PILOT'S OPERATING HANDBOOK
and
FAA APPROVED
AIRPLANE FLIGHT MANUAL

Mooney M20J

1978

NOTE:

> THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY CAR PART 3 AND MUST BE KEPT IN THE AIRPLANE AT ALL TIMES.

MOONEY AIRCRAFT CORPORATION
P. O. BOX 72, KERRVILLE, TEXAS 78028

SERIAL NUMBER 24-0545

REGISTRATION NUMBER HB-DFF

FAA Approved: Don P. Watson

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Department of Transportation
Southwest Region
Fort Worth, Texas

FAA APPROVED in Normal Category based on CAR 3, effective Model M20J, S/N 24-0084, 24-0378 - 24-0763.

REV D 3-7-84
ISSUED 11-15-77

MANUAL NUMBER 1221

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CONGRATULATIONS . . .

WELCOME TO MOONEY'S NEW DIMENSION IN SPEED AND ECONOMY. YOUR DECISION TO SELECT A NEW MOONEY HAS PLACED YOU IN AN ELITE AND DISTINCTIVE CLASS OF AIRCRAFT OWNERS. WE HOPE THAT YOU FIND YOUR NEW MOONEY A UNIQUE FLYING EXPERIENCE, WHETHER FOR BUSINESS OR PLEASURE, THE MOST PROFITABLE EVER.

-NOTICE-

This manual is provided as an operating guide for the Mooney 201, Model M20J. It is important that you--regardless of your previous experience--carefully read the handbook from cover to cover and review it frequently.

All information and illustrations in the manual are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice. Every effort has been made to present the material in a clear and convenient manner to enable you to use the manual as a ready reference. Your cooperation in reporting presentation and content recommendations is solicited.

REVISING THE MANUAL

Page i of this manual is a "List of Effective Pages" containing a complete current listing of all pages i.e., Original or Revised. Also, in the lower right corner of the outlined portion, is a box which denotes the issue or revision of the manual. It will be advanced one letter, alphabetically, per revision. With each revision to the manual a new List of Effective Pages will be received to replace the previous one.

This handbook will be kept current by Mooney Aircraft Corporation when the revision card in the front of this handbook has been filled in and mailed to Mooney Aircraft Corporation, P.O. Box 72, Kerrville, TX 78028.

ail. 10.9.78

LIST OF EFFECTIVE PAGES

Original	11-15-77
A	9-28-79
B	12-18-79
C	9-29-82
D	3-7-84

Always destroy superseded pages when inserting revised pages.

Title Page	D
"A" Page	Original
i through iii/iv BLANK	D
v/vi BLANK	Original
1-1 through 1-4	Original
1-5	A
1-6 through 1-8	Original
1-9/1-10 BLANK	A
2-1 through 2-5	Original
2-6	C
2-7	Original
2-8	A
2-9 through 2-14	Original
3-1	A
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3-3	A
3-4	Original
3-5 through 3-8	C
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3-10	A
3-11/3-12 BLANK	Original
4-1 through 4-3	Original
4-4 and 4-5	D
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4-10 through 4-13/4-14 BLANK	Original
5-1 through 5-3	B
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5-35 through 5-37/5-38 BLANK	A
6-1 and 6-2	Original
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6-13 through 6-19	Original
6-20	D

D

LIST OF EFFECTIVE PAGES

D

PILOT'S OPERATING HANDBOOK AND AIRPLANE FLIGHT MANUAL

LOG OF REVISIONS

WARNING: This manual may not include the latest revisions.

Revision Number	Revised Pages	Description of Revision	FAA Approved	Date
D	Title Page	Revised Data	D. D. Castle	3-7-84
	i through iii/ iv BLANK	Revised Data		
	4-4	Added & Relocated Data		
	4-5	Relocated Data		
	6-7	Revised Data		
	6-20	Added Data		
	7-17	Deleted Data		
	7-20	Revised Data		

The revised portions of affected pages are indicated by vertical black lines in the margin.

SECTION I.

GENERAL

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TITLE	PAGE

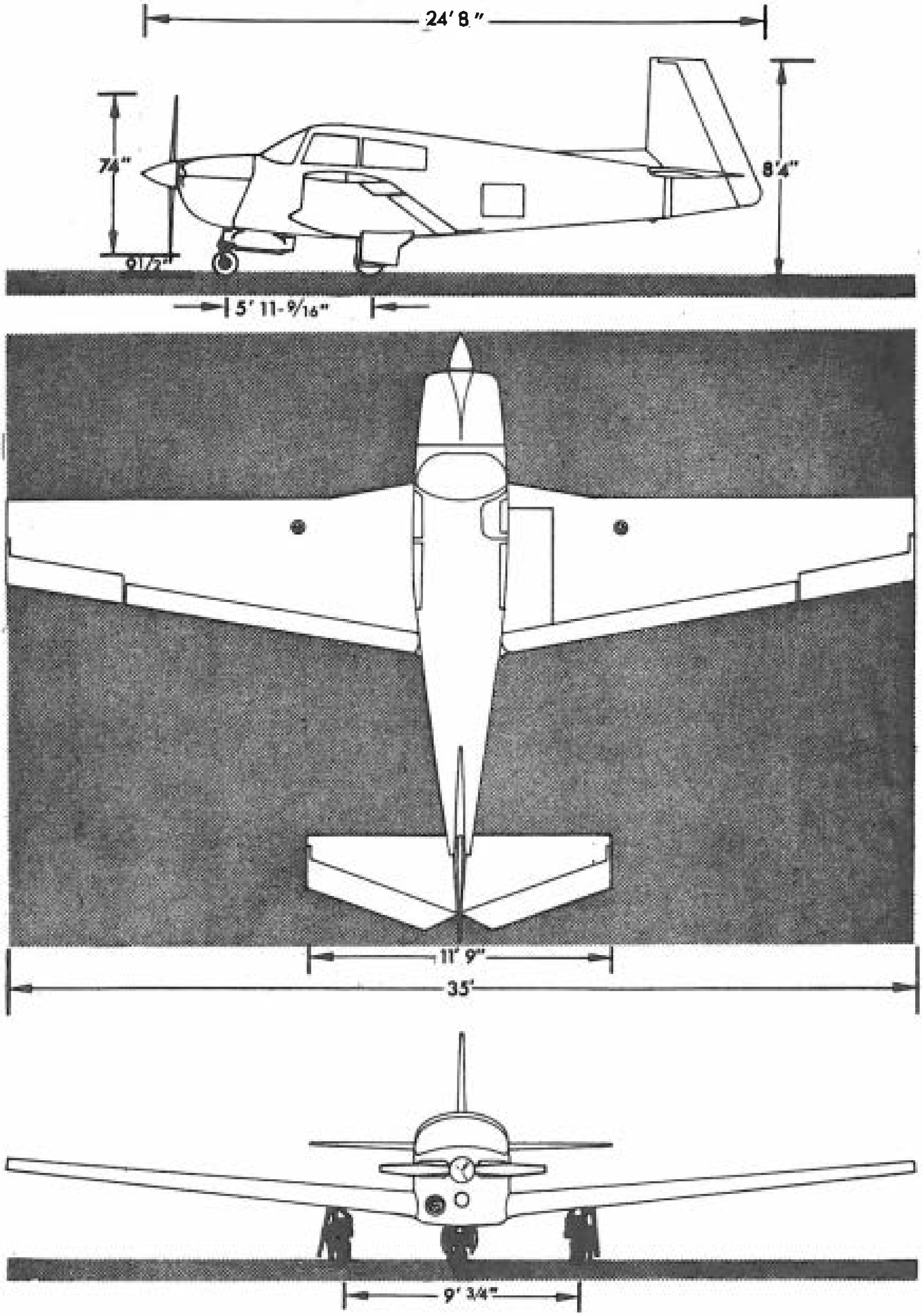

FIGURE 1-1 THREE VIEW

INTRODUCTION

This Pilot's Operating Handbook contains 9 sections and includes the material required to be furnished to the pilot by CAR Part 3. It also contains supplemental data supplied by Mooney Aircraft Corporation.

Section I contains information of general interest to the pilot. It also contains definitions of the terminology used in this Pilot's Operating Handbook.

DESCRIPTIVE DATA

LANDING GEAR

TYPE: Electrically operated tricycle gear with rubber shock discs, steerable nose wheel, and hydraulic disc brakes.

Wheel Base	5 ft. 11-9/16 in.
Wheel Tread	9 ft. 3/4 in.
Tire Size:	
Nose	(6 Ply) 5.00 x 5
Main	(6 Ply) 6.00 x 6
Tire Pressure:	
Nose	49 PSI
Main	30 PSI
Min. Turning Radius (No Brakes Applied)	41 ft.

ENGINE

TYPE: Four-cylinder, horizontally opposed, air cooled, and fuel-injected engine with a wet-sump lubricating system.

Number of Engines	1
Model (Lycoming)	IO-360-A3B6D
Recommended TBO	1600 Hrs.
Rated HP @ 2700 RPM	200 BHP @ Sea Level

Bore	5.125 in.
Stroke	4.375 in.
Displacement	361.0 Cu. In.
Compression Ratio	8.7:1
Fuel Injector, Bendix	RSA-5-AD1
Magnetos, Bendix	D4LN 2021

PROPELLER

TYPE: Constant-speed, hydraulically controlled propeller with a single-acting governor.

Model (McCauley)	B2D34C214/90DHB-16E
Diameter	74 in. max. 73 in. min.
Number of Blades	2
Blade Angle @ 30 In. Sta.:	
Low	$13.9^{o} \pm .2^{o}$
High	$33^{o} \pm .5^{o}$

FUEL

Total Fuel Capacity	66.5 U.S. Gal.
Usable Fuel Capacity	64 U.S. Gal.

Minimum Fuel Octane Rating & Color

Grade	Color
100	Green
100 LL	Blue

OIL

Oil Capacity (6 QTS MIN for flight)	8 QTS.

Oil grades, specifications and changing recommendations are contained in Section VIII.

MAXIMUM CERTIFICATED WEIGHTS

Maximum Loading (unless limited by loading envelope):

Gross Weight	2740 LBS.
Baggage Area	120 LBS.
Hat Rack	10 LBS.

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight	1640 LBS.
Standard Useful Load	1100 LBS.

BAGGAGE SPACE AND ENTRY DIMENSIONS

Baggage Area	24"x 35"x 35"H (17 cu. ft.)
Hat Rack	30"W x 19"D x 12H (Max.) (2.6 cu. ft.)
Baggage Door Opening	
Above Ground (Sill)	46"
Entry Width	17"
Entry Height	20.5"

SPECIFIC LOADINGS

Wing Loading @ G.W.	16.4 PSF
Power Loading @ G.W.	13.7 PHP

SYMBOLS, ABBREVIATIONS & TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY & SYMBOLS

CAS — Calibrated Airspeed means the indicated speed of an aircraft, 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 aircraft as shown on its airspeed indicator. IAS values published in this handbook assume zero instrument error.

TAS — True Airspeed is the airspeed of an airplane relative to undisturbed air.

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_{LE} Maximum Landing Gear Extended Speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.

V_{LO} Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.

V_{NE} Never Exceed Speed or Mach Number is the speed limit that may not be exceeded at any time.

V_{NO} 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 with gear and flaps up.

METEOROLOGICAL TERMINOLOGY

OAT	Outside Air Temperature is the free air static temperature, obtained either from inflight temperature indications or ground meteorological sources. It is expressed in degrees Celcius (previously Centigrade).
ISA	International Standard Atmosphere assumes that (1) The air is a dry perfect gas; (2) The temperature at sea level is 15^{o} Celcius; (3) The pressure at sea level is 29.92 inches Hg; (4) The temperature gradient from sea level to the altitude at which the temperature is -56.5^{o}C is -0.00198^{o}C per foot.
Indicated Pressure Altitude	The number actually read from an altimeter when and only when, the barometric subscale has been set to 29.92 inches of mercury.
Pressure Altitude	Pressure altitude is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Density Altitude	Altitude as determined by pressure altitude and existing ambient temperature. In standard atmosphere (ISA) density and pressure altitude are equal. For a given pressure altitude, the higher the temperature, the higher the density altitude.
Station Pressure	Actual atmospheric pressure at field elevation.

ENGINE POWER TERMINOLOGY

BHP	Brake Horsepower is the power developed by the engine.

RPM	Revolutions Per Minute is engine speed.
MP	Manifold Pressure is a pressure measured in the engine's induction system and is expressed in inches of mercury (Hg).

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Demonstrated Crosswind Velocity	Demonstrated Crosswind Velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. The value shown is not considered to be limiting.
g	g is the acceleration due to gravity.
Service Ceiling	Service ceiling is the altitude where the aircraft has the capability of climbing at the rate of 100 ft/min.

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.)
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.
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.
Usable Fuel	Fuel available for airplane propulsion.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Maximum Weight	The maximum weight is the maximum authorized weight of the aircraft and its contents as listed in the aircraft specifications.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids, and full oil.
Basic Empty Weight	The basic empty weight of an aircraft is the actual weight of the airplane and includes all operating equipment (including optional equipment) that has a fixed location and is actually installed in the aircraft. It includes the weight of the unusable fuel and full oil.
Useful Load	The useful load is the empty weight subtracted from the maximum weight of the aircraft. This load consists of the pilot, crew if applicable, maximum oil, fuel, passengers, and baggage.
Tare	Tare is the weight of chocks, blocks, stands, etc. used when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

SECTION II.

LIMITATIONS

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INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equipment such as autopilots are included in Section 9.

NOTE

The airspeeds listed in the Airspeed Limitations chart (figure 2-1) and the Airspeed Indicator Markings chart (figure 2-2) are based on Airspeed Calibration data shown in Section 5 with the normal static source. If the alternate static source is being used, ample margins should be observed to allow for the airspeed calibration variations between the normal and alternate static sources as shown in Section 5.

Your Mooney is certificated under FAA Type Certificate No. 2A3 as Mooney M20J.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in Figure 2-1. This calibration assumes zero instrument error.

	SPEED	CAS (mph)	IAS (mph)	REMARKS
V_{NE}	Never Exceed Speed	225	228	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	200	203	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed	135	138	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed	125	132	Do not exceed these speeds with the given flap settings.
V_{LE}	Maximum Landing Gear Extended Speed	150	153	Maximum speed at which the aircraft can be safely flown with the landing gear extended.
V_{LO} (EXT)	Maximum Speed for Gear Extension	150	155	Maximum speed at which the landing gear can be safely extended.
V_{LO} (RET)	Maximum Speed for Gear Retraction	120	125	Maximum speed at which the landing gear can be safely retracted.
	Maximum Pilot Window Open Speed	150	155	Do not exceed this speed with pilot window open.

FIGURE 2-1. AIRSPEED LIMITATIONS

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings, their color code and operational significance are shown in Figure 2-2.

MARKING	CAS VALUE OR RANGE (MPH)	SIGNIFICANCE
White Arc	61 - 125	Full Flap Operating Range. Lower limit is maximum weight V_{S_O} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	68 - 200	Normal Operating Range. Lower limit is maximum weight V_S with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	200 - 225	Operations must be conducted with caution and only in smooth air.
Radial Red Line	225	Maximum speed for all operations.

FIGURE 2-2. AIRSPEED INDICATOR MARKINGS

POWER PLANT LIMITATIONS

Engine Manufacturer: Avco Lycoming.
Engine Model Number: IO-360-A3B6D
Engine Operating Limits for Takeoff and

Continuous Operations:
- Maximum Power: 200 BHP
- Maximum Engine Speed: 2700 RPM.
- Maximum Cylinder Head Temperature: (475°F).
- Maximum Oil Temperature: (245°F).

Transient Engine RPM Limit - 2970 RPM for 3 Seconds or Less

Oil Pressure, Minimum: 25 psi.
Maximum: 100 psi
Fuel Pressure, Minimum: 14 psi
Maximum: 30 psi
Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: B2D34C214/90DHB-16E
Propeller Diameter, Minimum: 73 inches.
Maximum: 74 inches.

Propeller Operating Limits: Avoid continuous operation between 1500 and 1950 RPM with power settings below 15" HG manifold pressure.

Propeller Blade Angle at 30 Inch Station, Low 13.9° ± .2°
High 33.0° ± .5°

POWER PLANT INSTRUMENT MARKINGS

Tachometer	
Radial Red Line (Rated)	2700 RPM
Green Arc-- (Rated operating range)	1950-2700 RPM
Yellow Arc (Caution Range)	1500-1950 RPM
Cylinder Head Temperature	
Radial Red Line (Maximum)	$475^{o}F$ or $246^{o}C$
Green Arc (Operating range)	300^{o}-$475^{o}F$ or 149^{o}-$232^{o}C$
Oil Pressure	
Radial Red Line (Minimum idling)	25 PSI
Radial Red Line (Maximum)	100 PSI
Green Arc (Operating range)	60 to 90 PSI
Yellow Arc (Idling range)	25 to 60 PSI
Yellow Arc (Starting & warm-up range)	90 to 100 PSI
Fuel Pressure	
Radial Red Line (Minimum)	14 PSI
Radial Red Line (Maximum)	30 PSI
Green Arc (Operating range)	14 to 30 PSI
Oil Temperature	
Radial Red Line (Maximum)	$245^{o}F$ or $118^{o}C$
Green Arc (Operating range)	150^{o} to $245^{o}F$ or 65^{o} - $118^{o}C$

WEIGHT LIMITS

Maximum Weight (Takeoff & Landing) . . . . 2740 LBS.

Maximum Weight in Baggage
Compartment . . . . 120 Lbs. @ Fus. Sta. 95.5

Maximum Weight in Hatrack . . 10 Lbs. @ Fus. Sta. 119.0

CENTER OF GRAVITY LIMITS (GEAR DOWN)

Most Forward 41.0 IN. (Fus. Sta. in IN.)
13.4% MAC . . . . 2250 LBS.
Intermediate Forward 41.8 IN. (Fus. Sta. in IN.) 14.7% MAC . . . . 2470 LBS.
Forward Gross 45.0 IN. (Fus. Sta. in IN.)
20.1% MAC . . . . 2740 LBS.
Rear Gross 50.1 IN. (Fus. Sta. in IN.)
28.7% MAC . . . . 2740 LBS.
MAC (IN. at Wing Sta. 93.83) 59.18

Datum (station zero) is 5 inches aft of the center line of the nose gear attaching bolts, and 33 inches forward of the wing leading edge at wing station 59.25.

MANEUVER LIMITS

This airplane must be operated as a Normal Category airplane. Aerobatic maneuvers, including spins, are not approved.

Extreme sustained sideslips may result in fuel venting thereby causing fuel fumes in the cabin.

WARNING

Prolonged sideslips, steep descents, or takeoff maneuvers may cause loss of power if the selected fuel tank contains less than 48 lbs. (8 gallons) of fuel.

NOTE

Up to 290-foot altitude loss may occur during stalls at maximum weight.

MISCELLANEOUS LIMITATIONS

Autopilot installations with AFM Supplement approved prior to April 13, 1977 are limited to previously approved airspeed limits: e.g. V_{no} limit prior to April 13, 1977 is 175 MPH ; V_{ne} limit prior to April 13, 1977 is 200 MPH.

CAUTION

Slow throttle movement required at airspeeds above 190 MPH IAS. Above 190 MPH IAS, rapid throttle reduction may result in the propeller RPM exceeding transient limits.

FLIGHT LOAD FACTOR LIMITS

Maximum Positive Load Factor,
Flaps Up 3.8g
Maximum Positive Load Factor,
Flaps Down (33°). 2.0g
Maximum Negative Load Factor,
Flaps Up 1.5g

KINDS OF OPERATION LIMITS

Do not operate in known icing conditions.

This is a Normal Category aircraft approved for VFR/IFR/day or night operations, when equipped in accordance with FAR 91.

FUEL LIMITATIONS

2 Standard Tanks: 33.25 U.S. Gallons Each
Total Fuel: 66.5 U.S. Gallons
Usable Fuel : 64 U.S. Gallons
Unusable Fuel : 2.5 U.S. Gallons

NOTE

A reduced fuel quantity indicator is installed in each tank. These indicators show the 25 U.S. gallon usable fuel level in each tank.

Fuel Grade (and Color): 100 minimum grade aviation fuel (green). 100LL (low lead) aviation fuel (blue) with a lead content limited to 2 cc per gallon is also approved.

OTHER INSTRUMENTS AND MARKINGS

The following equipment is vacuum operated:

1. Artificial horizon
2. Directional gyro

DECALS & PLACARDS

INTERIOR:

The following placards must be installed inside the cabin at the locations specified.

OPERATIONAL LIMITATIONS

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS. NO AEROBATIC MANEUVERS, INCLUDING SPINS, ARE APPROVED. MAX SPEED WITH LANDING GEAR EXTENDED, 150 MPH. MAX SPEED TO RETRACT GEAR, 120 MPH. MAX SPEED TO EXTEND GEAR, 150 MPH. MAX MANEUVERING FLIGHT LOAD FACTOR – FLAPS UP +3.8, -1.5; FLAPS DOWN +2.0.

EMERGENCY MANUAL GEAR EXTENSION

1. PULL LANDING GEAR CIRCUIT BREAKER.
2. PUT GEAR SWITCH IN GEAR DOWN POSITION.
3. PUSH RELEASE TAB FORWARD AND LIFT UP RED HANDLE.
4. PULL T-HANDLE STRAIGHT UP (12 TO 20 INCHES).
5. ALLOW T-HANDLE TO RETURN TO ORIGINAL POSITION.
6. REPEAT UNTIL GEAR DOWN LIGHT COMES ON (12 TO 20 PULLS).
   IF TOTAL ELECTRICAL FAILURE - SEE MECHANICAL INDICATOR.

On Left Side Panel

CHECK LIST

TAKE OFF	CONTROLS	RUN-UP	SEAT BELT
	FUEL	PROP	DOOR
	INSTRMTS	WING FLAPS	WINDOW
	TRIM	BST PUMP	RAM AIR
	COWL FLAPS	SEAT LATCH	MIXTURE
LDG	SEAT BELT	MIXTURE	GEAR
	FUEL	WING FLAPS	PROP
	BST PUMP	RAM AIR	

On Lower Left Center Instrument Panel

On Lower Left
Instrument Panel

CAUTION	
1. TURN OFF STROBE LTS WHEN TAXIING NEAR OTHER ACFT OR WHEN FLYING IN FOG OR IN CLOUDS. STD POSITION LTS MUST BE USED FOR ALL NIGHT OPERATIONS. 2. IN CASE OF FIRE TURN OFF CABIN HEAT. 3. DO NOT SCREW VERNIER CONTROLS CLOSER THAN 1/8" FROM NUT FACE.	PULL FOR ALTERNATE STATIC SOURCE

On Pilots Window

**DO NOT OPEN
ABOVE 150 M.P.H.**

On Right Instrument Panel Below
Manifold Pressure Gage

AVOID CONT. OPERATION BETWEEN
1500 & 1950 RPM W/POWER SETTINGS
BELOW 15" HG. MANIFOLD PRESSURE.

On Lower Console Below Controls

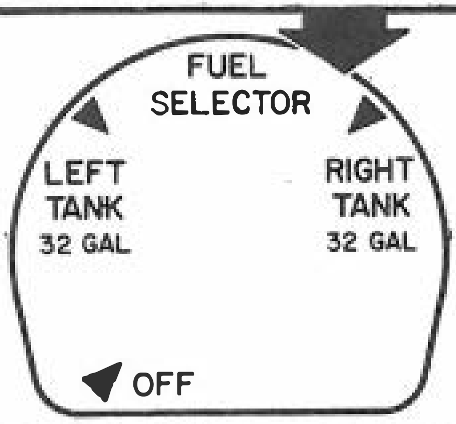
CABIN VENT PULL ON	DEFROSTER PULL ON	CABIN HEAT PULL ON

On Lower Console Below Controls

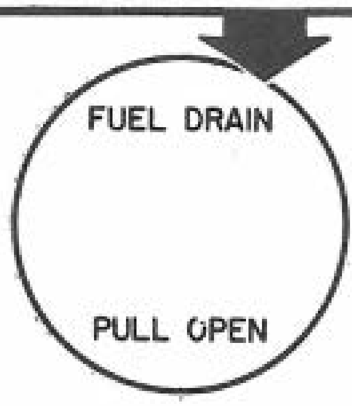
RAM AIR PULL ON	PARK BRAKE PULL ON

**COWL FLAPS
PULL OPEN**

On Fuel Selector Valve



On Gascolator



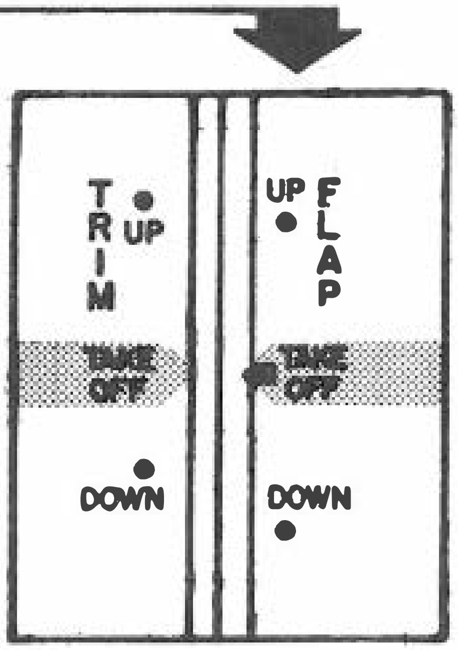
Above Baggage Compartment On Hatrack Shelf.

WARNING: DO NOT EXCEED 10 LBS. IN THIS COMPARTMENT
USE FOR STOWAGE OF LIGHT SOFT ARTICLES ONLY
SEE AIRCRAFT LOADING SCHEDULE DATA
FOR BAGGAGE COMPARTMENT ALLOWABLE

On Top Baggage Door Jamb.

**LOAD IN COMPLIANCE WITH
LOADING SCHEDULE. MAXIMUM
BAGGAGE ALLOWABLE — 120 LBS.**

On Lower Engine
Control Console



Above Inside
Door Handle

Above Inside
Baggage Door Handle

AUXILLARY EXIT
DO NOT OPEN IN FLIGHT
TO OPEN - PULL OFF COVER, PULL
WHITE KNOB, LIFT UP HANDLE.
(LATCH DOOR WITH OUTSIDE HANDLE)

EXTERIOR:

The following placards must be installed on the exterior of the aircraft at the locations specified.

On Main Gear Doors

TIRE PRESSURE 30 LBS.

On Nose Gear Door

TIRE PRESSURE 49 LBS

On Fuel Tank Caps

FUEL—100 (GREEN) OR
100 LL (BLUE) MIN. OCT.
32 U.S. GAL

On Nose Gear Leg

TOWING LIMITS

WARNING
DO NOT EXCEED
TOWING LIMITS

On Leading Edge of Horizontal Stabilizer and Trailing Edge of Both Sides of Rudder

DO NOT PUSH

On Inboard End of Right Flap

NO STEP

On Underside of Wing

HOIST POINT

SECTION III.

EMERGENCY PROCEDURES

TABLE OF CONTENTS

INTRODUCTION

This section provides the recommended procedures to follow during adverse flight conditions. The information is presented to enable you to form, in advance, a definite plan of action for coping with the most probable emergency situations which could occur in the operation of your airplane.

As it is not possible to have a procedure for all types of emergencies that may occur, it is the pilot's responsibility to use sound judgement based on experience and knowledge of the aircraft to determine the best course of action. Therefore, it is considered mandatory that the pilot read the entire manual, especially this section before flight.

When applicable, emergency procedures associated with optional equipment such as autopilots are included in Section 9.

NOTE

All airspeeds in this section are indicated (IAS) and assume zero instrument error unless stated otherwise.

ANNUNCIATOR PANEL WARNING LIGHTS

Warning Light	Fault & Remedy
Gear Unsafe	Landing gear is not in fully extended/ retracted position refer to "Failure of landing gear to extend electrically" procedure on page 3-8 or "Failure of landing gear to retract after take-off" procedure on page 3-11.
Left or Right Fuel Low	2 1/2 to 3 gallons of fuel remain in the respective tanks. Switch to fuller tank.
VAC (Flashing)	Suction is below 3.5 inches of mercury.
OR	
VAC (Steady)	Suction is above 5.5 inches of mercury. Attitude and directional gyros are unreliable. Vacuum system should be checked and/or adjusted as soon as practicable.
Volts (Flashing)	Low voltage.
OR	
Volts (Steady)	Overvoltage or trippage of voltage relay. Refer to "Alternator Power Loss" on page 3-9.
Ram Air	Ram air door is open (when landing gear extended); close before landing.

ENGINE FIRE- GROUND

1. Mixture - Idle Cutoff (Full Aft)
2. Fuel Selector Valve Off
3. Master Switch - Off
4. Extinguish with Fire Extinguisher

ENGINE FIRE- IN FLIGHT

1. Fuel Selector Valve - OFF
2. Throttle - Closed (Full Aft)
3. Mixture Control - IDLE CUTOFF (Full Aft)
4. Cabin Ventilation & Heating Controls - CLOSED (Control Forward)
5. Landing Gear - DOWN OR UP, depending on terrain.
6. Wing Flaps - EXTEND. As Necessary.

NOTE

If fire is not extinguished, attempt to increase airflow over the engine by increasing glide speed. Plan a power off landing as described in this section. Do not attempt an engine restart.

ELECTRICAL FIRE IN FLIGHT

(Smoke in Cabin)

1. Master Switch - OFF.

WARNING

Stall warning is not available with master switch OFF.
Gear warning is not available with master switch OFF.

2. Cabin Ventilation - Open
3. Heating Controls - Closed (Control Forward)
4. Circuit Breakers - CHECK. To identify faulty circuit if possible.
5. Land as soon as practicable.

If electrical power is essential for the flight, attempt to identify and isolate the faulty circuit as follows:

1. Master Switch - ON.
2. Select essential switches ON one at a time, and permit a short time to elapse before activating an additional circuit.

ENGINE FAILURE DURING GROUND ROLL

1. Throttle - CLOSED.
2. Braking - Maximum.
3. Fuel Selector - OFF.
4. Master and Magneto/Start Switch-OFF.

ENGINE FAILURE AFTER LIFTOFF AND DURING CLIMB

1. Fuel Selector - Select Other Tank.
2. Electric Fuel Boost Pump - ON.
3. Mixture Control - FULL RICH.
4. Magneto/Start Switch - CHECK ON BOTH.

If engine does not restart, proceed to POWER OFF landing.

ROUGH ENGINE OR LOSS OF POWER IN FLIGHT

Immediately upon noting any condition that could eventually lead to an engine failure (loss of oil or fuel system pressure, or rough engine operation), perform the following checks if time and altitude permit.

