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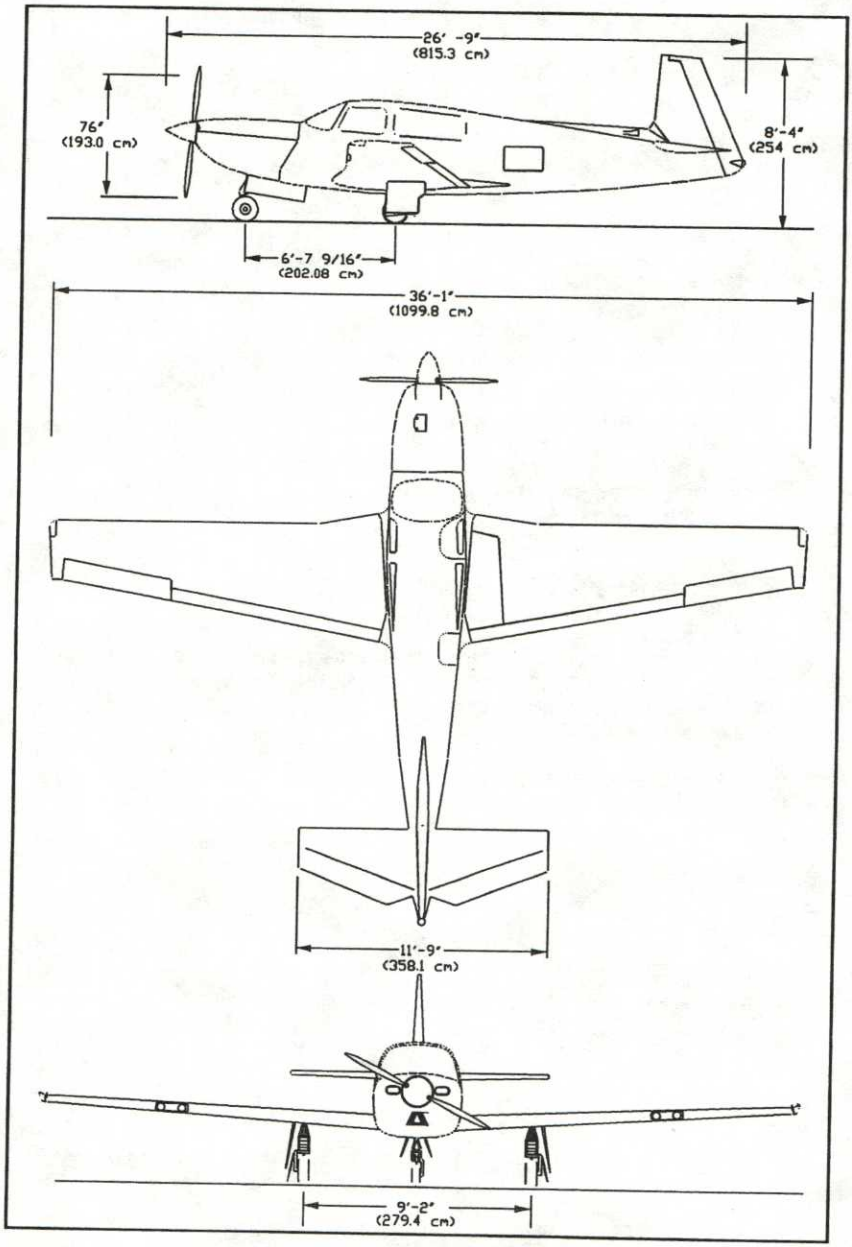

FIGURE 1 - 1 THREE VIEW - M20R
[S/N 29-0183, 29-0200 THRU 29-TBA]

INTRODUCTION

This Operators Manual conforms to GAMA Specification No. 1 and includes both Manufacturers material and FAA APPROVED material required to be furnished to the Pilot by the applicable Federal Aviation Regulations. Section IX 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 Operators Manual.

This Pilot's Operating Handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used for operational purposes unless kept in an up to date status.

All limitations, procedures, safety practices, servicing and maintenance requirements published in this POH/AFM are considered mandatory for the Continued Airworthiness of this airplane in a condition equal to that of its original manufacture.

DESCRIPTIVE DATA

ENGINE

Number of engines	1
Engine Manufacturer	Teledyne Continental Motors (TCM)
Model	IO-550-G(6)*
Recommended TBO	2000 Hours
Type	Reciprocating, air cooled, fuel injected
Number of cylinders	6, Horizontally opposed
Displacement	550 Cu. In. (9014 cc)
Bore	5.25 In. (13.3 cm)
Stroke	4.25 In. (10.8 cm)
Compression ratio	8.5 : 1

Fuel System

Type	Fuel Injection
Make	TCM
Fuel-Aviation Gasoline	100 octane - 100LL

Accessories

Magnetos	Bendix - S6RN-25
Ignition Harness	Shielded/Braided
Spark Plugs	AC 273 (or equivalent) (18 m/m)
Oil Cooler	TCM Full Flow
Alternator	28 Volt DC, 100 AMPS
Starter	24 volt DC

Ratings:

Maximum Takeoff Sea Level BHP/RPM	280/2500

PROPELLER

Number	1
Manufacturer	McCauley
Model Number	2A34C241/82PGC-6 *
Number of Blades	2
Diameter (MAX.)	76 in. (193.0 cm)
(MIN.)	75.5 in. (191.8 cm)
Type	Constant Speed
Governor (McCauley)	Hydraulically controlled by engine oil
Blade Angles @ 30.0 in. Sta.:	
Low	20.0 degrees +/- 0.5 degrees
High	37.5 degrees +/- 0.5 degrees

* Refer to McCauley TCDS P3EA for engine/propeller configuration required.

FUEL

Minimum Fuel Grade (Color)	100 LL (Blue) or 100 Octane (Green)
Total Capacity	95 U.S. Gal. (359.6 Liters)
Usable	89.0 U.S. Gal. (336.9 Liters)

OIL

Oil Specification	MHS-24( )
and as Approved by TCM. (Reference Engine Maintenance & Operators Manual)	
All Temperatures	15W50 or 20W50
Above 30°F (-1°C) Ambient Air (S.L.)	SAE 50
Below 50°F (10°C) Ambient Air (S.L.)	SAE 30, 10W30
Total Oil Capacity	8 Qts. (7.57 liters)
Min. Oil	6 Qts. (5.68 liters)
Oil Filter	Full Flow

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

LANDING GEAR

TYPE: Electrically operated, fully retractable tricycle gear with rubber shock discs. The main wheels have hydraulically operated disc brakes. The nose wheel is fully steerable 11° left to 13° right of center.

Wheel Base	79 9/16 in. (198.91 cm)
Wheel Track	110 in. (279.4 cm)
Tire Size:	
Nose	5.00 x 5 (6 ply)
Main	6.00 x 6 (6 ply)
Tire Pressure	
Nose	49 PSI
Main	42 PSI
Minimum Turning Radius (No brakes applied)	
Right	40 ft. (12.0 m)
Left	48 ft. (14.4 m)

MAXIMUM CERTIFICATED WEIGHTS

Gross Weight	3368 Lbs. (1528 Kg)
Maximum Landing Weight	3200 Lbs. (1452 Kg)
Baggage Area	120 Lbs. (54.4 Kg)
Rear Storage Area	10 Lbs. (4.5 Kg)
Cargo (Rear Seats Folded Down)	340 Lbs. (154.2 Kg)

STANDARD AIRPLANE WEIGHTS

Basic Empty Weight	See Page 1-8
Useful Load	Varies with installed equipment.
	See SECTION VI for specific airplane weight (pg. 6-5).

CABIN AND ENTRY DIMENSIONS

Cabin Width (Maximum)	43.5 In. (110.5 cm)
Cabin Length (Maximum)	126 In. (315 cm)
Cabin Height (Maximum)	44.5 In. (113 cm)
Entry Width (Minimum)	29.0 In. (73.4 cm)
Entry Height (Minimum)	35.0 In. (88.9 cm)

BAGGAGE SPACE AND ENTRY DIMENSIONS

Compartment Width	24 In. (60.9 cm)
Compartment Length	43 In. (109.2 cm)
Compartment Height	35 In. (88.9 cm)
Compartment Volume	20.9 cu. ft. (.592 cu. m)
Cargo Area (with rear seat folded down)	38.6 cu. ft. (1.09 cu. m)
Entry Height (Minimum)	20.5 In. (52.1 cm)
Entry Width	17.0 In. (43.2 cm)
Ground to Bottom of Sill	46.0 In. (116.8 cm)

SPECIFIC LOADINGS

Wing Loading - @ Maximum Gross Weight	19.26 lbs./sq. ft. (94 kg/sq. m)
Power Loading - @ Maximum Gross Weight	12.03 lbs./HP (5.46 kg/HP)

IDENTIFICATION PLATE

All correspondence regarding your airplane should include the Serial Number as depicted on the identification plate. The identification plate is located on the left hand side, aft end of the tail cone, below the horizontal stabilizer leading edge. The aircraft Serial Number and type certificate are shown.

SYMBOLS, ABBREVIATIONS & TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY & SYMBOLS

GS	GROUND SPEED - Speed of an airplane relative to the ground.
KCAS	KNOTS CALIBRATED AIRSPEED - 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.
KIAS	KNOTS INDICATED AIRSPEED - The speed of an aircraft as shown on its airspeed indicator. IAS values published in this handbook assume zero instrument error.
KTAS	KNOTS TRUE AIRSPEED - The airspeed of an airplane relative to undisturbed air which is the KCAS corrected for altitude and temperature.
V_a	MANEUVERING SPEED - The maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{fe}	MAXIMUM FLAP EXTENDED SPEED - The highest speed permissible with wing flaps in a prescribed extended position.
V_{le}	MAXIMUM LANDING GEAR EXTENDED SPEED -The maximum speed at which an aircraft can be safely flown with the landing gear extended.

GENERAL AIRSPEED TERMINOLOGY & SYMBOLS (con't.)

V_{lo}	MAXIMUM LANDING GEAR OPERATING SPEED - The maximum speed at which the landing gear can be safely extended or retracted.
V_{ne}	NEVER EXCEED SPEED - The speed limit that may not be exceeded at any time.
V_{no}	MAXIMUM STRUCTURAL CRUISING SPEED - The speed that should not be exceeded except in smooth air and then only with caution.
V_s	STALLING SPEED - The minimum steady-flight speed at which the airplane is controllable.
V_{so}	STALLING SPEED - The minimum steady flight speed at which the airplane is controllable in the landing configuration.
V_x	BEST ANGLE-OF-CLIMB SPEED - The airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V_y	BEST RATE-OF-CLIMB SPEED - The airspeed which delivers the greatest gain in altitude in the shortest possible time with gear and flaps up.

ENGINE POWER TERMINOLOGY

BHP	BRAKE HORSEPOWER - Power developed by the engine.
CHT	CYLINDER HEAD TEMPERATURE - Operating temperature of engine cylinder(s) being monitored by sensor unit. Expressed in ^{o}F.
EGT	EXHAUST GAS TEMPERATURE - The exhaust gas temperature measured in the exhaust pipe manifold. Expressed in ^{o}F.
MCP	MAXIMUM CONTINUOUS POWER - The maximum power for takeoff, normal, abnormal or emergency operations.
MP	MANIFOLD PRESSURE - Pressure measured in the engine's induction system and expressed in inches of mercury (Hg).
RPM	REVOLUTIONS PER MINUTE - Engine speed.

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

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

ENGINE CONTROLS & INSTRUMENTS TERMINOLOGY

Propeller Control	The control used to select engine speed.
Throttle Control	The control used to select engine power by controlling MP.
Mixture Control	Provides a mechanical linkage to the fuel injector mixture control to control the size of the fuel feed aperture, and therefore the air/fuel mixture. It is the primary method to shut the engine down.
CHT Gauge	Cylinder head temperature indicator used to determine that engine operating temperature is within manufacturers specifications.
Tachometer	An instrument that indicates rotational speed of the engine. The speed is shown as propeller revolutions per minute (RPM).
Propeller Governor	The device that regulates RPM of the engine/propeller by increasing or decreasing the propeller pitch, through a pitch change mechanism in the propeller hub.

METEOROLOGICAL TERMINOLOGY

AGL	Above ground level.
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 the temperature, the higher the density altitude.
Indicated Altitude	The altitude actually read from an altimeter when, and only when barometric subscale (Kollsman window) has been set to Station Pressure.
ISA	INTERNATIONAL STANDARD ATMOSPHERE assumes that (1) The air is a dry perfect gas; (2) The temperature at sea level is 15 degrees Celsius (59°F); (3) The pressure at sea level is 29.92 inches Hg (1013.2 mb); (4) The temperature gradient from sea level to the altitude at which the temperature is -56.5°C (-69.7°F) is -0.00198°C (-0.003564°F) per foot.
OAT	OUTSIDE AIR TEMPERATURE - The free air static temperature, obtained either from in-flight temperature indications or ground meteorological sources. It is expressed in °C.
Pressure Altitude	The indicated altitude when Kollsman window is set to 29.92 In. Hg. or 1013.2 MB. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.

WEIGHT AND BALANCE TERMINOLOGY

Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Basic Empty Weight	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 unusable fuel and full oil.
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.

WEIGHT AND BALANCE TERMINOLOGY (con't.)

C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. in % MAC	Center of Gravity expressed in percent of mean aerodynamic chord (MAC).
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
MAC	Mean Aerodynamic Chord.
Maximum Weight	The maximum authorized weight of the aircraft and its contents as listed in the aircraft specifications.
Maximum Landing Weight	The maximum authorized weight of the aircraft and its contents when a normal landing is to be made.
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.)
Reference Datum	An imaginary vertical plane from which all horizontal distances are are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.
Tare	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.
Unusable Fuel	Fuel remaining after a run-out test has been completed in accordance with Federal regulations.
Usable Fuel	Fuel available for aircraft engine combustion.
Useful Load	The basic empty weight subtracted from the maximum weight of the aircraft. This load consists of the pilot, crew (if applicable), useable fuel, passengers, and baggage.

MEASUREMENT CONVERSION TABLES

LENGTH

U. S. Customary Unit	Metric Equivalents
1 inch	2.54 centimeters
1 foot	0.3048 meter
1 yard	0.9144 meter
1 mile (statute, land)	1, 609 meters
1 mile (nautical, international)	1, 852 meters

AREA

U. S. Customary Unit	Metric Equivalents
1 square inch	6.4516 sq. centimeters
1 square foot	929 sq. centimeters
1 square yard	0.836 sq. meter

VOLUME OR CAPACITY

U. S. Customary Unit	Metric Equivalents
1 cubic inch	16.39 cubic centimeters
1 cubic foot	0.028 cubic meter
1 cubic yard	0.765 cubic meter

U.S. Customary Liquid Measure	Metric Equivalents
1 fluid ounce	29.573 milliliters
1 pint	0.473 liter
1 quart	0.946 liter
1 gallon	3.785 liters

U.S. Customary Dry Measure	Metric Equivalents
1 pint	0.551 liter
1 quart	1.101 liters

British Imperial Liquid and Dry Measure	U. S. Equivalents	Metric Equivalents
1 fluid ounce	0.961 U.S. fluid ounce, 1.734 cubic inches	28.412 milliliters
1 pint	1.032 U.S. dry pints, 1.201 U.S. liquid pts., 34.678 cubic inches	568.26 milliliters
1 quart	1.032 U.S. dry quarts 1.201 U.S. liquid qts., 69.354 cubic inches	1.136 liters
1 gallon	1.201 U.S. 277.420 cubic inches	4.546 liters

WEIGHT

U. S. Customary Unit (Avoirdupois)	Metric Equivalents
1 grain	64.79891 milligrams
1 dram	1.772 grams
1 ounce	28.350 grams
1 pound	453.6 grams

PRESSURE

U.S. Customary Unit	Metric Equivalents
1 PSIG	6.895 KPA
1 Inch Hg	3.388 KPA
1 Inch Hg	25.40 mm Hg

COMMON CONVERSIONS

1 pound/square foot	0.488 kg/ meter square
1 pound /sq. inch	2.036 inch Hg.
1 Pound/HP	0.4538 kg/HP

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INTRODUCTION

SECTION II includes the mandatory 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 IX.

| 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 V 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 V.

Your Mooney is certificated under FAA Type Certificate No. 2A3 as a Mooney M20R.

NOISE LIMITS

The certificated noise level for the Mooney M20R, S/N 29-0183, 29-0200 thru 29-TBA, at 3368 lbs. (1528 Kg.) maximum weight is 77.3 dB(A). No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

AIRSPEED LIMITATIONS

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

V / SPEED		KCAS/KIAS	REMARKS
V_{NE}	Never Exceed Speed	196/195	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	175/174	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed at:		
	lbs. /Kg.		
	2232/1012	104/103	Do not make full or abrupt control movement above this speed.
	2430/1102	109/108	
	3300/1497	127/126	
	3368/1528	128/127	
V_{FE}	Maximum Flap Extended Speed	111/110	Do not exceed this speed with flaps in full down position.
V_{LE}	Maximum Landing Gear Extended Speed	166/165	Maximum speed at which the aircraft can be safely flown with the landing gear extended.
V_{LO} (EXT)	Max. Speed for Gear Extension	141/140	Max. speed at which the landing gear can be safely extended.
V_{LO} (RET)	Max. Speed for Gear Retraction	107/106	Maximum speed at which the landing gear can be safely retracted.
	Maximum Pilot Window Open Speed	133/132	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	IAS VALUE or RANGE (KIAS)	SIGNIFICANCE
White Arc (Flap Operating Range)	59-110 KIAS	Lower limit is maximum weight V_{SO} in landing configuration. Upper limit is maximum speed permissable with flaps extended.
Green Arc (Normal Operating Range)	66-174 KIAS	Lower limit is maximum weight V_S with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc (Caution Range)	174-195 KIAS	Operations must be conducted with caution and only in smooth air.
Radial Red Line	195 KIAS	Maximum speed for all operations.

FIGURE 2-2 AIRSPEED INDICATOR MARKINGS

POWER PLANT LIMITATIONS

Number of Engines	1
Engine Manufacturer	Teledyne Continental Motors (TCM)
Engine Model Number	IO-550-G(6) *

Engine Operating Limits for Takeoff and Continuous Operations:

Maximum Continuous Power	280 BHP
Maximum Continuous RPM	2500 RPM
Transient RPM Limit	2600 RPM
Maximum Cylinder Head Temperature	460° F (237.7° C)
Maximum Oil Temperature	240° F (115° C)
Minimum Oil Temperature-Takeoff.	75° F (24° C)
Recommended Cruising Temperature	170°F-200°F (76°C-93°C)
Oil Pressure	
Normal Operating	30-100 PSI
Minimum (**IDLE ONLY**)	10 PSI

Oil Specification	MHS-24( ), MHS-25( ) and TCM Approved oils
Fuel Grade (Color)	100LL (Blue)** or 100 octane (Green) **
Number of Propellers	1
Propeller Manufacturer	**McCauley**
Propeller Hub/Blade Model Number	2A34C241/82PGC-6 ***
Number of Blades	2

Propeller Diameter: **McCauley**

Min	75.5 In. (191.8 cm)
Max	76 In. (193.0 cm)

McCauley - Propeller Blade Angles @ 30.0 In. sta.:

Low	20.0 Degrees +/- 0.5 Degrees
High	37.5 Degrees +/- 0.5 Degrees

Propeller Operating Limits (**McCauley**)	2500 RPM

* Refer to MAC TCDS 2A3 for engine configuration required.

** 100LL fuel is calibrated at 5.82 lb/gal(.69 Kg/liter)
100 octane fuel is calibrated at 6.0 lb.gal. (.72 Kg/liter)

*** Refer to MAC TCDS 2A3 & McCauley TCDS P3EA for propeller configuration required.

POWER PLANT INSTRUMENT MARKINGS

INSTRUMENT	REDLINE MINIMUM LIMIT	GREEN ARC NORMAL OPERATING	YELLOW ARC	REDLINE MAXIMUM LIMIT
Tachometer	600 RPM No Redline	2200-2500 RPM	———	2500 RPM
Cylinder Head Temperature		250-460° F (121 - 215.5°C)	----------	460° F (237.7°C)
Oil Temperature	No Redline	170 -240° F (76.6 - 104°C)	100 - 170°F (37.7-76.6°C)	240° F (115.5°C)
Oil Pressure	10.0 PSI (IDLE ONLY)	30-100 PSI	10 - 30 PSI	100 PSI
Exhaust Gas Temperature		1400-1450°F (760-788°C) (BLUE ARC =	recommended climb)	1650°F (899°C)

NOTE
Refer to TCM Engine Maintenance and Operators Manual Section on Engine Specifications and Operating Limits for recommended cruise power and temperature limitations.

FIGURE 2 - 3 POWER PLANT INSTRUMENT MARKINGS

FUEL LIMITATIONS

// WARNING //

Takeoff maneuvers when the selected fuel tank contains less than 12 gallons (45.4 liters) of fuel have not been demonstrated.

| NOTE |

Each fuel quantity gauge is calibrated to read zero only in coordinated level flight when remaining quantity of fuel can no longer be safely used.

| NOTE |

An optional visual fuel quantity gauge is installed on top of each tank and is to be used as a reference for refueling tanks only.

