. Even simple home or over-the-counter remedies and drugs such as aspirin, antihistamines, cold tablets, cough mixtures, laxatives, tranquilizers, and appetite suppressors, may seriously impair the judgment and coordination needed while flying. The safest rule is to take no medicine before or while flying, except

after consultation with your Aviation Medical Examiner.

SCUBA DIVING

Flying shortly after any prolonged scuba diving could be dangerous. Under the increased pressure of the water, excess nitrogen is absorbed into your system. If sufficient time has not elapsed prior to takeoff for your system to rid itself of this excess gas, you may experience the bends at altitudes even under 10,000 feet, where most light planes fly.

CARBON MONOXIDE AND NIGHT VISION

The presence of carbon monoxide results in hypoxia which will affect night vision in the same manner and extent as hypoxia from high altitudes. Even small levels of carbon monoxide have the same effect as an altitude increase of 8,000 to 10,000 feet. Smoking several cigarettes can result in a carbon monoxide saturation sufficient to effect visual sensitivity equal to an increase of 8,000 feet altitude.

ADDITIONAL INFORMATION

In addition to the coverage of subjects in this

section, the National Transportation Safety Board and the Federal Aviation Administration periodically issue, in greater detail, general aviation pamphlets concerning aviation safety. FAA Regional Offices also publish material under the FAA General Aviation Accident Prevention Program. These can be obtained at FAA Offices, Weather Stations, Flight Service Stations or Airport Facilities, and are very good sources of information and are highly recommended for study. Some of these are titled:

Airman's Information Manual
12 Golden Rules for Pilots
Weather or Not
Disorientation
Plane Sense
Weather Info Guide for Pilots
Wake Turbulence
Don't Trust to Luck, Trust to Safety
Rain, Fog, Snow
Thunderstorm - TRW
Icing
Pilot's Weather Briefing Guide
Thunderstorms Don't Flirt . . . Skirt 'em
IFR-VFR - Either Way Disorientation Can be Fatal
IFR Pilot Exam-O-Grams
VFR Pilot Exam-O-Grams
Flying Light Twins Safely

Tips on Engine Operation in Small General Aviation Aircraft
Estimating Inflight Visibility
Is the Aircraft Ready for Flight
Tips on Mountain Flying
Tips on Desert Flying
Always Leave Yourself An Out
Safety Guide for Private Aircraft Owners
Tips on How to Use the Flight Planner
Tips on the Use of Ailerons and Rudder
Some Hard Facts About Soft Landings
Propeller Operation and Care
Torque "What it Means to the Pilot"
Weight and Balance. An Important Safety Consideration for Pilots

SPECIAL CONDITIONS

MAINTENANCE

Airplanes operated for Air Taxi or other than normal operation, and airplanes operated in humid tropics, or cold and damp climates, etc., may need more frequent inspections for wear, corrosion and/or lack of lubrication. In these areas, periodic inspections should be performed until the operator can set his own inspection periods based on experience.

NOTE

The required periods do not constitute a guarantee that the item will reach the period without malfunction, as the aforementioned factors cannot be controlled by the manufacturer.

Corrosion, and its effects, must be treated at the earliest possible opportunity. A clean, dry surface is virtually immune to corrosion. Make sure that all drain holes remain unobstructed. Protective films and sealants help to keep corrosive agents from contacting metallic surfaces. Corrosion inspections should be made most frequently under high-corrosion-risk operating conditions, such as in areas of excessive airborne salt concentrations (e.g., near the sea) and in high-humidity areas (e.g., tropical regions).