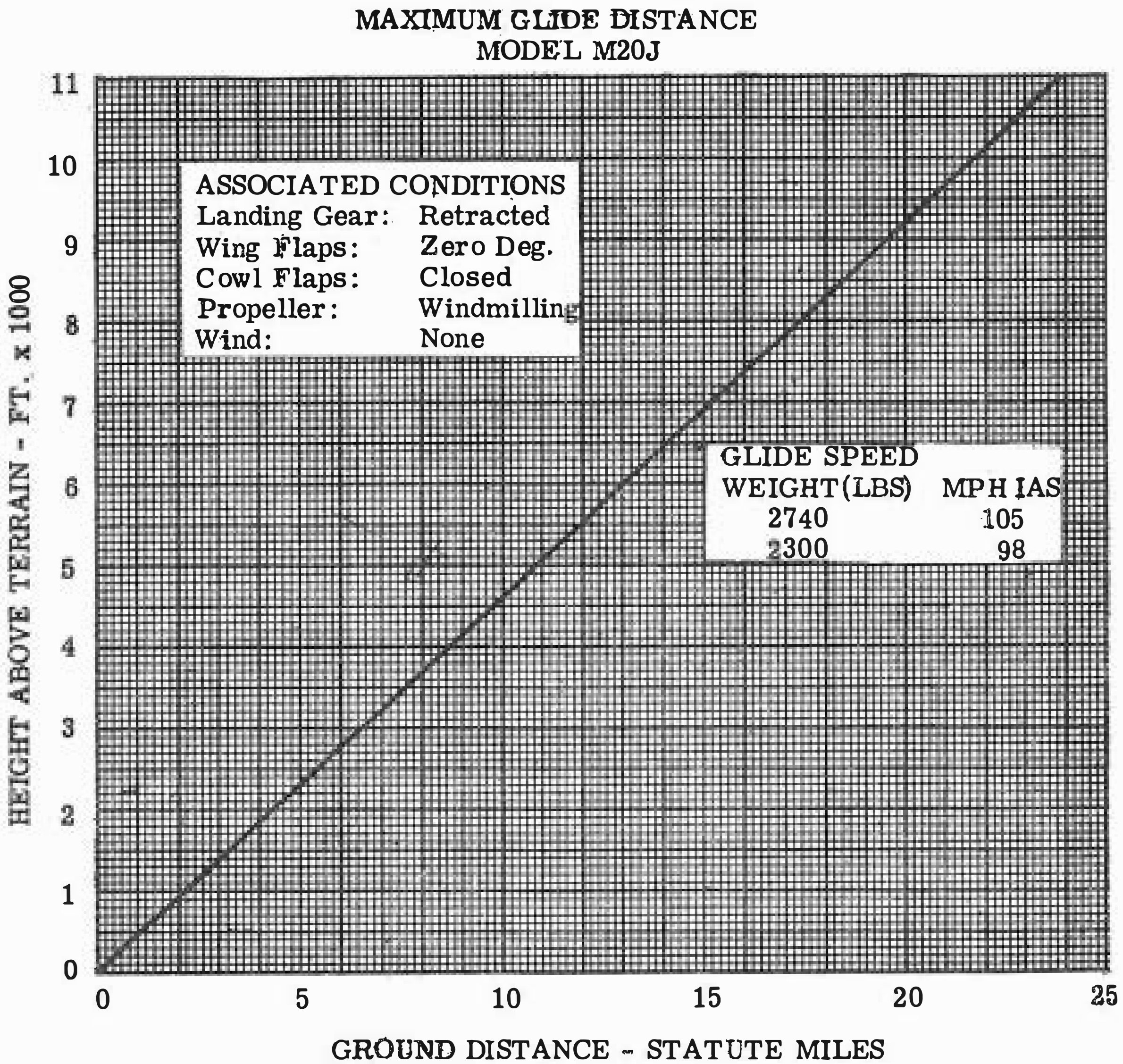
1. Low Fuel Quantity - FUEL SELECTOR TO FULLEST TANK.
2. Low Fuel Pressure - AUX. FUEL PUMP ON - OFF IF NO IMPROVEMENT NOTED.
3. Mixture Control - FULL RICH.
4. Magneto/Starter Switch - Switch to left and right single magneto operation; if no improvement, switch to BOTH.

If no improvement is noted, proceed to land as soon as practicable.

AIR START PROCEDURE

1. Propeller - High RPM (Full Forward).
2. Fuel Selector - Fuller Tank.
3. Mixture Control - Idle Cutoff (Full Aft).
4. Fuel Pressure - Check. If no fuel pressure is noted, turn electric fuel boost pump ON.
5. Throttle - Open 1/4 Travel.
6. Magneto/Starter Switch Both.
7. Mixture Control - Move slowly and smoothly to FULL RICH (Forward).
8. Re-establish cruise power and RPM - then lean mixture as required.

If engine fails to start establish best glide speed indicated by the chart below, then proceed to POWER OFF LANDING.



8. Approach Speed - 81 MPH (71 Kts) IAS.
9. Master Switch - OFF, Prior to Landing.

SPINS

WARNING

Up to 2000 feet of altitude may be lost in a one turn spin and recovery; therefore, stalls at low altitude are extremely critical.

NOTE

The best spin recovery technique is to avoid flight conditions conducive to spin entry. Low speed flight near stall should be approached with caution and excessive flight control movements in this flight regime should be avoided. Should an unintentional stall occur the aircraft should not be allowed to progress into a deep stall. Fast, but smooth stall recovery will minimize the risk of progressing into a spin. If an unusual post stall attitude develops and results in a spin, quick application of anti-spin procedures should shorten the recovery.

INTENTIONAL SPINS ARE PROHIBITED. In the event of an inadvertent spin, the following recovery procedure should be used:

1. Rudder - Apply FULL RUDDER opposite the direction of spin.
2. Control Wheel - FORWARD of neutral in a brisk motion. Additional FORWARD elevator control may be required if the rotation does not stop.
3. Ailerons - NEUTRAL.
4. Throttle - RETARD TO IDLE.

Hold anti-spin controls until rotation stops:

5. Flaps - If extended, RETRACT as soon as possible.
6. Rudder - NEUTRALIZE.
7. Control Wheel - Smoothly move aft to bring the nose up to a level flight attitude.

FAILURE OF LANDING GEAR TO EXTEND ELECTRICALLY

1. Airspeed - 132 KIAS or less.
2. Landing Gear Actuator Circuit Breaker - PULL
3. Gear Switch - DOWN
4. Manual Gear Extension Mechanism - LATCH FORWARD LEVER BACK.

NOTE

Slowly pull "T" handle 1 to 2 inches (2.5 to 5.1 cm) to rotate clutch mechanism and allow it to engage drive shaft.

5. T-handle - PULL (12 to 20 inches) and RETURN until gear is down and locked, GEAR DOWN light ILLUMINATED (12 to 20 pulls).
6. Visual Gear - Down Indicator - Check alignment by viewing from directly above the indicator.

CAUTION

Malfunction of landing gear requires maintenance inspection and repair prior to activating electrical system.

7. Return lever to normal position and secure with latch.
8. Reset Landing Gear Actuator Circuit Breaker.

WARNING

Do not operate landing gear electrically with manual extension system engaged.

GEAR-UP LANDING

If possible, choose firm sod or foamed runway. Make a normal approach, using full flaps. When you are sure of making the selected landing spot:

1. Throttle - CLOSED (Full Aft).
2. Mixture - IDLE CUT-OFF (Full Aft).
3. Master Switch and Magneto/Start Switches - OFF.
4. Fuel Selector Valve - OFF.
5. Keep wings level during touchdown.

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, but the flight characteristics of the airplane will not be affected. 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.

If it is deemed impractical to return and land, the door can be closed in flight, after reaching a safe altitude, by the following procedures:

1. Slow to approximately 110 mph/96 kts.
2. Open the storm window to reduce cabin air pressure.
3. Bank to the right.
4. Simultaneously apply left rudder (which will result in a right slip) and close the door.

ALTERNATOR POWER LOSS

If the red voltage warning light illuminates steadily, turn off the radio master and then turn the master switch off and on to reset the voltage regulator. If the voltage light comes on again pull the alternator field circuit breaker out. All electrical equipment not essential for flight should be turned off and the flight terminated as soon as practical to correct malfunction. A flashing voltage light indicates low voltage caused by an alternator malfunction, belt slippage, or tripped breaker. If resetting the alternator field breaker does not restore the alternator, turn off all electrical equipment not essential for the flight and terminate the flight as soon as practical.

NOTE

A tripped main alternator circuit breaker can only be caused by a shorted alternator circuit and cannot be corrected by resetting the breaker. This should be verified by attempting to reset the breaker not more than one time. If this fails, pull the alternator field breaker, turn off all non-essential electrical equipment and terminate the flight as soon as practical.

FLIGHT IN ICING CONDITIONS

DO NOT OPERATE IN KNOWN ICING CONDITIONS.

If icing conditions are inadvertently encountered:

1. Turn OFF ram air. Do not turn ram air on again when entering clear air until assured all ice and snow has melted from the aircraft.
2. Push ON pitot heat.(if installed)
3. Pull static air source to ALTERNATE (if installed).
4. Turn back or change altitude to obtain an outside air temperature less conducive to icing.

ALTERNATE STATIC SOURCE
(if installed)

The alternate static air source should be used whenever it is suspected that the normal static air sources are blocked. Selecting the alternate position changes the source of static air for the altimeter, airspeed indicator and rate-of-climb from the outside of the aircraft to the cabin interior.

When the alternate static air source is in use adjust the indicated airspeed and altimeter readings according to the appropriate alternate static source airspeed and altimeter calibration tables in Section 5.

The static air source valve is located in the lower left portion of the pilot's flight panel above the pilot's left knee.

FAILURE OF LANDING GEAR TO RETRACT AFTER TAKEOFF

NOTE

The following procedure applies to all aircraft modified with the airspeed safety override system with the "BY PASS" switch (S/N 24-0238 and above) and all aircraft prior with the mechanical squat switch safety override system which have been modified with the retraction "BY PASS" switch in accordance with Mooney Service Bulletin M20-196.

In the event that the gear fails to retract when the landing gear control switch is placed in the "UP" position due to the failure of the airspeed sensing or squat safety switch to activate after takeoff, the following procedure should be used as an alternate means to allow retraction:

(1) If the safety switch fails to actuate, as evidenced by illumination of the "GR SAFETY BY PASS" switch, both gear annunciator lights, and the activation of the gear warning horn, depress "GR SAFETY BY PASS" switch and hold until gear is fully retracted. This is evidenced by both the " gear unsafe and gear down" annunciator lights not being illuminated.

(2) Pull "GEAR CONT." circuit breaker to shut off gear horn. (Note: This does not affect normal operation of the horn, but must be reset prior to normal extension of the landing gear).

(3) To extend gear, reset the "GEAR CONT." circuit breaker and then place the gear control switch in the "DOWN" position.

(4) Check "AIRSPEED" or "SQUAT" safety switch to determine nature of malfunction as soon as practical.

SECTION IV.

NORMAL PROCEDURES

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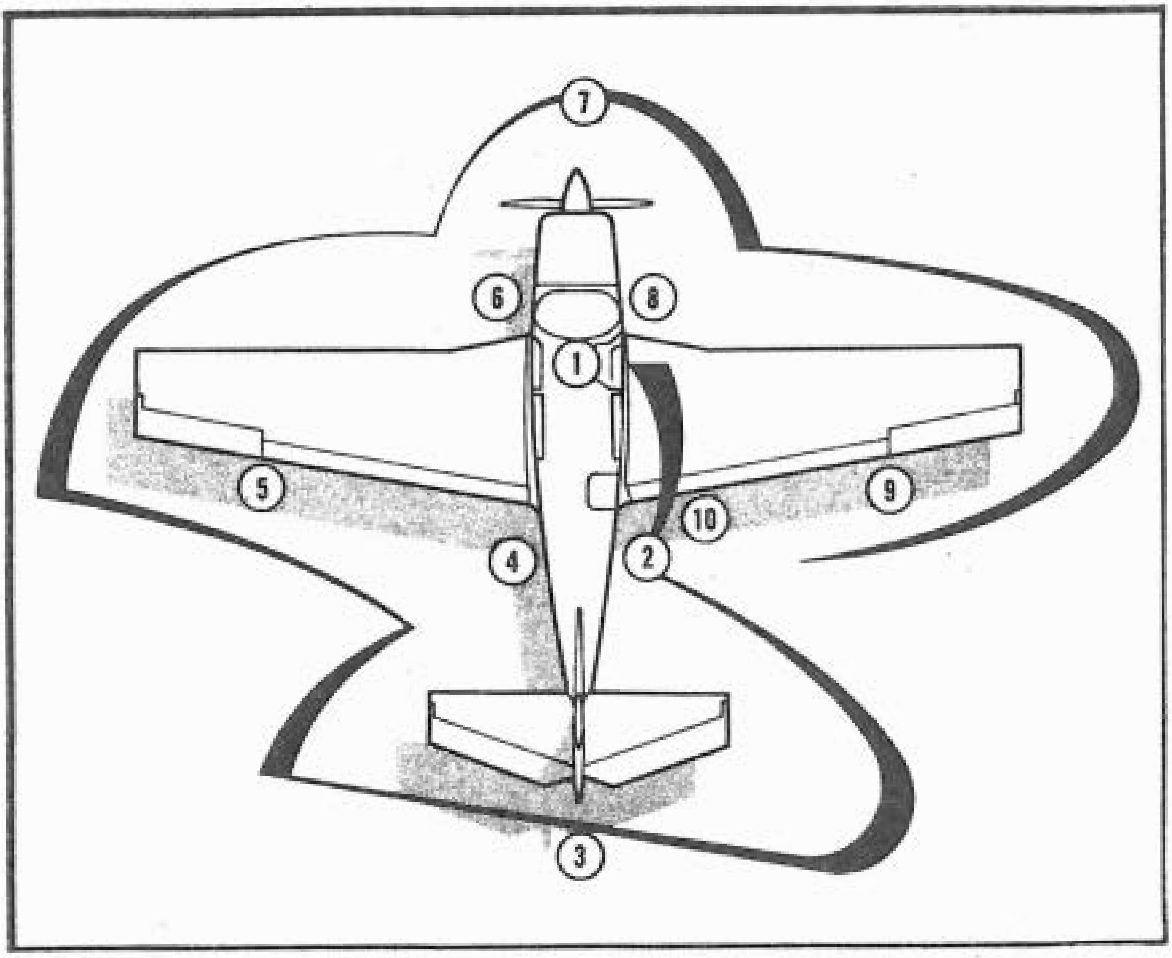


FIGURE 4-1. PREFLIGHT WALK AROUND DIAGRAM

PREFLIGHT INSPECTION

1. Magneto/Starter Switch--OFF.
   Gear Switch--DOWN.
   Master Switch--ON to check outside lights, fuel gages, then OFF.
   Fuel Selector Drain --Selector handle on R; pull gascolator ring and hold for five seconds.
   Repeat procedure with selector handle on L.

2. Instrument Static Port--UNOBSTRUCTED.
   Tail Tiedown--REMOVE.

3. Empennage--CHECK. Elevator & rudder attach points. Remove all ice, snow, or frost.

4. Instrument Static Port--UNOBSTRUCTED.
   Tail Cone Access Door--SECURE.
   Static System Drain--CHECK.

5. Wing Skins--CHECK.
Flap and Attach Points--CHECK.
Aileron and Attach Points--CHECK.
Wing Tip Strobe and Navigation Light--CHECK.
Remove all ice, snow, or frost.

6. Left Wing Leading Edge--CHECK.
Pitot Tube and Stall Switch Vane--UNOBSTRUCTED.
Fuel Tank--CHECK QUANTITY:

NOTE

A reduced fuel indicator is located in the filler neck. This indicator is used to indicate useable fuel capacity of 25 U. S. gallons.

Chock and Tiedown--REMOVE.
Left Main Gear, Shock Discs and Tire--CHECK.
Fuel Tank Sump Drain--SAMPLE.
Pitot System Drain--CHECK.
Tank Vent--UNOBSTRUCTED.
Fuel Selector Drain Valve--CLOSED.
Windshield--CLEAN.
Left Side Engine Cowl Fasteners--SECURE.

7. Propeller--CHECK for nicks, cracks and oil leaks.
Forward Engine Components--CHECK starter, alternator belt, etc.
Ram Air Door--CHECK off and secure.
Landing Light--CHECK.
Nose Gear--CHECK tire; check for towing damage.
Shock Discs--CHECK.
Chocks--REMOVE.

8. Right Side Engine Cowl Fasteners--SECURE.
Engine Oil Level--CHECK (Full for extended flight).
Windshield--CLEAN.
Fuel Tank Sump Drain--SAMPLE.
Tank Vent--UNOBSTRUCTED.
Chock and Tiedown--REMOVE.
Right Main Gear, Shock Discs and Tire--CHECK.
Right Wing Leading Edge--CHECK.

Fuel Tank--CHECK QUANTITY.

NOTE

A reduced fuel indicator is located in the filler neck. This indicator is used to indicate useable fuel capacity of 25 U.S. gallons.

9. Wing Skins - CHECK.
   Wing Tip Strobe (if installed) and Navigation Light - CHECK.
   Aileron and Attach Points - CHECK.
   Flap and Attach Points - CHECK.
   Remove all ice, snow, or frost.
10. Baggage Door - SECURE.

BEFORE STARTING CHECK

1. Preflight Inspection - COMPLETE.
2. Emergency Locator Transmitter - ARM (if installed).
3. Seats, Seat Belts and Shoulder Harness (if installed) - ADJUST AND SECURE.
4. Fuel Selector Handle - SET for fuller tank.
5. Parking Brake Control - DEPRESS BRAKE PEDALS AND PULL ON.
6. Magneto/Starter Switch and Master Switches - OFF.
7. Radio Master Switch - OFF.
8. Cowl Flaps - OPEN (Control Full Aft).
9. Ram Air Control - CLOSED.
10. Landing Gear Switch - DOWN.
11. Mixture Control - IDLE CUTOFF.
12. Propeller - FORWARD HIGH RPM.
13. Throttle - CLOSE (Full Aft).
14. Electric Fuel Boost Pump - OFF.
15. All External Lights - OFF.
16. Cabin Heat - OFF.
17. Main Circuit Breaker Panel - CHECK.
18. Alternate Static Air Control - CHECK IN.

STARTING ENGINE

NOTE

When starting engine using an approved external power source (Aux. Power Cable Adapter is available from Mooney Aircraft Corporation) no special starting procedure is necessary. Use normal starting procedures below.

1. Propeller Control - FORWARD/HIGH RPM.
2. Throttle Control - FORWARD 1/4.
3. Master Switch - ON.
4. Mixture Control - FULL FORWARD.
5. Electric Fuel Boost Pump Switch - ON TO ESTABLISH PRESSURE, THEN OFF.
6. Mixture Control - FULL AFT (IDLE CUT-OFF).
7. Propeller Area - CLEAR.
8. Magneto/Starter Switch - TURN AND PUSH TO START, RELEASE TO BOTH WHEN ENGINE STARTS.
9. Mixture - MOVE SLOWLY AND SMOOTHLY TO RICH.
10. Oil Pressure Gage - If minimum oil pressure not indicated within 30 seconds, STOP ENGINE, and determine trouble.

NOTE

Cranking should be limited to 30 seconds, and several minutes allowed between cranking periods to permit the starter to cool.

11. Throttle - Set for 1000 to 1200 RPM.

FLOODED ENGINE CLEARING

1. Throttle--FULL OPEN (FULL FORWARD).
2. Mixture Control--IDLE CUTOFF (FULL AFT).
3. Electric Fuel Boost Pump--OFF.
4. Magneto/Starter Switch--turn to "START" and PUSH forward.
5. Throttle--RETARD when engine starts.
6. Mixture Control--OPEN slowly to FULL RICH (FULL FORWARD).
7. Oil Pressure Gage--If minimum oil pressure not indicated within 30 seconds, STOP ENGINE, and determine trouble.

BEFORE TAKEOFF

1. Parking Brake--SET.
2. Controls--CHECK FREE AND CORRECT MOVEMENT.
3. Radio Master--ON
4. Instruments and Radios-- CHECK AND SET AS DESIRED.

5. Strobe Lights and Rotating Beacon--ON (if installed).

6. Annunciator Lights -- CHECK WITH PRESS-TO-TEST & THROTTLE RETARDED.

7. Trim -- TAKEOFF SETTING. If forward CG set trim to upper portion of band and to lower portion when at aft CG.

8. THROTTLE -- 1900-2000 RPM.

9. Magnetos -- CHECK. Make magneto check at 1900-2000 RPM, as follows:

   a. Magneto/Starter Switch - BOTH to R. Note RPM.

   b. Magneto/Starter Switch - BOTH. Allow time for plugs to clear.

   c. Magneto/Starter Switch - L. Note RPM.

   d. Magneto/Starter Switch - BOTH. The RPM drop should not exceed 175 RPM on either magneto or indicate greater than a 50 RPM differential between magnetos.

NOTE

An absence of RPM drop may be an indication of faulty magneto grounding or improper timing. If there is doubt concerning ignition system operation, RPM checks at a leaner mixture setting or higher engine speed will usually confirm whether a deficiency exists.

10. Propeller Control - CYCLE/RETURN TO HIGH RPM (full forward).

11. Throttle - IDLE RPM.

12. Cabin Door - LOCK.

13. Seat Belts - SECURE.

14. Wing Flaps - TAKEOFF (15^{o})

TAKEOFF

NOTE

Move the controls slowly and smoothly. In particular, avoid rapid opening and closing of the throttle as the engine is equipped with a counterweighted crankshaft and there is a possibility of detuning the counterweights and overspeeding with subsequent engine damage.

Proper full throttle engine operation should be checked early in the takeoff roll. Any significant indication of rough or sluggish engine response is reason to discontinue the takeoff.

When takeoff must be made over a gravel surface, it is important that the throttle be applied slowly. This will allow the aircraft to start rolling before a high RPM is developed, and gravel or loose material will be blown back from the prop area instead of being pulled into it.

TAKEOFF (Normal)

1. Electric Fuel Boost Pump - ON at start of takeoff roll.

2. Power - FULL THROTTLE and 2700 RPM.

3. Aircraft Attitude - LIFT NOSE WHEEL AT 71 MPH (62 KTS.) IAS.

4. Climb Speed - 82 MPH (71 KTS) IAS.

5. Landing Gear - RETRACT IN CLIMB BEFORE ATTAINING AN AIRSPEED OF 120 MPH (104 KTS) IAS.

6. Wing Flaps - RETRACT IN CLIMB.

7. Electric Fuel Boost Pump - OFF, CHECK PRESSURE.

TAKEOFF (Obstacle Clearance)

1. Electric Fuel Boost Pump - ON at start of takeoff roll.

2. Power - FULL THROTTLE AND 2700 RPM.

3. Aircraft Attitude - LIFT NOSE WHEEL AT 71 MPH (62 KTS.) IAS.

4. Climb Speed - 76 MPH (66 KTS.) IAS until clear of obstacle, then accelerate to 105 to 115 MPH (91 to 100 KTS.) IAS.

5. Landing Gear - RETRACT IN CLIMB AFTER CLEARING OBSTACLE.

6. Wing Flaps - RETRACT AFTER CLEARING OBSTACLE.

7. Electric Fuel Boost Pump - OFF, CHECK PRESSURE.

CLIMB

CLIMB (Normal)

1. Throttle - 26" HG MANIFOLD PRESSURE.

2. Propeller - 2600 RPM.

3. Mixture - LEAN FOR SMOOTH OPERATION.

4. Cowl Flaps - FULL OPEN.

5. Airspeed - 105-115 MPH (91-100 KTS).

6. Ram Air - OPEN AFTER ENTERING CLEAR AIR.

CLIMB (Best Rate)

1. Power - FULL THROTTLE & 2700 RPM.

2. Mixture - LEAN FOR SMOOTH OPERATION

3. Cowl Flaps - FULL OPEN.

4. Airspeed - 101 MPH (88 KTS) IAS at Sea Level decreasing to 94 MPH (82 KTS) IAS at 10,000 Ft.

5. Ram Air - OPEN AFTER ENTERING CLEAR AIR.

Manifold pressure will drop with increasing altitude at any throttle setting. Power can be restored by gradually opening the throttle.

At full throttle, opening the Ram Air control allows induction air to bypass the air filter increasing manifold pressure, thus increasing performance.

WARNING

Turn ram air off if encountering icing conditions. Do not fly aircraft into known icing conditions. Using unfiltered induction air when flying in snow or other IFR conditions can be hazardous. Snow can accumulate in the fuel injector impact tubes, or moisture can freeze in the inlet passages under icing conditions to cause loss of power. If snow or icing conditions were encountered DO NOT TURN RAM AIR ON AGAIN when entering clear air until assured that all ice has melted from the aircraft. Do not use ram air in visibly dusty air.

After establishing climb power and trimming the aircraft for climb, check to insure that all controls, switches, and instruments are set and functioning properly.

CRUISE

Upon reaching cruise altitude, allow acceleration to cruise airspeed, then trim the aircraft for level flight, reduce manifold pressure and RPM to desired cruise power, and close the cowl flaps. The cowl flaps should be partially opened (control pulled aft approximately three inches) if necessary, to maintain the oil and cylinder head temperatures within the normal operating range.

When cruising at 75 percent power or less, lean the mixture after cruise power is established in accordance with one of the following methods:

A. Leaning using exhaust gas temperature gage (EGT) (if installed)

1. Lean the mixture until temperature peaks on the EGT indicator.

   ECONOMY CRUISE - Enrich mixture (push mixture lever forward) until the EGT indicator drops 25^{O}F or more below peak.
   BEST POWER MIXTURE - Enrich mixture until EGT indicator drops 100^{O}F below peak.

   NOTE

   Best power mixture will result in a speed increase, an increase in fuel flow and a reduction in range.

2. Changes in altitude and power settings require the peak EGT to be rechecked and the mixture re-set.

B. Leaning without exhaust gas temperature gage (EGT)

1. Slowly move mixture control lever aft from "Full Rich" position toward lean position.

2. Continue leaning until slight loss of power is noted (loss of power may or may not be accompanied by roughness).

3. Enrich until engine runs smoothly and power is regained.

When increasing power always return mixture to full rich, then increase RPM before increasing manifold pressure; when decreasing power decrease manifold pressure before reducing RPM. Always stay within the established operating limits, and always operate the controls slowly and smoothly.

DESCENT

1. Mixture - RICH/OR LEAN FOR SMOOTH OPERATION.

2. Power - AS DESIRED.

CAUTION

Avoid continuous operation between 1500 and 1950 RPM with power settings below 15"Hg. manifold pressure.

NOTE

Exercise caution with power settings below 15" Hg manifold pressure at air-speeds between 80-130 MPH (70-113 Kts.) IAS to preclude continuous operation in the 1500-1950 RPM restricted range.

3. Cowl Flaps - CLOSED (control full forward).

BEFORE LANDING

1. Seats, Seat Belts and Shoulder Harnesses - ADJUST AND SECURE.

2. Landing Gear - EXTEND BELOW 150 MPH (130 KTS.) IAS.

3. Mixture Control - FULL RICH.

4. Fuel Selector - RIGHT OR LEFT (Fullest tank).

5. Propeller Control - HIGH RPM.

6. Wing Flaps - FULL DOWN (33^{o}) BELOW 132 MPH (115 KTS) IAS.

7. Trim - ADJUST, as necessary.

8. Electric Fuel Boost Pump - ON.

9. Ram Air - CLOSED; WARNING LIGHT OFF.

10. Check Gear Down - GEAR DOWN LIGHT ON - MARKS ALIGNED IN VISUAL INDICATOR IN FLOOR.

GO AROUND (BALKED LANDING)

1. Power - FULL THROTTLE AND 2700 RPM.
2. AIRSPEED - 75 MPH (65 KTS) IAS.
3. Flaps - AFTER CLIMB ESTABLISHED RETRACT TO 0 DEGREES WHILE ACCELERATING TO 84 MPH (73 KTS) IAS.
4. Gear - RETRACT AFTER CLIMB IS ESTABLISHED.
5. Cowl Flaps - FULL OPEN.

LANDING

1. Airspeed on Final - 81 MPH (71 KTS) IAS WITH FULL FLAPS.
2. Touchdown - MAIN WHEELS FIRST.
3. Landing Roll - LOWER NOSE WHEEL GENTLY.
4. Brakes - MINIMUM REQUIRED.
5. Wing Flaps - RETRACT AFTER CLEARING RUNWAY.
6. Cowl Flaps - OPEN
7. Electric Fuel Boost Pump - OFF AFTER LANDING.
8. Trim - TAKEOFF POSITION.

TAXI

1. Throttle--1000 to 1200 RPM.
2. Lighting--As required.
3. Stabilizer Trim--TAKEOFF.

SHUTDOWN

1. Throttle--IDLE at 1000 to 1200 RPM until cylinder head temperature starts to drop.
2. Cowl Flaps--OPEN.
3. Radio Master Switch--OFF.
4. Electrical Equipment Switches--OFF.
5. Mixture Control--IDLE CUTOFF.
6. Throttle--RETARD as engine stops firing.
7. Magneto/Starter Switch--OFF when propeller stops.
8. Parking Brake--Set (for short-term parking).
9. Trim--TAKEOFF.
10. Flaps--RETRACTED.
11. Master Switch--OFF.
12. Control Wheel--LOCK with seat belt.
13. Overhead Air Scoop--CLOSED.

SECURING THE AIRCRAFT

1. Parking Brake - SET.
2. Radio Master and Electrical Equipment - OFF.
3. Magneto/Starter Switch and Master Switch - OFF.
4. Mixture Control - IDLE CUTOFF.
5. Parking Brake - RELEASE AND INSTALL WHEEL CHOCKS.
6. For Extended Parking or in Gusty Wind Conditions - SECURE PILOTS CONTROL WHEEL WITH SEAT BELT, TIE DOWN AIRCRAFT AT WING AND TAIL POINTS.

SECTION V.

PERFORMANCE

TABLE OF CONTENTS

INTRODUCTION

All performance tables and graphs are grouped in this section of the manual for quick and easy reference. The information is presented to show performance that may be expected from the aircraft, and to assist you in planning your flights with reasonable detail and accuracy. All data has been compiled from both calculations and actual test flights with the aircraft and engine in good operating condition while using average piloting techniques. The cruise performance data makes no allowance for variables present with a specific aircraft or for wind and navigation errors. In using this data, allowances must be made for actual conditions.

A carefully detailed and analyzed flight plan will yield maximum efficiency. After making a flight plan based on estimates taken from the data in this section, you should check your actual performance and note the difference between your forecast conditions and actual flight performance so that your future estimates may be more accurate.