Standard Tanks (2)	47.5 U.S. Gal. each (179.8 liters)
Total Fuel	95 U.S. Gal.(359.6 liters)
Usable Fuel:	89 U.S. Gal. (336.8 liters)
Unusable Fuel:	6 U.S. Gal. (22.7 liters)

Fuel Grade (and color): 100LL (low lead) (blue) or 100 octane (green) is approved.

~ CAUTION ~

To reduce possibility of ice formation within the aircraft or engine fuel system it is permissible to add ISO-PROPYL alcohol to the fuel supply in quantities NOT TO EXCEED 3% of total fuel volume per tank. DO NOT add other additives to fuel system due to potential deteriorating effects within the fuel system.

WEIGHT LIMITS

Maximum Weight - Takeoff	3368 lb. (1528 Kg.)
Maximum Weight - Landing	3200 lb. (1452 Kg)
Maximum Weight in Baggage Compartment	120 lb. (54.4 Kg.) @ Fus. Sta. 101.5(253.7 cm)
Maximum Weight in Rear Storage Area	10 lb. (4.54 Kg.) @ Fus. Sta. 131.0(297.5 cm)
Maximum Weight in Cargo Area (Rear seats folded down)	340 lbs. (154.2 KG) @ Fus. Sta. 70.7(176.8 cm)

CENTER OF GRAVITY LIMITS (GEAR DOWN)

Most Forward	Fus. Sta. 41.0 IN. (104.1 cm) @ 2430 LB. (1102 Kg) 16.79% MAC
Intermediate Forward	Fus. Sta. 44 IN.(111.7 cm) @ 3300 lb. (1497 Kg) 21.7% MAC
Forward Gross	Fus. Sta. 46.0 IN. (116.8 cm) @ 3368 lb (1528 Kg) 24.98% MAC
Aft Gross	Fus. Sta. 51.0 IN(129.5 cm) @ 3368 lb. (1528 Kg) 33.18% MAC
MAC (at Wing Sta. 94.85)(241 cm)	61.00 In.

Datum (station zero) is 13 inches (32.5 cm) aft of the center line of the nose gear trunion attach/pivot bolts.

MANEUVER LIMITS

This airplane must be operated as a Normal Category airplane. Aerobatic maneuvers, including spins, are prohibited.

| NOTE |

Up to 500 foot altitude loss may occur during stalls at maximum weight.

FLIGHT LOAD FACTOR LIMITS

Maximum Positive Load Factor	
Flaps Up	+3.8 g.
Flaps Down (33 Degrees)	+2.0 g.
Maximum Negative Load Factor	
Flaps Up	-1.5 g.
Flaps Down	.0.0 g.

FLIGHT CREW

Pilot	One
Maximum passenger seating configuration	Three

OPERATING LIMITATIONS

When aircraft is not equipped with an approved oxygen system and flight operations above 12,000 ft. are desired, this airplane must be, (1) equipped with supplemental oxygen in accordance with FAR 23.1441, (2) operate in accordance with FAR 91.211 and (3) equipped with avionics in accordance with FAR 91 or FAR 135.

ALTERNATOR OPERATING LIMITATIONS IS 94 AMPS.

AVOID CONTINUOUS OPERATION BELOW 2100 RPM AT MANIFOLD PRESSURES GREATER THAN 21 INCHES HG.

KINDS OF OPERATION LIMITS

This is a Normal Category airplane certified for VFR/IFR day or night operations when the required equipment is installed and operational as specified in the KINDS OF OPERATION EQUIPMENT LIST and the applicable operating rules.

Optional equipment installations may not be required to be operational.

The pilot must determine that the applicable operating rules requirements for each kind of operation are met.

OPERATIONS IN KNOWN ICING CONDITIONS ARE PROHIBITED.

Autopilot Limitations - See SECTION IX.

KINDS OF OPERATION EQUIPMENT LIST

The following equipment was approved during Type Certification and must be installed and operable for each kind of operation as specified.

| NOTE |

The KINDS OF OPERATION EQUIPMENT list may not include all the equipment as required by applicable operating rules.

SEE NEXT PAGE FOR LISTINGS.

KINDS OF OPERATION EQUIPMENT LIST

SYSTEM or COMPONENT	VFR DAY *	VFR NIGHT	IFR DAY	IFR NIGHT
AIRSPEED INDICATOR	1	1	1	1
ALTIMETER, SENSITIVE	1	1	1	1
MAGNETIC DIRECTION INDICATOR	1	1	1	1
MANIFOLD PRESSURE GAUGE	-	-	-	-
TACHOMETER	1	1	1	1
FUEL QUANTITY INDICATOR	2	2	2	2
FUEL PRESSURE INDICATOR	-	-	-	-
OIL PRESSURE INDICATOR	1	1	1	1
OIL TEMPERATURE INDICATOR	1	1	1	1
CYLINDER HEAD TEMPERATURE INDICATOR	1	1	1	1
EXHAUST GAS TEMPERATURE INDICATOR	-	-	-	-
AMMETER	1	1	1	1
ALTERNATOR	1	1	1	1
LANDING GEAR POSITION INDICATOR	2	2	2	2
SEAT BELT & SHOULDER HARNESS FOR EACH OCCUPANT **	1	1	1	1
OXYGEN MASK FOR EACH OCCUPANT ***	1	1	1	1
POSITION LIGHTS	.	3		3
STROBE LIGHTS (ANTI-COLLISION)	.	3		3

* Equipment must be installed and operable for all operations.
** If inoperative for unoccupied seat(s), seat(s) must be placarded: "DO NOT OCCUPY"
*** Only required when the operating rules require use of oxygen.

KINDS OF OPERATION EQUIPMENT LIST (con't.)

SYSTEM or COMPONENT (con't.)	VFR DAY *	VFR NIGHT	IFR DAY	IFR NIGHT
GYRO-HORIZON			1	1
DIRECTIONAL GYRO			1	1
TURN COORDINATOR or TURN & BANK INDICATOR			1	1
LANDING LIGHT ****		1		1
INSTRUMENT LIGHTS (INTERNAL or GLARESHIELD)		1		1
CLOCK (WITH SWEEP SECOND HAND or DIGITAL)			1	1
COMMUNICATION SYSTEM			1	1
NAVIGATION SYSTEM (APPROPRIATE TO FACILITIES BEING USED)			1	1
BATTERIES	2	2	2	2
VACUUM SYSTEM/INDICATOR			1	1
FUEL BOOST PUMP	1	1	1	1
PILOT'S OPERATING HANDBOOK & AIRPLANE FLIGHT MANUAL	1	1	1	1
PITOT, Heated ****			1	1
OAT GAUGE ****			1	1
VSI ****			1	1
ALTERNATE STATIC SOURCE ****			1	1
STAND-BY VACUUM SYSTEM ****			1	1

* Equipment must be installed and operable for all operations.
**** When required by the appropriate regulations.

DECALS AND PLACARDS

CABIN INTERIOR

The following placards are relevent to proper operation of the airplane and must be installed inside the cabin at the locations specified.

OPERATING LIMITATIONS

THE MARKINGS AND PLACARDS INSTALLED IN THIS AIRPLANE CONTAIN OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE NORMAL CATEGORY. THIS AIRPLANE IS CERTIFIED FOR DAY AND NIGHT VFR/IFR OPERATION WHEN THE REQUIRED EQUIPMENT IS INSTALLED AND OPERATIONAL. FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED.NO AEROBATIC MANEUVERS, INCLUDING SPINS ARE APPROVED. OTHER OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THIS CATEGORY ARE CONTAINED IN THE FLIGHT MANUAL.
MANEUVERING SPEED (3368 LBS.), 127 KIAS; (2600 LBS.), 111 KIAS.

EMERGENCY MANUAL GEAR EXTENSION

1. PULL LANDING GEAR ACTUATOR 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.

CAUTION

1. TURN OFF STROBE LITES WHEN TAXIING NEAR OTHER ACFT OR FLYING IN FOG OR IN CLOUDS. STD POSITION LITES 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.

ON LEFT SIDE PANEL IN PILOT'S VISION

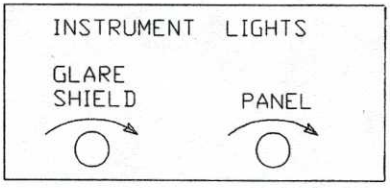
150056-1032

CHECK LIST

TAKE OFF	CONTROLS	RUN-UP	DOOR
	FUEL	PROP	WINDOW
	INSTRUMENTS	WING FLAPS	ALT AIR
	TRIM	SEAT LATCH	PARK BRAKE
		BELT/HARNESS	MIXTURE
	CONDUCT RUDDER AND ELEVATOR TRIM CHECK PRIOR TO FLIGHT, SEE PILOT'S OPERATING HANDBOOK		
LDG	BELT/HARNESS	GEAR	MIXTURE
	FUEL	WING FLAPS	PROP
			PARK BRAKE

ON CONSOLE

150056-1030



LOWER LEFT SIDE RADIO PANEL

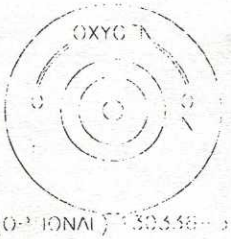
150056-1011

FLAP UP
150056-1027

CONSOLE ABOVE & BELOW SWITCH

FLAP DOWN
150056-1028

PILOT'S L/H PANEL, FWD OF ARM REST



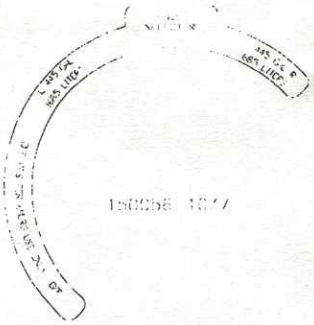
WARNING:

DO NOT EXCEED 170 LBS.
(77.1 Kg) ON THIS SEAT BACK.

SEE AIRCRAFT LOADING SCHEDULE DATA
FOR BAGGAGE COMPARTMENT ALLOWABLE.

FWD END OF REAR SEAT BOTTOM STRUCTURE

FLOORBOARD BETWEEN SEATS

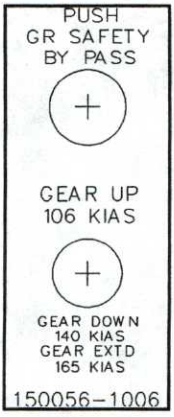


ON RADIO PANEL, ADJACENT TO ELT SWITCH

CAUTION
150056-1013

WHEN APPLICABLE ELT UNIT IS INSTALLED

150085-037 [360° DECAL]



UPPER CTR INSTR. PANEL

ABOVE INSIDE BAGGAGE DOOR HANDLE

AUXILIARY EXIT
DO NOT OPEN IN FLIGHT

TO OPEN
1. PULL OFF COVER
2. PULL CABLE EXTRACTING LOCK PIN
3. ACTUATE HANDLE

TO CLOSE
1. STORE HANDLE
2. INSERT LOCK PIN
3. INSTALL COVER
4. CLOSE AND LATCH DOOR USING OUTSIDE HANDLE
5. LOCK DOOR

150056-1045

LWR INSTR PNL.,BELOW CONTROL WHEEL SHAFT

150056-1009

GO AROUND

150056-1019
LOWER FLT PANEL
NEXT TO THROTTLE
[OPTIONAL]

DO NOT OPEN
ABOVE 132 KIAS

150056-1031

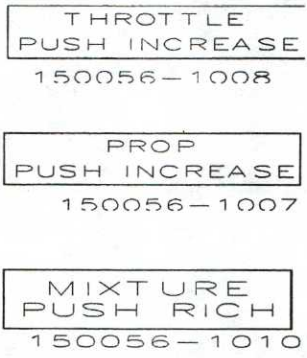
BELOW PILOT'S STORM WINDOW

ON MAGNETIC COMPASS

150056-1016

AROUND EACH OXYGEN OUTLET ON OVERHEAD PANEL

ABOVE EACH CONTROL ON LWR INSTR. PANEL



CONSOLE ON CONTROL KNOB

ALT AIR
PULL ON

917033-11

WARNING

DO NOT EXCEED 10 LBS (4.5 Kg) IN THIS COMPARTMENT
USE FOR STOWAGE OF LIGHT SOFT ARTICLES ONLY
SEE AIRCRAFT LOADING SCHEDULE DATA
FOR BAGGAGE COMPARTMENT ALLOWABLE

BAGGAGE COMPARTMENT
ON HAT RACK SHELF

150056-1044

TOP OF BAGGAGE DOOR JAMB

WARNING

DO NOT EXCEED 120 LBS
(54.4 Kg) IN THIS COMPARTMENT
SEE AIRCRAFT LOADING SCHEDULE DATA
FOR BAGGAGE COMPARTMENT ALLOWABLE

150056-1046

INSTRUMENT PANEL

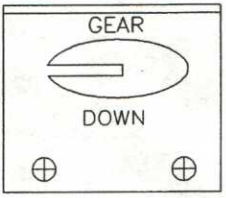
SPEEDBRAKE EQUIPPED: FOR OPERATING INSTRUCTIONS AND LIMITATIONS SEE FAA APPROVED AFM SUPPLEMENT OR PILOT'S OPERATING HANDBOOK.

(OPTIONAL) -4057

ON UPPER INSTRUMENT PANEL

NXXXXX

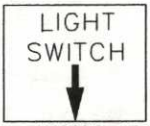
FLOORBOARD - BETWEEN SEATS



150056-1015

BETWEEN SEATS - ON EMERGENCY GEAR RELEASE EXTENSION HANDLE

150056-1040

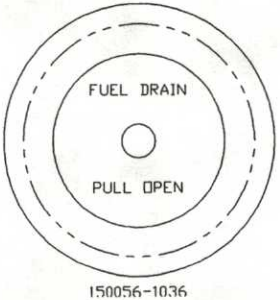


150056-1043

BAGGAGE DOOR FRAME

14 VOLTS
3 AMPS MAX.
5 A INTERMITTENT

RT. RADIO PNL.
ADJACENT TO AUX.
<-----PWR. PLUG
150056-1012



150056-1036

FLOORBOARD - FWD OF CO-PILOT SEAT---->

"AVOID CONTINUOUS OPERATION BELOW 2100 RPM AT MANIFOLD PRESSURES GREATER THAN 21 INCHES HG."

ON INSTRUMENT PANEL, ADJACENT TO TACHOMETER
NOTE: USED ONLY WHEN McCAULEY PROPELLERS INSTALLED.

FUSELAGE INTERIOR

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

CAUTION

THIS DOOR SHALL BE REMOVED AND STOWED WHEN FIELD TEMPERATURES EXCEED 30°F (-1°C)

150056-2024
ON KIT SLIDING DOOR AT OIL COOLER.
IF KIT INSTALLED

CAUTION
WINTERIZATION KIT INSTALLED

WHEN OPERATING AT TEMPERATURES ABOVE 30°F, (-1°C), REMOVE OIL COOLER DOOR.

150056-2002
ON OIL FILLER DOOR
IF KIT INSTALLED

MAINTAIN ↓
LEVEL HERE
150056-2016

HYDRAULIC OIL RESERVOIR

28 VOLTS ONLY
150056-2023

BACKSIDE OF AUX. PWR. RECEPTACLE DOOR

USE AVIATORS OXYGEN ONLY

SEE PILOT'S OPERATING HANDBOOK FOR FILLING PRESSURES

150056-2018

INSIDE OXYGEN FILLER DOOR

INSIDE ENGINE OIL FILLER DOOR

ENGINE OIL
OIL INSTALLED IN THIS ENGINE IS

NEXT OIL CHANGE DUE AT _____ HRS
(USE GREASE PENCIL) TACH TIME

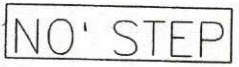
150056-2001

ON BATTERY ACCESS PANELS L/H & R/H

BOTH BATTERIES MUST BE INSTALLED FOR FLIGHT
150056-2015

EXTERIOR

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

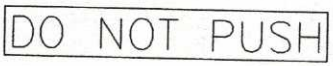


150056-2006

ON INBOARD END OF FLAP, WING LEADING EDGES AND WING AHEAD OF FLAPS

UNDERSIDE OF WING (2 PLCS) & AFT OF L/H COWL FLAP (1PLC)

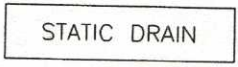
150056-2012



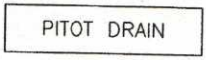
150056-2019

HORIZ. STAB. L/E
RUDDER T/E (BOTH SIDES)

UNDER TAILCONE AFT OF WING T/E



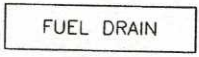
150056-2014



150056-2011

UNDER LEFT WING L/E NEAR FUSELAGE

UNDER WING NEAR SUMP DRAINS



150056-2013

UNDER FUSELAGE RT. SIDE AFT OF NOSE WHEEL WELL

150056-2010

ON MAIN LDG GEAR DOOR

TIRE PRESSURE 42 PSI (2.95 Kg/cm²)

150056-2005

TIRE PRESSURE 49 PSI (3.44 Kg/cm²)

150056-2004

ON NOSE LANDING GEAR DOOR

TOWING LIMITS

150056-2022

ON NOSE LANDING GEAR LEG ASSY

ON NOSE LANDING GEAR SPINDLE ASSY.

WARNING
DO NOT EXCEED
TOWING LIMITS

150056-2003

LWR L/H WING PANEL OUT/BD OF HOIST PT.

MAGNETIC AZIMUTH TRANSMITTER

LOCATED INSIDE THIS INSPECTION COVER. USE ONLY NON-MAGNETIC SCREWS FOR COVER INSTALLATION.

-6050

USED WITH KING FLIGHT CONTROL SYSTEMS ONLY

FUEL-100 (GREEN) OR
100LL (BLUE) MIN OCT
44.5 U.S. GAL. USABLE
168.5 LITERS USABLE

ON BOTH FUEL FILLER CAPS

150056-2008

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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 IX.

| NOTE |

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

AIRSPEEDS FOR EMERGENCY OPERATIONS

CONDITION	RECOMMENDED SPEED
ENGINE FAILURE AFTER TAKEOFF	
Wing Flaps UP	85 KIAS
Wing Flaps DOWN	80 KIAS
BEST GLIDE SPEED	
3368 lb/1528 kg	91.5 KIAS
3200 lb/1452 kg	89.0 KIAS
2900 lb/1315 kg	84.5 KIAS
2600 lb/1179 kg	80.0 KIAS
MANEUVERING SPEED	
3368 lb/1528 kg	127 KIAS
3300 lb/1497 kg	126 KIAS
2430 lb/ 1102 kg	108 KIAS
2232 lb/1012 kg	103 KIAS
PRECAUTIONARY LANDING WITH ENGINE POWER	
Flaps DOWN	75 KIAS
PRECAUTIONARY LANDING ABOVE 3200 LBS	
Flaps DOWN	80 KIAS
EMERGENCY DESCENT (GEAR UP)	
Smooth Air	196 KIAS
Turbulent Air	
3368 lb/1528 kg	127 KIAS
3300 lb/1497 kg	126 KIAS
2430 lb/1102 kg	108 KIAS
2232 lb/1012 kg	103 KIAS
EMERGENCY DESCENT (GEAR DOWN)	
Smooth Air	165 KIAS
Turbulent Air	
3368 lb/1528 kg	127 KIAS
3300 lb/1497 kg	126 KIAS
2430 lb/1102 kg	108 KIAS
2232 lb/1012 kg	103 KIAS

ANNUNCIATOR PANEL WARNING LIGHTS

WARNING LIGHT	FAULT & REMEDY
GEAR UNSAFE	RED light indicates landing gear is not in fully extended/or retracted position. Refer to "FAILURE OF LANDING GEAR TO EXTEND ELECTRICALLY" procedure or "FAILURE OF LANDING GEAR TO RETRACT" procedure.
LEFT or RIGHT FUEL	RED light indicates 6 to 8 gals.(23 to 30.3 liters) of usable fuel remain in the respective tanks. Switch to fuller tank.
SPEED BRAKE	AMBER light indicates Speed Brakes are activated.
ALT AIR	AMBER light indicates alternate induction air door is open.
PROP DE-ICE	BLUE light indicates power applied to De-Ice boots
PITOT HEAT	BLUE light indicates power is applied to heater. (Some Foreign A/C - AMBER light indicates power is NOT applied to heater.)
HI/LO VAC (Flashing)	Suction is below 4.25 in. Hg. (RED) Turn Stand-by Vacuum pump - ON
HI/LO VAC (Steady)	Suction is above 5.5 in. Hg. (RED) Turn Stand-by Vacuum pump - ON

| NOTE |

Attitude and Directional Gyros are unreliable when VAC light is illuminated (steady or flashing). Vacuum system should be checked and/or adjusted as soon as practicable.

ALT VOLTS (Flashing)	RED light indicates alternator output low. Refer to "ALTERNATOR OUTPUT LOW ".
ALT VOLTS (Steady)	RED light indicates overvoltage and Alt. field. C/B tripped. Refer to "ALTERNATOR OVER-VOLTAGE".
START POWER	RED light indicates switch or relay is engaged and starter is energized. Flight should be terminated as soon as practicable. Engine damage may result. This is normal indication during engine start.
STBY VAC	AMBER light indicates stand-by vacuum pump is ON.
REMOTE RNAV	OPTIONAL - "TRIM FAIL" LEGEND USED WHEN KFC-225 IS INSTALLED. MAY BE BLANK FOR OTHER SYSTEMS.
BOOST PUMP	BLUE light indicates power to auxiliary fuel boost pump.