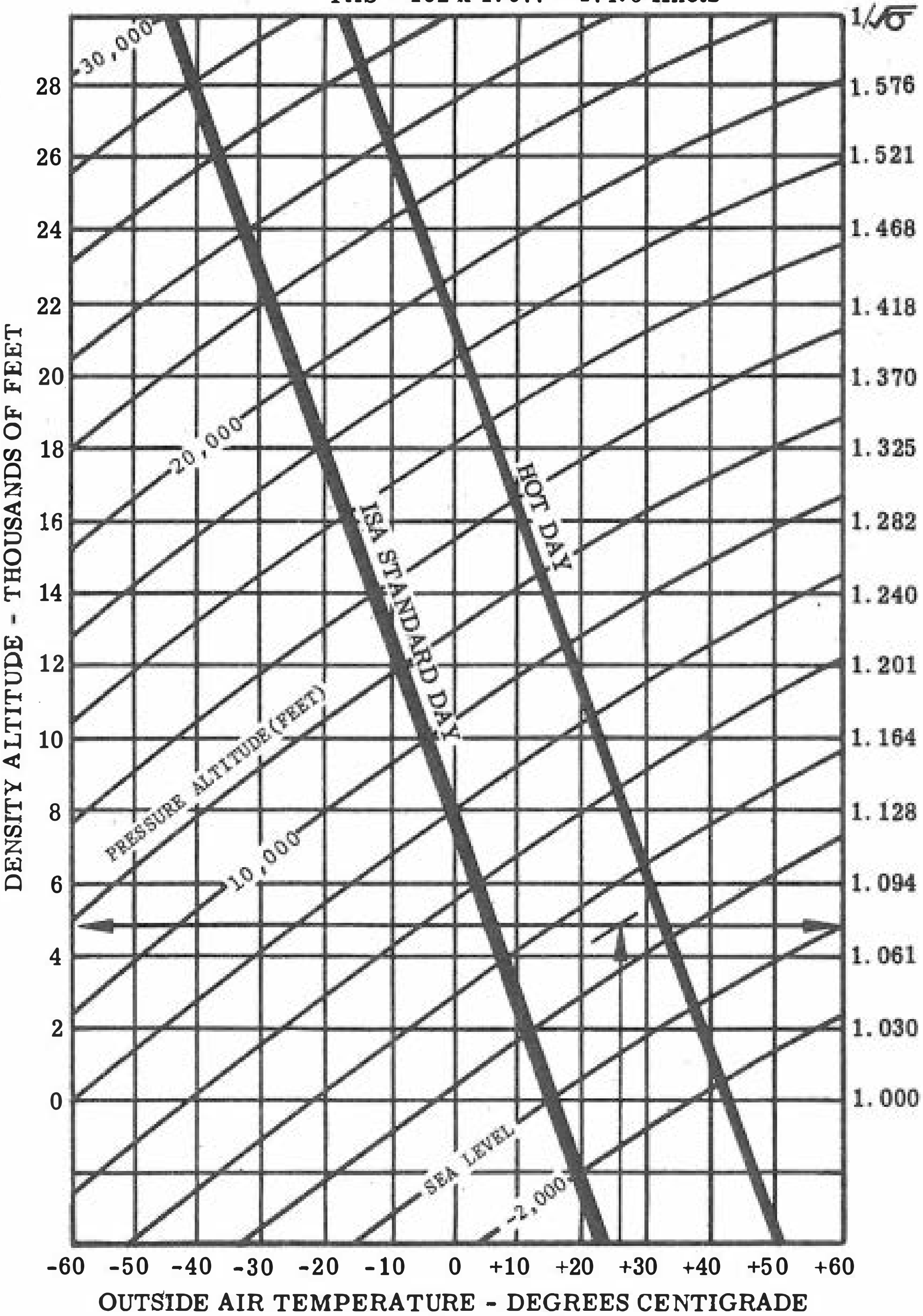
ALTITUDE CONVERSION

TAS = CAS x $1/\sqrt{\sigma}$

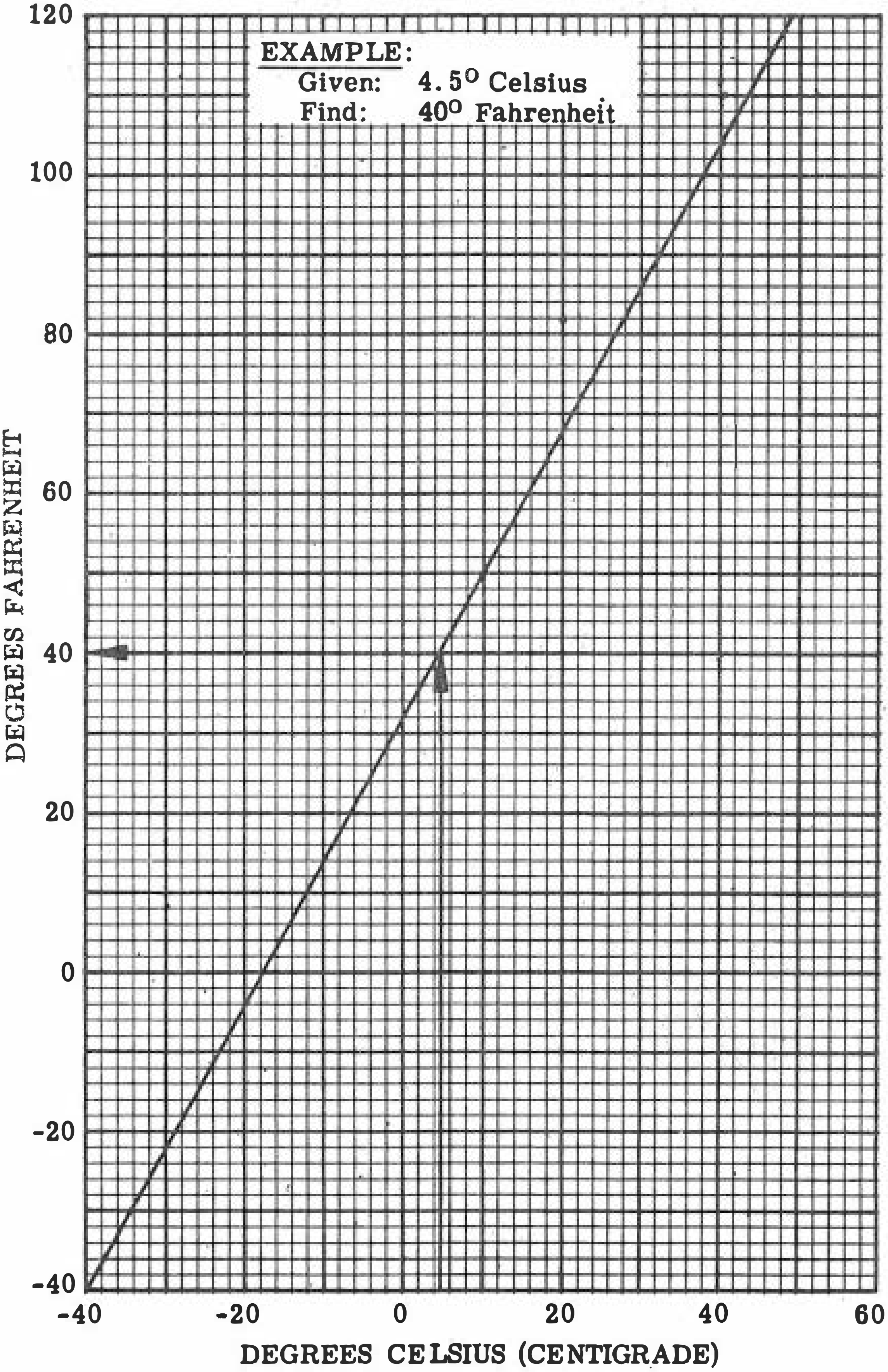
EXAMPLE:

Given: 26°C Outside Air Temperature
3000 Ft. Pressure Altitude
162 Knot CAS

Find: 4950 Ft. Density Alt.
$1.077 = 1/\sqrt{\sigma}$
TAS = 162 x 1.077 = 174.5 Knots

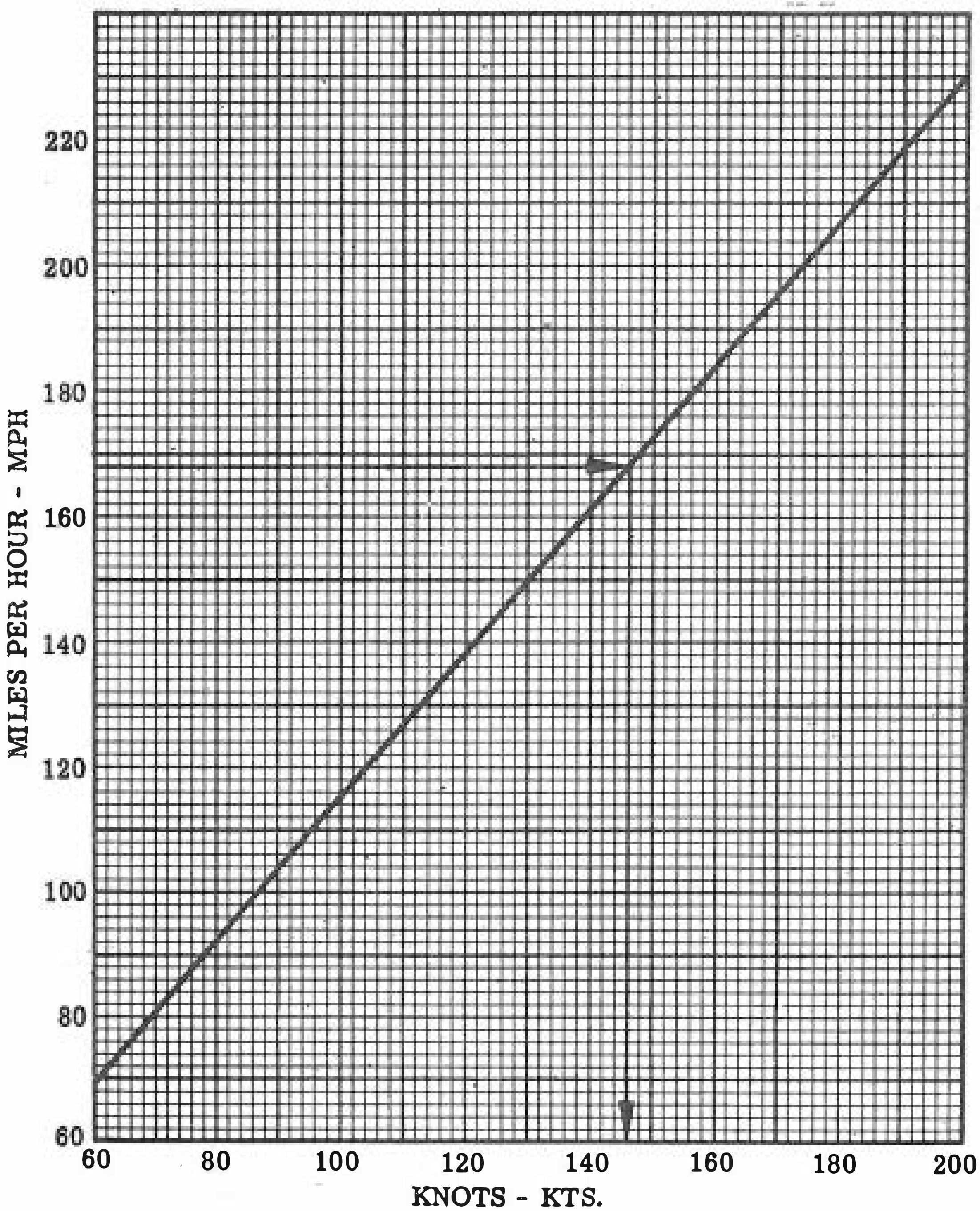


TEMPERATURE CONVERSION



AIRSPEED CONVERSION

EXAMPLE: Given: 168 MPH
Find: 146 KTS.



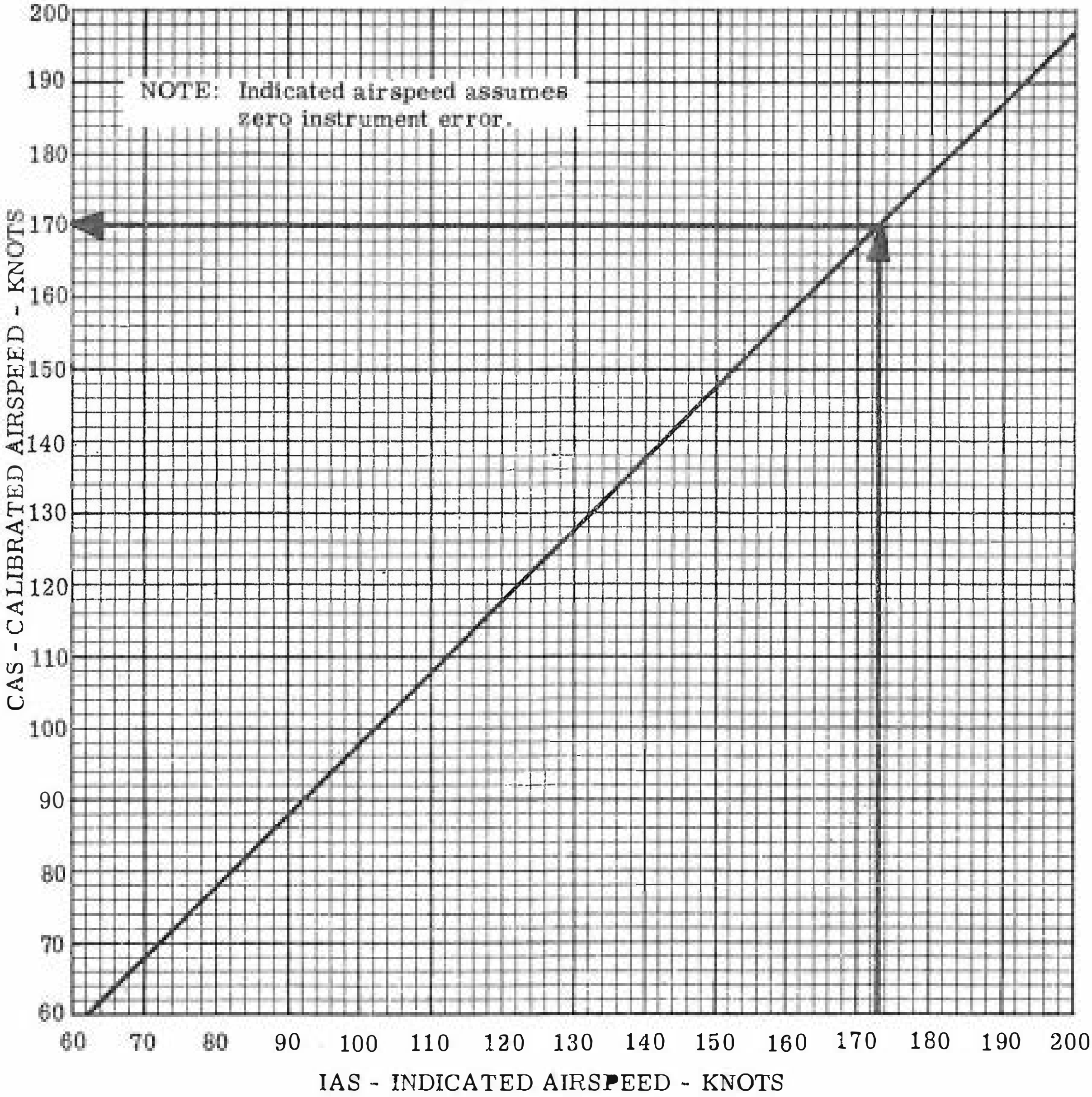
AIRSPEED CALIBRATION

NORMAL STATIC SYSTEM - FLAPS AND GEAR UP, POWER ON

EXAMPLE:

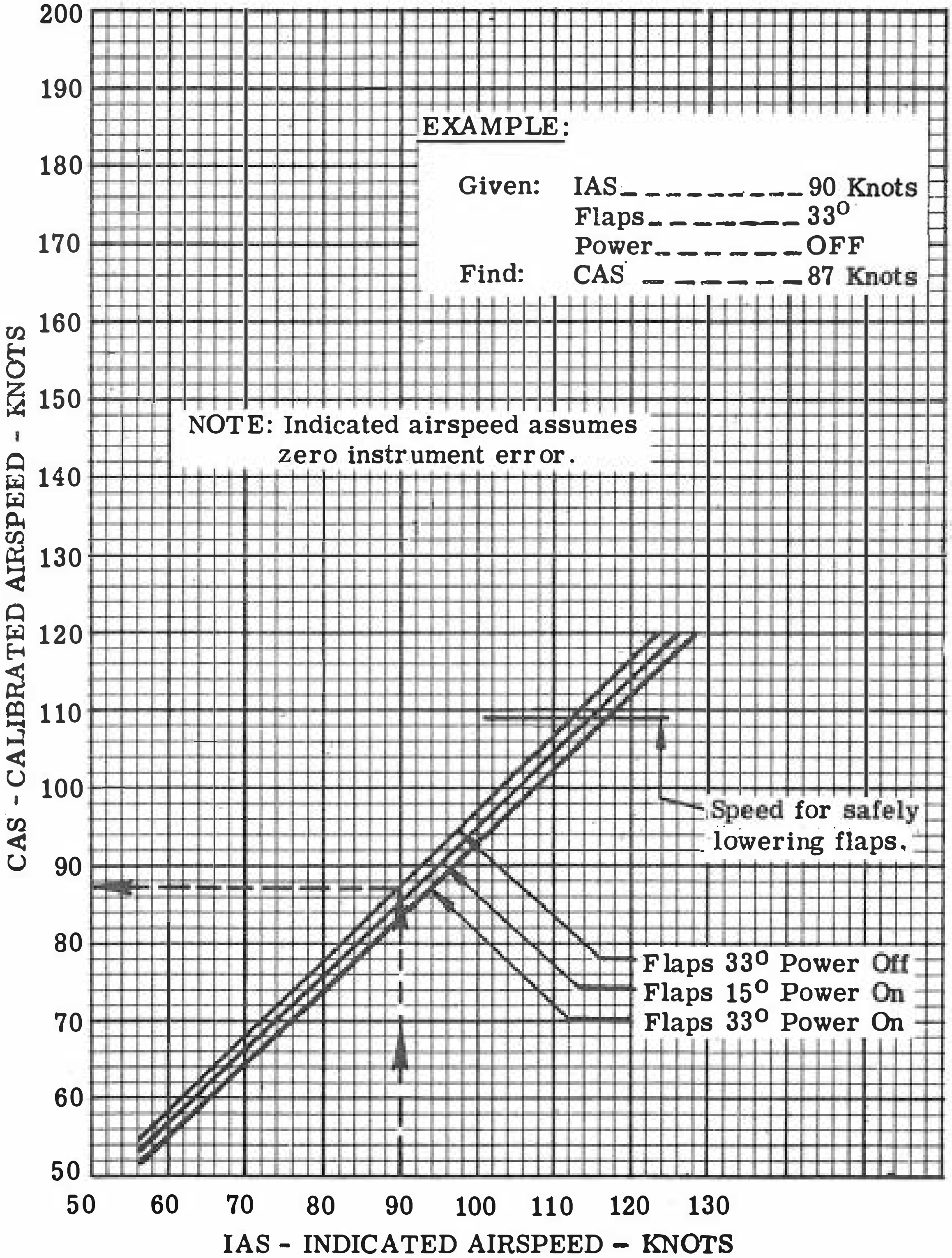
Given: 173 Knots IAS

Find: 170 Knots CAS



AIRSPEED CALIBRATION

NORMAL STATIC SYSTEM - FLAPS AND GEAR DOWN



AIRSPEED CALIBRATIONS
ALTERNATE STATIC SOURCE

IAS (MPH/KTS)	Gear & Flaps Up MPH/KTS	Gear & Flaps Down (15^{o}) MPH/KTS	Gear & Flaps Down (33^{o}) MPH/KTS
70/61	--	-2/-2	-4/-3
80/70	-2/-2	-3/-3	-6/-5
90/78	-4/-3	-5/-4	-8/-7
100/87	-4/-3	-7/-6	-9/-8
110/96	-5/-4	-8/-7	-11/-10
120/104	-6/-5	-8/-7	-11/-10
130/113	-6/-5	-8/-7	-12/-10
140/122	-7/-6	-- --	-- --
150/130	-7/-6	-- --	-- --
160/139	-7/-6	-- --	-- --
170/148	-7/-6	-- --	-- --
180/156	-7/-6	-- --	-- --
190/165	-4/-3	-- --	-- --
200/174	-4/-3	-- --	-- --
210/182	-5/-4	-- --	-- --
220/191	-5/-4	-- --	-- --
230/200	-6/-5	-- --	-- --

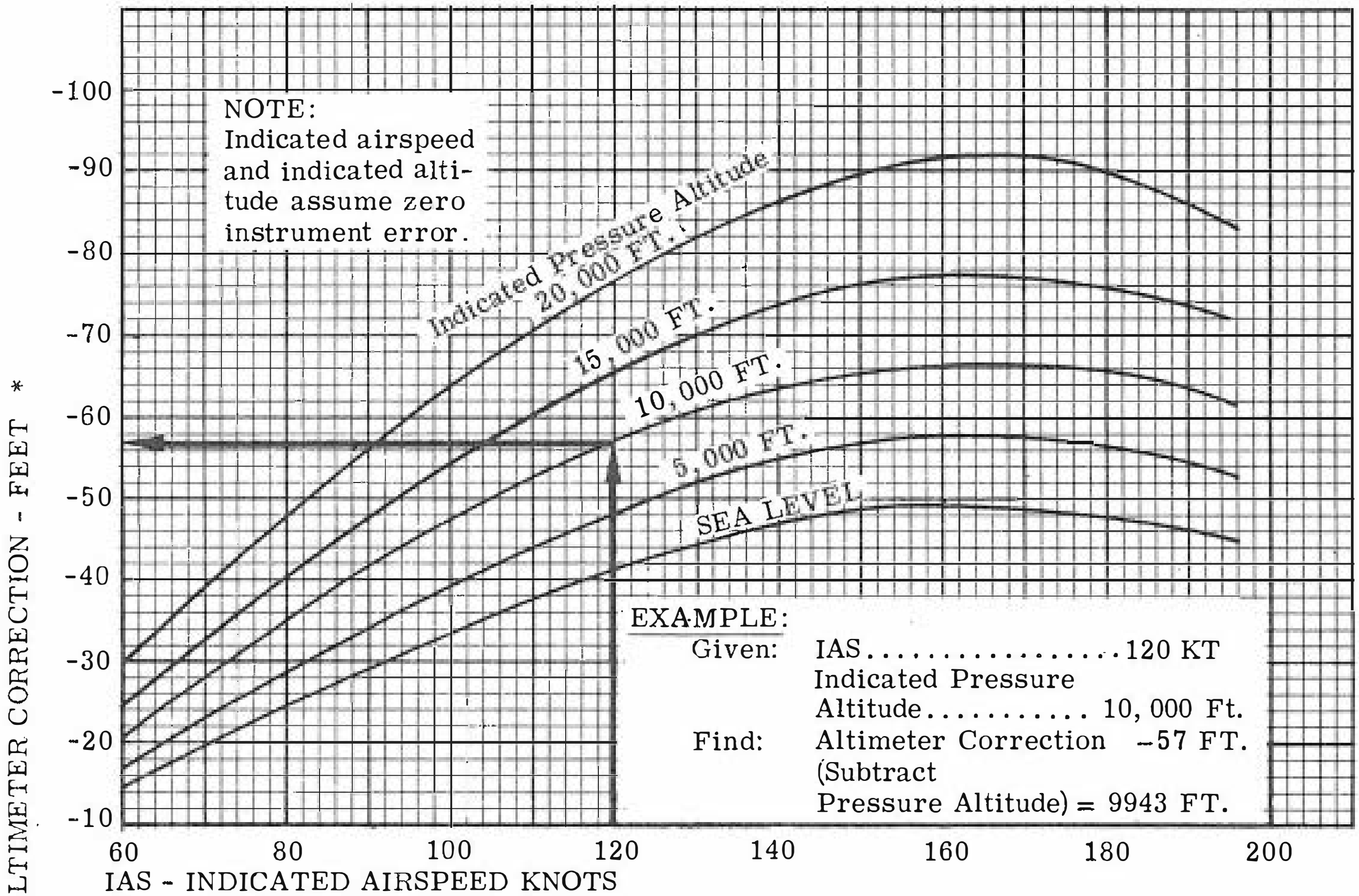
The minus sign indicates subtraction of the given numbers from IAS to obtain CAS assuming zero instrument error.

CONDITIONS: Storm Window and Vents: Closed
Defroster: Maximum

Power On

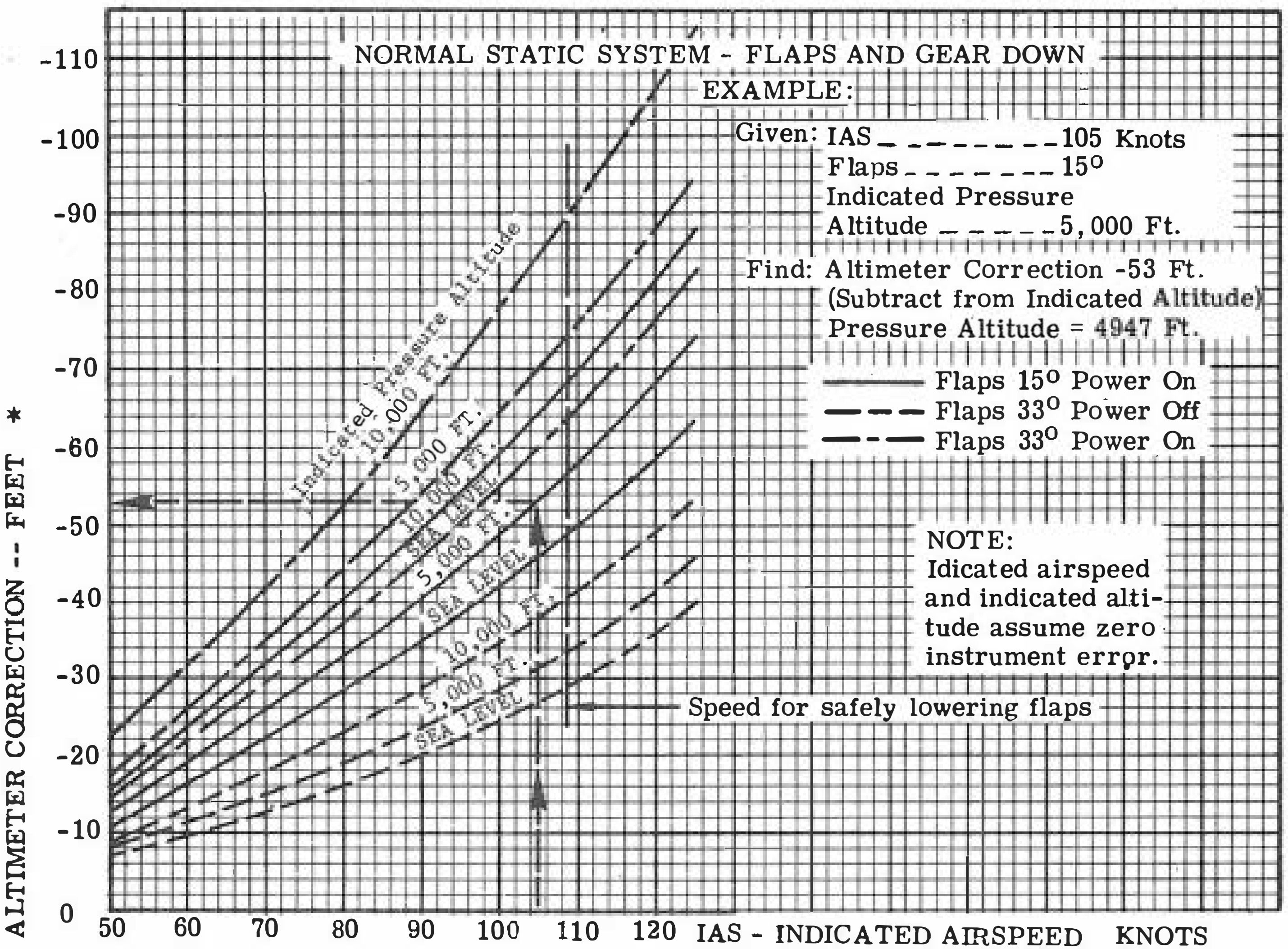
ALTIMETER CORRECTIONS

NORMAL STATIC SYSTEM - FLAPS & GEAR UP & POWER ON



*The minus sign indicates subtraction of the altimeter correction from indicated pressure to obtain corrected pressure altitude.

ALTIMETER CORRECTIONS



*The minus sign indicates subtraction of the altimeter correction from indicated pressure altitude to obtain corrected pressure altitude.

ALTIMETER CORRECTIONS
ALTERNATE STATIC SOURCE

CONDITIONS: Storm Window and Vents: Closed, Defroster: Maximum, Power On

IAS (MPH/KTS)	SEA LEVEL			10,000 FT.		
	Gear & Flaps Up	Gear & Flaps Down		Gear & Flaps Up	Gear & Flaps Down	
		15°	33°		15°	33°
70/61	--	-10	-21	-4	-15	-28
80/70	-17	-20	-35	-21	-28	-39
90/78	-26	-37	-55	-36	-50	-76
100/87	-32	-54	-71	-43	-71	-99
110/96	-40	-55	-82	-55	-77	-102
120/104	-54	-63	-96	-73	-86	-130
130/113	-54	--	--	-84	--	--
140/122	-64	--	--	-87	--	--
150/130	-72	--	--	-99	--	--
160/139	-75	--	--	-101	--	--
170/148	-99	--	--	-134	--	--
180/156	-54	--	--	-73	--	--
190/165	-54	--	--	-73	--	--
200/174	-68	--	--	-94	--	--
210/182	-64	--	--	-83	--	--
220/191	-75	--	--	-103	--	--
230/200	-91	--	--	-125	--	--

The minus sign indicates subtraction of the given numbers from the indicated pressure altitude to obtain pressure altitude assuming zero instrument error.

STALL SPEEDS

ASSOCIATED CONDITIONS:

Gross Weight = 2740 LBS.
Forward CG
Power - Idle
Stall Speeds are indicated airspeeds in MPH & KNOTS and assume zero instrument error.

NOTE

Maximum altitude loss during stall recovery is approximately 290 feet

WEIGHT LBS.	ASSOCIATED CONDITIONS		Stall Speeds - MPH/KNOTS Angle of Bank 0°	20°	40°	60°
2740	Flaps & Gear Up	MPH	72	74	82	99
		KNOTS	63	64	71	86
	Flaps 15° Gear Down	MPH	66	68	76	95
		KNOTS	57	59	66	83
	Flaps 33° Gear Down	MPH	63	65	73	89
		KNOTS	55	57	63	77

EXAMPLE:

Given:	Weight	2740 LBS.
	Landing Gear	Down
	Flaps	33°
	Angle of Bank	20°
Find:	Stall Speed	57 Knots IAS 65 MPH IAS

TAKEOFF DISTANCES (Maximum Performance)

ASSOCIATED CONDITIONS:

POWER------ FULL THROTTLE, 2700 RPM (Before Brake Release)
MIXTURE --- LEAN FOR SMOOTH OPERATION
FLAPS ------ 15°
LDG. GEAR-- EXTENDED UNTIL OBSTACLE CLEARED

RUNWAY------------- PAVED, LEVEL, DRY SURFACE
WEIGHT-------------- 2740 LBS.
TAKEOFF SPEED------ 71 MPH/62 KTS IAS
CLIMB OUT----------- 76 MPH/66 KTS IAS
COWL FLAPS--------- FULL OPEN

		PRESSURE ALTITUDE									
		Sea Level		2000 FT.		4000 FT.		6000 FT.		8000 FT.	
Wind Component Down Runway Knots	OAT °C	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet
0	-20	679	1179	803	1387	1029	1740	1330	2175	1692	2678
	-10	732	1267	873	1498	1118	1879	1446	2351	1843	2898
	0	793	1364	946	1613	1211	2024	1566	2532	1993	3119
	10	857	1465	1022	1732	1309	2175	1692	2720	2153	3352
	20	924	1570	1101	1856	1410	2330	1823	2916	2329	3603
	30	993	1678	1183	1983	1516	2491	1960	3119	----	----
	40	1064	1789	1269	2116	1625	2657	2101	3327	----	----
10	-20	608	1071	722	1264	929	1591	1205	1994	1538	2461
	-10	657	1153	787	1368	1016	1726	1312	2158	1678	2667
	0	713	1243	854	1475	1097	1856	1424	2328	1818	2875
	10	772	1337	924	1586	1188	1998	1541	2505	1967	3094
	20	834	1436	997	1702	1282	2143	1663	2689	2131	3329
	30	898	1537	1073	1821	1380	2294	1790	2879	----	----
	40	963	1640	1153	1946	1482	2450	1922	3075	----	----
20	-20	548	974	653	1154	843	1456	1097	1830	1405	2265
	-10	593	1050	713	1251	919	1577	1197	1984	1536	2459
	0	645	1135	775	1350	999	1704	1300	2143	1666	2654
	10	700	1223	840	1454	1083	1836	1409	2308	1805	2859
	20	757	1314	908	1563	1170	1972	1523	1481	1958	3081
	30	816	1408	978	1674	1262	2114	1642	2661	----	----
	40	877	1506	1053	1791	1357	2261	1765	2845	----	----

NOTE: 1) Maximum demonstrated crosswind velocity is 12 MPH (11 Knots). 2) Where distance value has been deleted, climb performance after lift off is less than 150 ft./min. 3) Conditions of high humidity can result in an increase of up to 10% to the above take-off distances.

ASSOCIATED CONDITIONS:

TAKEOFF DISTANCES

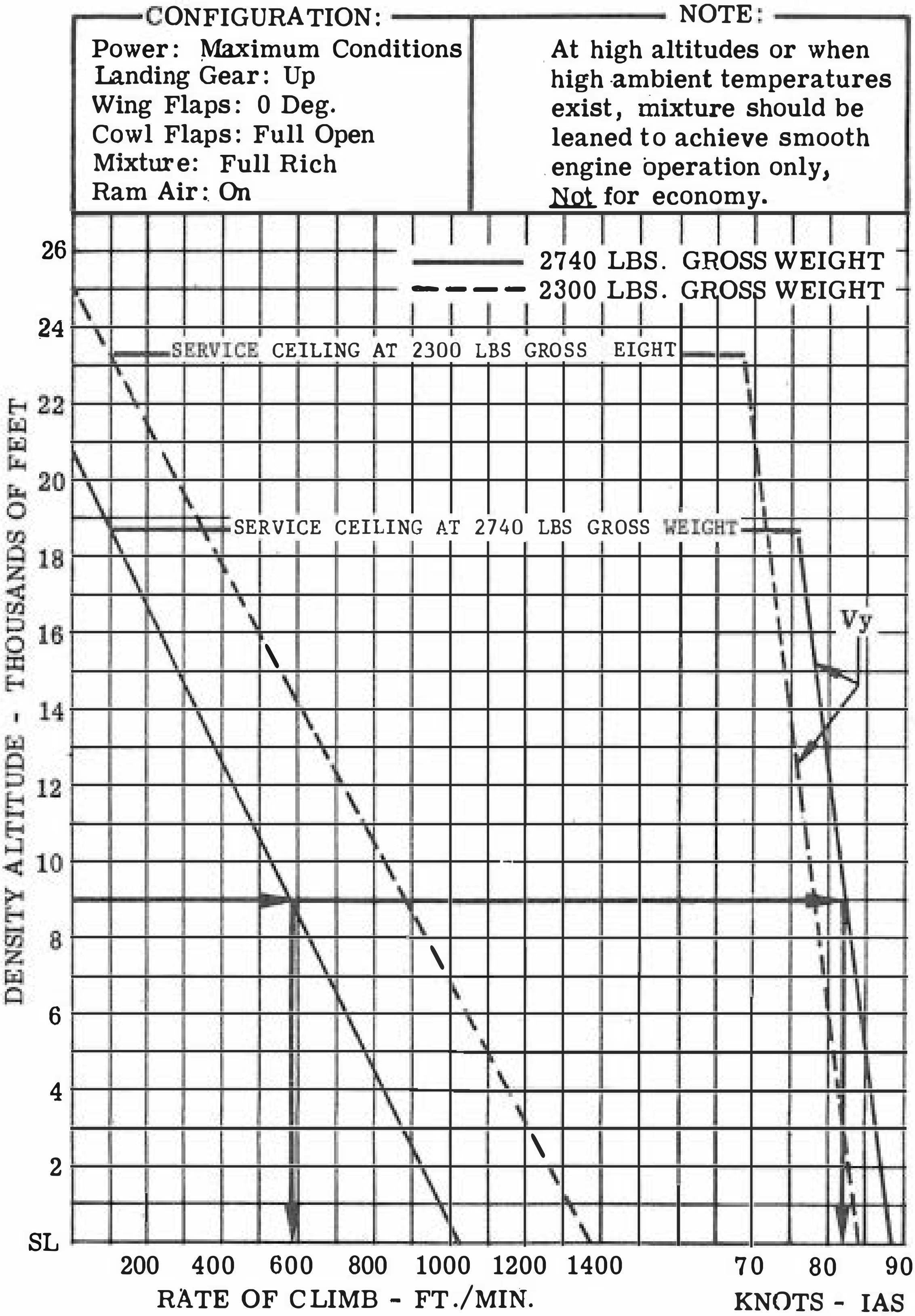
POWER------ FULL THROTTLE, 2700 RPM
(Before Brake Release)
MIXTURE --- LEAN FOR SMOOTH OPERATION
FLAPS ------ 15°
LDG. GEAR-- EXTENDED UNTIL OBSTACLE CLEARED

RUNWAY------------- PAVED, LEVEL, DRY SURFACE
WEIGHT-------------- 2740 LBS.
TAKEOFF SPEED ------73 MPH/63 KTS IAS
CLIMB OUT----------- 82 MPH/71 KTS IAS
COWL FLAPS---------- FULL OPEN

Wind Component Down Runway Knots	OAT °C	PRESSURE ALTITUDE									
		Sea Level		2000 FT.		4000 FT.		6000 FT.		8000 FT.	
		Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet	Ground Roll Feet	Total Over 50 Ft. Obstacle Feet
0	-20	704	1374	854	1646	1049	2074	1392	2808	1778	3820
	-10	765	1482	928	1776	1140	2237	1513	3028	1933	4118
	0	829	1594	1005	1910	1235	2406	1639	3256	2094	4426
	10	896	1711	1086	2050	1334	2581	1771	3494	2262	4746
	20	965	1831	1170	2194	1438	2764	1908	3738	2437	5077
	30	1037	1955	1258	2344	1545	2951	2051	3992	----	----
	40	1112	2084	1349	2498	1657	3145	2199	4253	----	----
10	-20	632	1255	769	1507	948	1906	1263	2490	1619	3537
	-10	688	1356	837	1629	1032	2059	1375	2797	1763	3818
	0	747	1460	908	1754	1120	2217	1492	3011	1913	4109
	10	814	1575	983	1885	1212	2382	1615	3236	2070	4412
	20	872	1681	1061	2021	1309	2555	1743	3466	2233	4725
	30	939	1798	1143	2162	1408	2730	1876	3705	----	----
	40	1008	1919	1227	2306	1513	2914	2014	3952	----	----
20	-20	570	1446	696	1381	862	1753	1151	2389	1480	3275
	-10	622	1240	760	1495	940	1897	1255	2583	1615	3541
	0	676	1338	826	1613	1021	2045	1365	2786	1755	3815
	10	738	1445	895	1736	1107	2200	1479	2997	1901	4101
	20	793	1546	967	1862	1197	2362	1598	3214	2054	4397
	30	854	1654	1043	1995	1290	2528	1723	3441	----	----
	40	919	1768	1122	2131	1387	2700	1852	3674	----	----

NOTE: 1) Maximum demonstrated crosswind velocity is 12 MPH (11 Knots). 2) Where distance value has been deleted, climb performance after lift off is less than 150 ft./min. 3) Conditions of high humidity can result in an increase of up to 10% to the above take-off distances.

CLIMB PERFORMANCE



EXAMPLE

GIVEN: DENSITY ALTITUDE–9000 FEET
GROSS WEIGHT–2740 LBS.
FIND: BEST RATE OF CLIMB–590 FT./ MIN.
BEST RATE OF CLIMB SPEED–82 KNOTS IAS

TIME, FUEL AND DISTANCE TO CLIMB

Associated Conditions for the Time, Fuel and Distance to Climb graph on the following page:

Climb Speed: Vy from Climb Performance graph on the preceeding page.

Power: 2700 RPM, Full Throttle
Mixture: Full Rich
Ram Air: On

Cowl Flaps: Full Open
Landing Gear: Up
Wing Flaps: Up
Fuel Density 6.0 Lbs./Gal.

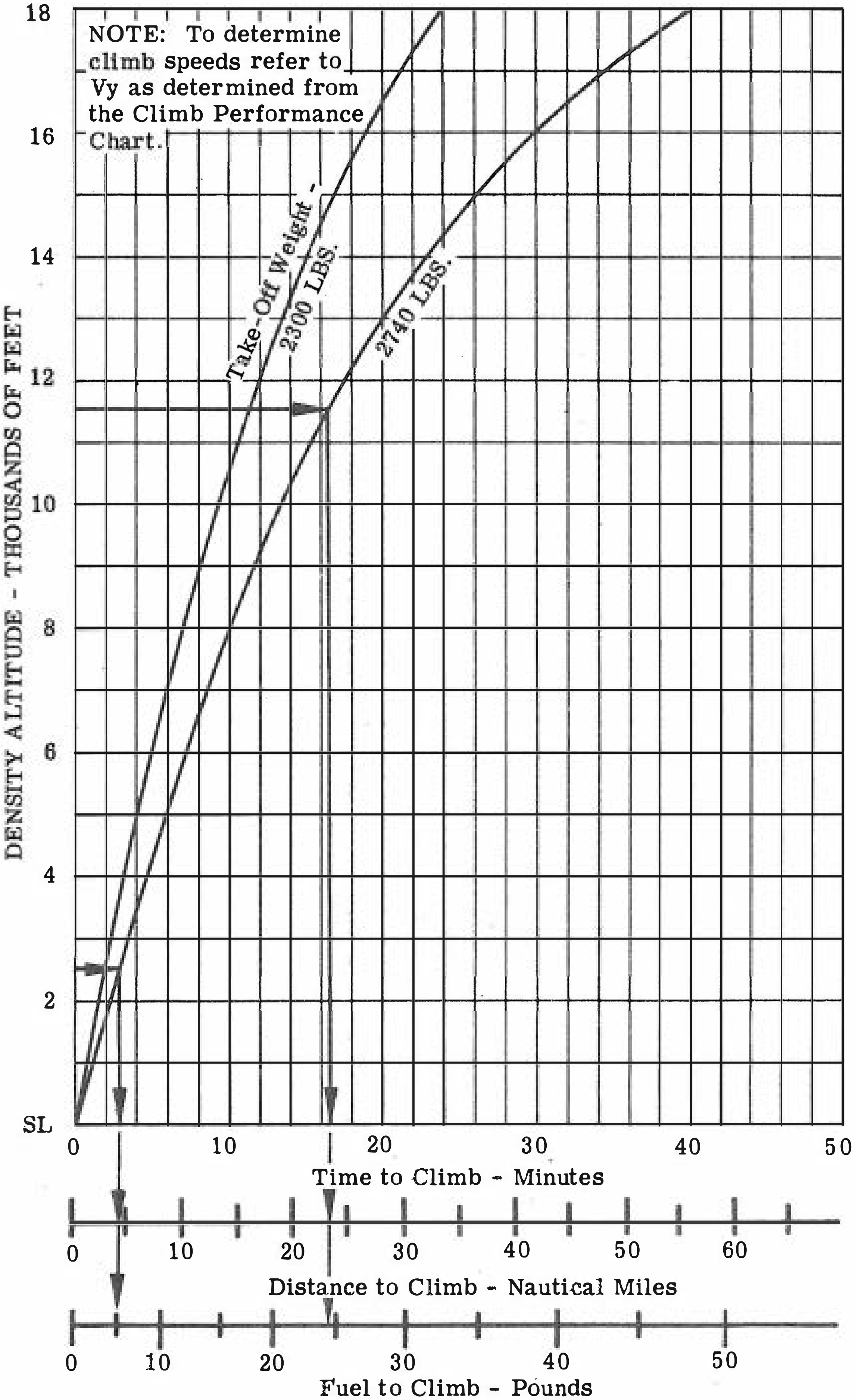
NOTE:

1. Distances shown are based on zero wind.
2. Add 9 LBS. of fuel for start, taxi and takeoff.

<u>EXAMPLE</u>:

Given:	Initial Density Altitude	2,500 Ft.
	Final Density Altitude	11,500 Ft.
	Takeoff Weight - 2740 Lbs.	
Find:	Time to Climb (16.5 - 3.0) 13.5 Minutes	
	Distance to Climb (23.5 - 4.5) 19.0 Naut. Mi.	
	Fuel to Climb (24.5 - 5.0) 19.5 Lbs.	

TIME, FUEL AND DISTANCE TO CLIMB



CRUISE & RANGE DATA CONDITIONS

1. All Cruise and Range Data tables allow for: warmup, taxi, take-off, climb at max. power at the best rate of climb speed (Vy) to cruise altitude; a cruise to destination at the specified power and mixture setting; and a 45-minute fuel reserve at the same altitude and power setting. The data is also based on 64 U.S. gallons of usable fuel, standard atmosphere, and no wind.

2. To obtain the performance shown by the Cruise and Range Data tables on non-standard days, increase or decrease the manifold pressure approximately .4" Hg for each 10^{O}C variation in outside air temperature. Increase manifold pressure for air temperatures above standard and decrease manifold pressure for air temperatures lower than standard.

3. During winter operations when snow and ice are likely to be present on the taxi and runway surfaces the inboard landing gear doors should be removed. Accumulation of ice and snow could prevent landing gear operation. If the inboard landing gear doors have been removed a decrease in cruise speed and range can be expected and should be considered in preflight planning. To be conservative the following figures should be used:

   a. Decrease true airspeed at normal cruise power setting by approximately 5 knots.
   b. Decreased range may be as much as 50 nautical miles for 64 gallon fuel capacity.

CRUISE & RANGE AT ECONOMY CRUISE
SEA LEVEL, 15° C

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	23.5	75	10.8	65.0	180/156	182/158	5:00	780	790
	22.0	70	10.3	61.5	175/152	178/155	5:20	810	826
	21.0	65	9.7	58.0	169/147	172/149	5:42	843	860
	19.5	60	9.2	55.0	163/142	167/145	6:08	864	891
	18.0	55	8.6	51.5	157/136	161/140	6:32	886	917
	14.0	40	7.0	42.0	130/113	138/120	8:20	921	977
2600	24.5	75	10.5	63.0	180/156	182/158	5:12	812	808
	23.0	70	10.0	60.0	175/152	178/155	5:30	843	856
	20.5	60	8.9	53.5	163/142	167/145	6:20	895	921
	19.0	55	8.3	50.0	157/136	161/140	6:45	917	951
	17.5	50	7.8	47.0	150/130	154/134	7:20	938	982
	15.0	40	6.8	40.5	130/113	138/120	8:35	951	1025
2400	27.0	75	10.3	62.5	180/156	182/158	5:20	834	827
	24.0	65	9.2	55.0	169/147	172/149	6:10	895	918
	21.0	55	8.1	48.5	157/136	161/140	7:00	951	977
	17.5	45	7.0	42.0	140/122	147/128	8:10	990	1036
	15.5	39	6.4	38.5	128/111	137/119	9:05	999	1064
2200	27.0	68	9.3	55.5	173/150	176/153	6:00	900	918
	22.5	55	7.8	47.0	157/136	161/140	7:15	986	1015
	21.0	50	7.3	44.0	150/130	154/134	7:30	1019	1050
	19.0	45	6.8	40.5	140/122	147/128	8:10	1079	1082
	17.5	37	5.9	35.5	122/106	133/116	9:25	1110	1125
2000	24.0	53	7.4	44.5	154/134	158/137	7:40	1030	1064
	23.0	50	7.1	42.5	150/130	154/134	8:10	1053	1090
	21.0	45	6.5	39.0	140/122	147/128	8:52	1079	1138
	17.0	36	5.6	33.5	119/103	130/113	10:40	1110	1221

CRUISE & RANGE AT ECONOMY CRUISE
2000 FT, 11°C

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR:MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	23.3	75	10.8	64.6	183/159	186/161	5:00	800	808
	20.6	65	9.7	58.0	171/149	176/153	5:40	849	869
	18.0	55	8.6	51.5	159/138	164/142	6:30	897	923
	14.8	43	7.3	43.5	139/121	146/127	7:50	947	994
2600	24.4	75	10.5	63.0	183/159	186/161	5:10	821	831
	21.6	65	9.4	56.5	172/149	176/153	5:50	869	892
	18.8	55	8.3	50.0	159/138	164/142	6:50	943	970
	15.2	42	6.9	41.5	136/118	145/126	8:20	982	1049
2400	26.8	75	10.3	61.4	183/159	186/161	5:20	847	858
	23.6	65	9.2	55.0	172/149	176/153	6:05	906	930
	20.4	55	8.1	48.5	159/138	164/142	7:00	966	994
	16.0	41	6.6	39.5	134/116	144/125	8:40	1004	1082
2200	25.4	64	8.7	52.4	171/149	175/152	6:20	943	962
	22.2	55	7.8	47.0	159/138	164/142	7:15	1000	1029
	18.7	45	6.8	40.5	142/123	150/130	8:30	1045	1105
	16.5	39	6.1	36.5	129/112	140/122	9:30	1064	1159
2000	22.5	50	7.1	42.5	151/131	157/136	8:05	1058	1099
	20.5	45	6.5	39.0	142/123	150/130	8:50	1086	1148
	17.4	37	5.7	34.0	124/108	136/118	10:20	1115	1218

CRUISE & RANGE AT ECONOMY CRUISE
4000 FT, 7° C

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	23.2	75	10.8	64.6	186/161	189/164	5:00	805	820
	20.5	65	9.7	58.0	175/152	179/155	5:40	861	878
	17.9	55	8.6	51.5	161/140	166/144	6:30	910	936
	14.8	43	7.3	43.5	140/121	148/128	7:45	937	992
2600	24.4	75	10.5	63.0	186/161	189/164	5:10	831	847
	21.5	65	9.4	56.5	175/152	179/155	5:52	891	909
	18.7	55	8.3	50.0	161/140	166/144	6:43	940	967
	15.0	42	6.9	41.5	138/120	146/127	8:30	1020	1079
2400	26.2	74	10.2	60.8	185/161	188/163	5:12	837	847
	23.3	65	9.2	55.0	175/152	179/155	5:57	904	922
	20.2	55	8.1	48.5	161/140	166/144	6:57	973	1000
	15.8	41	6.6	39.5	135/117	145/126	8:40	1013	1091
2200	24.4	62	8.5	51.5	171/148	175/152	6:25	949	975
	22.0	55	7.8	47.0	161/140	166/144	7:10	1003	1032
	18.6	45	6.8	40.5	144/125	151/131	8:28	1058	1109
	16.4	39	6.1	36.5	130/113	140/121	9:28	1069	1145
2000	22.4	50	7.1	42.5	154/134	159/138	8:00	1072	1104
	20.4	45	6.5	39.0	144/125	151/131	8:45	1093	1146
	17.2	37	5.7	34.0	124/108	137/119	10:14	1105	1217

CRUISE & RANGE AT ECONOMY CRUISE
6000 FT, 3°C

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	23.1	75	10.8	64.7	189/164	192/167	5:00	820	835
	20.4	65	9.7	58.0	178/154	181/157	5:40	871	888
	17.8	55	8.6	51.5	164/142	170/148	6:25	911	949
	15.2	45	7.5	45.0	145/126	155/134	7:28	940	1000
2600	24.1	75	10.5	63.0	189/164	192/167	5:10	847	862
	21.3	65	9.4	56.5	178/154	181/157	5:50	898	915
	18.5	55	8.3	50.1	164/142	170/148	6:38	941	981
	15.4	44	7.2	43.0	144/125	152/132	7:50	979	1034
2400	24.4	70	9.7	58.0	184/160	187/162	5:40	906	918
	22.8	65	9.2	55.0	178/154	181/157	6:00	924	942
	19.8	55	8.1	48.6	164/142	170/148	6:50	970	1011
	16.2	43	6.8	40.6	141/122	151/131	8:15	1006	1080
2200	23.6	60	8.3	50.0	171/148	176/153	6:38	981	1014
	21.8	55	7.8	47.1	164/142	170/148	7:10	1017	1060
	20.0	50	7.3	44.1	155/135	162/141	7:40	1035	1081
	17.2	42	6.4	38.5	139/121	150/130	8:50	1068	1148
2000	21.3	47	6.7	40.2	150/130	159/138	8:20	1083	1150
	18.8	41	6.1	36.4	136/118	147/128	9:20	1101	1194

CRUISE & RANGE AT ECONOMY CRUISE
8000 FT, -1° C

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	23.6	75	10.8	64.7	195/169	197/171	5:00	835	850
	21.7	70	10.3	61.6	187/162	191/166	5:15	850	871
	20.4	65	9.7	58.0	181/157	185/161	5:37	881	904
	19.0	60	9.2	55.1	174/151	179/156	6:00	906	936
	17.8	55	8.6	51.5	167/145	173/150	6:27	928	961
	14.8	44	7.4	44.4	146/127	155/135	7:31	954	1014
2600	23.0	71	10.1	60.6	189/164	193/168	5:20	869	890
	21.2	65	9.4	56.6	181/157	185/161	5:48	910	933
	19.8	60	8.8	53.3	174/151	179/156	6:10	931	962
	18.6	55	8.3	50.1	167/145	173/150	6:37	952	985
	17.0	50	7.8	46.8	158/137	165/143	7:05	970	1012
	15.2	43	7.6	45.5	144/125	153/133	7:55	989	1053
2400	22.8	64	9.1	54.4	181/157	185/161	6:04	946	970
	21.3	60	8.6	51.6	174/151	179/156	6:21	958	990
	19.8	55	8.1	48.6	167/145	173/150	6:50	984	1018
	18.2	50	7.5	45.5	158/137	165/143	7:20	1004	1048
	15.5	42	6.7	40.0	141/122	151/131	8:20	1016	1091
2200	22.0	55	7.8	47.1	167/145	173/150	7:05	1020	1055
	20.0	50	7.3	44.1	158/137	165/143	7:40	1050	1096
	16.8	41	6.3	38.0	138/120	150/130	8:54	1068	1157
2000	20.3	45	6.5	39.0	148/129	156/136	8:35	1102	1167
	18.2	40	6.0	35.7	135/117	147/128	9:28	1110	1211

CRUISE & RANGE AT ECONOMY CRUISE
10,000 FT, -5° C

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

					TRUE AIRSPEED MPH/KNOTS		ENDURANCE	RANGE (NAUT MI)	
RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	2740 LBS	2300 LBS	(HR: MIN)	2740 LBS	2300 LBS
2700	21.4	70	10.3	61.5	190/165	195/169	5:15	851	887
	20.2	65	9.7	58.0	184/160	189/164	5:31	877	904
	18.8	60	9.2	55.1	178/155	183/159	5:55	907	940
	17.6	55	8.6	51.5	170/148	176/153	6:20	927	969
	16.3	50	7.7	46.2	161/140	169/147	6:50	944	1004
	15.0	45	7.5	45.0	150/130	160/139	7:25	949	1030
2600	21.1	65	9.4	56.5	184/160	189/164	5:48	910	951
	19.8	60	8.9	53.3	178/155	183/159	6:10	938	980
	18.3	55	8.4	50.1	170/148	176/153	6:35	962	1007
	17.0	50	7.8	46.7	161/140	169/147	7:03	980	1036
	15.3	44	7.2	43.0	149/129	159/138	7:45	988	1069
2400	21.0	60	8.6	51.7	178/155	183/159	6:20	961	1006
	19.5	55	8.1	48.5	170/148	176/153	6:47	908	1037
	18.0	50	7.6	45.5	161/140	169/147	7:18	1076	1073
	16.2	44	7.1	42.5	149/129	159/138	8:01	1025	1106
2200	21.0	51	7.4	44.5	164/142	170/148	7:28	1051	1105
	17.8	44	6.7	39.9	149/129	159/138	8:24	1068	1159
2000									

CRUISE & RANGE AT ECONOMY CRUISE
12,000 FT, -9°

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	19.8	64	9.6	57.5	185/161	191/166	5:40	869	882
	18.8	60	9.2	55.1	180/156	186/162	5:55	898	947
	17.5	55	8.6	51.5	173/150	179/150	6:20	923	977
	16.2	50	7.7	46.2	165/143	171/149	6:45	947	1005
	14.6	44	7.4	44.4	150/130	160/139	7:28	955	1037
2600	19.6	60	8.9	53.3	180/156	186/162	6:10	896	973
	18.2	55	8.4	50.1	173/150	179/156	6:34	959	1011
	16.8	50	7.8	46.7	165/143	171/149	7:00	983	1043
	15.5	45	7.3	43.5	154/134	162/141	7:35	990	1069
	14.8	43	7.1	42.5	149/129	159/138	7:50	990	1081
2400	19.6	56	8.2	49.3	174/151	180/156	6:40	973	1039
	17.9	50	7.6	45.5	165/143	171/149	7:20	1016	1092
	16.4	45	7.0	42.0	154/134	162/141	7:54	1030	1113
	15.2	42	6.7	40.0	145/126	157/136	8:20	1025	1133
2200	19.4	49	7.2	43.0	162/141	170/147	7:40	1059	1126
	18.0	45	6.8	40.5	154/134	162/141	8:10	1080	1151
	17.8	42	6.4	38.5	145/126	157/136	8:35	1081	1180
2000									

CRUISE & RANGE AT ECONOMY CRUISE
14,000 FT, -13° C

MIXTURE SETTING:
Lean mixture in accordance with instructions in Section IV.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	18.4	58	8.9	53.5	180/156	186/162	6:05	912	964
	17.4	55	8.6	51.5	175/152	182/158	6:17	929	986
	16.1	50	7.7	46.2	165/143	175/152	6:42	946	1012
	14.4	44	7.4	44.4	150/130	164/142	7:20	948	1043
2600	18.2	56	8.4	50.6	176/153	184/160	6:30	994	1040
	16.7	50	7.8	46.7	165/143	175/152	7:00	1001	1064
	14.8	43	7.6	45.5	149/129	161/122	7:48	1006	951
2400	18.2	52	7.8	46.6	169/147	177/154	7:05	1000	1068
	16.2	45	7.0	42.0	154/134	165/143	7:45	1016	1116
	15.3	42	6.7	40.0	145/126	160/139	8:10	1016	1138
2200									
2000									

CRUISE & RANGE AT BEST POWER
SEA LEVEL, 15°C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR:MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	30.2	100	18.4	110.5	201/175	203/176	2:35	452	454
	26.2	85	15.8	94.5	188/163	191/166	3:15	530	539
	23.5	75	12.5	75.0	180/156	182/158	4:12	655	663
	21.0	65	11.3	67.5	169/147	172/149	4:45	698	707
	18.0	55	10.0	60.0	157/136	161/140	5:30	748	770
	14.9	43	8.7	52.0	136/118	143/124	6:30	767	806
2600	30.1	94	14.8	89.0	194/169	198/172	2:55	492	501
	27.5	85	13.7	82.0	188/163	191/166	3:15	529	539
	24.7	75	12.3	74.0	180/156	182/158	4:20	675	684
	21.8	65	10.9	65.5	169/147	172/149	4:55	722	732
	19.0	55	9.8	59.0	157/136	161/140	5:45	782	805
	15.1	41	8.2	49.0	132/115	140/122	6:55	795	843
2400	28.7	80	14.8	88.5	184/160	187/162	3:25	546	553
	27.0	75	12.0	72.0	180/156	182/158	4:30	702	711
	24.0	65	10.7	64.0	169/147	172/149	5:05	747	757
	21.0	55	9.5	57.0	157/136	161/140	5:50	793	816
	16.2	41	7.5	45.2	127/110	137/119	7:30	825	892
2200	27.1	68	11.3	67.5	173/150	176/153	5:05	762	777
	22.5	55	9.2	55.0	157/136	161/140	6:05	827	851
	20.8	50	8.6	51.5	150/130	154/134	6:30	845	871
	19.0	45	7.8	47.0	140/122	147/128	7:05	864	906
	17.2	40	7.5	44.8	130/113	138/120	7:40	865	919
2000	24.0	53	8.6	51.5	154/134	158/137	6:30	871	890
	23.0	50	8.3	50.0	150/130	154/134	6:50	888	915
	21.0	45	7.8	46.5	140/122	147/128	7:20	894	938
	17.0	36	6.7	40.0	119/103	130/113	8:33	880	966

CRUISE & RANGE AT BEST POWER
2000 FT, 11°C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR:MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	28.1	93	14.9	89.5	199/173	201/175	3:00	500	500
	26.0	85	13.8	83.0	192/167	195/169	3:10	534	543
	23.3	75	12.6	75.4	183/159	186/161	4:15	669	682
	20.6	65	11.3	67.5	171/149	176/153	4:50	714	730
	18.0	55	10.0	60.0	159/138	164/142	5:25	754	778
	15.5	45	8.8	53.0	142/123	150/130	6:15	766	817
2600	28.1	88	14.1	84.5	195/169	198/172	3:05	526	530
	24.4	75	12.3	74.0	183/159	186/161	4:20	682	695
	21.6	65	11.0	66.0	172/149	176/153	4:55	730	749
	18.8	55	9.8	59.0	159/138	164/142	5:35	773	802
	16.0	44	8.5	51.0	141/123	148/129	6:35	797	851
2400	28.0	79	12.6	75.5	187/162	190/165	3:30	569	575
	26.8	75	12.0	72.0	183/159	186/161	4:25	705	721
	23.6	65	10.7	64.0	172/149	176/153	5:05	758	782
	20.4	55	9.5	57.0	159/138	164/142	5:50	808	837
	16.5	43	8.1	48.5	138/120	147/128	7:00	834	895
2200	25.4	64	10.4	62.5	171/149	175/152	5:20	791	810
	22.2	55	9.2	55.0	159/138	164/142	6:05	834	863
	18.7	45	8.0	48.0	142/123	150/130	6:50	827	917
	17.5	42	7.7	46.0	136/118	126/109	7:20	864	930
2000	22.5	50	8.6	51.5	151/131	157/136	6:30	886	930
	20.5	45	8.0	48.0	142/123	150/130	7:20	897	917
	18.5	40	7.3	44.0	132/115	142/123	7:55	897	977

CRUISE & RANGE AT BEST POWER
4000 FT, 7°C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	26.5	87	14.2	85.0	197/171	200/174	3:10	521	539
	25.8	85	13.8	83.0	196/170	198/172	3:12	539	546
	23.2	75	12.5	75.0	186/161	189/164	4:10	673	692
	20.5	65	11.3	67.5	175/152	179/155	4:45	717	738
	17.9	55	10.0	60.0	161/140	166/144	5:25	752	782
	15.3	45	8.9	53.5	144/125	152/132	6:12	756	818
2600	26.2	82	13.3	79.5	193/168	196/170	3:20	556	566
	24.4	75	12.3	74.0	186/161	189/164	4:20	691	705
	21.5	65	10.9	65.5	175/152	179/155	4:52	734	756
	18.7	55	9.8	59.0	161/140	166/144	5:35	773	808
	15.7	44	8.5	51.0	123/107	130/113	6:30	799	847
2400	26.2	74	11.8	71.0	185/161	188/163	4:35	712	734
	23.3	65	10.7	64.0	175/152	179/155	5:05	756	787
	20.2	55	9.5	57.0	161/140	166/144	5:50	812	838
	16.7	44	8.2	49.0	143/124	150/130	6:50	843	892
2200	24.4	62	10.0	60.0	171/149	176/153	5:30	818	830
	22.0	55	9.2	55.0	161/140	166/144	6:00	838	871
	18.6	45	7.8	47.0	144/125	151/131	7:00	869	923
	17.6	42	7.7	46.0	142/123	147/128	7:20	871	934
2000	22.4	50	8.3	50.0	154/134	159/138	6:45	895	936
	20.4	45	7.8	46.5	144/125	151/131	7:15	908	963
	18.4	40	7.2	43.0	133/116	143/124	7:55	914	986

CRUISE & RANGE AT BEST POWER
6000 FT, 3°C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	24.7	81	13.3	80.0	195/169	200/174	3:20	573	573
	23.1	75	12.5	75.0	189/164	192/167	4:15	682	699
	20.4	65	11.3	67.5	178/155	181/157	4:45	725	747
	17.8	55	10.0	60.0	164/142	169/147	5:25	763	795
	15.2	45	8.9	53.5	145/126	155/134	6:15	782	834
2600	24.1	75	12.3	74.0	189/164	192/167	4:20	691	708
	21.3	65	10.9	65.5	178/154	181/157	4:55	743	765
	18.5	55	9.8	59.0	164/142	170/148	5:35	786	812
	15.8	45	8.6	51.5	145/126	155/135	6:25	810	864
2400	24.4	70	11.3	68.0	184/160	187/162	4:45	743	765
	22.8	65	10.7	64.0	178/154	181/157	5:05	769	795
	19.8	55	9.5	57.0	164/142	170/148	5:45	821	851
	16.5	44	8.0	48.0	143/124	153/133	6:50	847	906
2200	23.6	60	9.8	58.5	171/148	176/153	5:35	821	851
	21.8	55	9.2	55.0	164/142	170/148	6:00	847	882
	20.0	50	8.6	51.5	155/135	162/141	6:20	864	908
	17.6	43	7.8	46.5	141/123	151/131	7:10	878	943
2000	21.2	47	8.0	48.0	150/130	159/138	6:45	908	924
	19.2	42	7.4	44.5	139/121	150/130	7:20	912	986

CRUISE & RANGE AT BEST POWER
8000 FT, -1° C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	23.6	75	12.6	75.5	195/169	197/171	4:10	686	704
	21.7	70	11.9	71.5	187/162	191/166	4:25	708	730
	20.4	65	11.3	67.5	181/157	185/161	4:40	730	756
	19.0	60	10.7	64.0	174/151	177/156	5:00	752	778
	17.8	55	10.1	60.5	167/145	173/150	5:20	769	801
	15.2	45	8.9	53.5	148/129	157/136	6:10	786	839
2600	23.0	71	11.8	71.0	189/164	193/168	4:20	721	738
	21.2	65	11.1	66.5	181/157	185/161	4:50	749	772
	19.8	60	10.4	62.5	174/151	179/156	5:10	773	795
	18.6	55	9.8	59.0	167/145	173/150	5:30	791	821
	17.0	50	9.3	55.5	158/137	165/143	5:50	808	843
	15.6	45	8.7	52.0	148/129	157/136	6:25	815	864
2400	22.8	64	10.6	63.5	181/157	185/161	5:10	784	808
	21.3	60	10.1	60.5	174/151	179/156	5:25	804	830
	19.8	55	9.5	57.0	167/145	173/150	5:45	825	856
	18.2	50	8.9	53.5	158/137	165/143	6:10	841	882
	16.4	44	8.2	49.0	146/127	155/135	6:45	847	908
2200	22.0	55	9.2	55.0	167/145	173/150	5:55	851	886
	20.0	50	8.6	51.5	158/137	165/143	6:25	873	917
	17.5	43	7.8	46.5	144/125	153/133	7:10	880	949
2000	20.3	45	7.8	46.5	148/129	156/136	7:10	917	975
	19.0	42	7.4	44.5	141/122	151/131	7:30	917	989

CRUISE & RANGE AT BEST POWER
10,000 FT, -5° C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	21.4	70	11.9	71.5	190/165	195/169	4:25	715	740
	20.2	65	11.3	67.5	184/160	189/164	4:40	737	766
	18.8	60	10.7	64.0	178/155	183/159	5:00	760	793
	17.6	55	10.0	60.0	170/148	176/153	5:20	778	817
	16.3	50	9.5	57.0	161/140	169/147	5:40	792	836
	15.3	46	9.0	54.0	153/133	162/141	6:00	793	849
2600	21.1	65	11.0	66.0	184/160	189/164	4:50	756	782
	19.8	60	10.4	62.5	178/155	183/159	5:10	778	811
	18.3	55	9.8	59.0	170/148	176/153	5:25	798	838
	17.0	50	9.2	55.0	161/140	169/147	5:40	812	858
	15.5	46	8.8	52.5	153/133	162/141	6:05	819	876
2400	21.0	60	10.1	60.5	178/155	183/159	5:25	810	843
	19.5	55	9.5	57.0	170/148	176/153	5:45	832	871
	18.0	50	8.8	53.0	161/140	169/147	6:05	850	897
	16.8	46	8.4	50.5	153/133	162/141	6:30	858	912
2200	21.0	53	8.9	53.5	166/144	173/150	6:08	877	912
	19.8	50	8.6	51.5	162/141	169/147	6:12	884	928
	18.4	46	8.2	49.0	153/133	162/141	6:40	886	949
2000									

CRUISE & RANGE AT BEST POWER
12,000 FT, -9°C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	19.8	64	11.2	67.0	185/161	191/166	4:50	738	782
	18.8	60	10.7	64.0	180/156	186/162	5:00	756	798
	17.5	55	10.1	60.5	173/150	179/156	5:20	778	819
	16.2	50	9.5	57.0	165/143	171/149	5:40	791	843
	15.2	46	9.0	54.0	156/136	165/143	6:00	801	856
2600	19.6	60	10.4	62.5	180/156	186/162	5:10	778	817
	18.2	55	9.8	59.0	173/150	179/156	5:30	799	843
	16.8	50	9.3	55.5	165/143	171/149	5:50	815	864
	15.7	46	8.8	52.5	156/136	165/143	6:10	825	883
2400	19.6	56	9.6	57.5	174/151	180/156	5:40	825	899
	17.9	50	8.8	53.0	165/143	171/149	6:10	856	905
	16.4	45	8.3	49.5	154/134	162/141	6:35	863	926
2200	19.6	50	8.6	51.5	164/142	172/149	6:15	879	930
	18.0	45	8.0	48.0	154/131	162/141	6:50	893	960
2000									

CRUISE & RANGE AT BEST POWER
14,000 FT, -13°C

MIXTURE SETTING:
1. Use FULL RICH mixture above 75% power. 2. Lean mixture in accordance with instructions in Section IV at 75% power and below.