ENGINE

POWER LOSS - DURING TAKEOFF ROLL

Throttle	CLOSED
Brakes	AS REQUIRED TO STOP AIRCRAFT
Fuel Selector	OFF
Magneto/Starter Switch	OFF
Master Switch	OFF

POWER LOSS - AFTER LIFTOFF

Airspeed	85 KIAS (Flaps UP)
	80 KIAS (Flaps TAKEOFF/DOWN)
KEEP THE AIRCRAFT UNDER CONTROL - then:	
Fuel Selector	SELECT OTHER TANK
Throttle	FULL FORWARD
Magneto switch	Verify on BOTH
Mixture	FULL FORWARD
Propeller	FULL FORWARD
LOW Boost Pump Switch	ON - to attempt re-start
If Engine Quits - then:	
HIGH BOOST Pump (guarded switch)	ON - to attempt re-start

LAND AS SOON AS PRACTICABLE; CORRECT MALFUNCTION PRIOR TO NEXT FLIGHT.
If engine does not re-start, proceed to **FORCED LANDING EMERGENCY**.

////////////////////
//**WARNING**///
////////////////////

Engine may run rough due to overrich mixture. Lean mixture until engine operates smoothly.

| **NOTE** |

If high power is required, mixture may require enrichening.

POWER LOSS - IN FLIGHT (RE-START PROCEDURES)

Airspeed	85 KIAS minimum
Fuel Selector	SELECT OTHER TANK (Verify fullest tank)
LOW Boost Pump Switch	ON - to attempt re-start
Throttle	FULL FORWARD
Propeller	FULL FORWARD
Mixture	AS REQUIRED to restore power
Magneto/Starter Switch	VERIFY on BOTH
LOW Boost Pump Switch	OFF if engine does not start immediately
HIGH BOOST Pump (guarded switch)	ON - to attempt re-start
Alternate Air Door	Manually Open

If engine does not start after initial attempts:

Mixture	IDLE CUT-OFF (Initially)
	then advance slowly toward RICH until engine starts.

If engine does not re-start after several attempts establish best glide speed (Refer to Maximum Glide Distance Chart) and proceed to **FORCED LANDING EMERGENCY**.

After engine re-start:

Throttle	ADJUST as required
Propeller	ADJUST as required
Mixture	RELEAN as required for power setting
HIGH BOOST Pump Switch	OFF

| **NOTE** |

If engine fails when HIGH BOOST pump is turned OFF, suspect engine driven fuel pump failure. Proceed to ENGINE DRIVEN FUEL PUMP FAILURE.

LAND AS SOON AS PRACTICABLE; CORRECT MALFUNCTION PRIOR TO NEXT FLIGHT.

~ CAUTION~

Should engine excessively cool during engine out, care should be exercised during re-start to avoid excessive oil pressure. Allow engine to warm up.

OPERATING THE ENGINE AT TOO HIGH AN RPM BEFORE REACHING MINIMUM OIL TEMPERATURES MAY CAUSE LOSS OF OIL PRESSURE.

POWER LOSS - PRIMARY ENGINE INDUCTION AIR SYSTEM BLOCKAGE

Blockage of the primary engine induction air system may be experienced as a result of flying in cloud or heavy snow with cold outside air temperatures (0°C or below). At these temperatures, very small water droplets or solid ice crystals in the air may enter the primary engine induction inlet in cowl opening and travel inside inlet duct to the induction air filter. Ice particles or water droplets may collect and freeze on the air filter causing partial or total blockage of the primary engine induction system.

If primary induction air system blockage occurs, the alternate engine induction air system will automatically open, supplying engine with an alternate air source drawn from inside the cowling rather than through the air filter. The alternate air system can also be manually opened at any time by pulling the control labeled ALTERNATE AIR. Automatic or manual activation of the alternate induction system is displayed in the cockpit by the illumination of the ALT AIR light in the main annunciator panel. When operating on the alternate air system, available engine power will be less for a given propeller RPM compared to the primary induction air system. This is due to loss of ram effect and induction of warmer inlet air.

The following checklist should be used if a **partial power loss** due to primary induction air system blockage is experienced:

Alternate Air	Verify OPEN (annunciator light ON)
Manifold Pressure	1 - 2 inches less than normal, due to warm induction air

| NOTE |

The alternate air door should open automatically when primary induction system is restricted. If alternate air door has not opened (Annunciator light-OFF) it can be opened manually by pulling alternate air control.

Throttle	INCREASE as desired
Propeller	INCREASE as required to maintain desired cruise power setting (Ref.SECTION V)
Mixture	RELEAN to desired EGT
Flight	CONTINUE - request altitude with warmer air, if able.

In the unlikely event that a **total power loss**, due to primary engine induction air blockage, is experienced, the following checklist should be used:

Airspeed	BEST GLIDE SPEED
Alternate Air	Manually OPEN
LOW Boost Pump Switch	ON
Throttle	Full FORWARD
Propeller	FULL FORWARD
Mixture	AS REQUIRED to restore power
Magneto/Starter Switch	Verify on BOTH

After engine re-start:

Throttle	ADJUST as required
Propeller	ADJUST as required
Mixture	RELEAN as required for power setting (Refer to power charts - SECTION V)
LOW Boost Pump Switch	OFF

If engine does not re-start after several attempts, maintain best glide speed & proceed to **FORCED LANDING EMERGENCY**.

ENGINE ROUGHNESS

Engine instruments . . . . . CHECK
Fuel Selector . . . . . OTHER TANK
Mixture . . . . . READJUST for smooth operation
Magneto/Starter Switch . . . . . Select R or L or BOTH
If roughness disappears on single magneto, monitor power and continue on selected magneto.

////////////////////
// **WARNING** //
////////////////////

The engine may quit completely when one magneto is switched off if the other magneto is faulty. If this happens, close throttle to idle and mixture to idle cutoff before turning magnetos ON to prevent a severe backfire. When magnetos have been turned back ON, proceed to POWER LOSS - IN FLIGHT. Severe roughness may be sufficient to cause propeller separation. Do not continue to operate a rough engine unless there is no other alternative.

Throttle . . . . . REDUCE
. . . . check for a throttle setting that may cause roughness to decrease.
If severe engine roughness cannot be eliminated, LAND AS SOON AS PRACTICABLE.

HIGH CYLINDER HEAD TEMPERATURE

Mixture . . . . . ENRICH As Required
Airspeed . . . . . INCREASE As Required
Power . . . . REDUCE — if temperature cannot be maintained within limits

HIGH OIL TEMPERATURE

| **NOTE** |

Prolonged high oil temperature indications will usually be accompanied by a drop in oil pressure. If oil pressure remains normal, then a high temperature indication may be caused by a faulty gauge or thermocouple.

Airspeed . . . . . INCREASE
Power . . . . . REDUCE

PREPARE FOR POSSIBLE ENGINE FAILURE IF TEMPERATURE CONTINUES HIGH.

LOW OIL PRESSURE

Oil temperature and pressure gauges . . . . . Monitor
Pressure below 10 PSI . . . . . **EXPECT ENGINE FAILURE,**
. . . . . proceed to **FORCED LANDING EMERGENCY.**

ENGINE DRIVEN FUEL PUMP FAILURE

////////////////////
// **WARNING** //
////////////////////

When operating engine at moderate power with "HIGH BOOST" ON and engine driven fuel pump has failed, engine may quit or run rough when manifold pressure is reduced, unless manually leaned.

An engine driven fuel pump failure is probable when engine will only operate with HIGH BOOST pump ON. Operation of engine with a failed engine driven fuel pump and auxilliary fuel pump HIGH BOOST **ON** will require smooth operation of engine controls and corresponding mixture change when throttle is repositioned or engine speed is changed. When retarding throttle or reducing engine speed, adjust mixture to prevent engine power loss from an overrich condition. Enrich mixture when opening throttle or increasing engine speed to prevent engine power loss from a lean condition. Always lean to obtain a smooth running engine.

The following procedure should be followed when a failed engine driven fuel pump is suspected:

HIGH BOOST Pump (guarded switch) . . . . . ON
Throttle . . . . . CRUISE Position or as required for engine operation
Mixture . . . . . ADJUST for smooth engine operation.
LAND AS SOON AS PRACTICABLE & CORRECT MALFUNCTION.

FUEL VAPOR SUPPRESSION (Fluctuating Fuel Flow)

Low Fuel Boost Pump Switch . . . . . ON to clear vapors
Engine operation . . . . . MONITOR
Low Fuel Boost Pump Switch OFF - (If condition still exists, REPEAT PROCEDURE).

FIRES

ENGINE FIRE - DURING START ON GROUND

Magneto/Starter Switch . . CONTINUE cranking or until fire is extinguished.
If engine starts:
Power. . . . . 1500 RPM for several minutes
Engine . . . . . SHUTDOWN; inspect for damage
If engine does NOT start:
Magneto/Starter Switch . . . . . CONTINUE CRANKING
Mixture . . . . . IDLE CUTOFF
Low Fuel Boost Pump Switch . . . . . OFF
Throttle . . . . . FULL FORWARD
Fuel Selector Valve . . . . . OFF
Magneto/Starter Switch . . . . . OFF
Master Switch . . . . . OFF
FIRE . . . . . **EXTINGUISH** with Fire Extinguisher

ENGINE FIRE - IN FLIGHT

Fuel Selector Valve . . . . . OFF
Throttle . . . . . CLOSED
Mixture . . . . . IDLE CUTOFF
Magneto/Starter Switch . . . . . OFF
Cabin Ventilation & Heating Controls . . . . . CLOSED

| NOTE |

If fire is not extinguished, attempt to increase airflow over engine by increasing glide speed. Proceed with FORCED LANDING EMERGENCY. DO NOT attempt an engine restart.
If necessary, use fire extinguisher to keep fire out of cabin area.

ELECTRICAL FIRE - IN FLIGHT (Smoke in Cabin)

Master Switch . . . . . OFF

////////////////
// **WARNING** //
////////////////

Stall warning and landing gear warning, not available with Master Switch OFF.

Alternator Field Switch . . . . . OFF
Cabin Ventilation . . . . . OPEN
Heating Controls . . . . . CLOSED
Circuit Breakers . . . . . CHECK to identify faulty circuit if possible
LAND AS SOON AS POSSIBLE.

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

Master Switch . . . . . ON
Alternator Field Switch . . . . . ON

Select ESSENTIAL switches ON one at a time; permit a short time to elapse before activating an additional circuit.

EMERGENCY DESCENT PROCEDURE

In the event an emergency descent from high altitude is required, rates of descent of at least 3,000 feet per minute can be obtained in two different configurations:
(1) With landing gear and flaps retracted, an airspeed of 195 KIAS will be required for maximum rate of descent.

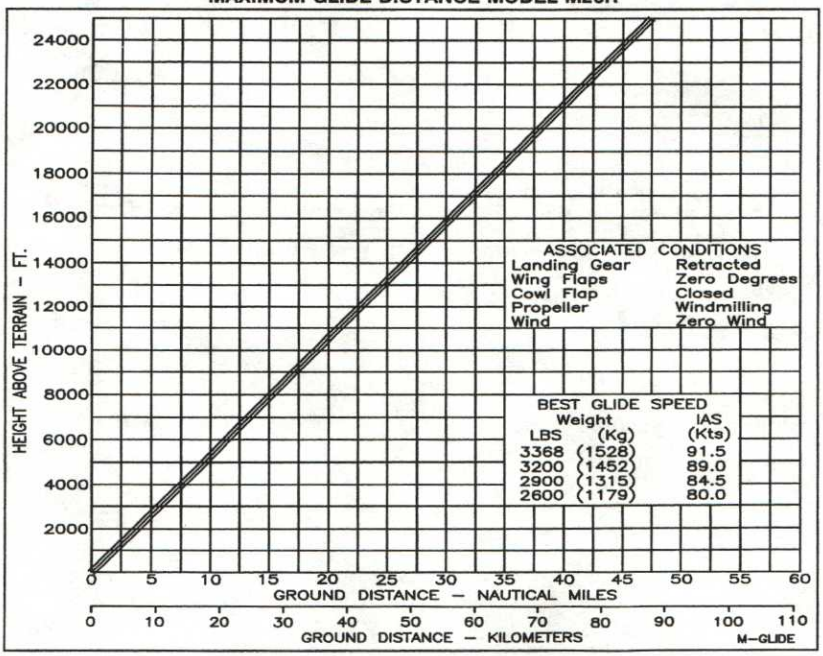
(2) With the landing gear extended and flaps retracted an airspeed of 165 KIAS will also give approximately the same rate of descent. At 165 KIAS and the gear extended, the angle of descent will be greater, thus resulting in less horizontal distance traveled than a descent at 196 KIAS. Additionally, descent at 165 KIAS will provide a smoother ride and less pilot work load.

THEREFORE; The following procedure is recommended for an emergency descent:

Power	RETARD INITIALLY
Airspeed	140 KIAS
Landing Gear	EXTEND
Airspeed	INCREASE TO 165 KIAS after landing gear is extended.
Wing Flaps	UP
Airspeed	MAINTAIN 165 KIAS during descent.
Speedbrakes (If installed)	EXTEND
Altitude	AS DESIRED
Power During Descent	AS REQUIRED to maintain CHT 250°F (121°C) minimum.

GLIDE

MAXIMUM GLIDE DISTANCE MODEL M20R



| NOTE |

Greater glide distances can be attained by moving the propeller control FULL AFT (LOW RPM).

FORCED LANDING EMERGENCY

GEAR RETRACTED OR EXTENDED

Emergency Locator Transmitter	ARMED
Seat Belts/Shoulder Harnesses	SECURE
Cabin Door	UNLATCHED
Fuel Selector	OFF
Mixture	IDLE CUTOFF
Magneto/Starter Switch	OFF
Wing Flaps	Full DOWN
Landing Gear	DOWN-If conditions permit
Approach Speed	80 KIAS
Master Switch	OFF, prior to landing
Wings	LEVEL Attitude

OVERWEIGHT LANDING PROCEDURES

In the event it is necessary to land with weight exceeding 3200 Lbs. (1452 Kg.) (max. landing weight) the following procedure is recommended in addition to normal APPROACH FOR LANDING procedures:

Approach Airspeed	80 KIAS

Use a flatter approach angle than normal, with power as necessary until a smooth touchdown assured.
Expectlanding distance over a 50 feet obstacle (Ref. SECTION V) to increase at least 600 ft.
Conduct Gear and Tire Servicing inspection as required (Ref. SECTION VIII).

SYSTEMS EMERGENCIES

PROPELLER

PROPELLER OVERSPEED

Throttle	RETARD
Oil Pressure	CHECK
Propeller	DECREASE RPM, re-set if any control available
Airspeed	REDUCE
Throttle	AS REQUIRED to maintain RPM below 2500 RPM

FUEL

LOW FUEL FLOW

Check mixture	ENRICH
Fuel Selector	SWITCH TANKS

If condition persists, use Fuel Boost Pump as necessary. LANDING should be made as soon as PRACTICABLE.

ELECTRICAL

ALTERNATOR OVERVOLTAGE/FAILURE

((Alternator warning light illuminated steady. The Alternator Field circuit breaker maybe tripped (overvoltage) or it may remain in its normal position (field fault).

Alternator Field Circuit Breaker	RESET (If tripped)

If circuit breaker will not reset, the following procedures are required:

1. Reduce electrical load, as required, to maintain essential systems.
2. Continue flight and LAND, when PRACTICABLE, to correct malfunction.

| NOTE |

The only source of electrical power is from the selected battery. Monitor battery voltage (min. 18V) and switch to other battery when necessary.

NOTE: (S/N 29-0297, 29-0300 THRU 27-TBA) Activating the EMERG BUS switch will automatically shed all systems outside the Yellow "ESSENTIAL" bands located on the Circuit Breaker Panel. All systems located within the Yellow "ESSENTIAL" bands will remain powered by the remaining alternator, or in the case of Dual alternator failure, the selected battery.

ALTERNATOR OUTPUT LOW
(Alternator warning light flashing)

REDUCE ELECTRICAL LOAD

If annunciator light still flashes:

Alternator Field Switch . . . . . OFF

1. Reduce electrical load, as required, to maintain essential systems.
2. Continue flight and LAND, when PRACTICABLE, to correct malfunction.

| NOTE |

The only source of electrical power is from the selected battery. Monitor battery voltage (min. 18V) and switch to other battery when necessary.

Battery endurance will depend upon battery condition and electrical load on battery. If one battery becomes depleted, switch to other battery.

LANDING GEAR

FAILURE OF LANDING GEAR TO EXTEND ELECTRICALLY

Airspeed . . . . . 140 KIAS or less
Landing Gear Actuator Circuit Breaker . . . . . PULL
Landing Gear Switch . . . . . DOWN
Gear Manual Emergency Extension Mechanism . . . . . LATCH FORWARD/LEVER BACK to engage manual extension mechanism

| 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.

T-Handle . . . . . PULL (12 to 20 times) and RETURN until gear is down and locked
. . . . . GEAR DOWN light ILLUMINATED; STOP when resistance is felt.
Visual Gear Down Indicator . . . . . CHECK ALIGNMENT by viewing from directly above indicator

~~~~~~
~ CAUTION~

Continuing to pull on T-Handle, after GEAR DOWN light ILLUMINATES, may bind actuator; electrical retraction MAY NOT be possible until binding is eliminated by ground maintenance. Return lever to normal position and secure with latch. Reset landing gear actuator circuit breaker.

////////////////////
//WARNING//

Do not operate landing gear electrically with manual extension system engaged

Do not fly craft until maintenance/inspection is done on landing gear system.

FAILURE OF LANDING GEAR TO RETRACT

AIRSPEED . . . . . Below 106 KIAS
GEAR Switch . . . . . UP Position

GEAR FAILS TO RETRACT — GEAR HORN - SOUNDING;
GEAR ANNUNCIATOR LIGHT & GEAR SAFETY BY-PASS LIGHT — ILLUMINATED
~~~~~~

Addendum to: **LANDING GEAR**

WARNING SYSTEM

~~~~~~
~CAUTION~
~~~~~~

The absence of any of the above described indications in their Normal sequence may represent a potential failure in the Landing Gear or Indicator system. The floor mounted visual gear position Indicator presents a mechanical indication of gear status. The Visual gear position indicator shall be verified to be in the **DOWN** Position (indicator marks aligned with the word **DOWN** fully visible) prior to **ALL** landings.

GEAR SAFETY BY-PASS SWITCH . . . . . DEPRESS
. . . . . HOLD until landing gear is fully retracted

"GEAR UNSAFE" and "GEAR DOWN" Lights . . . . . EXTINGUISHED
"GEAR RELAY" Ckt. Bkr. . . . . PULL
. . . . . (Warning Horn and Gear By Pass light will go OFF)
Check "Airspeed Safety Switch" or other malfunction as soon as practicable.
"GEAR RELAY" Ckt. Bkr . . . . . PUSH IN

WHEN READY TO EXTEND LANDING GEAR

Airspeed . . . . . BELOW 140 KIAS
Gear Relay C/B . . . . . RESET
Landing Gear Switch . . . . . DOWN
Gear Down Light . . . . . ILLUMINATED

| NOTE |

If above procedures do not initiate retraction process, check gear emergency manual extension lever (on floor) for proper position.

GEAR FAILS TO RETRACT — GEAR HORN - DOES NOT SOUND
GEAR ANNUNCIATOR LIGHTS & GEAR BY-PASS LIGHT — **NOT ILLUMINATED**

GEAR EMERGENCY EXTENSION LEVER (on floor) Verify LATCHED in proper position
GEAR ACTUATOR C/B . . . . . RESET
. . . . . Gear should retract if C/B was tripped
FLIGHT . . . . . CONTINUE (if desired)

When ready to extend landing gear at next landing:
AIRSPEED . . . . . Below 140 KIAS
GEAR SWITCH . . . . . DOWN Position
If gear will not extend electrically at this time, refer to FAILURE OF LANDING GEAR TO EXTEND ELECTRICALLY (previous page).

VACUUM

When "HI/LO VAC" annunciator light illuminates (flashing or steady), vacuum operated instruments are considered to be unreliable. Push stand-by vacuum pump switch ON. The flashing Hi/LO VAC annunciator light should extinguish and the STBY VAC annunciator will illuminate. The vacuum operated gyro instruments will be operating on the stand-by vacuum system. The steady RED annunciator light may not extinguish when the stand-by vacuum switch is ON. Continue flight, monitor non-vacuum gauges. Have vacuum system inspected prior to next flight.

OXYGEN

In the event of oxygen loss above 12,500 ft. return to 12.500 ft as soon as feasible. Refer to SECTION X for the physiological characteristics of high altitude flight.

ALTERNATE STATIC SOURCE

The alternate static air source should be used whenever it is suspected that the normal static air sources are blocked. Selecting the alternate static source changes the source of static air for the altimeter, airspeed indicator and rate-of-climb from outside of the aircraft to the cabin interior. When alternate static source is in use, adjust indicated airspeed and altimeter readings according to the appropriate alternate static source airspeed and altimeter calibration tables in SECTION V. The alternate static air source valve is located on the instrument panel below pilot's control wheel shaft.

| NOTE |

When using Alternate Static Source, pilot's window and air vents MUST BE KEPT CLOSED.