RPM	MAN PRES (IN. HG)	% BPH	FUEL (GAL/HR)	FUEL (LBS/HR)	TRUE AIRSPEED MPH/KNOTS 2740 LBS	TRUE AIRSPEED MPH/KNOTS 2300 LBS	ENDURANCE (HR: MIN)	RANGE (NAUT MI) 2740 LBS	RANGE (NAUT MI) 2300 LBS
2700	18.4	58	11.0	66.0	179/156	187/162	5:10	772	812
	17.4	55	10.1	60.5	174/151	182/158	5:15	782	825
	16.1	50	9.5	57.0	165/143	174/151	5:40	791	850
	15.6	48	9.3	55.5	160/139	171/149	5:50	792	860
2600	18.2	56	9.9	59.5	176/153	184/160	5:25	799	851
	16.7	50	9.2	55.0	165/143	174/151	5:50	812	873
	15.8	47	8.8	53.0	158/137	169/147	6:05	817	885
2400	18.2	52	9.1	54.5	169/147	177/154	5:55	847	902
	17.3	49	8.8	52.5	163/142	172/149	6:10	851	917
	16.4	46	8.4	50.5	156/136	167/145	6:30	853	930
2200									
2000									

NORMAL LANDING DISTANCES

ASSOCIATED CONDITIONS:

POWER--------------THROTTLE CLOSED
LANDING GEAR-------DOWN
WING FLAPS--------- FULL DOWN (33°)
WEIGHT--------------2740 LBS.

RUNWAY - PAVED, LEVEL, DRY SURFACE
APPROACH SPEED AT 50 FT - 81 MPH (71 KTS.) IAS

Wind Component Down Runway Knots	OAT °C	PRESSURE ALTITUDE Sea Level Ground Roll Feet	Sea Level Total Over 50 Ft. Obstacle Feet	2000 FT. Ground Roll Feet	2000 FT. Total Over 50 Ft. Obstacle Feet	4000 FT. Ground Roll Feet	4000 FT. Total Over 50 Ft. Obstacle Feet	6000 FT. Ground Roll Feet	6000 FT. Total Over 50 Ft. Obstacle Feet	8000 FT. Ground Roll Feet	8000 FT. Total Over 50Ft. Obstacle Feet
0	-20	676	1805	728	1901	783	2018	844	2145	911	2283
	-10	703	1851	756	1961	814	2082	878	2214	947	2358
	0	730	1906	785	2021	845	2147	911	2283	983	2433
	10	757	1962	814	2081	876	2211	944	2353	1019	2508
	20	783	2018	842	2141	907	2276	976	2423	1055	2583
	30	810	2074	871	2201	938	2340	1011	2492	1090	2658
	40	837	2129	900	2261	969	2405	1044	2562	1126	2733
10	-20	599	1587	648	1688	700	1800	757	1922	821	2055
	-10	625	1641	674	1746	729	1862	789	1988	855	2126
	0	650	1693	702	1804	758	1923	821	2054	889	2198
	10	675	1747	729	1861	788	1986	852	2121	923	2270
	20	700	1800	755	1917	817	2047	882	2188	957	2341
	30	725	1854	783	1976	846	2109	916	2255	991	2414
	40	751	1907	810	2033	876	2172	947	2322	1024	2485
20	-20	535	1392	581	1489	630	1596	684	1712	743	1839
	-10	559	1443	606	1544	657	1655	714	1776	776	1908
	0	583	1494	631	1598	685	1714	744	1839	808	1976
	10	606	1544	657	1653	712	1773	773	1903	840	2045
	20	630	1596	682	1708	740	1832	802	1968	873	2114
	30	653	1647	708	1764	768	1891	833	2031	905	2184
	40	677	1697	734	1819	795	1951	863	2095	937	2253

NOTE: Maximum demonstrated crosswind velocity is 12 MPH (11 Knots).

MAXIMUM PERFORMANCE LANDING DISTANCES

POWER ---------------- THROTTLE CLOSED
LANDING GEAR -------- DOWN
WING FLAPS ----------- FULL DOWN (33^{o})
WEIGHT ---------------- 2740 LBS.

RUNWAY - PAVED, LEVEL, DRY SURFACE
APPROACH SPEED AT 50 FT. - 75 MPH (65 KTS) IAS

Wind Component Down Runway Knots	OAT °C	PRESSURE ALTITUDE: Sea Level Ground Roll Feet	Sea Level Total Over 50 Ft. Obstacle Feet	2000 FT. Ground Roll Feet	2000 FT. Total Over 50 Ft. Obstacle Feet	4000 FT. Ground Roll Feet	4000 FT. Total Over 50 Ft. Obstacle Feet	6000 FT. Ground Roll Feet	6000 FT. Total Over 50 Ft. Obstacle Feet	8000 FT. Ground Roll Feet	8000 FT. Total Over 50 Ft. Obstacle Feet
0	-20	676	1465	728	1540	783	1632	844	1731	911	1840
	-10	703	1501	756	1588	814	1682	878	1785	947	1899
	0	730	1545	785	1634	845	1732	911	1840	983	1957
	10	757	1588	814	1681	876	1783	944	1894	1019	2016
	20	783	1632	842	1728	907	1834	976	1949	1055	2075
	30	810	1675	871	1775	938	1884	1011	2003	1090	2133
	40	837	1719	900	1822	969	1935	1044	2058	1126	2192
10	-20	599	1285	648	1364	700	1452	757	1547	821	1652
	-10	625	1328	674	1410	729	1500	789	1598	855	1708
	0	650	1369	702	1454	758	1548	821	1652	889	1764
	10	675	1410	729	1499	788	1597	852	1704	923	1821
	20	700	1452	755	1544	817	1646	882	1756	957	1877
	30	725	1493	783	1590	846	1694	916	1809	991	1934
	40	751	1536	810	1634	876	1743	947	1861	1024	1989
20	-20	535	1125	581	1202	630	1286	684	1377	743	1476
	-10	559	1166	606	1242	657	1332	714	1426	776	1531
	0	583	1206	631	1287	685	1378	744	1477	808	1584
	10	606	1245	657	1331	712	1424	773	1527	840	1638
	20	630	1286	682	1384	740	1471	802	1577	873	1693
	30	653	1325	708	1417	768	1518	833	1627	905	1747
	40	677	1365	734	1461	795	1563	863	1678	937	1801

NOTE: Maximum demonstrated crosswind velocity is 12 MPH (11 Knots).

SECTION VI.

WEIGHT & BALANCE

TABLE OF CONTENTS

NOTE:

The empty weight, center of gravity, and equipment list for the airplane as delivered from Mooney Aircraft Corporation is contained in this section. The use of this section is valid for use with the airplane identified below when approved by Mooney Aircraft Corporation.

Model - M20J

Aircraft Serial No. 24-0545

Aircraft Registration No. HB-DFF

4-25-78

Mooney Aircraft Corp. Approval Signature & Date

INTRODUCTION

This section describes the procedure for calculating loaded aircraft weight and moment for various flight operations. In addition, procedures are provided for calculating the empty weight and moment of the aircraft when the removal or addition of equipment results in changes to the empty weight and center of gravity. A comprehensive list of all Mooney equipment available for this airplane is included in this section. Only those items checked (X) were installed at Mooney and are included in the empty weight-and-balance data.

The FAA charges you, the aircraft owner and pilot, with the responsibility of properly loading your aircraft for safe flight. Data presented in this section will enable you to carry out this responsibility and insure that your airplane is loaded to operate within the prescribed weight and center-of-gravity limitations.

At the time of delivery, Mooney Aircraft Corporation provides the empty weight and center of gravity data for the computation of individual loadings. (The empty weight and C.G. (gear extended) as delivered from the factory is tabulated on page 6-5 when this manual is supplied with the aircraft from the factory.)

FAA regulations also require that any change in the original equipment affecting the empty weight and center of gravity be recorded in the Aircraft Log Book. A convenient form for maintaining a permanent record of all such changes is provided on page 6-5. This form, if properly maintained, will enable you to determine the current weight-and-balance status of the airplane for load scheduling. The weight-and-balance data entered as your aircraft left the factory, plus the record you maintain on page 6-5, is all of the data needed to compute loading schedules.

The maximum certificated gross weight for the Model M20J under all operating conditions is 2740 pounds. Maximum useful load is determined by subtracting the corrected aircraft empty weight from its maximum gross weight. The aircraft must be operated strictly within the limits of the Center-of-Gravity Moment Envelope shown on page 6-8.

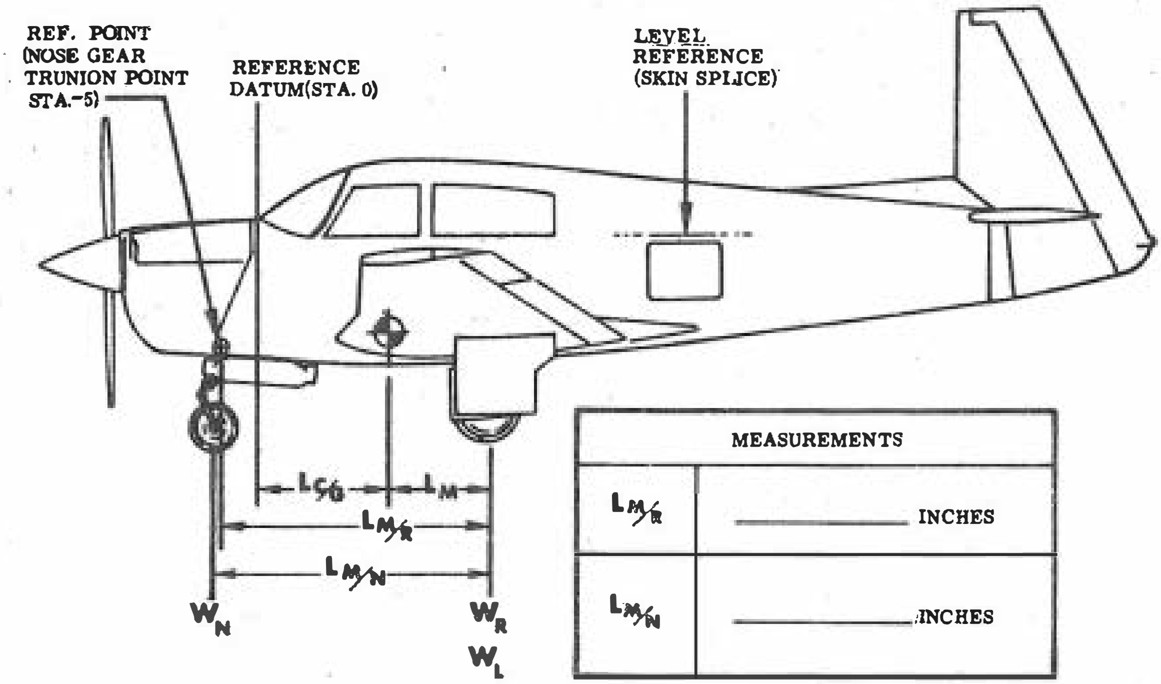
AIRPLANE WEIGHING PROCEDURE

(A) LEVELING: Place a spirit level on the skin line above the tailcone access door when leveling the aircraft longitudinally. Level the aircraft by increasing or decreasing air pressure in the nose wheel tire.

(B) WEIGHING: To weigh the aircraft, select a level work area and:

1. Check for installation of all equipment as listed in the Weight & Balance Record Equipment List.
2. Ground aircraft and defuel tanks as follows:
   a. Disconnect fuel line at electric boost pump outlet fitting.
   b. Connect to output fitting a flexible line that will reach fuel receptacle.
   c. Turn fuel selector valve to the tank to be drained, and remove filler cap from fuel filler port.
   d. Turn on boost pump until tank is empty. Repeat steps c. and d. to drain the other tank.
   e. Replace 1.25 gal. fuel @ 6.0 lb./gal. into each tank (unusable fuel).
   f. Replace filler caps.
3. Drain engine oil sump.
4. Position front seats in full forward position.
5. Position flaps in full up position.
6. Position a 2000-pound capacity scale under each of the three wheels.
7. Level aircraft as previously described making certain nose wheel is centered.
8. Weigh the aircraft and deduct any tare from each reading.
9. Find reference point by dropping a plumb bob from center of nose gear trunnion (retracting pivot axis) to the floor. Mark the point of intersection.
10. Locate center line of main wheel axles in the same manner.

11. Measure the horizontal distance from the reference point to main wheel axle center line. Measure horizontal distance from center line of nose wheel axle to center line of main wheel axles.
12. Record weights and measurements, and compute basic weight and CG as follows:



MEASUREMENTS	
$L_{M/R}$	________ INCHES
$L_{M/N}$	________ INCHES

SCALE POSITION AND SYMBOL	SCALE READING	TARE	NET WEIGHT
Nose Wheel (W_N)			
Right Main Wheel (W_R)			
Left Main Wheel (W_L)			
Empty Weight, as Weighed (W_T)			

a. CG Forward of Main Wheels:

____ LBS.	x	____ IN.	÷	____ LBS.	=	____ IN.
Weight of Nose		Distance Between Main and Nose Wheel Axle Centers		Total Weight of Aircraft		CG Forward of Main Wheels
(W_N)		($L_{M/N}$)		(W_T)		(L_M)

b. CG Aft of Datum (Station 0):

____ IN.	-	5 IN.	-	____ IN.	=	____ IN.
Distance from Center Nose Gear Trunion to Center of Main Wheel Axles (Horizontal)		Distance from Nose Gear Trunion to Datum		Result of Computation Above		CG (FUS. STA.) Distance Aft of Datum. (Empty Weight CG)
($L_{M/R}$)		Constant		(L_M)		(L_{CG})

OWNERS WEIGHT AND BALANCE RECORD

(ENTER BELOW ALL WEIGHT CHANGE DATA FROM AIRCRAFT LOG BOOK)

AIRPLANE MODEL - M20J | SERIAL NUMBER 24-0545 | FAA REGISTRATION NO. HB-DFF

DATE	DESCRIPTION OF MODIFICATION	WEIGHT CHANGE ADDED (+) Wt. (Pounds)	ADDED (+) Arm (Inches)	REMOVED (-) Wt. (Pounds)	REMOVED (-) Arm (Inches)	RUNNING EMPTY WEIGHT Wt. (Pounds)	Moment /1000	Arm (Inches)	Useful Load
4-25-78	EMPTY WEIGHT AS DELIVERED(W_T)	—	—	—	—	1705	75.88	44.5	1035
14.-11.78	EL. Trimm + KNS 80	11	43.9	—	—	1716	76.36	44.5	1024
16.8.79	KY-197/KA-134/Ant/Wir.	6.3	39.9	—	—	1722.3	76.61	44.48	1017.7
25.4.83	Intercom SPA400	0.5	18.7	--	--	1722.8	76.62	44.5	1017.2
26.3.90	S-TEC PSS-60	18.2	88.78	3.7	103.2	1737.3	77.85	44.81	1002.7
20.01.94	GPS Trimble TNL-1000DC	3.1	29.58	---	---	1740.40	77.88	44.75	999.6
14.2.07	Avionics change (inst. of GNS 430)	3.1	17.03	14.6	17.75	1733.90	77.76	44.85	1004.1
17.7.09	Avionics Mod. (inst. SL30, GTX328, HE4a)	10.2	38.55	13.6	41.20	1730.50	77.65	44.87	1009.5

CH.145.0181

LOADING CALCULATION PROCEDURE

Proper loading of the aircraft is essential for maximum flight performance and safety. This section will assist you in determining whether the aircraft loading schedule is within the approved weight and center-of-gravity limits.

To figure an actual loading problem for your aircraft, proceed as follows:

Step 1. Refer to the latest entry on page 6-5 for the current empty weight and moment.
NOTE: Since the engine oil is normally kept at the full level, use the oil weight and moment figures shown in the sample problems as constants in calculating all loading problems.

Step 2. Note the pilot's weight and the position his seat will occupy in flight. Find this weight on the left scale of the Loading Computation Graph (page 6-7) and cross the graph horizontally to the point representing the pilot's seat position between the FWD and AFT position lines on the graph for #1 and #2 seats. When this point is located, drop down to the bottom scale to find the value of the moment/1000 due to the pilot's weight and seat position.

Repeat the procedure for the copilot and enter these weights and moment/1000 values in the proper subcolumns in the Problem Form on page 6-7.

Step 3. Proceed as in Step 2 to account for the passengers in seats 3 and 4. Enter the weight and value of moment/1000 in the proper columns.

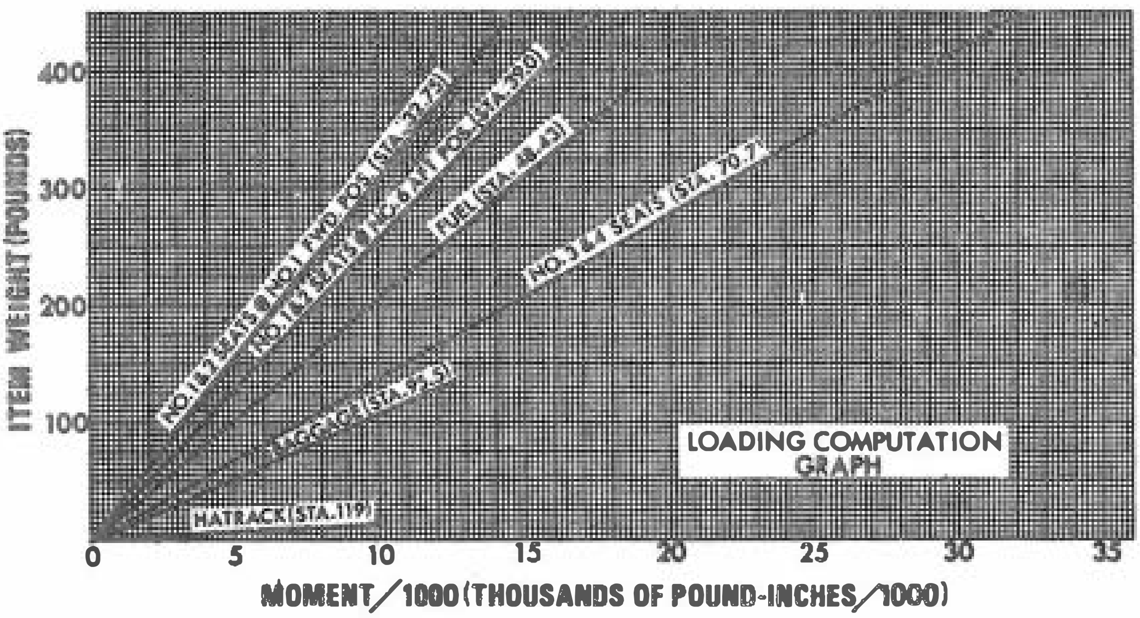
Step 4. Again proceed as in Step 2 to account for the amount of fuel carried, and enter the weight and moment/1000 values in the proper columns.

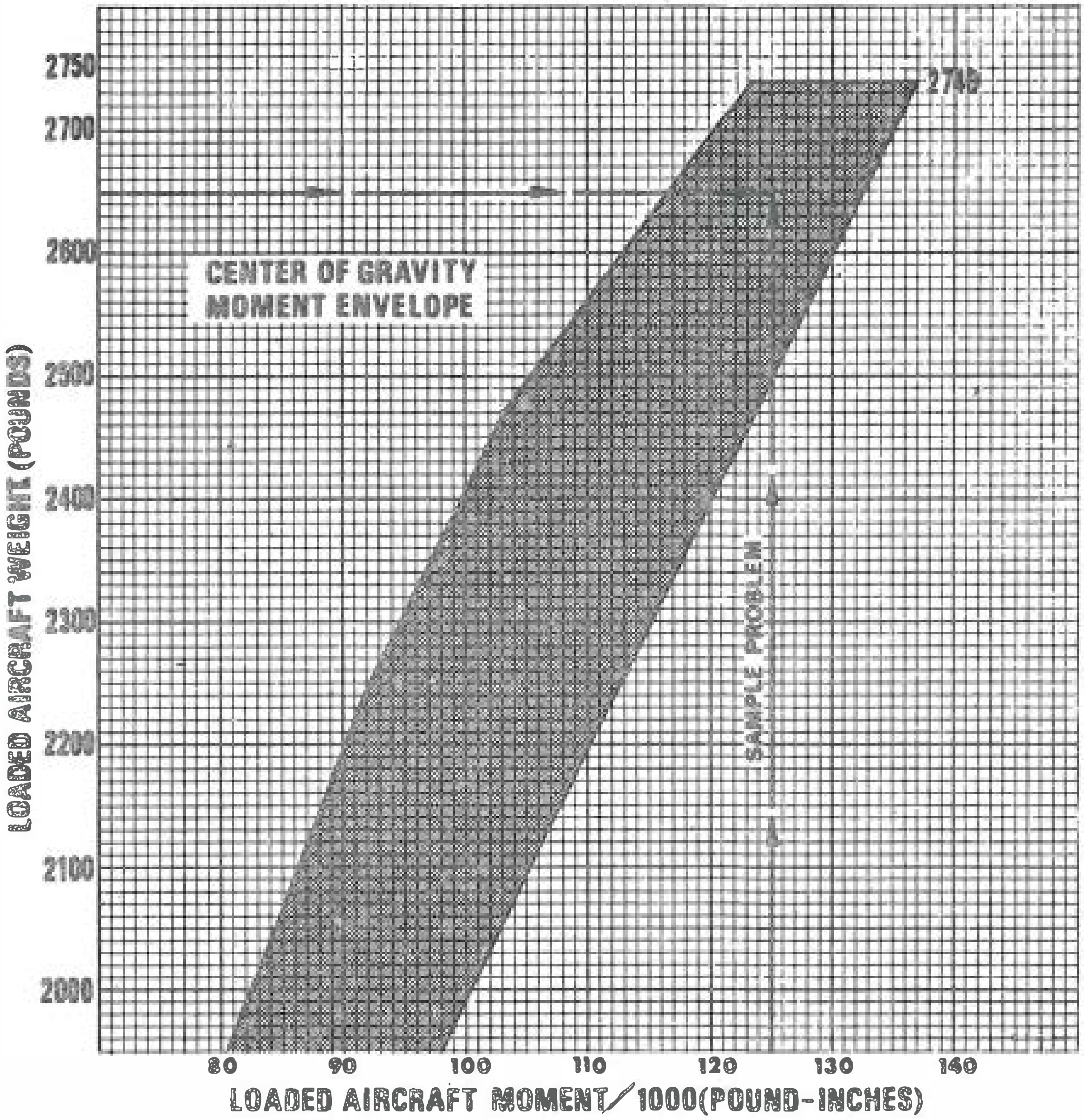
PROBLEM FORM

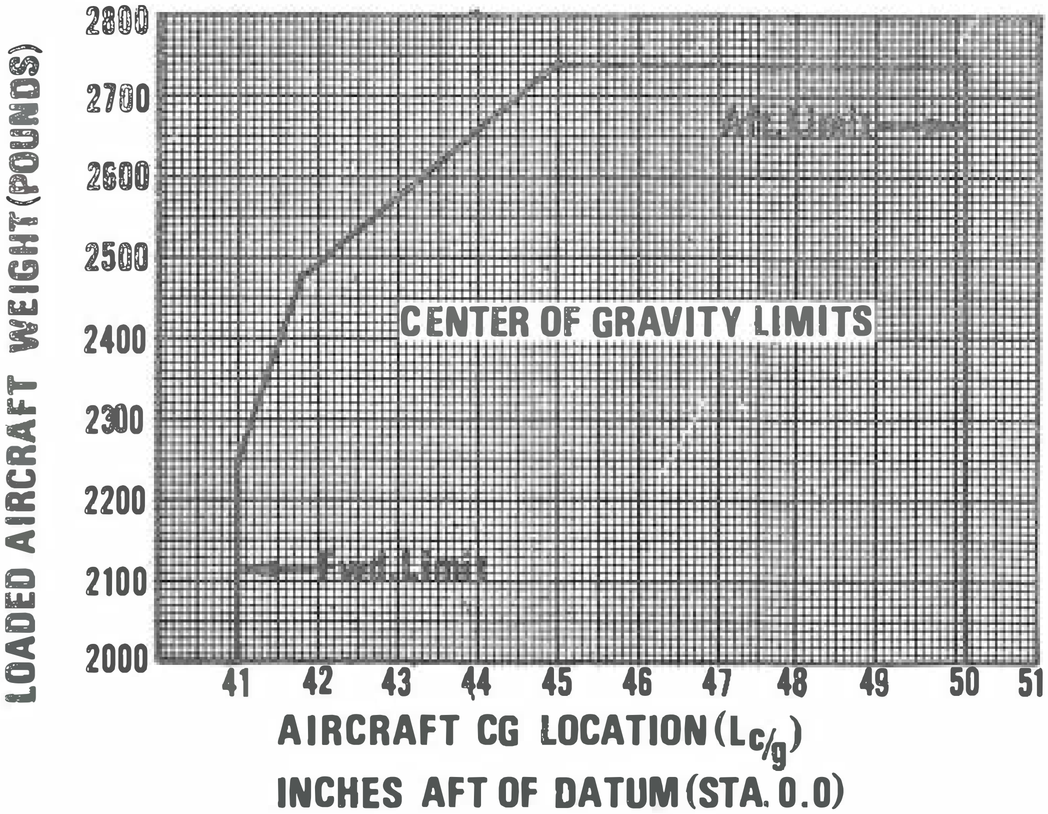
FAA REGISTRATION NO. ______________ M20J SERIAL NO. __________

Step	ITEM	Sample Problem Pilot & Two Pass.		Your Problem	
		Weight (LBS)	Moment (LB-INS. /1000)	Weight (LBS)	Moment (LB-INS. /1000)
1	Aircraft Basic Empty Weight, W_T (From Page 6-5) **Includes Full Oil** Oil --- 8 QT. @ 1.875 LBS/QT (Sta - 11.5) (Sump assumed full for all flights)	**1710.0**	**75.26**		
2	Pilot Seat (#1)*	170.0	6.0 (2nd Pos.)		
	Copilot Seat (#2)*	170.0	5.8 (Fwd. Pos.)		
3	Left Rear Seat (#3)	170.0	12.00		
	Right Rear Seat (#4)				
4	Fuel (Max. Usable 64 Gal. 384 LBS @ sta 48.43)	312.0	15.11		
5	Baggage (Max. 120 LBS @ Sta 95.5)	110.0	10.23		
	Hat Rack (Max. 10 LBS @ Sta 119.0)	3.0	.36		
6	Loaded Aircraft Weight	2645.0			
	Total Moment/1000		124.76		
7	Refer to Page 6-8, Center-of-Gravity Envelope, to determine whether your aircraft loading is acceptable.				

*Obtain the moment/1000 value for each seat position (FWD, MID, or AFT.) from loading computation graph below.