Alternate Static Source . . . . . PULL ON
Airspeed and Altimeter Readings . CHECK Calibration Tables (Ref SECTION V)

UNLATCHED DOORS IN FLIGHT

CABIN DOOR

If cabin door is not properly closed 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 (7.6 cm) open, but the flight characteristics of the airplane will not be affected. There will be considerable wind noise; loose objects, in the vicinity of the open door, may exit the aircraft. Return to the field in a normal manner. If practicable, secure the door in some manner to prevent it from swinging open during the landing.

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:

Airspeed	95 KIAS
Pilot's Storm Window	OPEN
Aircraft	RIGHT SIDESLIP (Right bank with left rudder)
Door	PULL SHUT & LATCH

BAGGAGE DOOR

If baggage door is not properly closed, it may come unlatched in flight. This may occur during or after takeoff. The door may open to its full open position and then take an intermediate position depending upon speed of aircraft. There will be considerable wind noise; loose objects, in the vicinity of the open door, may exit the aircraft. **There is no way to shut and latch door from the inside.** Aircraft flight characteristics will not be affected; fly aircraft in normal manner; LAND AS SOON AS POSSIBLE and secure baggage door.

Baggage Door latching mechanism	VERIFY MECHANISM PROPERLY ENGAGED (inside latching mechanism) then shut from outside aircraft.

ICING

////////////////////
// **WARNING** //
////////////////////

DO NOT OPERATE IN KNOWN ICING CONDITIONS.

The Model M20R is **NOT APPROVED** for flight into known icing conditions and operation in that environment is prohibited. However, if those conditions are inadvertently encountered or flight into heavy snow is unavoidable, the following procedures are recommended until further icing conditions can be avoided:

INADVERTENT ICING ENCOUNTER

Pitot Heat	ON
Propeller De-Ice	ON (if installed)
Alternate Static Source	ON (if required)
Cabin Heat & Defroster	ON
Engine Gauges	MONITOR for any engine power reduction

Turn back or change altitude to obtain an outside air temperature less conducive to icing.

Move propeller control to maximum RPM to minimize ice build-up on propeller blades. If ice builds up or sheds unevenly on propeller, vibration will occur. If excessive vibration is noted, momentarily reduce engine speed with propeller control to bottom of GREEN ARC, then rapidily move control FULL FORWARD.

| NOTE |

Cycling RPM flexes propeller blades and high RPM increases centrifugal force which improves propeller capability to shed ice.

As ice builds on the airframe, move elevator control fore and aft slightly to break any ice build-up that may have bridged gap between elevator horn and horizontal stablilizer.

Watch for signs of induction air filter blockage due to ice build-up; increase throttle setting to maintain engine power.

| NOTE |

If ice blocks induction air filter, alternate air sysem will open automaticallly.

With ice accumulation of 1/4 inch or more on the airframe, be prepared for a significant increase in aircraft weight and drag. This will result in significantly reduced cruise and climb performance and higher stall speeds. Plan for higher approach speeds requiring higher power settings and longer landing rolls.

~ CAUTION ~

Stall warning system may be inoperative.

| NOTE |

The defroster may not clear ice from windshield. If necessary open pilot's storm window for visibility in landing approach and touchdown.

With ice accumulations of 1 inch or less, use no more than 15° wing flaps for approach and landing. For ice accumulation of 1 inch or more, fly approaches and landing with flaps retracted to maintain better pitch control. Fly approach speed at least 15 knots faster than normal, expect a higher stall speed, resulting in higher touchdown speed with longer landing roll. Use normal flare and touchdown technique.

Missed approaches **SHOULD BE AVOIDED** whenever possible because of severly reduced climb performance. If a go-around is mandatory, apply full power, retract landing gear when obstacles are cleared; maintain 90 KIAS and retract wing flaps.

—— AVOID FURTHER ICING CONDITIONS ——

EMERGENCY EXIT OF AIRCRAFT

CABIN DOOR

PULL latch handle AFT.
OPEN door and exit aircraft.

BAGGAGE COMPARTMENT DOOR (Auxiliary Exit)

Release (Pull UP) rear seat back latches on spar.
Fold rear seat backs forward, CLIMB OVER.
PULL off plastic cover from over inside latch.
PULL lock pin.
Pull red handle.
OPEN door and exit aircraft.

To **VERIFY RE-ENGAGEMENT** of baggage door, outside, latch mechanism:

Open outside handle fully.
Close inside RED handle to engage pin into cam slide of latch mechanism.
Place lock pin in shaft hole to hold RED handle DOWN.
Replace cover.
CHECK & operate outside handle in normal manner.

SPINS

////////////////////
// WARNING //
////////////////////

Up to 2,000 ft. altitude may be lost in a one turn spin and recovery; STALLS AT LOW ALTITUDE ARE EXTREMELY CRITICAL.

| NOTE |

The best spin avoidance 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 antispin procedures should shorten the recovery.

INTENTIONAL SPINS ARE PROHIBITED.

In the event of an inadvertent spin, the following recovery procedure should be used:

Throttle . . . . . RETARD to IDLE
Ailerons . . . . . NEUTRAL
Rudder . . . . . Apply FULL RUDDER opposite direction of spin

Control Wheel . . . . . FORWARD of neutral in a brisk motion

ADDITIONAL FORWARD elevator control may be required if rotation does not stop.

—— HOLD ANTI-SPIN CONTROLS UNTIL ROTATION STOPS ——

Wing Flaps (If extended) . . . . . RETRACT as soon as possible
Rudder . . . . . NEUTRALIZE when spin stops
Control Wheel . . . . . SMOOTHLY MOVE AFT
to bring the nose up to level flight attitude.

OTHER EMERGENCIES

Refer to SECTION IX for Emergency Procedures of Optional Equipment.

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INTRODUCTION

This section describes the recommended procedures for the conduct of normal operations for the airplane. All of the required (FAA or ICAO regulations) procedures and those necessary for operation of the airplane as determined by the operating and design features of the airplane are presented.

These procedures are provided to present a source of reference and review and to supply information on procedures which are the same for all aircraft. Pilots should familiarize themselves with the procedures given in this section in order to become proficient in the normal operations of the airplane.

Normal procedures associated with those optional systems and equipment which require handbook supplements are provided by SECTION IX (Supplemental Data).

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a weight of 3368 pounds and may be used for any lesser weight. However, to achieve the performance specified in SECTION V for takeoff distance and climb performance, the speed appropriate to the particular weight must be used.

TAKEOFF:

Normal Climb Out	80-90 KIAS
Short Field Takeoff, Speed At 50 Ft.	75 KIAS

ENROUTE CLIMB, GEAR and FLAPS UP:

Best Rate of Climb	105 KIAS
Best Angle of Climb	85 KIAS

LANDING APPROACH (3200 lbs.):

Normal Approach, Flaps 10 degrees	80 KIAS
Normal Approach, Flaps 33 degrees	75 KIAS
Short Field Approach, Flaps 33 degrees	70 KIAS

BALKED LANDING (3200 lbs.):

Maximum Power, Flaps 10 degrees	85 KIAS

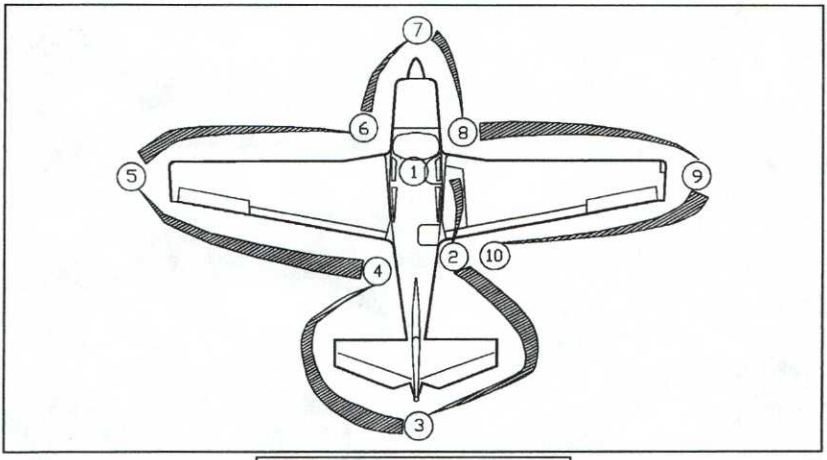
MAXIMUM RECOMMENDED TURBULENT AIR PENETRATION SPEED:

3368 lbs./1528 Kgs	127 KIAS
3200 lbs./1452 Kgs	123 KIAS
2900 lbs./1315 Kgs	117 KIAS
2600 lbs./1179 Kgs	111 KIAS
2400 lbs./1089 Kgs	106 KIAS

DEMONSTRATED CROSSWIND VELOCITY:

Takeoff or Landing . . . . . 13 Knots
(This is NOT A LIMITATION, only a demonstrated number)

(See CROSSWIND COMPONENT CHART, SECTION V)



PREFLIGHT INSPECTION

1. Cockpit -

Gear Switch . . . . . DOWN
Magneto/Starter Switch . . . . . OFF
All Rocker Switches . . . . . OFF
Master Switch . . . . . ON
All Circuit Breakers . . . . . IN
Battery Select Switch . . . . . SELECT from 1 to 2 or 2 to 1.
CHECK Voltmeter after each selection. Leave on Battery with highest voltage.
Internal/External Lights . . . . . CHECK operation
(Check for ammeter fluctuations as each light is checked)
Pitot Heat Switch . . . . . ON
(Check Pitot Heat annunciator light illuminated BLUE *)
Fuel Quantity Gauges . . . . . CHECK QTY
Fuel Selector
It is recommended that wing tank sumps be drained prior to draining gascolator.
Rt. Tank: Pull Gascolator ring (5 seconds)
Lt. Tank: Pull Gascolator ring (5 seconds)
Oxygen Supply Control Knob (if installed) . . . . . OFF
Oxygen Pressure Gauge . . . . . CHECK
Verify adequate oxygen supply for trip, (if use of oxygen is anticipated), refer to oxygen duration chart (Fig. 7-13, SECTION VII).
Also check that face masks and hoses are accessible and in good condition.

2. Right Fuselage/Tailcone

Oxygen Filler Access Door and Filler Cap . . . . . SECURED
Battery # 2 Access Panel. . . . . SECURED
Instrument Static Pressure Port. . . . . UNOBSTRUCTED
General Skin Condition . . . . . INSPECT
Tailcone/Empennage Access Panel . . . . . SECURED
Tail tiedown rope/chain . . . . . REMOVE

3. Empennage

Elevator and rudder attach points and control linkage attachments . INSPECT
Empennage Freeplay-Vertical/Horizontal . . . . . INSPECT
General skin condition . . . . . INSPECT
Remove ice, snow, or frost.

* If TKS system is installed , pitot heat annunciator will illuminate AMBER when switch is ON and Pitot Heat has failed. Annunciator will not be illuminated when switch is ON and system is operating properly.

4. Left Fuselage/Tailcone

Cabin Fresh Air Vent (Dorsal Fin)	UNOBSTRUCTED
Tailcone/Empennage Access Panel	SECURED
Instrument Static Pressure Port.	UNOBSTRUCTED
Avionics/Battery # 1 Access Panel	SECURED
Auxiliary Power Plug Access Door	SECURED
Static System Drain	PUSH Plunger UP, (Hold 3-5 Seconds)
General Skin Condition	INSPECT

5. Left Wing

General Skin Condition	INSPECT-Remove ice, snow, or frost.
Wing Flap & attach points	INSPECT
Aileron & attach points	INSPECT
Control linkages	INSPECT
Wing Tip, Lights and Lens	INSPECT
Fuel Tank Vent	UNOBSTRUCTED
Pitot Tube	UNOBSTRUCTED/SECURED (Heat element Operative)
Landing/Taxi Lights	INSPECT Lens & Bulbs
Stall Switch Vane	CHECK operation
Fuel Tank	CHECK QUANTITY/SECURE CAP

| NOTE |

The optional visual fuel quantity gauge is to be use for partial refueling purposes only; DO NOT use for preflight quantity check.

Tiedown rope/chain	REMOVE
Wheel chock	REMOVE
Left Main Landing Gear, shock discs, tire & doors	INSPECT
Fuel Tank Sump Drain	DRAIN

Use sampler cup to VERIFY fuel is free of water, sediment & other contamination; VERIFY proper fuel (BLUE/100LL)(GREEN/100 octane).

~~~~~~~~
~CAUTION ~
~~~~~~~~

Some diesel may be BLUE, Verify by smell and feel that 100LL is being used.

VERIFY drain closes and does not leak.

Pitot System Drain	PUSH plunger UP, (Hold for 3-5 seconds)

6. Left Cowl Area

Windshield	CLEAN
Cabin Air Inlet	UNOBSTRUCTED
Left Side Engine Cowl Fasteners	SECURED
Exhaust Pipes	INSPECT SECURED
Engine Oil Filler Door	OPEN & INSPECT AREA

| NOTE |

The engine compartment must be free of foreign objects which could result in possible over heating and serious damage to the engine.

Engine Oil	CHECK QUANTITY 8 Qts.(7.57 l)
Engine Oil Filler Door	CLOSE & SECURE
Cooling Air Inlet	Verify UNOBSTRUCTED

7. Propeller/Spinner & Front Cowl Area

Propeller/Spinner	INSPECT for nicks, cracks, oil leaks/rotational movement.
Prop De-Ice Boots (if installed)	INSPECT condition
Induction Air Inlet/Filter	UNOBSTRUCTED
Nose gear, shock discs, tire & doors	INSPECT
Wheel chock	REMOVE

8. Right Cowl Area

Right Side Engine Cowl Fasteners	SECURED
Cooling Air Inlet	Verify UNOBSTRUCTED
Windshield	CLEAN
Cabin Air Inlet	UNOBSTRUCTED

9. Right Wing

Fuel Tank Sump Drain	DRAIN
Use sampler cup to VERIFY fuel is free of water, sediment & other contamination.	
	VERIFY proper fuel (BLUE/100LL) (GREEN/100 octane).
	SEE CAUTION on diesel fuel on previous page
	VERIFY drain closes and does not leak.
Right main gear, shock discs, tire & doors	INSPECT
Wheel chock	REMOVE
General Skin Condition	INSPECT Remove ice, snow and frost.
Fuel Tank	CHECK QUANTITY/SECURE CAP

| NOTE |

The optional visual fuel quantity gauge is to be use for partial refueling purposes only; DO NOT use for preflight quantity check.

Tiedown rope/chain	REMOVE
Fuel Tank vent	UNOBSTRUCTED
Landing/Taxi Lights	INSPECT Lens & Bulbs
Wing tip, lights and lens	INSPECT
Aileron and attach points	INSPECT
Wing Flap and attach points	INSPECT
Control linkages	INSPECT

10. Baggage Door Area

Baggage Door	VERIFY SECURED
	(VERIFY inside handle is properly secured)
	(CHECK outside handle operation)

RETURN TO COCKPIT — MASTER/ROCKER SWITCHES . . . OFF

BEFORE STARTING CHECK

Preflight Inspection	COMPLETED
Seats, Seat Belts/Shoulder Harness (1 occupant per restraint)	ADJUST & SECURED
Magneto/Starter Switch	OFF
Master Switch	OFF
Alternator Field Switch	OFF
Radio Master Switch	OFF
Fuel Boost Pump Switches	OFF
Directional Gyro (slave/free switch)	SLAVED (If installed)
Circuit Breakers	CHECK - ALL IN
ELT Switch	ARMED
Rocker Switches	OFF
Alternate Static Source	Push OFF
Throttle	CLOSED
Propeller	FULL FORWARD (HIGH RPM)
Mixture	IDLE CUT-OFF
Parking Brakes	SET
Wing Flap Switch	FLAPS UP
Defrost	PUSH OFF
Cabin Heat	PUSH OFF
Cabin Vent	AS DESIRED
Fuel Selector	FULLEST TANK
All Rocker Switches	OFF
Landing Gear Switch	DOWN POSITION

RED Emergency Gear Extension Handle . . . DOWN AND LATCHED
Internal Lights . . . . . OFF
Passenger Briefing . . . . . COMPLETED
(Emergency and general information bri
Refer to SECTION IX Supplements for Optional Equipment Procedures and Check

Obtain local airport information prior to engine start.

ENGINE START

~ CAUTION ~

When either battery voltage is low, inspection should be conducted to determine condition of battery and/or reason for battery being low. Replacement or servicing of batteries is essential and charging for at least one hour should be done before engine is started. Batteries must be serviceable and IT IS RECOMMENDED THAT BATTERIES BE FULLY CHARGED TO OPERATE AIRCRAFT. Electrical components may also be damaged if aircraft is operated when batteries are low.

| NOTE |

When starting engine using the approved external power source, no special starting procedure is necessary. Use normal starting procedures below. DO NOT START ENGINE IF BOTH BATTERIES ARE INCAPABLE OF STARTING ENGINE. Recharge dead batteries for at least one hour (at 3 - 4 amps) before starting engine. Only No. 1 battery (left side of tailcone) is connected to the Auxiliary Power plug.

Before Starting Checklist . . . . . COMPLETED
Throttle . . . . . FULL OPEN
Propeller . . . . . FULL FWD (High RPM)
Mixture . . . . . Full Forward (RICH)
Master Switch . . . . . ON
Annunciator Lights . . . PRESS TO TEST (All lights should illuminate)
Low Fuel Boost Pump Switch . . . ON during engine starting sequ

~ CAUTION ~

For engine operation at outside air temperatures below -25° C (-13°F), the engine and engine oil should be preheated to at least -25° C (-13°F) before the engine is started.

Throttle . . . . . IDLE POSITION
Propeller Area . . . . . CLEAR
Magneto/Starter Switch . . . . . TURN & PUSH to START, release to BOTH when engine starts.
If No. 1 battery will not start engine . . . . SELECT No. 2 battery

| NOTE |

COLD ENGINE START - Low fuel boost pump ON during "Start" sequence. Turn low fuel boost pump OFF when engine obtains smooth operation.

| NOTE |

"START POWER" warning light should illuminate when Magneto/Starter switch is in "START" position.

| NOTE |

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

Throttle . . . . . IDLE 600 - 700 RPM

* Engine Oil Pressure	CHECK in GREEN ARC
	If minimum oil pressure (10 PSI) is not indicated within 30 seconds, accomplish engine shutdown procedures.
Alternator Field Switch	ON
Low Fuel Boost Pump Switch	OFF
* Ammeter	CHECK
	Turn LDG LT ON & observe Negative movement of needle.
* Interior/Exterior Lights	AS DESIRED
* Engine Instruments	CHECKED
* Fuel Flow Indicator	TEST/RESET (if desired)
* Throttle	900/1000 RPM
* Mixture	ADJUST FOR SMOOTH OPERATION

~ CAUTION ~

Do not operate engine above 1000 RPM unless oil temperature is 75° F (24°C) minimum. Operation of engine above 1000 RPM at temperatures below 75° F (24°C) may damage engine.

FLOODED ENGINE START

Throttle	1/ 2 OPEN
Mixture	IDLE CUTOFF
Low Fuel Boost Pump Switch	ON — 8 -10 SECONDS THEN OFF
Magneto/Starter Switch	TURN & PUSH to START
	release to BOTH when engine starts.
Mixture	Slowly advance toward RICH until engine starts
Throttle	IDLE 600 - 700 RPM

SEE ENGINE START PROCEDURES ABOVE * FOR REMAINING SEQUENCES.

WARM ENGINE START

Throttle	1/2 to 1 inch OPEN
Mixture	Full Forward (RICH)
Low Fuel Boost Pump Switch	ON - (TO CLEAR FUEL VAPORS)
Low Fuel Boost Pump Switch	OFF
Magneto/Starter Switch	WITHIN 1-2 SECONDS, TURN & PUSH to START
	release to BOTH when engine starts.
Throttle	IDLE 600 - 700 RPM

SEE ENGINE START PROCEDURES ABOVE * FOR REMAINING SEQUENCES.

HOT ENGINE START

Throttle	FULL OPEN
Mixture	IDLE CUT-OFF
Boost Pump	HIGH for 5 sec. or LOW for 15 sec.
Boost Pump	OFF
Throttle	IDLE POSITION
Mixture	Full Forward (RICH)
Magneto/Starter Switch	TURN & PUSH to START
	release to BOTH when engine starts.
Throttle	IDLE 600 - 700 RPM

SEE ENGINE START PROCEDURES ABOVE * FOR REMAINING SEQUENCES.

BEFORE TAXI

Engine Start Checklist	COMPLETED
Radio Master Switch	ON
Elevator Trim Switch	ON
Internal/External Lights	As Desired
Directional Gyro	SET or Slave switch ON
Stand-by Vacuum Pump Operational Check	
STBY VAC Switch	ON

BEFORE TAXI (con't.)

STBY VAC Switch	OFF
Instruments	Normal Operation
Radios	CHECKED and SET
Altimeter	SET
Fuel Selector	SWITCH TANKS verify engine runs on other tank
Cabin Heat	AS DESIRED
Defroster	AS DESIRED
Cabin Vent	AS DESIRED
Optional Equipment Checks	Reference SECTION IX.

TAXI

Before Taxi Checklist	COMPLETED
Rudder Trim	AS DESIRED

~~~~~~

~ CAUTION ~

With rudder trim in the full right position, the aircraft will tend to steer to the right during taxi.

Parking brake	**RELEASE**
Brakes	**CHECK** during TAXI
Directional Gyro	Proper indication during turns
Turn Coordinator	Proper indication during turns
Artificial Horizon	**ERECT** during turns
Throttle	Minimum power
Propeller	Full Forward (HIGH RPM)

~~~~~~

~ CAUTION ~

To prevent battery depletion in prolonged taxi or holding position before takeoff, increase RPM until "VDC-AMP" indicates positive charge.