2750
2700
2600
2500
2400
2300
2200
2100
2000
2740
CENTER OF GRAVITY
MOMENT ENVELOPE
SAMPLE PROBLEM
LOADED AIRCRAFT WEIGHT (POUNDS)
80
90
100
110
120
130
140
LOADED AIRCRAFT MOMENT/1000(POUND-INCHES)

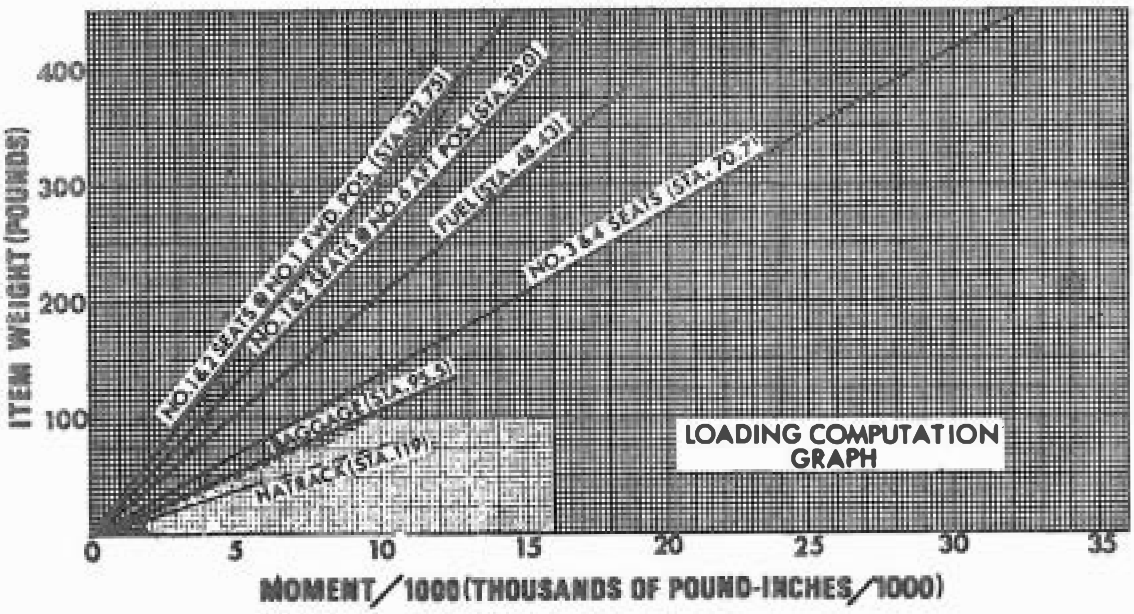

2800
2700
2600
2500
2400
2300
2200
2100
2000
Aft Limit
CENTER OF GRAVITY LIMITS
Fwd Limit
LOADED AIRCRAFT WEIGHT (POUNDS)
41
42
43
44
45
46
47
48
49
50
51
AIRCRAFT CG LOCATION ($L_{c/g}$)
INCHES AFT OF DATUM (STA. 0.0)

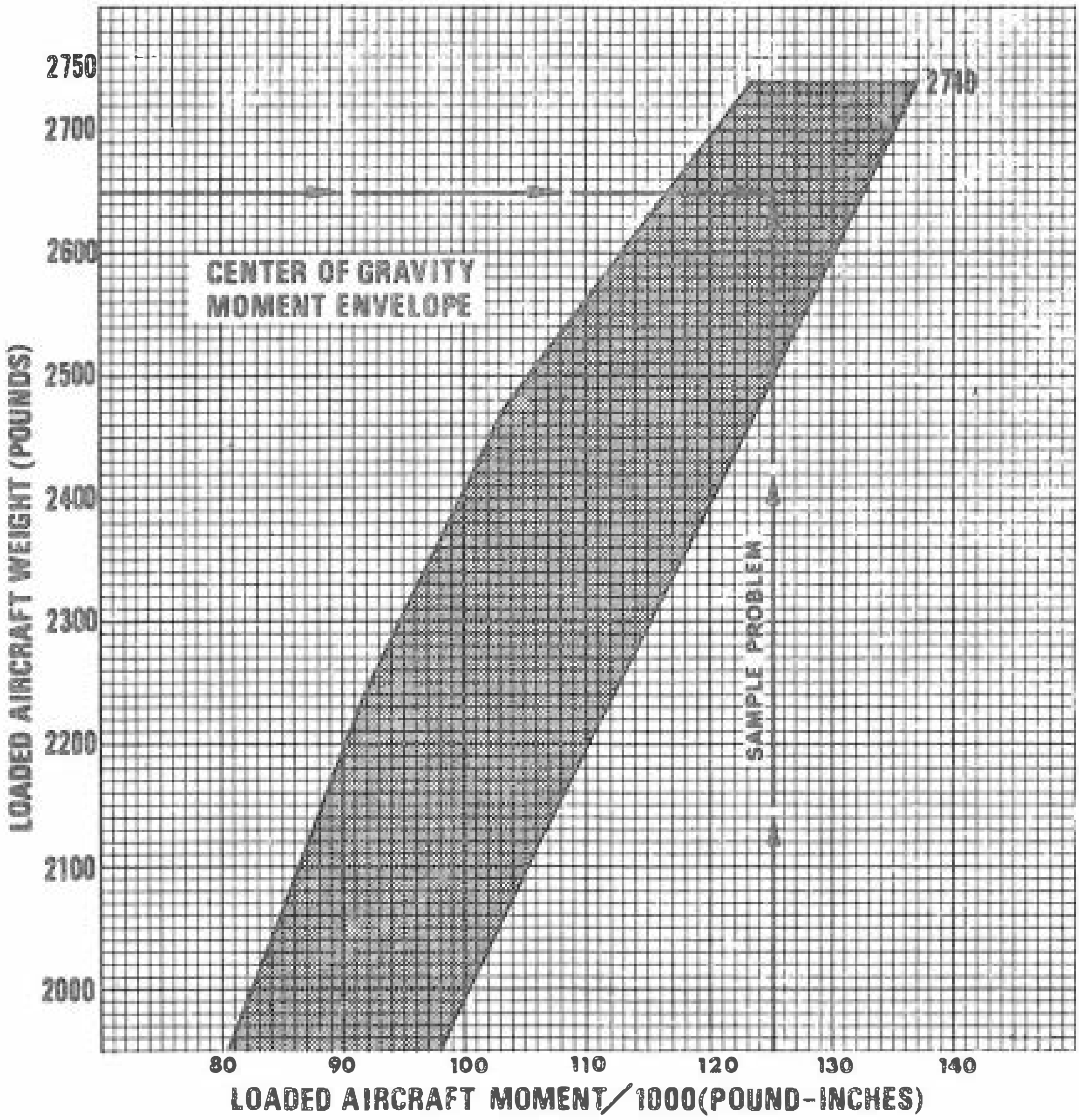
PROBLEM FORM

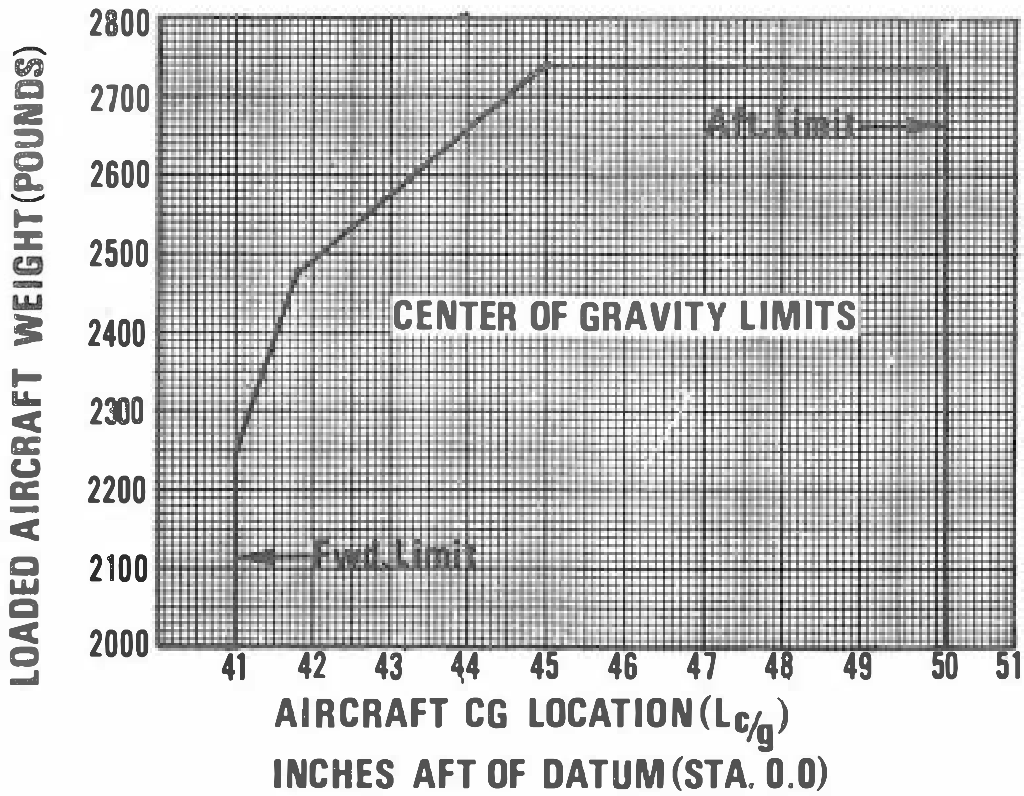
FAA REGISTRATION NO. ______________ M20J SERIAL NO. __________

Step	ITEM	Sample Problem Pilot & Two Pass.		Your Problem	
		Weight (LBS)	Moment (LB-INS. / 1000)	Weight (LBS)	Moment (LB-INS. /1000)
1	Aircraft Basic Empty Weight, W_T (From Page 6-5) **Includes Full Oil** Oil --- 8 QT. @ 1.875 LBS/QT (Sta - 11.5) (Sump assumed full for all flights)	**1710.0**	**75.26**		
2	Pilot Seat (#1)*	170.0	6.0 (2nd Pos.)		
	Copilot Seat (#2)*	170.0	5.8 (Fwd. Pos.)		
3	Left Rear Seat (#3)	170.0	12.00		
	Right Rear Seat (#4)				
4	Fuel (Max. Usable 64 Gal. 384 LBS @ sta 48.43)	312.0	15.11		
5	Baggage (Max. 120 LBS @ Sta 95.5)	110.0	10.23		
	Hat Rack (Max. 10 LBS @ Sta 119.0)	3.0	.36		
6	Loaded Aircraft Weight	2645.0	X		X
	Total Moment/1000	X	124.76	X	
7	Refer to Page 6-8, Center-of-Gravity Envelope, to determine whether your aircraft loading is acceptable.				

*Obtain the moment/1000 value for each seat position (FWD, MID, or AFT.) from loading computation graph below.




2750
2700
2600
2500
2400
2300
2200
2100
2000
2740
CENTER OF GRAVITY
MOMENT ENVELOPE
SAMPLE PROBLEM
80
90
100
110
120
130
140
LOADED AIRCRAFT WEIGHT (POUNDS)
LOADED AIRCRAFT MOMENT/1000(POUND-INCHES)


2800
2700
2600
2500
2400
2300
2200
2100
2000
Aft.Limit
CENTER OF GRAVITY LIMITS
Fwd.Limit
41
42
43
44
45
46
47
48
49
50
51
LOADED AIRCRAFT WEIGHT (POUNDS)
AIRCRAFT CG LOCATION ($L_{c/g}$)
INCHES AFT OF DATUM (STA. 0.0)

Step 5. Once more proceed as in Step 2 to account for the baggage to be carried and enter the figures in the proper columns.

Step 6. Total the weight columns. This total must be 2740 pounds or less. Total the Moment/1000 column. Do not forget to subtract negative numbers.

Step 7. Refer to the Center-of-Gravity Moment Envelope (page 6-8). Locate the loaded weight of your airplane on the left scale of the graph and trace a line horizontally to the right. Locate the total moment/1000 value for your airplane on the bottom scale of the graph and trace a line vertically above this point until the horizontal line for weight is intersected. If the point of intersection is within the shaded area, your aircraft loading is acceptable. If the point of intersection falls outside the shaded area, you must rearrange the load before takeoff.

EQUIPMENT LIST

The following Equipment List is a listing of all items approved at the time of publication for the Mooney M20J.

Only those items having an X in the "Mark If Installed" column and dated were installed at Mooney.

If additional equipment is to be installed it must be done in accordance with the reference drawing or a separate FAA approval.

NOTE

Positive arms are distances aft of the airplane datum. Negative arms are distances forward of the airplane datum.

Asterisks (*) after the item weight and arm indicate complete assembly installations. Some major components of the assembly are listed and indented on the lines following. The summation of the major components will not necessarily equal the complete assembly installation.

EQUIPMENT LIST

MO	4			
DAY	25			
YEAR	78			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	A. Powerplant and Accessories							
1A	Engine, Lycoming IO360-A3B6D (includes Starter, Prestolite 60 Amp Alternator, and Oil Filter)	600363-505	330.00*	-15.76*	X			
2A	Oil Radiator (Stewart Warner)	620016-501	3.00	-3.75	X			
3A	Valve, Oil Quick Drain (Net Change)	BJ1000AH4	0.00	-14.00	X			
4A	Propeller - Constant Speed (McCauley B2D34C214/90DHB-16E)	680031-505	49.50	-35.50	X			
5A	Governor, Propeller (McCauley C290D5/T17)	660115-503	2.75	-1.40	X			

IPMENT LIST

	MO	DAY	YEAR
1	4	25	78
2			
3			
4			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	A. Powerplant and Accessories cont.							
6A	Spinner Installation	680031-501	4.80	-35.00	X	✓		
7A	Induction Air Filter (Donaldson)	P-13-0234	1.00	-25.50	X	✓		

EQUIPMENT LIST

	4			
MO	4			
DAY	25			
YEAR	78			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	B. Electrical System							
1B	Battery 35 Amp Hr.	800330-000	28.10	110.80	X	✓		
2B	Regulator (Oeco)	800330-000	1.44	+4.00	X	✓		
3B	Heated Pitot Installation	820252-501	.70	+38.00	X	✓		
4B	Aux. Power Receptacle Instl	950086-509	2.60	111.00	X	✓		
5B	Belly Strobe Light Instl	950196-505	3.57	113.30				
6B	Rotating Beacon Installation	800331-000	1.68	168.00	X	✓		
7B	Cigarette Lighter	800330-000	.17	+19.50	X	✓		
8B	Fuel Pump	4140-00-19A	1.91	7.50	X	✓		
9B	Stall Warning Indicator (Mallory)	800330-000	1.00	+50.00	X	✓		
10B	Gear Warning Indicator (Mallory)	800330-000	1.00	+50.00	X	✓		
11B	Wingtip Strobe Light Instl	[illegible]330-000	1.54	+53.00	V	✓		

EQUIPMENT LIST

MO	4				
DAY	25				
YEAR	78				

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
1C	Two Main Wheel & Brake Assys (6.00.5)	Cleveland 20-86	13.72*	66.9	X	✓		
	Wheel Assy (2)	Cleveland 40-86	11.00					
	Brake Assy (2)	Cleveland 30-56A	2.72					
2C	Nose Wheel Assy (5.00.5)	Cleveland 40-87	2.60	-4.2	X	✓		
3C	Two Main Wheel Tire Assys		18.40	66.9	X	✓		
	(6-Ply Rating Tires, 6.00.6,							
	Type III, with regular tubes)							
4C	Nose Wheel Tire Assy		7.00	-4.2	X	✓		
	(6-ply rating tire, 5.00.5							
	Type III, with regular tube)							

EQUIPMENT LIST

MO	4			
DAY	25			
YEAR	78			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING OR PART NO.	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	D. Instruments							
1D	Attitude Gyro	820192-501	2.28	+17.50				
2D	Directional Gyro	820203-000	2.44	+16.82				
3D	Clock-Electric	CA7212	.32	+19.60	X	✓		
4D	Gage OAT/EGT	IFR-11A	.54	+18.50	X	✓		
5D	Indicator - Vertical Speed	UI-70000	.89	+18.50	X	✓		
6D	Turn Coordinator	2900-1	2.36	+16.50	X	✓		
7D								
8D	Manifold Press.	660063-503	1.00	+18.48	X	✓		
9D	Altimeter	12003	.95	+18.70	X	✓		
10D	Airspeed Indicator	820216-505	.66	+18.80				
11D	Magnetic Compass	820230-501	.75	+23.00	X	✓		

EQUIPMENT LIST

MO	4			
DAY	25			
YEAR	78			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
12D	Hour Meter Installation	950229-501	.25	18.5				
13D	Tachometer	660011-505	.63	+18.95	x	✓		
14D	Alternate Static Air Source	820284-503	.25	18.5	X	✓		

EQUIPMENT LIST

MO	4			
DAY	25			
YEAR	78			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	E. Vacuum System							
1E	Vacuum System Instl	860052-501	5.35	-2.35	X	✓		
	Vacuum Pump (Airborne)	200CC or 211CC	2.50	-3.00				

EQUIPMENT LIST

				MO	4			
				DAY	25			
				YEAR	78			
ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	F. Cabin Accommodations							
1F	Sun Visors	950234-501	1.0	+33.00	X	✓		
2F	Shoulder Harness, Front (Set of two)	950111-1	1.0	+53.00				
3F	Brake Instl, Dual	950021-505	3.00	+15.0				
4F	Fire Extinguisher Instl		5.25	+50.5				
5F	Curtains	950193-1	2.9	+64.00				
6F	Belt Assy, Rear Occupant Lap (2)	140166-505	2.0	+71.00	X	✓		
7F	Belt Assy, Front Occupant Lap (2)	140166-503	2.0	+35.00	X	✓		
8F	Headrest Assy	130272-501	1.22*	+45.00*				
	Headrest Mount Bar	950192-000	.70	+45.00				
9F	Ambulance Kit	950088-001	---	---				

EQUIPMENT LIST

MO	4	19.		
DAY	25	II.		
YEAR	78	81.		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	G. Avionics & Autopilots							
1G	True Airspeed Ind.	820308	.66	+18.80	X	✓		
2G	~~Narco ELT 10~~	~~810081~~ AAL 0236 H. Michel FOCA 1386	~~2.0~~	~~+121.0~~		X		
3G	Broad Band Antenna	810081	1.0	+59.0	X			
4G	~~King KT-76 Transponder~~	~~810081~~ AAL 0236 H. Michel FOCA 1386	~~3.0~~	~~+10.26~~	X	✓		
	COM INSTALLATIONS							
5G	~~King KX-170B w/KI-208~~	~~810081~~ AAL 0236 H. Michel FOCA 1386	~~3.25~~	~~14.15~~	X			
6G	King KR-86 ADF	810081	7.05	+43.33	X	✓		
7G	Century IIB	830123	9.52		X	✓		
8G	~~Mitchell EL.Trimm~~	~~830123~~	~~2.7~~	~~135.0~~	X			
9G	~~King KNS 80 / KI 206 (NAV Syst.)~~	9.3.07 AVIONITEC AG CH.145.0181	~~8.3~~	~~14.29~~	X			

EQUIPMENT LIST

MO	4	9	4	01
DAY	25	11	25	20
YEAR	78	79	83	94

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	G. Avionics & Autopilots cont...							
~~10G~~	~~King KY-197 VHF COM 2~~	AVIONITEC AG CH.145.0181	~~3.2~~	~~15.25~~		~~X~~		
11G	King KA-134 Audio Amplifier		0.8	17.5		X	LTA 186	
12G	Mooney VHF Antenne M7002		1.0	163.0		X		
13G	Wiring		1.3	19.6		X		
14G	Intercom Installation	Sigtronics	0.5	18.7			X	
~~15G~~	~~GPS Trimble TNL-1000DC Receiver/Display~~	AVIONITEC AG	~~3.1~~	~~29.58~~				~~X~~
14.1.07	NAV-Indicator GI-106A	Garmin	1.4	17.50	AVIONITEC AG			
	NAV/COM/GPS GNS 430	Garmin	6.5	14.50				
	GPS-Antenne GA-56	Garmin	0.2	96.00				
16G								

AVIONITEC AG
Sonder...
S 186

EQUIPMENT LIST

				MO	4			
				DAY	25			
				YEAR	78			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	H. Auxiliary Equipment							
1H	Tow Bar (Stowed)	010001-000	1.25	+95.5	X	✓		
2H	Jack Points (Stowed)	010000-000	.10	+119.0	X	✓		
3H	Wing Tie Down Rings (Stowed)	010002-000	.10	+119.0	X	✓		
4H	Fuel Sampler Cup (Stowed)	610010-000	.05	+119.0	X	✓		
5H	Fixed Step Assy	840071-000	2.25	+108.0				

EQUIPMENT LIST

MO	03			
DAY	26			
YEAR	90			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	G. Avionics & Autopilots cont...							
	S-TEC Programmer 0117		1.1	17.5	X			
10G	Computer 0110-1T		3.3	121.0	X			
11G	Pitch Servo 0107-1-P4		2.9	141.0	X			
12G	Transducer 0111		0.2	8.0	X			
13G	Trim Servo 0105-2-T6		2.9	134.4	X			
14G	Cable Assy 3937-1		3.8	67.0	X			
15G	Harware HK-049/TK-015		0.6	138.0	X			
	King NAV-Indicator KI-203		1.6	17.5	X			
	King Altimeter KEA-129		1.8	17.5	X			
	ADF RECEIVER INSTALLATIONS							
16G								

EQUIPMENT LIST

					MARK IF INSTALLED			
				MO				
				DAY				
				YEAR				
ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)				
	H. Auxiliary Equipment							
1H	Tow Bar (Stowed)	010001-000	2.25	+95.5	X			
2H	Jack Points (Stowed)	010000-000	.10	+119.0	X			
3H	Wing Tie Down Rings (Stowed)	010002-000	.10	+119.0	X			
4H	Fuel Sampler Cup (Stowed)	610010-000	.05	+119.0	X			
~~5H~~	~~Fixed Step Assy~~	~~840071-000~~	~~2.25~~	+108.0				
6H	Aircraft P.O.H./A.F.M.	010025	1.50	+119.0	X			
7H	Engine Operating Manual	010025	.75	+119.0	X			

EQUIPMENT LIST

MO	07			
DAY	17			
YEAR	09			

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	G. Avionics & Autopilots cont....				A-L 0238 H Michel ROCA-1306			
	COM/NAV SL-30	Garmin	2.8	14.50	X			
	XPDR GTX-328	Garmin	4.2	14.50	X			
	Encoder A-30 Mod. 8	ACK	0.5	13.00	X			
	ELT Transm. ME 406	Artex	2.3	121.00	X			
	ELT Ant. 110-773	Artex	0.3	107.00	X			
	ELT Switch 345-6196-04	Artex	0.1	17.50	X			

SECTION VII.

AIRPLANE & SYSTEMS DESCRIPTION

TABLE OF CONTENTS

INTRODUCTION

Acquiring a working knowledge of the aircraft's controls and equipment is one of your important first steps in developing a fully efficient operating technique. This airplane and Systems section describes location, function, and operation of systems' controls and equipment. It is advisable for you, the pilot, to familiarize yourself with all controls and systems while sitting in the pilot's seat and rehearsing the systems operations and flight procedures portions of this manual.

AIRFRAME

The airframe has a welded, tubular-steel cabin structure enclosed in sheet-aluminum skins. Stressed skins rivet to main and auxiliary spars in the wing, stabilizer, and vertical fin. The laminar-flow wing has full wrap-around skins with flush riveting over the forward top and bottom two thirds of the wing area.

For pitch trim control, the empennage pivots on the aft fuselage. A torque-tube-driven jack screw, bolted to the rear tailcone bulkhead, sets the stabilizer angle.

The forward-opening cabin door provides access to both front and rear seats. The baggage compartment door is located above the right wing trailing edge to permit baggage loading from the ground.

The tricycle landing gear allows maximum taxi vision and ground maneuvering. Hydraulic disc brakes and a steerable nose wheel aid in positive directional control during taxiing and crosswind landings.

The landing gear is electrically retracted and extended. A gear warning horn, a gear position indicator on the floorboard and a green "gear down" light help prevent inadvertent gear-up landings. A manual emergency gear extension system is provided for use in the event of an electrical failure.

ENGINE CONTROLS

The engine controls are centrally located, between the pilot and co-pilot, on the engine control console. The throttle knob regulates manifold pressure. Pushing the knob forward increases the setting; pulling the knob aft decreases the setting.

The propeller control, with its crowned blue or black knob, controls engine RPM through the propeller governor. Pushing the knob forward increases engine RPM; pulling the knob aft decreases the setting.

The mixture control, with its red fluted knob, establishes the fuel-air ratio (mixture). Pushing the knob full forward sets the mixture to full-rich, pulling the knob aft leans the mixture, and pulling the knob to its maximum aft travel position closes the idle cutoff valve, shutting down the engine. Precise mixture settings can be established by observing the EGT gage (if installed) on the pilot's right hand instrument panel while adjusting the mixture control.

The ram air control located directly below the throttle control, allows the selection of filtered induction air or unfiltered direct ram air.

Using ram air will increase the manifold pressure by allowing engine induction air to bypass the induction air filter. The use of ram air must be limited to clean, dust-free air. The engine will operate on direct unfiltered air when the ram air control is pulled out. When ram air is on allowing unfiltered air to enter the engine, the ram air annunciator light located above the center radio panel will illuminate when the landing gear is down. Should the induction air filter clog, a spring-loaded door in the induction system will open by induction vacuum to allow alternate air to enter the engine.

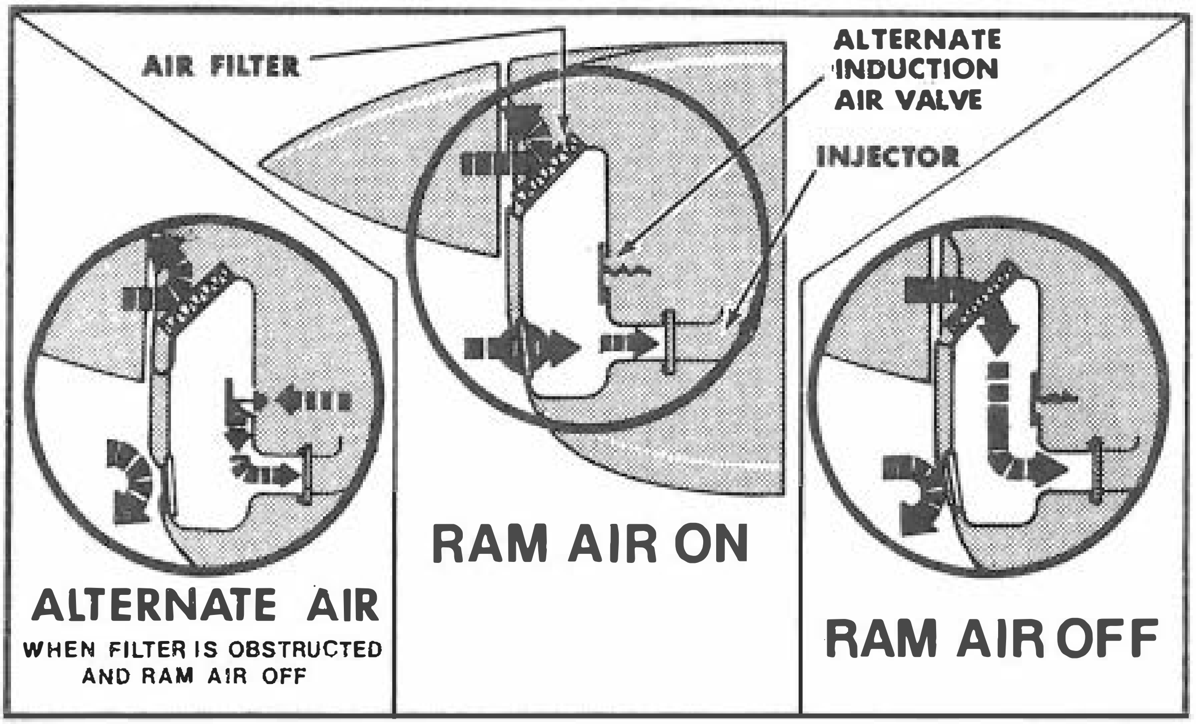


FIGURE 7-1 ENGINE AIR INDUCTION SYSTEM

Cylinder head temperature, oil pressure, fuel pressure and oil temperature gages are located above the flight instruments. EGT, tachometer, and manifold pressure are located to the right of the radio panel. Color arcs on instrument faces mark operating ranges. Proper interpretation of engine instrument readings is essential for selecting optimum control settings and for maintaining maximum cruise fuel economy.

IGNITION SYSTEM

The magneto ignition system features two electrically independent ignition circuits in one housing. The right magneto fires the lower right and upper left spark plugs, and the left magneto fires the lower left and upper right spark plugs. The magneto/starter switch has five positions: OFF, R (right), L (left), BOTH, and START. In the OFF position both magnetos are grounded. At the R position the left magneto grounds. At the L position the right magneto grounds. At the BOTH position both magnetos are HOT and the ignition system is on. For safety, the ignition switch must be OFF and key removed when the engine is not running. Turning the ignition switch to start and pushing in closes the starter solenoid, engages the starter and allows the impulse coupling to automatically retard the magneto until the engine is at its retard firing position. The spring action of the impulse is then released to spin the rotating magnet and produce the spark to fire the engine. After the engine starts, the impulse coupling flyweights do not engage due to centrifugal action. The coupling then acts as a straight drive and the magneto fires at the normal firing position of the engine. The magneto/starter switch is spring loaded to return from START to the BOTH position when released.

CAUTION

Do not operate the starter in excess of 30 seconds or re-engage the starter without allowing it time to cool.

WARNING

Do not turn the propeller when the magnetos are NOT grounded. Ground the magneto points before removing switch wires or electrical plugs. All spark plug leads can be removed as an alternate safety measure.

FUEL SYSTEM

Fuel is carried in two integral sealed sections of the forward inboard area of the wings. Total usable fuel capacity is 64 gallons. Both tanks have fuel level indicators visible through the filler ports. These indicators show the 25-gallon level in each tank. There are sump drains at the lowest point in each tank for taking fuel samples to check for sediment contamination and condensed water accumulation.

The recessed three-position fuel selector handle aft of the console on the floor allows the pilot to set the selector valve to LEFT tank, RIGHT tank, or OFF position. The gascolator, located to the left of the selector valve in the floorboard, is for draining condensed water and sediment from the lowest point in the fuel lines before the first flight of the day and after each refueling.

Fuel feeds from one tank at a time to the selector valve and through the electric fuel pump (boost pump) enroute to the engine-driven pump and the fuel injector unit. The electric fuel pump is capable of supplying sufficient pressure and fuel flow for maximum engine performance should the engine driven pump fail.

Electric fuel-level transmitters in the tanks operate the fuel gages. The master switch actuates the fuel quan-

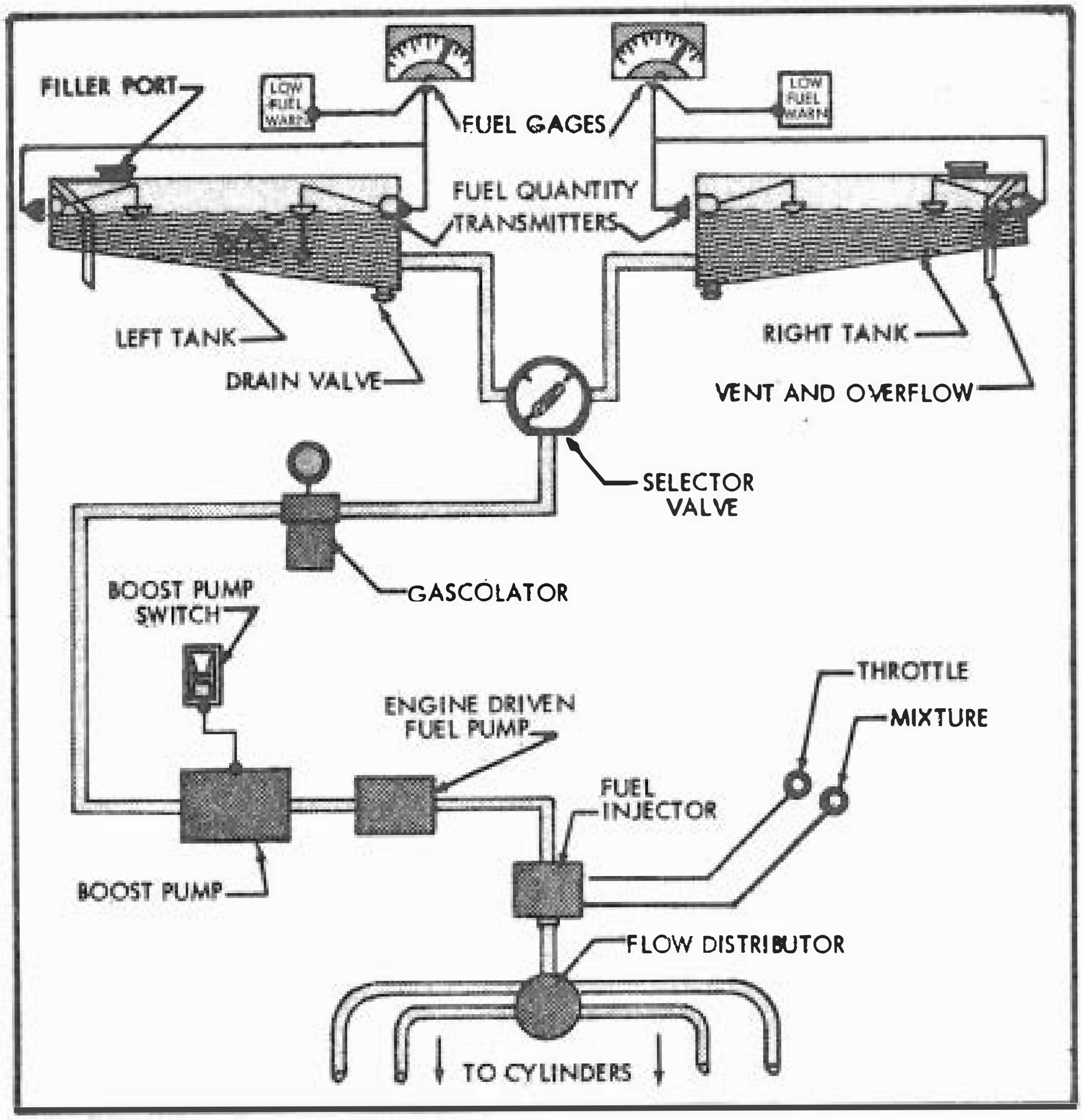


FIGURE 7-2 FUEL SYSTEM SCHEMATIC

tity indicator system to maintain an indication of fuel remaining in each tank. The fuel pressure gage registers fuel pressure in the line to the injector. Vents in each fuel tank allow for overflow and ventilation.

OIL SYSTEM

The engine has a full-pressure wet-sump oil system with an 8-quart capacity. An automatic bypass control valve routes oil flow around the oil cooler when operating temperatures are below normal or when the cooling radiator is blocked.

ENGINE COOLING

The down-draft engine cooling system provides ground and inflight power plant cooling. Engine baffling directs air over and around the cylinders and out the cowl flap openings. Opening the cowl flap doors allows proper air flow on the ground and during low-speed high-power climbs. Pulling the cowl flap control full aft opens the cowl flaps. The cowl flaps should be partially opened, (control pulled aft approximately two to three inches), if necessary to maintain the oil and cylinder head temperature within the normal operating range.