BEFORE TAKEOFF

Taxi Checklist	COMPLETED
Parking Brake	**SET**
Fuel Selector	**FULLEST TANK**
Throttle	1000 RPM
Propeller	HIGH RPM
Mixture	FULL FORWARD
Alternate Air	Verify CLOSED
Alternator Field Switch	Verify ON
Throttle	2000 RPM
Magneto Switch	**CHECK** - BOTH to L, BOTH to R, BOTH Verify engine operates smoothly on each magneto separately. (150 RPM MAX drop on each magneto, 50 RPM MAX difference)

| 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.

Propeller	CYCLE/Return to high RPM
Ammeter	CHECK Positive Charge Indication
Throttle	RETARD to 1000 RPM
Low Fuel Boost Pump Switch	ON-Verify annunciator light will illuminate BLUE
Low Fuel Boost Pump Switch	OFF

Elevator Trim	TAKEOFF SETTING
Rudder Trim	TAKEOFF SETTING
Wing Flaps	CHECK operation.
SET AT TAKEOFF position (10 Degrees)	
Flight Controls	CHECK free and correct movement
Cabin Door	CHECK SECURED
Seats, Seat Belts and Shoulder Harness	SECURED
Avionics and Auto Pilot	CHECK - (Refer to SECTION IX)
Annunciator Lights	CHECK
Internal/External Lights	AS DESIRED
Strobe Lights/Rotating Beacon	ON
Pilots Window	CLOSED
Emergency Gear Extension (RED) Handle	DOWN & LATCHED
Oil Temperature	75°F(24°C) minimum
CHT	250°F(121°C) minimum
Parking Brake	RELEASE

TAKEOFF

Proper engine operation should be checked early in the takeoff roll. Any significant indication of rough or sluggish engine response is reason to discontinue 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 high RPM is developed, and gravel or loose material will be blown back from the propeller area instead of being pulled into it.

TAKEOFF (NORMAL)

Power	**FULL THROTTLE** (2500 RPM)
Mixture	Check and Set to top of BLUE ARC on EGT
Annunciator	CHECK
Engine Instruments	CHECK for proper indications
Lift Off/Climb Speed	As specified in SECTION V (Takeoff Distance)
Landing Gear	**RETRACT IN CLIMB** after clearing obstacles.
Wing Flaps	UP

TAKEOFF (HIGH ALTITUDE)

For maximum engine power, the mixture should be adjusted during the initial takeoff roll to the top of the BLUE ARC on the EGT. The power increase is significant above 3000 ft. and this procedure should always be employed for field elevations greater than 5000 ft. above sea level.

| NOTE |

If maximum performance takeoffs are desired obtain full power before brake release. Use lift off and climb speed as specified in SECTION V.

CLIMB

| NOTE |

If applicable,use noise abatement procedures as required.

See SECTION V, for rate of climb graph.

CLIMB (CRUISE)

Power	2500 RPM
Manifold Pressure	24 Inches
Mixture	FULL RICH or BLUE ARC on EGT
Rudder Trim	As Desired
Airspeed	120 KIAS

CLIMB (BEST RATE)(V_y)

Power	FULL THROTTLE /2500 RPM
Mixture	FULL RICH or BLUE ARC on EGT
Rudder Trim.	As Desired
Airspeed	105 KIAS

CLIMB (BEST ANGLE)(V_x)

Power	FULL THROTTLE/2500 RPM
Mixture	FULL RICH
Rudder Trim.	As Desired
Airspeed.	85 KIAS

Leaning may be required during CLIMB depending on atmospheric conditions.

CRUISE

| NOTE |

Use recommended engine break-in procedures as published by engine manufacturer.

Airspeed.	**ACCELERATE** to cruise airspeed
Throttle	SELECTED SETTING (Ref. CRUISE PERFORMANCE CHARTS in SECTION V)

| NOTE |

Prolonged climbs to high cruise altitudes during hot weather operations may result in some fuel flow fluctuations as throttle is reduced. If fluctuations occur, turn Low Boost Pump Switch ON until cooling has alleviated fluctuations.

Propeller	Set RPM to selected setting
Mixture	LEAN TO 50°F rich of PEAK EGT

| NOTE |

Cruise operation at BEST POWER will result in a substantial increase in fuel flow, greatly decreasing range and endurance; reference charts published in SECTION V.

Engine instruments	**CHECK**

| NOTE |

Careful leaning of mixture control will result in best fuel efficiency. This requires operating at proper EGT. Failure to do so will result in excessive fuel burn. After leveling off at cruise altitude, set RPM for desired power setting per Cruise Power Chart in SECTION V. Slowly lean Mixture until EGT reaches peak value. Enrichen to 50°F rich of peak EGT for best power (50°F lean of peak is best economy); careful adjustments are necessary for accurate setting. Changes in altitude or power MAY REQUIRE readjustment of EGT.

Engine temperatures	STABILIZE at cruise condition.
Rudder Trim.	As Desired

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.

FUEL TANK SELECTION

Low Fuel Boost Pump Switch	ON
Fuel Selector	OPPOSITE TANK
Low Fuel Boost Pump Switch	OFF

OXYGEN SYSTEM

(OPTIONAL EQUIPMENT)

////////////////////
// **WARNING** //
////////////////////

Greasy lipsticks and waxed mustaches have been known to ignite spontaneously inside oxygen masks. Passengers should be suitably advised prior to flight.

For safety reasons NO SMOKING should be allowed in the airplane while oxygen is being used.

When ready to use the oxygen system, proceed as follows:

Mask and Hose . . . . . SELECT - either MIC or STD
. . . Adjust mask to face and adjust metallic nose strap for snug mask fit.
Delivery Hose . . . . . PLUG INTO OUTLET assigned to that seat.

| **NOTE** |

When the oxygen system is turned ON, oxygen will flow continuously at the appropriate rate of flow for the altitude without any manual adjustments.

Oxygen Supply Control Knob . . . . . ON.
Face Mask Hose Flow Indicator . . . . . CHECK
. . . . Oxygen is flowing if the indicator is being forced toward the mask.
Delivery Hose . . . UNPLUG from outlet when discontinuing use of oxygen.
. . . . . This automatically stops flow of oxygen from that outlet.
Oxygen Supply Control Knob . . . OFF - when oxygen is no longer required.

////////////////////
// **WARNING** //
////////////////////

Proper oxygen flow is critical to pilot/passenger safety, especially at altitudes above 20,000 ft. MSL. It is important to closely monitor the face mask hose flow indicator to ensure oxygen is constantly flowing to the mask. A GREEN indication on the flow indicator denotes proper oxygen flow. Always place the flow indicator in a position where it is in the normal scan area of the cockpit.

Refer to duration chart (Fig. 7-13, SECTION VII) for safe operational quantities.

DESCENT

| **NOTE** |

Avoid extended descents at low manifold pressure setting, as engine can cool excessively and may not accelerate satisfactorily when power is re-applied.

NORMAL DESCENT - GEAR UP

Seats, Seat Belts/Shoulder Harness . . . . . ADJUST AND SECURE
Wing Flaps . . . . . **UP**
Landing Gear . . . . . **UP**
Throttle . . . . . CHT in Green)
Propeller . . . . . 2400 RPM
Mixture . . . . . Peak EGT (Monitor as descent progresses)
Cylinder Head Temperature (CHT) . . MONITOR [250° F(121°C) minimum]
Airspeed . . . . . AS DESIRED(196 KIAS max.)
Rudder Trim . . . . . AS DESIRED

| NOTE |

Plan descents to arrive at pattern altitude on downwind leg for maximum fuel efficiency and minumum aircraft noise.

~ CAUTION ~

DO NOT fly in YELLOW ARC speed range unless the air is smooth.

NORMAL DESCENT - GEAR DOWN

Seats, Seat Belts/Shoulder Harness	ADJUST AND SECURE
Wing Flaps	UP
Airspeed	**DECELERATE** to 140 KIAS
Landing Gear	**DOWN**
Throttle	Keep CHT in Green Arc
Propeller	2400 RPM
Mixture	Peak EGT (Monitor as descent progresses)
Cylinder Head Temperature (CHT)	Monitor (250° F (121°C) min)
Airspeed	165 KIAS or LESS.

| NOTE |

Using landing gear as a descent aid will result in a steeper descent rate (greater altitude loss per horizontal distance traveled).

APPROACH FOR LANDING

~ CAUTION ~

The airplane must be within allowable weight and balance envelope for landing (REF. SECTION VI). It will require a minimum of one hour of flight before a permissable landing weight is attained when takeoffs are made at maximum gross weight. If landing at a weight exceeding maximum landing weight (3200 Lbs.)(1452 Kgs.) is required, see OVERWEIGHT LANDING PROCEDURE, SECTION III.

Seats, Seat Belts/Shoulder Harness	ADJUST AND SECURE
Internal/External lights	AS DESIRED
Landing Gear	EXTEND below 140 KIAS (Check Gear Down light **ON**-Check visual indicator)
Mixture	FULL RICH (on final)
Propeller	HIGH RPM (on final)
Fuel Boost Pump Switches	OFF
Fuel Selector	FULLEST TANK
Wing Flaps	T/O POSITION (FULL DOWN below 110 KIAS)

~ CAUTION ~

To minimize control wheel forces when entering landing configuration, timely nose-up trimming is recommended to counteract nose down pitching moment caused by reduction of power and/or extension of flaps.

Elevator Trim	AS DESIRED
Rudder Trim	AS DESIRED
Parking Brake	VERIFY **OFF**

| NOTE |

The parking brake should be rechecked to preclude partially applied brakes during touchdown.

GO AROUND (BALKED LANDING)

~ CAUTION ~

To minimize control wheel forces during GO-AROUND, timely nose-down trimming is recommended to counteract nose up pitching moment as power is increased and/or flaps are retracted.

Power	**FULL FORWARD**/2500 RPM)
Mixture	Verify **FULL RICH**
Fuel Boost Pump Switches	OFF
Wing Flaps	**TAKEOFF POSITION** (10°) (After POSITIVE climb established)
Trim	**NOSE DOWN** to reduce forces
Airspeed	**85 KIAS**
Landing Gear	**RETRACT**
Wing Flaps	**RETRACT**
Airspeed	**105 KIAS**

LANDING

LANDING (NORMAL)

Approach for Landing Checklist	COMPLETED
Approach Airspeed	As specified in SECTION V (Landing Distance)
Touchdown	**MAIN WHEELS FIRST** (aligned w/ runway)
Landing Roll	**LOWER** nose wheel gently
Brakes	**MINIMUM** required

| NOTE |

Landing information for reduced flap settings is not available. See SECTION V for Landing Distance tables.

| NOTE |

If maximum performance landings are desired, use above procedures except, reduce approach airspeed to 70 KIAS (flaps full down) and apply maximum braking (without skidding tires) during rollout.

| NOTE |

Crosswind landings should be accomplished by using above procedures except maintain approach speed appropriate for wind conditions. Allow aircraft to crab until the landing flare. Accomplish touchdown in a slight wing low sideslip (low wing into wind) and aircraft aligned with runway. During landing roll, position flight controls to counteract crosswind.

~ CAUTION ~

Landing gear may retract during landing roll if landing gear switch is placed in the UP position.

TAXI AFTER LANDING

Throttle	AS REQUIRED
Fuel Boost Pump Switches	OFF
Wing Flaps	**RETRACT**
Elevator Trim	**TAKEOFF SETTING**
Avionics/Radios	AS REQUIRED
Interior/Exterior Lights	AS DESIRED

SHUTDOWN

Parking Brake	SET
Throttle	IDLE RPM
Radio Master Switch	OFF
Interior/Exterior Lights	OFF
Pitot Heat	OFF
Alternator Field Switch	OFF
Magneto/Starter Switch	GROUNDING CHECK
Mixture	IDLE CUT-OFF
Master Switch	OFF
Magneto/Starter Switch	OFF

SECURING AIRCRAFT

Magneto/Starter Switch	VERIFY OFF/ Key removed
Master Switch	VERIFY OFF
Radio Master Switch	Verify OFF
Electrical Switches	Verify OFF
Interior Light Switches	VERIFY OFF
Parking Brake	RELEASE - INSTALL WHEEL CHOCKS
Extended parking	CONTROL WHEEL SECURED with seat belts, cabin vents closed;
Cabin Windows and Doors	CLOSED AND LOCKED

TIE DOWN AIRCRAFT at wing and tail points.

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INTRODUCTION

The purpose of this section is to present the owner or operator with information needed to facilitate planning of flights with reasonable accuracy.
The Performance Data and charts presented herein are calculated, based on actual flight tests with the airplane and engine in good condition and the engine power control system properly adjusted.
The flight test data has been corrected to International Standard Atmosphere conditions and then expanded analytically to cover various airplane gross weights, operating altitudes, and outside air temperatures.

VARIABLES

It is not possible to make allowances in the charts for varying levels of pilot technique, proficiency or environmental conditions. Mechanical or aerodynamic changes are not authorized because they can affect the performance or flight characteristics of the airplane. The effect of such things as soft runways, sloped runways, winds aloft or airplane configuration changes must be evaluated by the pilot. However, the performance on the charts can be duplicated by following the stated procedures in a properly maintained MOONEY M20R.

Examples are given to show how each chart is used. The only charts with no example are those where such an example of use would be repetitive.

To obtain effect of altitude and OAT on aircraft performance:

1. Set altimeter to 29.92 and read "pressure altitude".

2. Using the OAT grid for the applicable chart read the corresponding effect of OAT on performance.

~ CAUTION ~

Be sure to return to local altimeter setting in calculating aircraft elevation above sea level.

OPERATIONAL PROCEDURES FOR MAXIMUM FUEL EFFICIENCY

For maximum fuel efficiency on the M20R, proper mixture leaning during cruise flight must be accomplished. The TCM IO-550-G(6) engine in the M20R has been designed to attain maximum fuel efficiency at desired cruise power. Best power mixture (at 2400 RPM) has been determined to be 50°F (10°C) rich of peak EGT. EGT is usually a more accurate indication of engine operation and fuel burn than indicated fuel flow. Therefore, it is recommended that the mixture be set using EGT as the primary reference instead of setting to a particular fuel flow.

The following procedures is recommended for setting cruise power and leaning to best economy at 75% power or less.

1. After leveling off, set manifold pressure and RPM for the desired cruise power settings as shown in this SECTION. At this point, mixture is at full rich from the climb.

2. Slowly move mixture control toward lean while observing EGT indicator. If leaning mixture toward peak EGT causes the original manifold pressure setting to change, adjust throttle to maintain that desired cruise manifold pressure and continue leaning until best economy setting is obtained.

PERFORMANCE CONSIDERATIONS

RANGE and ENDURANCE ASSUMPTIONS

Range and endurance allowance is based on climbing at maximum continuous power to cruise altitude.
Range and endurance reserves of 45 minutes at cruise power have been allowed for. Other conditions used for Range and Endurance are listed on each chart.

OPTIONAL PROPELLER DE-ICE BOOTS

With the optional propeller de-ice boots installed, expect climb performance to be degraded approximately 50 FPM from what is presented in the manual.

LANDING GEAR DOORS

When snow and ice are likely to be present on taxi and runway surfaces, inboard landing gear doors should be removed. Accumulation of ice and snow could prevent landing gear operation.
If inboard landing gear doors are 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:

Decrease of true airspeed at normal cruise power setting by approximately 5 KTAS.

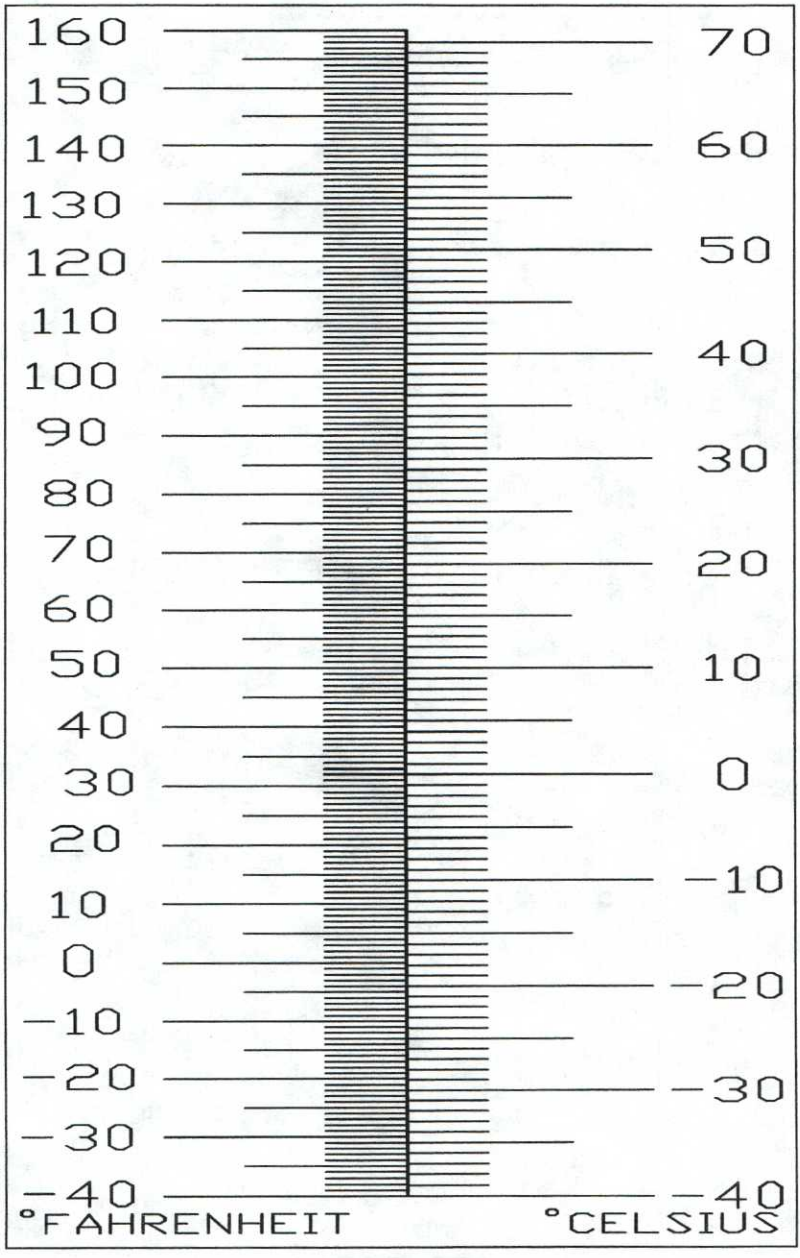
An approximate adjustment to range data shown in this manual can be made based on flight time planned **with landing gear doors removed** from aircraft. For example, using the above cruise speed decrease for a 5 hour flight will result in a decrease in range of approximately 25 N.M.:

5 HR X 5 KTS = ... 25 N.M. reduction in range.

~~~~~~~~
~ CAUTION ~
~~~~~~~~

Zero wind conditions seldom occur. In addition, varying atmospheric conditions, aircraft weight, mechanical condition of the aircraft and piloting techniques all affect the actual flight time and fuel used during a flight.

It is the pilot's responsibility to determine the actual operating conditions and plan the flight accordingly.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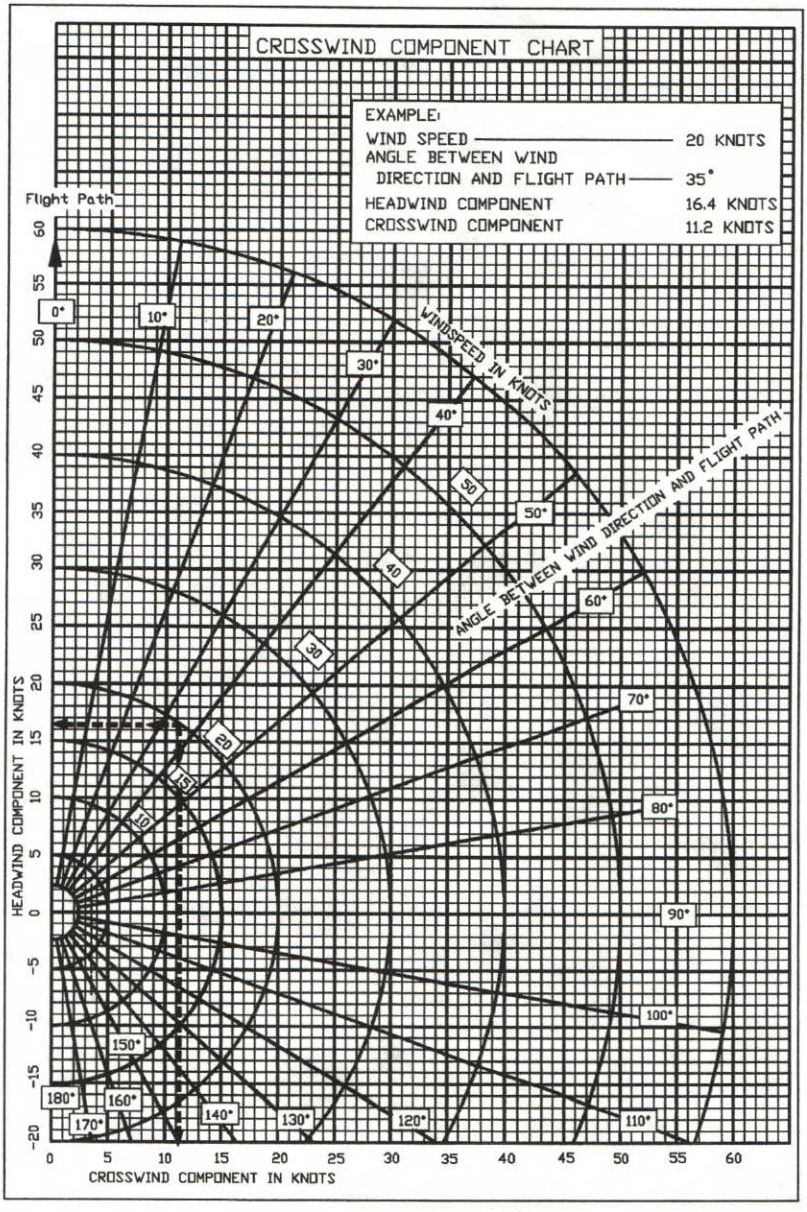
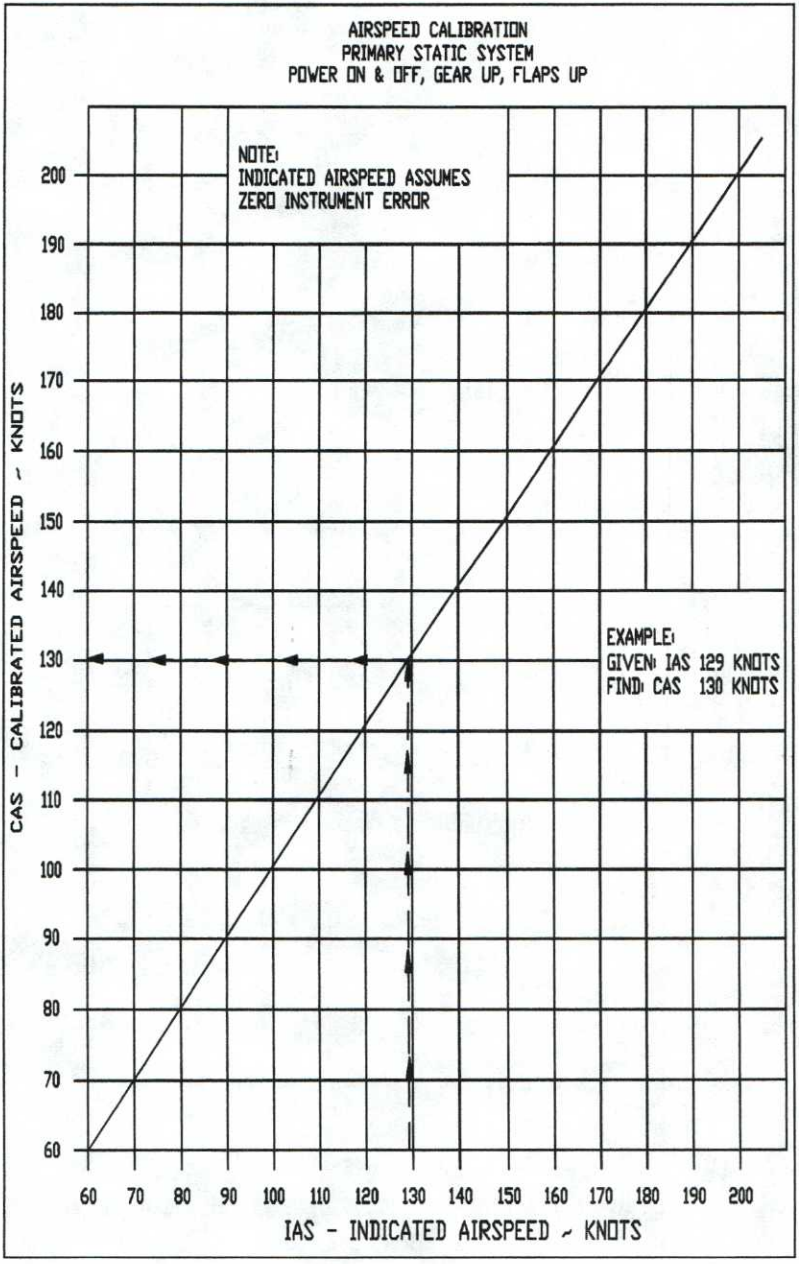
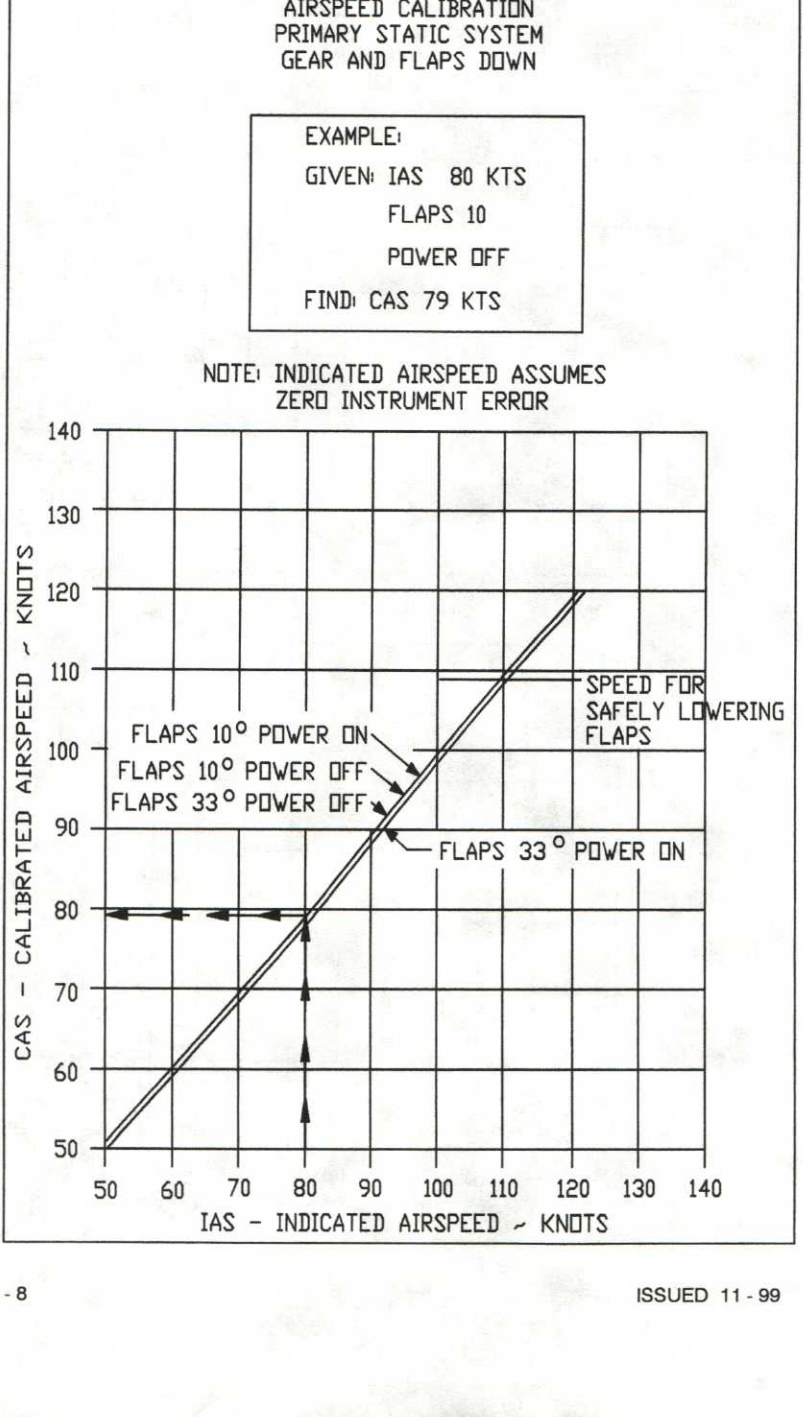


TEMPERATURE CONVERSION

CROSSWIND COMPONENT CHART


AIRSPEED CALIBRATION
PRIMARY STATIC SYSTEM
POWER ON & OFF, GEAR UP, FLAPS UP
NOTE:
INDICATED AIRSPEED ASSUMES
ZERO INSTRUMENT ERROR
EXAMPLE:
GIVEN: IAS 129 KNOTS
FIND: CAS 130 KNOTS
CAS - CALIBRATED AIRSPEED - KNOTS
IAS - INDICATED AIRSPEED - KNOTS
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200


AIRSPEED CALIBRATION
PRIMARY STATIC SYSTEM
GEAR AND FLAPS DOWN
EXAMPLE:
GIVEN: IAS 80 KTS
FLAPS 10
POWER OFF
FIND: CAS 79 KTS
NOTE: INDICATED AIRSPEED ASSUMES
ZERO INSTRUMENT ERROR
CAS - CALIBRATED AIRSPEED - KNOTS
IAS - INDICATED AIRSPEED - KNOTS
140
130
120
110
100
90
80
70
60
50
50 60 70 80 90 100 110 120 130 140
SPEED FOR
SAFELY LOWERING
FLAPS
FLAPS 10° POWER ON
FLAPS 10° POWER OFF
FLAPS 33° POWER OFF
FLAPS 33° POWER ON

**DEMONSTRATED CROSS WIND IS 13 KNOTS
(THIS IS NOT A LIMITATION)**

AIRSPEED CALIBRATION - PRIMARY STATIC SYSTEM (GEAR UP)

AIRSPEED CALIBRATION - PRIMARY STATIC SYSTEM (GEAR DN)

AIRSPEED CALIBRATION - ALTERNATE STATIC SYSTEM

KIAS	GEAR & FLAPS UP KIAS	GEAR & FLAPS DN (10°) KIAS	GEAR & FLAPS DN (33°) KIAS
50	3.0	0.0	-1.0
60	1.5	-1.2	-2.0
70	0.0	-2.2	-3.2
80	-1.8	-3.2	-4.5
90	-2.8	-4.0	-6.0
100	-3.0	-4.7	-7.4
110	-3.0	-5.4	-8.8
120	-3.0	-	-
130	-3.6	-	-
140	-4.5	-	-
150	-5.1	-	-
160	-5.6	-	-
170	-6.1	-	-
180	-6.5	-	-
190	-7.2	-	-
200	-7.9	-	-

NOTE: The minus sign indicates subtraction of the given numbers from KIAS to obtain the corrected airspeed.

CONDITIONS: Power-ON, Storm Window & Vents - CLOSED, Heater & Defroster - ON or OFF

ALTIMETER CORRECTION - PRIMARY STATIC SYSTEM

KIAS	SEA LEVEL			12,500 FT.			25,000 FT.		
	Gear & Flaps UP	Gear Dn/10° Flaps	Gear Dn/33° Flaps	Gear & Flaps UP	Gear Dn/10° Flaps	Gear Dn/33° Flaps	Gear & Flaps UP	Gear Dn/10° Flaps	Gear Dn/33° Flaps
50	-2	4	-3	-4	7	-4	-5	10	-5
60	-3	3	-5	-4	4	-7	-7	7	-10
70	-3	-2	-9	-5	-3	-13	-8	-4	-20
80	-4	-8	-14	-6	-12	-20	-9	-17	-30
90	-8	-11	-19	-12	-17	-28	-18	-25	-43
100	-6	-11	-22	-9	-16	-33	-13	-24	-50
110	2	-5	-23	2	-7	-33	4	-11	-51
120	9	—	—	13	—	—	20	—	—
130	21	—	—	31	—	—	47	—	—
140	23	—	—	33	—	—	51	—	—
150	15	—	—	22	—	—	33	—	—
160	12	—	—	17	—	—	26	—	—
170	9	—	—	13	—	—	26	—	—
180	8	—	—	12	—	—	18	—	—
190	10	—	—	14	—	—	22	—	—
200	12	—	—	18	—	—	27	—	—

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

EXAMPLE:
KIAS = 110 . . . . . ALTIMETER CORRECTION: -7 ft.
FLAPS = 10° . . . . . (Subtract from Indicated Altitude)
INDICATED PRESSURE ALTITUDE:12,500 ft. **PRESSURE ALTITUDE; =12,493 ft.**

ALTIMETER CORRECTION - ALTERNATE STATIC SYSTEM

	SEA LEVEL			12,500 FT.			25,000 FT.		
KIAS	GEAR UP FLAPS UP	GEAR &FLAPS DN 10°	GEAR &FLAPS DN 33°	GEAR UP FLAPS UP	GEAR & FLAPS DN 10°	GEAR & FLAPS DN 33°	GEAR UP FLAPS UP	GEAR &FLAPS DN 10°	GEAR &FLAPS DN 33°
50	13	0	-4	20	0	-7	30	0	-10
60	8	-6	-11	12	-9	-16	18	-14	-24
70	0	-14	-20	0	-20	-29	0	-31	-45
80	-13	-23	-32	-19	-34	-47	-29	-51	-72
90	-23	-32	-48	-33	-47	-71	-50	-72	-108
100	-27	-42	-66	-39	-62	-97	-68	-94	-148
110	-30	-53	-87	-43	-78	-127	-66	-119	-194
120	-32	-	-	-48	-	-	-72	-	-
130	-53	-	-	-77	-	-	-118	-	-
140	-57	-	-	-84	-	-	-127	-	-
150	-69	-	-	-102	-	-	-155	-	-
160	-82	-	-	-128	-	-	-182	-	-
170	-95	-	-	-139	-	-	-211	-	-
180	-107	-	-	-158	-	-	-248	-	-
190	-126	-	-	-185	-	-	-282	-	-
200	-146	-	-	-215	-	-	-327	-	-

NOTE: The minus sign indicates subtraction of the given number from the indicated altitude to obtain the corrected altitude.

CONDITIONS: Power -ON, Vents & Storm Window - CLOSED, Heater & Defroster - ON or OFF.

STALL SPEED vs. ANGLE OF BANK

ASSOCIATED CONDITIONS:
FORWARD C.G.
POWER IDLE

NOTE: UP TO 500 FEET ALTITUDE LOSS MAY OCCUR DURING STALLS AT MAXIMUM WEIGHT

EXAMPLE:

WEIGHT	3000 LBS (1361 KGS)
LANDING GEAR	DOWN
FLAPS	10°
ANGLE OF BANK	45°
STALL SPEED	72.5 KCAS (73.0 KIAS)

GROSS WEIGHT	GEAR AND FLAP POSITION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS
3368 LBS (1528 KGS)	GEAR UP, FLAPS 0°	66.0	66.5	71.0	71.5	78.5	79.0	93.5	94.0
	GEAR DOWN, FLAPS 10°	64.5	64.5	69.5	69.5	76.5	77.5	91.0	92.0
	GEAR DOWN FLAPS 33°	59.0	59.0	63.5	63.5	70.0	70.0	83.5	84.5
3000 LBS (1361 KGS)	GEAR UP, FLAPS 0°	62.5	63.0	67.0	67.5	74.5	75.0	88.5	89.5
	GEAR DOWN, FLAPS 10°	61.0	61.0	65.5	65.5	72.5	73.0	86.5	87.5
	GEAR DOWN FLAPS 33°	55.5	55.5	59.5	59.5	66.0	66.0	78.5	79.5
2700 LBS (1225 KGS)	GEAR UP, FLAPS 0°	59.0	59.5	63.5	64.0	70.0	70.5	83.5	84.0
	GEAR DOWN, FLAPS 10°	58.0	58.0	62.5	62.5	69.0	69.0	82.0	83.0
	GEAR DOWN FLAPS 33°	53.0	53.0	57.0	57.0	63.0	63.0	75.0	76.0

TAKEOFF DISTANCE – HARD SURFACE [NORMAL]

TAKEOFF WEIGHT–LBS (KGS)	TAKEOFF SPEED KIAS	SPEED AT 50 FT–KIAS
3368 LBS (1528 KGS)	67	85
3100 LBS (1406 KGS)	64	82
2700 LBS (1225 KGS)	60	76

TAKEOFF DISTANCE

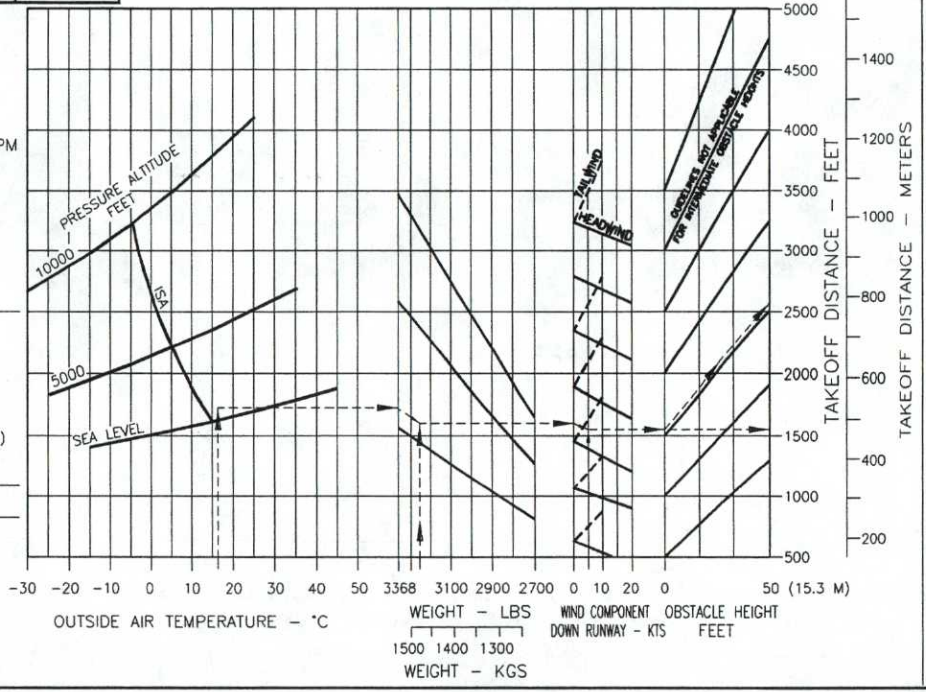
NOTE: 1. CONDITIONS OF HIGH HUMIDITY CAN RESULT IN AN INCREASE OF UP TO 10% TO THE TAKEOFF DISTANCE.
2. MAXIMUM DEMONSTRATED CROSSWIND IS 13 KNOTS.