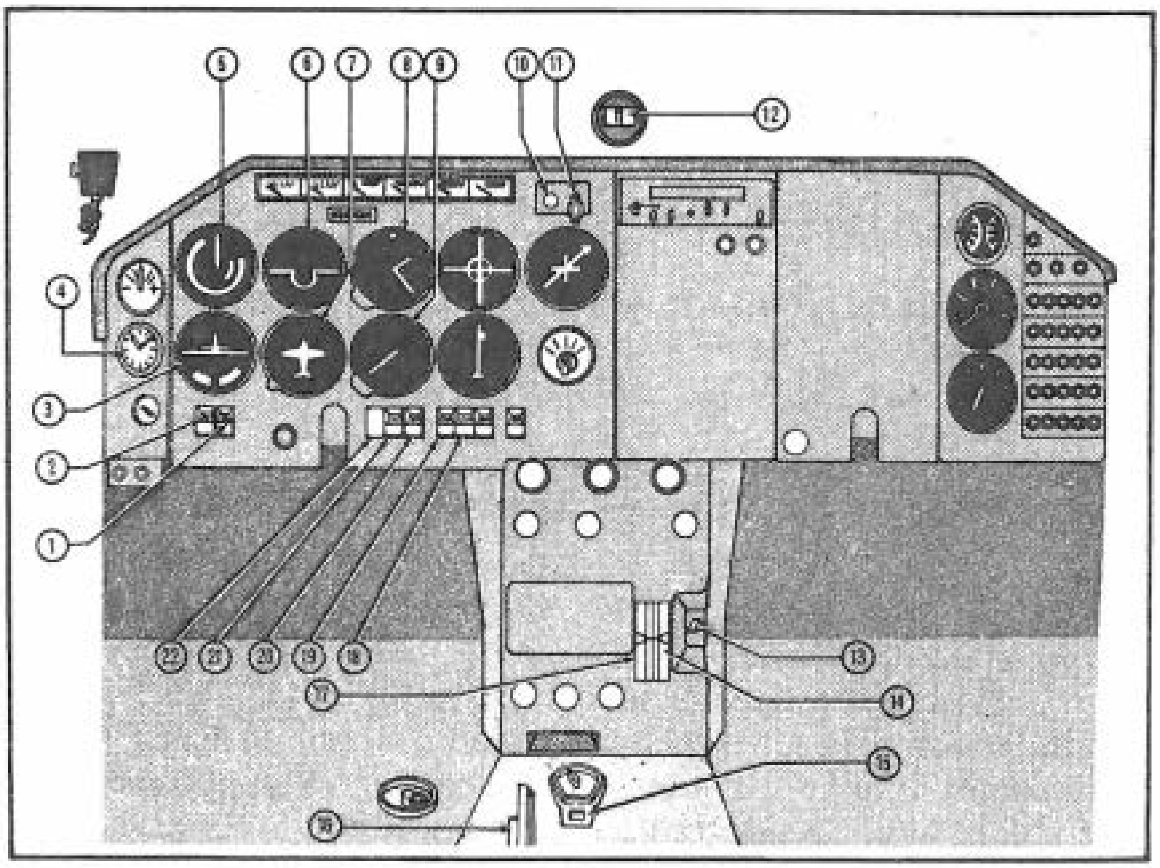
VACUUM SYSTEM

An engine-driven vacuum pump supplies suction for the vacuum-operated gyroscopic flight instruments. Air entering the vacuum-powered instruments is filtered; hence, sluggish or erratic operation of vacuum-driven instruments may indicate that a clogged vacuum filter element is preventing adequate air intake. A vacuum annunciator light is provided to monitor system operation.

PROPELLER

The propeller, of the constant speed type, is a single-acting unit in which hydraulic pressure opposes the natural, centrifugal twisting moment of the rotating blades, and the force of a spring, to obtain the correct pitch for the engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the propeller shaft. The amount and pressure of the oil supplied is controlled by an engine-driven governor. Increasing engine speed will cause oil to be admitted to the piston, thereby increasing the pitch. Conversely, decreasing engine speed will result in oil leaving the piston, thus decreasing the pitch.

FLIGHT INSTRUMENTS AND CONTROLS



(1) RADIO MASTER

The Radio Master Switch/Circuit Breaker operates a relay supplying power to the radio bus bars. Since the relay is energized to cut the power to the radio bus, failure of the relay coil will still allow power to the radio bus. Energizing the starter automatically energizes the relay and disconnects the radios from the bus.

(2) MASTER SWITCH

The master switch operates the battery relay which controls battery power to the main ship bus bar. This switch also cuts the alternator field power - from main bus to the alternator. This cuts off all ships power except the cabin light and electric clock.

(3) TURN COORDINATOR (if installed)

The turn coordinator takes the place of a turn and bank indicator and operates from an electric power source. The turn coordinator is independent of the flight reference gyros. The turn coordinator displays variations in roll and yaw to the pilot by means of a damped miniature aircraft silhouette display - this provides the pilot with the essential information to execute a "proper turn".

(4) CLOCK (if installed)

The electric clock with a sweep second hand, may be set by the pilot by pulling the knob and turning either left or right.

(5) AIRSPEED INDICATOR

The standard airspeed indicator is marked in knots and miles per hour. Limitation markings are CAS and include the white arc (61 to 125 MPH) green arc (68 to 200 MPH), yellow arc (200 to 225 MPH), and a red line (225 MPH).

(6) ATTITUDE GYRO (if installed)

The attitude gyro gives a visual indication of flight attitude. Bank attitude is presented by a pointer at the top of the indicator relative to the bank scale which is marked in increments of 10^{o}, 20^{o}, 30^{o}, 45^{o}, 60^{o}, and 90^{o} either side of the center mark. Pitch attitude is presented by an airplane silhouette in relation to the horizon bar. A knob at the bottom of the instrument is provided for in-flight adjustment of the silhouette to the horizon bar for a more accurate flight attitude indication.

(7) DIRECTIONAL GYRO (if installed)

The directional gyro displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The directional indicator will precess slightly over a period of time. Therefore, the compass card should be set in accordance with the magnetic compass just prior to takeoff, and occasionally re-adjusted on extended flights. A knob on the lower left edge of the instrument is used to adjust the compass card to correct for any precession.

(8) ALTIMETER

Airplane altitude is depicted by a barometric type altimeter. A knob near the lower left portion of the indicator provides adjustment of the instrument's barometric scale to the proper barometric pressure reading.

(9) VERTICAL SPEED INDICATOR (if installed)

The vertical speed indicator depicts airplane rate of climb or descent in feet per minute. The pointer is actuated by an atmospheric pressure change supplied by the static source.

(10) GEAR SAFETY OVERRIDE SWITCH

The gear safety override switch is a mechanical means of electrically bypassing the airspeed safety switch. In the event the gear control switch is inadvertently placed in the gear-up position, the gear airspeed safety switch prevents the gear being retracted before approximately 75 MPH airspeed is reached. Should it be necessary to retract at lower airspeed the gear safety override switch may be pressed allowing the gear to retract.

CAUTION

The activation of the gear safety override switch overrides the safety features of the airspeed switch and can cause the gear to start retracting while on the ground.

(11) GEAR SWITCH

The electric gear switch identifiable by its wheel shaped knob, is a two-position switch. Pulling aft and lowering the knob lowers the landing gear while pulling aft and raising the knob raises the gear.

NOTE

Failure to "Pull" knob out prior to movement may result in a broken switch.

(12) MAGNETIC COMPASS

The magnetic compass is liquid-filled, with expansion provisions to compensate for temperature changes. It is equipped with compensating magnets adjustable from the front of the case. Access to the compass light and the compensating magnets is provided by pivoted covers. No maintenance is required on the compass except an occasional check on a compass rose with adjustment of the compensation, if necessary, and replacement of the lamp.

(13) FLAP SWITCH

The flap switch in a recess on the right of the console, operates the electrically-actuated wide span wing flaps. Holding the spring-loaded switch in the down position lowers the flaps to the desired angle of deflection. A pointer in the center console indicates flap position. Simply releasing downward pressure on the switch allows it to return to the OFF position stopping the flaps at any desired intermediate position during extension. When flap-up position is selected, flaps will retract to full up position unless the switch is returned to the neutral position for a desired intermediate setting. Pushing the switch to the UP position retracts the flaps.

(14) FLAP POSITION INDICATOR

Wing flap position is mechanically indicated thru a cable mounted directly to the flap jackshaft. A pointer in the flap position indicator indicates flap position. The intermediate mark in the pointer range is the flap TAKEOFF setting.

(15) GEAR POSITION INDICATOR

The illuminated gear-down position indicator in the back of the fuel selector, trim pan aft of the center console has two marks that align when the gear is down and illuminates when the green gear down light is on.

(16) TRIM CONTROL WHEEL

Rotating the trim control wheel forward lowers the nose while rearward rotation raises the nose of the aircraft.

(17) TRIM POSITION INDICATOR

Stabilizer trim position is mechanically indicated thru a cable attached to the trim wheel mechanism. Position indications are shown on the console.

(18) PITOT HEAT SWITCH/CIRCUIT BREAKER (if installed)

Pushing ON the pitot heat combination rocker switch/ circuit breaker turns on the heating elements within the pitot tube. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

LANDING LIGHT SWITCH/CIRCUIT BREAKER

(19) Pushing ON the landing light combination rocker switch/circuit breaker turns ON the landing light. Should a short occur the combination switch/ circuit breaker will automatically trip to the OFF position. The landing light should not be operated when the engine is not running to preclude over-heating of the lamp.

(20) NAVIGATION LIGHT SWITCH/CIRCUIT BREAKER

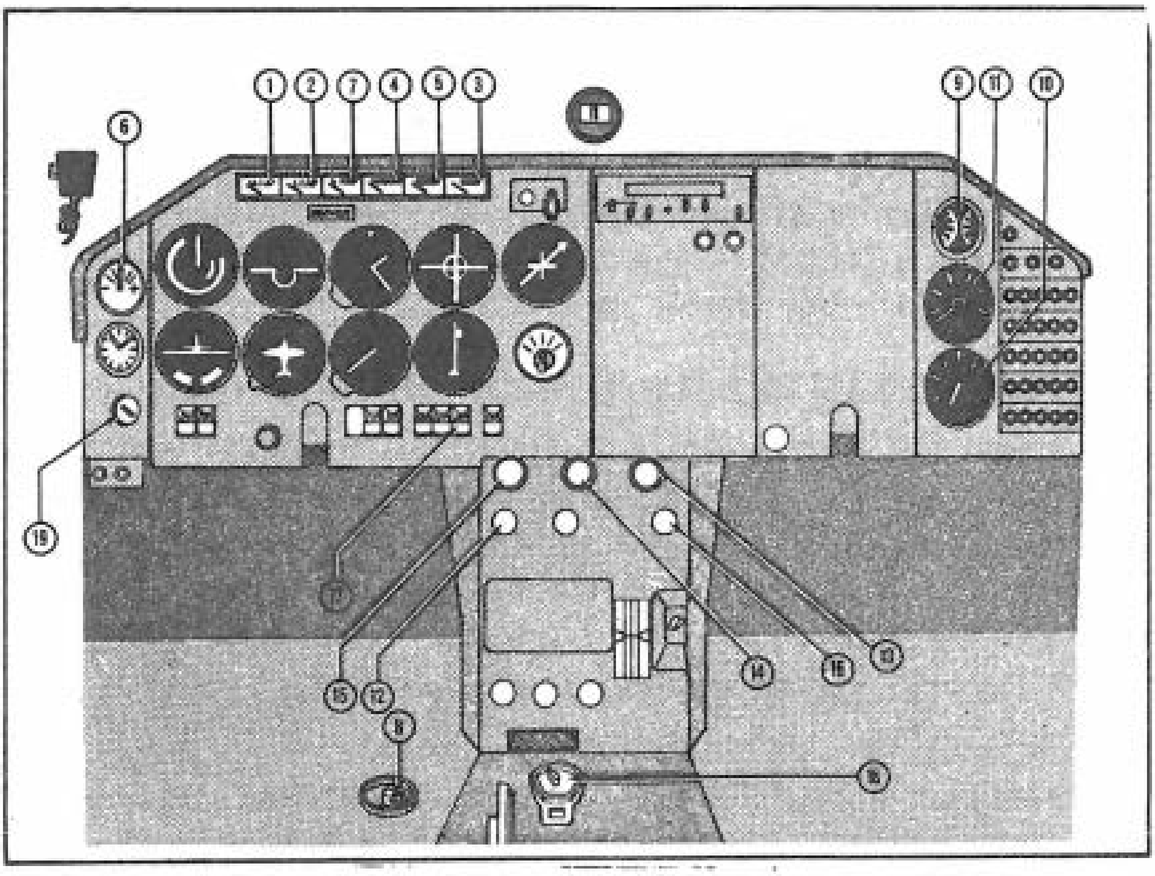
Pushing ON the navigation light combination rocker switch/circuit breaker turns ON the wing tip and tail navigation lights. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

(21) STROBE LIGHT SWITCH/CIRCUIT BREAKER (if installed)

Pushing ON the strobe light combination switch/ circuit breaker turns ON the wing tip strobe lights. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

(22) ROTATING BEACON SWITCH/CIRCUIT BREAKER (if installed)

Pushing ON the rotating beacon combination switch/ circuit breaker turns ON the rotating beacon. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.



1. and 2. FUEL QUANTITY INDICATORS

The fuel quantity indicators are used in conjunction with a float-operated variable-resistance transmitter in each fuel tank. The tank-full position of the transmitter float produces a maximum resistance through the transmitter, permitting minimum current flow through fuel quantity indicator and maximum pointer deflection.

3. CYLINDER HEAD TEMPERATURE

The cylinder head temperature indications are controlled by an electrical resistance type temperature probe installed in the number three cylinder, and receives power from the aircraft electrical system.

4. OIL PRESSURE GAGE

The electric transducer type oil pressure gage is a direct-reading gage, operated by a pressure pickup line connected to the engine main oil gallery.

5. OIL TEMPERATURE GAGE

The oil temperature gage is an electric instrument connected electrically to a temperature bulb in the engine. Temperature changes of the engine oil change the electrical resistance in the bulb thereby allowing more or less current to flow through the indicating gage.

(6.) AMMETER

The ammeter indicates current flow, in amperes, from the alternator to the battery, or from the battery to the electrical system. With the engine operating, and master switch "ON", the ammeter indicates the rate of charge being applied to the battery. In the event of an alternator malfunction, or if the electrical load demand exceeds the alternator output, the ammeter will indicate the discharge rate of the battery.

(7.) FUEL PRESSURE GAGE

The fuel pressure gage is of the electric transducer type and is calibrated in pounds per square inch and indicates the pressure to the fuel injector.

(8.) GASCOLATOR

The gascolator, located to the left of the console on the floorboard, allows the pilot to drain condensed water and any sediment from the lowest point in the fuel line. To activate the gascolator pull the ring upward, to stop drainage release the ring.

(9.) EGT/OAT GAGE

The EGT/OAT gage is located to the right of the radio panels and above the engine tachometer. A thermocouple probe in the number 3 exhaust pipe transmits temperature variations to the indicator mounted in the instrument panel. The indicator serves as a visual aid to the pilot when adjusting mixture. Exhaust gas temperature varies with fuel-to-air ratio, power and RPM. The OAT, gage provides the pilot with the free stream outside air temperature in degrees centigrade.

(10) TACHOMETER

The tachometer is a mechanical indicator driven at half crankshaft speed by a flexible shaft. Most tachometer difficulties will be found in the driveshaft. To function properly, the shaft housing must be free of kinks, dents and sharp bends.

(11) MANIFOLD PRESSURE

The manifold pressure gage is of the direct reading type and is mounted above the engine tachometer. The gage is calibrated in inches of mercury and indicates the pressure in the induction air manifold.

(12) RAM AIR CONTROL

Pulling the ram air control allows the use of unfiltered air. The use of ram air must be limited to clean dust-free air and must not be used during any ground operations.

(13) MIXTURE CONTROL

The mixture control allows the pilot to adjust the fuel-air ratio (mixture) of the engine. Pushing the control forward richens the mixture. Pulling the control aft leans the mixture and pulling the control full aft closes the idle cutoff valve shutting down the engine. The control is of the vernier type and fine adjustments of the mixture can be obtained by turning the knob, clockwise richens the mixture, counter-clockwise leans.

(14) PROPELLER CONTROL

Pushing the propeller control forward increases engine RPM; pulling the control aft decreases the engine RPM. The control is of the vernier type and fine adjustments of RPM's can be obtained by turning the knob clockwise increases RPM's, counter-clockwise decreases RPM's.

(15) THROTTLE CONTROL

Pushing the throttle control forward increases the manifold pressure thereby increasing the engine power.

Pulling the control aft decreases the manifold pressure thereby decreasing the engine power.

(16) COWL FLAP CONTROL

Pulling the cowl flap control full aft opens the cowl flap doors allowing additional airflow to properly cool the engine on the ground and during low speed high power climbs. The cowl flaps should be partially opened, (control pulled aft approximately three inches) if necessary, to maintain oil and cylinder head temperatures at approximately three-fourths the normal operating range.

(17) FUEL BOOST PUMP SWITCH/CIRCUIT BREAKER

Pushing ON the fuel boost pump combination rocker switch/circuit breaker turns ON the fuel boost pump. Use of the fuel boost pump should be limited to starting, takeoff, switching fuel tanks, landing, and emergency situations.

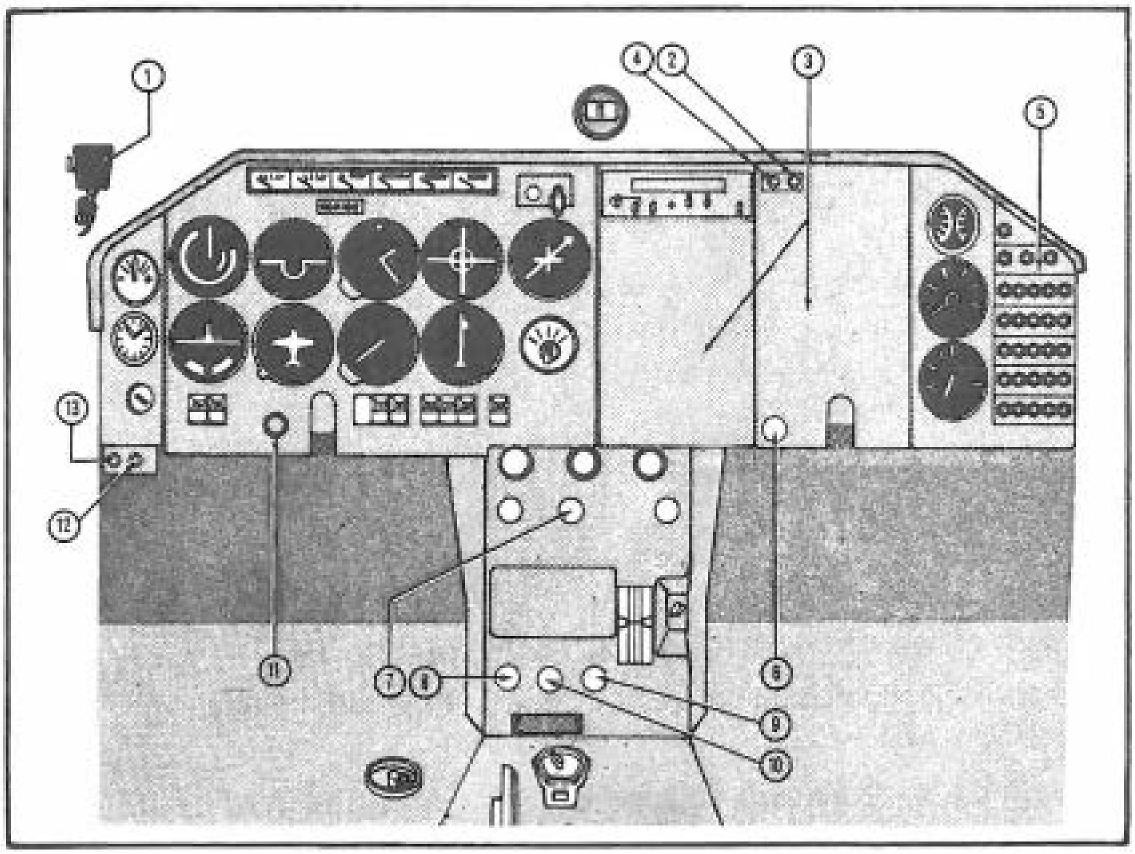
The fuel boost pump is capable of supplying fuel to the engine at the rated quantities and pressures to permit the engine to develop maximum rated power.

(18) FUEL SELECTOR VALVE

The fuel selector valve located on the floorboard is a three-position valve which allows the pilot to select either the left or right fuel tank. Turning the valve to OFF shuts off all fuel to the engine. At full throttle the engine will stop from fuel starvation in 2 to 3 seconds.

(19) MAGNETO/STARTER SWITCH

The magneto/starter switch combines both ignition and starting functions. Turning the ignition key clockwise through R, L, and BOTH to the START MAG position and then pushing forward on the key and receptacle engages the starter. Releasing the key when the engine starts allows the switch to return by spring action to the BOTH position.



(1.) RADIO MICROPHONE (If Installed)

(2.) RADIO LIGHT SWITCH AND DIMMER

Turning the radio light switch knob clockwise turns ON the radio and indicator lights. Continued turning clockwise increases light intensity.

(3.) RADIO PANELS

Adequate space is provided for installation of optional avionics.

(4.) PANEL LIGHT SWITCH AND DIMMER

Turning the panel light switch knob clockwise turns ON the instrument lights located in the glareshield. Continued turning clockwise increases the lighting intensity.

(5) CIRCUIT BREAKER PANEL

Push-to-reset and push-pull circuit breakers automatically break the electrical current flow if the systems receive an overload.

6. CIGAR LIGHTER (if installed)

7. PARKING BRAKE CONTROL
Pulling the parking brake control and depressing the brake pedals sets the parking brake. Pushing in the parking brake control releases the parking brake.

8. CABIN VENT CONTROL
Pulling the cabin vent control aft opens the cabin vent, located on the right side of the airplane. Optimum use of the cabin vent control is described in the Cabin Environment Section.

9. CABIN HEAT CONTROL
Pulling the cabin heat control turns on cabin heat. To lower cabin temperature the cabin heat control is pushed forward toward the OFF position. Optimum use of the cabin heat control is described in the Cabin Environment Section.

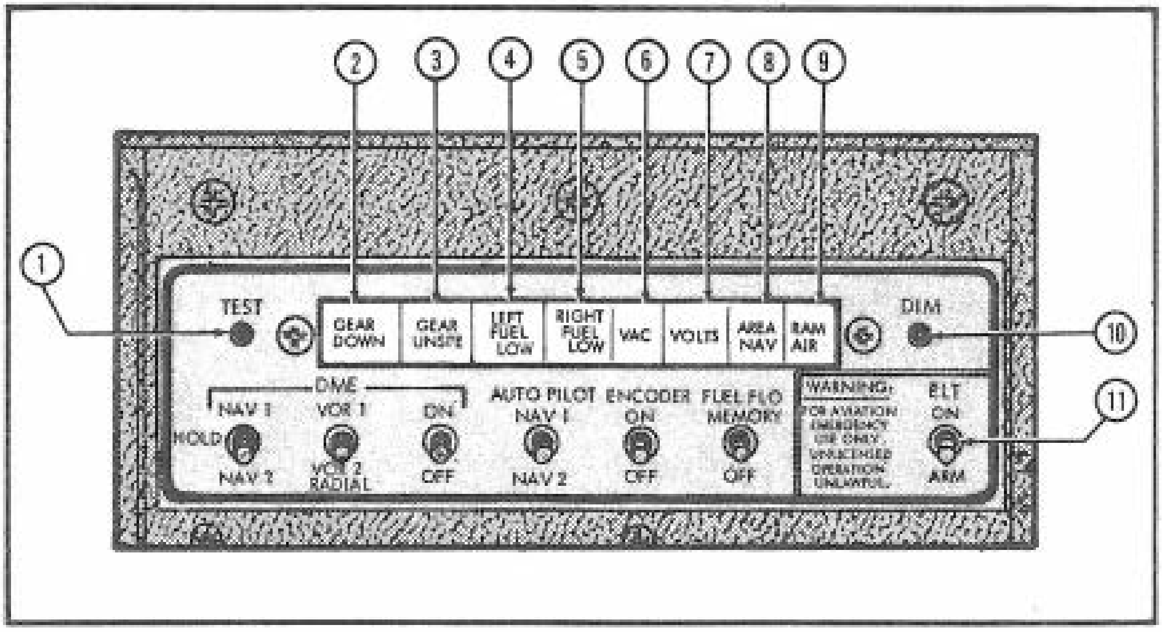
10. DEFROST CONTROL
Pulling the defrost control decreases air flow to cabin and increases air flow over the windshield in the front of the glareshield area. Optimum use of the defrost control is described in the Cabin Environment Section.

11. ALTERNATE STATIC SOURCE VALVE
Pulling the alternate static source valve to the full aft position (alternate) changes the source of static air for the altimeter, airspeed indicator and rate-of-climb indicator from the outside of the aircraft to the cabin interior.

12. HEADSET JACK

13. MICROPHONE JACK

ANNUNCIATOR AND SWITCH PANEL



(1) PRESS-TO-TEST SWITCH
Pressing the red press-to-test switch with the master switch ON will illuminate all annunciator light bulbs. Defective bulbs should be replaced prior to the next flight.

(2) and (3) GEAR SAFETY INDICATOR
The green GEAR DN light and a red GEAR UNSFE light provide visual gear position signals. The green light (GEAR DN) shows continuously when the gear is fully extended. With the navigation lights on, the GEAR DN light is dim for night operation. All gear lights are out when the gear is fully retracted. Gear unsafe light is on between gear fully extended and gear fully retracted position.

(4) and (5) FUEL LOW INDICATORS
Left and/or right, red, fuel low annunciator light comes on when there is 2-1/2 to 3 gallons of useable fuel remaining in the respective tanks.

6 VACUUM MALFUNCTION INDICATOR
The red VAC annunciator light indicates a malfunction or improper adjustment of air suction system. Air suction is available for operation of the attitude gyro, and also the directional gyro, and will be shown in inches of mercury. The designated suction range is 3.5 to 5.5 inches of mercury. The vac light will blink when suction is below 3.5 inches of mercury and gives a steady light when suction is above 5.5 inches of mercury. In either case the gyros should not be considered reliable during this warning time.

7 VOLTAGE IRREGULARITY INDICATOR
The red VOLTS annunciator light comes on designating improper voltage supply. A red blinking light designates low, or no voltage from the alternator; a steady red light indicates over voltage or a trippage of the voltage relay.

8 AREA NAV FUNCTION INDICATOR
The blue AREA NAV light refers only to the ON or OFF position of specific navigation equipment.

9 RAM AIR POSITION INDICATOR
The amber RAM AIR annunciator light is a reminder that ram air system is in operation when the gear comes down and should be closed to reroute air through air filter.

10 DIM SWITCH
The DIM switch is activated when the low fuel lights come on bright. The switch will dim both low fuel lights but will not turn them off. To restore the display to bright, press the test switch.

11 EMERGENCY LOCATOR TRANSMITTER SWITCH
The ELT switch manually activates the emergency locator transmitter located in the forward portion of the tailcone. To activate the system pull the switch out and raise. Failure to pull out can result in a breakage of the switch. Reference should be made to the Emergency Locator Transmitter section for proper and lawful usage of the ELT.

FLIGHT CONTROLS

PRIMARY FLIGHT CONTROLS

Push-pull tubes with self-aligning rod end bearings actuate the primary flight control surfaces. A spring-loaded interconnect device indirectly joins the aileron and rudder control systems to assist in lateral stability during flight maneuvers. Control surface gap seals minimize airflow through the hinge slots and reduce drag.

TRIM CONTROLS

For pitch trim control, the entire empennage pivots on the tail cone attachment points to increase or decrease the horizontal stabilizer angle. This design allows flight trim establishment with minimum control surface deflection. A trim indicator on the console indicates stabilizer trim position. In flight, forward rotation of the trim wheel lowers the nose; rearward rotation raises the nose.

WING FLAP CONTROLS

The flap control is located in a recess on the right side of the engine control console and operates the electrically-actuated wide-span wing flaps. Moving the control to the UP position, retracts the flaps. The position of the flaps can be noted from the flap position indicator located adjacent to the trim indicator. Holding the control in the down position moves the flaps down until the desired position is reached, releasing the control stops flap movement. Limit switches prevent flap travel above or below travel limits.

PITOT STATIC SYSTEM

A pitot tube, mounted on the lower surface of the left wing, picks up airspeed indicator ram air. A heated pitot prevents pitot tube icing when flying in moisture-laden air. A pitot system drain valve is located on the forward bottom skin of the left wing just outboard of the wing fillet. Static ports on each side of the tail cone supply static air pressure for the altimeter, the airspeed indicator, and the vertical speed indicator. A static system drain valve is located on the fuselage bottom skin below the tail cone access door. An alternate static pressure source valve is installed under the left flight panel above the pilot's left knee.

STALL WARNING SYSTEM

The electrical stall warning system uses a vane-actuated switch, installed in the left wing leading edge, to energize a stall warning horn located in the cabin. The stall warning switch is adjusted to provide aural warning at 5 to 10 MPH before the actual stall is reached and will remain on until the aircraft flight attitude is changed.

EMERGENCY LOCATOR TRANSMITTER

The Emergency Locator Transmitter (ELT) is located in the forward portion of the tailcone and is accessible by removing the radio access panel on the left side of the fuselage. The emergency locator transmitter meets the requirements of FAR 91.52 and is automatically activated by a longitudinal force of 5 to 7 g's. The ELT transmits a distress signal on both 121.5 MHz and 243.0 MHz for a period of from 48 hours in low temperature areas and up to 100 hours in high temperature areas. The unit operates on a self-contained battery.

The battery has a useful life of four years. However, to comply with FAA regulations it must be replaced after two years of shelf life. The battery should also be replaced if the transmitter has been used in an emergency situation or if accumulated test time exceeds one hour. The replacement date is marked on the transmitter label.

On the unit itself is a three position selector switch placarded "OFF", "ARM", "ON". The "ARM" position is provided to set the unit to the automatic position so that it will transmit only after impact and will continue to transmit until the battery is drained to depletion or until the switch is manually moved to the "OFF" position. The "ARM" position is selected when the transmitter is installed at the factory and the switch should remain in that position whenever the unit is installed in the airplane. The "ON" position is provided so the unit can be used as a portable transmitter or in the event the automatic feature was not triggered by impact or to periodically test the function of the transmitter.

Select the "OFF" position when changing the battery, when rearming the unit if it has been activated for any reason, or to discontinue transmission.

NOTE

> If the switch has been placed in the "ON position for any reason, the "OFF" position has to be selected before selecting "ARM". If "ARM" is selected directly from the "ON" position the unit will continue to transmit in the "ARM" position.

A pilot's remote switch, located above the radio panel, is provided to allow the transmitter to be controlled from inside the cabin. The pilot's remote switch is placarded "ON", "ARM".

The locator should be checked during the ground check to make certain the unit has not been accidentally activated. Check by tuning a radio receiver to 121.5 MHz. If there is an oscillating sound, the locator may have been activated and should be turned off immediately. Reset to the "ARM" position and check again to insure against outside interference.

NOTE

> If for any reason a test transmission is necessary, the operator must first obtain permission from a local FAA/FCC representative (or other applicable Authority) or in accordance with current regulations. Test transmission should be kept to a minimal duration.

ELECTRIC GEAR RETRACTION SYSTEM

The two-position electric gear control switch, identified by its wheel-shaped knob, is located near the top of the instrument panel above the throttle.

There are two ways to check that the electrically-actuated gear is down:

(1) The green gear-down annunciator light is on.
(2) The indicator marks align as seen on the floor-board visual gear-position indicator.

A green GEAR DN light, a red UNSAFE light, and a warning horn provide visual and audible gear position signals. The green light (GEAR DN) shows continuously when the gear is fully extended. With the navigation lights on, the GEAR DN light is dim for night operation. All gear lights are off when the gear is fully retracted.

NOTE

Retarding the throttle below 12 inches manifold pressure causes the gear warning horn to emit an intermittent tone if the gear is not down.

To prevent inadvertent retraction of the landing gear system an airspeed actuated safety switch is installed in the pitot system. The switch is not intended to substitute for the gear switch in keeping the gear extended while taxiing, taking-off, or landing.