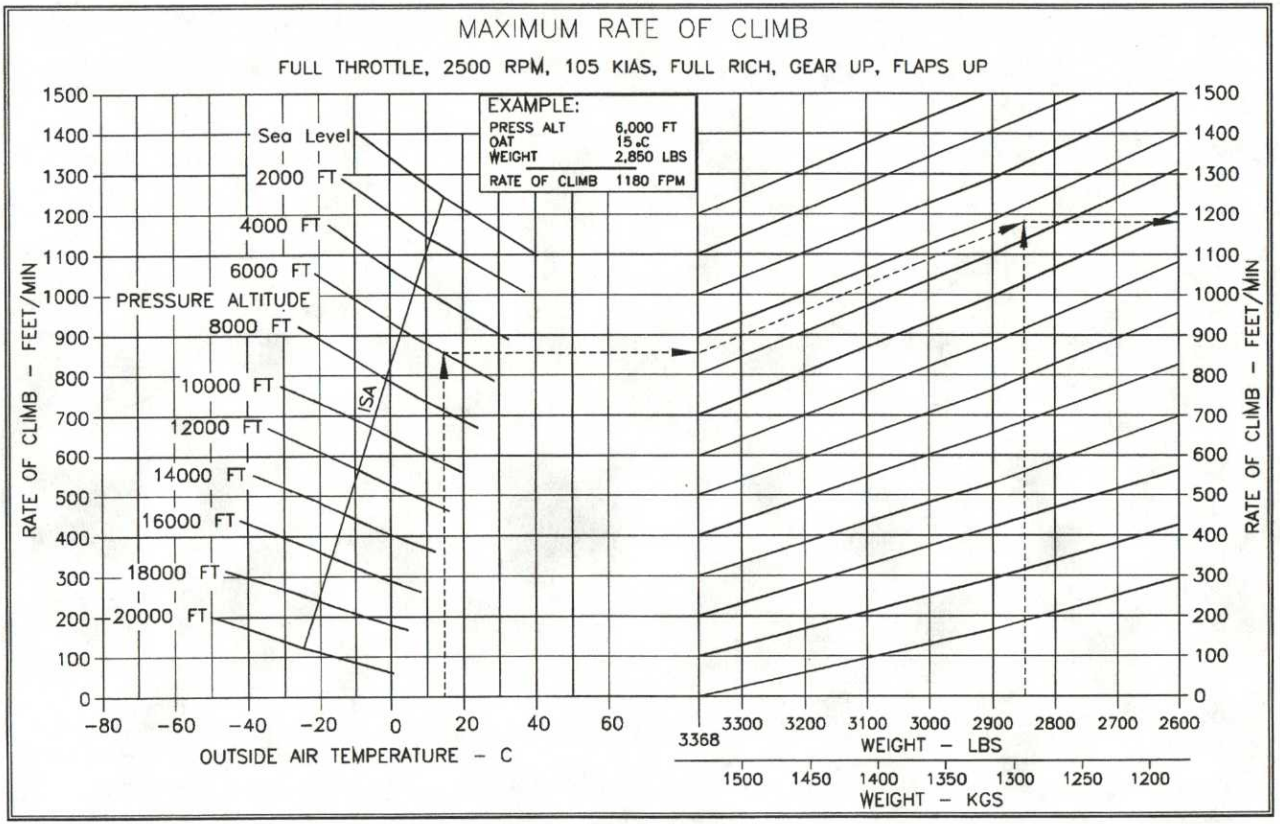
ASSOCIATED CONDITIONS

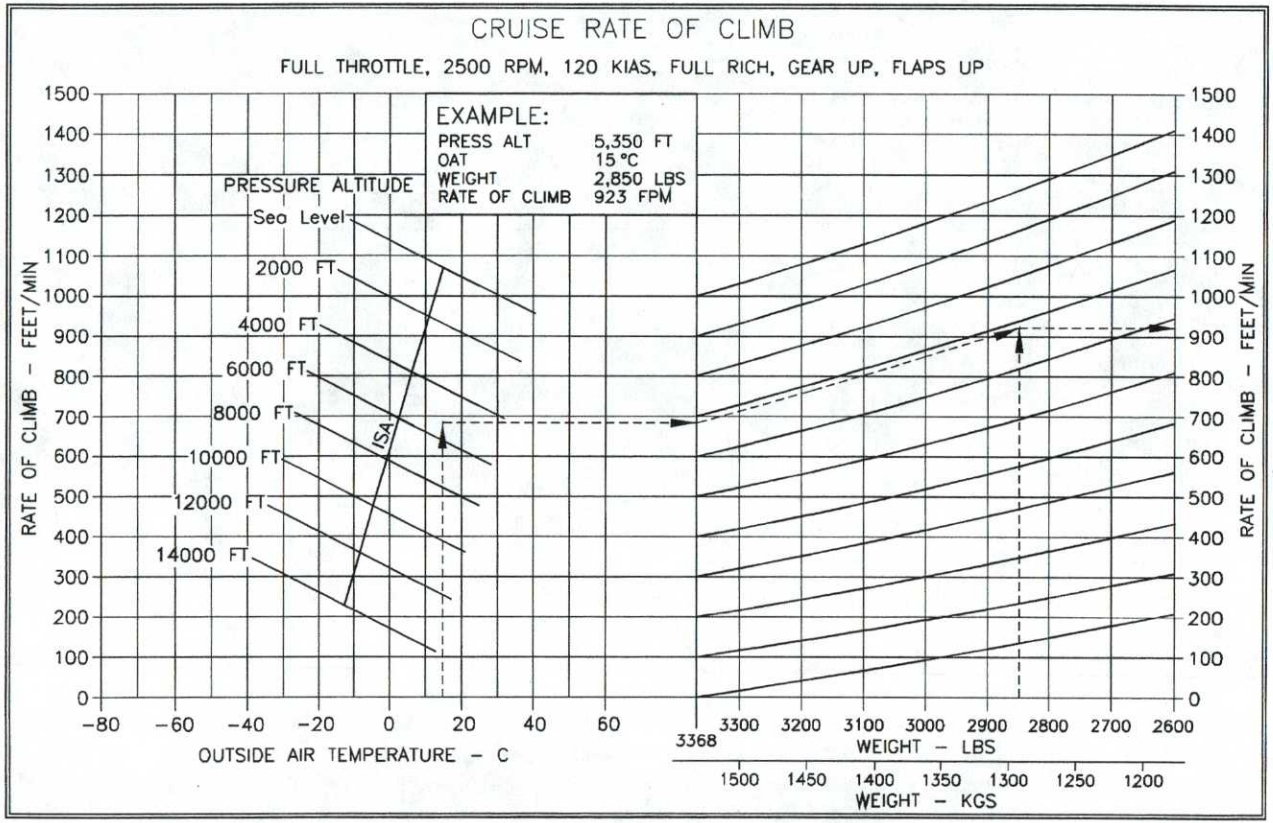
POWER	FULL THROTTLE/2500 RPM
MIXTURE	SET EGT TO TOP OF BLUE ARC AS REQUIRED
LDG GEAR	DOWN UNTIL OBSTACLE CLEARED
WING FLAPS	10°
RWY SURF.	PAVED LEVEL, DRY
HUMIDITY	80% IS STANDARD

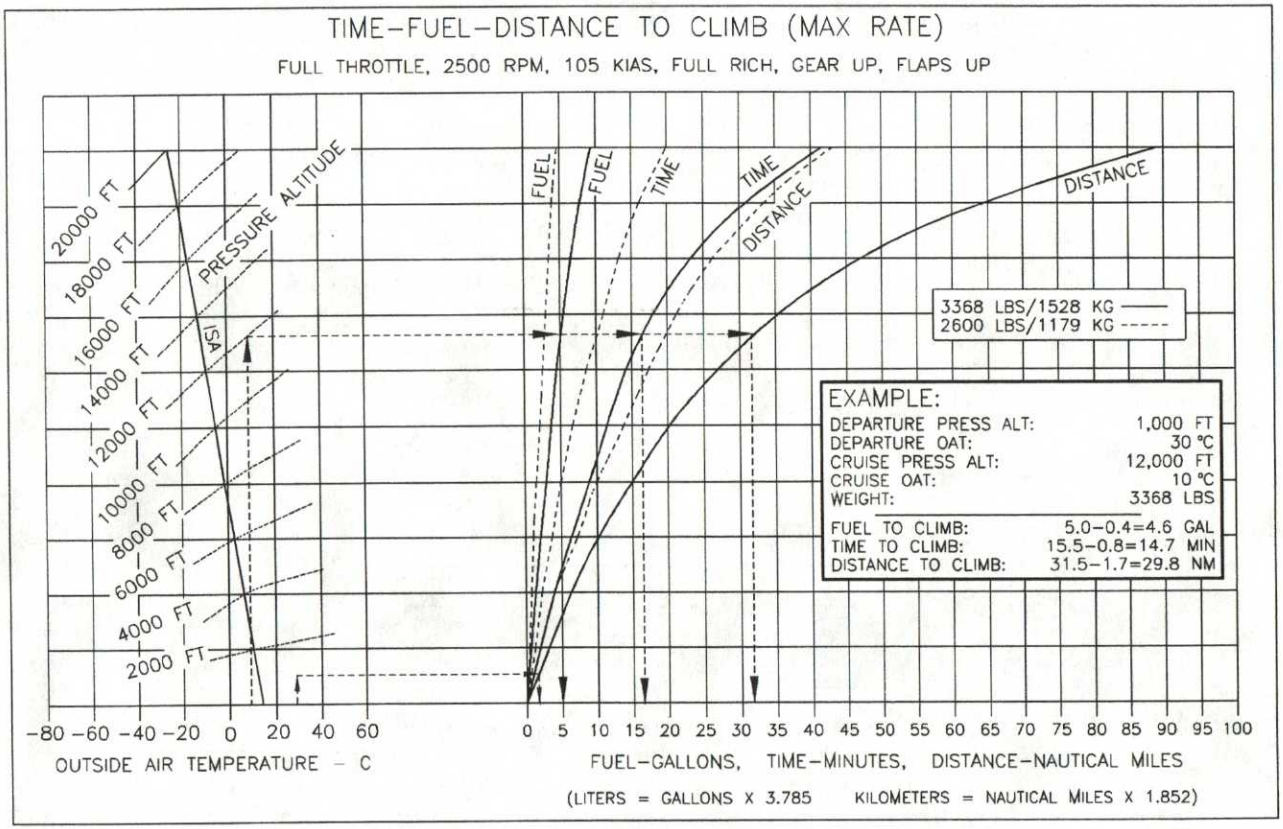
EXAMPLE:

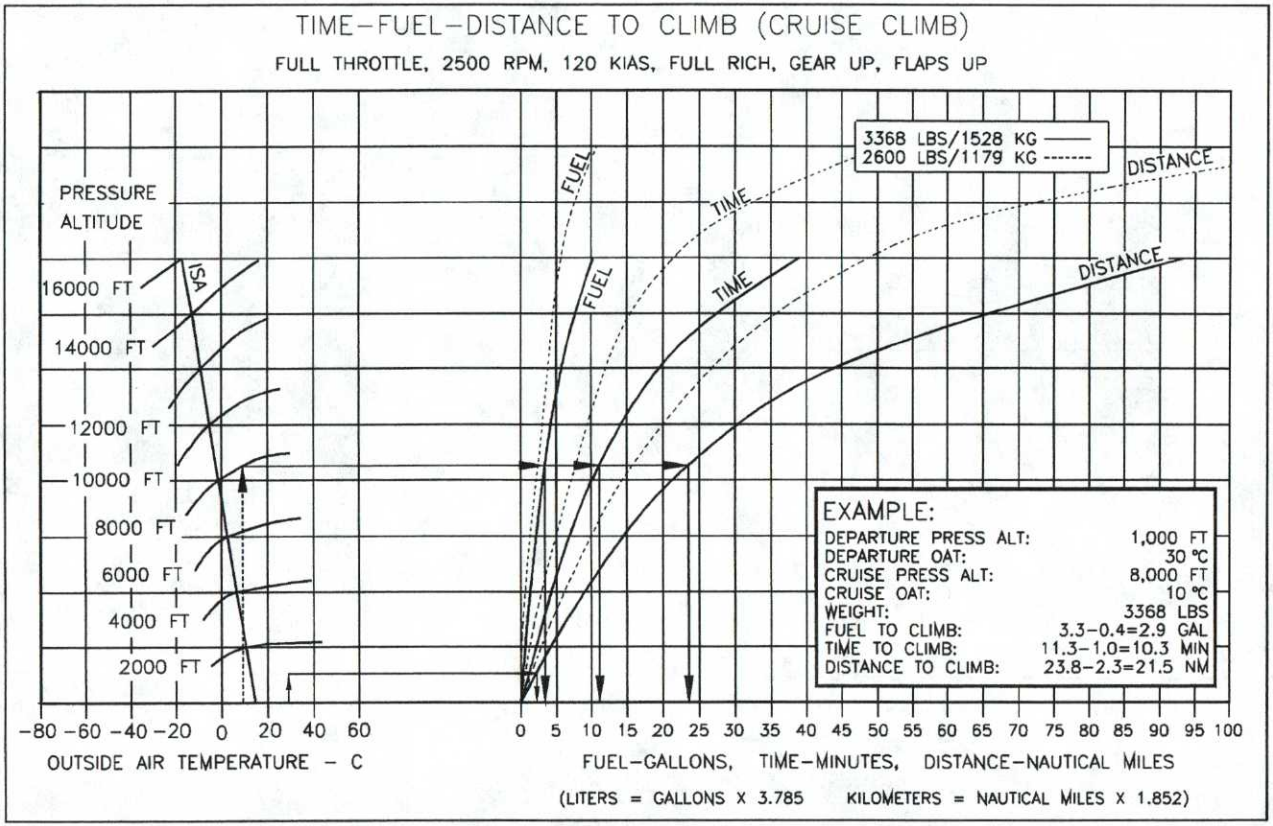
OAT	17 °C
PRESSURE ALTITUDE	1000 FT
WEIGHT	3250 LBS (1474 KGS)
HEADWIND COMPONENT	5 KTS
GROUND ROLL	1600FT (488 M)
TOTAL TAKEOFF DISTANCE (50 FT OBSTACLE)	2560 FT (780 M)




MAXIMUM RATE OF CLIMB
FULL THROTTLE, 2500 RPM, 105 KIAS, FULL RICH, GEAR UP, FLAPS UP
EXAMPLE:
PRESS ALT 6,000 FT
OAT 15 °C
WEIGHT 2,850 LBS
RATE OF CLIMB 1180 FPM
Sea Level
2000 FT
4000 FT
6000 FT
PRESSURE ALTITUDE
8000 FT
10000 FT
12000 FT
14000 FT
16000 FT
18000 FT
20000 FT
ISA
RATE OF CLIMB - FEET/MIN
OUTSIDE AIR TEMPERATURE - C
WEIGHT - LBS
WEIGHT - KGS
3368


CRUISE RATE OF CLIMB
FULL THROTTLE, 2500 RPM, 120 KIAS, FULL RICH, GEAR UP, FLAPS UP
EXAMPLE:
PRESS ALT 5,350 FT
OAT 15 °C
WEIGHT 2,850 LBS
RATE OF CLIMB 923 FPM
PRESSURE ALTITUDE
Sea Level
2000 FT
4000 FT
6000 FT
8000 FT
10000 FT
12000 FT
14000 FT
ISA
RATE OF CLIMB - FEET/MIN
OUTSIDE AIR TEMPERATURE - C
WEIGHT - LBS
WEIGHT - KGS
3368


TIME–FUEL–DISTANCE TO CLIMB (MAX RATE)
FULL THROTTLE, 2500 RPM, 105 KIAS, FULL RICH, GEAR UP, FLAPS UP
PRESSURE ALTITUDE
20000 FT
18000 FT
16000 FT
14000 FT
12000 FT
10000 FT
8000 FT
6000 FT
4000 FT
2000 FT
ISA
FUEL
FUEL
TIME
TIME
DISTANCE
DISTANCE
3368 LBS/1528 KG
2600 LBS/1179 KG
EXAMPLE:
DEPARTURE PRESS ALT: 1,000 FT
DEPARTURE OAT: 30 °C
CRUISE PRESS ALT: 12,000 FT
CRUISE OAT: 10 °C
WEIGHT: 3368 LBS
FUEL TO CLIMB: 5.0–0.4=4.6 GAL
TIME TO CLIMB: 15.5–0.8=14.7 MIN
DISTANCE TO CLIMB: 31.5–1.7=29.8 NM
–80 –60 –40 –20 0 20 40 60
OUTSIDE AIR TEMPERATURE – C
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
FUEL–GALLONS, TIME–MINUTES, DISTANCE–NAUTICAL MILES
(LITERS = GALLONS X 3.785 KILOMETERS = NAUTICAL MILES X 1.852)


TIME–FUEL–DISTANCE TO CLIMB (CRUISE CLIMB)
FULL THROTTLE, 2500 RPM, 120 KIAS, FULL RICH, GEAR UP, FLAPS UP
3368 LBS/1528 KG
2600 LBS/1179 KG
PRESSURE ALTITUDE
16000 FT
14000 FT
12000 FT
10000 FT
8000 FT
6000 FT
4000 FT
2000 FT
ISA
FUEL
TIME
DISTANCE
EXAMPLE:
DEPARTURE PRESS ALT: 1,000 FT
DEPARTURE OAT: 30 °C
CRUISE PRESS ALT: 8,000 FT
CRUISE OAT: 10 °C
WEIGHT: 3368 LBS
FUEL TO CLIMB: 3.3–0.4=2.9 GAL
TIME TO CLIMB: 11.3–1.0=10.3 MIN
DISTANCE TO CLIMB: 23.8–2.3=21.5 NM
–80 –60 –40 –20 0 20 40 60
OUTSIDE AIR TEMPERATURE – C
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
FUEL–GALLONS, TIME–MINUTES, DISTANCE–NAUTICAL MILES
(LITERS = GALLONS X 3.785 KILOMETERS = NAUTICAL MILES X 1.852)

EXAMPLE:
Cruise Alt. 8000 ft.
OAT 9° C (SEE NOTE)
Power Setting Desired 75%

RPM/MP 2500/22.3
Fuel Flow 16.0

M20R CRUISE POWER SETTINGS AND FUEL FLOWS

BEST POWER 50°F Rich of Peak

Pressure Altitude (Feet)	RPM		Max. Recommended		75% Power			65% Power			55% Power			45% Power		
	Fuel Flow	Best POWER	2400	2500	2300	2400	2500	2300	2400	2500	2300	2400	2500	2300	2400	2500
			17.8	17.9	15.8	15.9	16.0	13.9	14.0	14.1	11.9	12.0	12.1	10.0	10.1	10.2
Std. Day	Std. Temp.		MANIFOLD PRESSURE – INCHES OF MERCURY													
S. L.	15°C	59°F	27.0	26.2	25.5	24.5	23.2	22.9	21.9	20.8	20.5	19.4	18.3	18.0	17.2	16.4
2,000	11°C	52°F	26.5	25.7	25.0	24.0	22.8	22.5	21.6	20.5	20.1	19.0	17.9	17.5	16.8	16.0
4,000	7°C	45°F		25.2	24.4	23.4	22.5	22.1	21.3	20.2	19.7	18.7	17.6	16.9	16.3	15.7
6,000	3°C	38°F			23.8	23.0	22.2	21.6	20.8	19.7	19.3	18.3	17.3	16.6	16.0	15.4
8,000	-1°C	31°F					21.9	21.1	20.3	19.2	18.9	17.9	16.9	16.3	15.7	15.1
10,000	-5°C	23°F						20.7	19.8	18.7	18.5	17.6	16.6	15.9	15.4	14.8
12,000	-9°C	16°F							19.2	18.4	18.1	17.2	16.3	15.6	15.1	14.5
14,000	-13°C	9°F									17.7	16.9	16.0	15.3	14.8	14.3
16,000	-17°C	2°F											15.7	15.0	14.6	14.1
18,000	-21°C	-5°F												14.8	14.4	13.9
20,000	-25°C	-12°F													14.1	13.7

NOTE: Add .4" MP for each 10°C (18°F) OAT above standard day temperature. Subtract .4" MP for each 10°C (18°F) below standard day temperature. If OAT above standard precludes obtaining the desired MP, use the next higher RPM/MP with appropriate temperature correction to MP.

EXAMPLE:
Cruise Alt. 8000 ft.
OAT 9° C (SEE NOTE)
Power Setting Desired 65%
RPM/MP 2300/22.7
Fuel Flow 12.2

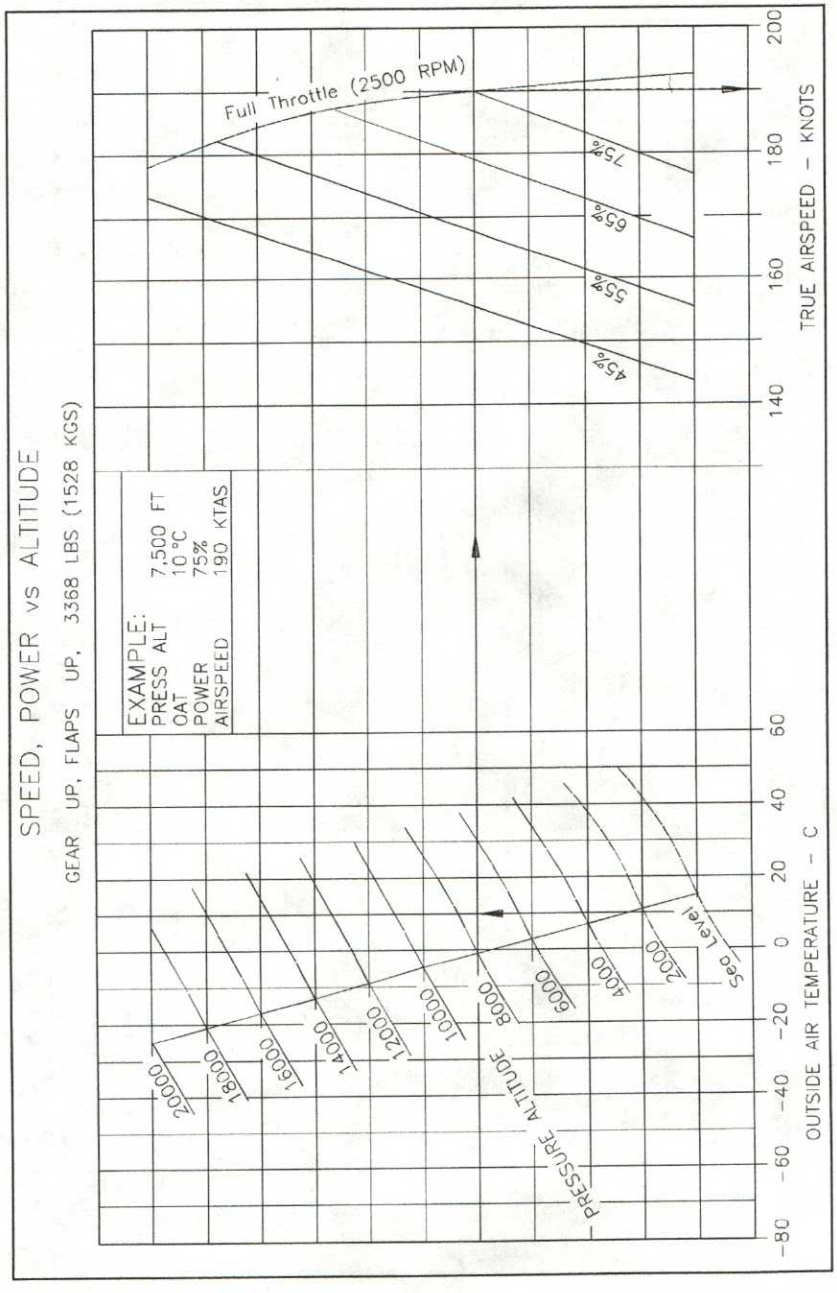
M20R CRUISE POWER SETTINGS AND FUEL FLOWS

BEST ECONOMY 50°F Lean of Peak

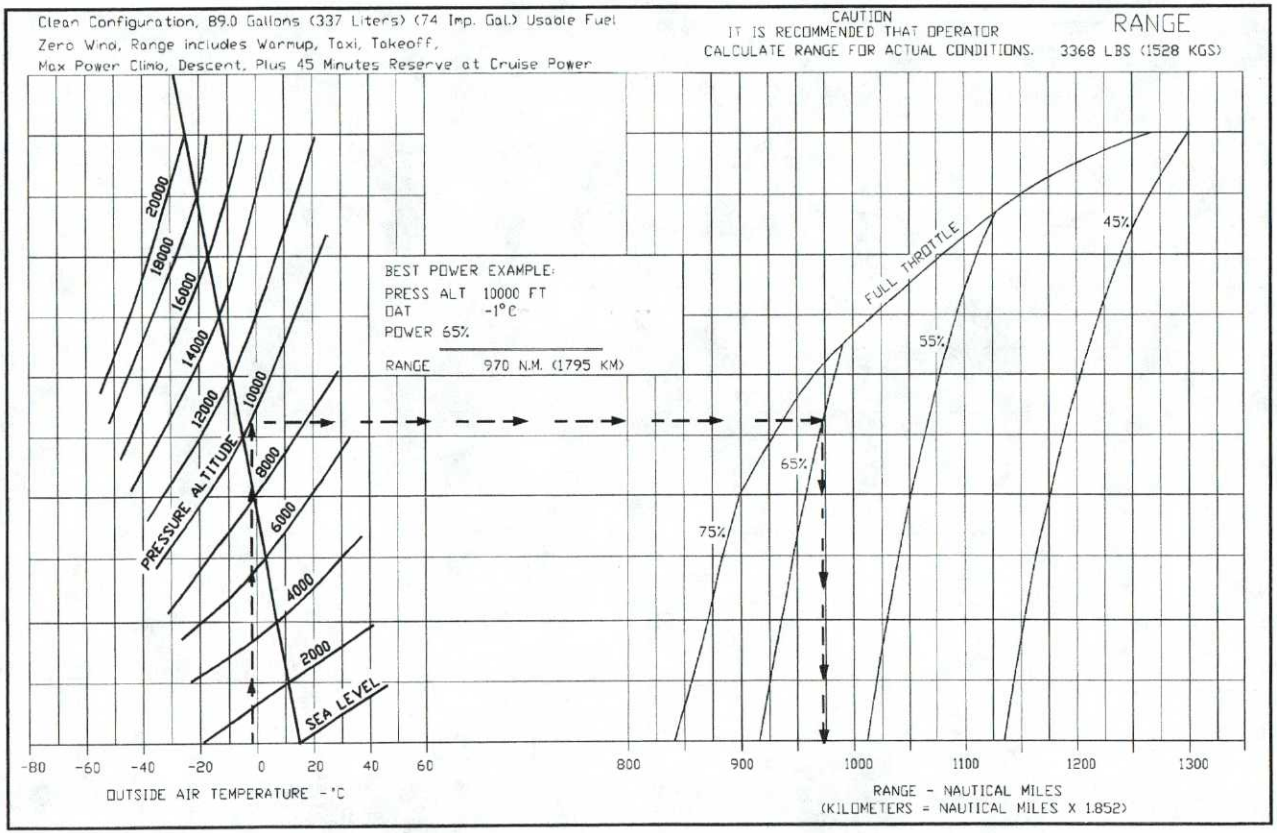
			Max. Recommended		75% Power			65% Power			55% Power			45% Power		
	RPM		2400	2500	2300	2400	2500	2300	2400	2500	2300	2400	2500	2300	2400	2500
Pressure Altitude (Feet)	Fuel Flow	Best ECON.	16.3	16.4	14.3	14.4	14.5	12.2	12.3	12.4	10.2	10.3	10.4	8.2	8.3	8.4
Std. Day	Std. Temp.		MANIFOLD PRESSURE – INCHES OF MERCURY													
S. L.	15°C	59°F	28.2	27.4	26.7	25.7	24.4	24.1	23.1	22.0	21.7	20.6	19.5	19.2	18.4	17.6
2,000	11°C	52°F		26.9	26.2	25.2	24.0	23.7	22.8	21.7	21.3	20.2	19.1	18.7	18.0	17.2
4,000	7°C	45°F			25.6	24.6	23.7	23.3	22.5	21.4	20.9	19.9	18.8	18.1	17.5	16.9
6,000	3°C	38°F					23.4	22.8	22.0	20.9	20.5	19.5	18.5	17.8	17.2	16.6
8,000	-1°C	31°F						22.3	21.5	20.4	20.1	19.1	18.1	17.5	16.9	16.3
10,000	-5°C	23°F							21.0	19.9	19.7	18.8	17.8	17.1	16.6	16.0
12,000	-9°C	16°F									19.3	18.4	17.5	16.8	16.3	15.7
14,000	-13°C	9°F											17.2	16.5	16.0	15.5
16,000	-17°C	2°F												16.2	15.8	15.3
18,000	-21°C	-5°F													15.6	15.1
20,000	-25°C	-12°F														14.9

NOTE: Add .4" MP for each 10°C (18°F) OAT above standard day temperature. Subtract .4" MP for each 10°C (18°F) below standard day temperature. If OAT above standard precludes obtaining the desired MP, use the next higher RPM/MP with appropriate temperature correction to MP.

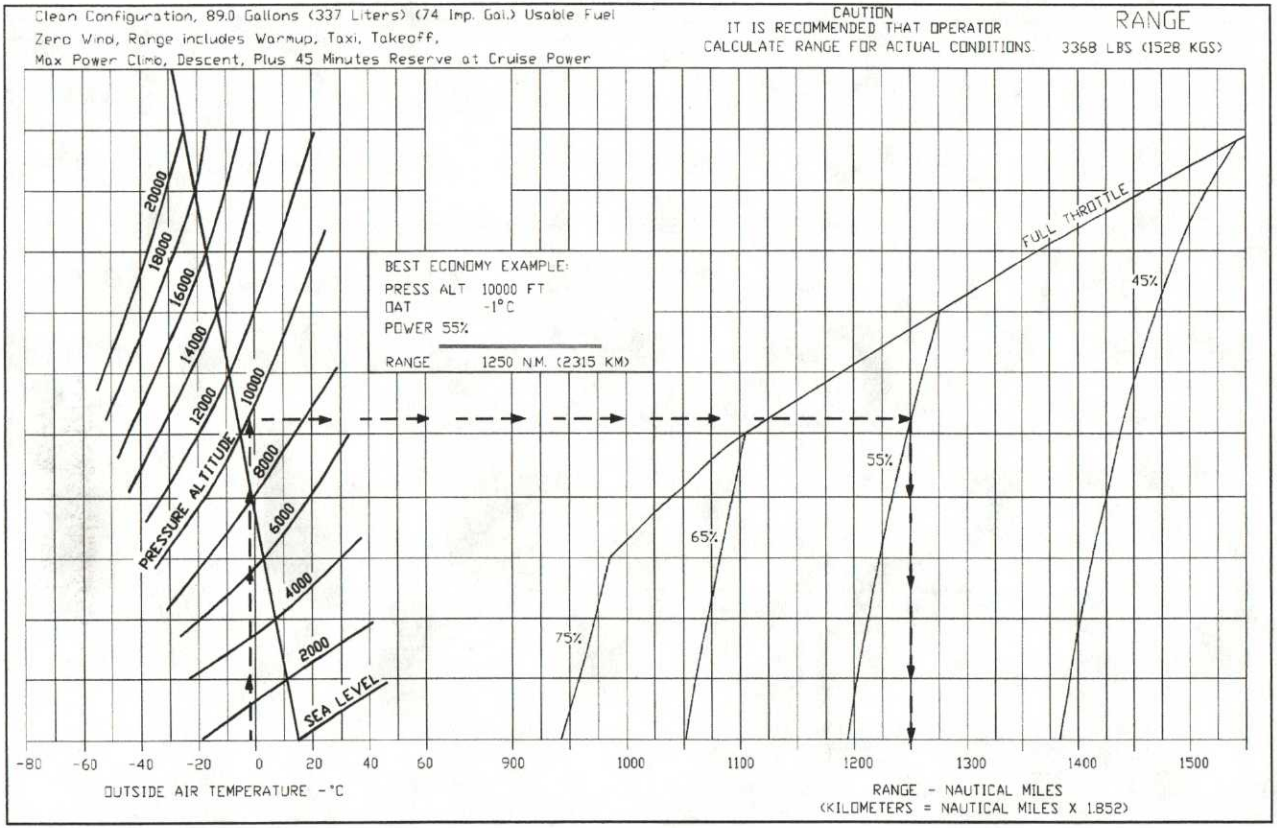
M20R (OVATION 2) SPEED POWER VS ALTITUDE

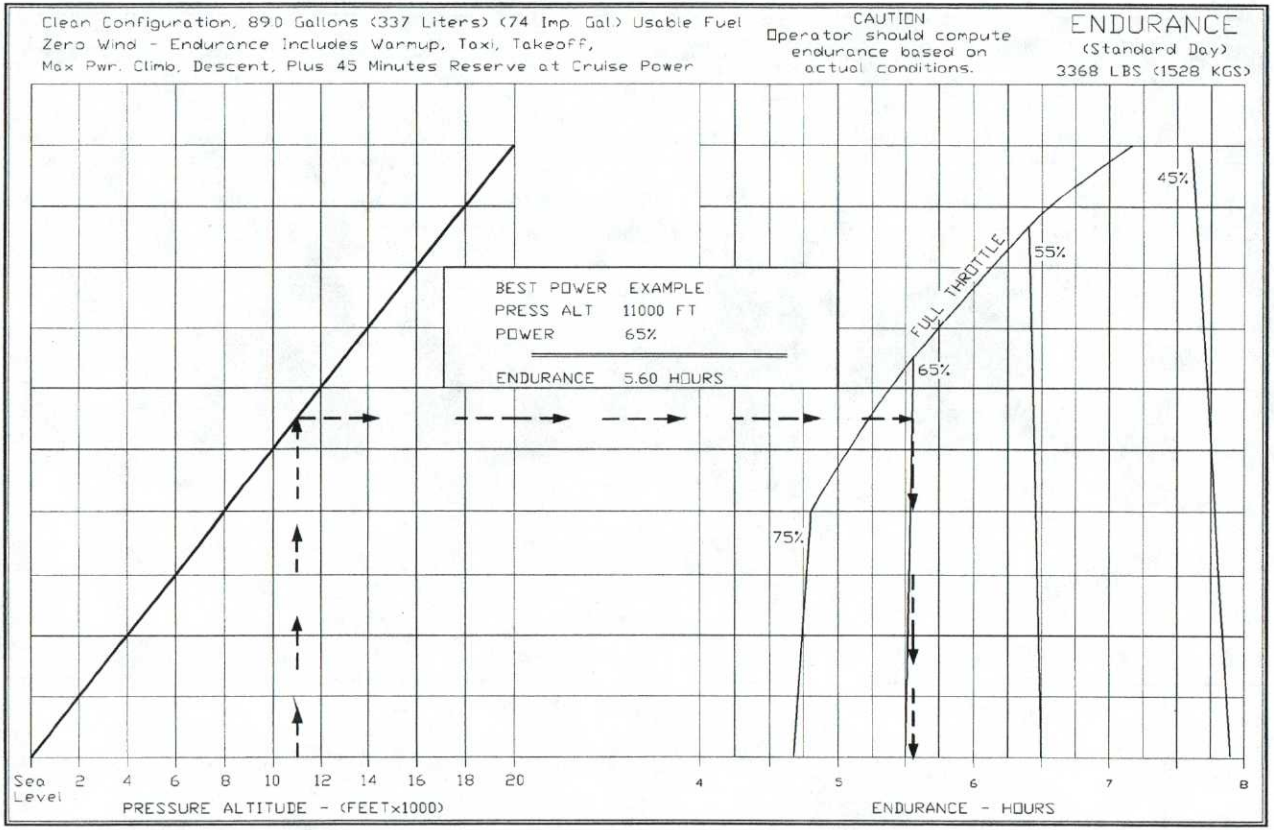


RANGE - BEST POWER

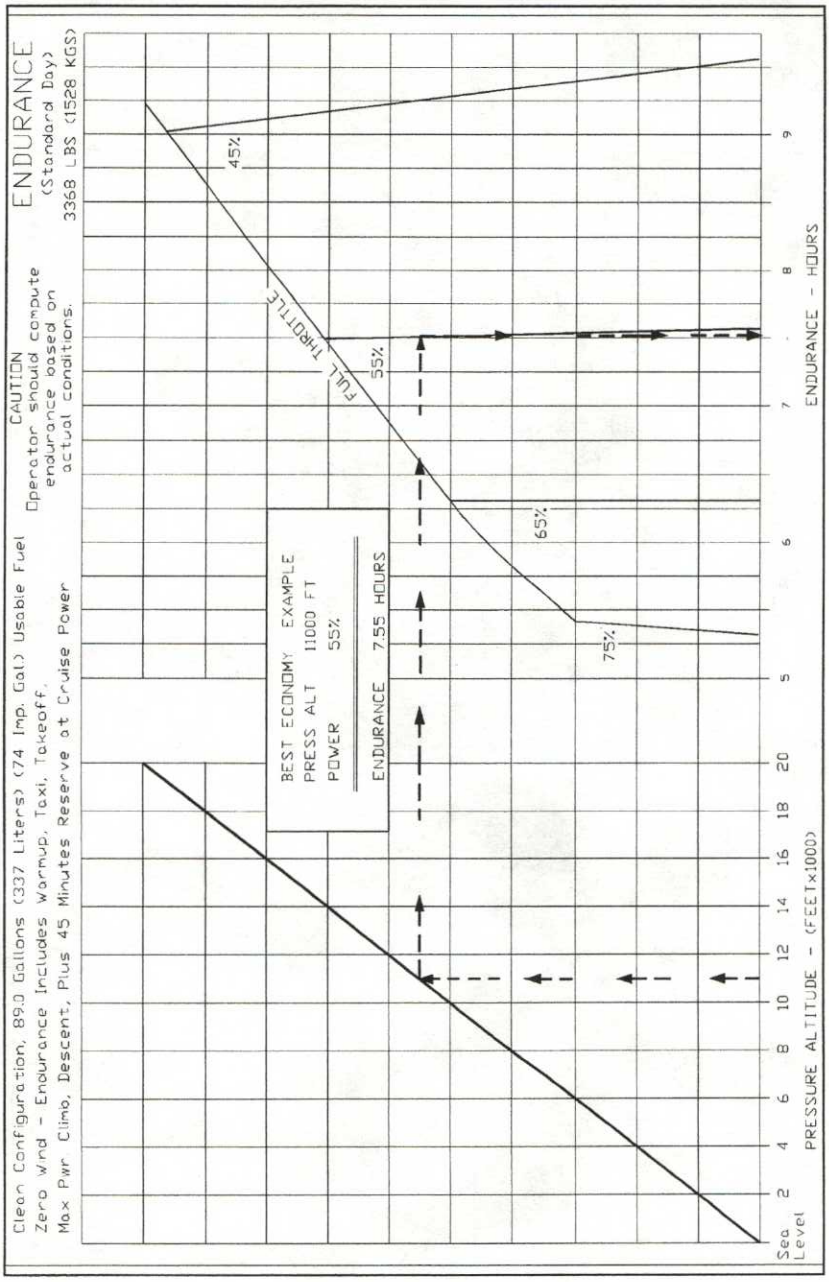


RANGE - BEST ECONOMY




Clean Configuration, 89.0 Gallons (337 Liters) (74 Imp. Gal) Usable Fuel
Zero Wind - Endurance Includes Warmup, Taxi, Takeoff,
Max Pwr. Climb, Descent, Plus 45 Minutes Reserve at Cruise Power
CAUTION
Operator should compute endurance based on actual conditions.
ENDURANCE
(Standard Day)
3368 LBS (1528 KGS)
BEST POWER EXAMPLE
PRESS ALT 11000 FT
POWER 65%
ENDURANCE 5.60 HOURS
45%
55%
FULL THROTTLE
65%
75%
Sea Level
2
4
6
8
10
12
14
16
18
20
PRESSURE ALTITUDE - (FEET x 1000)
4
5
6
7
8
ENDURANCE - HOURS

ENDURANCE - BEST ECONOMY



TIME-FUEL-DISTANCE TO DESCEND

TIME-FUEL-DISTANCE TO DESCEND

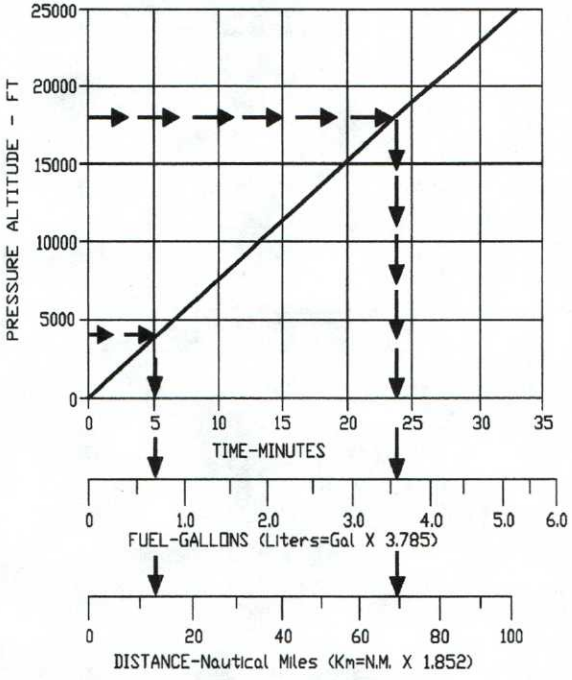
150 KIAS DESCENT SPEED

ASSOCIATED CONDITIONS:

POWER: 2000 RPM/MAP AS REQ'D TO MAINTAIN
750 FPM RATE OF DESCENT
LANDING GEAR: UP
FLAPS: UP
MIXTURE:
LEAN TO BLUE ARC or ENRICHEN FOR SMOOTHNESS

EXAMPLE:

INITIAL PRESSURE ALT:	18000
FINAL PRESSURE ALT:	4000
TIME TO DESCEND:	24.0-5.0=19 MINUTES
FUEL TO DESCEND:	3.6-0.7=2.9 GALLONS
DISTANCE TO DESCEND:	69.0-13.0=56.0 NAUTICAL MILES



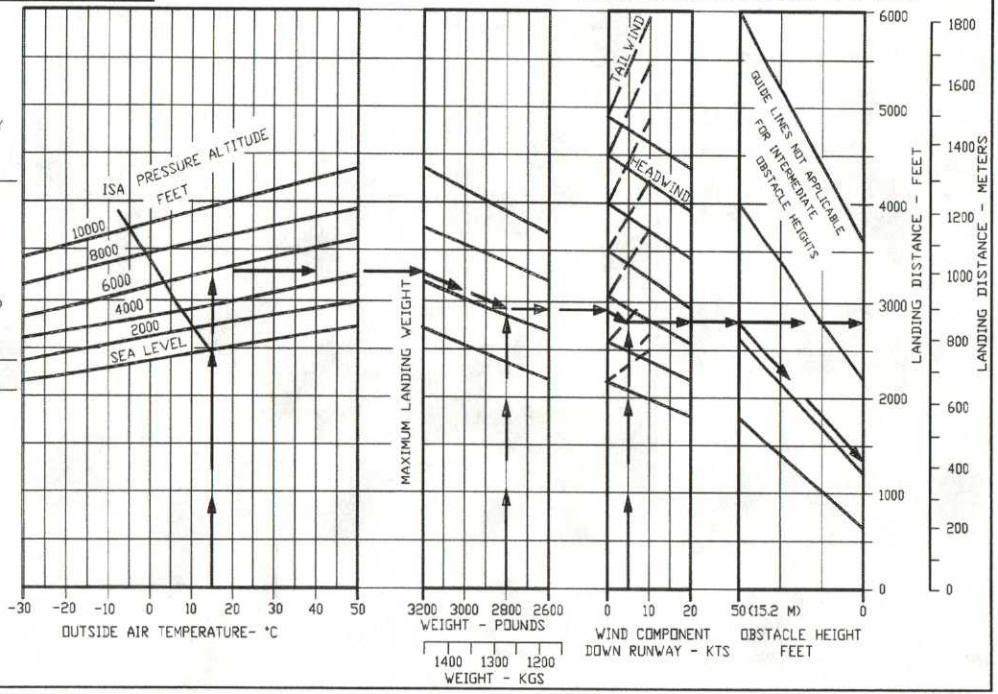
LANDING DISTANCE

LANDING WEIGHT - LBS (KGS)	APPROACH SPEED KIAS
3200 (1452)	75
2900 (1315)	71
2600 (1175)	68

NOTE:
1) MAXIMUM DEMONSTRATED CROSSWIND IS 13 KNOTS.

ASSOCIATED CONDITIONS:

POWER	IDLE
LANDING GEAR	DOWN
WING FLAPS	FULL DOWN (33°)
RUNWAY SURFACE	PAVED, LEVEL, DRY
BRAKING	MAXIMUM

EXAMPLE:

OAT	15° C
PRESSURE ALTITUDE	6000 FT.
WEIGHT	2800 LBS (1270 KGS)
HEADWIND COMPONENT	5 KTS
GROUND ROLL	1350 FT. (411 M)
TOTAL LANDING DISTANCE (50 FT. (15.2 M) OBSTACLE)	2800 FT. (853 M)