CAUTION

Never rely on the safety switch to keep the gear down during taxi, take-off or landing. Always make certain that the landing gear switch is in the down position during these operations.

The aircraft is also equipped with a landing gear safety bypass switch override should the gear fail to retract after take-off. Section III discusses the procedure to be used should the landing gear safety switch fail to de-activate after take-off.

EMERGENCY GEAR-EXTENSION SYSTEM

The emergency gear extension pull cord located between and aft of the seats is for manually driving the electric gear actuator to extend the gear if the electric system malfunctions. Section III discusses the emergency gear extension procedure.

BRAKE & STEERING SYSTEMS

The main gear wheels incorporate self-adjusting disc-type hydraulic brakes. The pilot's rudder pedals have individual toe-actuated brake cylinders linked to the rudder pedals. Depressing the toe pedals and pulling out the parking brake control on the console sets the brakes. Pushing the parking brake control forward releases the brakes.

It is not advisable to set the parking brake when the brakes are overheated, after heavy braking or when outside temperatures are unusually high. Trapped hydraulic fluid may expand with heat and damage the system. Wheel chocks and tiedowns should be used for long-term parking.

Rudder pedal action steers the nose wheel. Gear retraction relieves the rudder control system of its nose wheel steering and centers the wheel to permit retraction into the nose wheel well. The minimum turning radius on the ground is 41 feet.

ELECTRICAL POWER

ALTERNATOR & BATTERY

A 12-volt 35-ampere-hour storage battery in the tailcone and a 60-ampere self-rectifying alternator supply electrical power for equipment operation. The ammeter in the engine instrument display indicates battery charge/discharge rate. A power loss in the alternator or voltage regulator will be shown as a discharge reading on the ammeter; a discharged battery will be indicated as a high-charge reading.

The voltage regulator adjusts alternator output to current load while maintaining a constant voltage level. A voltage warning light illuminates steadily when voltage limits are exceeded and flashes when the voltage is low.

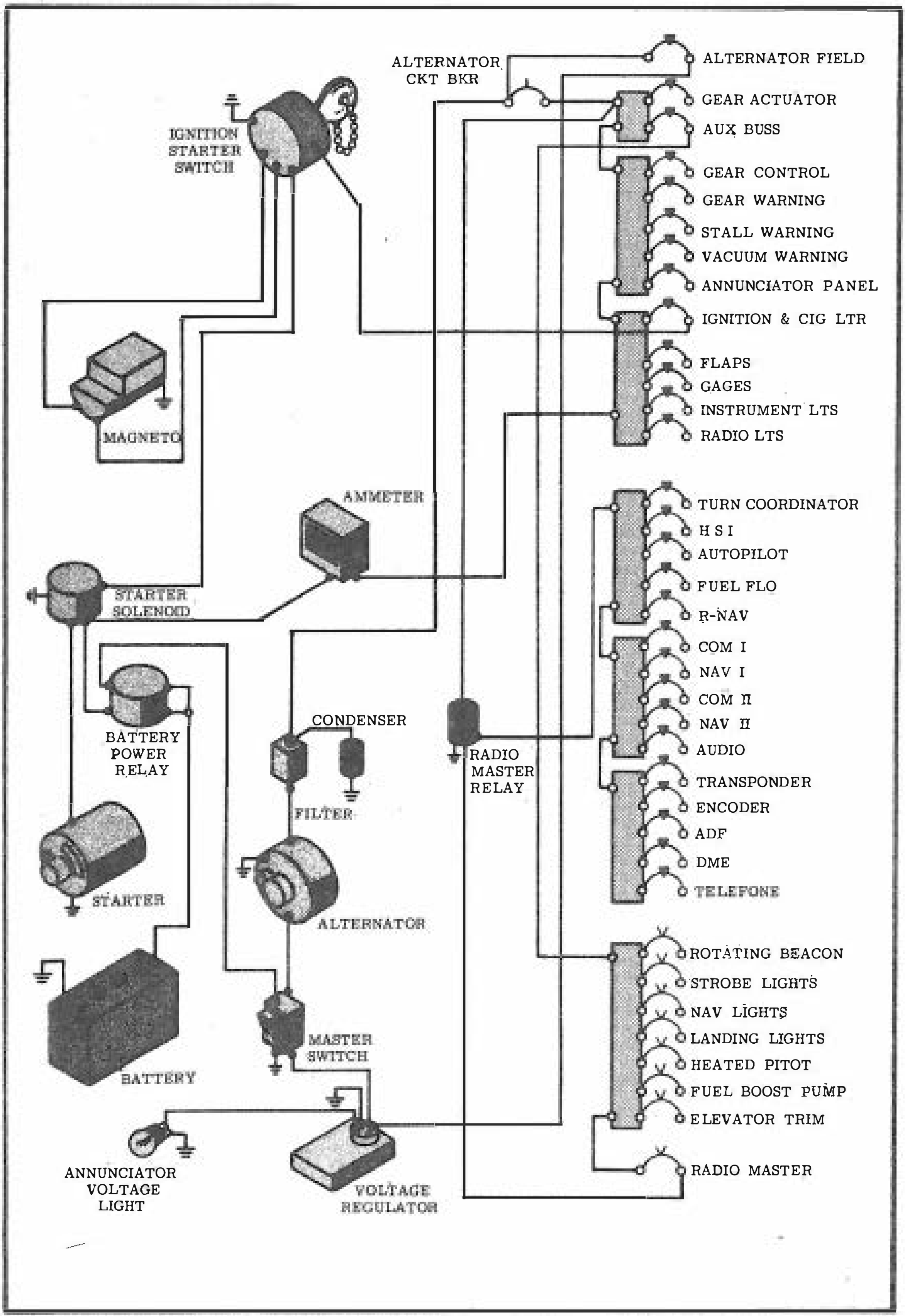


FIGURE 7-3 ELECTRICAL SYSTEM SCHEMATIC

CIRCUIT BREAKERS

Push-to-reset, push-pull, or rocker-switch circuit breakers automatically break the electrical current flow if the systems receive an overload, thus preventing damage to electrical wiring.

The main circuit breaker panel is in the extreme right panel. Figure 7-4 illustrates the main circuit breaker panel with its push-pull standard equipment circuit breakers. All rocker-switch circuit breakers are at the bottom of the flight panel.

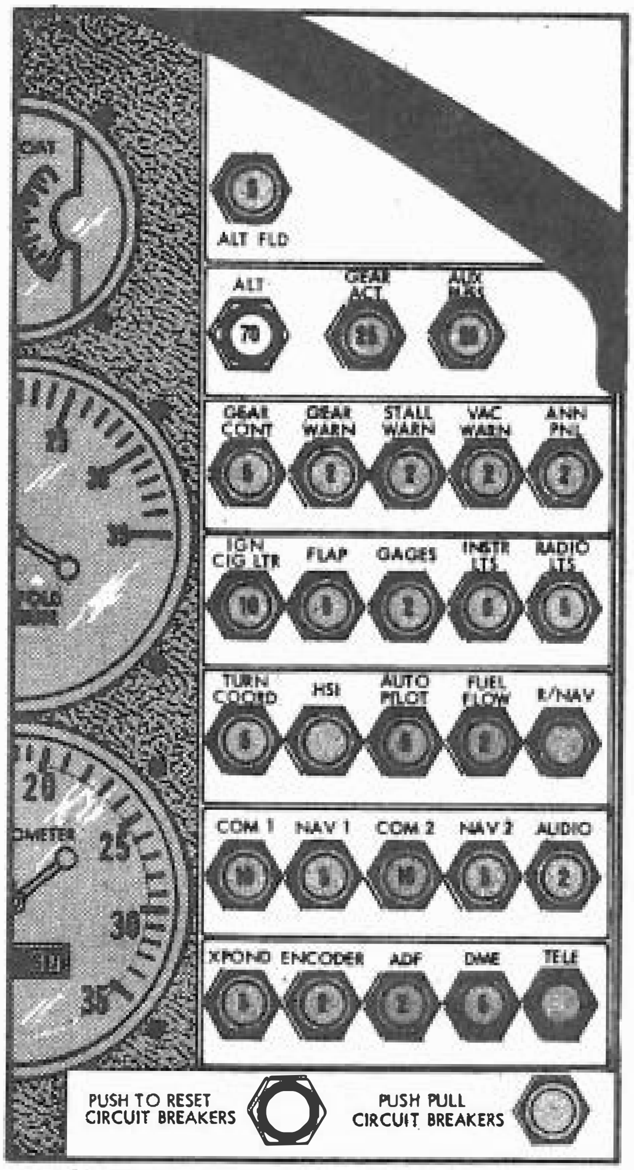


FIGURE 7-4
Main
Circuit Breaker Panel

The alternator push-to-reset circuit breaker on the main breaker panel furnishes an emergency overload break between the alternator and the main buss. Since the alternator is incapable of output in excess of the circuit breakers capacity, a tripped breaker normally indicates a fault within the alternator. Since the alternator is then cut out of the power circuit, the storage battery supplies electrical power in steadily diminishing output with the master switch on.

The alternator-field is a push-pull circuit breaker and furnishes an emergency break in the alternator field excitation circuit in the event of alternator or voltage regulator malfunction. If the regulator output voltage exceeds limits, the red voltage warning light illuminates steadily. Turning off the radio master switch and then turning master switch off and on, will reset the voltage regulator. The overvoltage annunciator light should remain out. If the overvoltage light comes on again, pulling out the alternator-field circuit breaker cuts the alternator out of the power circuit. Once again the battery is the only source of electrical power; therefore, all electrical equipment not essential for flight should be turned off and the flight terminated as soon as practical to correct the malfunction.

ANNUNCIATOR LIGHTS

The landing gear lights, low fuel light, voltage lights, and ram air lights are grouped in the annunciator and switch panel. A test switch, dim switch, and ELT switch are also found in the panel and each of the lights and switches are discussed elsewhere in this section.

INSTRUMENT & PLACARD LIGHTS

All instrument faces and placards are floodlighted by light bulbs in the glareshield. There are two rheostat knobs on the right hand radio panel, the left control regulates the intensity of the instruments and placard lighting. The right control provides avionic lighting. Rotating the knobs clockwise turns on and increases light intensity.

CABIN LIGHTING

A dome light illuminates the cabin. Its BRIGHT-OFF-DIM switch is slightly forward and to the right of the dome light.

EXTERIOR LIGHTING

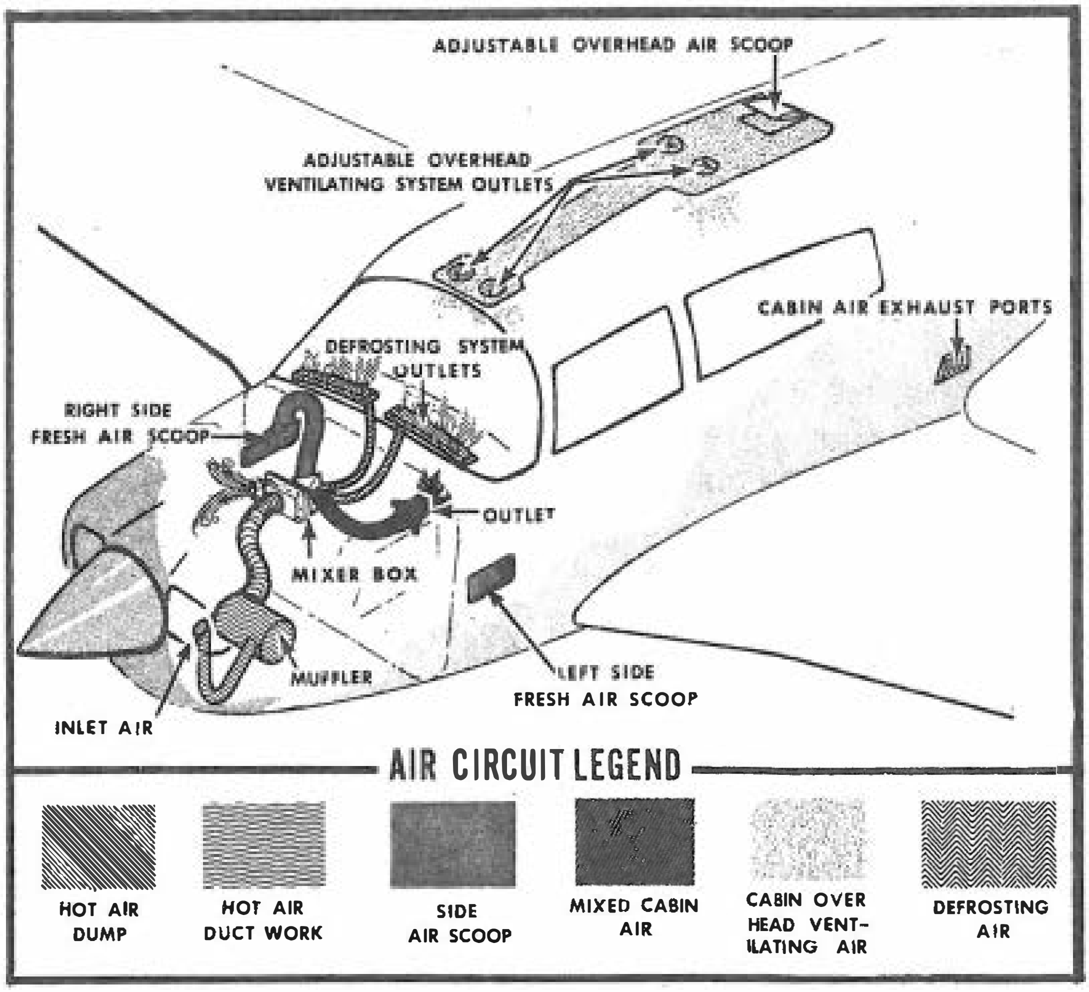
Conventional navigation and high intensity strobe lights are installed on the wing tips. A landing and taxi light is installed on the right side of the lower engine cowling. All exterior lights are controlled by rocker type switches on the lower left portion of the instrument panel.

When high intensity wing tip strobe lights are installed, they should be turned off when taxiing near other aircraft, in fog or clouds. The conventional navigation lights must be used for all night operations.

CABIN ENVIRONMENT

HEATING & VENTILATION SYSTEMS

Three ventilating systems provide cabin environmental control suited to individual pilot and passenger preferences. Fresh air heated by the engine exhaust muffler, and cool air from an airscoop on the co-pilot side, can be individually controlled and mixed to the desired temperature. The left side fresh-air scoop has an adjustable eyeball outlet near the pilot's knee.



Rotating the knob above the pilot seat extends or retracts the overhead airscoop to control air intake and to prevent air-buffeting at high cruising speeds. Small directional vent deflectors with inner knob air volumn controls, within easy reach of each occupant, distribute incoming outside air as individually desired

The cabin heat control is marked CABIN HEAT. Pulling the cabin heat control aft supplies heat to the cabin and defroster system. The cabin vent control is marked VENT. Pulling the vent control aft supplies fresh air to the lower cabin and the defrost system. Hot and cold air may be mixed by adjusting both heat and vent controls. These controls may be adjusted between full open and full closed. The right side airscoop has outlets under the side panel for installation of radio cooling ducts.

WINDSHIELD DEFROSTING SYSTEM

The windshield defrost system takes air from the cabin air distribution system and distributes this air over the windshield interior surface any time the heat and/or fresh air valves are opened. Pulling the defrost control full aft decreases flow to the cabin and forces maximum air to flow through the defrost ducts.

CABIN

SEATS & SAFETY BELTS

The front seats are individually mounted and may be adjusted fore and aft to fit individual comfort preferences. Resetting a seat back is accomplished by pulling the seat back forward, rotating the large cam selector knob at the lower back juncture, and allowing the back to return to the new position.

Safety belts, if worn properly, keep occupants firmly in their seats in rough air and during maneuvers. The belts are mechanically simple and comfortable to wear. They are attached to the seat, which can be moved without readjusting the belt.

BAGGAGE & CARGO AREAS

The baggage compartment has 17 cubic feet of baggage or cargo space and two pairs of floor tiedown straps. The loose equipment, consists of wing jackpoints and tiedown rings, a fuel sampling cup, and a towbar. These are stowed in the baggage compartment. The rear seat back may be removed for additional cargo space by removing attaching bolts at top and bottom of seat back.

If desired for any reason the baggage door can be opened from the inside even though locked.

To re-engage outside latch; open outside latch fully, close inside latch and push in on white button until latched. Operate outside latch in normal method.

SECTION VIII.

HANDLING, SERVICING & MAINTENANCE

TABLE OF CONTENTS

INTRODUCTION

This section contains factory recommended procedures for proper ground handling, routine care and servicing of your Mooney.

As required by Federal Aviation Regulations, all civil aircraft of U. S. registry must undergo a complete inspection (ANNUAL) each twelve calendar months. In addition to the required ANNUAL inspection, aircraft operated commercially (for hire) must have a complete inspection every 100 hours of operation. All inspections must be performed by a designated representative of the FAA.

The FAA may require other inspections by the issuance of airworthiness directives applicable to the airplane, engine, propeller and other components. It is the responsibility of the owner/operator to ensure compliance with all applicable airworthiness directives and, when the inspections are repetitive, to take appropriate steps to prevent inadvertent noncompliance.

Scheduling of ALL maintenance is the responsibility of the aircraft operator. A general knowledge of the aircraft is necessary to perform day-to-day service procedures and to determine when unusual service or shop maintenance is needed.

Service information in this section of the manual is limited to service procedures which the operator will normally perform or supervise. Reference should be made to FAR Part 43 for information regarding preventive maintenance which may be performed by a licensed pilot.

It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

Keep in touch with your Mooney Service Center and take advantage of his knowledge and experience. He knows your airplane and how to maintain it.

Should an extraordinary or difficult problem arise concerning the repair or upkeep of your Mooney, consult the Customer Service Department, Mooney Aircraft Corporation, P.O. Box 72, Kerrville, TX 78028. Phone Area Code 512-896-6000.

All correspondence regarding your airplane should include the model and serial numbers. These numbers can be found on an identification plate located on the lower aft portion of the left side of the tailcone. The model and serial numbers must also be used when consulting either the Service & Maintenance Manual or Parts Manual.

Service & Maintenance and Parts Manuals may be obtained for your airplane from your Mooney Marketing and Service Center.

GROUND HANDLING

TOWING

For maneuvering the aircraft in close quarters, in the hangar, or on the ramp, use the tow bar furnished with the aircraft loose equipment. The towbar attaches to the nose gear crossbar. One man can move the aircraft providing the ground surface is relatively smooth and the tires are properly inflated.

When no towbar is available, or when assistance in moving the aircraft is required, push by hand: (1) on the wing leading edges, (2) on the wing tips, and (3) on the inboard portion of propeller blades adjacent to the propeller hub. Towing by tractor or other powered equipment is not recommended.

CAUTION

Exercise care not to turn the nose wheel past its normal swivel angle of 14° either side of center. Exceeding the turn limits shown on the turn indicator may cause structural damage.

TIEDOWN

As a precaution against wind damage, always tie down the aircraft when parked outside. Removable wing tiedown eye-bolts, supplied with the loose equipment, screw into wing receptacles marked HOIST POINT just outboard of each main gear. Replace these eyebolts with jack point fixtures when it is necessary to lift the aircraft with jacks. The tail tiedown point is part of the tail skid.

To tie down the aircraft:

a. Park the airplane facing the wind.
b. Fasten the co-pilot seat belt through the flight control wheel.
c. Fasten strong ground-anchored chain or rope to the installed wing tiedown eyebolts, and place wheel chocks fore and aft of each wheel.
d. Fasten a strong ground-anchored chain or rope through the tail skid.

JACKING

When it is necessary to raise the aircraft off the ground:

a. Install jack points in tiedown mounting holes outboard of each main gear.
b. Use standard aircraft jacks at both wing hoist points (wing tiedown eyebolt receptacles) outboard of the main gears. While holding jack point in place, raise jack to firmly contact jack point.
c. Raise aircraft, keeping wings as nearly level as possible.
d. Secure safety locks on each jack.
e. Use a yoke-frame jack under propeller to lift the nose.

CAUTION

Do not raise the aircraft on jacks out of doors when wind velocity is over 10 MPH (8 KTS). When lowering aircraft on jacks, bleed off pressure on all jacks simultaneously and evenly to keep aircraft level as it is lowered.

NOTE

Individual wheels may be raised without raising the entire aircraft. Wheels not being raised should be chocked fore and aft.

SERVICING

REFUELING

Integral sealed tanks in the forward inboard sections of the wings carry the fuel. With the aircraft standing on level ground, service each fuel tank after flight with 100 or 100 LL octane aviation-grade gasoline. Both tanks have fuel level indicators that are visible through the filler ports. These indicators show the 25-gallon fuel level in each tank.

Before filling the fuel tanks when planning a maximum weight flight configuration, consult the Weight & Balance Record for loading data.

CAUTION

Never use aviation fuel of a lower grade than 100 or 100 LL octane. Aviation fuel grades can be distinguished by their color: 80 octane is red, 100 LL octane is blue, 100 octane is green.

Sample fuel from the sump drain in each tank before the first flight of the day and after each refueling to check for water or sediment contamination.

WARNING

Allow five minutes after refueling for water and sediment to settle in the tank and fuel selector valve drain before taking fuel samples or draining the gascolator.

Tank sump drains are near each wing root forward of the wheel wells. A small plastic cup is supplied in the loose equipment kit for obtaining fuel samples. To collect a fuel sample, insert the cup actuator prong in the sump drain receptacle and push upward to open the valve momentarily and drain fuel into the cup. If water is in the fuel, a distinct line separating the water from between the gasoline will be seen through the transparent cup wall. Water, being heavier, will settle to the bottom of the cup, while the colored fuel will remain on top. Continue taking fuel samples until all water is purged from the tank.

The fuel tank gascolator control is on the cabin floor forward of the pilot's seat. To flush the gascolator sump and the lines leading from the wing tanks to the selector valve, turn the selector handle to the left, and pull the fuel drain control for about five seconds. Repeat the procedure for the right tank, being sure that the fuel drain control ring is returned to the closed position and that the drain valve is not leaking.

ENGINE LUBRICATION

The new Lycoming engine has been carefully run-in and tested at the factory. Operate the new engine at full power within the limitations given in Section II. Before every flight, check the engine oil level and replenish as necessary.

Check engine oil level after engine has been stopped long enough for oil to drain back into sump. The oil filler cap access door is located in the top cowling. Any lubricating oil, either straight mineral or compounded, must conform with Lycoming Specification No. 301E to be acceptable for use in Lycoming engines. New or newly overhauled engines should be operated on aviation grade straight mineral oil during the first 25 hours of operation or until oil consumption has stabilized. The aircraft is delivered from Mooney with straight mineral oil of the correct viscosity.

The engine is equipped with an external oil filter and the engine oil change intervals may be extended to 100-hour intervals providing the external filter element is changed AT 50-HOUR INTERVALS. If an engine has been operating on straight mineral oil for several hundred hours, a change to additive oil should be undertaken with caution. If the engine is in an extremely dirty condition, the switch to additive oil should be deferred until after engine has been overhauled. When changing from straight mineral oil to additive or compounded oil, after several hundred hours of operation on straight mineral oil, take the following precautionary steps:

a. Do not mix additive oil and straight mineral oil. Drain straight mineral oil from engine, change filter and fill with additive oil.
b. Do not operate engine longer than five hours before again changing oil.
c. Check oil filter for evidence of sludge or plugging. Change oil and replace oil filter element every 10 hours if sludge is evident. Resume normal oil drain periods after sludge conditions improve.

Your Mooney Service Center will change the engine oil in addition to performing all other service and inspection procedures needed when you bring your airplane in for its 50-hour, 100-hour, or annual inspections. Excessive oil sludge buildup indicates that the oil system needs servicing at less than 50-hour intervals.

When changing or adding oil Lycoming specifies the following grades of oil to use for various ambient air temperatures.

Average Ambient Air	*Recommended Grade Oil Single Viscosity	Multi Viscosity
Above 60°F	SAE 50	40 or 50
30° to 90°F	SAE 40	40
0° to 70°F	SAE 30	40 or 20W-30
Below 10°F	SAE 20	20W-30

*Refer to the latest edition of Lycoming Service Instruction No. 1014.

Your Mooney Service Center has approved brands of lubricating oil and all consumable materials necessary to service your airplane.

INDUCTION AIR FILTER SERVICING

The importance of keeping the induction air filter clean cannot be over-emphasized. A clean filter promotes fuel economy and longer engine life. The dry-type Donaldson filter can usually be washed six to eight times before replacement is necessary. Replace the induction air filter every 500 hours or at one-year intervals, whichever occurs first.

1. To clean the Donaldson dry-type induction air filter:
   a. Remove the top engine cowling.
   b. Remove filter element.
   c. Direct a jet of air against down or clean side of filter (opposite to normal airflow). Keep air nozzle at least two inches from filter element. Cover entire filter area with air jet.

CAUTION

Do not use a compressor unit with a nozzle pressure greater than 100 PSI.

   d. After cleaning, inspect filter and gasket for damage. Discard a ruptured filter or broken gasket.

NOTE

If filter shows an accumulation of carbon, soot, or oil, continue with cleaning steps e. through h.

   e. Soak filter in nonsudsing detergent for 15 minutes; then agitate filter back and forth for two to five minutes to free filter element of deposits.

NOTE

A Donaldson D-1400 Filter Cleaner is also recommended. Do not use solvents.

f. Rinse filter element with a stream of clear water until rinse water is clear.
g. Dry filter thoroughly. Do not use a light bulb or air heated above 180^{O} F for filter drying.
h. Inspect for damage and ruptures by holding filter before a light bulb. If damage is evident, replace filter with a new one.

GEAR & TIRE SERVICE

The aircraft is equipped with 6-ply standard-brand tires and tubes. Keep the main gear tires inflated at 30 PSI and the nose tire at 49 PSI for maximum service life. Proper inflation will minimize tire wear and impact damage. Visually inspect the tires at preflight for cracks and ruptures, and avoid taxi speeds that require heavy braking or fast turns. Keep the gear and exposed gear retraction system components free of mud and ice to avert retraction interference and binding.

The gear warning horn may be checked in flight by retarding the throttle with the gear up. The gear horn should sound with an intermittent note at about 12 inches manifold pressure.

BATTERY SERVICE

The 12-volt 35-ampere-hour electrical storage battery is located in the tailcone, aft of baggage compartment bulkhead, accessible through tailcone access panel. Check battery fluid level every 25 flight hours or each 30 days, whichever comes first.

To service the battery, remove the battery box cover and check the terminals and connectors for corrosion. Add distilled water to each battery cell as necessary; keep the fluid at one-quarter inch over the separator tops. Check the fluid specific gravity for a reading of 1.265 to

1.275. A recharge is necessary when the specific gravity is 1.240 or lower. Start charging at four amperes and finish at two amperes; do not allow battery temperature to rise above 120°F during recharging. Keep the battery at full charge to prevent freezing in cold weather and to prolong service life.

CAUTION

The alternator and voltage regulator operate only as a one-polarity system. Be sure the polarity is correct when connecting a charger or booster battery.

If corrosion is present, flush the battery box with a solution of baking soda and water. Do not allow soda to enter the battery cells. Keep cable connections clean and tightly fastened, and keep overflow lines free of obstruction.

HYDRAULIC BRAKE RESERVOIR SERVICE

The brake system hydraulic reservoir is located in the tailcone above the battery. To service, remove the tailcone access panel and check fluid level every 50 hours of operation. Fluid level should be no higher than two (2) inches below the filler cap. Use only hydraulic fluid (Red) conforming to specification MIL-H-5606. DO NOT FILL reservoir while parking brake is set.

MAINTENANCE

PROPELLER CARE

The high stresses to which propeller blades are subjected makes their careful inspection and maintenance vitally important. Check the blades for nicks, cracks, or indications of other damage before each flight. Nicks tend to cause high-stress concentrations in the blades which, if ignored, may result in cracks. It is very important that all nicks and scratches be polished out prior to next flight.

It is not unusual for the propeller blades to have some end play or fore and aft movement as a result of manufacturing tolerances in the parts. This has no adverse affect on propeller performance or operation and is no cause for concern if the total movement at the blade tip does not exceed .12 inches. With the first turn, centrifugal force firmly seats the blades, rigidly and positively against the retention bearing in the propeller hub.

Preflight inspection of the propeller blades should include in addition to the foregoing an occasional wiping with an oily cloth to clean off grass and bug stains. Never use an alkaline cleaner on the blades; remove grease and dirt with tetrachloride or Stoddard solvent. McCauley recommends the propeller be removed and overhauled every 1200 hours of operation.

Your Mooney Service Center will answer any questions you may have concerning blade repair and inspection.

EXTERIOR CARE

As with any paint applied to a metal surface, an initial curing period is necessary for developing the desired qualities of durability and appearance. Therefore, do not apply wax or polish to the new aircraft exterior until two or three months after delivery. Wax substances will seal paint from the air and prevent curing. Do wash the exterior to prevent dirt from working into the curing paint, but hold buffing to a minimum until curing is complete and there is no danger of disturbing the undercoat.

Before washing the exterior, be certain the brake discs are covered, a pitot cover is in place, and all static-air buttons are masked off. Remove grease or oil from the exterior by wiping with a cotton cloth saturated in kerosene. Flush away loose dirt and mud deposits before washing the exterior with an aircraft-type washing compound mixed in warm water. Use soft cleaning cloths or a chamois, and avoid harsh or abrasive detergents that might scratch or corrode the surface. It is essential that all cleaning compounds and application cloths be free of abrasives, grit, or other foreign matter. Use a prewax cleaner to remove a heavy oxidation film. For nonoxidized or precleaned surfaces, apply a good exterior finish wax recommended for protection of urethane enamel finishes. Carefully follow the manufacturer's instructions. A heavier coating of wax on the leading edge of the wings, empennage, and nose section will help reduce drag and abrasion in these areas.

If fuel, hydraulic fluid, or any other dye-containing substance is found on the exterior paint, wash the area at once to prevent staining. Immediately flush away spilled battery acid, and treat the area with a baking soda-and-water solution, followed by a thorough washing with a mild aircraft detergent and warm water.

Before wiping the windows or windshield, flush the exterior with clear water to remove particles of dirt. Household window cleaning compounds should not be used as some contain abrasives or solvents which could harm plexiglas. An anti-static plexiglas cleaner is good for cleaning and polishing the windshield and windows.

INTERIOR CARE

Normal household cleaning practices are recommended for routine interior care. Frequently vacuum clean the seats, rugs, upholstery panels, and headliner to remove as much surface dust and dirt as possible. Occasionally wash the leather or vinyl upholstery and kick panels with a mild soap solution to prevent dirt from working into the surface. Wipe clean with a slightly damp cloth and dry with a soft cloth. Never apply furniture polishes. Foam-type shampoos and cleaners for vinyl, leather, textiles, and plastic materials are good for removing stains and reconditioning the entire interior. Spray dry cleaners are also recommended. Grease spots on fabric should be removed with a jelly-type spot lifter.

Never use denatured alcohol, benzene, carbon tetrachloride, acetone, or gasoline for cleaning plexiglas or interior plastics. Carefully follow the manufacturer's instructions when using commercial cleaning and finishing compounds.

Do not saturate fabrics with a solvent which could damage the backing and padding materials. To minimize carpet wetting, keep foam as dry as possible and gently rub in circles. Use a vacuum cleaner to remove foam and to dry the materials. Use a damp cloth or a mild soap solution to clean interior garnish plastic, vinyl trim, and metal surfaces.

AIRPLANE FILE

Certain miscellaneous data, information and licenses are a part of the airplane file. The following is a checklist of documents that must either be carried in the airplane or available on request of the proper authority.

1. To be displayed in the airplane at all times:

   (a) Aircraft Airworthiness Certificate (FAA Form 8100-2)
   (b) Aircraft Registration Certificate (FAA Form 8050-3)
   (c) Aircraft Radio Station License, if transmitter installed (FCC Form 556).

2. To be carried in the airplane during all flight operations:

   (a) Pilot's Operating Handbook (including FAA Approved Flight Manual)
   (b) Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
   (c) Equipment List.

NOTE

The original weight and balance data and Equipment List are contained in Section VI of this manual, when the manual is supplied with a new airplane purchased from Mooney Aircraft Corporation. It is recommended that copies of Section V be made and stored in a safe place.

3. To be made available upon request:

   (a) Airplane Log Book
   (b) Engine Log Book

Since the Regulations of other nations may require other documents and data, owners of airplanes not registered in the United States should check with their own aviation officials to determine their individual requirements.